DEFINITY®
Enterprise Communications Server
Release 10
Administration for Network Connectivity

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The equipment described in this manual complies with standards of the following organizations and laws, as applicable:

- Australian Communications Agency (ACA)
- American National Standards Institute (ANSI)
- Canadian Standards Association (CSA)
- Committee for European Electrotechnical Standardization (CENELEC) – European Norms (EN’s)
- Digital Private Network Signaling System (DPNSS)
- European Computer Manufacturers Association (ECMA)
- European Telecommunications Standards Institute (ETSI)
- FCC Rules Parts 15 and 68
- International Electrotechnical Commission (IEC)
- International Special Committee on Radio Interference (CISPR)
- International Telecommunications Union - Telephony (ITU-T)
- ISDN PBX Network Specification (IPNS)
- National ISDN-1
- National ISDN-2
- Underwriters Laboratories (UL)

Product Safety Standards

This product complies with and conforms to the following international Product Safety standards as applicable:

Safety of Information Technology Equipment, IEC 60950, 3rd Edition including all relevant national deviations as listed in Compliance with IEC for Electrical Equipment (IECEE) CB-96A.

Safety of Laser products, equipment classification and requirements:

- IEC 60825-1, 1.1 Edition
- Safety of Information Technology Equipment, CAN/CSA-C22.2 No. 60950-00 / UL 60950, 3rd Edition
- Safety Requirements for Customer Equipment, ACA Technical Standard (TS) 001 - 1997
- One or more of the following Mexican national standards, as applicable: NOM 001 SCFI 1993, NOM SCFI 016 1993, NOM 019 SCFI 1998

Electromagnetic Compatibility (EMC) Standards

This product complies with and conforms to the following international EMC standards and all relevant national deviations:

Limits and Methods of Measurement of Radio Interference of Information Technology Equipment, CISPR 22:1997 and EN55022:1998.

Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurement, CISPR 24:1997 and EN55024:1998, including:

- Electrostatic Discharge (ESD) IEC 61000-4-2
- Radiated Immunity IEC 61000-4-3
- Electrical Fast Transient IEC 61000-4-4
- Lightning Effects IEC 61000-4-5
- Conducted Immunity IEC 61000-4-6
- Mains Frequency Magnetic Field IEC 61000-4-8
- Voltage Dips and Variations IEC 61000-4-11
- Powerline Harmonics IEC 61000-3-2
- Voltage Fluctuations and Flicker IEC 61000-3-3

Federal Communications Commission Statement

Part 15:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Part 68: Answer-Supervision Signaling. Allowing this equipment to be operated in a manner that does not provide proper answer-supervision signaling is in violation of Part 68 rules. This equipment returns answer-supervision signals to the public switched network when:

- answered by the called station,
- answered by the attendant, or
- routed to a recorded announcement that can be administered by the customer premises equipment (CPE) user.

This equipment returns answer-supervision signals on all direct inward dialed (DID) calls forwarded back to the public switched telephone network. Permissible exceptions are:

- A call is unanswered.
- A busy tone is received.
- A reorder tone is received.

Avaya attests that this registered equipment is capable of providing users access to interstate providers of operator services through the use of access codes. Modification of this equipment by call aggregators to block access dialing codes is a violation of the Telephone Operator Consumers Act of 1990.

This equipment complies with Part 68 of the FCC Rules. On the rear of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN) for this equipment. If requested, this information must be provided to the telephone company.

The REN is used to determine the quantity of devices which may be connected to the telephone line. Excessive RENs on the telephone line may result in devices not ringing in response to an incoming call. In most, but not all areas, the sum of RENs should not exceed 5.0. To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company.

REN is not required for some types of analog or digital facilities.

Means of Connection

Connection of this equipment to the telephone network is shown in the following table.

Manufacturer's Port Identifier	FIC Code	SOC/REN/ A.S. Code	Network Jacks
Off/On premises station	OL13C	9.0F	RJ2GX, RJ21X, RJ11C
DID trunk	02RV2-T	0.0B	RJ2GX, RJ21X
CO trunk	02GS2	0.3A	RJ21X
CO trunk	02LS2	0.3A	RJ21X
Tie trunk	TL31M	9.0F	RJ2GX
Basic Rate Interface	02IS5	6.0F, 6.0Y	RJ49C
1.544 digital interface	04DU9-BN, 1KN, 1SN	6.0F	RJ48C, RJ48M
120A2 channel service unit	04DU9-DN	6.0Y	RJ48C

If the terminal equipment (for example, the DEFINITY® System equipment) causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with this equipment, for repair or warranty information, please contact the Technical Service Center at 1-800-242-2121 or contact your local Avaya representative. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

It is recommended that repairs be performed by Avaya certified technicians.
The equipment cannot be used on public coin phone service provided by the telephone company. Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.
This equipment, if it uses a telephone receiver, is hearing aid compatible.

Canadian Department of Communications (DOC) Interference Information

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

DECLARATIONS OF CONFORMITY

United States FCC Part 68 Supplier's Declaration of Conformity (SDoC)

Avaya, Inc. in the United States of America hereby certifies that the equipment described in this document and bearing a TIA TSB-168 label identification number complies with the FCC's Rules and Regulations 47 CFR Part 68, and the Administrative Council on Terminal Attachments (ACTA) adopted technical criteria.
Avaya further asserts that Avaya handset equipped terminal equipment described in this document complies with Paragraph 68.316 of the FCC Rules and Regulations defining Hearing Aid Compatibility and is deemed compatible with hearing aids.
Copies of SDoCs signed by the Responsible Party in the U. S. can be obtained by contacting your local sales representative and are available on the following Web site:
http://support.avaya.com/elmodocs2/DoC/SDoC/index.jhtml/
All DEFINITY® system products are compliant with FCC Part 68, but many have been registered with the FCC before the SDoC process was available. A list of all Avaya registered products may be found at:
http://www.part68.org/
by conducting a search using "Avaya" as manufacturer.

European Union Declarations of Conformity

CE

Avaya Inc. declares that the equipment specified in this document bearing the "CE" (*Conformité Europeénne*) mark conforms to the European Union Radio and Telecommunications Terminal Equipment Directive (1999/5/EC), including the Electromagnetic Compatibility Directive (89/336/EEC) and Low Voltage Directive (73/23/EEC). This equipment has been certified to meet CTR3 Basic Rate Interface (BRI) and CTR4 Primary Rate Interface (PRI) and subsets thereof in CTR12 and CTR13, as applicable.
Copies of these Declarations of Conformity (DoCs) signed by the Vice President of DEFINITY® systems research and development, Avaya Inc., can be obtained by contacting your local sales representative and are available on the following Web site:
http://support.avaya.com/elmodocs2/DoC/IDoC/index.jhtml/

Japan

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may occur, in which case, the user may be required to take corrective actions.

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Network Connections

Digital Connections - The equipment described in this document can be connected to the network digital interfaces throughout the European Union.
Analogue Connections - The equipment described in this document can be connected to the network analogue interfaces throughout the following member states:

Belgium	Germany	Greece	Italy	Luxemburg
Netherlands	Spain	United Kingdom		

LASER Product

The equipment described in this document may contain Class 1 LASER Device(s) if single-mode fiber-optic cable is connected to a remote expansion port network (EPN). The LASER devices operate within the following parameters:

- Maximum power output –5 dBm to -8 dBm
- Center Wavelength 1310 nm to 1360 nm
- CLASS 1 LASER PRODUCT IEC 60825-1: 1998

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About This Document

This book describes how to administer connections among DEFINITY® ECS switches (csi, si, and r models), DEFINITY ONE, GuestWorks, IP600 Internet Protocol Communications Server, and Avaya R300 Remote Office. The main focus is on TCP/IP for DCS signaling and H.323 trunks.

Purpose

This document provides information about connections between DEFINITY ECS systems in a network using IP connections.

For installation or upgrade procedures for establishing physical connectivity between DEFINITY switches, or for connecting the CMS and Intuity AUDIX adjuncts to a DEFINITY switch. Refer to the upgrades and installation documents listed in the References section.

Audience

This document is intended for people involved in planning, designing, or administering DEFINITY ECS systems as part of networks using IP connectivity.

What's new in this book

New information is included for the following features:

- Alternate gatekeeper
- C-LAN circuit pack administration
- Interworking between TGU/TGE Trunks and ISDN (Italy)
- QSIG/Stand-alone path replacement
- QSIG/DCS Voice Mail Interworking
- Quality of Service (QOS) administration

Content

The information in this book is presented as follows:

- Networking Overview provides an overview of DEFINITY Connectivity and IP addressing.
- Circuit Packs provides an overview of circuit packs used with IP connectivity.
- IP Networking Administration provides procedures for initial administration of IP trunks using H.323 IP connections.
- Quality of Service and Voice Quality Administration provides instructions for administering Quality of Service on a DEFINITY system.
- Networking Examples describes how to administer TCP/IP data connections between DEFINITY ECS switches using the C-LAN circuit pack.
- A Complex Networking Example shows examples of administration screens used for setting up a complex network.
- Private Networking describes DCS features and QSIG.
- IP Routes explains how to add IP routes when you want to define specific network paths through gateways other than the default gateway.
- IP Addressing describes IP addressing, subnetting, and routing.
- Index

Conventions used

This section explains how certain terms are used in this book.

- Screen

  A screen is the set of switch-administration interface pictures that contain the fields that hold the switch-translations values. In some parts of this book, the terms “screen” and “form” are used interchangeably.

- Node

  In this book, node is used to refer to a network interface, as with TCP/IP connectivity. For example, each of the 17 ports on the C-LAN board is a node. This is also the common usage in a data networking environment. With these definitions, a “DCS node” (a switch) can have many “IP nodes,” (network interfaces). This is how the term is used on the Node Names, Data Module, Processor Channel, and IP Routing screens.

  There is another meaning for the term “node” for DEFINITY ECS switches connected in a network. In a DCS network, node means a switch or adjunct. This is how the term is used on the Dial Plan screen for the field name, “Local Node Number.”

- IP Media Processor

  IP Media Processor refers to the TN2302 circuit pack.

- IP Interface and MedPro

  In this book, IP Interface assembly, MedPro board, and the TN802B circuit pack are used interchangeably.

  The official name for the TN802B circuit pack is the IP Interface assembly. It is a media processing circuit pack in a 3-slot wide assembly. It can be administered to operate in either IP Trunk mode or MedPro mode.

How to access this book from the web

If you have internet access, you can view and download the latest version of DEFINITY ECS Release 10
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Networking Overview

This chapter provides background information to help you understand and use this book. It describes how DEFINITY ECS switches can be connected, with a focus on IP connectivity.

DEFINITY Switch Connectivity

This section describes the basic components of a network of DEFINITY switches, and how voice and signaling data are transmitted between switches for different types of switch connections. It also provides a summary of the administration procedures for connecting switches via an IP network using the C-LAN and media processor circuit packs.

Connectivity Overview

DEFINITY switches can be connected in different ways for various reasons. Connected switches enable people within an enterprise to easily communicate with one another, regardless of their physical location or the particular communications server they use. Inter-switch connections also provide shared communications resources such as messaging and Call Center services.

Types of connections

Trunks

Switches communicate with each other over trunk connections. There many types of trunks that provide different sets of services. Commonly used trunk types are (Central Office) CO trunks, which provide connections to the public telephone network through a central office, and tie trunks, which provide connections between switches in a private network.

These and other common trunk types are described in *DEFINITY ECS Administrator's Guide*, 555-233-506.

DEFINITY ECS Release 8 introduced the H.323 trunk, which allows voice and fax data to be transmitted over the Internet to another DEFINITY system with H.323 trunk capability. The H.323 trunk supports Q.931 services such as DCS+ and QSIG.

Networks

When two or more switches are connected via tie trunks, they form a private network. There are two basic types of networks for Avaya switches:

- Main-satellite/tributary (MS/T) — A network of switches in which a main switch is fully functional and provides attendants and CO trunks for connected satellite switches. Tributary switches are connected to the main and may have their own attendant and CO trunks. The main switch may be connected to one or more Electronic tandem networks (ETNs).
- Electronic tandem network (ETN) — A wide-area network of switches in which a call can tandem through one or more switches on its way from the originating switch to the destination switch. ETNs have a uniform dial plan (UDP), automatic alternate routing (AAR), and automatic route selection (ARS).

AT&T provides a service called software-defined network (SDN) that allows you to build a private network through the AT&T public network facilities. An ETN can be combined with an SDN to form a hybrid (ETN/SDN) network.

The switches in MS/T or ETN networks need to be provisioned with special DEFINITY networking software packages.

DCS

Distributed Communications System (DCS) is a messaging overlay for ETN or MS/T networks. The overlay provides signaling connections between network nodes that enable certain call features to operate transparently across the DCS network. The transparent features operate as if the switches in the DCS network were a single switch. For example, the DCS Call Coverage feature enables calls to an extension on one switch to be covered by extensions on a remote switch in the network.

DCS consists of two components, routing and message signaling. Routing the message requires one of several networking software packages. UDP is typically used because it is included with DCS at no additional charge.

Although DCS is actually a messaging overlay for an existing network, it is commonly thought of as a type of network itself. In this document, DCS network refers to a cluster of switches that are part of an existing ETN or MS/T network and are administered for DCS.

In addition to tie-trunk connections for the transmission of voice and call-control data, DCS requires a special signaling connection to carry the information needed to make the DCS features work. This signaling connection, or link, between two switches in a DCS network can be implemented in one of three ways:

- over a processor interface (PI) channel (on the si model) or a packet gateway (PGATE) channel (r model) using the X.25 protocol
- over an ISDN-PRI D-channel (csi, si, or r models)
- over a TCP/IP (either PPP or 10Base-T Ethernet) connection (csi, si, or r models)

NOTE:
The csi model does not support X.25 connections.

TCP/IP signaling connections were introduced with DEFINITY Release 7, and X.25 was no longer sold. DEFINITY ECS now provides TCP/IP connections or ISDN-PRI for DCS signaling. However, existing systems with X.25 and/or ISDN-PRI DCS signaling can be upgraded to the latest version and keep those signaling links, or a new system can be added to an existing DCS network. Connections to the CMS Call Center and Intuity AUDIX adjuncts can use either X.25 or 10Base-T DCS signaling.

When a DCS network uses a mixture of two or three of the different DCS signaling types, one or more switches in the network must act as a gateway. A gateway switch is connected between two switches using different signaling protocols and the gateway enables the two end switches to communicate by converting the signaling messages between the two protocols. A gateway switch can provide conversion between two or all three of the signaling protocols, but only one protocol can be used for DCS signaling between any two switches.

What is transmitted between connected switches?

A telephone call consists of voice (bearer) data and call-signaling data. If the call is over a DCS network, DCS signaling data is also required. The DCS signaling data is sent over a separate path from the voice and call-signaling data.

Call-signaling data

The call-signaling data includes messages that set up the call connection, maintain the connection during the call, and remove the connection when the call is finished.

DCS-signaling data

The DCS-signaling data is separate from the call-signaling data. The type of connection determines the signaling protocol for the DCS-signaling data transmission.

Transmission between switches

The following table gives a summary of the different types of call connections and how the voice and signaling data are transmitted between switches.

Table 1. Call connections and data transmissions

Connection Type	Tie Trunk		LAN or WAN	
	Voice & Call-Signaling	DCS Signaling	Voice	Call & DCS Signaling
ISDN (DCS+) & QSIG	T1/E1 facilities using ISDN-PRI or DS1 B-Channel	TSCs on the ISDN-PRI D-Channel		TSCs on the ISDN-PRI D-Channel
X.25	T1/E1 facilities using ISDN-PRI or DS1 B-Channel OR Analog trunk	Packet PVC		
C-LAN PPP	T1/E1 facilities using ISDN-PRI or DS1 B-Channel OR Analog trunk	Packet PVC		
C-LAN Ethernet	T1/E1 facilities using ISDN-PRI or DS1 B-Channel OR Analog trunk			TCP Packet (DCS signaling only)
IP Interface			RTP Packet IP media processor	TCP Packet (C-LAN)

For DCS+, X.25, and ppp connection types, the signaling and voice data are sent together over tie-trunk facilities as TDM-multiplexed frames. The DCS signaling data is sent as packets over a permanent virtual circuit (PVC) on tie-trunk facilities.

For C-LAN Ethernet connections, the signaling and voice data are sent together over tie-trunk facilities as TDM-multiplexed frames. The DCS signaling data is sent as TCP datagrams over an IP network through the C-LAN.

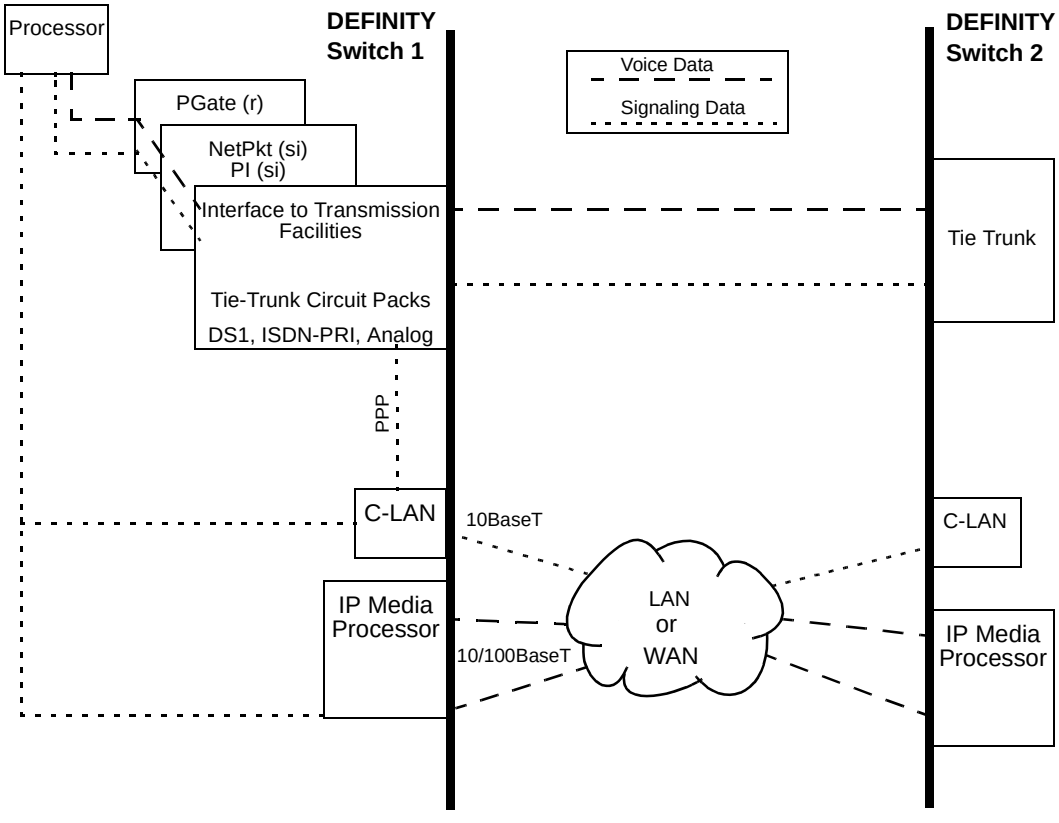


Figure 1. Components of Switch Connectivity

Types of circuit packs

The following section describes the function of each circuit pack shown in the Components of Switch Connectivity figure.

Processor

The processor board is the main control element in handling the call. This is the UN332B for the r model, the TN 790B for the si model, and the TN798B for the csi model.

PGATE (r only)

On the r model, the PGATE board (TN577) connects the processor to the packet bus and terminates X.25 signaling.

NetPkt (si only)

The Network control/Packet Interface (NetPkt) board (TN794) replaces the NETCON (TN777B) and the PACCON (TN778) circuit packs in the R7si model. It also replaces the LAPD portion of the PI (TN765) circuit pack.

C-LAN

The C-LAN circuit pack (TN799B/TN799C) enables signaling data to be transmitted via the TCP/IP protocols across a LAN or WAN. Signaling types include call setup and teardown, registration of IP softphones, TSCs, QSIG and DCS signaling.

The C-LAN circuit pack provides the data link interface between the switch processor and the transmission facilities. C-LAN prepares the signaling information for TCP/IP transmission over one of two pathways — either via an Ethernet LAN or a point to point protocol (PPP) connection — depending on how the data link is administered. If the link is administered for an ethernet connection, the signaling data is sent out on a 10Base-T network, which is connected directly to the C-LAN ethernet port. If the link is administered for a PPP connection, C-LAN inserts the signaling data on the TDM bus for subsequent inclusion (via the switching fabric) in the same DS1 bit stream as the voice transmissions.

The C-LAN board can be inserted in any available port slot.

Although you can insert a C-LAN into DEFINITY ONE, this model can supply 500 sockets without a C-LAN. About 160 of the DEFINITY ONE build-in sockets are likely to be used for non-networking purposes.

IP Media Processor

The TN2302 IP Media Processor reduces per-port costs and improves quality through its dynamic jitter buffers. It performs echo cancellation, silence suppression, DTMF detection, and conferencing.

The TN2302 IP Media Processor can work in the same DEFINITY with the TN802 IP Trunking and the TN802B IP Interface Assembly. DEFINITY chooses media processing resources for an IP endpoint from the TN2302 over the TN802B, when both type of media processing are available on the system.

The TN2302 enables the transmission of voice and fax data (non-DCS signaling) over IP connections. The IP Media Processor is suitable for H.323 multimedia applications in DEFINITY and other H. 323 V2 compliant endpoints.

IP-Interface

Like the TN2302 IP Media Processor, the IP Interface circuit pack (TN802B) enables two switches to transmit voice data between them over an IP network. The TN802B normally operates in the MedPro mode, which enables support of applications that comply with the H.323-v2 protocols. It also operates in the IP Trunk mode supporting R7 IP trunks that emulate DS1 connections, however this method of connections obsolete.

Tie-Trunk Circuit Packs

The tie-trunk circuit packs provide an interface between the switch and the transmission facilities for voice data, call-signaling data and data. See *System Description*, 555-230-211 for descriptions of tie-trunk (and other) circuit packs.

DEFINITY Connection types

This section gives an overview of the types of connections that can be set up with DEFINITY switches and adjuncts, and capacities for some connectivity parameters.

Types of connections

The following table lists the types of connections possible with each DEFINITY model and adjunct.

Table 2. Types of connections

DEFINITY ECS Model	Connection Type	Endpoint
R9csi and later	Ethernet	DCS, CMS, Intuity AUDIX, IP Telephone, IP Softphone, Avaya R300
	Synchronous PPP	DCS
	ISDN-PRI	DCS+
	H.323 Trunk	DCS+
	Synchronous PPP	DCS

Continued on next page

Table 2. Types of connections — *Continued*

R9si and later	Ethernet	DCS, CMS, Intuity AUDIX, IP Telephone, IP Softphone, Avaya R300
	Synchronous PPP	DCS
	ISDN-PRI	DCS+
	BX.25	DCS, CMS, Intuity AUDIX, DEFINITY AUDIX
	H.323 Trunk	DCS+
R9r and later	Ethernet	DCS, CMS, Intuity AUDIX, IP Telephone, IP Softphone, Avaya R300
	Synchronous PPP	DCS
	ISDN-PRI	DCS+
	BX.25	DCS, CMS, Intuity AUDIX, DEFINITY AUDIX
	H.323 Trunk	DCS+
	Synchronous PPP	DCS

If an R9 or later DEFINITY switch is connected to two endpoints by different connection types, it acts as a gateway (protocol converter) between the endpoints.

Avaya R300 Remote Office Communicator

The Avaya R300 Remote Office Communicator provides an effective way to maintain remote DCP and analog phones and local trunks from a DEFINITY ECS. In addition to voice telephony features, the Avaya R300 provides the remote site with data integration capability and provides a conversion of voice and data applications in the same product.

This remote application provides full DEFINITY functionality and features to the remote site either through a WAN or LAN using IP protocol.

LAN Security

Often customers are concerned that a user could access the switch using the inads line, gain access to C-LAN, and then access to the customer's LAN. DEFINITY's architecture prevents access to the customer's LAN as depicted in Figure 2.

Figure 2 shows a high level view of the system architecture of a DEFINITY switch with a C-LAN port board. This architectural view shows that logins via the inads line terminate in Software; Software communicates with Firmware over an internal bus via a limited message set. There are two main reasons why a user can not access a customer's LAN via the inads line:

- A user logging into Software can not get direct access to the C-LAN Firmware. The user can only enter SAT commands that request C-LAN information or to configure C-LAN (ip addresses, clock).
- The C-LAN application TFTP is currently disabled and can not be enabled by DEFINITY Software. TELNET only interconnects C-LAN Ethernet clients to the system management application on the switch. FTP exists only as a server and is used only for firmware downloads, and it cannot connect to the client network.

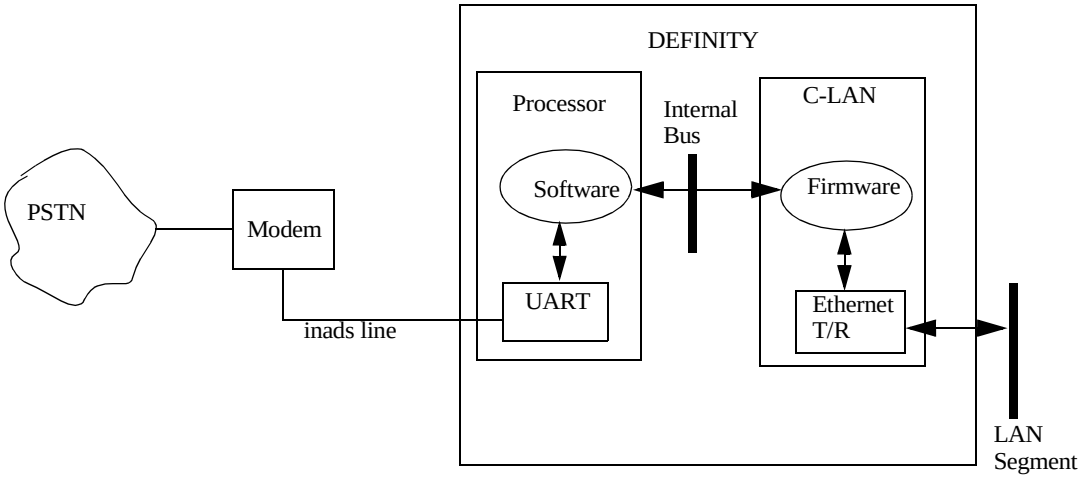


Figure 2. High Level System Architecture

Circuit Packs

This chapter contains a description of the TN799 C-LAN, the TN2302 IP Media Processor and the UDS1 tie trunk circuit packs. Also included are installation and administration for these circuit packs.

TN799 C-LAN

Systems in a DCS network are interconnected by both tie trunks (for voice communications) and data links (for control and transparent feature information). Various DS1 interface circuit packs (including TN464C, TN767C, TN722, and TN760) provide the voice-communications interface. For TCP/IP connectivity, the data-link interface is provided by a TN799 C-LAN circuit pack.

The C-LAN handles the data-link signaling information in one of two configurations; either Ethernet or point-to-point (ppp).

- In the Ethernet configuration, the C-LAN passes the signaling information over a separateTCP/IP network, usually via a hub or Ethernet switch. (Avaya recommends a data switch over a hub to minimize broadcast traffic.) For this configuration, install the C-LAN circuit pack and connect the appropriate pins of the C-LAN I/O field to the hub or Ethernet switch as described below.
- In the ppp configuration, the C-LAN passes the data-link signaling to the DS1 for inclusion in the same DS1 bit stream as the DCS voice transmissions. For this configuration, install the C-LAN circuit pack; no other connections are needed. The appropriate DS1 circuit packs must be installed if they are not already present.

Physical Addressing

The Address Resolution Protocol (ARP) on the C-LAN circuit pack relates the 32-bit IP address configured in software, to the 48-bit MAC address of the C-LAN circuit pack. The MAC address is burned into the board at the factory. The C-LAN board has an ARP table that contains the IP addresses associated with each hardware address. This table is used to route messages across the network. Each C-LAN board has one MAC address, one Ethernet address, and up to 16 PPP addresses.

Installing the TN799 C-LAN

Before you install the C-LAN circuit pack, be sure you understand the requirements of your data network. Refer to http://support.avaya.com and search for the White paper *Avaya IP Voice Quality Network Requirements*.

To install the TN799 C-LAN:

Insert C-LAN Circuit Packs

TCP/IP connections (Ethernet or ppp) require a TN799 C-LAN circuit pack. Complete the following steps to install these circuit packs.

1. Determine the carrier/slot assignments of the circuit packs to be added. Both types of circuit pack can go into any port slot with the following exception — the C-LAN circuit pack cannot be installed in the A carrier for the r model.
2. Insert the circuit packs into the slots specified in step 1. You do not need to power down the cabinet to install a C-LAN circuit pack.

Administer the C-LAN Bus Bridge for csi models

For the csi model only, complete the following steps to administer the Bus Bridge for the new C-LAN circuit pack. Administration of system-parameters maintenance must be performed by an Avaya representative using the craft or higher login.

NOTE:
If there are 2 C-LAN circuit packs installed in this csi switch, administer the Bus Bridge for *only one* of them.

1. Enter change system-parameters maintenance.
2. Move to the Packet Intf2 field and enter **y**.
3. Enter the location of the C-LAN circuit pack in the Bus Bridge field (for example, 01a08 for cabinet 1, carrier A, and slot 8).
4. Enter the port bandwidths or use the defaults in the Pt0, Pt1, and Pt2 Inter-Board Link Timeslots fields.
5. Submit the screen.
6. Verify that the bus bridge LED is lit on the C-LAN circuit pack. This indicates that the packet bus is enabled.

Test the Packet Bus and C-LAN Circuit Pack

To test the packet bus and the TN799 C-LAN circuit pack, the cabinet needs a TN771D Maintenance/Test circuit pack.

1. If there is no TN771D circuit pack in the cabinet, place one in a port slot.
2. Enter **test pkt port-network 1 long**. For more information about these tests, refer to the “test pkt command” section in the maintenance book.
3. If the TN771D circuit pack was already in the cabinet, leave it there.
4. If you added the TN771D circuit pack to the cabinet in order to test the TN799 circuit pack, remove it from the cabinet.

Install C-LAN Cables

Install a cable from the backplane peripheral connector to a hub or Ethernet switch as required. See the figure below.

1. Connect the 259A connector to the backplane connector of the port slot containing the C-LAN circuit pack.
2. Connect the Category 5 UTP cable between the 259A connector and a hub or Ethernet switch.

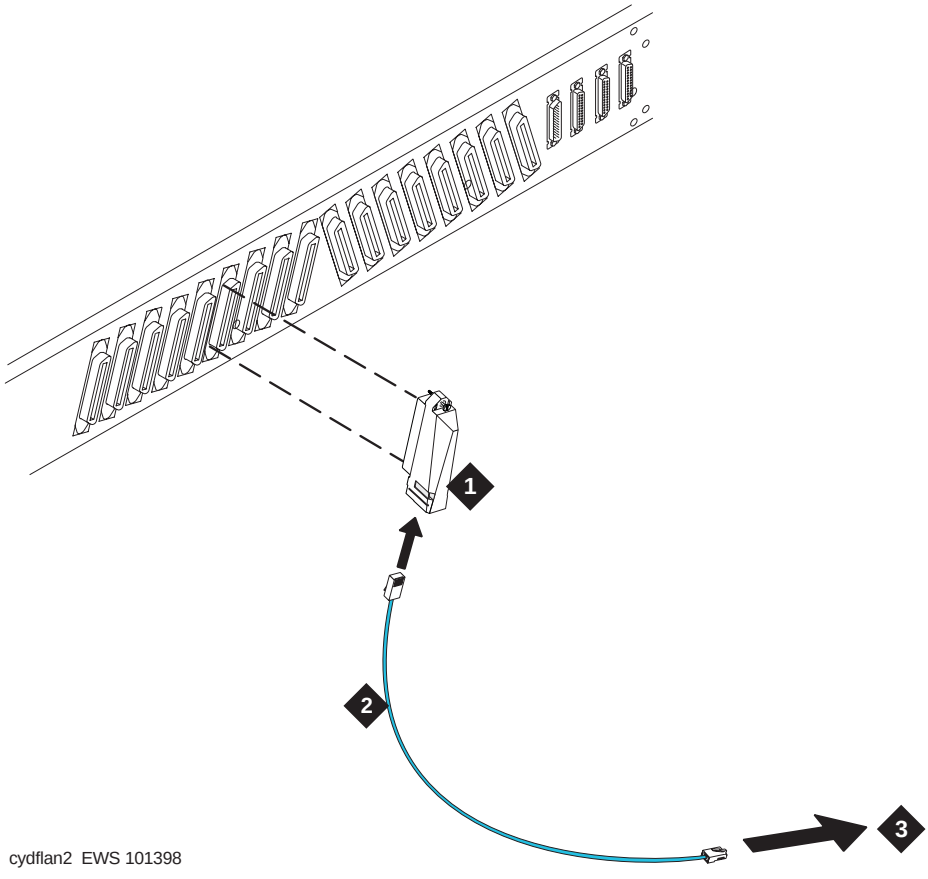


Figure Notes

1. 259A Connector
2. Category 5 UTP Cable (max length 100m)
3. hub or Ethernet switch

Figure 3. Cable Connection for C-LAN Connectivity

This connects port 17 on the C-LAN circuit pack to the LAN.

Default gateway

On LANs that connect to other networks or subnetworks, Avaya recommends that you define a default gateway. The default gateway node is a routing device that is connected to different (sub)networks. Any packets addressed to a different (sub)network, and for which no explicit IP route is defined, are sent to the default gateway node.

A default gateway can be assigned to a node (C-LAN port or IP Interface port) on the IP Interfaces screen.

The default node is a display-only entry on the Node Names screen with IP address 0.0.0.0. It acts as a variable that takes on unknown addresses as values. When the “default” IP route is set up, any address not known by the C-LAN is substituted for the default address in the default IP route, which uses the router as the default gateway.

Alternate Gatekeeper and C-LAN load balancing

Alternate gatekeeper gives endpoints alternate paths to the C-LANs on the DEFINITY system.

If registration with the original C-LAN circuit pack IP address is successful, the DEFINITY system sends back the IP addresses of all the C-LAN circuit packs in one network region, not including interconnected regions. These C-LAN addresses are called gatekeeper addresses. These addresses can also be used if the call signaling on the original C-LAN circuit pack fails.

If the network connection to one C-LAN circuit pack fails, the IP endpoint re-registers with a different C-LAN.

IP Telephones can be programmed to search for a gatekeeper independent of DEFINITY load-balancing. This provides increased reliability and supports multiple homing. The IP Telephone accepts gatekeeper addresses in the message from the Dynamic Host Configuration Protocol (DHCP) server or in the script downloaded from the Trivial File Transfer Protocol (TFTP) server. If the phone cannot contact the first gatekeeper address, it uses an alternate address. If the extension and password is rejected by the first gatekeeper, the IP Telephone contacts the next gatekeeper. The number of gatekeeper addresses the phone accepts depends on the length of the addresses administered into the DCHP server.

Alternate gatekeeper and registration addresses, and C-LAN circuit pack load-sharing, spread IP endpoint registration across more than one C-LAN circuit pack. With the TN799C vintage 4 or later, or TN799D, this increases system performance and reliability.

C-LAN load balancing and alternate gatekeeper addresses require IP stations that accept multiple IP addresses: IP telephone, IP softphone, CentreVu IP Agent or Avaya R300.

Endpoint capabilities

Endpoint	Number of Gatekeepers	How set
IP Telephone	8	■ on DHCP ■ on the DEFINITY system ■ manually on phone
IP Softphone	8	manually through options or properties of the IP Softphone after it is installed
IP Agent	8	manually through options or properties of the IP agent after it is installed
Avaya R300	2	manually through the Avaya R300 administration

NOTE:
DHCP servers send a list of alternate gatekeeper and C-LAN addresses to the IP Telephone endpoint. It is possible for someone to request IP addresses from the DHCP server.

TN2302 IP Media Processor

Use the TN2302 IP Media Processor to transmit voice and fax data (non-DCS signaling) over IP connections, and for H.323 multimedia applications in DEFINITY or other H.323 V2 compliant endpoints.The TN2302 IP Media Processor board supports the T.38 standard for fax transmissions.

The TN2302 IP Media Processor provides reduction of per-port costs and improved voice quality through its dynamic jitter buffers. The TN2302 IP Media Processor includes a 10/100BaseT Ethernet interface to support H.323 endpoints for DEFINITY IP trunks and H.323 endpoints.

The TN2302 IP Media Processor can perform echo cancellation, silence suppression, DTMF detection, and conferencing. It supports the following codecs, fax detection for them, and conversion between them:

- G.711 (mu-law or a-law, 64Kbps)
- G.723.1 (6.3Kbps or 5.3Kbps audio)
- G.729 (8Kbps audio)

Transmission interface

The TN2302 IP Media Processor contains improved voice quality through its dynamic jitter buffers. The TN2302's DSPs, by default, insert 5.0 dB of loss in the signal from the IP endpoints, and insert 5.0 dB of gain in the signal to the IP endpoints. This inserted dB change is under switch software control. Beginning in DEFINITY ECS R9.5, users can administer loss/gain, based on country code on the Terminal-parameters screen.

Hairpinning

The TN2302 IP Media Processor supports 64 ports of shallow hairpin. IP packets that do not require speech coder transcoding can be looped back at the UDP/IP layers with a simple change of addressing. This reduces delay and leaves DSP resources available.

Facility test calls

The TN2302 IP Media Processor is a service circuit pack, not a trunk circuit pack. Therefore, an H.323 tie trunk cannot be used for facility test calls. Use the ping command to test TN2302's ports.

Survivable remote EPN

Any survivable remote EPN containing a C-LAN board and H.323 station sets should also contain a TN2302 IP Media Processor.

Troubleshooting the TN2302 and C-LAN circuit pack

If the TN2302 IP Media Processor or C-LAN circuit pack is not working, try these basic procedures before contacting an authorized Avaya Service Center for assistance. The following table lists some common TN2302 IP Media Processor troubleshooting solutions.

Table 3. TN2302 IP Media Processor Troubleshooting

Area	Issue	Solution
SCREEN ACCESS	Switch does not allow the "IP Stations" or "H.323 Trunks' fields to be set to y	Review system version. IP Networking is not available on bug fixes older than V7. The "status ip-board" command is given on R8, however higher R9 capacities can not be administered.

Continued on next page

Table 3. TN2302 IP Media Processor Troubleshooting — *Continued*

Area	Issue	Solution
SCREEN ERROR MESSAGES	"Invalid board location; please press HELP" message error appears after submitting the **list measurements clan sockets hourly <board location>** command.	Inspect board location. The entered board location is invalid or does not contain a C-LAN (TN799) board.
	"No resource administered for this region" error message appears after submitting a list measurement command.	Enter correct resource type on ip-interfaces screen. Region number entered has no resources of type MEDPRO administered to it on the ip-interfaces screen.
	"This board is not an administered IP-Interface" error message appears after submitting the **list measurements clan sockets hourly <board location>** command.	Inspect board location. The entered board location contains a C-LAN which has not been administered on the ip-interfaces screen.
	"Invalid board location; please press HELP" error message appears after submitting the **list measurements clan sockets detail yesterday-peak** command.	Inspect board location. The entered board location is invalid or does not contain a C-LAN (TN799) board.
	"This board is not an administered IP-Interface" error message appears after submitting the **list measurements clan sockets detail yesterday-peak** command.	Inspect board location. The entered board location contains a C-LAN which has not been administered on the ip-interfaces screen.

Universal DS1 (UDS1) Circuit Packs

Universal DS-1 circuit packs have the same functionality as the DS1 circuit packs, with the addition of echo cancellation circuitry. The UDS1 offers long echo cancellation tail lengths of up to 96 milliseconds (ms).

The UDS1 circuit packs are intended for DEFINITY customers who encounter echo over circuits connected to the Direct Distance Dialing (DDD) network. Echo is most likely to occur when DEFINITY is configured for ATM, IP, and wideband. In addition, echo can occur on system interfaces to local service providers that do not routinely install echo cancellation equipment in all their circuits.

Echo cancellation is a software right-to-use feature that supports voice channels, and is not intended for data. When a data call is received, these circuit packs detect a modem tone and turn off echo cancellation for the duration of a data call. Echo cancellation is also selectable per channel, even though it is administered on a trunk group basis.

Echo Cancellation on UDS1 Circuit Packs

Follow this procedure to administer echo cancellation on UDS1 circuit packs.

System-Parameters Customer-Options

NOTE:
Starting with Release 10, the System Parameters Customer Options screen is display only. The License File controls the system software release, the Offer Category, features, and capacities. The init login does not have the ability to change the customer options, offer options, and special applications screens.

1. Type **display system-parameters customer-options**.
2. Find and review the following fields (they may appear on different pages of the screen:

Field	Conditions/Comments
Maximum Number of DS1 Boards with Echo Cancellation	Specifies the number of DS1 boards that have echo cancellation turned on.
DS1 Echo Cancellation	If y, echo cancellation is enabled.

3. Exit the screen.

Administer Echo Cancellation on Trunks

Since echo cancellation on the DS1 circuit packs are for voice channels, the circuit pack supports the following trunk group types:

- CO
- FX
- WATS
- DID
- DIOD
- DMI-BOS
- ISDN-PRI
- TIE

Administer the trunk group

1. Type **add trunk-group next** to open the Trunk Group screen.

```
add trunk-group next                                          Page 2 of x
TRUNK FEATURES
         ACA Assignment? _      Measured: ____
                                              Maintenance Tests? _
                       Data Restriction? _

  Abandoned Call Search? _
  Suppress # Outpulsing? _

     Charge Conversion: _____
         Decimal Point: ______
       Currency Symbol: ___
           Charge Type: _______   Receive Analog Incoming Call ID: ________
                                       Per Call CPN Blocking Code: ___
                                    Per Call CPN Unblocking Code: ___
                                                  MF Tariff Free? _
                              DS1 Echo Cancellation?
```

2. Move to the following field

Field	Conditions/Comments
DS1 Echo Cancellation	Enter y to enable echo cancellation on a per port basis.

3. Submit the screen.

Administer DS1 Circuit Pack

1. Type **add ds1 <port>** to open the DS1 Circuit Pack screen.

```
add ds1 01c0401                                              Page 1 of 2
                          DS1 CIRCUIT PACK

             Location: 01C04            Name: _________________
             Bit Rate: _____                Line Coding: ____
   Line Compensation: _                     Framing Mode: ___
      Signaling Mode: ___________               D-Channel: __
             Connect: __________       Interface: ____________
       Interconnect: ___           Peer Protocol: ________
                                    Country Protocol: ____
                                       Protocol Version: _
 Interface Companding: _____                          CRC? _
            Idle Code: ________
               DCP/Analog Bearer Capability: ________
   MMI Cabling Board: _____  MMI Interface: ESM

MAINTENANCE PARAMETERS

       Slip Detection? _  Near-end CSU Type: ________
   Echo Cancellation?
        EC Direction:
    EC Configuration:
```

2. On the DS1 Circuit Pack screen, complete the following fields:

Field	Conditions/Comments
Echo Cancellation	Enter y to enable echo cancellation on the Universal DS-1 circuit pack.
EC Direction	Indicates the direction of the echo that is being cancelled. Enter inward or outward.
EC Configuration	Indicates the set of echo cancellation defaults to administer. Appears when the Echo Cancellation field is set to **y**. Enter digits between **1-15**. Enter 1, 5-15 to provide most rapid adaptation in detecting and correcting echo at the beginning of a call, regardless of the loudness of the talker's voice. For very loud talkers and severe echo, the far-end talker's speech is heard as clipped when both parties talk at the same time. Enter 2 for slightly slower adaptation to echo, use if speech is often clipped when both parties talk at the same time. Enter 3 for slightly slower adaptation to echo, may result in a 2 or 3 second fade on strong echo for quiet talkers. Completely removes speech clipping. Enter 4 in cases of extreme echo, excessive clipping or breakup of speech. May result in slight echo or background noise.

Administer Echo Cancellation per Channel

1. Enter **add personal-co-line** to open the Personal CO Line Group screen.

```
add personal-CO-line                                          Page 1 of x
                    PERSONAL CO LINE GROUP

 Group Number: __                  Group Type:_____________  CDR Reports: _
   Group Name: ____________________                              TAC: ____
Security Code: ____              Coverage Path: ____     Data Restriction? _
                               Outgoing Display? _

TRUNK PARAMETERS
                 Trunk Type: _____________          Trunk Direction: ________
                 Trunk Port: _______          Disconnect Timing(msec): ____
                 Trunk Name: ___________            Trunk Termination: ______
         Outgoing Dial Type: __________           Analog Loss Group: ___
                   Prefix-1? _                   Digital Loss Group: ___
Disconnect Supervision - In? _                     Call Still Held? _
 Answer Supervision Timeout: ___          Receive Answer Supervision? _
                 Trunk Gain: ____                            Country: __
          Charge Conversion: _____             DS1 Echo Cancellation: _
              Decimal Point: ______
            Currency Symbol: ___
                Charge Type: _______
```

2. Complete the following field:.

Field	Conditions/Comments
DS1 Echo Cancellation	Enter y to enable the echo canceller on a Personal CO Line.

3. Submit the screen.

IP Networking Administration

This chapter contains instructions for the initial administration of H.323 trunks, shuffling, hairpinning, IP Telephones, and IP softphones. This chapter also contains a description of IP serviceability tools and troubleshooting of IP networks.

Overview

IP Solutions use the TN2302 IP Media Processor for voice processing and the TN799 C-LAN for signaling.

H.323 Trunks

IP-connected trunks allow trunk groups to be defined as ISDN-PRI-equivalent tie lines between switches over an IP network.

Trunks that use IP connectivity reduce costs and simplify management. Benefits include a reduction in long distance voice and fax expenses, facilitation of global communications, full-function networks with data and voice convergence, and network optimization by using the existing network resources.

H.323 Trunk

The TN2302 enables H.323 trunk service using IP connectivity between a DEFINITY ECS system and another H.323 v2-compliant endpoint. H.323 trunk groups can be configured as DEFINITY-specific tie trunks supporting ISDN trunk features such as DCS+ and QSIG, as generic tie-trunks permitting interconnection with other vendors' H.323 v2-compliant switches, or as direct-inward-dial (DID) type public trunks providing access to the switch for unregistered users.

H.323 Trunk Administration

This section describes the administration steps needed to set up H.323 trunks.

Pre-administration task summary

Before you can set up a H.323 trunk, perform the following tasks:

	Task
	Verify customer options for H.323 trunking
	Administer C-LAN and IP Media Processor circuit packs. **NOTE:** These circuit packs are not required on a DEFINITY One, or an IP600 switch.
	Administer QoS parameters by setting thresholds for network performance (see Quality of Service and Voice Quality Administration).
	Administer additional QoS parameters, including defining IP Network Regions and specifying the codec type to be used (see Quality of Service and Voice Quality Administration).
	Assign IP node names and IP addresses to each node in the network.
	Define the IP interface for each C-LAN, MedPro, and IP Media Processor on the switch.
	Administer an ethernet data module for the connection between the C-LAN board and the LAN.
	Optionally, implement Best Service Routing (BSR).

Verify customer options for H.323 trunking

Verify that H.323 trunking is set up correctly on the system-parameters customer-options screen. If any changes need to be made to fields on this screen, call your Avaya representative for more information.

NOTE:
Starting with Release 10, the System Parameters Customer Options screen is display only. Use the display system-parameters customer-options command to review the screen. The License File controls the system software release, the Offer Category, features, and capacities. The init login does not have the ability to change the customer options, offer options, and special applications screens.

1. Type **display system-parameters customer-options** and go to the Optional Features screen.

```
                                                          Page   1 of X
                          OPTIONAL FEATURES

                  G3 Version:                              Maximum Ports: 100
                    Location:                    Maximum XMOBILE Stations: 0


IP ENDPOINT CAPACITIES (Sum Cannot Exceed 1000)
                                Maximum Administered IP Trunks:
                    Maximum Concurrently Registered IP Stations:
                      Maximum Administered Remote Office Trunks:
        Maximum Concurrently Registered Remote Office Stations:

Maximum Number of DS1 Boards with Echo Cancellation:
```

2. Verify that the following fields have been completed:

Field	Conditions/Comments
G3 Version	This value should reflect the current version.
Maximum Administered IP Trunks	Number of trunks purchased. Value must be **greater than 0**.
Maximum Administered Remote Office Trunks	Number of remote office trunks purchased.

3. Go to the page that displays the H.323 trunks field.

```
                                                    Page   3 of 8

                        OPTIONAL FEATURES

   Emergency Access to Attendant?                          ISDN-BRI Trunks?
          Extended Cvg/Fwd Admin?                                  ISDN-PRI?
     External Device Alarm Admin?                      Malicious Call Trace?
                 Flexible Billing?     Mode Code for Centralized Voice Mail?
   Forced Entry of Account Codes?                        Mode Code Interface?
      Global Call Classification?                   Multifrequency Signaling?
             Hospitality (Basic)? Multimedia Appl. Server Interface (MASI)?
 Hospitality (G3V3 Enhancements)?         Multimedia Call Handling (Basic)?
                     H.323 Trunks?       Multimedia Call Handling(Enhanced)?
                                                    Multiple Locations?
                      IP Stations?           Personal Station Access (PSA?)?
                ISDN Feature Plus?
   ISDN Network Call Redirection?
```

4. Verify that the following fields have been completed:.

Field	Conditions/Comments
H.323 Trunks	Enter y.
ISDN-PRI	Enter y.

Administer C-LAN and IP Media Processor circuit packs

Follow these steps to administer the C-LAN and IP Media Processor circuit packs:

1. Type **change circuit-packs** to open the circuit-packs screen.

```
                                                              Page 2 of 5

                          Circuit Packs

Cabinet 1                          Carrier B
Cabinet Layout: five-carrier     Carrier Type: port

Slot Code    SF Mode Name              Slot Code    SF Mode Name
00  TN799    C       C-LAN
01  TN2302           IP Media Processor
02
03
04
```

2. To administer a C-LAN board, complete the following fields:

Fields for CLAN	Conditions/Comments
Code	**TN799**
Name	**C-LAN**

3. To administer an IP Media Processor, complete the following fields:

Fields for IP Media Processor	Conditions/Comments
Code	**TN2302**
Name	**IP Media Processor** automatically appears

4. Submit the screen.

Administer QoS parameters

Four parameters on the maintenance-related system-parameters screen determine threshold values for network performance. You can use the default values for these parameters, or you can change them to fit the needs of your network. (See "Set thresholds for network performance of IP trunking").

Administer additional QoS parameters

Administer additional QoS parameters, including defining IP Network Regions and specifying the codec type to be used. See Quality of Service and Voice Quality Administration.

Assign IP Node Names

The DEFINITY system uses node names to reference IP addresses throughout the system. Use the IP Node Names screen to assign node names and IP addresses to each node in the network that this switch communicates with via IP connections. The Node Names screen must be administered on each DEFINITY switch in an IP network.

A node can be:

- a C-LAN ethernet or ppp port
- a bridge or router
- a CMS ethernet port
- or an Intuity AUDIX or other MSA network interface card

Enter the AUDIX and MSA node name and IP address on the Audix and MSA Node Names screen. Enter data for all other node types on the IP Node Names screen.

For H.323 connections, each MedPro ethernet port (IP interface) on the local switch must also be assigned a node name and IP address on the IP Node Names screen.

Assign the node names and IP addresses in the network in a logical and consistent manner from the point of view of the whole network. Assign the names and addresses in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

To assign Node Names, do the following:

1. Type **change node-names ip** to open the IP Node Names Screen.

IP Node Names

```
change node-names ip                                        Page 2 of 6

                        IP NODE NAMES

Name            IP Address      Name            IP Address
clan-a1         192.168.10.31   _______         ___.___.___.___
clan-a2         192.168.20.31   _______         ___.___.___.___
default         0  .0  .0  .0   _______         ___.___.___.___
medpro-a1       192.168.10.81   _______         ___.___.___.___
medpro-a2       192.168.10.B1   _______         ___.___.___.___
medpro-a3       192.168.10.82   _______         ___.___.___.___
medpro-b1       192.168.10.83   _______         ___.___.___.___
```

2. Move to the fields below and complete them as follows:

Field	Conditions/Comments
Name	Enter unique node names for: ■ Each C-LAN ethernet port on the network ■ Each IP Media Processor ■ Each Remote Office ■ Other IP gateways, hops, etc. The default node name and IP address is used to set up a default gateway, if desired. This entry is automatically present on the Node Names screen and cannot be removed. When the Node Names screen is saved, the system automatically alphabetizes the entries by node name.
IP Address	Enter a unique IP addresses for each node name.

3. Submit the screen.

Define IP Interfaces

The IP interface for each C-LAN and Media Processor board on the switch must be defined on the IP Interfaces screen. Each DEFINITY switch in an IP network has one IP Interfaces screen.

To define IP Interfaces, do the following:

1. Type **change ip-interfaces** to open the IP Interfaces screen.

```
change ip-interfaces                                          Page 1 of 4

              IP INTERFACES

  En-                                                                  Net
abled  Type   Slot   Code Sfx Node Name       Subnet Mask    Gateway Address Rgn
   y   C-LAN  01A10  TN799 C clan-a1          255.255.0.0     192.168.10 .100 1
   y   MEDPRO 01A13  TN2302   medpro-a1       255.255.0.0     192.168.10 .100 1
   y   MEDPRO 01A16  TN2302   medpro-a2       255.255.0.0     192.168.20 .100 1
   y   C-LAN  01A09  TN799 D clan-a2          255.255.0.0     192.168.20 .100 2
   n                                         255.255.255.0
   n                                         255.255.255.0
   n                                         255.255.255.0
```

2. Complete the following fields as shown:

Field	Conditions/Comments
Enable Eth Pt	Enter y to use the ethernet port. Enter n to disabled the port before you make changes to its attributes on this screen.
Type	Enter **C-LAN** or **MEDPRO**.
Slot	Enter the slot location for the circuit pack.
Code	Display only. This field is automatically populated with TN799 for C-LAN or TN2302 for IP Media Processor.
Sfx	Display only. This field is automatically populated with the prefix of the circuit pack.
Node name	Enter the node name for the IP interface. This node name must already be administered on the IP Node Names screen.
Subnet Mask	Enter the subnet mask associated with the IP address for this IP interface. The IP address is associated with the node name on the Node Names screen.
Gateway Addr	Enter the address of a network node that serves as the default gateway for the IP interface.
Net Rgn	Enter the region number for the IP interface. Enter a value between 1-44.

3. Submit the screen.

Assign Link via Ethernet Data Module to the LAN

Use this screen to administer an ethernet data module for the connection between the C-LAN board's ethernet port (port 17) and the LAN. The data module associates a link number and extension number with the C-LAN ethernet port location. This association is used by the DEFINITY processor to set up and maintain signaling connections for multimedia call handling.

The C-LAN ethernet port is indirectly associated with the C-LAN IP address via the slot location (which is part of the port location) on the IP Interfaces screen and the node name, which is on both the IP Interfaces and Node Names screens.

To assign a link via an ethernet data module, do the following:

1. Type **add data-module next** to open the Data Module screen.

```
add data-module next                                          Page   1 of 2
                              DATA MODULE

   Data Extension: 2377                  Name: C-LAN                    BCC:
             Type: ethernet       COS: 1
             Port: 01c0817        COR: 1
             Link: 2

Network uses 1's for broadcast addresses? y
```

2. Complete the following fields as shown:

Field	Conditions/Comments
Type	Enter **ethernet**. This indicates the data-module type for this link.
Port	Ethernet connections must be assigned to port **17** on the C-LAN circuit pack.
Link	Enter **1 – 33** for G3r, a link not previously assigned on this switch. Enter **1 – 25** for G3si and G3csi, a link not previously assigned on this switch.
Name	Display only. The name appears in lists generated by the "list data module" command.
Network uses 1's for broadcast addresses	Enter y when the private network contains only DEFINITY switches and adjuncts. Enter n when the network includes non-DEFINITY switches that use the 0's method of forming broadcast addresses.

3. Submit the screen.

Best Service Routing (Optional)

Use H.323 trunks to implement Best Service Routing (BSR). You can use H.323 trunks for polling, or for both polling and interflow. Because polling requires only a small amount of data exchange, the additional network traffic is insignificant. However, interflow requires a significant amount of bandwidth to carry the voice data. Depending on the other uses of the LAN/WAN and its overall utilization rate, voice quality could be degraded to unacceptable levels.

Avaya recommends that if H.323 trunks are used for BSR interflow, the traffic should be routed to a low-occupancy or unshared LAN/WAN segment. Alternatively, you might want to route internal interflow traffic, which may have lower quality-of-service requirements, over H.323 trunks, and route customer interflow traffic over circuit-switched tie trunks.

H.323 Trunk Administration

After you have finished the pre-administration tasks, you need to perform the following administration to set up H.323 trunks:

- Create a signaling group for H.323 trunks that connect this switch to a far-end switch.
- Create a new trunk group for H.323 trunks.
- Modify a signaling group to add a trunk group to the Trunk Group for the Channel Selection field.

This section describes the tasks that you need to complete to administer an H.323 trunk. Sample values are used to populate the fields to show the relationships between the screens and fields.

Create a Signaling Group

Create a signaling group that is associated with H.323 trunks that connect this switch to a far-end switch. One or more unique signaling groups must be established for each far-end node that this switch is connected to via H.323 trunks.

NOTE:
The following steps address only those fields that are specifically related to H.323 trunks. The other fields are described in the Administrator's Guide.

To create a signaling group, do the following:

1. Type **add signaling-group <number>** to open the Signaling Group screen.

```
add signaling-group 1                                          Page 1 of 5
                              SIGNALING GROUP

Group Number: 1              Group Type: h.323
                                          Max Number of NCA TSC: 0
                                           Max number of CA TSC: 0
                                       Trunk Group for NCA TSC:  ___
     Trunk Group for Channel Selection:  75
        Supplementary Service Protocol: a      Network Call Transfer? n

Near-end Node Name: clan-a1 ___       Far-end Node Name: clan-b1 ___________
Near-end Listen Port: 1720 _____Far-end Listen Port: 1720 _
                             Far-end Network Region:
   LRQ Required? n             Calls Share IP Signaling Connection? n
   RRQ Required? n
                                   Bypass If IP Threshold Exceeded? n
                                    Direct IP-IP Audio Connections? n
                                              IP Audio Hairpinning? n
                                    Internetworking Message: PROGress
```

2. Complete the following fields as shown:

Table 4. Signaling Group screen options

Field	Conditions/Comments
Group Type	Enter **h.323**
Trunk Group for Channel Selection	Leave blank until you create a trunk group in the following task, then use the change command and enter the trunk group number in this field.
Near-end Node Name	Enter the node name for the C-LAN IP interface on this switch. The node name must be administered on the Node Names screen and the IP Interfaces screen.
Far-end Node Name	This is the node name for the far-end C-LAN IP Interface used for trunks assigned to this signaling group. The node name must be administered on the Node Names screen on this switch. Leave blank when the signaling group is associated with an unspecified destination.
Near-end Listen Port	Enter an unused port number from the range 1719, 1720 or 5000–9999. Avaya recommends **1720**. If the LRQ field is y, enter **1719**.
Far-end Listen Port	Enter the same number as the one in the Near-end Listen Port field. This number must match the number entered in the Near-end Listen Port field on the signaling group screen for the far-end switch. Leave blank when the signaling group is associated with an unspecified destination.
Far-end Network Region	Identify network assigned to the far end of the trunk group. The region is used to obtain the codec set used for negotiation of trunk bearer capability. If specified, this region is used instead of the default region (obtained from the C-LAN used by the signaling group) for selection of a codec. Enter a value between **1-44**. Leave blank to select the region of the near-end node (C-LAN).
LRQ Required	Enter n when the far-end switch is a DEFINITY ECS. Enter y when the far-end switch is a non-DEFINITY switch that requires a location request to obtain a signaling address in its signaling protocol.

Continued on next page

Table 4. Signaling Group screen options — *Continued*

Field	Conditions/Comments
Calls Share IP Signaling Connection	Enter y for inter-DEFINITY connections. Enter n when the local and/or remote switch is not a DEFINITY switch.
RRQ Required	Enter y when a vendor registration request is required for connection to the DEFINITY system.
Bypass if IP Threshold Exceeded	Enter y to automatically remove from service trunks assigned to this signaling group when IP transport performance falls below limits administered on the Maintenance-Related System Parameters screen.

3. If using DCS, go to the Administered NCA TSC Assignment page of this screen.

```
                                                                Page 2 of 5
                  ADMINISTERED NCA TSC ASSIGNMENT
Service/Feature: ___________              As-needed Inactivity Time-out (min):_
  TSC    Local                                                      Mach.
 Index    Ext.   Enabled  Established   Dest. Digits    Appl.        ID
  1:     _____      __     _________    _____________   _______      __
  2:     _____      __     _________    _____________   _______      __
  3:     _____      __     _________    _____________   _______      __
  4:     _____      __     _________    _____________   _______      __
  5:     _____      __     _________    _____________   _______      __
  6:     _____      __     _________    _____________   _______      __
  7:     _____      __     _________    _____________   _______      __
  8:     _____      __     _________    _____________   _______      __
  9:     _____      __     _________    _____________   _______      __
 10:     _____      __     _________    _____________   _______      __
 11:     _____      __     _________    _____________   _______      __
 12:     _____      __     _________    _____________   _______      __
 13:     _____      __     _________    _____________   _______      __
 14:     _____      __     _________    _____________   _______      __
 15:     _____      __     _________    _____________   _______      __
```

4. Enter NCA TSC information on this screen. See "Switch 1 Task — Assign Signaling Group and administered NCA TSC" on page 162, for instructions.
5. Submit the screen.

Create a Trunk Group

This task creates a new trunk group for H.323 trunks. Each H.323 trunk must be a member of an ISDN trunk group and must be associated with an H.323 signaling group.

NOTE:
The following steps address only those fields that are specifically related to H.323 trunks. The other fields are described in the Administrator's Guide.

To create a trunk group, do the following:

1. Type **add trunk-group next** to open the Trunk Group screen.

```
add trunk-group next                                          Page 1 of x
                              TRUNK GROUP

 Group Number: 3__                   Group Type: isdn          CDR Reports: y
   Group Name: TG 3 for H.323 trunks       COR: 1       TN: 1__        TAC: 103
    Direction: two-way        Outgoing Display? n          Carrier Medium: IP
  Dial Access? y                Busy Threshold: 99 Night Service: _____
 Queue Length: 0
 Service Type: tie                    Auth Code? n           Test Call ITC: unre
                 Far End Test Line No:
Test Call BCC: 0                           ITC? ____
 TRUNK PARAMETERS
Codeset to Send Display: 0     Codeset to Send National IEs: 6
        Max Message Size to Send: 260   Charge Advice: none
  Supplementary Service Protocol: a     Digit Handling (in/out): enbloc/enbloc

            Trunk Hunt: cyclical     QSIG Value-Added Lucent? n
                                                  Digital Loss Group: 13
Calling Number - Delete:     Insert:         Numbering Format:
              Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? n
 Answer Supervision Timeout: 0
```

2. Complete the following fields as shown:

Field	Conditions/Comments
Group Type	Enter isdn
Carrier Medium	Enter ip
Service Type	Enter tie
TestCall ITC	Enter unre (unrestricted).
TestCall BCC	Enter 0
Codeset to Send Display	Enter 0
Outgoing Display	This field may need to be changed if the far-end is not a DEFINITY switch.

3. If using DCS, go to the Trunk Features page of this screen.

```
add trunk-group next                                          Page  2 of  10
                                TRUNK FEATURES
          ACA Assignment? n             Measured: none      Wideband Support? n
                                 Internal Alert? n        Maintenance Tests? y
                               Data Restriction? n     NCA-TSC Trunk Member:
                                      Send Name: n      Send Calling Number: n
            Used for DCS? y  PBX ID: 4
  Suppress # Outpulsing? n                                 DCS Signaling: d-chan
Outgoing Channel ID Encoding: exclusive     UUI IE Treatment: service-provider

                                                  Replace Restricted Numbers? n
                                                 Replace Unavailable Numbers? n
                                                       Send Connected Number: n
               Send UCID? n
Send Codeset 6/7 LAI IE? y
```

4. Complete the following fields as shown:

Field	Conditions/Comments
Used for DCS	Enter y.
PBX ID	Enter the switch ID. This is the value in the Destination Node Number field on the Dial Plan Record screen of the remote switch.
DCS Signaling	Enter d-chan.
Send Name Send Calling Number Send Connected Number	These fields may need to be changed if the far-end is a not a DEFINITY switch.

5. To add a second signaling group, go to the Group Member Assignments page of this screen.

```
add trunk-group next                            Page   4 of  10
                              TRUNK GROUP
                          Administered Members (min/max):   0/0
GROUP MEMBER ASSIGNMENTS       Total Administered Members:   0

       Port    Code Sfx Name        Night           Sig Grp
  1: ip        H.323 Tr 1                             3
  2: ip        H.323 Tr 2                             3
  3: ip        H.323 Tr 3                             3
  4:
  5:
```

NOTE:
Each signaling group can support up to 31 trunks. If you need more than 31 trunks between the same two switches, add a second signaling group with

different listen ports, and add a second trunk group. See Signaling group assignments (page 37) for more information about the relationship between signaling groups and H.323 trunk groups.

6. Enter group numbers using the following fields:

Field	Conditions/Comments
Port	Enter ip. When the screen is submitted, this value is automatically changed to a “T” number (Txxxxx).
Name	Enter a 10-character name to identify the trunk.
Sig Grp	Enter the number of the signaling group that you set up for H.323 trunks.

Modify a Signaling Group

Modify the signaling group screen to add a trunk group number to the Trunk Group for Channel Selection field.

To modify a signaling group:

1. Type **busy signaling-group <number>** to busy-out the signaling group.
2. Type **change signaling-group <number>** to open the Signaling Group screen.

```
                                                              Page 1 of 5
                              SIGNALING GROUP

Group Number  ___            Group Type: h.323
                                          Max Number of NCA TSC: 0
                                            Max number of CA TSC: 0
                                        Trunk Group for NCA TSC:  ___
     Trunk Group for Channel Selection:  75
        Supplementary Service Protocol: a      Network Call Transfer? n

Near-end Node Name: clan-a1          Far-end Node Name: clan-b1
Near-end Listen Port: 1720          Far-end Listen Port: 1720
                                 Far-end Network Region:
   LRQ Required? n                 Calls Share IP Signaling Connection? n
   RRQ Required? n
                                       Bypass If IP Threshold Exceeded? n
                                        Direct IP-IP Audio Connections? n
                                                  IP Audio Hairpinning? n
                                        Internetworking Message: PROGress
```

3. Complete the following field:

Field	Conditions/Comments
Trunk Group for Channel Selection	Enter the trunk group number. If there is more than one trunk group assigned to this signaling group, the group entered in this field will be the one that accepts incoming calls.

4. Submit the screen.
5. Type **release signaling-group <number>** to release the signaling group.

H.323 Trunk Problem Solving

Signaling group assignments

You can assign multiple H.323 trunk groups to a single signaling group. However, when H.323 trunk groups have different attributes, assign each H.323 trunk group to a separate signaling group. An H.323 signaling group directs all incoming calls to a single trunk group, regardless of how many trunk groups are assigned to that signaling group. This is specified in the field “Trunk Group for Channel Selection” on the H.323 signaling group screen.

In the example shown in Figure 4, two trunk groups are assigned to the same signaling group on each of two switches, A and B. Trunk groups A1 and B1 are set up to route calls over a private network. Trunk groups A2 and B2 are set up to route calls over the public network. The signaling group on switch B terminates all incoming calls on trunk group B1 as specified by the “Trunk Group for Channel Selection” field. Calls from switch A to switch B using trunk group A1 and the private NW are terminated on trunk group B1, as desired. However, calls from switch A to switch B using trunk group A2 and the public NW are also terminated on trunk group B1, not trunk group B2, which is the desired outcome.

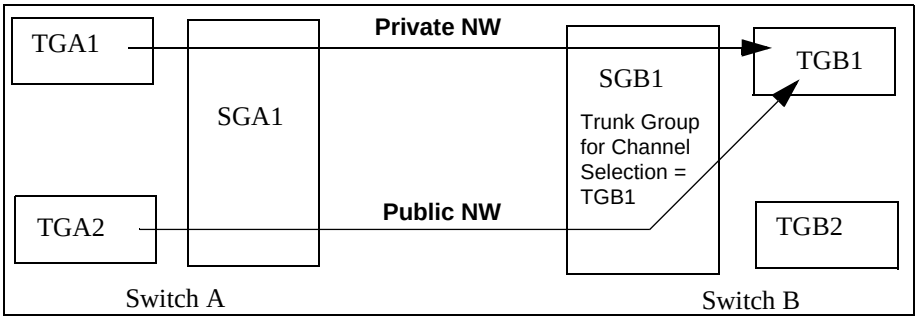


Figure 4. Shared signaling group

The solution to this problem is to set up a separate signaling group for each trunk group, as shown in the following figure. More generally, set up a separate signaling group for each set of trunk groups that have common attributes.

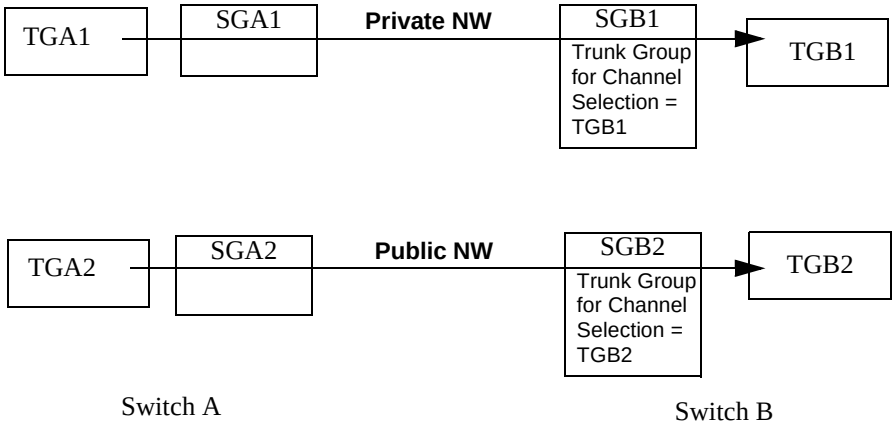


Figure 5. Separate signaling group

No MedPro resources available

If two switches are connected via an H.323 trunk and all MedPro resources are in use on the call-destination switch when a call is made, the call will fail even when a second preference is administered in the routing pattern on the source switch. This can be avoided by setting the first preference look ahead routing (LAR) to “next” in the routing pattern.

C-LAN sharing

Depending on the network configuration, a single C-LAN board can handle the signaling for multiple applications. For example, the call center Call Management System (CMS) typically uses a small portion of a C-LAN’s capacity so the same C-LAN can handle the signaling for other IP endpoints at the same time. There are many variables that affect the number of C-LAN circuit packs that you need for your network configuration. Contact your Avaya representative to discuss ways to accurately estimate the C-LAN resources you need.

Traffic congestion is potentially a problem when multiple IP Interfaces (such as C-LAN, IP Media Processor, PCs, CMS) share a network and some of the endpoints are heavily used. This problem can be minimized by using a switched network and assigning endpoints (such as CMS) to a separate LAN/WAN segment.

IP Softphones

DEFINITY IP Softphones operate on a PC equipped with Microsoft Windows 95/98/NT and with TCP/IP connectivity to DEFINITY ECS. DEFINITY IP Solutions supports IP Softphone configurations:

- Road-warrior application consists of a PC running the DEFINITY IP Softphone application and an H.323v2-compliant audio application, with a single IP connection to a DEFINITY server.
- Telecommuter application consists of a PC running the DEFINITY IP Softphone application with an IP connection to the DEFINITY server, and a standard telephone with a separate PSTN connection to the DEFINITY server.
- The Native H.323 mode is a PC-based single phone with limited features.

Documentation on how to set up and use the IP Softphones is included on the CD-ROM containing the IP Softphone software. Procedures for administering the DEFINITY ECS server to support IP Softphones are given in *DEFINITY ECS Administrator's Guide*.

IP SoftPhone Administration

This book focuses on administration for the trunk side of the DEFINITY IP Solutions offer, plus a brief checklist of IP Softphone administration. Comprehensive information on the administration IP Softphones is covered in *DEFINITY ECS Administrator's Guide*.

There are two main types of DEFINITY IP Softphone applications: the telecommuter application and the road-warrior application. The CentreVu IP Agent is a variation of the telecommuter application.

The DEFINITY system can distinguish between various IP stations at RAS using the product ID and release number sent during registration. An IP phone with an Avaya manufacturer ID can register if the number of stations with the same product ID and the same or lower release number *is less than* the administered system capacity limits. DEFINITY system limits are based on the number of simultaneous registrations.

The telecommuter application uses two connections to the DEFINITY system: a connection to the PC over the IP network and a connection to the telephone over the PSTN. The user places and receives calls with the DEFINITY IP Softphone interface running on a PC and uses the telephone handset to speak and listen.

Administering a telecommuter application

NOTE:
Starting with Release 10, the System Parameters Customer Options screen is display only. Use the display system-parameters customer-options command to review the screen. The License File controls the system software release, the Offer Category, features, and capacities. The init login does not have the ability to change the customer options, offer options, and special applications forms.

1. Verify that the DEFINITY system is enabled for IP Softphone.

   Type display system-parameters customer-options.

   Review the following fields on the System-Parameters Customer Options screen:

Field	Value
Maximum Concurrently Registered IP Stations	Identifies the maximum number of IP stations that are simultaneously registered, not the maximum number that are simultaneously administered. This value must be greater than 0.
Maximum Concurrently Registered IP Stations	Specifies the maximum number of IP stations that are simulated registered, not the maximum number that are simultaneously administered. This value must be greater than 0.
IP Stations	y
Product ID	This is a 10-character field that allows any character string. For new installations, IP Soft, IP Phone, IP Agent and IP ROMax, the product IDs automatically appear
Rel. (Release)	Identifies the release number.
Limit	Defaults to **1** for every product except the IP Remote Office Max. The IP Remote Office Max defaults to the maximum allowed value, based on the Concurrently Registered Remote Office Stations field on page 1 of the System Parameters Customer Options screen.

2. Go to the Station screen and complete the fields listed in the table below to add a DCP station (or change an existing DCP station):

Field	Value
Type	Enter the phone model, such as 6408D.
Port	Enter x if virtual, or the port number of an existing phone.
Security Code	Enter the user's password.
IP Softphone	Enter y.

3. Go to page 2; Service Link Mode: **as-needed**
4. Install the IP Softphone software on the user's PC.

Road-warrior application

The road-warrior application uses two separate software applications running on a PC that is connected to a DEFINITY system over an IP network. The single network connection carries two channels: one for call control signaling and one for voice. DEFINITY IP Softphone software handles the call signaling. With IP Softphone R2 or greater, iClarity is automatically installed to handle voice communications. For older versions of IP Softphones, you need an H.323 V2-compliant audio application (such as Microsoft® NetMeeting®) to handle the voice communications.

Administering a Road-warrior application

NOTE:
Starting with Release 10, the System Parameters Customer Options screen is display only. Use the display system-parameters customer-options command to review the screen. The License File controls the system software release, the Offer Category, features, and capacities. The init login does not have the ability to change the customer options, offer options, and special applications forms.

1. Verify that the DEFINITY system is enabled for IP Softphone.

   Type display system-parameters customer-options.

   Go to the appropriate pages on the System-Parameters Customer Options screen to review the following fields:

Field	Value
Maximum Concurrently Registered IP Stations	Specifies the maximum number of IP stations that are simultaneously registered, not the maximum number that are simultaneously administered. This value must be greater than 0.
IP Stations	Must be **y**.
Product ID	This is a 10-character field that allows any character string. For new installations, IP Soft, IP Phone, IP Agent and IP ROMax product IDs automatically display.
Rel. (Release)	Identifies the release number
Limit	Displays **1** for every product except the IP Remote Office Max. The IP Remote Office Max defaults to the maximum allowed value, based on the Concurrently Registered Remote Office Stations field on page 1 of the System Parameters Customer Options screen.

2. Go to the Station screen and complete the fields listed in the table below to add an H.323 station:

Field	Value
Type	Enter H.323.
Port	Enter x.

3. Go to the Station screen and complete the fields listed in the table below to add a DCP station (or change an existing DCP station):

Field	Value
Type	Enter the phone model you wish to use, such as 6408D.
Port	Enter **x** if virtual, or the port number of an existing phone.
Security Code	Enter the user's password.
IP Softphone	Enter **y**.

4. Go to page 2; Service Link Mode: as-needed

5. Install the IP Softphone software on the user's PC (iClarity automatically installed with the IP Softphone R2 or greater).
6. For pre-R2 IP Softphones, an H.323 V2-compliant audio application (such as Microsoft NetMeeting) must be installed.

IP Softphone Problem Solving

Codecs used with Netmeeting

Voice quality for the road-warrior application of DEFINITY IP softphone will vary depending on several factors. Poor voice quality can be caused by the use of the high-compression codecs (G.723 or G.729) in situations where the low-compression codec (G.711) should be used. This can happen unexpectedly when using NetMeeting. When the G.711 is set as the preferred codec on the switch, NetMeeting may fail to use it. Since there is no way to monitor which codec is being used, the only way to determine that this is the problem is to disable all but the G.711 codecs. If calls no longer work, it can be concluded that NetMeeting is failing to use the G.711. The solution to this problem is to reinstall NetMeeting.

Telecommuter use of phone lines

The telecommuter application of the IP Softphone requires the use of two phone lines: one for the IP connection to DEFINITY, which is used for softphone registration and call signaling, and the other for a PSTN connection, which DEFINITY uses as a callback number to establish the voice path. How you allocate your phone lines to these two functions may make a difference.

For example, assume that you have telephone services provided by the local phone company, such as voice mail, associated with one of your lines and not the other. In this case, you should use the line with the services to make the initial IP connection to register the softphone and use the line without the services as the POTS callback for the voice path. Otherwise, there could be undesirable interactions between the softphone and the local services. For example, if your telecommuter application is registered and you were using your POTS callback line for a personal call when a business associate dialed your work extension, the business associate would hear your home voice mail message.

iClarity audio level adjustments

When your system uses iClarity, and you have trouble hearing the audio on calls, you can use the Avaya IP Softphone Audio Control toolbar and the Audio Status dialog box to check microphone volume and channel power (speakers and headsets) while you are on an active call. You can also use the tools menu to check bandwidth settings and gain. You can run the Tuning Wizard to retrain Avaya iClarity IP Audio to the level of background noise at your location. See your IP Softphone online help for more information.

You can access the Avaya support website at http://support.avaya.com. From there, you can search for additional information, including:

- Recommended Headsets for IP Softphone and IP Agent at http://support.avaya.com/inet/vt/pc2/ja/4591.jhtml
- Recommended soundcards for IP Softphone and IP Agent at http://support.avaya.com/inet/vt/pc2/faq/6128.jhtml
- USB Headset information at http://support.avaya.com/inet/vt/pc2/ta/6172.jhtml
- Avaya IP voice quality Network requirements, including VPN and NAT information at http://support.avaya.com/inet/vt/pc2/ta/4986.jhtml

Avaya associates can access IP Softphone information at http://sj.usae.avaya.com/projects/ids/sbs/voicequality

NetMeeting drops unanswered calls

For calls made to a NetMeeting softphone, if the call is not answered or if coverage is not administered, after about 5 rings NetMeeting drops the call and the station stops ringing but the caller continues to hear ringback. To avoid this situation, make sure that coverage is administered for the NetMeeting softphone.

NetMeeting ignores out-of-band tones

NetMeeting ignores any H.323 digits received out-of-band, so it never hears DTMF from DEFINITY, which always strips DTMF from the audio path and plays it out-of-band with H.323.

For example, if you are on a call on a NetMeeting softphone and the calling party presses a number or character on their keypad, you will not hear the tone.

Avaya IP telephones

The Avaya line of digital business phones uses the Internet Protocol (IP) technology with Ethernet line interfaces and has downloadable firmware.

IP Telephones provide support for dynamic host configuration protocol (DHCP) and trivial file transfer protocol (TFTP) over IPv4/UDP, which enhance the administration and servicing of the phones.

46xx IP phone series

The 46xx IP Telephone product line possesses a number of shared model features and capabilities. These include unit handset and cord, wall mount ability, dial pad, red message waiting LED, headset jack, speakerphone, and auxiliary power. All models also have specific DEFINITY downloadable firmware and come equipped with the following: Ethernet line interface, Ethernet hub and secondary jack infrared interface, automatic IP address resolution via DHCP, and manual IP address programming.

Some features and capabilities are distinctive to each of the IP Telephone models.

4606 IP telephone

The 4606 has six line appearance/feature button assignments. The 4606 does not support any softkey assignments.

4612 IP telephone

The 4612 has twelve line appearance/feature button assignments. The 4612 supports twelve softkey button assignments.

4624 IP telephone

The 4624 has 24 line appearance/feature button assignments. The 4624 also supports twelve softkey button assignments.

4630 IP screenphone

The 4630 IP Screenphone uses a single connection. A large, color, touch-sensitive screen is used to operate the telephone functions. Avaya provides default settings on the administrable feature buttons with status indication. For more information, see the *DEFINITY ECS Administrator's Guide*.

eConsole IP Attendant

The eConsole IP Attendant is a Windows-based application that can replace the physical 302-series console. Attendants use a PC interface to answer and route calls via IP.

Installing IP telephones

The IP Telephone R1.0 uses dual connection architecture with two station extensions, one to carry the signaling channel and one to carry the audio channel. R1.5 and newer IP Telephones use single connection architecture, and do not require two station extensions to be administered.

Audio capability for the IP Telephones requires the TN2302 IP Media Processor circuit pack. The DEFINITY system provides hairpinning and shuffling on the TN2302 IP Media Processor circuit pack. This conserves TDM board and timeslot resources and improves voice quality.

The 46xx IP Telephone also requires a TN799 Control-LAN (C-LAN) circuit pack for the signaling capability on the DEFINITY system csi, si, and r platforms. The IP600 does not require a C-LAN board to connect an IP Telephone.

To install an IP Telephone:

Install Circuit Packs

1. Determine the carrier/slot assignments of the circuit packs to be added.
2. Insert the circuit pack into the slot specified in step 1. It is not necessary to power down the cabinet to install the circuit packs.

Software requirements

Native support of the 46xx IP Telephones requires DEFINITY Release 9 or newer. The 46xx IP Telephones can work with DEFINITY Release 8.4 if the station is aliased as a 6400 type of station with the IP softphone field set to “y”, but native support is not provided.

46xx IP Telephones are shipped from the factory installed with operational firmware. Some system-specific software applications is downloaded from a TFTP server via automatic power-up or reset. The 46xx IP Telephones search and download new firmware from the TFTP server before attempting to register with the DEFINITY system.

The DEFINITY system treats the 46xx IP Telephones as any new station type to include the capability to list station, display station, change station, duplicate station, alias station, and remove station.

Administering Avaya IP Telephones

IP Telephones R1.5 or greater use a single connection, and only the station type needs to be administered.

In dual connection architecture (IP Telephone R1.0), administer two station extensions. The extension type (administer as a 4600 series phone) carries the signaling channel, and the H.323 extension type carries the audio channel. In order for the IP Telephone to work with the DEFINITY switch, the IP and H.323 station customer options need to be turned on, as described below.

Administering IP telephones

1. Type **add station next** to go to the Station screen.

```
add station next                                              Page 1 of 5
                                STATION

       Extension:                Lock Messages? n                BCC: 0
            Type: 4624               Security Code:                TN: 1
            Port: x                Coverage Path 1:                COR: 1
            Name:                  Coverage Path 2:                COS: 1
                                 Hunt-to Station:

STATION OPTIONS
              Loss Group: 2                  Personalized Ringing Pattern: 1
                                                       Message Lamp Ext:
            Speakerphone: 2-way                  Mute Button Enabled? y
       Display Language: english

                                                     Media Complex Ext:
                                                           IP Station? y
```

2. Complete the fields as shown in the following table:

Field	Value
Extension Type	Enter the IP Telephone 46 model number such as 4624.
Port	Enter **x**.

NOTE:
A 46xx IP Telephone is always administered as an X port, and then once it is successfully registered by the system, a virtual port number is assigned.

3. For dual-connection architecture IP Telephones (R1.0), complete the fields as shown in the following table:

Field	Value
Media Complex Ext	Enter the H.323 administered extension.
Port	Enter **x**.

4. Submit the screen.

Troubleshooting Avaya IP telephones

If the Avaya IP Telephone installation or administration is not working, try these procedures before contacting your Avaya Service Center for assistance. The following table outlines some common IP Telephone troubleshooting solutions.

Table 5. IP Telephone Troubleshooting

Issue	Solution Suggestion
Unable to access IP Station screens	Make sure the IP Stations field in the Customer-Options Screen is set to **y**.
Port Field Display on the Station Screen reads “x”	The field defaults to **x** when a station is not registered. When the station is registered, the port field shows the virtual LAN port address.
IP Telephone not working	Use the status station command to see if the station is registered with the DEFINITY system. The status should be “registered-authenticated”.

Shuffling, Hairpinning, and Inter-Network Management Features

Overview

This section describes Shuffling, Hairpinning, and Inter-network region Connection Management. Shuffling and Hairpinning provides savings in per-port costs with Digital Signal Processor (DSP) and time slot DEFINITY resources. Shuffling and Hairpinning also provides savings of IP bandwidth.

The hairpinning and shuffling part of this feature reduces the number of codec conversions that voice will encounter, which helps improve the voice quality users experience over IP calls. Shuffling and shallow hairpinning also reduces the number of media conversion ports required.

Shuffling is described as either: 1) rerouting the voice channel connecting two IP endpoints so that the voice that previously went ip-tdm-ip now goes ip-ip, or 2) rerouting the voice channel connecting two IP endpoints so that the voice that previously went ip-ip now goes ip-tdm-ip.

Hairpinning is described as: rerouting the voice channel connecting two IP endpoints so that the voice goes through the TN2302 Media Processor board in IP format, without having to go through the DEFINITY TDM bus. Only the IP and RTP packet headers are changed as the packet goes through the TN2302 Media Processor Board. This requires that both endpoints be using the same codec.

A TN2302 Media Processor board is required in order to set up an ip-media processor-ip hairpin connection. Both the TN2302 Media Processor, and the Medpro circuit packs are capable of accepting the commands to shuffle an audio connection. Almost any IP endpoint can be an endpoint on a hairpinned connection, although system administrators may choose to restrict hairpin connections per switch, region, signaling group, and to certain endpoints.

For most user actions, the switch will behave the same way for an IP phone as it does for any other Digital Communications Protocol (DCP) set. Similarly, from a user's point of view, for most user actions, the switch will behave the same way for calls carried over a LAN by ip-ip direct audio connections and ip-media processor-ip hairpinned connections as it does for calls switched through the TDM bus. The section on Feature to Feature Interactions describes any differences that users may perceive.

Feature Descriptions

Shuffling and Hairpinning consists of four subfeatures:

- Audio Hairpin Connections
- Audio Shuffling Connections
- Inter-network region Connection Management

Audio Hairpin Connections

DEFINITY ECS provides audio ip-media processor-ip hairpinning on the Media Processor (TN2302 circuit pack) to conserve resources on the board and time slots on the Time Division Multiplexed (TDM) bus and to improve voice quality by eliminating use of codecs on the media processor. The end user does not have to take any action to invoke audio hairpinning. The switch will hairpin, if necessary, after a point-to-point call is established between two voice endpoints.

The Media Processor on DEFINITY ECS typically accomplishes audio hairpinning within approximately 50ms intervals (converting a TDM based connection to/from shallow hairpin connection). The Media Processor preserves media stream integrity such as Real-Time Protocol (RTP) headers.

Audio Shuffling Connections

DEFINITY ECS provides shuffling of audio connections to save switch resources, such as channels on the Media Processor and TDM bus time slots, and to improve voice quality by eliminating extra coder/decoder functions on the Media Processor. The enduser does not have to take any action to invoke audio shuffling. The switch will shuffle, if necessary, after a point-to-point call is established between two voice endpoints.

The shuffling of audio connections between two endpoints requires that both endpoints are capable of handling shuffling.

If DEFINITY ECS determines that shuffling is not supported on both legs of the call, it may attempt to hairpin the audio connection. The DEFINITY ECS may attempt to shuffle IP audio connections as soon as the point-to-point connection between two endpoints is established. If the endpoints take some actions that require DEFINITY to insert a tone plant in the connection, the audio connection will be converged back to the DEFINITY TDM bus through the Media Processor.

Inter-network region Connection Management

For calls requiring direct ip-ip media connection between two regions that are interconnected, the DEFINITY ECS checks for path availability and also ensures that the path meets the performance criteria determined by the system administrator. The DEFINITY ECS performs a periodic background ping test between each interconnected region to collect the data to manage the inter-network connections.

The delay threshold is used to determine whether two network-regions that are administered to be connected on the network-region screen can form a connection that meets the specified performance criteria. If the criteria is not met, then the connection is not allowed.

Capacity Constraints and Feature Limitations

The TN2302 Media Processor board provides up to 64 audio channels. They may be either:

- channels of hairpin IP-IP. Each hairpin call needs two channels per board, one to each endpoint
- channels of G.711 IP-TDM
- channels of G.729 or G.723-TDM
- channels of Fax IP-TDM

The number of simultaneous voice channels that one board can handle is limited to a total of 64. Fax IP-TDM and G.723 or G.729-TDM count as two channels when determining number of channels in use.

Hairpin and ip-ip direct calls continue to use sockets on a C-LAN board or on a DEFINITYOne. All three types of connections; ip-tdm, ip-ip hairpin, and ip-ip direct, still need call control sockets. When registered, a single connect set uses one socket, a dual connect set in “permanent” mode uses two sockets, and a dual connect set in “as-needed” mode uses one socket plus one additional socket whenever active on a call.

Signaling & Audio Channel Origination Coordination

After an audio channel shuffle to the switch, the switch will delay audio feedback from the TDM bus to the user in response to any user-pressed buttons until the bi-directional audio channel is established.

Requirements for Hairpinning/Shuffling

Software

Hairpinning and shuffling require R9 or greater software.

Hardware

A TN2302 Media Processor board is required in order to set up an ip-media processor-ip hairpin connection. Both the TN2302 Media Processor and the Medpro circuit packs are capable of dropping out of an audio connection in order to shuffle an audio connection.

Platforms (csi, si, r, DefinityOne)

This feature applies across all platforms.

Feature Call Processing

Audio Hairpin Connection Setup

The following conditions must be met to connect audio endpoints with an ip-media processor-ip hairpin:

- A point-to-point voice connection must exist between two endpoints.
- The endpoints must be in the same LAN region or in interconnected LAN regions.
- A single media processor (TN2302 Media Processor) must serve both endpoints.
- The endpoints must use a single common codec. Two different speeds of G.723 count as one codec.
- The endpoints must be administered to allow hairpinning.
- Everything in hairpinning is satisfied and shuffling is not allowed.

When a multiparty call is reduced to a two-party call (via DROP or hang-up), the resulting connection is hairpinned only if the remaining two parties satisfy the conditions or the requirement for Hairpinned Setup.

Audio Shuffling Setup

The following conditions must be met to connect the audio of two IP endpoints in an ip-ip direct connection:

- Both IP endpoints must be administered to allow shuffling.
- A point-to-point voice connection must exist between two endpoints and no active call (in-use or held) exists on either endpoint that requires TDM connectivity (such as applying tones, announcement, or conferencing).
- The endpoints must be in the same LAN region or in interconnected LAN regions.
- The inter-region connection management rules are must be met.
- There is at least one codec in common between the codec lists of the endpoints involved and the Inter-network region Connection Management codec list.
- The endpoints must have at least one codec in common as shown in their current codec negotiations between the endpoint and the switch.

Inter-network Region Connection Management

The DEFINITY system Roundtrip Propagation Delay threshold is administered on the system-parameters ip-options screen. In order for the DEFINITY system software to connect two network-regions, the connection must meet the Roundtrip Propagation Delay threshold, and the network-regions must be administered on the IP network-region form.

Shuffling and Hairpinning Administration Description

By Endpoint

Whether any given station is allowed to shuffle or hairpin away from ip-tdm-ip is independently administered per station. The specific station types that can be administered are the 4606 IP, 4612 IP, 4624 IP,4630 IP, eConsole IP Attendant, H.323 stations, and the station types that can be administered as IP softphones, for example those with the IP softphone field on the station screen.

Whether a trunk is allowed to shuffle or hairpin away from ip-tdm-ip is independently administered in the H.323 signaling group.

By Region

Whether calls with endpoints or media processing resources in any given network region are allowed to shuffle or hairpin away from ip-tdm-ip is independently administered by network region. If a call is moving to direct ip-ip, whether the move is allowed only needs to be checked for the two endpoints' regions. If a call is moving to ip-media processor-ip, whether the move is allowed needs to be checked for the hairpinning TN2302 Media Processor's region and for the two endpoints' regions.

The new administration fields added to provide this flexibility are hidden unless the least one of the IP stations or H.323 trunks or Remote Office is set to **y** on the System-parameter customer option screen.

By Switch

The DEFINITY system can be administered on the Feature-Related System-Parameters screen to block all new ip-media processor-ip hairpin connections and all new ip-ip direct connection.

IP or Remote Office Stations Only

The new shuffling and hairpinning fields on the station screens appear when IP Stations or Remote Office is set to y on the System-parameter customer option screen.

Trunks Only

The new shuffling and hairpinning fields on the signaling group screens appear when the H.323 trunks field is y on the System-parameter customer option screen.

The Direct IP-IP Audio Connections field can be set to:

- y - the switch assumes the endpoint will be directly connected unless the endpoint signals to the contrary during registration
- n - the switch assumes the endpoint is not directly ip-ip connected. This value overrides any contrary signaling from the endpoint during registration.

Administering a Station for Hairpinning and Shuffling

To administer an IP station to allow the DEFINITY system to shuffle or hairpin connections:

1. Type **change station xxx** to open the Station screen.

```
change station 12345                                        Page   2 of   4

                              STATION

FEATURE OPTIONS
             LWC Reception: spe    Auto Select Any Idle Appearance? n
          LWC Activation? y              Coverage Msg Retrieval? y
    LWC Log External Calls? n                        Auto Answer: none
              CDR Privacy? n                     Data Restriction? n
     Redirect Notification? y          Idle Appearance Preference? n
   Per Button Ring Control? n
     Bridged Call Alerting? n            Restrict Last Appearance? y
Active Station Ringing: single

           H.320 Conversion? y Per Station CPN - Send Calling Number?
         Service Link Mode: as-needed
           Multimedia Mode: enhanced
                                    Display Client Redirection? n
                     AUDIX Name:   Select Last Used Appearance? n
     Messaging Server Name:          Coverage After Forwarding? s
                                       Multimedia Early Answer? n
                                Direct IP_IP Audio Connections? n
                                          IP Audio Hairpinning? n
```

2. Administer the following fields:

Field	Value
Direct IP-IP Audio Connections	y
IP Audio Hairpinning	y

NOTE:
The Direct IP-IP Audio Connections and IP Audio Hairpinning fields appear only when the IP Stations field and the Remote Office field on the Customer Options screen are set to **y**.

3. Submit the screen.
4. The IP station, the signaling group, the network region, and the DEFINITY system must all be administered for shuffling and hairpinning in order for it to work.

Administering a Signaling Group for Hairpinning and Shuffling

To administer a signaling group to allow shuffling and hairpinning:

1. Type **change signaling group xxx** to open the Signaling Group screen.

```
change signaling group 4                                        Page 1 of 5
                              SIGNALING GROUP

Group Number: 4              Group Type: h.323
                                          Max Number of NCA TSC: 5
                                           Max number of CA TSC: 5
                                        Trunk Group for NCA TSC: 44
     Trunk Group for Channel Selection: 44
        Supplementary Service Protocol: a      Network Call Transfer? n

Near-end Node Name: mipsn01A          Far-end Node Name: dr99
Near-end Listen Port: 1800           Far-end Listen Port: 1800
                               Far-end Network Region:
   LRQ Required? n                 Calls Share IP Signaling Connection? n
   RRQ Required? n
                                       Bypass If IP Threshold Exceeded? n
                                        Direct IP-IP Audio Connections? y
                                                  IP Audio Hairpinning? y
                                        Internetworking Message: PROGress
```

2. Administer the following fields:

Field	Value
Direct IP-IP Audio Connections	y
IP Audio Hairpinning	y

NOTE:
The Direct IP-IP Audio Connections and IP Audio hairpinning fields appear when the H.323 Trunks field on the customer options screen is set to **y.**

3. Submit the screen.
4. The IP station, the signaling group, the network region, and the DEFINITY system must all be administered for shuffling and hairpinning in order for it to work.

Administering a Network Region for Hairpinning and Shuffling

To administer the network region to allow hairpinning and shuffling:

1. Type **change ip network-region xxx** to open the Network Region screen.

```
change ip-network-region 1                                    Page   1 of   2
                         NETWORK REGION

                        Region: 1
                          Name: Denver North Campus

Audio Parameters
                     Codec Set: 1
            DiffServ PHB Value: 0
Direct IP-IP Audio Connections? y
          IP Audio Hairpinning? y
UDP Port Range
                           Min: 2048
                           Max: 65525
```

2. Administer the following fields:

Field	Value
Direct IP-IP Audio Connections	y
IP Audio Hairpinning	y

3. If C-LAN and IP Media Processor resources are shared between network regions, go to the Inter Network Region Connection Management page of the Network Region screen.

NOTE:
This page of the ip-network-region screen is hidden if the IP Stations field, the H.323 Trunks field, and the Remote Office field on the customer options screen are all set to **n**.

NOTE:
You will not be able to connect IP endpoints in different network regions or share resources between or among network regions unless you make an entry in this page specifying the CODEC set to be used.

```
change ip-network-region 1                                    Page   2 of  2
          Inter Network Region Connection Management

Region                    (Group of 32)
          1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
001-032   1 _ _ 2 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
033-064   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
065-096   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
097-128   _ _ 5 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
129-160   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
161-192   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
193-224   6 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
225-256   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
257-288   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
289-320   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
321-352   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
353-384   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
385-416   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
417-448   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
449-480   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
481-500   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
```

4. Specify CODEC sets for your shared network regions as done in the example above. In the example, network region 1 shares resources with the following other network regions, using the specified CODEC sets:
   - network region 1 using CODEC set 1.
   - network region 4 using CODEC set 2.
   - network region 99 using CODEC set 5.
   - network region 193 using CODEC set 6.
5. Submit the screen.

NOTE:
The IP station, the signaling group, the network region, and the DEFINITY system must all be administered for shuffling and hairpinning in order for it to work.

Administering System Parameters for Hairpinning and Shuffling.

To administer the DEFINITY system to allow hairpinning and shuffling:

1. Type **change system parameters feature** to open the Feature-Related System Parameters screen.

```
change system-parameters features                              Page 12 of 12
               FEATURE-RELATED SYSTEM PARAMETERS

IP PARAMETERS
                                Direct IP-IP Audio Connections? y
                                          IP Audio Hairpinning? y
```

2. Administer the following fields:

Field	Value
Direct IP-IP Audio Connections	y
IP Audio Hairpinning	y

3. Submit the screen.
4. The IP station, the signaling group, the network region, and the DEFINITY system must all be administered for shuffling and hairpinning in order for it to work.

Shuffling and Hairpinning Maintenance

Use the following procedures to maintain and review the status of stations, trunks, and IP network regions.

Reviewing Station Status Link Types

Use the status station command to determine whether a station is part of an ip to tdm, an ip hairpin, or an ip direct connection.

1. Type **status station xxx** to open the Call Control Signaling screen.
2. Move to the Call Control Signaling page

```
status station 23484                                Page 3  of 3
                    CALL CONTROL SIGNALING
                Switch              IP                          IP
                Port     Switch-end Addr: Port          Set-end Addr:    Port
IP Signaling: 1C1417   xxx.xxx.xxx.xxx: nnnnn          xxx.xxx.xxx.xxx: nnnnn
    Node name:      CLAN-Board____              STATION-user-5

                        AUDIO CHANNEL
         Switch            IP                        IP
         Port   Switch-end Addr: Port        Set-end Addr:Port
G.711-MU Audio: S0005 xxx.xxx.xxx.xxx: nnnnn xxx.xxx.xxx.xxx: nnnnn
    Node name:      STATION-user-6              STATION-user-5

Audio Connection Type: ip direct
           Product ID: 1234SoftR2
  Registration Status: authenticated
```

NOTE:
The Audio Connection Type field shows one of: “ip-tdm”, “ip hairpin”, “ip direct”, or “ip-idle”.

3. Review the following fields:

Field	Value
Audio Connection Types	■ **ip-tdm -** connections from one endpoint through the DEFINITY TDM bus and back through the Media Processor ■ **ip-hairpin -** connection is between two endpoints that goes through the Media Processor but not through the TDM bus ■ **ip-direct** - connection goes directly between two endpoints without going through the DEFINITY ■ **ip-idle** - the endpoint is idle and not connected

4. Exit the screens.

Reviewing Status Trunk Link Types

Use the status trunk command to determine whether a trunk is part of an ip to tdm, an ip hairpin, or an ip direct connection, or is ip-idle.

1. Type **status trunk** to open the Trunk Status screen.

```
status trunk 1/19                                          SPE B
                         TRUNK STATUS
Trunk Group/Member: 01/19                 Service State: in-service/active
          Port: T00123       Maintenance Busy? no
Signaling Group ID: 1                       CA-TSC state: not allowed
                           MM Conference ID: 8
                             MM Endpoint ID: 2

Connected Ports: 01B1431 01C1008
                 S00004

            Switch                    IP                    IP
            Port    Near-end IP Addr: Port   Far-end IP Addr: Port
     Q.931: 12B1217 xxx.xxx.xxx.xxx: nnnnn   xxx.xxx.xxx.xxx: nnnnn
     H.245: 12B1217 xxx.xxx.xxx.xxx: nnnnn   xxx.xxx.xxx.xxx: nnnnn
G.711-MU Audio:12B1108    xxx.xxx.xxx.xxx:  nnnnn     xxx.xxx.xxx.xxx: nnnnn

H.245 Tunneled in Q.931? no
Audio Connection Type: ip-tdm
```

2. Review the following fields:

Field	Value
Audio Connection Types	■ **ip-tdm** - connections from one endpoint through the DEFINITY TDM bus and back through the Media Processor For an ip-TDM call, the audio switch port field shows one of ports 1-8 on a TN2302 Media Processor board. ■ **ip-hairpin -** IP connection is between two endpoints and goes through the Media Processor, but not through the TDM bus For an ip-media processor-ip hairpin call, the audio switch port field shows a cabinet and slot, but not a port, on a TN2302 Media Processor board. ■ **ip-direct** - the IP-IP connection goes directly between two endpoints without going through the DEFINITY For an ip-ip direct call, the audio switch port field shows a virtual port number, for example, one starting with T. ■ **ip-idle -** IP endpoint is idle and not connected If a trunk is ip-idle, the audio switch port field is blank.

3. Exit the screen.

Reviewing Status of ip-network-region Link

USe the status ip-network-region x (where x is between 1 and 250 for G3r and between 1 and 80 for G3si or G3csi) to review the status of the administered inter-network region connection management based on the background maintenance ping test. If the background maintenance test concluded a failed connectivity between two regions x and y, then the matrix for status ip-network-region x, or status ip-network-region y will indicate the result as “f” (failed) between those two regions.

1. Type **status ip-network-region x** to open the Inter Network Region Connection Management screen.

```
status ip-network-region 1                                    Page   1 of 1
              Inter Network Region Connection Management

Region                          (Group of 32)
        1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
001-032   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ f _ _ _ _ _ _ _ _ _ _ _ _ _ _
033-064   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
065-096   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
097-128   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
129-160   _ _ 1 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
161-192   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
193-224   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
225-256   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
257-288   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
289-320   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
321-352   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
353-384   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
385-416   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
417-448   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
449-480   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
481-500   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
```

2. Review the information on the screen.

   The Field Values represent the following:

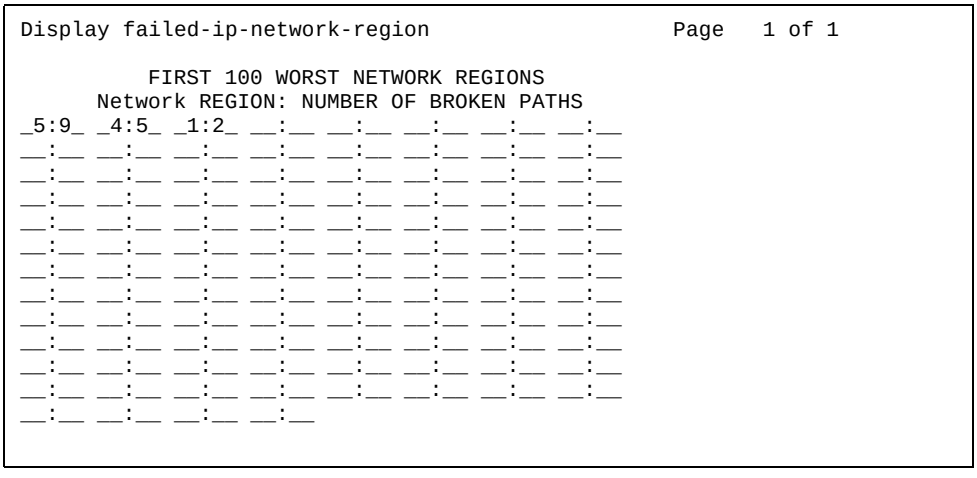
   - blank - not administered
   - f - failed, based on background maintenance ping test
   - 1 to 7 - passed, represents the preferred codec to be used between the two regions and implied meaning that inter-network region connectivity exists between these two regions

3. Exit the screen.

Reviewing failed ip-network-region-connections

Use the **display failed-ip-network-region** command to list the worst 100 network regions with broken connectivity.

1. Type **display failed-ip-network-region** to open the first 100 worst network regions screen...



2. The network regions are ordered from worst to best analogous to the following:
   - 5:9 (Region 5 has 9 broken paths)
   - 4:5 (Region 4 has 5 broken paths)
   - 1:2 (Region 1 has 2 broken paths)
3. Exit the screen.

Testing failed-ip-network-region all

Use the **test failed-ip-network-region <#>** or **all** command to initiate a real-time ping test for all failed network-regions connections. To specify a network region, use the test failed-ip-network-region xxx (where xxx is in the range of 1-250 for r and 1-80 for si/csi/d)” command.

If there are no failed network-region connections, the warning alarm associated with the broken network-region connectivity is cleared.

1. Type **test failed-ip-network-region <#>** or **all** to begin the test.
2. Test results screen appears at end of the test.

```
                          TEST RESULTS

Port    Maintenance Name     Alt.Name    Test No.    Result    Error Code

        NR-CONN                  XXX-YYY       ZZZ            PASS/FAIL/ABORT
```

3. Review the test results.
   - NR-CONN represents the Maintenance Object Name for this test
   - XXX-YYY represents the pair of failed network regions under test
   - ZZZ represents the test number to be assigned by the maintenance developer
4. Exit the screen.

Initialization and Recovery

System Resets

On a level 2 or greater restart, all IP network endpoints are cleared, calls are dropped, and endpoints are unregistered. Hairpinned calls and TDM calls are dropped.

What happens to calls carried by ip-ip direct audio connections on a level 2 or greater restart depends on the endpoints involved in the call. On a level 2 or greater restart, the set on such calls will lose registration. Whether an endpoint will drop the call when it loses its registration is specified in the endpoints' requirements documents.

Interfaces

External Interfaces

DEFINITY ECS uses the single-connect protocol to shuffle the audio connection of single-connect DEFINITY endpoints, such as Remote Office Stations and IP trunks.

Transmission Interface

The amount of loss applied between any two endpoints on a call is administrable. However, the Telecommunications Industry Association (TIA) has published standards for the levels that IP endpoints should use. The IP endpoints will always transmit audio at TIA standard levels, and expect to receive audio at TIA standard levels. If an IP audio signal goes to or comes from the TDM bus via a TN2302 Media Processor, the board will adjust the levels to approximately equal the levels of a signal to or from a Digital Communications Protocol (DCP) set. By default, IP endpoints are the same loss group as DCP sets, Group 2.

Adjust loss to USA DCP levels

The switch will instruct the TN2302 Media Processor board to insert loss into the signal coming from the IP phone, and insert gain in the signal going to the IP phone, to equal the levels of a signal to or from a DCP set.

Voice levels are not administrable on shuffled calls

The voice level on a shuffled call is not affected by entries administered in the 2 PARTY LOSS PLAN administration screen.

Preference Order

Note that the loss to be applied during a call carried by an ip-ip direct or an ip-media processor-ip hairpin audio connection is constant during shuffling or hairpinning of all three types of connections:

- station to station
- station to trunk
- trunk to trunk

Cross-Product Compatibility/Commonality

Terminals

All IP endpoints available from Avaya can shuffle including the IP Telephone, the IP Softphone, and the Avaya R300 Remote Office endpoints.

Adjunct Switch Applications Interface (ASAI)

The switch delays sending an acknowledgement to the ASAI adjunct that the ASAI instruction has been completed until after all necessary resources to set up the audio channels between the sets and the TN2302 Media Processor's are allocated if the following are true:

- The two endpoints' audio paths are directly ip-ip connected together, and
- ASAI issues an instruction that causes the switch to reconnect the speech paths back to a TN2302 Media Processor port,

The following ASAI instructions may cause the switch to reconnect the speech paths back to a TN2302 Media Processor port:

- Selective listening
- Third Party make call
- Third Party take control
- Third Party selective hold
- Third Party Single Step Conference
- Third Party merge
- Third Party Selective Drop
- Third Party Clear Call
- Third Party send DTMF
- Third Party Answer
- Third Party Auto Dial
- Request Feature.

Whether each of these instructions do or do not cause the switch to return the call to ip-tdm-ip will depend on such options as whether the switch needs to supply music on hold, for example.

If there are insufficient ports available on TN2302 Media Processor to carry out the above commands, the switch will send an appropriate Denial (NAK) Cause value back to the ASAI adjunct.

Feature Interactions

If sufficient audio channels are not available when an IP direct (shuffled) or IP hairpin call needs to return to the TDM bus, the switch blocks the user's action and notifies the user via a lamp flutter. There are several features that require calls to return to the TDM bus.

Attendant Console

If a station is on an IP-media processor-ip hairpin call or a call carried over an ip-ip direct audio connection, that station will still show up as busy on the attendant busy lamp field and on Busy Indication buttons.

Bridging

Circuit switched endpoint bridged with IP endpoints

If endpoint A and endpoint B have an audio connection to each other and user C has a bridged call appearance of endpoint A on C's set, the connection between A and B can still be made via ip-media processor-ip hairpin, or ip-ip directly. User C is not considered a third party to this call for Hairpin Setup, or Audio Shuffling Setup unless user C selects the bridged call appearance.

Bridging and new connections

The switch will not set up a direct ip-ip or and ip-media processor-ip connection between two endpoints while either endpoint is bridged in a call with additional parties.

End to End Signaling

Direct ip-ip and hairpinned ip-media processor-ip connections have potential impact on end to end signaling.

If endpoint A and endpoint B have an audio connection to each other via ip-media processor-ip hairpin or ip-ip directly, and user A presses a DTMF button the DTMF signal will not reach the far end of the connection. DTMF tones are not carried in-band on H.323 trunks.

Hold

If user A, user B, and user C are talking on a conference call, and user C presses the hold button, leaving A and B talking together, the switch will not set up a direct ip-ip or ip-media processor-ip hairpin connection between those two endpoints as long as C keeps them on hold. This prevents a delay when C re-enters the call.

Hold with misoperation handling

A call that is re-alerting at the holding endpoint by the misoperation handling feature is treated the same as any other incoming call for hairpinning and shuffling. The caller hears ringback, and so must be connected to the TDM bus.

Music On Hold

Music On Hold uses network and TN2302 circuit pack resources.

Soft Hold

The switch will not set up an ip-ip direct or an ip-media processor-ip hairpin connection between two endpoints while either endpoint has a TDM party on soft hold awaiting a transfer.

Manual Signaling

If endpoint A and endpoint B have an audio connection to each other via ip-media processor-ip hairpinning or ip-ip directly, and a third endpoint C uses manual signaling to ring endpoint A, A and B will remain ip-media processor-ip hairpinned or ip-ip directly connected together.

Considerations

The conditions outlined below should be considered when using hairpinning and shuffling.

Table 6. Considerations with hairpinning and shuffling

Condition	Solution
Audio Hairpin Connections come undone	The DEFINITY ECS may undo hairpinning of audio connections, if a third party is conferenced into the existing two-party call, or when the DEFINITY ECS wants to insert a tone or announcement into the connection, or for many other reasons. See Feature to Feature Interactions in this section for a complete list of situations that would cause DEFINITY ECS to undo a hairpin connection.
Volume is too quiet after a hairpin	The enduser using the Avaya endpoint would not have to adjust the volume control while the enduser using a non-Avaya endpoint may need to adjust the audio volume after the audio hairpinning is done.
Audio Shuffling Connections	The audio shuffling may cause a disruption in the media exchange for a duration of approximately 200ms. The disruption may be longer for an inter-network region call or a call traversing multiple switches. For a call involving a H.323 trunk as one of the endpoints, the administered value of the field “direct ip-ip audio connections” on the signaling group associated with that trunk determines the peer PBX’s Media Processor capability to handle shuffling. For a call traversing through multiple switches, the shuffling process may continue either leading to a full shuffle or a partial shuffle. For a normal point-to-point call between two IP terminals, the process can begin as soon as the terminating end answers the call. The call may undergo direct ip-ip audio connection or TDM connection based on user actions and feature interactions.

Continued on next page

Table 6. Considerations with hairpinning and shuffling — *Continued*

Condition	Solution
The yellow LED on Media Processor board remains lit	As long as a TN2302 Media Processor board is hairpinning calls, its yellow LED will be lit. There is no simple way to identify all of the extension numbers that are hairpinning through a particular TN2302 Media Processor board. It is possible to determine which TN2302 Media Processor board a particular extension is using for hairpinning, by looking at the audio port field on the status station screen. A hairpinned call will show there as using a TN2302 Media Processor board slot, but not which TN2302 port.
TTD equipment is not sending or receiving tones accurately	If Teletype for the Deaf (TTD) equipment is to communicate over H.323 trunks, the system administrator should ensure that G.711 codecs are the primary codec choice for those trunks. This will ensure that the TTD tones are accurately sent through the connection.
Audio quality degrades	Audio quality may suffer if a call is subjected to a series of compressions of different types (some degradation is observed even if the same codec is used multiple times). If hairpinning or shuffling cannot be invoked, then maximum use of a G.711 codec should be encouraged to avoid multiple codec steps.
Switch ends IP audio channel	When and ip-media processor-ip hairpin or ip-ip direct call disconnects, if any set remains off-hook, the switch will connect to the set the appropriate tone as administered by the Station Tone Forward Disconnect field on the Feature-Related System Parameters screen. If that administered value is not silence, the switch will reconnect the audio path of such sets back to a TN2302 Media Processor port and the TDM bus, if an audio channel is available in the same network region. If that administered value is silence, the switch will end the IP audio channel.
Station cannot hairpin	If a station is administered for dual-connect, and if the two extension numbers for that station have differing values administered in their “Direct IP-IP audio connection?” fields, the resulting station will not be allowed to hairpin. If a station is administered for dual-connect, and if the two extension numbers for that station have differing values administered in their “IP-IP audio hairpinning?” fields, the resulting station will not be allowed to hairpin.

Continued on next page

Table 6. Considerations with hairpinning and shuffling — *Continued*

Condition	Solution
User experiences one-way audio as soon as the far end connects	If an endpoint is not capable of shuffling, and also is not capable of signaling that limitation during registration, but the system administrator administers that endpoint to allow shuffling, the endpoint user will notice that two-party calls to other IP endpoints that are also administered as capable of shuffling will have one-way audio as soon as the far end answers the call, and similarly for calls from such endpoints.
Service Observer experiences break in speech path	If a call center agent is active on a two-party ip-ip direct call, and a call center supervisor chooses to service observe into the call, the agent would likely notice the 200ms break in the speech path while the call is being shuffled back to an ip-tdm-ip call. Stations that may be service observed should be administered to block shuffling.
LAN endpoint cannot be administered to allow shuffling	If a LAN endpoint is administered for permanent audio service link operation, the endpoint can not be administered to shuffle audio connections.
Calls are dropped during Busyout and Release	Busying out the TN2302 Media Processor board will drop all calls using the board in any manner. Note that calls carried by ip-ip direct audio connections are not using a TN2302 Media Processor board. Busying out ports 1-8 on the TN2302 Media Processor will drop all ip-tdm-ip hairpinned call and prevent future such calls on that port until the port is released, but not drop ip-media processor-ip hairpinned calls. Busying out a C-LAN board will cause the sets registered through that C-LAN to lose their registrations. If the sets are active on TDM connected or hairpinned calls, the calls will drop. Busying out a C-LAN board that is carrying signaling for tandem trunks causes all calls carried over those trunks to drop. What happens to calls carried by direct ip-ip audio connections when the corresponding C-LAN board is busied out depends on the endpoints involved in the call. Whether an endpoint will drop the call when it loses its registration will be specified in the endpoints' requirements documents. In either case, the switch will not attempt to send new calls to unregistered sets.

IP Serviceability tools

IP Serviceability consists of switch-resident tools for troubleshooting communication problems between two IP endpoints within a DEFINITY system.

Prior to R9.5, DEFINITY systems and IP600 systems had limited commands to assess the health of IP links. Local network analyzers or “sniffers” often were required to monitor the performance of the link in question requiring expensive equipment and on-site personnel.

With the switch-resident tools, local and remote service personnel can troubleshoot, diagnose, and repair IP network-related problems without additional troubleshooting equipment.

This feature is a collection of report-generating utilities that use existing TN799 (C-LAN) and the TN2302 circuit packs along with new software and firmware. The following table lists these utilities.

Table 7. IP Serviceability commands

Description	Command
Packet Loss/Jitter Size Report This information is not available for shuffled calls.	**status station** and **status trunk xx/yy**
IP Denial Events Log	**display events** event type: **denial**
Netstat ARP Report Address Resolution Protocol (ARP) is a low-level protocol that “maps” IP addresses to their corresponding MAC addresses	**netstart arp**
Refresh route tables	**refresh route-table**
IP Denial Events Log	**display events**
Trace Route Results	**trace-route node-name**
Trace Route Results	**trace-route ip-address**
Ping Results	**ping ip-address**

This feature requires existing circuit packs (see "Hardware specifications" for more details):

- C-LAN
  - TN799A (V27 or higher)
  - TN799B (all versions)
  - TN799C
- TN2302 with V27 or higher firmware

Hardware specifications

The following table lists the required hardware and software for the various DEFINITY models:

Table 8. Required hardware and software

Model	IP service	C-LAN circuit pack
r	IP Services on Customer Options screen enabled	TN799A (V27 or higher) TN799B (all versions) TN799C TN2302 with V27 firmware or higher
si	IP Services on Customer Options screen enabled	
csi	IP Services on Customer Options screen enabled	
DEFINITY ONE	Requires Windows 95/98 TCP/IP connectivity	TN799C
Avaya IP600	Requires Windows 95/98 TCP/IP connectivity	TN799C

Maintenance and troubleshooting

These features provide system-based diagnostic and troubleshooting tools for communication problems between IP endpoints.

Fixing problems / troubleshooting strategy

The following table lists some of the most common IP problems, their cause and possible solutions.

Table 9. IP troubleshooting guide

Problem	Possible cause	Solution
Noisy connection that eventually breaks up, creating gaps in the conversation and making speech unintelligible.	Packet loss Jitter	Depending on the “side” of the switch, use: status station status trunk xx/yy
IP service not responsive or cannot make connection	IP connection problem	Use the **display events** command with event type: **denial** to look for denied IP events.

Diagnostic and troubleshooting commands

Table 10 lists diagnostic and troubleshooting commands and their use.

Table 10. Diagnostic/troubleshooting commands and their use

Command	Description	Use
display events event type: denial	This command creates a list of each time an IP event is denied, rejected, or some service is not provided. Each log entry consists of ■ a 25-character string that describes the problem ■ an identification number that uniquely implicates a specific piece of code ■ another numeric string describing the denial	Accumulates data to track denied or rejected IP service.
status station	This command generates a report that shows: ■ the number of packets that are either lost or corrupted ■ amount of jitter on the connection. In this instance, jitter is the variability in the amount of time, in milliseconds, that packets are received over the network. When jitter increases, the user experiences a noisy connection, delays, and a general loss of quality, making speech unintelligible.	Diagnose for station-side IP problems, including the IP phone.
status trunk xx/yy		Diagnose for trunk-side IP problem.

Quality of Service and Voice Quality Administration

This chapter provides instructions for administering Quality of Service on a DEFINITY system.

Quality of Service Overview

Quality of Service (QoS) allows you to control network operating parameters to optimize audio performance. This feature is designed to provide the best possible audio experience when part or all of the audio path is carried over packet facilities.

QoS is implemented in two phases:

1. The DEFINITY system or the data-network tags voice packets with a priority value.
2. The data-network equipment uses the priority tag to make decisions bout queueing and discarding packets.

First, establish priority policies on the data-network. Then administer the DEFINITY system to match the data-network.

The DEFINITY system offers the following features for implementing QoS:

- configurable UDP port ranges
- voice traffic classification using DiffServ and IEEE 802.1p/Q for each network region

The DEFINITY system also provides the following features for improving IP voice quality:

- audio CODEC settings for each network region
- multiple CODEC sets with frames-per-packet settings and silence suppression for each CODEC
- network region by signaling group administration (permits different CODEC sets for trunk calls verses station-to-station calls)
- dynamically-adjusted jitter buffers
- improved hybrid echo cancellation
- packet loss concealment

Cajun Rules, an Avaya product used for QoS administration, also helps define network utilization policies.

Voice Traffic Priority

Networks may give priority to voice packets over ordinary data packets for Voice over IP solutions to function well. Strategies to prioritize voice traffic include prioritizing ports using the User Datagram Protocol, using Differentiated Services (DiffServ), and using IEEE 802.1Q to set the priority bits.

Establish a DiffServ policy across your data network. The DiffServ values of the DEFINITY system and IP Endpoints must be set to follow this policy.

CAUTION:
If you change 802.1p/Q on your DEFINITY system, it changes the format of the Ethernet frames. 802.1p/Q settings must be the same for your data network and your DEFINITY system.

DiffServ is an OSI model layer 3 solution.

Configuring ports using UDP

Avaya allows users to configure User Datagram Protocol (UDP) port ranges used by VoIP packets. The data network equipment uses the port ranges to assign priority throughout the network. This is an OSI model Layer 4 solution.

Differentiated Services

The Differentiated Services Code Point (DSCP or DiffServ) prioritization scheme redefines the Type of Service (TOS) byte in the IPv4 header by combining the first six bits into 64 possible Per Hop Behaviors (PHBs). Set these bits according to your company's policy.

A DiffServ policy must be established across entire IP network, and the DiffServ values of the DEFINITY system and IP Endpoints must follow this policy. DiffServ is an OSI model layer 3 solution.

802.1p/Q

The 802.1p feature is important to the endpoint side of the network since PC-based endpoints must prioritize audio traffic over routine data traffic. 802.1p is an Ethernet tagging mechanism that can instruct Ethernet switches to give priority to audio frames. IEEE standard 802.1Q allows you to specify both a virtual LAN and a frame priority at layer 2 for LAN switches or Ethernet switches, which allows for routing based on MAC addresses. 802.1Q/p provides for 8 levels of priority and also for a large number of Virtual LAN identifiers. Interpretation of the priority is controlled by the Ethernet switch and is usually based on highest priority first. The VLAN identifier permits segregation of traffic within Ethernet switches to reduce traffic on individual links. 802.1p operates on at the MAC layer. Since 802.1p may vary from LAN segment to LAN segment within a single network region, you must administer 802.1p/Q options individually for each network interface. IEEE 802.1p and IEEE 802.1Q are OSI model layer 2 solutions.

Using VLANs

VLANs provide security and create smaller broadcast domains by using software to create virtually separated subnets. Broadcasts are common in most data networks from protocols used by PCs, servers, switches and routers. Creating separate VLANs result in more effective bandwidth utilization and reduces the processor burden on most endpoints.VLANs are defined in data switches, and separate VLANs for voice are strongly recommended. This is an OSI model layer 2 solution.

Quality of Service Administration

This section contains information about network parameters which effect voice quality, and instructions for setting network performance thresholds, defining network regions, and administering CODEC sets.

Network parameters

A number of network parameters effect voice quality, including packet delay, jitter, packet loss, echo, and silence suppression.

Packet delay

Packet delay is the length of time it takes for a packet to traverse the network. Best practices suggest that the end-to-end one-way packet delay should not exceed 150 ms. Each element of the network adds to packet delay, including switches, routers, distance travelled through the network, firewalls, and jitter buffers. Packet delay exceeding 150 ms may begin to have a noticeable effect; however, some applications or users may elect to tolerate it. A network assessment from Avaya, measuring latency and making recommendations to solve latency issues, is recommended before implementing VoIP solutions.

Jitter

Jitter is a measure of the variance in the time it takes for communication to reach the receiver from the sender, from the application's perspective. Jitter is generally considered the statistical average variance in delivery time between packets or datagrams.

If this variance exceeds 20 ms it can create audible voice quality problems. Symptoms of excessive jitter are similar to symptoms of excessive delay, because in both cases packets are discarded.

To compensate for network jitter, many vendors of H.323 voice applications implement a jitter buffer. The purpose of the jitter buffer is to hold incoming packets for a specified period of time before forwarding them, thereby smoothing packet flow.

Because of the added packet delay, jitter buffers should be sized to no more than twice the largest statistical variance between packets. The best solution is to have dynamic jitter buffers. These reduce their size as allowed by the network, thereby reducing the delay caused by jitter buffers. Many Avaya IP solutions including the DEFINITY ECS, IP600, IP Softphone, and IP Telephone incorporate dynamic jitter buffers.

Packets are discarded if they arrive later than the jitter buffer can hold them. If a packet arrives out-of-order, it is generally due to individual packets being sent across different paths over the network. A packet that arrives out-of-order is generally discarded.

Packet loss

Network packet loss is when a packet is sent but not received at its final destination. A good quality VoIP network should have packet loss of less than 0.2% between endpoints. Avaya implements packet loss concealment to lessen its impact.

NOTE:
Too much packet delay can be perceived as dropped packets. To a tool which measures packet loss, these dropped packets may appear as lost packets, when in fact they were discarded intentionally.

Echo

Echo is hearing your own voice reflected back at you, which happens when a signal on a transmit path appears on a receive path. Echo stems from electrical (imbalanced impedance, cross-talk) or acoustical (room size or speakerphone) sources, and is troublesome if it impairs the ability to have a normal conversation. The difference in time from when a voice enters the network and when it is returned to the originator is known as echo path delay.

Echo cancellers are used to minimize echo. They work by comparing incoming voice patterns to current voice patterns, and cancelling echo when the patterns match. The echo cancellers are limited in their effectiveness by the amount of memory they have, and therefore the amount of voice patterns which they can hold at one time. VoIP can exacerbate the problem when traffic delay exceeds the echo canceller's memory. Avaya's echo cancellers are designed for use with VoIP to improve voice quality.

Silence suppression

Voice Activity Detection (VAD) monitors the received signal for voice activity. When no activity is detected for the configured period of time, the software informs the packet voice protocol. This prevents the signal from being sent across the network when there is silence, which saves bandwidth. VADs can greatly conserve bandwidth, but overly aggressive VADs can cause voice clipping and reduce voice quality. When planning for network bandwidth use, especially across WANs, silence suppression is an important factor to consider.

Set thresholds for network performance of IP trunking

NOTE:
Avaya strongly recommends that you leave the default values for the following screens on your system.

Four parameters on the maintenance-related system-parameters screen determine threshold values for network performance. You can use the default values for these parameters, or you can have an Avaya representative change them to fit the needs of your network. These threshold values apply only to IP trunks, and do not effect other IP endpoints.

The craft (or higher) login is required to perform this administration. To administer the maintenance-related system-parameters screen do the following:

1. Type **change system-parameters ip-options** to open the ip-options system-parameters screen.

```
change system-parameters ip-options                Page 1 of 1
               IP-OPTIONS SYSTEM PARAMETERS


IP MEDIA PACKET PERFORMANCE THRESHOLDS
  Roundtrip Propagation Delay (ms)    High: 800   Low:400
                  Packet Loss (%)     High: 40        Low:15
                  Ping Test Interval (sec): 20
  Number of Pings Per Measurement Interval: 10
```

2. Enter values for the fields suitable for your network needs (defaults shown in the table below).

Field	Conditions/Comments
Roundtrip Propagation Delay (ms)	High: 800 Low: 400
Packet Loss (%)	High: 40 Low: 15
Ping Test Interval (sec)	20
Number of Pings per Measurement Interval	10

3. Submit the screen.

These parameters have no effect unless the **bypass if IP threshold exceeded** field is set to **y** on the Signaling Group screen. If bypass is activated for a signaling group, ongoing measurements of network activity collected by the system are compared with the values in the IP-options system parameters screen. If the values of these parameters are exceeded by the current measurements, the bypass function terminates further use of the network path associated with the signaling group. The following actions are taken when thresholds are exceeded:

- Existing calls on the IP trunk associated with the signaling group are not maintained.
- Incoming calls are not allowed to arrive at the IP trunks on the bypassed signaling group. They are diverted to alternate routes.
- Outgoing calls are blocked on this signaling group. If so administered, blocked calls are diverted to alternate routes (either IP or circuits) as determined by the administered routing patterns

Administer IP Codec Set

NOTE:
Avaya strongly recommends that you leave the default values for the following screens on your system.

The IP Codec Set screen allows you to specify the type of CODEC used for voice encoding and companding, compression/decompression. The main difference between CODECs is in the compression algorithm used: some CODECs compress the voice data more than others. A greater degree of compression results in lower bandwidth requirements on the network, but also introduces transmission delays and lower voice quality.

Depending upon bandwidth availability and required voice quality, it may be worthwhile to select a CODEC that produces compressed audio.

- A G.711 CODEC produces audio uncompressed to 64 kbps. This is the default CODEC.
- A G.729 CODEC produces audio compressed to 8 kbps.

If the far-end is a not a DEFINITY switch, you may need to change the CODEC to match one that is supported.

The following table compares CODECs by listing several voice quality considerations. Mean Opinion Score (MOS) is a long-standing subjective method of measuring voice quality. Toll-quality voice must achieve a MOS of 4 or above.

Table 11. Comparison of Speech Coding Standards

Standard	Coding Type	Bit Rate (kbps)	MOS
G.711	PCM	64	4.3
G.729	CS-ACELP	8	4.0
G.723.1	ACELP	6.3	3.8
	MP-MLQ	5.3	

The IP Codec Set screen

NOTE:
Avaya strongly recommends that you leave the default values for the following screens on your system.

The order in which the CODECs are listed on the following screen is the order of preference of usage. A trunk call between two DEFINITY switches is set up to use the first common CODEC listed.

NOTE:
The CODEC order must be the same on DEFINITY switches at both ends of an H.323 trunk connection. The set of CODECs listed need not be the same, but the order of the listed CODECs must be the same.

The IP Codec Set screen allows you to define the CODECs and packet sizes used by each IP network region. You can also enable or disable silence suppression for each CODEC in the set. The screen dynamically displays the packet size in milliseconds for each CODEC in the set, based on the number of frames you administer per packet.

To administer an IP Codec Set:

1. Type **change ip-codec-set <#>** to open the IP Codec Set screen.

```
change ip-codec-set 1                              Page 1 of 1
                        IP Codec Set                              Codec
Set: 1
    Audio Codec  Suppress  Frames   Packet
                  Silence   per Pkt   Size (ms)
1.  G.711mu         n        2      20
2.  G.729           n        2      20
3.
4.
5.
```

2. Complete the following fields:

Table 12. IP Codec Set screen fields

Field	Conditions/Comments
Audio Codec	Specifies an audio CODEC. Valid values are: ■ **G.711a** (a-law) ■ **G.711mu** (μ-law) ■ **G.723.1-5.3** ■ **G.723.1-6.3** ■ **G.729** ■ **G.729B** **NOTE:** Use these bandwidth requirements to decide which CODECs to administer. These numbers change with packet size, and do not include layer 2 overhead. With 20 ms packets: G.711 A-law - 80 Kbps G.711 μ-law - 80 Kbps (used in U.S. and Japan) G.723.1-5.3 - 21.3 Kbps G.723.1-6.3 - 22.3 Kbps G.729A - 24 Kbps
Suppress Silence	Enter **n**. Enter **y** for silence suppression on the audio stream. This may affect audio quality.
Frames per Pkt	Specifies frames per packet. Enter a value between **1-6**. Default values are: ■ **2** for G.711 Codec (frame size 10ms) ■ **2** for G729 Codec (frame size 10ms)
Packet Size (ms)	Automatically appears.

3. Submit the screen.

4. Type **list ip-codec-set** to list all your CODEC sets on the CODEC set screen.

```
list ip-codec-set                                   Page 1 of 1

                          Codec Sets                                Codec
 Codec 1    Codec 2    Codec 3    Codec 4      Codec 5
Set
1.       G.711MU    G.729
2.       G.729B     G.729      G.711MU    G.711A
```

5. Review your CODEC sets.

Define IP network region

NOTE:
Avaya strongly recommends that you leave the default values for the following screens on your system.

The IP Network Region screen allows you to define a network region to specify which audio transport parameters the DEFINITY system will use when communicating with an endpoint in this region. Audio transport parameters that you can specify on this screen include a CODEC set, DSCP (DiffServ) PHB, 802.1p priority, 802.1Q VLAN ID, and UDP port range.

NOTE:
Although they are not defined on this screen, the IP network region also encompasses a series of resources, media processor boards, that are shared by IP endpoints when they are making calls. Network regions also encompass a series of CLAN circuit packs that are shared by the DEFINITY system's Load Balancing and Alternate Gatekeeper features. See "Alternate Gatekeeper and C-LAN load balancing" for more information.

The IP-network-region screen

To define an IP network region, do the following:

1. Type **change ip-network-region** to open the IP Network Region screen.

```
change ip-network-region 1                                    Page 1 of 2

                          IP Network Region
                  Region: 1
                    Name: Denver
        Audio Parameters
               Codec Set: 1

           UDP Port Range
                     Min: 2048_
                     Max: 65535


DiffServ PHB Value: 46_                    Direct IP-IP Audio Connections? y
                                                 IP Audio Hairpinning? y
   802.1p/Q Enabled? y
    802.1p Priority: 6
        802.1Q VLAN: 0
```

2. Complete the fields in the following table as shown:

Field	Conditions/Comments
Name	Describes the region. Enter a character string up to 20 characters.
Codec Set	Specifies the CODEC set assigned to a region. Enter a value between **1-7**. **NOTE:** CODEC sets are administered on the CODEC set screen (see "Administer IP Codec Set").
UDP Port Range-Min	Specifies the lowest port number to be used for audio packets. Enter a value between **2-65534**. **NOTE:** Note: This number must be twice the number of calls you want to support plus one, must start with an even number, and must be consecutive. **CAUTION:** *Avoid the range of well-known or IETF-assigned ports. Do not use ports below 1024.*

Continued on next page

Field	Conditions/Comments
UDP Port Range-Max	Specifies the highest port number to be used for audio packets. Enter a value between **3-65535**. **CAUTION:** *Avoid the range of well-known or IETF-assigned ports. Do not use ports below 1024.*
DiffServ PHB Value	Contains the decimal equivalent of the DiffServ PHB value. Enter a value between **0-63.** Use PHB **46** for expediting forwarding of packets. Use PHB **40** for audio for legacy systems that only support IPv4 Type-of-Service. This correlates to the older TOS critical setting.
802.1p/Q Enabled	Specifies whether 802.1p MAC-layer prioritization and 802.1Q Virtual LAN specification are enabled for edge devices in this region. **NOTE:** This option applies only to the audio traffic sourced by the TN2302 Media Processor circuit pack.
802.1p Priority	Specifies the 802.1p priority value, and appears only if 802.1p/Q field is y. Enter 6. **CAUTION:** *If you change 802.1p/Q on your DEFINITY system, it changes the format of the Ethernet frames. 802.1p/Q settings must be the same for your data network and your DEFINITY system.*
802.1Q VLAN	Specifies the 802.1Q virtual LAN value and appears only if the 802.1p/Q field is y. **CAUTION:** *If you change 802.1p/Q on your DEFINITY system, it changes the format of the Ethernet frames. 802.1p/Q settings must be the same for your data network and your DEFINITY system.*

3. If C-LAN and IP Media Processor resources are shared between regions, go to the Inter Network Region Connection Management screen.

NOTE:
You will not be able to connect IP endpoints in different network regions or communicate between or among network regions unless you make an entry in this page specifying the CODEC set to be used.

```
change IP-network-region 1                                    Page   2 of 2
                Inter Network Region Connection Management

Region                              (Group of 32)
          1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
001-032   1 _ _ 2 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
033-064   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
065-096   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
097-128   _ _ 5 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
129-160   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
161-192   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
193-224   6 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
225-256   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
257-288   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
289-320   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
321-352   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
353-384   _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
```

4. Specify CODEC sets for your shared network regions as done in the example above. In the example, network region 1 will communicate with the following other network regions, using the specified CODEC sets:
   - network region 1 using CODEC set 1
   - network region 4 using CODEC set 2
   - network region 99 using CODEC set 5
   - network region 193 using CODEC set 6
5. Submit the screen.
6. Type **list ip-network-region** to list all your network regions on the IP Network Region screen.

```
list ip-network-region                                  Page 1 of 1
                IP Network Region
Region  Name:       Codec UDP Port Range  DiffServ  802.1p
                     Set   Min     Max     Value   priority  1
 Denver          1   2048   65535      28          _
2       Cheyenne       1   2048   65535      28          3
```

7. Review the network regions with the new audio transport parameters.

Quality of Service to Endpoints

Default QoS parameters are downloaded to the IP Telephone R1.5 and the IP Softphone R3 when the values are not provided by the endpoint installer or the user. Certain options can be set locally by the endpoints or via the gatekeeper. The endpoints receive the parameters upon registration, and once they are registered, whenever the administered values of the QoS parameters are modified.

DiffServ and 802.1p priorities apply to both ends of a connection. Configure QoS values for the switch interfaces and the endpoints to correspond to the network to which they are connected. In many cases, the endpoints are “local” and the values for the endpoints and the networks are the same. In other cases, the endpoints and the network have different QoS values. The switch can download default values to the endpoint when values are not provided by the endpoint installer or the user.

Quality of Service Integration with Cajun Rules

DEFINITY system software allows you more control over the Quality of Service (QoS) in your IP voice network by using Cajun Rules to establish Quality of Service parameters. Use of Cajun Rules ensures that those parameters are consistently applied to both the data network and the voice network.

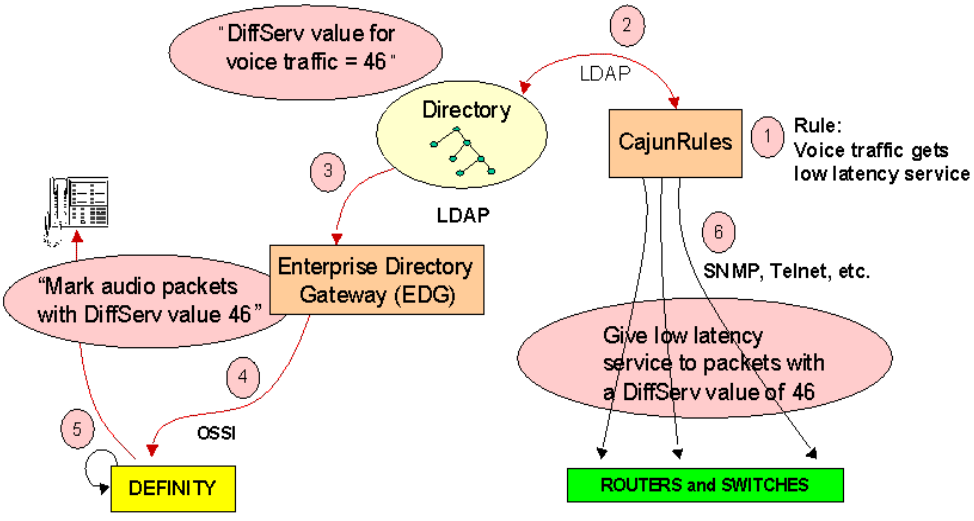
Cajun Rules provides a central repository for QoS parameters and allows comprehensive QoS management across routers, switches, and endpoints. QoS parameters and policies are assigned according to network regions and are distributed through Enterprise Directory Gateway to the DEFINITY ECS and to routers and switching devices.

Cajun Rules is a policy management system that allows network managers to define network utilization policies. These policies are targeted on elements in an enterprise directory, such as users, groups, and applications, as well as other factors such as time of day, and can therefore express a rich variety of business rules. These policies can be uniformly and consistently applied throughout the network. Cajun Rules is driven by a directory and can communicate its policy based rules to various data switches and routers (including Cajun and Cisco).

Cajun Rules Release 2.1 includes support for the management of QoS parameters introduced in DEFINITY Release 9. Cajun Rules is able to communicate these QoS policy-based rules to DEFINITY via the Enterprise Directory Gateway. The Enterprise Directory Gateway contains LDAP schema for DEFINITY ECS administration data and communicates with DEFINITY via the proprietary OSSI protocol. The LDAP schema in the Enterprise Directory Gateway is extended to include the QoS parameters described above.

Cajun Rules is able to populate the DEFINITY-specific QoS LDAP schema in the Enterprise Directory Gateway. The Enterprise Directory Gateway then sends the updated QoS parameters to DEFINITY via the OSSI protocol. Cajun Rules also communicates these same QoS policy rules to the various data switches and routers in the network, so that there can be consistent quality of service across the network for the voice packets.

The following figure illustrates this architecture:



Scenario

1. Business rule established in CajunRules (CR)
2. Cajun Rules uses LDAP to update DEFINITY schema in the Directory
3. EDG identifies the change in the Directory
4. Enterprise Directory Gateway updates DEFINITY administration via OSSI
5. DEFINITY tells its own media processors and phones to mark audio packets with DSCP = 46.
6. CR distributes policy information to the devices, including a low latency service for DiffServ value of 46.

Networking Examples

This chapter describes how to administer TCP/IP data connections between DEFINITY ECS switches using the C-LAN circuit pack.

Overview

This chapter provides an update of CLAN administration procedures. The changes described in this chapter are:

TCP/IP connections (ppp or ethernet) require DEFINITY ECS Release 7 or later hardware and software. Pre-R7 switches can be connected to R8 switches via ISDN or BX.25. However, all switches in the example configuration are assumed to be upgraded to R7 or later.

Supported Switches and Adjuncts

Csi-model switches and R8si and R8r or later switches cannot have X.25 connections. However, pre-R7 switches with X.25 connections can be upgraded and keep the X.25 connections.

The vs model switch cannot be upgraded beyond R6.3. However, pre-R7 releases of the vs model are supported via X.25 and ISDN (not TCP/IP) in customer networks that include newer versions of the csi, si, and r models.

The call management system (CMS) and Intuity adjuncts can be connected to the DEFINITY ECS csi with an ethernet connection and to the si and r models with either an ethernet or Bx.25 connection. Procedures for administering these connections are documented in *CentreVu CMS Switch Connections and Administration* (585-215-876) for CMS and in *Intuity Messaging Solutions, LAN Integration with DEFINITY ECS* (585-313-602) for Intuity. CMS administration is covered in *Centre CMS Software Installation and Setup* (585-215-866).

Checklist for Prerequisite Administration

Review this section before you proceed with the network administration tasks. Take care to follow the correct instructions for the model and version for your system.

License File

Remote Feature Activation (RFA) is a Web-based application that enables the creation and deployment of License Files for all switches beginning with R10. The License File enables the switch's software category, release, features, and capacities. License Files are created using SAP order information and/or current customer configuration information. Without a license file, the switch does not provide normal call processing.

Pre-upgrade checklist (R10)

In order to be properly prepared for the upgrade, have the items listed below ready.

Table 13. Pre-upgrade checklist

Item No.	Item	✔
1.	Software Release Letter	
2.	Release 10 system software on removable media	
3.	Extra formatted removable media	
4.	Authorized wrist grounding strap	
5.	Documentation (book or PDF file) for the current release: ■ DEFINITY Enterprise Communications Server Maintenance for R10si ■ DEFINITY Enterprise Communications Server Administrator's Guide	
6.	Your personal Single Sign-On (SSO) for RFA website authentication login.	
7.	SAP order number with RTUs	
8.	License File serial number(s)	
9.	Transaction Record number	

Continued on next page

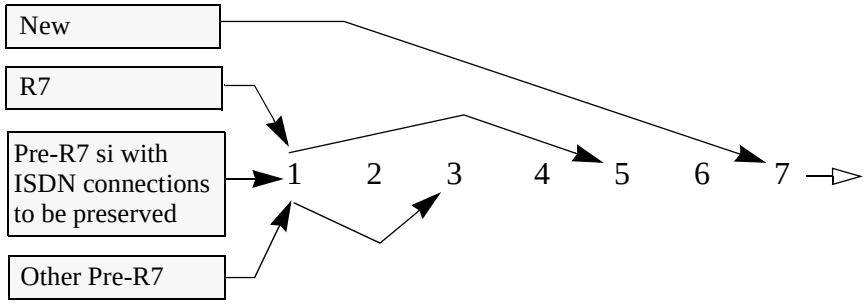
Table 13. Pre-upgrade checklist — *Continued*

Item No.	Item	✔
10.	System Identification (SID) number	
11.	Switch telephone number or IP address	
12.	Access to the RFA Information page for these items (if not already installed on your PC): ■ Features Extraction Tool (FET) application ■ FET documentation ■ License Installation Tool (LIT) application ■ LIT documentation	
13.	Adobe Acrobat Reader application installed on your laptop/PC (to read FET and LIT documentation)	
14.	Internet Explorer 5.0 or higher installed on your laptop/PC	
15.	Intranet access to your designated RFA portal. The Remote Feature Activation (RFA) website automates some of the upgrade procedures, including generating a License File. See the upgrades documentation for your system for more information.	
16.	IF THE UPGRADE IS FROM G3V4 THROUGH RELEASE 8 TO RELEASE 10, THERE WILL BE HARDWARE REPLACEMENT AS WELL AS SOFTWARE UPGRADE. RELEASE 9 TO RELEASE 10 IS A SOFTWARE-ONLY UPGRADE.	

Prerequisite Administration

✔	Checklist Item

The prerequisite administration needed depends on whether the system is new or is being upgraded from an R7 or pre-R7 system. Use the following map to determine which steps to perform.



UPGRADES ONLY: Steps 1–6 apply only to systems being upgraded from an R7 or pre-R7 release. For new systems, skip to step 7.

1. Save translations on customer flash card (csi or si models) or tape (r model). For R7 systems, skip to step 5.

2. This step is for the *si model only.* It preserves ISDN-PRI connections, which (for R7 and later) are carried on the NetPkt circuit pack instead of the PI or PACCON circuit packs. ISDN-PRI connections are preserved transparently on the csi and r models.

If:

the si switch has existing ISDN-PRI connections that the customer wants to keep, complete the following steps:

- De-administer the ISDN-PRI connections:
  - busy the ISDN links
  - remove comm-interface links of type ISDN
  - remove comm-interface processor channels that use ISDN links
  - remove data modules using those links
- Save translations on a “working” flash card

Otherwise:

skip to step 3.

✔	Checklist Item
	3. Remove old circuit packs: ■ Turn off the power. ■ For the *csi model*, remove the Processor (TN798) circuit pack (*Don't* remove the processor circuit pack if it is a TN798B). ■ For the *si model*, remove the Processor (TN790), PACCON (TN778), and NETCON (TN777) circuit packs. If there are X.25 connections that the customer wants to keep, leave the PI (TN765) circuit pack in the switch; otherwise remove it. ■ For the *r model*, if there are X.25 connections that the customer wants to keep, leave the PGATE (TN755) circuit pack in the switch; otherwise, remove it.
	4. Install new circuit packs on all switches upgrading from a pre-R7 software load: ■ For *csi models*: install the TN798B (processor) and TN799B (C-LAN) circuit packs. ■ For *si models*: install the TN790B (processor), TN794 (NetPkt), and TN799 (C-LAN) circuit packs. For any PPN or EPN that will be carrying packet data, replace the TN776 (Expansion Interface) with the TN570B or TN570C circuit pack. ■ For *r models*: install TN799 (C-LAN.) The C-LAN circuit pack is required for TCP/IP (ppp and ethernet) connections. In all cases, the software will run without the TN799 (C-LAN) circuit pack; all other new circuit packs are required.
	5. Install the new software on all switches being upgraded.
	6. Deliver or install the License File (R10 only. See the upgrades documentation for your system
	7. Copy translations from translations flash card or tape (G3r). Use the "working" flash card if step **3** was performed.
NEW and UPGRADE Systems — the following items apply to both new systems and systems being upgraded from a previous release.	
	8. Establish physical connections at each node.
	9. Check software version on the System-Parameters Customer-Options screen.
	10. Turn on Alarm Origination and administer the numbers (R10)

✔	Checklist Item
	Use the Automatic Registration Tool (ART) to register the swtich for maintenance (R10).You must have switch connectivity through the INADS line or an IP address. ART is not accessible from the public internet (outside the Avaya intranet firewall). At your laptop/PC, direct your browser to this URL: **http://spiexp1.eng.avaya.com:8000/cgi-bin/ART/ARTstart.cgi**
	General Administration for new installations — the following translations should already be in place for existing systems and usually should not need to be changed for an upgrade unless new nodes are being added to the network.
	11. Administer DS1 circuit packs.
	12. Administer signaling group. page 1 — Trunk board address and Interface ID Page 2 — Administered NCA TSC assignment
	13. Administer synchronization plan.
	14. Assign trunk groups.
	15. Administer dial plan.
	16. Administer uniform dial plan.
	17. Administer AAR analysis.
	18. Administer route pattern.
	19. Assign hunt groups.

(Sheet 3 of 3)

Configurations

The task descriptions are presented in six relatively simple configurations. Each configuration describes how to administer either a 2-switch connection or a 3-switch gateway connection. The procedures for administering these configurations can be used either individually or in groups as “building blocks” for constructing most networks involving DEFINITY ECS and pre-R7 switches.

The following table lists the configurations described in this chapter.

Config-uration	Switch 2	Con-nection 1	Switch 1	Con-nection 2	Switch 3	Page
1	R7si	ppp	R7r			Page 98
2	R7csi	ethernet	R7r (+CMS)			Page 108
3	si	bx.25	R7r	ethernet	R7si	Page 132
4	csi	isdn	R7si	ppp	R7csi	Page 154
5A	R7csi	ppp	R7r	ethernet	R7si	Page 174
5B	R7csi	ppp	R7r (2 C-LAN boards)	ethernet	R7si	Page 197

The first 2 configurations are simple 2-switch networks. The next two are 3-switch networks with Switch 1 serving as a gateway between different signaling types for connection 1 and connection 2. The last two configurations are ppp–ethernet networks; 5B, is the same as 5A except the Switch 1 has two C-LAN boards instead of one.

TCP/IP connections (ppp or ethernet) require DEFINITY ECS Release 7 or later hardware and software. ISDN and BX.25 connections are supported on switches being upgraded from R7 or pre-R7 software. Pre-R7 switches can be connected to later release switches via ISDN or BX.25, however, new systems are not sold with X.25 connections. Therefore, all switches in the five configurations are assumed to be R7 or later except the si connected via BX.25 and the csi connected via ISDN in configurations 3 and 4 — these 2 switches could be either R7 or pre-R7 versions.

Organization of this chapter

The descriptions of the configurations have a common format. Each configuration section has the following subsections:

- Configuration overview
- Task summary
- Checklist of prerequisite tasks
- Configuration diagram
- Administration tasks

The subsections are described below.

Configuration Overview

Each of the configuration sections begins with a brief description of the network represented by the configuration. This section includes a high-level diagram and a description of the switches and their connections for each node in the network.

Task Summary

Lists the tasks that need to be performed to administer this configuration.

1. Review checklist
2. Assign node names
3. Assign links
4. Assign processor channels

Procedures for completing each of these tasks are described in detail following this summary.

Configuration Diagram

A detailed diagram of the configuration is shown after the task summary. The diagram is in two parts — one part showing the software-defined connections and the other part showing the hardware connections. The diagram shows many of the parameters that are entered on the administration screens

In the hardware part of the diagram, the paths for voice and signaling data are shown by dashed or dotted lines. The data for voice and call-setup signaling usually takes a different path through the switch hardware from the path for DCS and ISDN signaling data. These two types of data are distinguished in the hardware part of the diagram by the following convention.

A dashed line, , indicates voice and call-setup data.

A dotted line, , indicates DCS signaling data.

In the software part of the diagram, the virtual path from processor to processor between two nodes is traced by dashed lines. The path starts at a processor channel on one node, through the link/interface-channels on each node, to the processor channel on the connected node.

Administration tasks

This section gives the detailed steps for administering the connections between switches. For each configuration, there are several tasks and each task consists of several steps. All of the tasks needed to administer all the nodes in the network are included in each configuration.

The administration task sections list the steps for completing a screen and show a representation of the filled-in screen. Many of the field values shown in the screens are examples — you will use different values that are appropriate for your system. Information about the fields and their values — when and why different values are used — is given for each screen. More detailed information about the screens and their fields is given in Appendix A.

Intuity AUDIX LAN Setup Summary

The following list summarizes the steps for setting up an Intuity AUDIX on a LAN.

1. Assign node name and IP address
2. Assign UNIX machine name, IP address, configure LAN card.

   “Networking Administration, TCP/IP Administration”
3. Assign country and switch type

   “Switch Interface Administration, Switch Selection”
4. Assign extension length, Host Switch Number (switch node from dial plan), AUDIX Number, Switch Number IP address of the switch, and TCP Port.

   “Switch Interface Administration, Call Data Interface Administration, Switch Link Administration.”
5. Reboot the Intuity AUDIX

   “Customer/Services Administration, System management, System Control, Shutdown System.”
6. Set up the DCS Network Time Zones
7. “Audix Administration, change switch-time-zone.”

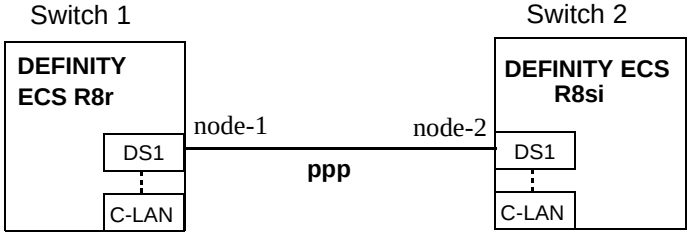
CMS LAN Setup Summary

The following list summarizes the steps for setting up a CMS server.

1. Edit the /etc/hosts file to add switch names and IP addresses
2. Set up a second NIC
3. Add a default router
4. Set up the local/remote port
5. Choose between x.25 and TCP/IP signaling
6. For X.25, define which physical port is used on CMS
7. For TCP/IP, assign the switch host name or IP address and TCP port number

Configuration 1: R8r <—ppp—> R8si

Configuration 1 is a ppp connection between a DEFINITY ECS R8r and a DEFINITY ECS R8si switch in a DCS network.



Task Summary

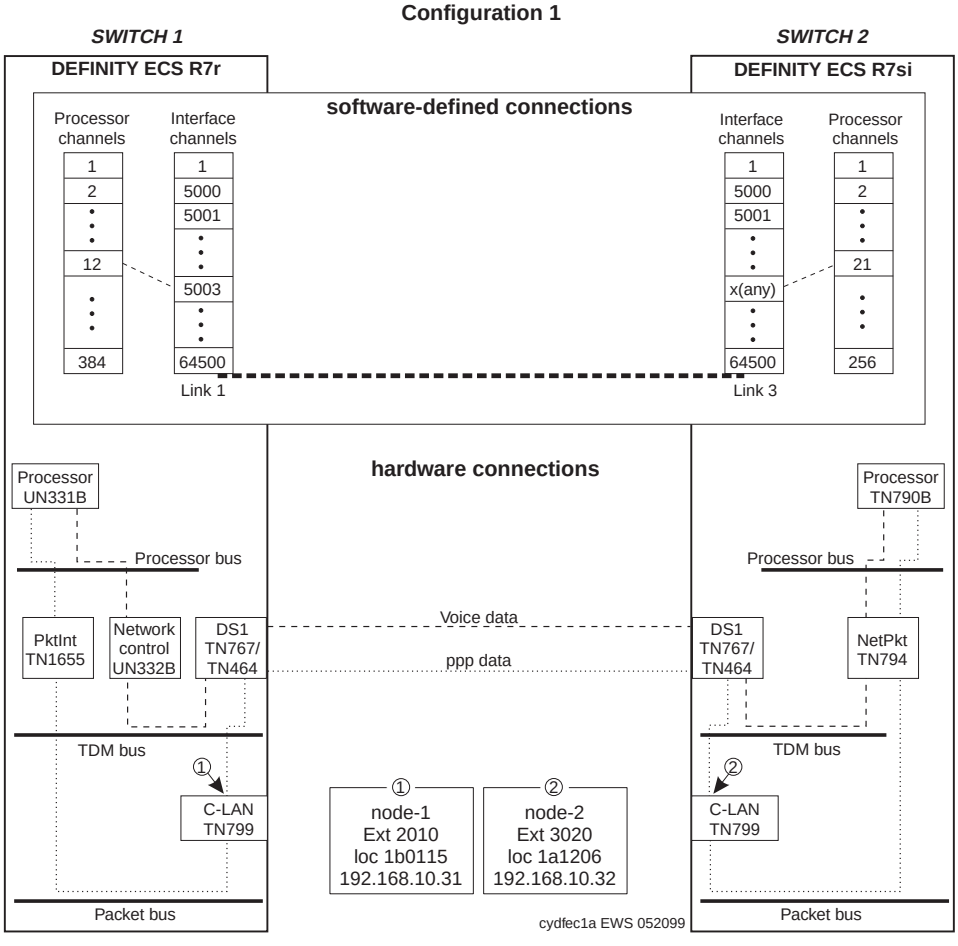
Complete the following tasks for Switch 1 and Switch 2:

1. Review prerequisite administration checklist
2. NODE 1 administration
    a. Assign node names
    b. Assign link (via a data module) to node-2
    c. Assign processor channels
3. NODE 2 administration
    a. Assign node names
    b. Assign link to (via a data module) node-1
    c. Assign processor channels
4. Enable links and processor channels

Prerequisite Administration

There are some system administration tasks that need to be completed before you can proceed with the connectivity administration described in this section.

Review the checklist of prerequisite administration tasks in Checklist for Prerequisite Administration (page 90), before proceeding with the connectivity administration in this section.



Switch 1 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 1. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on page 1. Enter node names for switches, routers, and CMS starting on page 2.

1. Enter **change node-names ip** to open the IP Node Names screen.

```
change node-names ip                                  Page 1 of 1
                                  IP NODE NAMES

    Name              IP Address            Name              IP Address
default_____________  0__.0__.0__.0__   ____________________  ___.___.___.___
node-1______________  192.168.10_.31_   ____________________  ___.___.___.___
node-2______________  192.168.10_.32_   ____________________  ___.___.___.___
____________________  ___.___.___.___   ____________________  ___.___.___.___
```

2. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 2 nodes: C-LAN PPP port on Switch 1 C-LAN PPP port on Switch 2.
IP Address	The unique IP addresses of the nodes named in the previous field.

3. Submit the screen

Switch 1 Task — Assign Link via ppp Data Module to Switch 2

This task administers a ppp data module on Switch 1 for the ppp connection to Switch 2. The data module defines a network interface. It associates a link number with a port address and node name for the C-LAN port on Switch 1. It also specifies the node name for the destination node, which is a C-LAN port on Switch 2.

1. Enter **add data-module** to open the Data Module screen.

```
add data-module next
                                                          Page 1 of x
                          DATA MODULE

    Data Extension: 2010            Name: _ppp on link 1 to node-2___  BCC: 2
              Type: ppp_____         COS: 1
              Port: 01b0115          COR: 1
              Link: 1_                TN: 1
       Enable Link? n

         Node Name: node-1_____
       Subnet Mask: 255.255.255.0__

Establish Connection: y

DESTINATION
            Digits: 6113020_______
         Node Name: node-2_____
              CHAP? n
```

The system assigns the extension 2010 to this data module. Instead of **n** (next) in the command line, you could specify any unused extension in the dial plan.

2. Enter values

Field	Conditions/Comments
Type	Indicates the data-module type for this connection (ppp).
Port	In this example, the C-LAN circuit pack is in slot 01b01; the ppp connection is through port 15.
Link	For G3r, the link number must be in the range 1 – 33, not previously assigned on this switch.
Enable Link	If you need to add an IP route that uses this node as a gateway, this field must be set to **y** *before* adding the IP route. Otherwise leave this field set to **n** until the link administration is complete; that is, until after all data modules and the processor channels are assigned, then set to **y**.
Name	Information-only; appears in list generated by the list data module command.
COS	Fields are specified by the system administrator.
COR	
TN	
BCC	Bearer Capability Class. This is a display-only field.
Node Name	The node name for the interface (C-LAN port) defined by this data module. This must be a name previously entered on the Node Names screen.

Field	Conditions/Comments
Subnet Mask	
Establish Connection	**y** means that this switch will be responsible for the call setup for this connection. Enter **n** when administering the data module for Switch 2.
Destination Digits	Trunk access code (611) plus extension of data module on node 2 (3020). If you use just the extension, then you must administer UDP and AAR route patterns to access the correct trunk group.
Destination Node Name	Name of the node at the far end (Switch 2) of this connection. This must be a name entered on the Node Names screen (on both switches).
CHAP	This field enables/disables the Challenge Handshake Authentication Protocol security mechanism on this link. If you enter **y**, another field will appear prompting for a CHAP secret (password).

(Sheet 2 of 2)

3. Submit the screen

Switch 1 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on Switch 1 and specifies the destination node and machine ID.

1. Enter **change communications-interface processor-channels** to open the Processor Channel Assignment screen**.**

```
change communications-interface processor-channels
                                                              Page 1 of X
                        PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy          Interface     Destination       Session     Mach
Chan Enable  Appl.    To  Mode  Link/Chan   Node         Port  Local/Remote  ID
  1:   n     _______       _    __  _____  __________   0____  ___   ___     __
  2:   n     _______       _    __  _____  __________   0____  ___   ___     __
  :
 12:   y     dcs____       s    1_  5003_  node-2____   0____  12_   21_     2_
  :
 64:   n     _______       _    __  _____  __________   0____  ___   ___     __
```

2. Enter values for processor channel 12

Field	Conditions/Comments
Enable	Set to **y**
Appl.	Set to **dcs** for DCS signaling
Mode	node-1 is the server for this session. Set node-2 to client (**c**).
Interface Link	This must match the link number assigned on the node-1 data module screen in the previous task.
Interface Chan	For TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications; for example, if there are two Intuity AUDIX's, use 5002 for both; or if there are four DEFINITY ECS's, use 5003 for all four. The combination of Link, Interface Channel, and Mach ID must be unique. The recommended values for gateway switches is 6001–6099. The interface channel number must be unique for each gateway. This number must match the Destination Port number on the node-2 Processor Channel screen.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.
Destination Port	A value of **0** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number for this connection on the Switch-2 Processor Channel screen must also be set to **0**.
Session - Local	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch (in the Local Node Number field).

3. Submit the screen

Switch 2 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 2. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on the Audix-MSA Node Names screen. Enter node names for switches, routers, and CMS on the IP Node Names screen.

1. Enter **change node-names ip** to open the IP Node Names screen.

```
change node-names ip                                          Page 1 of 1
                          IP NODE NAMES

   Name                 IP Address       Name                 IP Address
default_________  0__.0__.0__.0__   ___________________  ___.___.___.___
node-1__________  192.168.10_.31_   ___________________  ___.___.___.___
node-2__________  192.168.10_.32_   ___________________  ___.___.___.___
________________  ___.___.___.___   ___________________  ___.___.___.___
________________  ___.___.___.___   ___________________  ___.___.___.___
```

2. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 2 nodes: ■ C-LAN PPP port on Switch 2 ■ C-LAN PPP port on Switch 1.
IP Address	The unique IP addresses of the nodes named in the previous field.

3. > Submit the screen

Switch 2 Task — Assign Link via ppp Data Module to Switch 1

This task administers a ppp data module on Switch 2 for the ppp connection to Switch 1. The data module defines a network interface. It associates a link number with a port address and node name for the C-LAN port on Switch 2. It also specifies the node name for the destination node, the C-LAN port on Switch 1.

1. Enter **add data module to** open the Data Module screen.

```
add data-module next
                                                          Page 1 of x
                                   DATA MODULE

    Data Extension: 3020                 Name: _ppp on link 3 to node-1___  BCC: 2
              Type: ppp_____              COS: 1
              Port: 01a1206               COR: 1
              Link: 3_                     TN: 1
       Enable Link? n

         Node Name: node-2_____ _____
       Subnet Mask: 255.255.255.0__


Establish Connection: n

DESTINATION
            Digits: _____ _____________
         Node Name: node-1_____ _____
              CHAP? n
```

[This data module is assigned the next available extension, 3020.]

2. Enter values

Field	Conditions/Comments
Type	This indicates the data-module type for this link.
Port	In this example, the C-LAN circuit pack is in slot 01a12; the ppp connection is through port 06.
Link	The link number must be in the range 1 – 25, not previously assigned on this switch.
Enable Link	If you need to add an IP route that uses this node as a gateway, this field must be set to **y** *before* adding the IP route. Otherwise leave this field set to **n** until the link administration is complete; that is, until after all data modules and the processor channels are assigned, then set to **y**.
Name	Information-only; appears in list generated by the “list data module” command.
COS	The values for these fields will be specified by the system administrator.
COR	
TN	
BCC	This is a display-only field.
Node Name	The node name for the interface (C-LAN port) defined by this data module. This must be a name entered on the Node Names screen.

Field	Conditions/Comments
Subnet Mask	
Establish Connection	**n** means that the switch at the remote end of this connection (Switch 1 in this case) will be responsible for the call setup. Enter **y** when administering the data module for Switch 1.
Destination Digits	Not needed if the “Establish Connection” field is set to **n**
Destination Node Name	Name of the node at the far end (Switch 1) of this connection. Must be a name entered on the Node Names screen.
CHAP	This field enables/disables the Challenge Handshake Authentication Protocol security mechanism on this link. If you enter **y**, the system will prompt for a CHAP secret (password).

(Sheet 2 of 2)

3. Press the ENTER/SAVE key to save and exit.

Switch 2 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on Switch 2.

1. Enter **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels
                                                          Page 1 of X
                    PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy         Interface    Destination      Session    Mach
Chan Enable  Appl.   To  Mode   Link/Chan   Node          Port  Local/Remote  ID
  1:   n     _______       _     __  _____  __________    0____  ___   ___    __
  2:   n     _______       _     __  _____  __________    0____  ___   ___    __
  :
 21:   y     dcs____       c     3_  0____  node-1____    5003_  21_   12_    1_
  :
 64:   n     _______       _     __  _____  __________    0____  ___   ___    __
```

2. Enter values

Field	Conditions/Comments
Processor Channel 21: (ppp connection to Switch 1)	
Enable	Set to y.
Appl.	Set to dcs for DCS signaling.
Mode	Node-2 is the “client” for this session. Set node-1 to “server” (**s**).

(Sheet 1 of 2)

Field	Conditions/Comments
Interface Link	This must match the link number on the node-2 data module screen in the previous task.
Interface Chan	0 allows any available interface channel to be used for this connection. The Destination Port number on the Switch-1 Processor Channel screen must also be set to 0.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.
Destination Port	This number must match the Interface Channel number assigned on the Switch-1 Processor Channel screen.
Session - Local	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.

(Sheet 2 of 2)

3. Submit the screen.

Enable links and processor channels

You must enable links and processor channels before the connections can be used.

To enable a link, open its data module screen (**`ch da`** [**`ext`**]) and set the Enable Link field to **y**.

NOTE:
To view a list of assigned data modules and their extensions, enter “list data-module” (**`l da`**).

To enable the processor channels, open the processor channel screen (**ch com p**) and set the Enable field to **y** for each assigned processor channel.

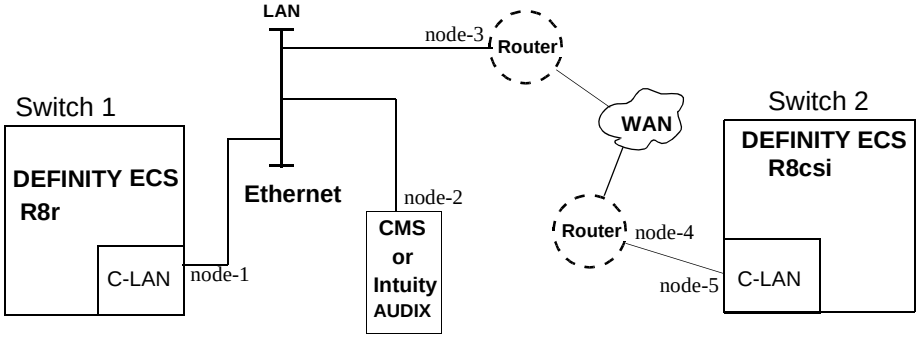
NOTE:
You must disable a link or processor channel before you can change its parameters.

NOTE:
The **busy-out** command overrules the data module Enable Link field.

NOTE:
On the C-LAN boards, low-level connectivity can remain intact when higher-level applications such as DCS are not functioning. For example, an external ping to a C-LAN's ethernet port could be successful even when the board is busied-out. When debugging connectivity problems, pinging only checks low-level connectivity.

Configuration 2: R7r (+CMS) <—ethernet—> R7csi

This configuration is a 10BaseT ethernet connection between a DEFINITY ECS R8r and a DEFINITY ECS R8csi switch in a DCS network, which includes routers between the switches. The R8r is connected to a CMS adjunct (the DEFINITY administration for Intuity AUDIX would be similar) via the LAN.



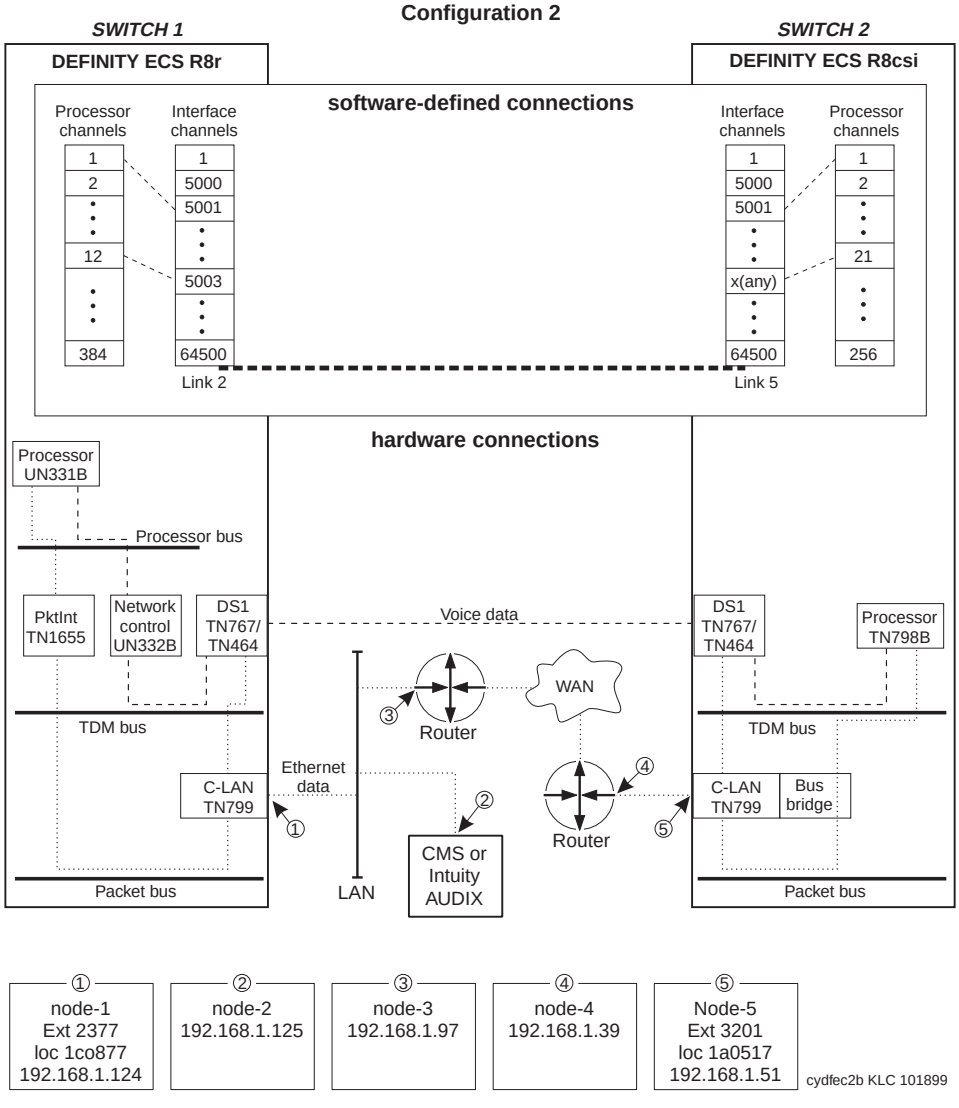
NOTE:
This network has 5 IP nodes: 2 DCS nodes, 2 nodes on the router and one adjunct node. The router separates two subnets, so IP routes are needed from each switch to the nodes on the other side of the network.

Task Summary

The following tasks need to be completed for Switch 1 and Switch 2:

1. Review prerequisite administration checklist
2. Switch 1 administration
    a. Assign node names
    b. Assign IP Interfaces
    c. Assign link (via a data module) to the LAN
    d. Assign processor channels
3. Switch 2 administration
    a. Enable bus bridge connectivity
    b. Assign node names
    c. Assign IP Interfaces
    d. Assign link (via a data module) to the LAN
    e. Assign IP routes
    f. Assign processor channels
4. Intuity AUDIX administration
    a. Administer the UNIX name and IP address
    b. Administer the switch interface link
    c. Administer extension numbers, channels, and services
    d. Administer subscribers
5. CMS administration.

    See *CentreVu CMS Software Installation and Setup*, 585-215-866 and *CentreVu CMS Switch Connections and Administration*, 585-215-876 for details of CMS setup and administration. (For Intuity AUDIX connections, see *Intuity Messaging Solutions LAN Integration with DEFINITY ECS*, 585-313-602.)
6. Enable links and processor channels


Configuration 2
SWITCH 1
DEFINITY ECS R8r
SWITCH 2
DEFINITY ECS R8csi
software-defined connections
Processor channels
Interface channels
1
2
12
384
1
5000
5001
5003
64500
Link 2
Interface channels
Processor channels
1
5000
5001
x(any)
64500
1
2
21
256
Link 5
hardware connections
Processor UN331B
Processor bus
PktInt TN1655
Network control UN332B
DS1 TN767/ TN464
Voice data
DS1 TN767/ TN464
Processor TN798B
TDM bus
WAN
③
Router
TDM bus
Ethernet data
C-LAN TN799
①
②
CMS or Intuity AUDIX
LAN
④
Router
⑤
C-LAN TN799
Bus bridge
Packet bus
Packet bus
① node-1 Ext 2377 loc 1co877 192.168.1.124
② node-2 192.168.1.125
③ node-3 192.168.1.97
④ node-4 192.168.1.39
⑤ Node-5 Ext 3201 loc 1a0517 192.168.1.51
cydfec2b KLC 101899

Switch 1 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 1. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA on the Audix-MSA Node Names screen. Enter node names for switches, routers, and CMS on the IP Node Names screen.

1. Enter **change node-names ip** to open the Node Names screen.
2. Go to page 2

```
change node-names ip                                        Page 1 of 1
                                NODE NAMES

Name                IP Address          Name                IP Address
default             0__.0__.0__.0__      _________________   ___.___.___.___
node-1              192.168.1__.124      _________________   ___.___.___.___
node-2              192.168.1__.125      _________________   ___.___.___.___
node-3              192.168.1__.97_      _________________   ___.___.___.___
node-5              192.168.1__.51_      _________________   ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter node names for the following 4 nodes: ■ *node-1*: C-LAN Ethernet port on Switch 1 ■ *node-2*: CMS node (for consistency, use the host name of the CMS computer assigned during the CMS setup procedure — see *CentreVu CMS Software Installation and Setup*, 585-215-866) ■ *node-3*: Interface on the router to the subnet of Switch 1. ■ *node-5*: C-LAN Ethernet port on Switch 2.
IP Address	The unique IP addresses for the nodes named in the previous field. See the description of the Subnet Mask field in the next task for information on valid IP addresses.

4. Submit the screen

Switch 1 Task — Assign IP Interfaces

The IP interface for each C-LAN and IP Media Processor board on the switch must be defined on the IP Interfaces screen. Each DEFINITY switch in an IP network has one IP Interfaces screen.

1. Enter **change ip-interfaces** to open the IP Interfaces screen.

```
change ip-interfaces                                    Page   1 of   2

                                IP Interfaces

Enable                                                                  Net
Eth Pt Type   Slot  Code Sfx Node Name     Subnet Mask     Gateway Addr    Rgn
   y   C-LAN  01c08 TN799 B  node-1        255.255.0.0      192.168.1_.97_  1
   n                                      255.255.255.0
   n                                      255.255.255.0
   n                                      255.255.255.0
```

2. Enter values

Field	Conditions/Comments
Enable Eth Pt	The Ethernet port must be enabled (**y**) before it can be used. The port must be disabled (**n**) before changes can be made to its attributes on this screen.
Type	Enter c-lan or medpro.
Slot	Enter the slot location for the circuit pack.
Code	Display only. This field is automatically populated with TN799 for C-LAN and TN802 or TN2302 for MedPro.
Sfx	Display only. This field is automatically populated.
Node name	Enter the unique node name for the IP interface. The node name here must already be administered on the Node Names screen

(Sheet 1 of 2)

Field	Conditions/Comments
Subnet Mask	Enter the subnet mask associated with the IP address for this IP interface. The IP address for node-1, specified on the Node Names screen, is 192.168.1.124. The 192 in the first octet puts this address in the range of “Class C” addresses, which means the first 3 octets are used for the network ID and the fourth octet is used for host IDs. The subnet mask defines the network and host parts of the IP addresses. In the Subnet Mask for this example (192.168.1.224), the 224 in the fourth octet indicates that 3 high-order bits from the fourth octet are used to define subnets on the network 192.168.1 (224 = 128+64+32 = 11100000). The first 3 bits are used for subnet IDs and the last 5 bits are used for host IDs. Eight subnets can be defined with 3 bits and each subnet can have a maximum of 32 hosts, defined with the remaining 5 bits. Of these, only 6 subnets with 30 hosts each are usable. The usable IP addresses in the 6 subnets have the following ranges of values for the fourth octet: 33–62, 65–94, 97–126, 129–158, 161–190, and 193–222. The IP address for this (node-1) IP interface, 192.168.1.124, is on the third subnet because 124 lies in the range 97–126. Note that node 2 (adjunct, 192.168.1.125) and node 3 (router, 192.168.1.97) are both also on the third subnet. Node 4 (192.168.1.51) and node 5 (192.168.1.39) are both on the first subnet. The first and last IP addresses in each subnet are not usable as host addresses because they have all 0’s or all 1’s for host IDs. For example, in the third subnet, the fourth octet of the first IP address is 96 (= 01100000) and the fourth octet of the last IP address is 127 (= 01111111). The “network address” of a subnet is the first IP address (the all 0’s host ID) of that subnet. In this example, the subnet addresses of the six subnets are — **1st:** 192.168.1.32 **2nd:** 192.168.1.64 **3rd:** 192.168.1.96 **4th:** 192.168.1.128 **5th:** 192.168.1.160 **6th:** 192.168.1.192. See Appendix for more information on IP addresses and subnetting.
Gateway Addr	Enter the address of a network node that will serve as the default gateway for the IP interface.
Net Rgn	Enter the region number for this IP interface.

(Sheet 2 of 2)

3. Submit the screen

Switch 1 Task — Assign Link via ethernet Data Module to the LAN

This task administers an ethernet data module for the ethernet connection to the CMS adjunct and to Switch 2. The data module defines a network interface. It associates a link number with a port address and node name for the C-LAN port used for this connection.

1. Enter **add data-module next** to open the Data Module screen.

```
add data-module next
                                                          Page 1 of X
                                DATA MODULE

    Data Extension: 2377            Name: ethernet on link 2
               Type: ethernet
               Port: 01c0817
               Link: 2


Network uses 1's for broadcast addresses? y
```

2. Enter values

Field	Conditions/Comments
Type	This indicates the data-module type for this link.
Port	Ethernet connections must be assigned to port 17 on the C-LAN circuit pack.
Link	The link number must be in the range 1 – 33 (for G3r), not previously assigned on this switch.
Name	This field is information-only; it appears in lists generated by the "list data module" command.
Network uses 1's for broadcast addresses	Leave **y** if the private network contains only DEFINITY switches and adjuncts. Set to **n** if the network includes non-DEFINITY switches that use the 0's method of forming broadcast addresses. See *DEFINITY ECS Administrator's Guide* for more information about this field.

3. Submit the screen

Switch 1 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on the node 1 switch.

1. Enter **change communications-interface processor channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels
                                                          Page 1 of X
                    PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy          Interface    Destination      Session    Mach
Chan Enable  Appl.    To  Mode   Link/Chan   Node          Port  Local/Remote  ID
  1:   y    mis____         s     2   5001   node-2____    0____  1    1     __
  2:   n    _______         _     __  _____  __________    0____  ___  ___   __
  3:   n    _______         _     __  _____  __________    0____  ___  ___   __
  4:   n    _______         _     __  _____  __________    0____  ___  ___   __
   :
 12:   y    dcs____         s     2   5003   node-5____    0____  12   21    2
   :
 64:   n    _______         _     __  _____  __________    0____  ___  ___   __
```

2. Enter values

Field	Conditions/Comments
Processor Channel 1: (connection to CMS)	
Enable	Set to **y**.
Appl.	Enter **mis** for the CMS connection on Processor Channel 1.
Mode	Set the Mode to **s** (“server”) on both switches for connections to CMS.
Interface Link	This must match the link number assigned on the node-1 data module screen.
Interface Chan	For TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications; for example, if there are two Intuity AUDIX’s, use 5002 for both; or if there are four DEFINITY ECS’s, use 5003 for all four. The combination of Link, Interface Channel, and Mach ID must be unique. The recommended values for gateway switches is 6001–6099. The interface channel number must be unique for each gateway.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.

Field	Conditions/Comments
Destination Port	A value of **0** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number on the Switch-2 Processor Channel screen must also be set to **0**.
Session - Local Session - Remote	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Mach ID	This field is not used for CMS.
Processor Channel 12: (ethernet connection to Switch 2)	
Enable	Set to **y**.
Appl.	Enter **dcs** for the DCS connection on Processor Channel 12.
Mode	Set the node-5 Mode field to **c** (“client”) on the Processor Channel Assignment screen on Switch 2.
Interface Link	This must match the link number assigned on the node-1 data module screen.
Interface Chan	For TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications; for example, if there are two Intuity AUDIX’s, use 5002 for both; or if there are four DEFINITY ECS’s, use 5003 for all four. The combination of Link, Interface Channel, and Mach ID must be unique. The recommended values for gateway switches is 6001–6099. The interface channel number must be unique for each gateway.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.

Field	Conditions/Comments
Destination Port	A value of **0** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number on the Switch-2 Processor Channel screen must also be set to **0**.
Session - Local	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Session - Remote	
Mach ID	Destination switch ID. This is the Local Node Number on the dial plan of the destination switch.

(Sheet 3 of 3)

3. Submit the screen

Switch 2 Task — Enable Bus Bridge Connectivity

This task enables the bus bridge functionality on the C-LAN circuit pack to provide a path between the packet bus and the processor. This task must be completed by an Avaya representative using the craft or higher login.

NOTE:
Bus Bridge Connectivity is used on the csi model only. This task may have been completed when the C-LAN circuit pack was installed.

1. Type **change system-parameters maintenance** to open the Maintenance-Related System Parameters screen.
2. Move to the Packet Intf2 field.

```
change system-parameters maintenance                              Page   2 of   3

                   MAINTENANCE-RELATED SYSTEM PARAMETERS

MINIMUM MAINTENANCE THRESHOLDS ( Before Notification )
        TTRs: 4         CPTRs: 1        Call Classifier Ports: 0
        MMIs: 0           VCs: 0

TERMINATING TRUNK TRANSMISSION TEST ( Extension )
   Test Type 100:          Test Type 102:          Test Type 105:

ISDN MAINTENANCE
   ISDN-PRI Test Call Extension:         ISDN-BRI Service SPID:

DS1 MAINTENANCE
   DS0 Loop-Around Test Call Extension:


SPE OPTIONAL BOARDS
                     Packet Intf1? y     Packet Intf2? y
         Bus Bridge: 01a05_  Inter-Board Link Timeslots  Pt0: 6 Pt1: 1 Pt2: 1
```

3. Enter values

Field	Conditions/Comments
Packet Intf2	Enables the bus bridge.
Bus Bridge	Location of the C-LAN circuit pack. If the system has two C-LANs, only one is administered for bus bridge.
Inter-Board Link Timeslots Pt0, Pt1, Pt2	Specifies the bandwidth used on the 3 ports of the Inter-Board Link. The total number of timeslots assigned cannot exceed 11. Pt0 carries PPP traffic and can have 1–9 timeslots. Pt1 carries maintenance messages and can have 1–3 timeslots. Pt2 carries broadcast messages and can have 1–3 timeslots.

4. Submit the screen

Switch 2 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network on the Node Names screen. This screen is administered on Switch 2. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in a network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on ***page 1***. Enter node names for switches, routers, and CMS starting on ***page 2***.

1. Type **change node-names ip** to open the Node Names screen.
2. Go to page 2

```
change node-names ip                                    Page 2 of 6
                              NODE NAMES

Name               IP Address         Name                IP Address
default_________   0__.0__.0__.0__      _________________   ___.___.___.___
net-96        _    192.168.1 _.96       _________________   ___.___.___.___
node-1_________    192.168.1__.124      _________________   ___.___.___.___
node-2_________    192.168.1__.125      _________________   ___.___.___.___
node-4_________    192.168.1__.39_      _________________   ___.___.___.___
node-5_________    192.168.1__.51_      _________________   ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter node names for the following 5 nodes: ■ *net-96*: the network address of the node-1 and node-2 subnet (this is described in the IP-Route task) ■ *node-1*: C-LAN Ethernet port on Switch 1 ■ *node-2*: CMS node (for consistency, use the host name of the CMS computer assigned during the CMS setup procedure — see *CentreVu CMS Software Installation and Setup*, 585-215-866) ■ *node-4*: Interface on the router to the subnet of Switch 2. ■ *node-5*: C-LAN Ethernet port on Switch 2.
IP Address:	The unique IP addresses of the nodes named in the previous field.

4. Submit the screen

Switch 2 Task — Define IP Interfaces

The IP interface for each C-LAN and IP Media Processor board on the switch must be defined on the IP Interfaces screen. Each DEFINITY switch in an IP network has one IP Interfaces screen.

1. Type **change ip-interfaces** to open the IP Interfaces screen.

```
change ip-interfaces                                    Page   1 of   2

                                IP Interfaces

Enable                                                                  Net
Eth Pt Type   Slot  Code Sfx Node Name     Subnet Mask     Gateway Addr    Rgn
   y   C-LAN  01a05 TN799 B  node-5        255.255.255.224  ___.___.___.___ 1
   n                                       255.255.255.0
   n                                       255.255.255.0
   n                                       255.255.255.0
```

2. Enter values

Field	Conditions/Comments
Enable Eth Pt	The Ethernet port must be enabled (**y**) before it can be used. The port must be disabled (**n**) before changes can be made to its attributes on this screen.
Type	Enter **c-lan**.
Slot	Enter the slot location for the circuit pack.
Code	Display only. This field is automatically populated with TN799 for C-LAN.
Sfx	Display only. This field is automatically populated.
Node name	Enter the unique node name for the IP interface. The node name here must already be administered on the Node Names screen

(Sheet 1 of 2)

Field	Conditions/Comments
Subnet Mask	Enter the subnet mask associated with the IP address for this IP interface. (The IP address is associated with the node name on the Node Names screen). Since the node-1 and node-5 IP interfaces are on the same network (192.168.1), they must be assigned the same subnet mask. In this example, the subnet mask 255.255.255.224 divides the network 192.168.10 into 6 (usable) subnets. This C-LAN IP Interface (node-5) is on the first subnet. See Switch 1 Task — Assign IP Interfaces (page 112) for an explanation of this subnet. See Subnetting (page 379) in IP Addressing for a detailed description of subnetting.
Gateway Addr	Leaving this field blank adds a level of network security for this IP interface but requires that IP routes be administered to enable communication with nodes on different (sub)networks.
Net Rgn	Enter the region number for this IP interface.

(Sheet 2 of 2)

3. Switch 2 Task— Assign Link via ethernet Data Module to the LAN

This task administers an ethernet data module on Switch 2 for the ethernet connection to Switch 1. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module next** to open the Data Module screen.

```
add data-module next
                                                          Page 1 of X
                                  DATA MODULE

    Data Extension: 3201              Name: ethernet on link 5
              Type: ethernet
              Port: 01a0517
              Link: 5


Network uses 1's for broadcast addresses? y
```

[This data module is assigned the next available extension, 3020.]

2. Enter values

Field	Conditions/Comments
Type	This indicates the data-module type for this link.
Port	Ethernet connections must be assigned to port 17 on the C-LAN circuit pack. In this example, the C-LAN circuit pack is in slot 1a05.
Link	The link number must be in the range 1 – 25 (R8csi), not previously assigned on this switch.
Name	Information-only; appears in list generated by the “list data module” command.
Network uses 1’s for broadcast addresses	Leave the default (**y**) if the private network contains only DEFINITY switches and adjuncts. Set to **n** only if the network includes non-DEFINITY switches that use the 0’s method of forming broadcast addresses. See *DEFINITY ECS Administrator’s Guide* for more information about this field.

3. Submit the screen

Switch 2 Task — Assign IP Route (to Switch 1)

This task specifies a route for packets sent by the node 5 IP interface (the ethernet port on the switch-2 C-LAN board) to the nodes 1 and 2. An IP route is required because node 5 is on a different subnetwork from nodes 1&2 (as defined in the Subnet Mask field on the IP Interfaces screen), *and* the Gateway Address field for node 5 on the IP Interfaces screen was left blank.

The Destination Node will be set to “net-96”, which is associated with the network IP address of 192.168.1.96 on the Node Names screen. This will enable node 5 to communicate with any node on the 192.168.1.96 subnetwork.

1. Type **add ip-route next** to open the IP Routing screen.

```
add ip-route next                              Page   1 of   1
                          IP ROUTING


     Route Number: 2
 Destination Node: net-96
          Gateway: node-4
      C-LAN Board: 1c05
           Metric: 0
```

[The system assigns the route number 2.]

2. Enter values

Field	Conditions/Comments
Destination Node	The name of the node at the destination of this route. In this case, net-96 is associated with IP address 192.168.1.96 on the Node Names screen. This is the network IP address of the subnet that nodes 1 and 2 are on. See the description of the Subnet Mask field in Switch 1 Task — Assign IP Interfaces (page 112).
Gateway	Node name of the IP-route gateway by which the destination node is reached for this route. In this case, it is the node name of the router port.
C-LAN Board	The location of the C-LAN circuit pack that provides the interface for this route.
Metric	Enter **0**. See DEFINITY ECS Administrator's Guide for more information on the use of the Metric field.

3. Submit the screen

NOTE:
We could have defined 2 individual IP routes, one each to node-1 and node-2, instead of this IP route. However, the network route is easier because we need only one. The network route enables packets to get to *any* IP address on the 192.168.1.96 subnet (that is, addresses 192.168.1.97 through 192.168.1.126), so no other IP routes are needed.

No IP routes were needed on Switch-1 because a gateway address was assigned to the C-LAN on the IP Interfaces screen. IP routes are needed in only two cases: when a gateway address is not assigned for an ethernet interface, and when there are intermediate nodes between the endpoints of a ppp connection.

Switch 2 Task— Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on Switch 2.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels
                                                          Page 1 of X
                    PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy          Interface    Destination      Session    Mach
Chan Enable  Appl.    To  Mode   Link/Chan   Node        Port   Local/Remote  ID
  1:   y    mis____        s     5   5001   node-2____   0____   1__   1__    __
  2:   n    _______        _     __  _____  __________   0____   ___   ___    __
  3:   n    _______        _     __  _____  __________   0____   ___   ___    __
  4:   n    _______        _     __  _____  __________   0____   ___   ___    __
  :
 21:   y    dcs____        c     5   0____  node-1____   5003_   21_   12_    1_
  :
 64:   n    _______        _     __  _____  __________   0____   ___   ___    __
```

2. Enter values

Field	Conditions/Comments
Processor Channel 1: (connection to CMS)	
Enable	Set to **y**.
Appl.	Enter **mis** for the CMS connection on Processor Channel 1.
Mode	Set the Mode to **s** (“server”) on both switches for connections to CMS.
Interface Link	This must match the link number assigned on the node-5 data module screen on this switch.
Interface Chan	For TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications. For example, if there are two Intuity AUDIX’s, use 5002 for both, or if there are four DEFINITY ECS’s, use 5003 for all four. The combination of Link, Interface Channel, and Mach ID must be unique. The recommended values for gateway switches is 6001–6099. The interface channel number must be unique for each gateway.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.
Destination Port	A value of **0** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number on the Switch-2 Processor Channel screen must also be set to **0**.

(Sheet 1 of 2)

Field	Conditions/Comments
Session - Local Session - Remote	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Mach ID	This field is not used for CMS.
`Processor Channel 21`: (ethernet connection to Switch 1)	
Enable	Set to **`y`**.
Appl.	**`dcs`** indicates that this connection will carry DCS data.
Mode	Node-5 will be the “client” on this session. Set node-1 (on Switch 1) to “server” (**`s`**).
Interface Link	This must match the link number assigned on the node-5 data module screen.
Interface Chan	A value of **`0`** allows any available interface channel to be used for this connection. The Destination Port number on the Switch-1 Processor Channel screen must also be set to **`0`**.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.
Destination Port	This number must match the Interface Channel number assigned on the Switch-1 Processor Channel screen.
Session - Local Session - Remote	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Mach ID	Destination switch ID. This is the Local Node Number on the dial plan of the destination switch.

(Sheet 2 of 2)

3. Submit the screen

Intuity System Administration

Procedure Overview

The following is a checklist of procedures that must be completed to administer a DEFINITY ECS with a TCP/IP connection to a Intuity system. The DEFINITY administration procedures are described in *DEFINITY ECS Administrator's Guide*, 555-233-502 and in previous sections of this chapter. The Intuity system administration procedures are describe following the checklist.

For a complete description of the administration procedures for connecting an Intuity system to a DEFINTIY ECS, see *Intuity Messaging Solutions — Using a LAN to Integrate with DEFINTIY ECS*, 585-313-602 for Intuity R4.4 or 585-313-604 for Intuity R5.

DEFINITY ECS administration

The following procedures must be done on the host switch:

- Administer the local node number in the dial plan.
- Administer the Intuity system voice ports as stations, including Class of Restriction (COR) and Class of Service (COS).
- If the switch is a *csi* model, assign the bus bridge.
- Assign node names for the Intuity system and the switch.
- Administer a hunt group, and add the Intuity system voice ports to that hunt group.
- Add an ethernet data module.
- Administer a processor channel for the link from the switch to the Intuity system.
- Enable the link on the ethernet data module.
- Set up a coverage path for access to the voice port hunt group.
- Apply the coverage path to stations, and if the switch is an *r* model, specify the node name of the Intuity system for each station that has a voice mailbox on the Intuity system.

Intuity system administration

The following procedures must be done on the Intuity system:

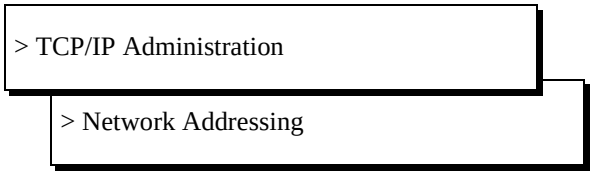
- Administer the UNIX name and IP address for the Intuity system.
- Administer the switch interface link to the host switch. This includes the Extension Length, Host Switch Number, AUDIX Number, Switch Number, Switch IP Address, and TCP Port.
- Administer extension numbers, channels, and services.
- Administer subscribers.

Administer the TCP/IP Network Addressing

Do the following procedures to administer the Intuity system.

If not already done, you must set up the basic networking addressing for the Intuity system. Do the following:

1. Beginning at the INTUITY Main menu, select:



The system responds with the Network Addressing screen.

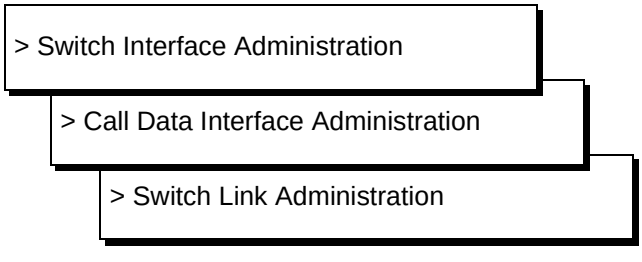
```
+-------------------------------------------------------+
+                    Network Addressing                 +
+-------------------------------------------------------+
|            TCP/IP Interface: eeE_0                    |
|                  Host Name: denaudix                  |
|                 IP Address: 192.168.1.125              |
|                Subnet Mask: 192.168.1.224              |
|  Default Gateway IP Address: 192.168.1.97              |
+-------------------------------------------------------+
```

2. Use Worksheet A to enter the correct values in this screen.
3. Press **F3** (Save).
4. Continue with the next procedure, “Administer Switch Interface.”

Administer the Switch Interface

You must now administer the switch interface. Do the following.

1. Starting at the INTUITY Main menu, select:



The system responds with the Switch Interface Administration screen.

```
+-------------------------------------------------------------------------+
+                    Switch Interface Administration                      +
+-------------------------------------------------------------------------+
| Switch Link Type: LAN                       Country: UNITED STATES      |
| Extension Length: 4                          Switch: DEFINITY OVERLAN   |
| Host Switch Number: 1                                                   |
| AUDIX Number: 1                                                         |
|                                                                         |
|Switch     IP Address/      TCP      Switch     IP Address/      TCP     |
|Number     Host Name        Port     Number     Host Name        Port    |
|   1      192.168.1.124     5002                                        |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
```

2. Use Worksheet B to enter the correct values in this screen.
3. Press **F3** (Save).
4. Continue with the next procedure, “Administer Extension Numbers, Channels, and Services.”

Administer Extension Numbers, Channels, and Services

To associate the switch voice ports, you must do the following on the Intuity system:

- Map channels to switch extensions
- Map services to channels
- Assign services to called numbers.

For more information on this, see “Administering Channels” in the *INTUITY Messaging Solutions Release 5* documentation.

Continue with the next procedure, “Administer Subscribers.”

Administer Subscribers

Subscribers must be administered on the Intuity system. For more information on this, see the *INTUITY Messaging Solutions Release 5* documentation. The following screens show examples of subscriber screens on the Intuity system.

```
add subscriber 3066                                          Page 1 of 2
                                SUBSCRIBER

         Name: Jean Collins                          Locked? n
    Extension: 150                                 Password:
          COS: class00                          Miscellaneous:
Switch Number: 1                          Covering Extension: 161
 Community ID: 1                           Broadcast Mailbox? n
Secondary Ext:
 Account Code:
```

```
add subscriber 3066                                          Page 2 of 2
                  SUBSCRIBER CLASS OF SERVICE PARAMETERS

Addressing Format: extension             Login Announcement Set: System
System Multilingual is ON         Call Answer Primary Annc. Set: System
Call Answer Language Choice? n  Call Answer Secondary Annc. Set: System

PERMISSIONS
      Type: call-answer     Announcement Control? y             Outcalling? n
      Priority Messages? n             Broadcast: none        IMAPI Access? y
 IMAPI Message Transfer? n          Fax Creation? n  Trusted Server Access? y

INCOMING MAILBOX          Order: fifo               Category Order: no
  Retention Times (days),   New: 10       Old: 10         Unopened: 10
OUTGOING MAILBOX          Order: fifo               Category Order: unfda
Retention Times(days), File Cab: 10       Delivered/Nondeliverable: 5

Voice Mail Message (seconds),  Maximum Length: 300  Minimum Needed: 32
Call Answer Message (seconds), Maximum Length: 120  Minimum Needed: 8
        End of Message Warning Time (seconds):
          Maximum Mailing Lists: 25     Total Entries in all Lists: 250
Mailbox Size (seconds), Maximum: 3600            Minimum Guarantee: 0
```

Worksheet A: Names and IP Addresses for Intuity System

Use this worksheet to collect the information you need to administer the INTUITY system for integration with the switch.

Field	Recommended	Your Entry
Intuity System TCP/IP Administration Screen (TCP/IP Administration, Network Addressing or Networking Administration, TCP/IP Administration)		
TCP/IP Interface	**eeE_0**	
Host Name (called UNIX Machine Name on R4.4) This information may already be administered. If not, enter the UNIX name for this machine. The name is case-sensitive.	**denaudix**	
IP Address IP address administered on the Intuity system	**192.168.1.125**	
Subnet Mask	**192.168.1.224**	
Default Gateway IP Address	192.168.1.97	

Worksheet B: LAN Data for the Intuity System

Use this worksheet to collect the information you need to administer the INTUITY system for integration with the switch.

Field	Recommended	Your Entry
INTUITY System Switch Interface Administration Window		
Extension Length Use the extension length from the switch dial plan	4	
Host Switch Number Use **1** if the integration supports only one DEFINITY switch. If more than one DEFINITY system will be supported, use the number administered on the Local Node Number field in the host switch dial plan.	1	
AUDIX Number The number assigned to the INTUITY system on the DEFINITY ECS. For *r*-model switches, a number from **1** to **8**; for *csi* and *si*, **1**. This must match the Machine-ID field of the Processor Channels screen.	1	
Switch Number Enter the node number of the switch being administered. If there is only one switch, the value must be **1**. This must match the Local Node Number field in the switch dial plan.	1	
IP Address/Host Name Enter the IP address for the switch being administered.	192.168.1.124	
TCP Port Enter a TCP port number for each Intuity AUDIX for each switch being administered. This must match the Interface Channel field of the Processor Channels screen. You should use **5002** for every switch linked over the LAN in a DCS network. Use the numbers **6001-6999** for gateway TCP links to remote switches in a DCS network.	5002	

Enable links and processor channels

You must enable links and processor channels before the connections can be used.

To enable a link, open its data module screen (type **ch da** [**ext**]) and set the Enable Link field to **y**.

NOTE:
To view a list of assigned data modules and their extensions, enter the “list data-module” command (**l da**).

To enable the processor channels, open the processor channel screen (**ch com p**) and set the Enable field to **y** for each assigned processor channel.

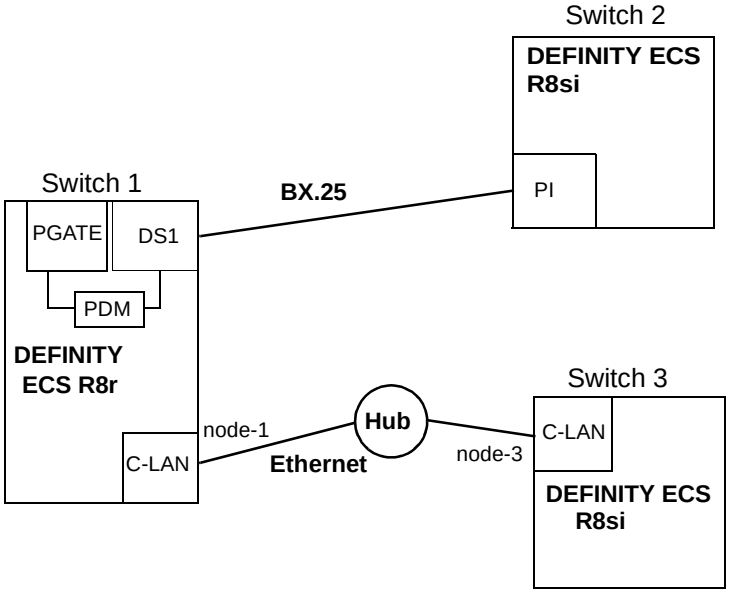
NOTE:
1. You must disable a link or processor channel before you can change its parameters.

NOTE:
2. The **busy-out** command overrules the data module Enable Link field.

NOTE:
3. On the C-LAN boards, low-level connectivity can remain intact when higher-level applications such as DCS are not functioning. For example, an external ping to a C-LAN’s ethernet port could be successful even when the board is busied-out. When debugging connectivity problems, pinging only checks low-level connectivity.

Configuration 3: R8si<—x.25 —> R8r Gateway <—ethernet—> R8si

In this configuration, a DEFINITY ECS R8r acts as a gateway between two other nodes — one connected via X.25 to an R8si and the other via ethernet to another R8si.



Task Summary

The following tasks need to be completed for Switch 1, Switch 2, and Switch 3:

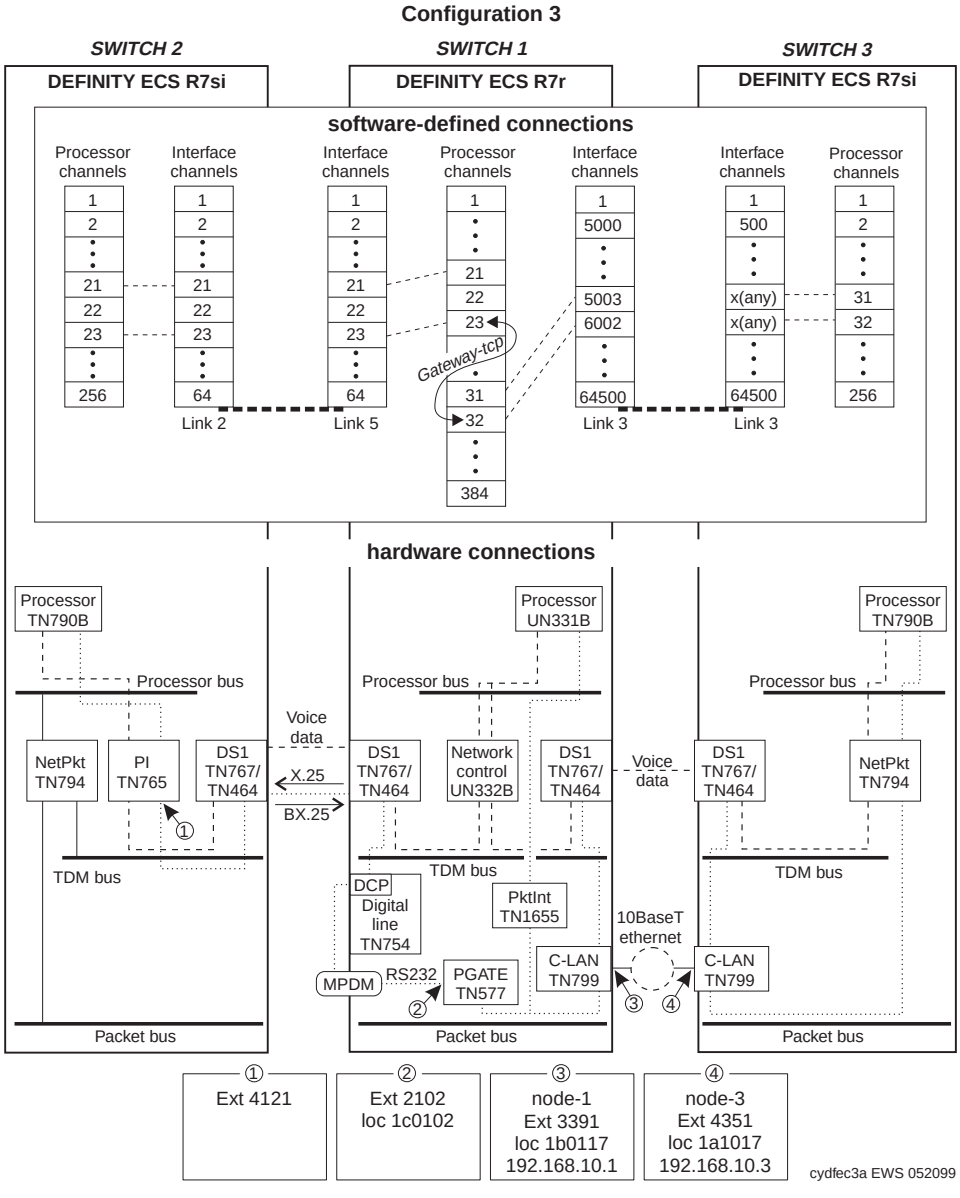
1. Review checklist
2. Switch 1 administration
    a. Assign node names
    b. Assign pdm data module
    c. Assign IP Interfaces
    d. Assign link (via an x.25 data module) to Switch 2
    e. Assign link (via an ethernet data module) to the LAN
    f. Assign processor channels
3. Switch 2 administration
    a. Assign link (via a proc-intf data module) to node 1
    b. Assign processor channels

4. Switch 3 administration
    a. Assign node names
    b. Assign IP Interfaces
    c. Assign link (via an ethernet data module) to the LAN
    d. Assign processor channels
5. Enable links and processor channels

Prerequisite Administration

There are some system administration tasks that need to be completed before you can proceed with the connectivity administration described in this section.

Review the checklist of prerequisite administration tasks in Checklist for Prerequisite Administration (page 90), before proceeding with the connectivity administration in this section.


Configuration 3
SWITCH 2
DEFINITY ECS R7si
SWITCH 1
DEFINITY ECS R7r
SWITCH 3
DEFINITY ECS R7si
software-defined connections
Processor channels
Interface channels
Interface channels
Processor channels
Interface channels
Interface channels
Processor channels
1
2
21
22
23
256
64
Link 2
64
Link 5
21
22
23
Gateway-tcp
31
32
384
5000
5003
6002
64500
Link 3
500
x(any)
x(any)
64500
Link 3
31
32
256
hardware connections
Processor TN790B
Processor bus
NetPkt TN794
PI TN765
DS1 TN767/ TN464
TDM bus
Packet bus
Voice data
X.25
BX.25
DS1 TN767/ TN464
Processor UN331B
Processor bus
Network control UN332B
DS1 TN767/ TN464
TDM bus
DCP
Digital line TN754
MPDM
RS232
PGATE TN577
PktInt TN1655
C-LAN TN799
Packet bus
Voice data
10BaseT ethernet
DS1 TN767/ TN464
C-LAN TN799
Processor TN790B
Processor bus
NetPkt TN794
TDM bus
Packet bus
① Ext 4121
② Ext 2102 loc 1c0102
③ node-1 Ext 3391 loc 1b0117 192.168.10.1
④ node-3 Ext 4351 loc 1a1017 192.168.10.3
cydfec3a EWS 052099

Switch 1 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 1. A Node Names screen must be administered on each switch in the network.

A *node* is defined as any of the following — a C-LAN port, a bridge or router, a CMS ethernet port, or an Intuity AUDIX or other MSA network interface card. The Audix and MSA node name and IP address must be entered on page 1 of the screen. The data for all other node types must be entered on pages 2–6.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on ***page 1***. Enter node names for switches, routers, and CMS starting on ***page 2***.

1. Type **change node-names ip** to open the Node Names screen.
2. Go to page 2.

```
change node-names ip                                    Page 1 of 1
                                NODE NAMES

   Name                IP Address      Name                IP Address
default_________   0__.0__.0__.0__     ________________    ___.___.___.___
node-1___________  192.168.10_.1__     ________________    ___.___.___.___
node-3___________  192.168.10_.3__     ________________    ___.___.___.___
_______________ _  ___.___.___.___     ________________    ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 2 nodes: ■ C-LAN Ethernet port on Switch 1 ■ C-LAN Ethernet port on Switch 3.
IP Address	The unique IP addresses of the nodes named in the previous field.

4. > Submit the screen.

Switch 1 Task — Assign pdm Data Module

This task administers a pdm data module for the connection between the PGATE board and the DS1 board for the connection to node-2. The data module associates a link number with a port address and extension number for the PGATE port used for this connection.

1. Type **add data-module next** to open the Data Module screen.

```
add data-module next                                          Page 1 of 2

                                  Data Module

    Data Extension: 30           Name: pdm on port 1c0102              BCC:
              Type: pdm          COS: 1              Remote Loop-Around Test? n
              Port: 01C0102      COR: 1                Secondary data module? n
               ITC: restricted   TN: 1                          Connected to: dte

ABBREVIATED DIALING
  List1: ___

SPECIAL DIALING OPTION:

ASSIGNED MEMBER (Station with a data extension button for this data module)
          Ext      Name
      1: 1002     station name
```

2. Enter values

Field	Conditions/Comments
Type:	This indicates the data-module type for this connection.
Port	This example means that the PGATE circuit pack is in slot 01c01 and link 5 uses port 02.
ITC	Enter **restricted**. (**unrestricted** is used only for wideband transmission.)
Name	Information-only; appears in list generated by the “list data module” command.
COS	The values for these fields will be specified by the system administrator.
COR	
TN	
Remote Loop-Around Test	Set to **n** unless testing.
Secondary data modules	Enter **n**.
Connected To	Enter **dte**.
Keep the default values for the rest of the fields.	

Switch 1 Task — Assign Link via x.25 Data Module to Switch 2

This task administers an x.25 data module for the connection to node 2. The data module associates a link number with a port address and extension number for the PGATE port used for this connection.

1. If a PGATE circuit pack is not already administered in slot 1c01, insert the circuit pack in the slot and enter **`add pgate 1c01`**, then fill in the PGATE screen.
2. Type **add data-module next** to open the Data Module screen.

```
add data-module next
                                                          Page 1 of 2
                              DATA MODULE

Data Extension: 2102                    Name: x.25 on link 5 to sw-2
          Type: x.25             COS: 1       Remote Loop-Around Test? n
          Port: 01C0102          COR: 1            Destination Number: external
     Baud Rate: 9600              TN: 1          Establish Connection? y
 Endpoint Type: adjunct     DTE/DCE: dte       Connected Data Module: 4121
          Link: 5      Enable Link? n                    Error Logging? n



 Permanent Virtual Circuit? y        Highest PVC Logical Channel: 64
  Switched Virtual Circuit? n
```

3. Enter values

Field	Conditions/Comments
Type	This indicates the data-module type for this connection.
Port	This example means that the PGATE circuit pack is in slot 01c01 and link 5 uses port 02.
Baud Rate	Set to **`9600`** for DCS connections to vs or si models, or to an r model with an external 9600 baud data line. Set to **`switched`** for r-to-r connections with common channel signaling on DS1 trunks. Set to 9600 for connections to Intuity AUDIX. Set to either **`9600`** or **`19200`** for CMS, depending on the physical connectivity.
Endpoint Type	For DCS, CMS, or Intuity AUDIX, set this field to **`adjunct`**.
Link	The link number must be in the range 1 – 33 (for R8r), not previously assigned on this switch.

(Sheet 1 of 2)

Field	Conditions/Comments
Name	Information-only; appears in list generated by the “list data module” command.
COS	The values for these fields will be specified by the system administrator.
COR	
TN	
DTE/DCE	The DTE/DCE assignments must be opposites on the two ends of the connection. Use **dce** for node 2.
Enable Link	Set to **y** after the processor channels have been assigned.
Remote Loop-Around Test	Set to **n** unless testing.
Destination Number	**external** is used when connecting an r-model to an si-model. For an r-to-r connection, enter the TAC+extension.
Establish Connection	**y** means that this switch will be responsible for the call setup for this connection. Enter **n** when administering the data module for Switch 2.
Connected Data Module	Extension of node-2 data module.
Error Logging	Set to **n** for normal operations. Set to **y** for testing — logs all data module errors.
Permanent Virtual Circuit	Always **y** for DCS, CMS, and Intuity AUDIX.
Switched Virtual Circuit	Always **n** for DCS, CMS, and Intuity AUDIX.
Highest PVC Logical Channel	Set to 64 for normal operations.

(Sheet 2 of 2)

4. Submit the screen

Switch 1 Task — Assign IP Interfaces

The IP interface for each C-LAN board on the switch must be defined on the IP Interfaces screen. Each DEFINITY switch in an IP network has one IP Interfaces screen.

1. Type **change ip-interfaces** to open the IP Interfaces screen.

```
change ip-interfaces                                    Page   1 of   2

                                IP Interfaces

Enable                                                                  Net
Eth Pt Type   Slot  Code Sfx Node Name      Subnet Mask      Gateway Addr    Rgn
   y   C-LAN  01b01 TN799 B  node-1         255.255.255.0    ___.___.___.___  1
   n   _____  _____ _____ _  _____________  255.255.255.0    ___ ___ ___ ___ _
   n   _____  _____ _____ _  _____________  255.255.255.0    ___ ___ ___ ___ _
   n   _____  _____ _____ _  _____________  255.255.255.0    ___ ___ ___ ___ _
```

2. Enter values

Field	Conditions/Comments
Enable Eth Pt	The Ethernet port must be enabled (**y**) before it can be used. The port must be disabled (**n**) before changes can be made to its attributes on this screen.
Type	Enter c-lan or medpro.
Slot	Enter the slot location for the circuit pack.
Code	Display only. This field is automatically populated with TN799 for C-LAN or TN802 or TN2302 for MedPro.
Sfx	Display only. This field is automatically populated.
Node name	Enter the unique node name for the IP interface. The node name here must already be administered on the Node Names screen

(Sheet 1 of 2)

Field	Conditions/Comments
Subnet Mask	Enter the subnet mask associated with the IP address for this IP interface. (The IP address is associated with the node name on the Node Names screen). In this example, leave the default subnet mask, 255.255.255.0, which indicates no subnetting for a Class C IP address. See the discussion of subnetting, Subnetting (page 379), in IP Addressing and Configuration 1: R8r <—ppp—> R8si (page 98) in this chapter for details about subnet masks.
Gateway Addr	Leave blank for this configuration. The only connection to this IP interface is node-3 on Switch 3. Node-3 is on the same subnetwork as this IP interface, so no gateway is needed. In general, for connectivity to other (sub)networks, enter the address of a network node that will serve as the default gateway to the other (sub)networks.
Net Rgn	Enter the region number for this IP interface.

(Sheet 2 of 2)

Switch 1 Task — Assign Link via ethernet Data Module to the LAN

This task administers an ethernet data module for ethernet connections. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module next** to open the Data Module screen.

```
add data-module next                                          Page 1 of x
                          DATA MODULE

Data Extension: 3391                        Name: ethernet on link 3   BCC: 2
              Type: ethernet
              Port: 01b0117
              Link: 3


Network uses 1's for broadcast addresses? y
```

Field	Conditions/Comments
Link	The link number must be in the range 1 – 33 (for R8r).
Name	Information-only; appears in list generated by the “list data module” command.
Network uses 1’s for broadcast addresses	Leave **y** if the private network contains only DEFINITY switches and adjuncts. Set to **n** if the network includes non-DEFINITY switches that use the 0’s method of forming broadcast addresses. See *DEFINITY ECS Administrator’s Guide* for more information about this field.

3. Submit the screen

Switch 1 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on the node-1 switch.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels
                                                          Page 1 of X
                            PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy          Interface    Destination      Session    Mach
Chan Enable  Appl.    To  Mode  Link/Chan   Node        Port  Local/Remote  ID
  1:    n   ________      _    __  _____  __________  0____  ___   ___     __
  2:    n   ________      _    __  _____  __________  0____  ___   ___     __
   :
 21:    y   dcs_____      _    5   21___  __________  0____  21    21      2
   :
 23:    y   gtwy-tcp 32   _    5   23___  __________  0____  23    23      __
   :
 31:    y   dcs_____      s    3   5003   node-3___  0____  31    31      3
   :
 32:    y   gtwy-tcp 23   s    3   6002   node-3___  0____  32    32      __
   :
256:    n   ________      _    __  _____  __________  0____  ___   ___     __
```

NOTE:
The Processor Channel number, the Interface Channel number, and the Local and Remote Session numbers do not need to be the same number but they should be made the same whenever possible to simplify network “bookkeeping” and diagnostics.

2. Enter values

Field	Conditions/Comments
Processor Channel 21: (X.25 connection to Switch 2)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Used for TCP/IP connections only.
Interface Link	This must match the link number assigned on the x.25 data module screen.
Interface Chan	The interface channel number must be in the range 1 – 64 for an X.25 link.
Destination Node	Used for TCP/IP connections only.
Destination Port	Used for TCP/IP connections only.
Session - Local Session - Remote	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Mach ID	Destination switch ID identified on the dial plan of the destination switch.
Processor Channel 23: (The X.25 side of the gateway)	
Enable	Set to **y**.
Appl.	Use **gtwy-tcp** for conversion between X.25 and TCP/IP.
Gateway To	Indicates a software connection between processor channels 23 and 32.
Mode	Used for TCP/IP connections only.
Interface Link	This must match the link number assigned on the x.25 data module screen.
Interface Chan	The interface channel number must be in the range 1 – 64 for an X.25 link.
Destination Node	Used for TCP/IP connections only.

Field	Conditions/Comments
Destination Port	Used for TCP/IP connections only.
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Leave blank for **gtwy-tcp**.
Processor Channel 31: (ethernet connection to Switch 3)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-1 is the “server” for this session. Set node-3 to “client” (**c**).
Interface Link	This must match the link number assigned on the node-1 data module screen.
Interface Chan	For TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications; for example, if there are two Intuity AUDIX’s, use 5002 for both; or if there are four DEFINITY ECS’s, use 5003 for all four. The combination of Link, Interface Channel, and Mach ID must be unique.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.
Destination Port	A value of **0** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number on the Switch-3 Processor Channel screen must also be set to **0**.
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.
Processor Channel 32: (The Ethernet side of the gateway)	
Enable	Set to **y**.
Appl.	Use **gtwy-tcp** for conversion between X.25 and TCP/IP.

Field	Conditions/Comments
Gateway To	Indicates a software connection between processor channels 32 and 23.
Mode	Node-1 is the “server” for this session. Set node-3 to “client” (**c**).
Interface Link	This must match the link number assigned on the data module screen.
Interface Chan	For TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. The combination of Link, Interface Channel, and Mach ID must be unique. The recommended values for gateway switches is 6001–6099. The interface channel number must be unique for each gateway.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.
Destination Port	A value of **0** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number on the Switch-3 Processor Channel screen must also be set to **0**.
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Leave blank for **gtwy-tcp**.

(Sheet 3 of 3)

3. Submit the screen

Switch 2 Task — Assign Link via procr-intf Data Module to Switch 1

This task administers a processor-interface data module for the x.25 connection to node 1. The data module associates a link number with a physical channel number and extension number for the PI port used for this connection.

1. Type **add data-module next** to open the Data Module screen.

```
add data-module next                                          Page 1 of 1
                                DATA MODULE

  Data Extension: 4121                      Name: _x.25 on link 2 to node-1__
            Type: procr-intf          COS: 1        Maintenance Extension: 4191
Physical Channel: 02_                 COR: 1           Destination Number: 8122102
             ITC: Restricted           TN: 1         Establish Connection? n
            Link: 2_                DTE/DCE: dce      Connected Data Module: _______
                                Enable Link: n
ABBREVIATED DIALING
  List1: _______________

SPECIAL DIALING OPTION: _________________

ASSIGNED MEMBER (Station with a data extension button for this data module)

         Ext               Name
    1.
```

2. Enter values.

Field	Conditions/Comments
Type	This indicates the data-module type for this connection.
Physical Channel	This must be the same as the link number.
ITC	Enter **restricted**. (**unrestricted** is used only for wideband transmission.)
Link	The link number must be in the range 1 –25 (for R8si), not previously assigned on this switch.
Name	Information-only; appears in list generated by the “list data module” command.
COS	The values for these fields will be specified by the system administrator.
COR	
TN	
DTE/DCE	The DTE/DCE assignments must be opposites on the two ends of the connection. Use **dte** for node 1.
Enable Link	Set to **y** after the processor channels have been assigned.

(Sheet 1 of 2)

Field	Conditions/Comments
Maintenance Extension	Specified on dial plan.
Destination Number	TAC (812) + extension (2102) of the data module on the far end that will establish the connection.
Establish Connection	**n** means that the switch at the remote end of this connection (Switch 1 in this case) will be responsible for the call setup. Enter **y** when administering the data module for Switch 1.
Connected Data Module	This is an information-only field.
Keep the default values for the rest of the fields.	

(Sheet 2 of 2)

Switch 2 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on Switch 2.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels
                                                          Page 1 of X
                          PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy          Interface    Destination      Session    Mach
Chan Enable  Appl.    To  Mode   Link/Chan   Node         Port  Local/Remote  ID
  1:    n   _______       _     __  _____  _________    0____  ___   ___     __
  2:    n   _______       _     __  _____  _________    0____  ___   ___     __
   :
 21:    y   dcs____       _     2   21___  _________    0____  21    21      1
 23:    y   dcs____       _     2   23___  _________    0____  23    23      3
    :
256:    n   _______       _     __  _____  _________    0____  ___   ___     __
```

NOTE:
The Processor Channel number, the Interface Channel number, and the Local and Remote Session numbers do not need to be the same number but they should be made the same whenever possible to simplify network “bookkeeping” and diagnostics.

2. Enter values

Field	Conditions/Comments
Processor Channel 21: (X.25 connection to Switch 1)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Used for TCP/IP connections only.
Interface Link	This must match the link number assigned on the procr-intf data module screen.
Interface Chan	The interface channel number must be in the range 1 – 64 for an X.25 link.
Destination Node	Used for TCP/IP connections only.
Destination Port	Used for TCP/IP connections only.
Session - Local	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch. This is usually called the “node number.”
Processor Channel 23: (connection to Switch 1 for gateway to Switch 3)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Used for TCP/IP connections only.
Interface Link	This must match the link number assigned on the procr-intf data module screen.
Interface Chan	The interface channel number must be in the range 1 – 64 for an X.25 link.
Destination Node	Used for TCP/IP connections only.
Destination Port	Used for TCP/IP connections only.

Field	Conditions/Comments
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.

(Sheet 2 of 2)

3. Submit the screen

Switch 3 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 3. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on ***page 1***. Enter node names for switches, routers, and CMS starting on ***page 2***.

1. Type **change node-names ip** to open the Node Names screen.
2. Go to page 2.

```
change node-names ip
                                                          Page 2 of 6
                                NODE NAMES

   Name              IP Address          Name              IP Address
default___________  0__.0__.0__.0__   _________________   ___.___.___.___
node-1____________  192.168.10_.1__   _________________   ___.___.___.___
node-3____________  192.168.10_.3__   _________________   ___.___.___.___
__________________   ___.___.___.___   _________________   ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 2 nodes: ■ C-LAN Ethernet port on Switch 3 ■ C-LAN Ethernet port on Switch 1.
IP Address	The unique IP addresses of the nodes named in the previous field.

4. Submit the screen

Switch 1 Task — Assign IP Interfaces

The IP interface for each C-LAN board on the switch must be defined on the IP Interfaces screen. Each DEFINITY switch in an IP network has one IP Interfaces screen.

1. Type **change ip-interfaces** to open the IP Interfaces screen.

```
change ip-interfaces                                    Page   1 of   2

                                IP Interfaces

Enable                                                                  Net
Eth Pt Type   Slot  Code Sfx Node Name      Subnet Mask      Gateway Addr    Rgn
   y   C-LAN  01a10 TN799 B  node-1         255.255.255.0    ___.___.___.___  1
   n   _____  _____ _____ _  _____________  255.255.255.0    ___ ___ ___ ___ _
   n   _____  _____ _____ _  _____________  255.255.255.0    ___ ___ ___ ___ _
   n   _____  _____ _____ _  _____________  255.255.255.0    ___ ___ ___ ___ _
```

2. Enter values

Field	Conditions/Comments
Enable Eth Pt	The Ethernet port must be enabled (**y**) before it can be used. The port must be disabled (**n**) before changes can be made to its attributes on this screen.
Type	Enter c-lan or medpro.
Slot	Enter the slot location for the circuit pack.
Code	Display only. This field is automatically populated with TN799 for C-LAN or TN802 or TN2302 for MedPro.
Sfx	Display only. This field is automatically populated with B for the TN802 or TN2302 and TN799.

(Sheet 1 of 2)

Field	Conditions/Comments
Node name	Enter the unique node name for the IP interface. The node name here must already be administered on the Node Names screen
Subnet Mask	Enter the subnet mask associated with the IP address for this IP interface. (The IP address is associated with the node name on the Node Names screen). In this example, leave the default subnet mask, 255.255.255.0, which indicates no subnetting for a Class C IP address. See the discussion of subnetting, Subnetting (page 379), in IP Addressing and Configuration 1: R8r <—ppp—> R8si (page 98) in this chapter for details about subnet masks.
Gateway Addr	Leave blank for this configuration. The only connection to this IP interface is node-1 on Switch 1. Node-1 is on the same subnetwork as this IP interface, so no gateway is needed. In general, for connectivity to other (sub)networks, enter the address of a network node that will serve as the default gateway to the other (sub)networks.
Net Rgn	Enter the region number for this IP interface.

(Sheet 2 of 2)

Switch 3 Task — Assign Link via ethernet Data Module to the LAN

This task administers an ethernet data module on Switch 3 for the ethernet connection to Switch 1. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module next** to open the Data Module screen.

```
add data-module next                                  Page 1 of x
                            DATA MODULE

Data Extension: 4531           Name: ethernet on link 3    BCC: 2
               Type: ethernet
               Port: 01a1017
               Link: 3


Network uses 1's for broadcast addresses? y
```

2. Enter values.

Field	Conditions/Comments
Type	This indicates the data-module type for this connection.
Port	In this example, the C-LAN circuit pack is in slot 01a10; the ethernet connection is through port 17.
Link	The link number must be in the range 1 – 25 (for R8si), not previously assigned on this switch.
Name	Information-only; appears in the “list data module” command list.
Network uses 1’s for broadcast addresses	Leave the default (**y**) if the private network contains only DEFINITY switches and adjuncts. Set to **n** only if the network includes non-DEFINITY switches that use the 0’s method of forming broadcast addresses. See *DEFINITY ECS Administrator’s Guide*for more information about this field.

3. Submit the screen

Switch 3 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on Switch 3.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels
                                                          Page 1 of X
                            PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy      Interface       Destination      Session    Mach
Chan Enable  Appl.   To  Mode   Link/Chan     Node        Port  Local/Remote  ID
  1:   n     _______       _     __  _____  ____________ 0____  ___   ___    __
  2:   n     _______       _     __  _____  ____________ 0____  ___   ___    __
  :
 31:   y     dcs____       c     3   0____  node-1______ 5003_  31_   31_    1_
  :
 32:   y     dcs____       c     3   0____  node-1______ 6002_  32_   32_    2_
  :
256:   n     _______       _     __  _____  ____________ 0____  ___   ___    __
```

NOTE:
The Processor Channel number, the Interface Channel number, and the Local and Remote Session numbers do not need to be the same number but they should be made the same whenever possible to simplify network “bookkeeping” and diagnostics.

2. Enter values

Field	Conditions/Comments
`For Processor Channel 31`: (ethernet connection to Switch 1)	
Enable	Set to **`y`**.
Appl.	Indicates that this connection will carry DCS data.
Mode	Node-3 is the “client” for this session. Set node-1 to “server” (**`s`**).
Interface Link	This must match the link number assigned on the node-3 data module screen.
Interface Chan	A value of **`0`** allows any available interface channel to be used for this connection. This number must match the Destination Port number on the Switch-1 Processor Channel screen.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.
Destination Port	The Destination Port number must match the Interface Channel number for this connection on the Switch-1 Processor Channel screen.
Session - Local	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.
`Processor Channel 32`: (connection to Switch 1 for gateway to Switch 2)	
Enable	Set to **`y`**.
Appl.	Set to **`dcs`** for DCS signaling.
Mode	Node-3 is the “client” for this session. Set node-1 to “server” (**`s`**).
Interface Link	This must match the link number assigned on the node-3 data module screen.
Interface Chan	A value of **`0`** allows any available interface channel to be used for this connection. This number must match the Destination Port number on the Switch-1 Processor Channel screen.

Field	Conditions/Comments
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.
Destination Port	The Destination Port number must match the Interface Channel number for this connection on the Switch-1 Processor Channel screen.
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.

(Sheet 2 of 2)

3. Submit the screen the screen

Enable links and processor channels

You must enable links and processor channels before the connections can be used.

To enable a link, open its data module screen (**ch da** [**ext**]) and set the Enable Link field to **y**.

NOTE:
To view a list of assigned data modules and their extensions, enter the “list data-module” command (**l da**).

To enable the processor channels, open the processor channel screen (**ch com p**) and set the Enable field to **y** for each assigned processor channel.

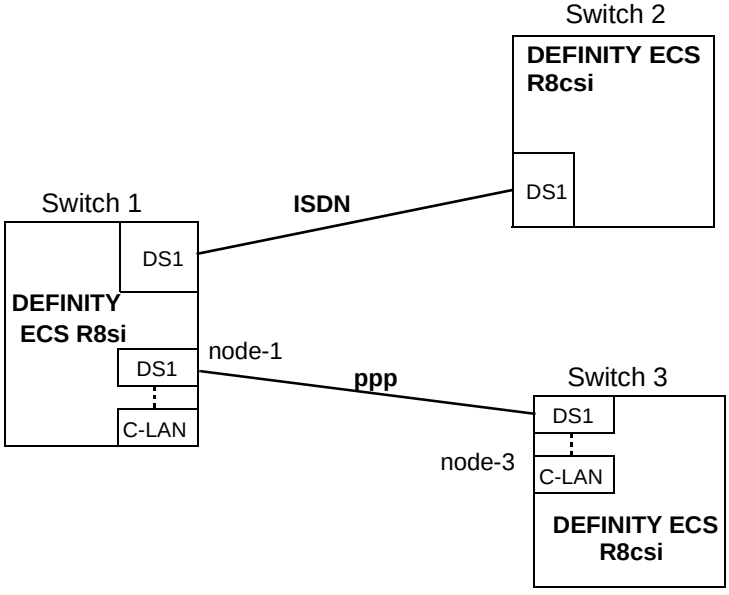
NOTE:
1. You must disable a link or processor channel before you can change its parameters.

NOTE:
2. The **busy-out** command overrules the data module Enable Link field.

NOTE:
3. On the C-LAN boards, low-level connectivity can remain intact when higher-level applications such as DCS are not functioning. For example, an external ping to a C-LAN’s ethernet port could be successful even when the board is busied-out. When debugging connectivity problems, pinging only checks low-level connectivity.

Configuration 4: R8csi <—ISDN—> R8si Gateway <—ppp—> R8csi

In this configuration, a DEFINITY ECS R8r provides gateway conversion between ISDN and TCP/IP.



Task Summary

The following tasks need to be completed for Switch 1, Switch 2, and Switch 3:

1. Review checklist
2. Switch 1 administration
    a. Assign node names
    b. Assign signaling group and administered NCA TSC
    c. Assign ISDN-TSC Gateway Channel
    d. Assign link (via a data module) to node 3
    e. Assign processor channels
3. Switch 2 administration
    a. Assign signaling group and administered NCA TSC

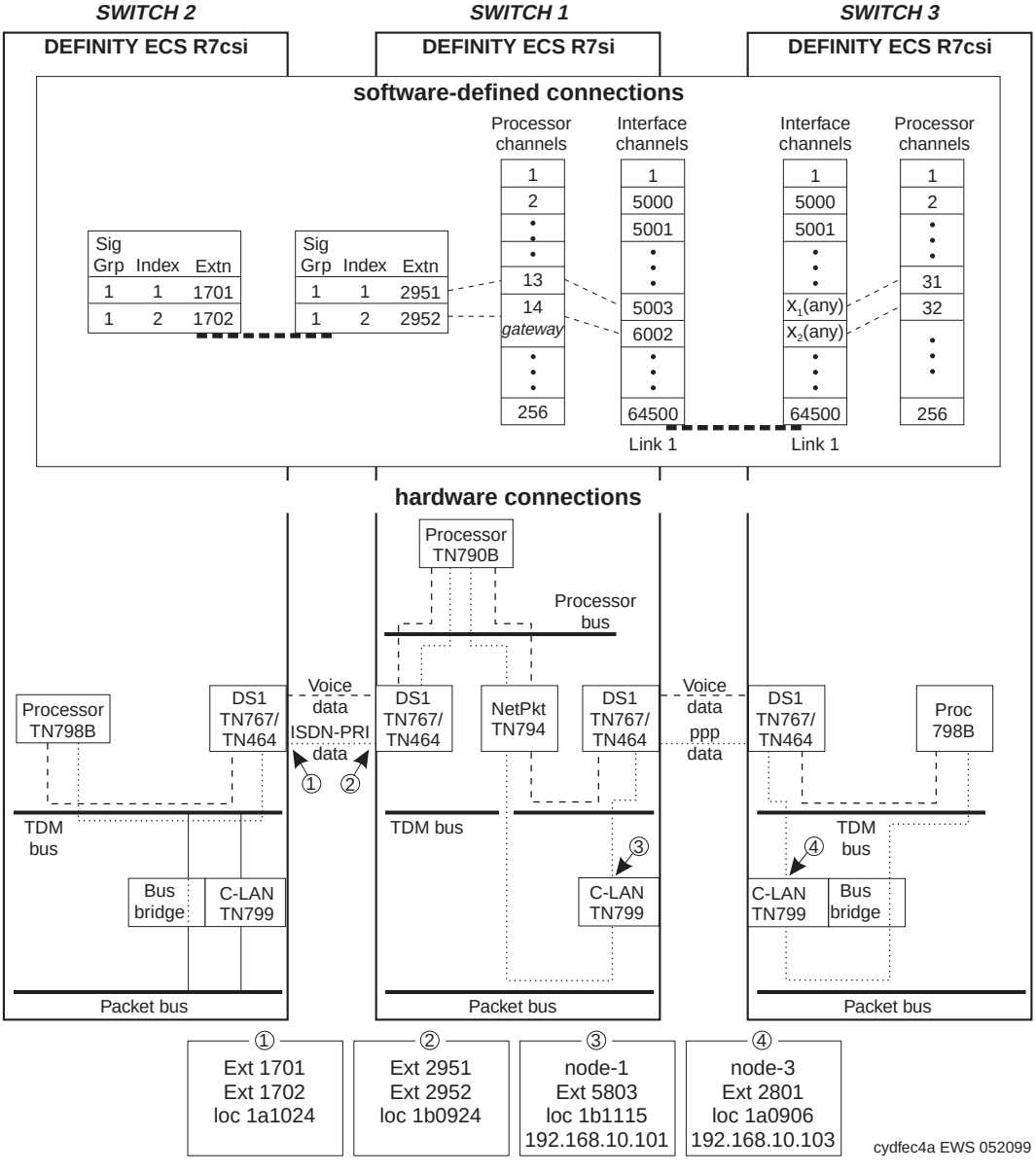
4. Switch 3 administration
    a. Enable bus bridge connectivity
    b. Assign node names
    c. Assign link (via a data module) to node 1
    d. Assign processor channels
5. Enable links and processor channels

Prerequisite Administration

There are some system administration tasks that need to be completed before you can proceed with the connectivity administration described in this section.

Review the checklist of prerequisite administration tasks in Checklist for Prerequisite Administration (page 90), before proceeding with the connectivity administration in this section.

Configuration 4



Switch 1 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 1. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on ***page 1***. Enter node names for switches, routers, and CMS starting on ***page 2***.

1. Type **change node-names ip** to open the Node Names screen.
2. Go to page 2.

```
change node-names ip                                    Page 1 of 1
                                NODE NAMES

   Name                IP Address          Name              IP Address
default_________   0__.0__.0__.0__     _________________   ___.___.___.___
node-1__________   192.168.10_.101     _________________   ___.___.___.___
node-3__________   192.168.10_.103     _________________   ___.___.___.___
_________________  ___.___.___.___     _________________   ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 2 nodes: ■ C-LAN PPP port on Switch 1 ■ C-LAN PPP port on Switch 3.
IP Address	The unique IP addresses of the nodes named in the previous field.

4. Submit the screen

Switch 1 Task — Assign Link via ppp Data Module to Switch 3

This task administers a ppp data module for the ppp connection to node 3. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module 5803** to open the Data Module screen.

```
add data-module 5803
                                                          Page 1 of x
                          DATA MODULE

    Data Extension: 5803            Name: _ppp on link 1 to node-3___  BCC: 2
              Type: ppp_____         COS: 1
              Port: 01b1115          COR: 1
              Link: 1_                TN: 1
       Enable Link? n

         Node Name: node-1_________
       Subnet Mask: 255.255.255.0__


Establish Connection: y

DESTINATION
             Digits: 792801_________
         Node Name: node-3_________
              CHAP? n
```

[This data module is assigned the extension 5803; you can assign any unused extension in the dial plan]

2. Enter values

Field	Conditions/Comments
Type	This indicates the data-module type for this connection.
Port	In this example, the C-LAN circuit pack is in slot 01b11; the ppp connection is through port 15.
Link	The link number must be in the range 1 – 25 (for R8si), not previously assigned on this switch.
Enable Link	If you need to add an IP route that uses this node as a gateway, this field must be set to **y** *before* adding the IP route. Otherwise leave this field set to **n** until the link administration is complete; that is, until after all data modules and the processor channels are assigned, then set to **y**.
Name	Information-only; appears in list generated by the “list data module” command.
BCC	Bearer Capability Class. This is a display-only field.

(Sheet 1 of 2)

Field	Conditions/Comments
COS	The values for these fields will be specified by the system administrator.
COR	
TN	
Node Name	The node name for the interface defined by this data module. This must be a name entered on the Node Names screen.
Establish Connection	**y** means that this switch will be responsible for call setup for this connection. Enter **n** when administering the data module for Switch 3.
Destination Digits	Trunk access code (79) plus extension of data module on node-3 (2801).
Destination Node Name	Name of the node at the far end of this connection. This must be a name entered on the Node Names screen
CHAP	This field enables/disables the Challenge Handshake Authentication Protocol security mechanism on this link. If you enter **y**, the system will prompt for a CHAP secret (password).

(Sheet 2 of 2)

3. Submit the screen

Switch 1 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on the node 1 switch.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels                Page 1 of X
                     PROCESSOR CHANNEL ASSIGNMENT

Proc                 Gtwy         Interface    Destination      Session    Mach
Chan Enable  Appl.   To  Mode  Link/Chan   Node         Port  Local/Remote  ID
  1:    n   _______      _    __  _____  __________  0____  ___   ___     __
  2:    n   _______      _    __  _____  __________  0____  ___   ___     __
  :
 13:    y   dcs____      s    1_  5003_  node-3____  0____  13__  31_     3_
 14:    y   gateway      s    1_  6002_  node-3____  0____  14__  32_     __
  :
 64:    n   _______      _    __  _____  __________  0____  ___   ___     __
```

2. Enter values

Field	Conditions/Comments
`Processor Channel 13`: (ppp connection to Switch 3)	
Enable	Set to **`y`**.
Appl.	Set to **`dcs`** for DCS signaling.
Mode	Node-1 is the “server” for this session. Set node-3 to “client” (**`c`**).
Interface Link	This must match the link number assigned on the node-1 data module screen.
Interface Chan	For TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications; for example, if there are two Intuity AUDIX’s, use 5002 for both; or if there are four DEFINITY ECS’s, use 5003 for all four. The combination of Link, Interface Channel, and Mach ID must be unique. This number must match the Destination Port number on the node-3 Processor Channel screen.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.
Destination Port	A value of **`0`** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number for this connection on the Switch-3 Processor Channel screen must also be set to **`0`**.
Session - Local	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.
`Processor Channel 14`: (Gateway between Switch 2 and Switch 3)	

Field	Conditions/Comments
Enable	Set to **y**.
Appl.	Set to **gateway** for conversion between ISDN and TCP/IP.
Mode	Node-1 is the “server” for this session. Set node-3 to “client” (**c**).
Interface Link	This must match the link number assigned on the node- 1 data module screen.
Interface Chan	For TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications; for example, if there are two Intuity AUDIX’s, use 5002 for both; or if there are four DEFINITY ECS’s, use 5003 for all four. The combination of Link, Interface Channel, and Mach ID must be unique. The recommended values for gateway switches is 6001–6099. The interface channel number must be unique for each gateway. This number must match the Destination Port number on the node-3 Processor Channel screen.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.
Destination Port	A value of **0** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number for this connection on the Switch-2 Processor Channel screen must also be set to **0**.
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Leave blank for gateway applications.

(Sheet 2 of 2)

3. > Submit the screen

Switch 1 Task — Assign Signaling Group and administered NCA TSC

This task assigns a signaling group and an administered NCA TSC for the ISDN connection to Switch 2.

1. Type **add signaling-group next** to open the Signaling Group screen.

```
add signaling-group next                                        Page 1 of 5
                         SIGNALING GROUP
Group Number: 1
                     Associated Signaling? y            Max number of NCA TSC: 5
                        Primary D-Channel: 01b0924       Max number of CA TSC: 23
                                                    Trunk Group for NCA TSC: 12
       Trunk Group for Channel Selection: 12
          Supplementary Service Protocol: a
```

2. Enter values

Field	Conditions/Comments
Associated Signaling	Specifies Facility-Associated Signaling (FAS) — the D-channel carries signaling only for the B-channels on the same DS1 interface.
Primary D-Channel	Specifies D-Channel signaling on port 24 of the DS1 circuit pack located at 01b09.
Max number of NCA TSC	Maximum number of simultaneous non-call-associated Temporary Signaling Connections. The TSCs carry signaling for features not associated with a specific call; for example, signals to turn on Leave Word Calling.
Max number of CA TSC	Maximum number of simultaneous call-associated TSCs that can exist in the signaling group. Typically, this is the number of ISDN-PRI trunk group members controlled by this signaling group.
Trunk Group for NCA TSC	The ISDN-PRI trunk group number whose incoming call-handling table will be used to handle incoming NCA-TSCs through this signaling group.
Trunk Group for Channel Selection	
Supplementary Service Protocol	**a** indicates AT&T protocol; **b** indicates QSIG protocol.

3. Press the Next Page key

```
                                                              Page 2 of 5
                        ADMINISTERED NCA TSC ASSIGNMENT

Service/Feature: __________           As-needed Inactivity Time-out (min): __

 TSC    Local                                                        Mach.
Index    Ext.   Enabled Established   Dest. Digits     Appl.          ID
  1:    2951_     y     permanent    1701_________    dcs____        2_
  2:    2952_     y     permanent    1702_________    gateway        __
  3:    _____     _     _________    _____________    _______        __
  :
```

4. Enter values

Field	Conditions/Comments
TSC Index 1: (for DCS connection to Switch 2)	
Local Ext.	Extension number of the ISDN interface on the Switch-1DS1 circuit pack.
Enabled	**y** enables the administered NCA-TSC.
Established	Used to indicate the strategy for establishing this administered NCA-TSC. **permanent** means that the administered NCA-TSC can be established by either the near end or the far end. **as-needed** means the administered NCA-TSC will be established the first time the administered NCA-TSC is needed; it can be set up either by the near end or far end switch.
Dest. Digits	Extension number of the ISDN interface on the Switch-2 DS1 circuit pack.
Appl. 1	TSC #1 carries the DCS signaling between node 1 and node 2.
Mach ID 1	Destination is node 2.
TSC Index 2: (for connection to Switch 2 for gateway to Switch 3)	
Local Ext.	Extension number of the ISDN interface on the Switch-1 DS1 circuit pack.
Enabled	**y** enables the administered NCA-TSC.
Established	Used to indicate the strategy for establishing this administered NCA-TSC. **permanent** means that the administered NCA-TSC can be established by either the near end or the far end. **as-needed** means the administered NCA-TSC will be established the first time the administered NCA-TSC is needed; it can be set up either by the near end or far end switch.

Field	Conditions/Comments
Dest. Digits	Extension number of the ISDN interface on the Switch-2 DS1 circuit pack.
Appl.	Specifies that TSC #2 will carry signaling that will be converted in Switch-1 to another protocol (TCP/IP), which will then be forwarded to Switch-3.
Mach ID	Leave blank for gateway

(Sheet 2 of 2)

5. Submit the screen

Switch 1 Task — Assign ISDN-TSC Gateway

This task assigns the ISDN TSC gateway channels needed for ISDN signaling between node 1 and node2

1. Type **change isdn tsc-gateway** to open the ISDN TSC Gateway Channel Assignment screen.

```
change isdn tsc-gateway                                          Page   1 of   2
                    ISDN TSC GATEWAY CHANNEL ASSIGNMENT

   Sig   Adm'd NCA  Processor  Appli-     Sig   Adm'd NCA  Processor  Appli-
  Group  TSC Index   Channel   cation    Group  TSC Index   Channel   cation
 1: 1_      2_         14_      dcs_   17: __     __         ___       ____
 2: __      __         ___      ____   18: __     __         ___       ____
 3: __      __         ___      ____   19: __     __         ___       ____
 4: __      __         ___      ____   20: __     __         ___       ____
 5: __      __         ___      ____   21: __     __         ___       ____
 6: __      __         ___      ____   22: __     __         ___       ____
 :
```

2. Enter values

Field	Conditions/Comments
For Gateway Channel 1: (ISDN connection to Switch 2)	
Sig Group	Signaling group number assigned on the Signaling Group screen.
Adm'd NCA TSC Index	TSC Index assigned on page 2 of the Signaling Group screen (Administered NCA TSC Assignment).
Processor Channel	This is the Processor Channel number specified as a **gateway** application on the Processor Channel Assignment screen.
Application	The application that this TSC is used for.

3. Submit the screen

Switch 2 Task — Assign Signaling Group and administered NCA TSC

This task assigns a signaling group and an administered NCA TSC for the ISDN connection to Switch 1.

1. Type **add signaling-group next** to open the Signaling Groups screen.

```
add signaling-group next                                        Page 1 of 5
                         SIGNALING GROUP
Group Number: 1
                    Associated Signaling? y            Max number of NCA TSC: 5
                       Primary D-Channel: 01a1024       Max number of CA TSC: 23
                                                   Trunk Group for NCA TSC: 12
       Trunk Group for Channel Selection: 21
          Supplementary Service Protocol: a
```

2. Enter values

Field	Conditions/Comments
Associated Signaling	Specifies Facility-Associated Signaling (FAS) — the D-channel carries signaling only for the B-channels on the same DS1 interface.
Primary D-Channel	Specifies D-Channel signaling on port 24 of the DS1 circuit pack located at 1a10.
Max number of NCA TSC	Maximum number of simultaneous non-call-associated Temporary Signaling Connections that can exist in the signaling group. This number includes all NCA-TSCs that are administered on this screen and those that tandem through the switch in-route to another switch in the network. The TSCs carry signaling for features not associated with a specific call; for example, signals to turn on Leave Word Calling.
Max number of CA TSC	Maximum number of simultaneous call-associated TSCs that can exist in the signaling group. Typically, this is the number of ISDN-PRI trunk group members controlled by this signaling group. If the connection is using the public network (SDN), the total NCA + CA TSCs cannot exceed the number ordered.
Trunk Group for NCA TSC	The trunk group used by the NCA-TSCs.
Trunk Group for Channel Selection	Leave blank — this field is currently not used.
Supplementary Service Protocol	**a** indicates AT&T protocol; **b** indicates QSIG protocol.

3. Press the Next Page key

```
add signaling-group next                                        Page 2 of 5
                     ADMINISTERED NCA TSC ASSIGNMENT

Service/Feature: __________          As-needed Inactivity Time-out (min): __

 TSC   Local                                                        Mach.
Index   Ext.  Enabled Established   Dest. Digits    Appl.             ID
  1:   1701_     y     permanent    2951_________   dcs____           1_
  2:   1702_     y     permanent    2952_________   dcs____           3_
  3:   _____     _     _________    ____________    _______           __
  :
```

4. Enter values

Field	Conditions/Comments
TSC Index 1: (for DC S connection to Switch 1)	
Local Ext.	Extension number of the ISDN interface for TSC #1 on the Switch-2 DS1 circuit pack.
Enabled	**y** enables the administered NCA-TSC.
Established	Used to indicate the strategy for establishing this administered NCA-TSC. **permanent** means that the administered NCA-TSC can be established by either the near end or the far end. **as-needed** means the administered NCA-TSC will be established the first time the administered NCA-TSC is needed; it can be set up either by the near end or far end switch.
Dest. Digits	Extension number of the ISDN interface for TSC #1 on the Switch-1 DS1 circuit pack.
Appl.	TSC #1 carries DCS signaling between node 2 and node 1.
Mach ID	Destination is node 1.
TSC Index 2: (for DCS connection to Switch 1)	
Local Ext.	Extension number of the ISDN interface for TSC #2 on the Switch-2 DS1 circuit pack.
Enabled	**y** enables the administered NCA-TSC.
Established	Used to indicate the strategy for establishing this administered NCA-TSC. **permanent** means that the administered NCA-TSC can be established by either the near end or the far end. **as-needed** means the administered NCA-TSC will be established the first time the administered NCA-TSC is needed; it can be set up either by the near end or far end switch.

Field	Conditions/Comments
Dest. Digits	Extension number of the ISDN interface for TSC #2on the Switch-1 DS1 circuit pack.
Appl.	TSC #2 carries DCS signaling between Switch 2 and Switch 1. As specified on the Switch-1 NCA TSC Assignment screen, TSC #2 is administered as a gateway on Switch 1, where the ISDN signals are converted to TCP/IP.
Mach ID	Destination is node 3.

(Sheet 2 of 2)

5. Submit the screen

Switch 3 Task — Enable Bus Bridge Connectivity

This task enables the bus bridge functionality on the C-LAN circuit pack to provide a path between the packet bus and the processor.

NOTE:
Bus Bridge Connectivity is used on the csi model only. This task may have been complete when the C-LAN circuit pack was installed.

1. Type **change system-parameters maintenance** to open the Maintenance-Related System Parameters screen.
2. Go to page 2 and skip to the Packet Intf2 field near the bottom of the screen

```
change system-parameters maintenance                              Page   2 of   3

                    MAINTENANCE-RELATED SYSTEM PARAMETERS

MINIMUM MAINTENANCE THRESHOLDS ( Before Notification )
        TTRs: 4        CPTRs: 1        Call Classifier Ports: 0
        MMIs: 0          VCs: 0

TERMINATING TRUNK TRANSMISSION TEST ( Extension )
   Test Type 100:          Test Type 102:          Test Type 105:

ISDN MAINTENANCE
   ISDN-PRI Test Call Extension:         ISDN-BRI Service SPID:

DS1 MAINTENANCE
   DS0 Loop-Around Test Call Extension:


SPE OPTIONAL BOARDS
                     Packet Intf1? y     Packet Intf2? y
         Bus Bridge: 01a09__Inter-Board Link Timeslots  Pt0: 6 Pt1: 1 Pt2: 1
```

3. Enter values

Field	Conditions/Comments
Packet Intf2	Enables the bus bridge.
Bus Bridge:	Location of the C-LAN circuit pack. If the system has two C-LANs, only one is administered for bus bridge.
Inter-Board Link Timeslots: Pt0, Pt1, Pt2	Specifies the bandwidth used on the 3 ports of the Inter-Board Link. The total number of timeslots assigned cannot exceed 11. Pt0 carries PPP traffic and can have 1–9 timeslots. Pt1 carries maintenance messages and can have 1–3 timeslots. Pt2 carries broadcast messages and can have 1–3 timeslots.

4. Submit the screen

Switch 3 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 3. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on ***page 1***. Enter node names for switches, routers, and CMS starting on ***page 2***.

1. Type **change node-names ip** to open the Node Names screen.
2. Go to page 2.

```
change node-names ip                                    Page 1 of 1
                                NODE NAMES

   Name              IP Address          Name              IP Address
default_________  0__.0__.0__.0__    _______________    ___.___.___.___
node-1__________  192.168.10_.101    _______________    ___.___.___.___
node-3__________  192.168.10_.103    _______________    ___.___.___.___
_______________   ___.___.___.___    _______________    ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 2 nodes: C-LAN PPP port on Switch 3 C-LAN PPP port on Switch 1.
IP Address	The unique IP addresses of the nodes named in the previous field.

4. Submit the screen

Switch 3 Task — Assign Link via ppp Data Module to Switch 1

This task administers a ppp data module on Switch 3 for the ppp connection to Switch 1. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module next** to open the Data Module screen.

```
add data-module next                                          Page 1 of x
                          DATA MODULE

    Data Extension: 2801            Name: _ppp on link 1 to node-1___  BCC: 2
              Type: ppp_____         COS: 1
              Port: 01a0906          COR: 1
              Link: 1_                TN: 1
       Enable Link? n

         Node Name: node-3_____________
       Subnet Mask: 255.255.255.0__


Establish Connection: n

DESTINATION
             Digits: _________________
          Node Name: node-1_____________
               CHAP? n
```

[This data module is assigned the extension 2801; you can assign any unused extension in the dial plan.]

2. Enter values

Field	Conditions/Comments
Type	This indicates the data-module type for this connection.
Port	In this example, the C-LAN circuit pack is in slot 01a09; the ppp connection is through port 06.
Link	The link number must be in the range 1 – 25 (for R8csi), not previously assigned on this switch.
Enable Link	If you need to add an IP route that uses this node as a gateway, this field must be set to **y** *before* adding the IP route. Otherwise leave this field set to **n** until the link administration is complete; that is, until after all data modules and the processor channels are assigned, then set to **y**.
Name	Information-only; appears in list generated by the “list data module” command.
BCC	Bearer Capability Class. This is a display-only field.
COS	The values for these fields will be specified by the system administrator.
COR	
TN	
Node Name	The node name for the interface defined by this data module. This must be a name entered on the Node Names screen.
Subnet Mask	
Establish Connection	**n** means that the switch at the remote end of this connection (Switch 1 in this case) will be responsible for the call setup. Enter **y** when administering the data module for Switch 1.
Destination Digits	Not needed if the “Establish Connection” field is set to **n**
Destination Node Name	Name of the node at the far end of this connection. This must be a name entered on the Node Names screen.
CHAP	This field enables/disables the Challenge Handshake Authentication Protocol security mechanism on this link. If you enter **y**, the system will prompt for a CHAP secret (password).

3. Submit the screen

Switch 3 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on Switch 3.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels                Page 1 of X

                    PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy         Interface      Destination   Session    Mach
Chan Enable  Appl.    To  Mode   Link/Chan      Node      Port  Local/Remote  ID
  1:    n   _______       _      __  _____   _________  0____  ___   ___    __
  2:    n   _______       _      __  _____   _________  0____  ___   ___    __
  :
 31:    y   dcs____       c      1   0____   node-1___  5003_  31_   13_    1_
 32:    y   dcs____       c      1   0____   node-1___  6002_  32_   14_    2_
  :
64:    n   _______       _      __  _____   _________  0____  ___   ___    __
```

2. Enter values

Field	Conditions/Comments
Processor Channel 31: (ppp connection to Switch 1)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-3 is the “client” for this session. Set node-1 to “server” (**s**).
Interface Link	This must match the link number assigned on the node-3 data module screen.
Interface Chan	A value of **0** allows any available interface channel to be used for this connection. This number must match the Destination Port number on the Switch-1 Processor Channel screen.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.
Destination Port	This must match the Interface Channel number assigned on the Switch-1 Processor Channel screen.

(Sheet 1 of 2)

Field	Conditions/Comments
Session - Local	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.
Processor Channel 32: (connection to Switch 1 for gateway to Switch 2)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-3 is the “client” for this session. Set node-1 to “server” (**s**).
Interface Link	This must match the link number assigned on the data module screen.
Interface Chan	A value of **0** allows any available interface channel to be used for this connection. This number must match the Destination Port number on the Switch-1 Processor Channel screen.
Destination Node	Node name for the gateway through which the destination is reached. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.
Destination Port	This must match the Interface Channel number assigned on the Switch-1 Processor Channel screen.
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.

(Sheet 2 of 2)

3. Submit the screen

Enable links and processor channels

You must enable links and processor channels before the connections can be used.

To enable a link, open its data module screen (**ch da** [**ext**]) and set the Enable Link field to **y**.

NOTE:
To view a list of assigned data modules and their extensions, enter the “list data-module” command (**l da**).

To enable the processor channels, open the processor channel screen (**ch com p**) and set the Enable field to **y** for each assigned processor channel.

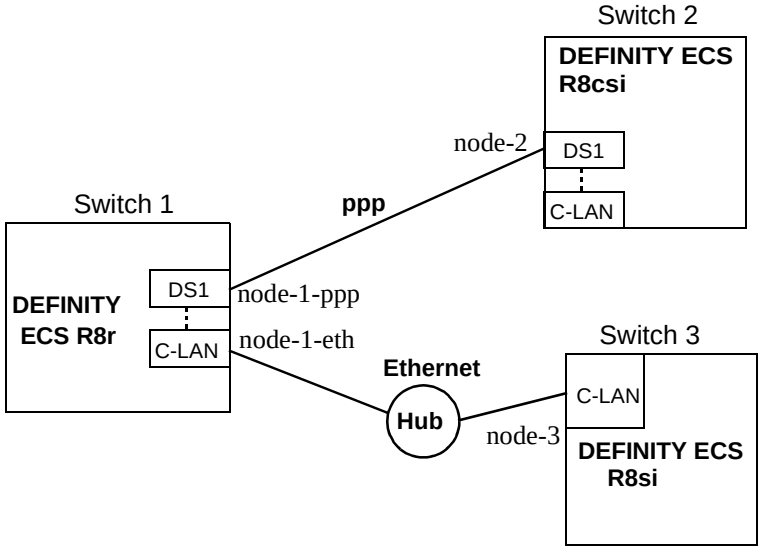
NOTE:
1. You must disable a link or processor channel before you can change its parameters.

NOTE:
2. The **busy-out** command overrules the data module Enable Link field.

NOTE:
3. On the C-LAN boards, low-level connectivity can remain intact when higher-level applications such as DCS are not functioning. For example, an external ping to a C-LAN’s ethernet port could be successful even when the board is busied-out. When debugging connectivity problems, pinging only checks low-level connectivity.

Configuration 5A: R8csi <—ppp—> R8r (one C-LAN) <—ethernet—> R8si

In this configuration, a DEFINITY ECS R8r acts as a gateway between two other nodes — one connected via ppp to an R8csi and the other via ethernet to another R8si.



Task Summary

The following tasks need to be completed for Switch 1, Switch 2, and Switch 3:

1. Review checklist
2. Switch 1 administration
    a. Assign node names
    b. Assign link (via a data module) to Switch 2
    c. Assign link (via a data module) to the LAN
    d. Assign processor channels
3. Switch 2 administration
    a. Enable bus bridge connectivity
    b. Assign node names
    c. Assign link (via a data module) to Switch 1
    d. Assign processor channels
    e. Assign IP Route

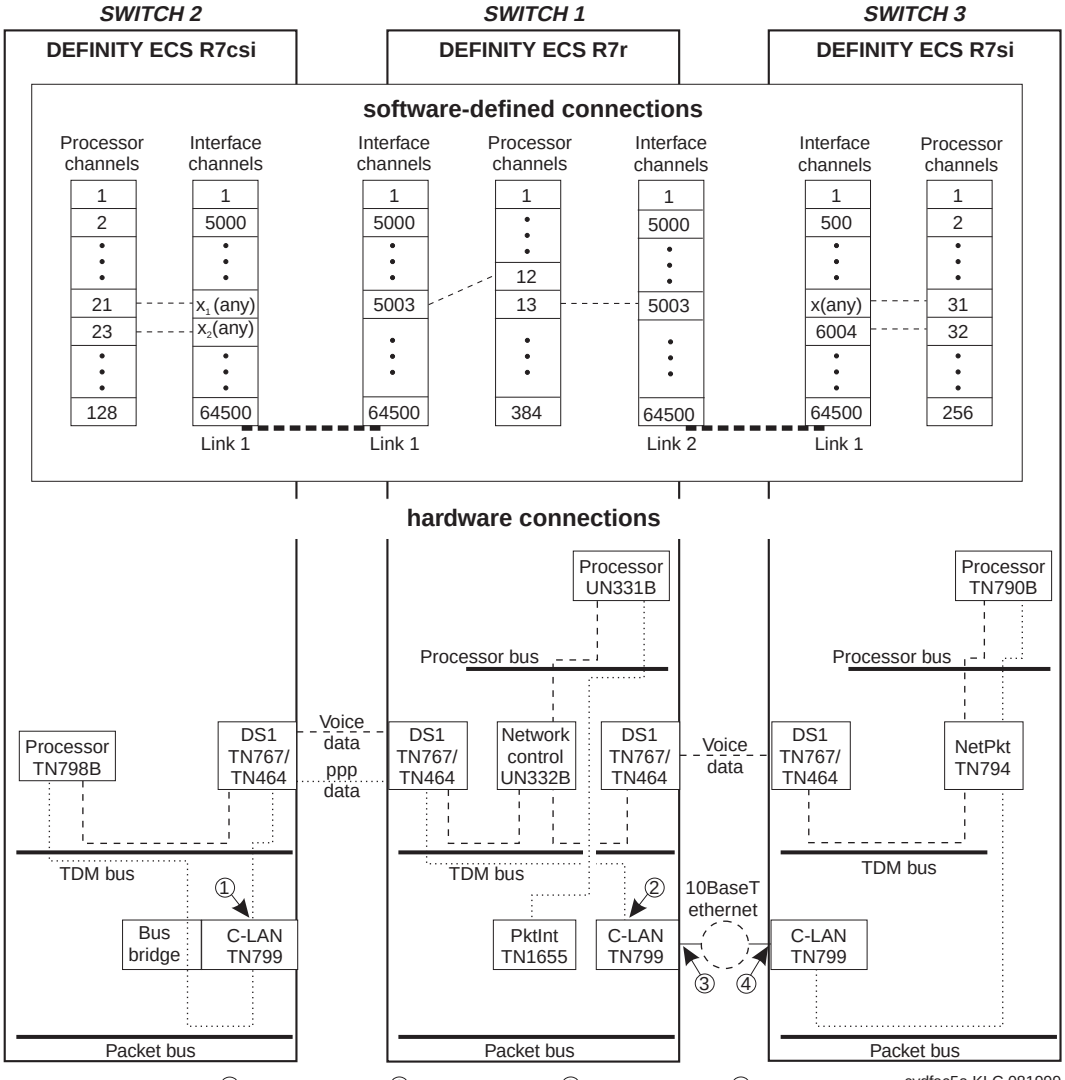
4. Switch 3 administration
    a. Assign node names
    b. Assign link (via a data module) to Switch 1
    c. Assign processor channels
5. Enable links and processor channels

Prerequisite Administration

There are some system administration tasks that need to be completed before you can proceed with the connectivity administration described in this section.

Review the checklist of prerequisite administration tasks in the Checklist for Prerequisite Administration (page 90), before proceeding with the connectivity administration in this section.

Configuration 5A



Switch 1 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 1. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on ***page 1***. Enter node names for switches, routers, and CMS starting on ***page 2***.

1. Type **change node-names ip** to open the Node Names screen.
2. Go to page 2

```
change node-names ip                                    Page 1 of 1
                              NODE NAMES

   Name                IP Address       Name                IP Address
default_____________  0__.0__.0__.0__   ________________    ___.___.___.___
node-1-ppp__________  192.168.10_.130    ________________    ___.___.___.___
node-1-eth__________  192.168.10_.128    ________________    ___.___.___.___
node-2______________  192.168.10_.12_    ________________    ___.___.___.___
node-3______________  192.168.10_.129    ________________    ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 4 nodes: ■ C-LAN PPP port on Switch 1 ■ C-LAN Ethernet port on Switch 1. ■ C-LAN PPP port on Switch 2 ■ C-LAN Ethernet port on Switch 3
IP Address	The unique IP addresses of the nodes named in the previous field.

4. Submit the screen

Switch 1 Task — Assign Link via ppp Data Module to Switch 2

This task administers a ppp data module on Switch 1 for the ppp connection to Switch 2. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module 2376** to open the Data Module screen.

```
add data-module 2376                                          Page 1 of x
                         DATA MODULE

    Data Extension: 2376            Name: _ppp on link 1 to node-2___  BCC: 2
              Type: ppp_____         COS: 1
              Port: 01c0815          COR: 1
              Link: 1_                TN: 1
       Enable Link? n

         Node Name: node-1-ppp___
       Subnet Mask: 255.255.255.0__


Establish Connection: y

DESTINATION
            Digits: 8993020_________
         Node Name: node-2__________
              CHAP? n
```

2. Enter values

Field	Conditions/Comments
Type	This indicates the data-module type for this connection.
Port	In this example, the C-LAN circuit pack is in slot 01c08; the ppp connection is through port 15.
Link	The link number must be in the range 1 – 33 (for R8r), not previously assigned on this switch.
Enable Link	If you need to add an IP route that uses this node as a gateway, this field must be set to **y** *before* adding the IP route. Otherwise leave this field set to **n** until the link administration is complete; that is, until after all data modules and the processor channels are assigned, then set to **y**.
Name	Information-only; appears in list generated by the “list data module” command.
BCC	Bearer Capability Class. This is a display-only field.
COS	The values for these fields will be specified by the system administrator.
COR	
TN	

Field	Conditions/Comments
Node Name	The node name for the interface defined by this data module. This must be a name entered on the Node Names screen.
Subnet Mask	
Establish Connection	**y** means that this switch will be responsible for call setup for this connection. Enter **n** when administering the data module for Switch 2.
Destination Digits	Trunk access code (899) plus extension of data module on node-2 (3020).
Destination Node Name	Name of the node at the far end of this connection. This must be a name entered on the Node Names screen.
CHAP	This field enables/disables the Challenge Handshake Authentication Protocol security mechanism on this link. If you enter **y**, the system will prompt for a CHAP secret (password).

(Sheet 2 of 2)

3. Submit the screen

Switch 1 Task — Assign IP Interfaces

The IP interface for each C-LAN board on the switch must be defined on the IP Interfaces screen. Each DEFINITY switch in an IP network has one IP Interfaces screen.

1. Type **change ip-interfaces** to open the IP Interfaces screen.

```
change ip-interfaces                                    Page   1 of   2

                                IP Interfaces

Enable                                                                  Net
Eth Pt Type   Slot  Code Sfx Node Name     Subnet Mask     Gateway Addr    Rgn
   y   C-LAN  01c08 TN799 B  node-1-eth    255.255.0  .0   ___.___.___.___  1
   n   _____  _____ _____ _  _____________ 255.255.255.0   ___ ___ ___ ___  _
   n   _____  _____ _____ _  _____________ 255.255.255.0   ___ ___ ___ ___  _
   n   _____  _____ _____ _  _____________ 255.255.255.0   ___ ___ ___ ___  _
```

2. Enter values

Field	Conditions/Comments
Enable Eth Pt	The Ethernet port must be enabled (**y**) before it can be used. The port must be disabled (**n**) before changes can be made to its attributes on this screen.
Type	Enter c-lan or medpro.
Slot	Enter the slot location for the circuit pack.
Code	Display only. This field is automatically populated with TN799 for C-LAN or TN802 or TN2302 for MedPro.
Sfx	Display only. This field is automatically populated.
Node name	Enter the unique node name for the IP interface. The node name here must already be administered on the Node Names screen
Subnet Mask	Enter the subnet mask associated with the IP address for this IP interface. (The IP address is associated with the node name on the Node Names screen). In this example, leave the default subnet mask, 255.255.255.0, which indicates no subnetting for a Class C IP address. See the discussion of subnetting, Subnetting (page 379), in IP Addressing and Configuration 1: R8r <—ppp—> R8si (page 98) in this chapter for details about subnet masks.
Gateway Addr	Leave blank for this configuration. The only IP connection to this IP interface is node-3 on Switch 3. Node-3 is on the same subnetwork as this IP interface, so no gateway is needed. In general, for connectivity to other (sub)networks, enter the address of a network node that will serve as the default gateway to the other (sub)networks.
Net Rgn	Enter the region number for this IP interface.

Switch 1 Task — Assign Link via ethernet Data Module to Ethernet

This task administers an ethernet data module for the ethernet connection to node 3. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module next** to open the Data Module screen.

```
add data-module next                                          Page 1 of X
                          DATA MODULE

    Data Extension: 2377            Name: ethernet on link 2          BCC: 2
               Type: ethernet
               Port: 01c0817
               Link: 2


Network uses 1's for broadcast addresses y
```

2. Enter values

Field	Conditions/Comments
Type	This indicates the data-module type for this connection.
Port	Ethernet connections must be assigned to port 17 on the C-LAN circuit pack.
Link	The link number must be in the range 1 – 33 (for R8r), not previously assigned on this switch.
Name	Information-only; appears in list generated by the "list data module" command.
Network uses 1's for broadcast addresses	Leave the default (**y**) if the private network contains only DEFINITY switches and adjuncts. Set to **n** only if the network includes non-DEFINITY switches that use the 0's method of forming broadcast addresses. See *DEFINITY ECS Administrator's Guide* for more information about this field.

3. Submit the screen

Switch 1 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on the Switch 1.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels              Page 1 of X

                            PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy      Interface    Destination      Session    Mach
Chan Enable  Appl.    To  Mode  Link/Chan    Node       Port  Local/Remote  ID
  1    n   _______       _     __  _____  _________  0____  ___   ___     __
  2:   n   _______       _     __  _____  _________  0____  ___   ___     __
  3:   n   _______       _     __  _____  _________  0____  ___   ___     __
  :
 12:   y   dcs____       s     1_  5003_  node-2___  0____  12_   21_     2_
 13:   y   dcs____       s     2_  5003_  node-3___  0____  13_   31_     3_
  :
384:   n   _______       _     __  _____  _________  0____  ___   ___     __
```

2. Enter values

Field	Conditions/Comments
Processor Channel 12: (ppp connection to Switch 2)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-1-ppp is the “server” for this session. Set node-2 to “client” (**c**).
Interface Link	This must match the link number assigned on the node-1a data module screen.
Interface Chan	or TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications; for example, if there are two Intuity AUDIX’s, use 5002 for both; or if there are four DEFINITY ECS’s, use 5003 for all four. The combination of Link, Interface Channel, and Mach ID must be unique. This number must match the Destination Port number on the Switch-2 Processor Channel screen.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.

Field	Conditions/Comments
Destination Port	A value of **0** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number for this connection on the Switch-2 Processor Channel screen must also be set to **0**.
Session - Local Session - Remote	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Mach ID	Destination switch ID identified on the dial plan of the destination switch.
Processor Channel 13: (ethernet connection to Switch 3)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-1-eth is the “server” for this session. Set node-3 to “client” (**c**).
Interface Link	This must match the link number assigned on the node-1b data module screen.
Interface Chan	For TCP/IP, interface channel numbers are in the range 5000 – 64500. The value 5003 is recommended for the DCS connections. This number must match the Destination Port number on the Switch-2 Processor Channel screen. (Note that **5003** can be used for the connections to both Switch 2 and 3 because they are on different links).
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.
Destination Port	A value of **0** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number on the Switch-3 Processor Channel screen must also be set to **0**.

Field	Conditions/Comments
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.

(Sheet 3 of 3)

3. Submit the screen

Switch 2 Task — Enable Bus Bridge Connectivity

This task enables the bus bridge functionality on the C-LAN circuit pack to provide a path between the packet bus and the processor.

NOTE:
Bus Bridge Connectivity is used on the csi model only. This task may have been complete when the C-LAN circuit pack was installed.

1. Type **change system-parameters maintenance** to open the Maintenance-Related System Parameters screen.
2. Go to page 2 and skip to the Packet Intf2 field near the bottom of the screen

```
change system-parameters maintenance                              Page   2 of   3

                   MAINTENANCE-RELATED SYSTEM PARAMETERS

MINIMUM MAINTENANCE THRESHOLDS ( Before Notification )
        TTRs: 4        CPTRs: 1        Call Classifier Ports: 0
        MMIs: 0          VCs: 0

TERMINATING TRUNK TRANSMISSION TEST ( Extension )
   Test Type 100:          Test Type 102:          Test Type 105:

ISDN MAINTENANCE
   ISDN-PRI Test Call Extension:         ISDN-BRI Service SPID:

DS1 MAINTENANCE
   DS0 Loop-Around Test Call Extension:


SPE OPTIONAL BOARDS
                     Packet Intf1? y     Packet Intf2? y
         Bus Bridge: 01a04__Inter-Board Link Timeslots  Pt0: 6 Pt1: 1 Pt2: 1
```

3. Enter values

Field	Conditions/Comments
Packet Intf2	Enables the bus bridge.
Bus Bridge	Location of the C-LAN circuit pack. If the system has two C-LANs, only one is administered for bus bridge.
Inter-Board Link Timeslots Pt0, Pt1, Pt2	Specifies the bandwidth used on the 3 ports of the Inter-Board Link. The total number of timeslots assigned cannot exceed 11. Pt0 carries PPP traffic and can have 1–9 timeslots. Pt1 carries maintenance messages and can have 1–3 timeslots. Pt2 carries broadcast messages and can have 1–3 timeslots.

4. Submit the screen

Switch 2 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 2. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on ***page 1***. Enter node names for switches, routers, and CMS starting on ***page 2***.

1. Type **change node-names ip** to open the Node Names screen.
2. Go to page 2.

```
change node-names ip                                    Page 1 of 1
                              NODE NAMES

   Name              IP Address          Name              IP Address
default_________  0__.0__.0__.0__   _________________   ___.___.___.___
node-1-ppp______  192.168.10_.130   _________________   ___.___.___.___
node-2 _________  192.168.10_.12_   _________________   ___.___.___.___
node-3__________  192.168.10_.129   _________________   ___.___.___.___
_________________ ___.___.___.___   _________________   ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 3 nodes: ■ C-LAN PPP port on Switch 2 ■ C-LAN PPP port on Switch 1. ■ C-LAN Ethernet port on Switch 3
IP Address	The unique IP addresses of the nodes named in the previous field.

4. Submit the screen.

Switch 2 Task — Assign Link via ppp Data Module to Switch 1

This task administers a ppp data module on Switch 2 for the ppp connection to Switch 1. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module 3020** to open the Data Module screen.

```
add data-module 3020                                          Page 1 of x

                              DATA MODULE

    Data Extension: 3020            Name: _ppp on link 1 to node-1-ppp__   BCC: 2
              Type: ppp____          COS: 1
              Port: 01a0413          COR: 1
              Link: 1_                TN: 1
       Enable Link? n

         Node Name: node-2_______
       Subnet Mask: 255.255.255.0__


Establish Connection: n

DESTINATION
             Digits: _________________
         Node Name: node-1-ppp_____
              CHAP? n
```

2. Enter values.

Field	Conditions/Comments
Type	This indicates the data-module type for this connection.
Port	In this example, the C-LAN circuit pack is in slot 01a04; the ppp connection is through port 13.
Link	The link number must be in the range 1 – 25 (for R8csi), not previously assigned on this switch
Enable Link	If you need to add an IP route that uses this node as a gateway, this field must be set to **y** *before* adding the IP route. Otherwise leave this field set to **n** until the link administration is complete; that is, until after all data modules and the processor channels are assigned, then set to **y**.
Name	Information-only; appears in list generated by the “list data module” command.
BCC	Bearer Capability Class. This is a display-only field.
COS	The values for these fields will be specified by the system administrator.
COR	
TN	
Node Name	The node name for the interface defined by this data module. This must be a name
Establish Connection	**n** means that the switch at the remote end of this connection (Switch 1 in this case) will be responsible for the call setup. Enter **y** when administering the data module for Switch 1.
Destination Digits	Not needed if the “Establish Connection” field is set to **n**
Destination Node Name	Name of the node at the far end of this connection. This must be a name entered on the Node Names screen.
CHAP	This field enables/disables the Challenge Handshake Authentication Protocol security mechanism on this link. If you enter **y**, the system will prompt for a CHAP secret (password).

3. Submit the screen.

Switch 2 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on the Switch 2.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels                  Page 1 of X

                    PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy         Interface      Destination      Session    Mach
Chan Enable  Appl.    To  Mode   Link/Chan        Node            Port  Local/Remote  ID
  1:    n   _______       _     __  _____  _______________        0     ___    ___    __
  2:    n   _______       _     __  _____  _______________        0     ___    ___    __
  3:    n   _______       _     __  _____  _______________        0     ___    ___    __
  4:    n   _______       _     __  _____  _______________        0     ___    ___    __
  :
 21:    y   dcs____       c     1   0      node-1-ppp_____        5003  21     12     1
 23:    y   dcs____       c     1   0      node-3_________        5003  23     32     3
  :
 64:    n   _______       _     __  _____  _______________        0     ___    ___    __
```

2. Enter values.

Field	Conditions/Comments
For Processor Channel 21: (ppp connection to Switch 1)	
Enable	Set to **y** after the link administration is complete.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-2 is the “client” for this session. Set node-1-ppp on Switch 1 to “server” (**s**).
Interface Link	This must match the link number assigned on the node-2 data module screen.
Interface Chan	A value of **0** allows any available interface channel to be used for this connection. The Destination Port number on the Switch-1 Processor Channel screen must also be set to **0**.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.
Destination Port	This number must match the Interface Channel number assigned on the Switch-1 Processor Channel screen

(Sheet 1 of 2)

Field	Conditions/Comments
Session - Local Session - Remote	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Mach ID	Destination switch ID identified on the dial plan of the destination switch.
For Processor Channel 23: (connection to Switch 3 through Switch 1)	
Enable	Set to **y** after the link administration is complete.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-2 is the “client” for this session. Set node-3 to “server” (**s**).
Interface Link	This must match the link number assigned on the node-2 data module screen.
Interface Chan	A value of **0** allows any available interface channel to be used for this connection. The Destination Port number on the Switch-1 Processor Channel screen must also be set to **0**.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.
Destination Port	This number must match the Interface Channel number assigned on the Switch-1 Processor Channel screen
Session - Local Session - Remote	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Mach ID	Destination switch ID identified on the dial plan of the destination switch.

(Sheet 2 of 2)

3. Submit the screen.

Switch 2 Task — Assign IP Route to node-3

This task specifies an initial route for messages handled by node-2 that are destined for node-3. An IP route is required for this route because there are intermediate nodes between node-2 and node-3.

1. Enable the ppp link on the node-2 data module screen:

   ch da 3020, set Enable Link? to **y**.

2. Type **add ip-route next** to open the IP Routing screen.

```
add ip-route next                                Page   1 of   1
                          IP ROUTING


    Route Number: 1
 Destination Node: node-3
          Gateway: node-1-ppp
     C-LAN Board: 1a04
          Metric: 0
```

   [The system assigns the route number 1.]

3. > Enter values.

Field	Conditions/Comments
Destination Node	The name of the node at the destination of this route.
Gateway	Node name of the gateway by which the destination node is reached for this route.
C-LAN Board	The location of the C-LAN circuit pack that provides the interface for this route.
Metric	Enter **0**. See *DEFINITY ECS Administrator's Guide*for more information on the use of the Metric field.

4. Submit the screen.

Switch 3 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 3. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on page 1. Enter node names for switches, routers, and CMS starting on page 2.

1. Type **change node-names ip** to open the Node Names screen.
2. Go to page 2.

```
change node-names ip                                    Page 1 of 1

                              NODE NAMES

   Name                IP Address          Name                IP Address
default_____________  0__.0__.0__.0__     ________________    ___.___.___.___
node-1-eth__________  192.168.10_.128      ________________    ___.___.___.___
node-2______________  192.168.10_.12_      ________________    ___.___.___.___
node-3______________  192.168.10_.129      ________________    ___.___.___.___
____________________  ___.___.___.___     ________________    ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 3 nodes: ■ C-LAN Ethernet port on Switch 3 ■ C-LAN Ethernet port on Switch 1. ■ C-LAN PPP port on Switch 2
IP Address	The unique IP addresses of the nodes named in the previous field.

4. Submit the screen.

Switch 3 Task — Assign IP Interfaces

The IP interface for each C-LAN board on the switch must be defined on the IP Interfaces screen. Each DEFINITY switch in an IP network has one IP Interfaces screen.

1. Type **change ip-interfaces** to open the IP Interfaces screen.

```
change ip-interfaces                                    Page   1 of   2

                                IP Interfaces

Enable                                                                  Net
Eth Pt Type   Slot  Code Sfx Node Name     Subnet Mask     Gateway Addr    Rgn
   y   C-LAN  01a05 TN799 B  node-3        255.255.255.0    192.168.10 .128 . 1
   n                                      255.255.255.0
   n                                      255.255.255.0
   n                                      255.255.255.0
```

2. Enter values.

Field	Conditions/Comments
Enable Eth Pt	The Ethernet port must be enabled (**y**) before it can be used. The port must be disabled (**n**) before changes can be made to its attributes on this screen.
Type	Enter c-lan or medpro.
Slot	Enter the slot location for the circuit pack.
Code	Display only. This field is automatically populated with TN799 for C-LAN or TN802 or TN2302 for MedPro.
Sfx	Display only. This field is automatically populated.
Node name	Enter the unique node name for the IP interface. The node name here must already be administered on the Node Names screen

(Sheet 1 of 2)

Field	Conditions/Comments
Subnet Mask	Enter the subnet mask associated with the IP address for this IP interface. (The IP address is associated with the node name on the Node Names screen). In this example, leave the default subnet mask, 255.255.255.0, which indicates no subnetting for a Class C IP address. See the discussion of subnetting, Subnetting (page 379), in IP Addressing and Configuration 1: R8r <—ppp—> R8si (page 98) in this chapter for details about subnet masks.
Gateway Addr	Leave blank for this configuration. The only connection to this IP interface is node-1 on Switch 1. Node-1 is on the same subnetwork as this IP interface, so no gateway is needed. In general, for connectivity to other (sub)networks, enter the address of a network node that will serve as the default gateway to the other (sub)networks.
Net Rgn	Enter the region number for this IP interface.

(Sheet 2 of 2)

3. Submit the screen.

Switch 3 Task — Assign Link via ethernet Data Module to the LAN

This task administers an ethernet data module on Switch 3 for the ethernet connection. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module next** to open the Data Module screen.

```
add data-module next                                        Page 1 of X
                            DATA MODULE

Data Extension: 3901          Name: ethernet on link 1              BCC: 2
              Type: ethernet
              Port: 01a0517
              Link: 1


Network uses 1's for broadcast addresses? y
```

2. Enter values.

Field	Conditions/Comments
Type	This indicates the data-module type for this link.
Port	Ethernet connections must be assigned to port 17 on the C-LAN circuit pack.
Link	The link number must be in the range 1 – 25, not previously assigned on this switch.
Name	Information-only; appears in “list data module” list.
Network uses 1’s for broadcast addresses	Leave the default (**y**) if the private network contains only DEFINITY switches and adjuncts. Set to **n** only if the network includes non-DEFINITY switches that use the 0’s method of forming broadcast addresses. See *DEFINITY ECS Administrator’s Guide* for more information about this field.

3. Submit the screen.

Switch 3 Task — Assign Processor Channels

This task associates data links with processor channels on Switch 3.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels                Page 1 of X

                    PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy          Interface    Destination       Session    Mach
Chan Enable  Appl.   To  Mode   Link/Chan   Node         Port   Local/Remote  ID
  1:   n     _______       _     __  _____  _________    0____  ___   ___     __
  2:   n     _______       _     __  _____  _________    0____  ___   ___     __
 :
 31:   y     dcs____       c     1_  0____  node-1-eth   5003_  31_   13__    1_
 32:   y     dcs____       s     1_  5003_  node-2___    0____  32_   23__    2_
 64:   n     _______       _     __  _____  _________    0____  ___   ___     __
```

2. Enter values.

Field	Conditions/Comments
Processor Channel 31: (ethernet connection to Switch 1)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-3 is the “client” for this session. Set node-1-eth to “server” (**s**).

Field	Conditions/Comments
Interface Link	This must match the link number assigned on the node-3 data module screen.
Interface Chan	A value of **0** allows any available interface channel to be used for this connection. The Destination Port number on the Switch-1 Processor Channel screen must also be set to **0**.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.
Destination Port	This number must match the Interface Channel number assigned on the Switch-1 Processor Channel screen.
Session - Local	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.
For Processor Channel 32: (connection to Switch 2 through Switch 1)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-3 is the “server.” Set node-2 to “client” (**c**).
Interface Link	This must match the link number assigned on the node-3 data module screen.
Interface Chan	This must match the Destination Port number on the Switch-1 Processor Channels screen.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.
Destination Port	or TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications. The combination of Link, Interface Channel, and Mach ID must be unique. This number must match the Destination Port number on the Switch-2 Processor Channel screen.

Field	Conditions/Comments
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.

(Sheet 3 of 3)

3. Submit the screen.

Enable links and processor channels

You must enable links and processor channels before the connections can be used.

To enable a link, open its data module screen (**ch da** [**ext**]) and set the Enable Link field to **y**.

NOTE:
To view a list of assigned data modules and their extensions, enter the "list data-module" command (**l da**).

To enable the processor channels, open the processor channel screen (**ch com p**) and set the Enable field to **y** for each assigned processor channel.

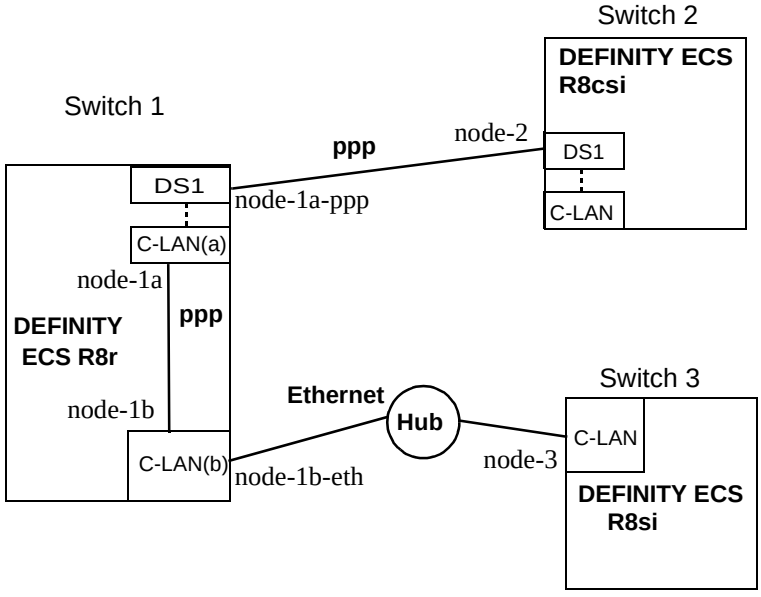
NOTE:
1. You must disable a link or processor channel before you can change its parameters.

NOTE:
2. The **busy-out** command overrules the data module Enable Link field.

NOTE:
3. On the C-LAN boards, low-level connectivity can remain intact when higher-level applications such as DCS are not functioning. For example, an external ping to a C-LAN's ethernet port could be successful even when the board is busied-out. When debugging connectivity problems, pinging only checks low-level connectivity.

Configuration 5B: R8csi <—ppp—> R8r (2 C-LANs) <—ethernet—> R8si

In this configuration, a DEFINITY ECS R8r acts as a gateway between two other nodes — one connected via ppp to an R8csi and the other via ethernet to another R8si. This configuration is the same as configuration 5A except that Switch 1 has two C-LAN circuit packs instead of one. One C-LAN handles the ppp connection and the other handles the ethernet connection.



Task Summary

The following tasks need to be completed for Switch 1, Switch 2, and Switch 3:

1. Review checklist
2. Switch 1 administration
    a. Assign node names
    b. Assign link to (via a data module) to node-2
    c. Assign link to (via a data module) to the LAN
    d. Assign link (via a data module) from C-LAN(a) to C-LAN(b)
    e. Assign link (via a data module) from C-LAN(b) to C-LAN(a)
    f. Assign processor channels
    g. Assign IP Route: C-LAN(a) to node-3
    h. Assign IP Route: C-LAN(b) to node-2

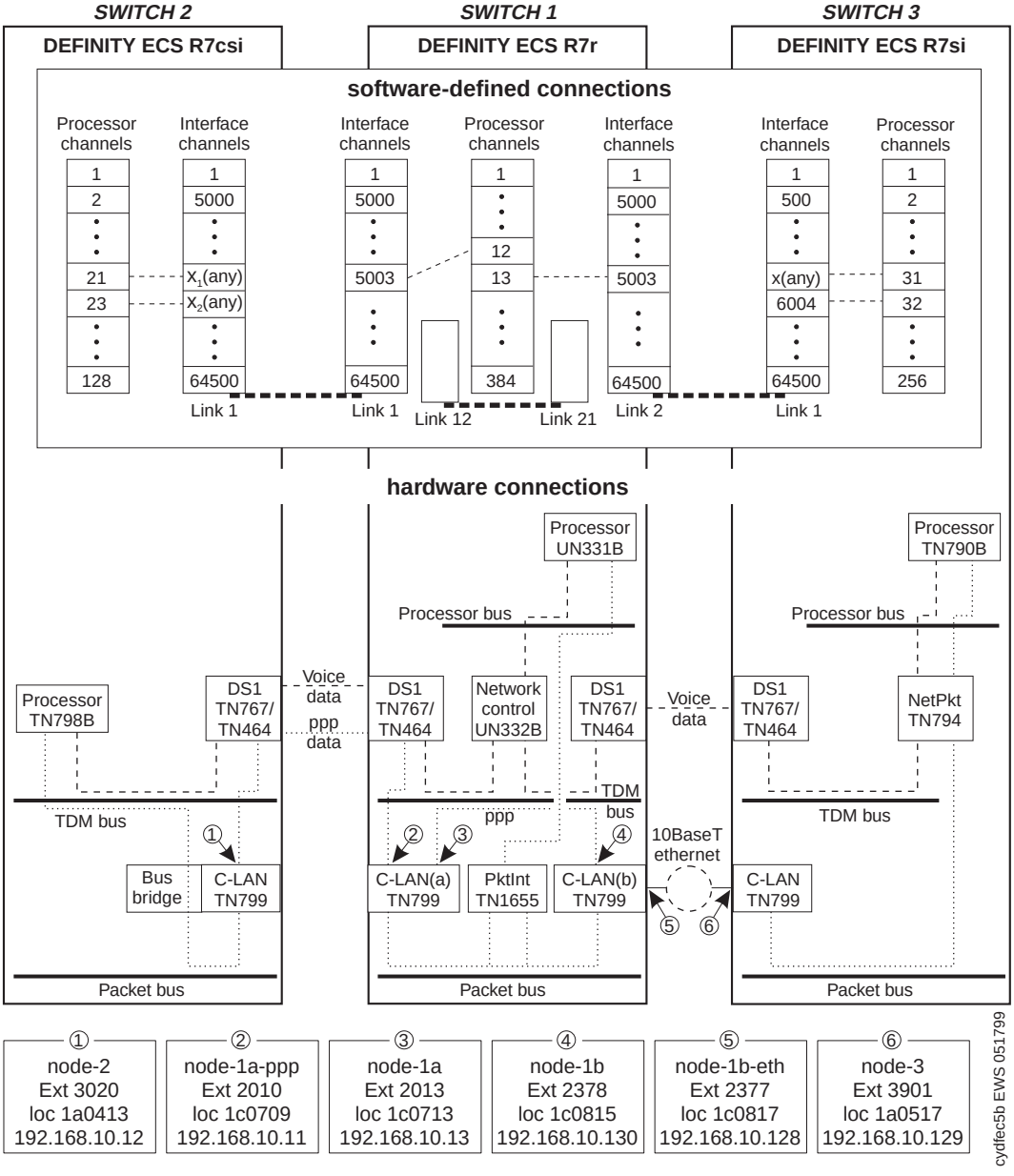
3. Switch 2 administration
    a. Enable bus bridge connectivity
    b. Assign node names
    c. Assign link (via a data module) to node-1a-ppp
    d. Assign processor channels
    e. Assign IP Route to node-3
4. Switch 3 administration
    a. Assign node names
    b. Assign link (via a data module) to the LAN
    c. Assign processor channels
5. Enable links and processor channels

Prerequisite Administration

There are some system administration tasks that need to be completed before you can proceed with the connectivity administration described in this section.

Review the checklist of prerequisite administration tasks in the Checklist for Prerequisite Administration (page 90), before proceeding with the connectivity administration in this section.

Configuration 5B



Switch 1 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 1. A Node Names screen must be administered on each switch in the network.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on ***page 1***. Enter node names for switches, routers, and CMS starting on ***page 2***.

1. Type **change node-names ip** to open the Node Names screen.
2. Go to page 2.

```
change node-names ip                                        Page 1 of 1

                              NODE NAMES

Name                IP Address        Name                IP Address
default_________    0__.0__.0__.0__   _________________   ___.___.___.___
node-1a-ppp_____    192.168.10_.11    _________________   ___.___.___.___
node-1a_________    192.168.10_.13    _________________   ___.___.___.___
node-1b_________    192.168.10_.130   _________________   ___.___.___.___
node-1b-eth_____    192.168.10_.128   _________________   ___.___.___.___
node-2__________    192.168.10_.12_   _________________   ___.___.___.___
node-3__________    192.168.10_.129   _________________   ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 6 nodes: ■ C-LAN(a) PPP port on Switch 1 for the connection to Switch 2 ■ C-LAN(a) PPP port on Switch 1 for the connection to C-LAN(b) ■ C-LAN(b) PPP port on Switch 1 for the connection to C-LAN(a) ■ C-LAN(b) Ethernet port on Switch 1 ■ C-LAN PPP port on Switch 2. ■ C-LAN Ethernet port on Switch 3
IP Address	The unique IP addresses of the nodes named in the previous field.

4. Submit the screen.

Switch 1 Task — Assign Link via ppp Data Module to Switch 2

This task administers a ppp data module on Switch 1 for the ppp connection to Switch 2. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module 2010** to open the Data Module screen.

```
add data-module 2010                                          Page 1 of x

                          DATA MODULE

    Data Extension: 2010            Name: _ppp on link 1 to node 2___  BCC: 2
              Type: ppp_____         COS: 1
              Port: 01c0709          COR: 1
              Link: 1_                TN: 1
       Enable Link? n

         Node Name: node-1a-ppp___
       Subnet Mask: 255.255.255.0__


Establish Connection: y

DESTINATION
             Digits: 8993020_________
          Node Name: node-2__________
               CHAP? n
```

2. Enter values.

Field	Conditions/Comments
Type	This indicates the data-module type for this link.
Port	In this example, the C-LAN(a) circuit pack is in slot 01c07; the ppp connection is through port 09.
Link	The link number must be in the range 1 – 33 (for R8r), not previously assigned on this switch.
Enable Link	If you need to add an IP route that uses this node as a gateway, this field must be set to **y** *before* adding the IP route. Otherwise leave this field set to **n** until the link administration is complete; that is, until after all data modules and the processor channels are assigned, then set to **y**.
Name	Information-only; appears in list generated by the “list data module” command.
BCC	Bearer Capability Class. This is a display-only field.

(Sheet 1 of 2)

Field	Conditions/Comments
COS	The values for these fields will be specified by the system administrator.
COR	
TN	
Node Name	The node name for the interface defined by this data module. This must be a name entered on the Node Names screen.
Establish Connection	**y** means that this switch will be responsible for the call setup. Enter **n** when administering the data module for Switch 2.
Destination Digits	Trunk access code (899) plus extension of data module on node-2 (3020).
Destination Node Name	Name of the node at the far end of this connection. Must be a name entered on the Node Names screen
CHAP	This field enables/disables the Challenge Handshake Authentication Protocol security mechanism on this link. If you enter **y**, the system will prompt for a CHAP secret (password).

(Sheet 2 of 2)

3. Submit the screen.

Switch 1 Task — Assign IP Interfaces

The IP interface for each C-LAN board on the switch must be defined on the IP Interfaces screen. Each DEFINITY switch in an IP network has one IP Interfaces screen.

1. Type **change ip-interfaces** to open the IP Interfaces screen.

```
change ip-interfaces                                    Page   1 of   2

                                IP Interfaces

Enable                                                                  Net
Eth Pt Type   Slot  Code Sfx Node Name     Subnet Mask     Gateway Addr    Rgn
  y    C-LAN  01c08 TN799 B  node-1b-eth   255.255.255.0   ___.___.___.___  1
  n    ______ ______ _____ _ _____________ 255.255.255.0   ___ ___ ___ ___ _
  n    ______ ______ _____ _ _____________ 255.255.255.0   ___ ___ ___ ___ _
  n    ______ ______ _____ _ _____________ 255.255.255.0   ___ ___ ___ ___ _
```

2. Enter values.

Field	Conditions/Comments
Enable Eth Pt	The Ethernet port must be enabled (**y**) before it can be used. The port must be disabled (**n**) before changes can be made to its attributes on this screen.
Type	Enter c-lan or medpro.
Slot	Enter the slot location for the circuit pack.
Code	Display only. This field is automatically populated with TN799 for C-LAN or TN802 or TN2302 for MedPro.
Sfx	Display only. This field is automatically populated.
Node name	Enter the unique node name for the IP interface. The node name here must already be administered on the Node Names screen
Subnet Mask	Enter the subnet mask associated with the IP address for this IP interface. (The IP address is associated with the node name on the Node Names screen). In this example, leave the default subnet mask, 255.255.255.0, which indicates no subnetting for a Class C IP address. See the discussion of subnetting, Subnetting (page 379), in IP Addressing and Configuration 1: R8r <—ppp—> R8si (page 98) in this chapter for details about subnet masks.
Gateway Addr	Leave blank for this configuration. The only connection to this IP interface is node-3 on Switch 3, which is on the same subnetwork as this IP interface, so no gateway is needed. In general, for connectivity to other (sub)networks, enter the address of a network node that will serve as the default gateway to the other (sub)networks.
Net Rgn	Enter the region number for this IP interface.

3. Submit the screen.

Switch 1 Task — Assign Link via ethernet Data Module to the LAN

This task administers an ethernet data module on Switch 1 for the ethernet connection. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module next** to open the Data Module screen.

```
add data-module next                                          Page 1 of X

                          DATA MODULE

    Data Extension: 2377            Name: ethernet on link 2          BCC: 2
              Type: ethernet
              Port: 01c0817
              Link: 2


Network uses 1's for broadcast addresses? y
```

2. Enter values.

Field	Conditions/Comments
Type	This indicates the data-module type for this connection.
Port	Ethernet connections must be assigned to port 17 on the C-LAN(b) circuit pack.
Link	The link number must be in the range 1 – 33 (for R8r), not previously assigned on this switch.
Name	Information-only; appears in list generated by the "list data module" command.
Network uses 1's for broadcast addresses	Leave the default (**y**) if the private network contains only DEFINITY switches and adjuncts. Set to **n** only if the network includes non-DEFINITY switches that use the 0's method of forming broadcast addresses. See *DEFINITY ECS Administrator's Guide*for more information about this field.

3. Submit the screen.

Switch 1 Task — Assign Link via ppp Data Module to C-LAN(a)

This task administers a ppp data module on Switch 1 for the ppp connection from the C-LAN(b) circuit pack to the C-LAN(a) circuit pack.

1. **>** Type **add data-module 2378** to open the Data Module screen.

```
add data-module 2378                                          Page 1 of x

                                  DATA MODULE

    Data Extension: 2378              Name: _ppp on link 21 to clan(a)_ BCC: 2
              Type: ppp_____           COS: 1
              Port: 01c0815            COR: 1
              Link: 21                  TN: 1
       Enable Link? n

         Node Name: node-1b_______
       Subnet Mask: 255.255.255.0__


Establish Connection: n

DESTINATION
            Digits: _______________
         Node Name: node-1a_______
              CHAP n
```

2. Enter values.

Field	Conditions/Comments
Type	This indicates the data-module type for this link.
Port	In this example, the C-LAN(b) circuit pack is in slot 01c08; the ppp connection is through port 15.
Link	The link number must be in the range 1 – 33 (for R8r), not previously assigned on this switch
Enable Link	If you need to add an IP route that uses this node as a gateway, this field must be set to **y** *before* adding the IP route. Otherwise leave this field set to **n** until the link administration is complete; that is, until after all data modules and the processor channels are assigned, then set to **y**.
Name	Information-only; appears in list generated by the “list data module” command.
BCC	Bearer Capability Class. This is a display-only field.
COS	The values for these fields will be specified by the system administrator.
COR	
TN	

Field	Conditions/Comments
Node Name	The node name for the interface defined by this data module. This must be a name entered on the Node Names screen.
Subnet Mask	
Establish Connection	**n** means that the node at the remote end of this connection (node-1b in this case) will be responsible for the call setup. Enter **y** when administering the data module for node-1b.
Destination Digits	Not needed if the “Establish Connection” field is set to **n**
Destination Node Name	Name of the node at the far end of this connection. Must be a name entered on the Node Names screen.
CHAP	This field enables/disables the Challenge Handshake Authentication Protocol security mechanism on this link. If you enter **y**, the system will prompt for a CHAP secret (password).

(Sheet 2 of 2)

3. Submit the screen.

Switch 1 Task — Assign Link via ppp Data Module to C-LAN(b)

This task administers a ppp data module on Switch 1 for the ppp connection from the C-LAN(a) circuit pack to the C-LAN(b) circuit pack.

1. Type **add data-module 2013** to open the Data Module screen.

```
add data-module 2013                                          Page 1 of x

                          DATA MODULE

    Data Extension: 2013            Name: _ppp on link 12 to clan(b)__ BCC: 2
              Type: ppp_____          COS: 1
              Port: 01c0713           COR: 1
              Link: 12                 TN: 1
       Enable Link? n

         Node Name: node-1a_______
       Subnet Mask: 255.255.255.0__


Establish Connection: y

DESTINATION
            Digits: 2378___________
         Node Name: node-1b_____________
              CHAP? n
```

2. Enter values.

Field	Conditions/Comments
Type	This indicates the data-module type for this link.
Port	In this example, the C-LAN(a) circuit pack is in slot 01a07; the ppp connection is through port 13.
Link	The link number must be in the range 1 – 33 (for R8r), not previously assigned on this switch.
Enable Link	If you need to add an IP route that uses this node as a gateway, this field must be set to **y** *before* adding the IP route. Otherwise leave this field set to **n** until the link administration is complete; that is, until after all data modules and the processor channels are assigned, then set to **y**.
Name	Information-only; appears in list generated by the “list data module” command.
BCC	Bearer Capability Class. This is a display-only field.
COS	The values for these fields will be specified by the system administrator.
COR	
TN	
Node Name	The node name for the interface defined by this data module. This must be a name entered on the Node Names screen.
Subnet Mask	
Establish Connection	**y** means that this node is responsible for the call setup for the link to node-1c. Enter **n** when administering the data module for node-1c.
Destination Digits	Extension (2378) of data module on node-1c.
Destination Node Name	Name of the node at the far end of this connection. Must be a name entered on the Node Names screen.
CHAP	This field enables/disables the Challenge Handshake Authentication Protocol security mechanism on this link. If you enter **y**, the system will prompt for a CHAP secret (password).

3. Submit the screen.

Switch 1 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on Switch 1. Note that there are no processor channels or interface channels associated with the ppp connection between the two C-LAN circuit packs.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels              Page 1 of X

                            PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy       Interface    Destination      Session    Mach
Chan Enable  Appl.    To  Mode   Link/Chan    Node       Port  Local/Remote  ID
  1:    n   _______       _     __  _____   _________  0____  ___   ___     __
  2:    n   _______       _     __  _____   _________  0____  ___   ___     __
  3:    n   _______       _     __  _____   _________  0____  ___   ___     __
  :
 12:    y   dcs____       s     1   5003    node-2___  0____  12    21      2
 13:    y   dcs____       s     2   5003    node-3___  0____  13    31      3
  :
384:    n   _______       _     __  _____   _________  0____  ___   ___     __
```

2. Enter values.

Field	Conditions/Comments
Processor Channel 12: (ppp connection to Switch 2)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-1a is the “server” for this session. Set node-2 to “client” (**c**).
Interface Link	This must match the link number assigned on the node-1a data module screen.
Interface Chan	For TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications; for example, if there are two Intuity AUDIX’s, use 5002 for both; or if there are four DEFINITY ECS’s, use 5003 for all four. The combination of Link, Interface Channel, and Mach ID must be unique. This number must match the Destination Port number on the Switch-2 Processor Channel screen

Field	Conditions/Comments
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.
Destination Port	A value of **0** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number on the Switch-2 Processor Channel screen must also be set to **0**.
Session - Local Session - Remote	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Mach ID	Destination switch ID identified on the dial plan of the destination switch.
Processor Channel 13: (ethernet connection to Switch 3)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-1d is the “server” for this session. Set to node-3 to “client” (**c**).
Interface Link	This must match the link number assigned on the node -1d data module screen.
Interface Chan	or TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications. The combination of Link, Interface Channel, and Mach ID must be unique. This number must match the Destination Port number on the Switch-3 Processor Channel screen
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.

Field	Conditions/Comments
Destination Port	A value of **0** allows any available interface channel on the destination node to be used for this connection. The Interface Channel number on the Switch-3 Processor Channel screen must also be set to **0**.
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.

(Sheet 3 of 3)

3. > Submit the screen.

Switch 1 Task — Assign IP Route: C-LAN(a) to node-3

This task specifies a route for packets handled by C-LAN(a) destined for node-3. This route is needed because node-1a and node-3 are connected via ppp and there are intermediate nodes between them.

1. Enable the ppp link on the node-1a data module screen:

   ch da 2013, set Enable Link to **y**.

2. Type **add ip-route next** to open the IP Routing screen.

```
add ip-route next                              Page   1 of   1
                          IP ROUTING


    Route Number: 1
 Destination Node: node-3
         Gateway: node-1b
     C-LAN Board: 1c07
          Metric: 1
```

   [The system assigns the route number 1.]

3. Enter values.

Field	Conditions/Comments
Destination Node	The name of the node at the destination of this route.

Field	Conditions/Comments
Gateway	Node name of the gateway by which the destination node is reached for this route.
C-LAN Board	The location of the C-LAN circuit pack that provides the interface for this route.
Metric	Enter **1**, which indicates a complex route involving two C-LAN boards. See DEFINITY ECS Administrator's Guide for more information on the use of the Metric field.

4. Submit the screen.

Switch 1 Task — Assign IP Route: C-LAN(b) to node-2

This task specifies a route for packets handled by C-LAN(b) destined for node-2. This route is needed because node-1b and node-2 are connected via ppp and there are intermediate nodes between them.

1. Enable the ppp link on the node-1b data module screen:

   ch da 2378, set Enable Link to **y**.

2. Type **add ip-route next** to open the IP Routing screen.

```
add ip-route next                                Page   1 of   1
                          IP ROUTING


    Route Number: 3
 Destination Node: node-2____
         Gateway: node-1a_____
     C-LAN Board: 1c08
          Metric: 1
```

[The system assigns the route number 3.]

3. Enter values.

Field	Conditions/Comments
Destination Node	The name of the node at the destination of this route.
Gateway	Node name of the gateway by which the destination node is reached for this route.
C-LAN Board	The location of the C-LAN circuit pack that provides the interface for this route.
Metric	Enter **1**, which indicates a complex route involving two C-LAN boards. See DEFINITY ECS Administrator's Guide for more information on the use of the Metric field.

4. Submit the screen.

Switch 2 Task — Enable Bus Bridge Connectivity

This task enables the bus bridge functionality on the C-LAN circuit pack to provide a path between the packet bus and the processor.

NOTE:
Bus Bridge Connectivity is used on the csi model only. This task may have been complete when the C-LAN circuit pack was installed.

1. Type **change system-parameters maintenance** to open the Maintenance-Related System Parameters screen.

2. Go to page 2 and skip to the Packet Intf2 field near the bottom of the screen.

```
change system-parameters maintenance                              Page   2 of   3

                    MAINTENANCE-RELATED SYSTEM PARAMETERS

MINIMUM MAINTENANCE THRESHOLDS ( Before Notification )
        TTRs: 4        CPTRs: 1        Call Classifier Ports: 0
        MMIs: 0          VCs: 0

TERMINATING TRUNK TRANSMISSION TEST ( Extension )
   Test Type 100:          Test Type 102:          Test Type 105:

ISDN MAINTENANCE
   ISDN-PRI Test Call Extension:         ISDN-BRI Service SPID:

DS1 MAINTENANCE
   DS0 Loop-Around Test Call Extension:


SPE OPTIONAL BOARDS
                     Packet Intf1? y     Packet Intf2? y
         Bus Bridge: 01a04__Inter-Board Link Timeslots  Pt0: 6 Pt1: 1 Pt2: 1
```

3. Enter values.

Field	Conditions/Comments
Packet Intf2	Enables the bus bridge.
Bus Bridge	Location of the C-LAN circuit pack. If the system has two C-LANs, only one is administered for bus bridge.
Inter-Board Link Timeslots Pt0, Pt1, Pt2	Specifies the bandwidth used on the 3 ports of the Inter-Board Link. The total number of timeslots assigned cannot exceed 11. Pt0 carries PPP traffic and can have 1–9 timeslots. Pt1 carries maintenance messages and can have 1–3 timeslots. Pt2 carries broadcast messages and can have 1–3 timeslots.

4. Submit the screen.

Switch 2 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 2. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on ***page 1***. Enter node names for switches, routers, and CMS starting on ***page 2***.

1. Type **change node-names ip** to open the Node Names screen.
2. Go to page 2.

```
change node-names ip                                    Page 1 of 1

                              NODE NAMES

   Name                IP Address          Name                IP Address
default_____________  0__.0__.0__.0__     ________________    ___.___.___.___
node-1a-ppp_________  192.168.10_.11_     ________________    ___.___.___.___
node-2 _____________  192.168.10_.12_     ________________    ___.___.___.___
node-3_____________   192.168.10_.129     ________________    ___.___.___.___
___________________   ___.___.___.___     ________________    ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 3 nodes: ■ C-LAN(a) PPP port on Switch 1 for the connection to Switch 2 ■ C-LAN PPP port on Switch 2 ■ C-LAN Ethernet port on Switch 3
IP Address	The unique IP addresses of the nodes named in the previous field.

4. Submit the screen.

Switch 2 Task — Assign Link via ppp Data Module to Switch 1

This task administers a ppp data module on Switch 2 for the ppp connection to Switch 1. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module 3020** to open the Data Module screen.

```
add data-module 3020                                          Page 1 of x

                                DATA MODULE

    Data Extension: 3020            Name: _ppp on link 1 to node-1a-ppp BCC: 2
              Type: ppp____          COS: 1
              Port: 01a0413          COR: 1
              Link: 1_                TN: 1
       Enable Link? n

         Node Name: node-2_________
       Subnet Mask: 255.255.255.0__

Establish Connection: n

DESTINATION
             Digits: ________________
          Node Name: node-1a-ppp______
               CHAP? n
```

2. Enter values.

Field	Conditions/Comments
Type	This indicates the data-module type for this connection.
Port	In this example, the C-LAN circuit pack is in slot 01a04; the ppp connection is through port 13.
Link	The link number must be in the range 1 – 25 (for R8csi), not previously assigned on this switch
Enable Link	If you need to add an IP route that uses this node as a gateway, this field must be set to **y** *before* adding the IP route. Otherwise leave this field set to **n** until the link administration is complete; that is, until after all data modules and the processor channels are assigned, then set to **y**.
Name	Information-only; appears in list generated by the “list data module” command.
BCC	Bearer Capability Class. This is a display-only field.
COS	The values for these fields will be specified by the system administrator.
COR	
TN	

(Sheet 1 of 2)

Field	Conditions/Comments
Node Name	The node name for the interface defined by this data module. This must be a name entered on the Node Names screen.
Subnet Mask	
Establish Connection	**n** means that the switch at the remote end of this connection (Switch 1 in this case) will be responsible for the call setup. Enter **y** when administering the data module for Switch 1.
Destination Digits	Not needed if the “Establish Connection” field is set to **n**
Destination Node Name	Name of the node at the far end of this connection. This must be a name entered on the Node Names screen.
CHAP	This field enables/disables the Challenge Handshake Authentication Protocol security mechanism on this link. If you enter **y**, the system will prompt for a CHAP secret (password).

(Sheet 2 of 2)

3. Submit the screen.

Switch 2 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on Switch 1.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels                  Page 1 of X

                    PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy         Interface      Destination      Session    Mach
Chan Enable  Appl.    To  Mode   Link/Chan       Node        Port  Local/Remote  ID
  1:    n   _______      _    __  _____  _____________  0____  ___   ___     __
  2:    n   _______      _    __  _____  _____________  0____  ___   ___     __
  3:    n   _______      _    __  _____  _____________  0____  ___   ___     __
  4:    n   _______      _    __  _____  _____________  0____  ___   ___     __
  :
 21:    y   dcs____      c    1   0____  node-1a-ppp__  5003   21    12      1
 23:    y   dcs____      c    1   0____  node-3_______  5003   23    32      3
  :
 64:    n   _______      _    __  _____  _____________  0____  ___   ___     __
```

2. Enter values.

Field	Conditions/Comments
For Processor Channel 21: (ppp connection to Switch 1)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-2 is the “client” for this session. Set node-1a to “server” (**s**).
Interface Link	Must match the link number assigned on the node-2 data module screen.
Interface Chan	A value of **0** allows any available interface channel to be used for this connection. The Destination Port number on the Switch-1 Processor Channel screen must also be set to **0**.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen. For ppp connections, it must match the Destination Node Name entered on the ppp Data Module screen.
Destination Port	This number must match the Interface Channel number assigned on the Switch-1 Processor Channel screen.
Session - Local Session - Remote	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers. It is allowed, but not recommended, to use the same Session numbers for two or more connections.
Mach ID	Destination switch ID identified on the dial plan of the destination switch.
For Processor Channel 23: (connection to Switch 3 through Switch 1)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-2 is the “client” for this session. Set node-3 to “server” (**s**).
Interface Link	This must match the link number assigned on the node-2 data module screen.

Field	Conditions/Comments
Interface Chan	A value of **0** allows any available interface channel to be used for this connection. The Destination Port number on the Switch-3 Processor Channel screen must also be set to **0**.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.
Destination Port	This number must match the Interface Channel number assigned on the Switch-3 Processor Channel screen.
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.

(Sheet 2 of 2)

3. Submit the screen.

Switch 2 Task — Assign IP Route to node-3

This task specifies a route for packets handled by node-2 that are destined for node-3. An IP route is required for this route because there are intermediate nodes between node-2 and node-3.

1. Enable the ppp link on the node-2 data module screen:

   ch da 3020, set Enable Link? to **y**.

2. Type **add ip-route next** to open the IP Routing screen.

```
add ip-route next                                Page   1 of   1
                          IP ROUTING


    Route Number: 4
 Destination Node: node-3____
         Gateway: node-1a-ppp___
     C-LAN Board: 1a04
          Metric: 0
```

[The system assigns the route number 4.]

3. Enter values.

Field	Conditions/Comments
Destination Node	The name of the node at the destination of this route.
Gateway	Node name of the gateway by which the destination node is reached for this route.
C-LAN Board	The location of the C-LAN circuit pack that provides the interface for this route. For simple routes, the gateway node is on this circuit pack.
Metric	Enter **0**. See DEFINITY ECS Administrator's Guide for more information on the use of the Metric field.

4. Submit the screen.

Switch 3 Task — Assign Node Names

This task assigns node names and IP addresses to each node in the network. This screen is administered on Switch 3. A Node Names screen must be administered on each switch in the network.

The node names and IP addresses in any network should be assigned in a logical and consistent manner from the point of view of the whole network. These names and addresses should be assigned in the planning stages of the network and should be available from the customer system administrator or from an Avaya representative.

NOTE:
Enter node names for Intuity AUDIX and MSA adjuncts on ***page 1***. Enter node names for switches, routers, and CMS starting on ***page 2***.

1. Type **change node-names ip** to open the Node Names screen.
2. Go to page 2.

```
change node-names ip                                    Page 1 of 1

                                NODE NAMES

   Name              IP Address          Name              IP Address
default_________  0__.0__.0__.0__    _________________   ___.___.___.___
node-1b-eth_____  192.168.10_.128    _________________   ___.___.___.___
node-2__________  192.168.10_.12_    _________________   ___.___.___.___
node-3__________  192.168.10_.129    _________________   ___.___.___.___
_________________ ___.___.___.___    _________________   ___.___.___.___
```

3. Enter values.

Field	Conditions/Comments
Name	Enter unique node names for the following 3 nodes: ■ C-LAN(b) Ethernet port on Switch 1 ■ C-LAN PPP port on Switch 2 ■ C-LAN Ethernet port on Switch 3
IP Address	The unique IP addresses of the nodes named in the previous field.

4. Submit the screen.

Switch 3 Task — Assign IP Interfaces

The IP interface for each C-LAN board on the switch must be defined on the IP Interfaces screen. Each DEFINITY switch in an IP network has one IP Interfaces screen.

1. Type **change ip-interfaces** to open the IP Interfaces screen.

```
change ip-interfaces                                    Page   1 of   2

                                IP Interfaces

Enable                                                                  Net
Eth Pt Type   Slot  Code Sfx Node Name     Subnet Mask     Gateway Addr    Rgn
   y   C-LAN  01a05 TN799 B  node-3        255.255.255.0    192.168.1  .128 1
   n   _____  _____ _____ _  _____________ 255.255.255.0    ___ ___ ___ ___ _
   n   _____  _____ _____ _  _____________ 255.255.255.0    ___ ___ ___ ___ _
   n   _____  _____ _____ _  _____________ 255.255.255.0    ___ ___ ___ ___ _
```

2. Enter values.

Field	Conditions/Comments
Enable Eth Pt	The Ethernet port must be enabled (**y**) before it can be used. The port must be disabled (**n**) before changes can be made to its attributes on this screen.
Type	Enter c-lan or medpro.
Slot	Enter the slot location for the circuit pack.
Code	Display only. This field is automatically populated with TN799 for C-LAN or TN802 or TN2302 for MedPro.
Sfx	Display only. This field is automatically populated.
Node name	Enter the unique node name for the IP interface. The node name here must already be administered on the Node Names screen

(Sheet 1 of 2)

Field	Conditions/Comments
Subnet Mask	Enter the subnet mask associated with the IP address for this IP interface. (The IP address is associated with the node name on the Node Names screen). In this example, leave the default subnet mask, 255.255.255.0, which indicates no subnetting for a Class C IP address. See the discussion of subnetting, Subnetting (page 379), in IP Addressing and Configuration 1: R8r <—ppp—> R8si (page 98) in this chapter for details about subnet masks.
Gateway Addr	Leave blank for this configuration. The only connection to this IP interface is node-1b on Switch 1, which is on the same subnetwork as this IP interface, so no gateway is needed. In general, for connectivity to other (sub)networks, enter the address of a network node that will serve as the default gateway to the other (sub)networks.
Net Rgn	Enter the region number for this IP interface.

(Sheet 2 of 2)

3. Submit the screen.

Switch 3 Task — Assign Link via ethernet Data Module to the LAN

This task administers an ethernet data module on Switch 3 for the ethernet connection to Switch 1. The data module associates a link number with a port address, extension number, and node name for the C-LAN port used for this connection.

1. Type **add data-module next** to open the Data Module screen.

```
add data-module next                                          Page 1 of X

                                DATA MODULE

    Data Extension: 3901          Name: ethernet on link 1          BCC: 2
              Type: ethernet
              Port: 01a0517
              Link: 1


Network uses 1's for broadcast addresses? y
```

2. Enter values.

Field	Conditions/Comments
Type	This indicates the data-module type for this connection.
Port	Ethernet connections must be assigned to port 17 on the C-LAN circuit pack.
Link	The link number must be in the range 1 – 25 (for R8si), not previously assigned on this switch.
Name	Information-only; appears in list generated by the list data module command.
Network uses 1's for broadcast addresses	Leave the default (**y**) if the private network contains only DEFINITY switches and adjuncts. Set to **n** only if the network includes non-DEFINITY switches that use the 0's method of forming broadcast addresses. See DEFINITY ECS Administrator's Guide for more information about this field.

3. Submit the screen.

Switch 3 Task — Assign Processor Channels

This task associates data links (hardware) with processor channels (software) on Switch 3.

1. Type **change communications-interface processor-channels** to open the Processor Channel Assignment screen.

```
change communications-interface processor-channels                Page 1 of X

                    PROCESSOR CHANNEL ASSIGNMENT

Proc                  Gtwy          Interface     Destination       Session     Mach
Chan Enable  Appl.    To  Mode  Link/Chan   Node         Port   Local/Remote   ID
  1:   n     _______        _     __  _____  ___________  0____  ___    ___     __
  2:   n     _______        _     __  _____  ___________  0____  ___    ___     __
  3:   n     _______        _     __  _____  ___________  0____  ___    ___     __
  4:   n     _______        _     __  _____  ___________  0____  ___    ___     __
  :
 31:   y     dcs____        c     1   0____  node-1b-eth  5003_  31_    13__    1_
 32:   y     dcs____        s     1   5003_  node-2_____  0____  32_    23__    2_
  :
 64:   n     _______        _     __  _____  ___________  0____  ___    ___     __
```

2. Enter values.

Field	Conditions/Comments
Processor Channel 31: (ethernet connection to Switch 1)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.

Field	Conditions/Comments
Mode	Node-3 is the client for this session. Set node-1 to server (**s**).
Interface Link	This must match the link number assigned on the node-3 data module screen.
Interface Chan	A value of **0** allows any available interface channel to be used for this connection. The Destination Port number on the Switch-1 Processor Channel screen must also be set to **0**.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.
Destination Port	This number must match the Interface Channel number assigned on the Switch-1 Processor Channel screen.
Session - Local	The Local and Remote Session numbers can be any value between 1 and 256 (si model) or 384 (r model), but they must be consistent between endpoints. For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa. It is allowed, and sometimes convenient, to use the same number for the Local and Remote Session numbers.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.
For Processor Channel 32: (connection to Switch 2 through Switch 1)	
Enable	Set to **y**.
Appl.	Set to **dcs** for DCS signaling.
Mode	Node-3 is the server. Set node-2 to client (**c**).
Interface Link	This must match the link number assigned on the node-3 data module screen.
Interface Chan	For TCP/IP, interface channel numbers are in the range 5000 – 64500. This number must match the Destination Port number on the Switch-3 Processor Channel screen.
Destination Node	Name of the far-end node for this channel. This must be a name entered on the Node Names screen.
Destination Port	For TCP/IP, interface channel numbers are in the range 5000 – 64500. The recommended values are: 5001 for CMS, 5002 for Intuity AUDIX, and 5003 for DCS connections that are not gateways. These three values should be reused for multiple instances of these applications. The combination of Link, Interface Channel, and Mach ID must be unique. This number must match the Destination Port number on the Switch-2 Processor Channel screen.

Field	Conditions/Comments
Session - Local	For each connection, the Local Session number on this switch must equal the Remote Session number on the remote switch and vice versa.
Session - Remote	
Mach ID	Destination switch ID identified on the dial plan of the destination switch.

(Sheet 3 of 3)

3. Submit the screen.

Enable links and processor channels

You must enable links and processor channels before the connections can be used.

To enable a link, open its data module screen (**ch da** [**ext**]) and set the Enable Link field to **y**.

NOTE:
To view a list of assigned data modules and their extensions, enter the “list data-module” command (**l da**).

To enable the processor channels, open the processor channel screen (**ch com p**) and set the Enable field to **y** for each assigned processor channel.

NOTE:
1. You must disable a link or processor channel before you can change its parameters.

NOTE:
2. The **busy-out** command overrules the data module Enable Link field.

NOTE:
3. On the C-LAN boards, low-level connectivity can remain intact when higher-level applications such as DCS are not functioning. For example, an external ping to a C-LAN’s ethernet port could be successful even when the board is busied-out. When debugging connectivity problems, pinging only checks low-level connectivity.

A Complex Networking Example

This chapter provides an example of a complex network. It describes procedures for administering trunk groups, dial plans, signaling groups, and data links for a four-switch network with an Intuity AUDIX and a CMS.

The network example is unchanged from the example in Issue 1 (for R7) of this book. The screens have been updated for R8.

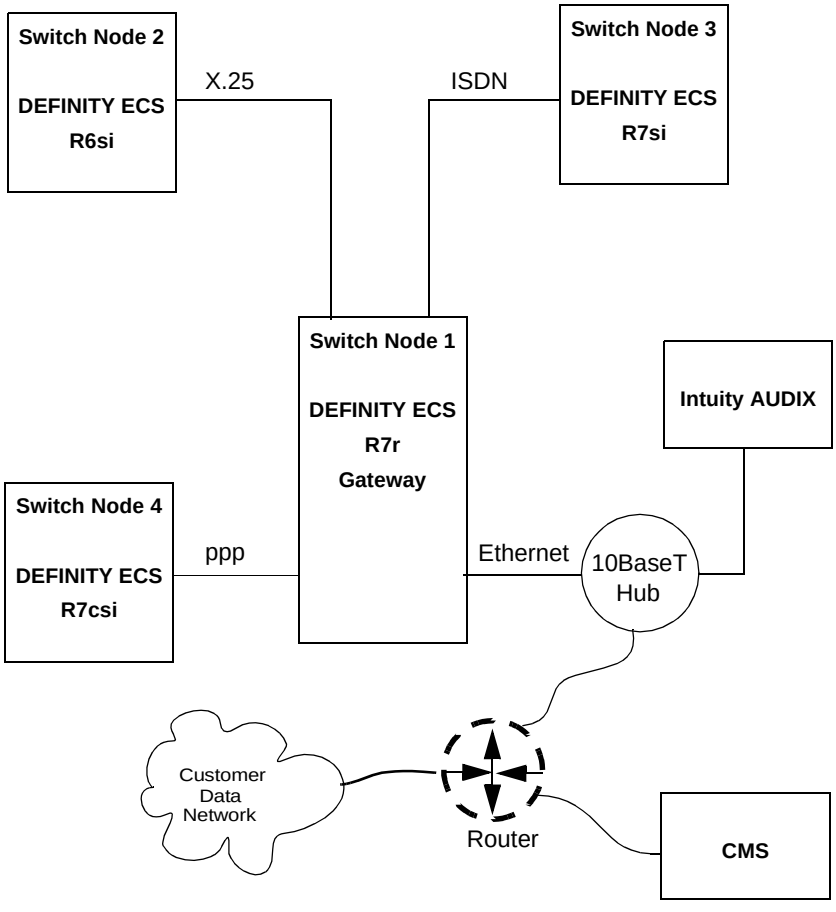
Overview

This section shows a high-level diagram of the example network and lists the administration tasks that need to be completed for each node to set up the network.

NOTE:
The term node defines a network interface such as a port on the C-LAN board. A “DCS node” is referred to as a “Switch Node.” Thus, a Switch Node (a switch) can have many nodes (network interfaces). The Dial Plan and AAR Digit Analysis Table screens have fields that use node to refer to a switch.

Network Diagram

The following diagram shows a high-level view of the example network.



Task Summary

The following matrix summarizes the administration tasks required to set up this network.

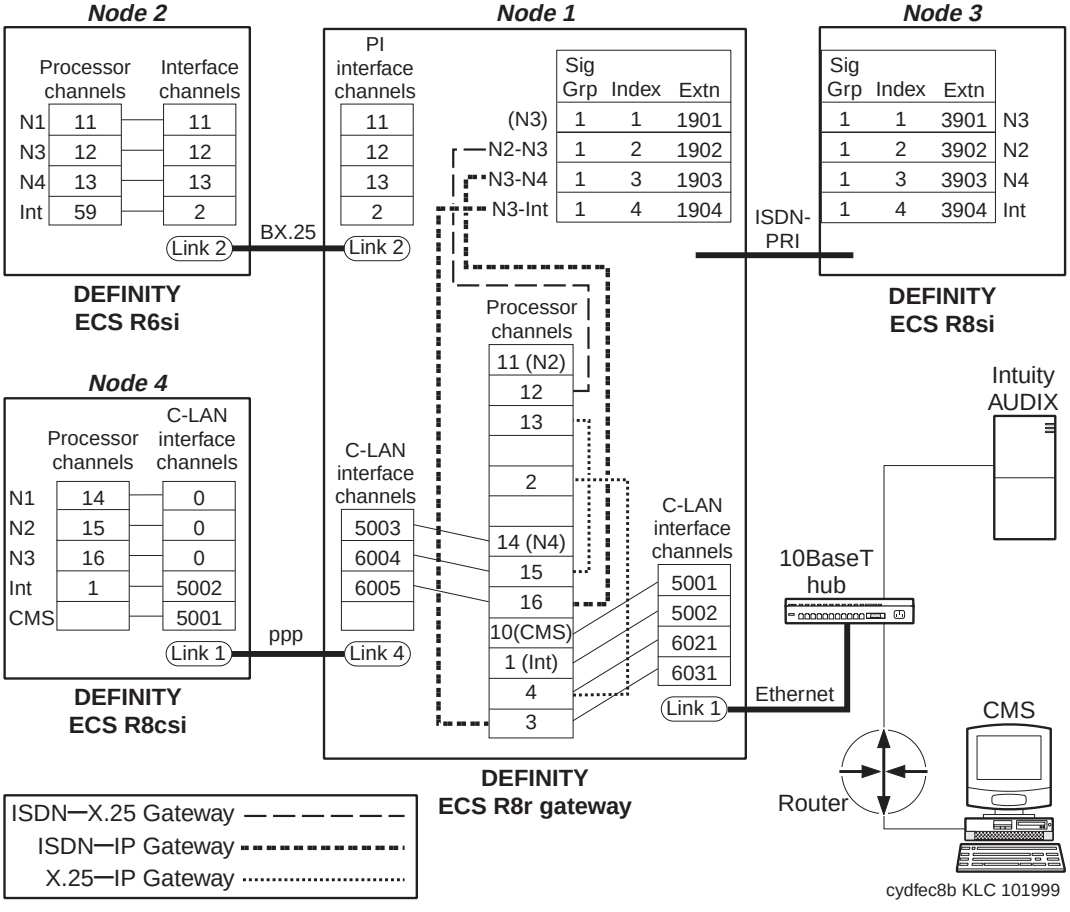
Administration Task	Switch Node 1 R7r	Switch Node 2 R6si	Switch Node 3 R7csi	Switch Node 4 R7si	CMS	Intuity AUDIX
DS1 Circuit Pack	X	X	X	X		
Synchronization Plan	X	X	X	X		
Trunk Groups	X	X	X	X		
Dial Plan	X	X	X	X		
Uniform Dialing Plan	X	X	X	X		

Continued on next page

Administration Task	Switch Node 1 R7r	Switch Node 2 R6si	Switch Node 3 R7csi	Switch Node 4 R7si	CMS	Intuity AUDIX
AAR Digit Analysis	X	X	X	X		
Signaling Group	X		X			
Hunt Group		X	X	X		
ISDN TSC Gateway Channel Assignment	X					
Interface Links		X				
Node Names	X			X	X	X
IP Route	X			X	X	X
Data Modules	X	X	X	X		
Processor Channel Assignments	X	X	X	X	X	X
Routing Patterns	X	X	X	X		
Bus Bridge			X			
Intuity Translations for DCS Audix						X
CMS Server Translations					X	

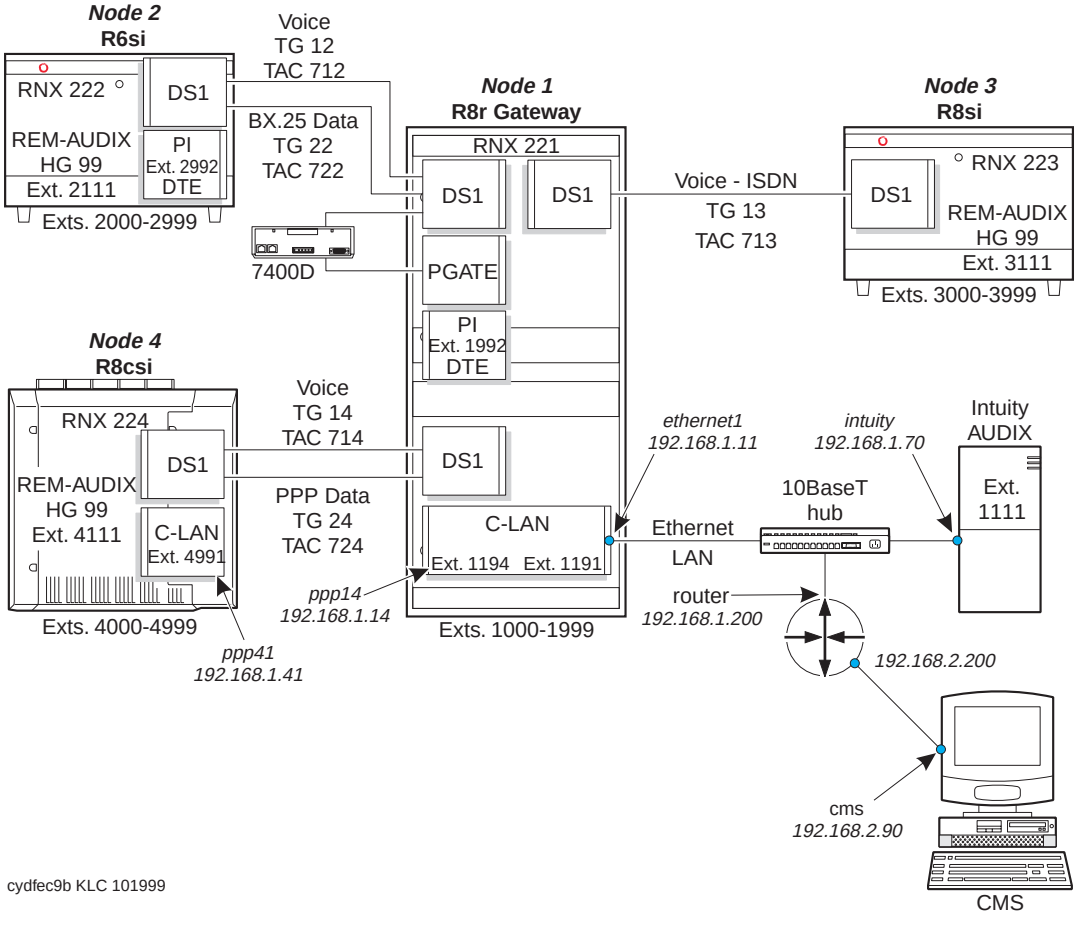
Link/Channel/TSC Map

The link/channel/TSC map shows the link, processor channel, and temporary signaling connection numbers, and the connection types for each Switch Node in the network.



Network Map

The network map shows the RNX, trunk group, hunt group numbers, data module type, and extension for each Switch Node in the network. For TCP/IP connections, the node name and IP address is shown for each node.



cydfec9b KLC 101999

Switch-Node 1 Administration

This section displays the screens for the administration of Switch Node 1.

DS1 Circuit Packs

Connection to Switch Node 2

```
add ds1 1c19                                                Page   1 of   2
                              DS1 CIRCUIT PACK

           Location: 01c19                          Name: Switch 1 to Switch 2
           Bit Rate: 1.544                   Line Coding: b8zs
   Line Compensation: 1                     Framing Mode: esf
      Signaling Mode: common-chan



Interface Companding: mulaw
           Idle Code: 11111111
             DMI-BOS? n




      Slip Detection? n                Near-end CSU Type: other
```

Connection to Switch Node 3

```
add ds1 1c18                                                Page   1 of   2
                              DS1 CIRCUIT PACK

           Location: 01c18                          Name: Switch 1 to Switch 3
           Bit Rate: 1.544                   Line Coding: b8zs
   Line Compensation: 1                     Framing Mode: esf
      Signaling Mode: isdn-pri
             Connect: pbx                          Interface: network
                                        Country Protocol: 1
                                        Protocol Version: a
Interface Companding: mulaw                          CRC? n
           Idle Code: 11111111
                              DCP/Analog Bearer Capability: 3.1kHz



      Slip Detection? n                Near-end CSU Type: other
```

Connection to Switch Node 4

```
add ds1 1c17                                                  Page   1 of   2
                              DS1 CIRCUIT PACK

           Location: 01C17                          Name: Switch 1 to Switch 4
           Bit Rate: 1.544                   Line Coding: b8zs
   Line Compensation: 1                     Framing Mode: esf
      Signaling Mode: robbed bit



Interface Companding: mulaw
           Idle Code: 11111111
             DMI-BOS? n




      Slip Detection? n                 Near-end CSU Type: other
```

Dial Plan

```
display dialplan
                              DIAL PLAN RECORD

                                                  Local Node Number: 1
                                                    ETA Node Number:
       Uniform Dialing Plan: 4-digit             ETA Routing Pattern:
  UDP Extension Search Order: local-extensions-first
FIRST DIGIT TABLE
First                                  Length
Digit  - 1 -       - 2 -       - 3 -       - 4 -       - 5 -       - 6 -
  1:                                     extension
  2:                                     extension
  3:                                     extension
  4:                                     extension
  5:
  6:
  7:                           dac
  8: fac
  9: fac
  0: attd
  *:                           dac
  #:                           dac
```

Signaling Group

Page 1

```
add signaling-group next                                        Page 1 of 5
                         SIGNALING GROUP
Group Number: 1              Group Type:
                    Associated Signaling? y          Max number of NCA TSC: 5_
                       Primary D-Channel: 01c1824     Max number of CA TSC: 23
                                                   Trunk Group for NCA TSC: 13
       Trunk Group for Channel Selection: ___
          Supplementary Service Protocol: a__
```

Page 2 – Administered NCA TSC Assignment

```
add signaling-group next                                        Page 2 of 5
                       ADMINISTERED NCA TSC ASSIGNMENT

Service/Feature: __________          As-needed Inactivity Time-out (min): __

 TSC   Local                                                  Adj.      Mach.
Index   Ext.  Enabled Established   Dest. Digits    Appl.     Name       ID
  1:   1901_     y     permanent    3901_________   dcs____   _______    3_
  2:   1902_     y     permanent    3902_________   gateway   _______    __
  3:   1903_     y     permanent    3903_________   gateway   _______    __
  4:   1904_     y     permanent    3904_________   gateway   _______    __
  5:
  :
 16:
```

Synchronization Plan

```
change synchronization                                          Page 1 of X
                              SYNCHRONIZATION PLAN
                    SYNCHRONIZATION SOURCE (circuit pack location)
                          Stratum: 4
                     Port Network: 1
                          Primary: 01c20      Secondary: ___

       Location   Name       Slip   Type     Location   Name          Slip  Type
       01c17 DCS Node 4_____  n    UDS1-BD  _____  _________________   _     ___
       01c18 DCS Node 3____   n    TBRI-BD  _____  _________________   _     ___
       01c19 DCS Node 2_____  n             _____  _________________   _     ___
       01c20 AT&T _____ _____ y             _____  _________________   _     ___
       _____ _____________    _             _____  _________________   _     ___
       _____ _____________    _             _____  _________________   _     ___
       _____ _____________    _             _____  _________________   _     ___
       _____ _____________    _             _____  _________________   _     ___
NOTE: TN722B & TN464B DS1 sources result in stratum 4, type II synchronization
```

Trunk Groups

Group 12 (tie to Switch Node 2) — page 1

```
add trunk-group 12                                          Page   1 of  10
                              TRUNK GROUP

Group Number: 12                    Group Type: tie           CDR Reports: y
  Group Name: Switch 1 to Switch 2 tg12  COR: 1       TN: 1       TAC: 712
   Direction: two-way       Outgoing Display? n    Trunk Signaling Type:
 Dial Access? y               Busy Threshold: 99         Night Service:
Queue Length: 0                                    Incoming Destination:
   Comm Type: avd                   Auth Code? n
                                  Trunk Flash? n
        BCC: 0
TRUNK PARAMETERS
   Trunk Type (in/out): wink/wink        Incoming Rotary Timeout(sec): 5
    Outgoing Dial Type: tone                      Incoming Dial Type: tone
      Wink Timer(msec): 300                  Disconnect Timing(msec): 500
       Digit Treatment:                                        Digits:
                                                    Sig Bit Inversion: none
     Connected to Toll? n      STT Loss: normal       DTT to DCO Loss: normal
    Incoming Dial Tone? y
             Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? n
 Answer Supervision Timeout: 0             Receive Answer Supervision? y
```

Group 12 — Page 2

```
add trunk-group 12                                          Page   2 of  10
TRUNK FEATURES
          ACA Assignment? n            Measured: none
                                Internal Alert? n        Maintenance Tests? y
                              Data Restriction? n
                                Glare Handling: none
            Used for DCS? y   PBX ID: 2
   Suppress # Outpulsing? n
                    Seize When Maintenance Busy: neither-end




Incoming Tone (DTMF) ANI: no                  Per Call CPN Blocking Code:
         Connected to CO? n                 Per Call CPN Unblocking Code:
```

Group 12 — member assignments

```
add trunk-group 12                                          Page 3 of x
                              TRUNK GROUP
                                     Administered Members (min/max):   1/3
GROUP MEMBER ASSIGNMENTS                 Total Administered Members:   3

       Port    Code Sfx Name        Night           Mode      Type   Ans Delay
  1: 01c1901  TN767  F                                                    20
  2: 01c1902  TN767  F                                                    20
  3: 01c1903  TN767  F                                                    20
  4:
  5:
```

Group 22 (data to Switch Node 2)— page1

```
add trunk-group 22                                          Page   1 of  10
                              TRUNK GROUP

Group Number: 22                    Group Type: tie           CDR Reports: y
  Group Name: DCS data to node 2 - TG22   COR: 1        TN: 1        TAC: 722
   Direction: two-way       Outgoing Display? n    Trunk Signaling Type:
 Dial Access? y                 Busy Threshold: 99          Night Service:
Queue Length: 0                                     Incoming Destination:
   Comm Type: data                   Auth Code? n
                                  Trunk Flash? n
         BCC: 0
TRUNK PARAMETERS
   Trunk Type (in/out): wink/wink        Incoming Rotary Timeout(sec): 5
    Outgoing Dial Type: tone                      Incoming Dial Type: tone
      Wink Timer(msec): 300                 Disconnect Timing(msec): 500
       Digit Treatment:                                       Digits:
                                                   Sig Bit Inversion: none
     Connected to Toll? n      STT Loss: normal       DTT to DCO Loss: normal
    Incoming Dial Tone? y
              Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? n
 Answer Supervision Timeout: 0             Receive Answer Supervision? y
```

Group 22 — Page 2

```
add trunk-group 22                                          Page   2 of  10
TRUNK FEATURES
          ACA Assignment? n            Measured: none
                                Internal Alert? n        Maintenance Tests? y
                               Data Restriction? n
                                 Glare Handling: none
            Used for DCS? n
   Suppress # Outpulsing? n
                  Seize When Maintenance Busy: neither-end




Incoming Tone (DTMF) ANI: no                  Per Call CPN Blocking Code:
         Connected to CO? n                 Per Call CPN Unblocking Code:
```

Group 22 — Group member assignments

```
add trunk-group 22                                          Page 4 of x
                              TRUNK GROUP
                                   Administered Members (min/max):   1/3
GROUP MEMBER ASSIGNMENTS               Total Administered Members:   3

       Port    Code Sfx Name        Night           Mode      Type   Ans Delay
  1: 01c1923  TN767  F                                                   20
  2:
  3:
  4:
  5:
  6:
  7:
  8:
  9:
 10:
```

Group 13 (ISDN-PRI to Switch Node 3) — page 1

```
add trunk-group 13                                          Page   1 of  10
                              TRUNK GROUP

Group Number: 13                    Group Type: isdn          CDR Reports: y
  Group Name: ISDN TG 13 to Switch 3     COR: 1        TN: 1        TAC: 713
   Direction: two-way        Outgoing Display? n                   ATM? _
 Dial Access? n                 Busy Threshold: 99          Night Service: _____
Queue Length: 0
Service Type: tie                    Auth Code? n            TestCall ITC: rest
                         Far End Test Line No:
TestCall BCC: 4
TRUNK PARAMETERS
         Codeset to Send Display: 6     Codeset to Send TCM,Lookahead: 6
        Max Message Size to Send: 260   Charge Advice: none
  Supplementary Service Protocol: a     Digit Handling (in/out): enbloc/enbloc

             Trunk Hunt: cyclical
      Connected to Toll? n      STT Loss: normal       DTT to DCO Loss: normal
Calling Number - Delete:          Insert:             Numbering Format:
               Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? n
 Answer Supervision Timeout: 0
```

Group 13 — page 2

```
add trunk-group 13                                          Page   2 of  10
                              TRUNK FEATURES
          ACA Assignment? n            Measured: none      Wideband Support? n
                                Internal Alert? n        Maintenance Tests? y
                               Data Restriction? n     NCA-TSC Trunk Member: 1
                                    Send Name: n      Send Calling Number: n
            Used for DCS? y   PBX ID: 3
              Suppress # Outpulsing? n                        DCS Signaling: d-chan
 Outgoing Channel ID Encoding: preferred        UUI IE Treatment: service-provider


                                                  Send Connected Number: n


               Send UCID? n
 Send Codeset 6/7 LAI IE? y
```

Group 13 — member assignments

```
add trunk-group 13                                          Page   4 of  10
                              TRUNK GROUP
                                   Administered Members (min/max):   0/0
GROUP MEMBER ASSIGNMENTS               Total Administered Members:   0

       Port    Code Sfx Name        Night           Sig Grp
  1: 01c1801  TN464  E                                1
  2: 01c1802  TN464  E                                1
  3: 01c1803  TN464  E                                1
  4: 01c1804  TN464  E                                1
  5:
  6:
  7
```

Group 14 (tie to Switch Node 4) — page 1

```
add trunk-group 14                                          Page   1 of  10
                              TRUNK GROUP

Group Number: 14                    Group Type: tie           CDR Reports: y
  Group Name: Switch 1 to Switch 4 tg14   COR: 1        TN: 1        TAC: 714
   Direction: two-way       Outgoing Display? n    Trunk Signaling Type:
 Dial Access? y                 Busy Threshold: 99          Night Service:
Queue Length: 0                                     Incoming Destination:
   Comm Type: voice                  Auth Code? n
                                   Trunk Flash? n
         BCC: 0
TRUNK PARAMETERS
   Trunk Type (in/out): wink/wink        Incoming Rotary Timeout(sec): 5
    Outgoing Dial Type: tone                      Incoming Dial Type: tone
      Wink Timer(msec): 300                  Disconnect Timing(msec): 500
       Digit Treatment:                                       Digits:
                                                  Sig Bit Inversion: none
     Connected to Toll? n      STT Loss: normal       DTT to DCO Loss: normal
    Incoming Dial Tone? y
              Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? n
 Answer Supervision Timeout: 0             Receive Answer Supervision? y
```

Group 14 — Page 2

```
add trunk-group 14                                          Page   2 of  10
TRUNK FEATURES
          ACA Assignment? n            Measured: none
                                Internal Alert? n        Maintenance Tests? y
                               Data Restriction? n
                                 Glare Handling: none
            Used for DCS? y   PBX ID: 4
   Suppress # Outpulsing? n
                    Seize When Maintenance Busy: neither-end




Incoming Tone (DTMF) ANI: no                  Per Call CPN Blocking Code:
         Connected to CO? n                 Per Call CPN Unblocking Code:
```

Group 14 — member assignments

```
                               TRUNK GROUP
                                    Administered Members (min/max):   1/3
GROUP MEMBER ASSIGNMENTS                Total Administered Members:   3

       Port    Code Sfx Name        Night           Mode      Type   Ans Delay
  1: 01c1701 TN767  F                                                    20
  2: 01c1702 TN767  F                                                    20
  4: 01c1703 TN767  F                                                    20
  5:
  6:
  7:
  8:
  9:
 10:
```

Group 24 (data to Switch Node 4) — page1

```
add trunk-group 24                                          Page   1 of  10
                              TRUNK GROUP

Group Number: 24                    Group Type: tie           CDR Reports: y
  Group Name: DCS data to node 4-TG24     COR: 1        TN: 1        TAC: 724
   Direction: two-way        Outgoing Display? n    Trunk Signaling Type:
 Dial Access? y                Busy Threshold: 99          Night Service:
Queue Length: 0                                       Incoming Destination:
   Comm Type: rbavd                   Auth Code? n
                                  Trunk Flash? n
         BCC: 0
TRUNK PARAMETERS
   Trunk Type (in/out): wink/wink        Incoming Rotary Timeout(sec): 5
    Outgoing Dial Type: tone                      Incoming Dial Type: tone
      Wink Timer(msec): 300                  Disconnect Timing(msec): 500
       Digit Treatment:                                        Digits:
                                                 Sig Bit Inversion: none
     Connected to Toll? n      STT Loss: normal       DTT to DCO Loss: normal
    Incoming Dial Tone? y
              Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? n
 Answer Supervision Timeout: 0             Receive Answer Supervision? y
```

Group 24 — Page 2

```
add trunk-group 24                                          Page   2 of  10
TRUNK FEATURES
          ACA Assignment? n            Measured: none
                                Internal Alert? n        Maintenance Tests? y
                               Data Restriction? n
                                 Glare Handling: none
            Used for DCS? n
   Suppress # Outpulsing? n
                    Seize When Maintenance Busy: neither-end




Incoming Tone (DTMF) ANI: no                  Per Call CPN Blocking Code:
         Connected to CO? n                  Per Call CPN Unblocking Code:
```

Group 24 — member assignments

```
                                TRUNK GROUP
                                     Administered Members (min/max):   1/3
GROUP MEMBER ASSIGNMENTS                 Total Administered Members:   3

       Port    Code Sfx Name        Night           Mode      Type   Ans Delay
  1: 01c1723  TN767  F                                                    20
  2:
  3:
  4:
  5:
  6:
  7:
  8:
  9:
 10:
```

Uniform Dialing Plan

```
change udp 2                                                    Page 1 of 2
                              UNIFORM DIALING PLAN
                                 Ext Codes: ddxx_

                               Ext Code: _____ Type: ________ ___

dd   Type        dd   Type        dd   Type        dd   Type        dd   Type
0x: ________ ___ 1x: local__ ___ 2x: udpcode 222 3x: udpcode 223 4x: udpcode 224
00: ________ ___ 10: ________ ___ 20: ________ ___ 30: ________ ___ 40: ________ ___
01: ________ ___ 11: ________ ___ 21: ________ ___ 31: ________ ___ 41: ________ ___
02: ________ ___ 12: ________ ___ 22: ________ ___ 32: ________ ___ 42: ________ ___
03: ________ ___ 13: ________ ___ 23: ________ ___ 33: ________ ___ 43: ________ ___
04: ________ ___ 14: ________ ___ 24: ________ ___ 34: ________ ___ 44: ________ ___
05: ________ ___ 15: ________ ___ 25: ________ ___ 35: ________ ___ 45: ________ ___
06: ________ ___ 16: ________ ___ 26: ________ ___ 36: ________ ___ 46: ________ ___
07: ________ ___ 17: ________ ___ 27: ________ ___ 37: ________ ___ 47: ________ ___
08: ________ ___ 18: ________ ___ 28: ________ ___ 38: ________ ___ 48: ________ ___
09: ________ ___ 19: ________ ___ 29: ________ ___ 39: ________ ___ 49: ________ ___
```

AAR Digit Analysis

```
change aar analysis 1                                      Page   1 of   2
                            AAR DIGIT ANALYSIS TABLE
                                                          Percent Full:    6

          Dialed          Total      Route    Call   Node  ANI
          String         Min  Max  Pattern   Type   Num   Reqd
           222           7    7     102      aar    2     n
           223           7    7     103      aar    3     n
           224           7    7     104      aar    4     n
```

ISDN TSC Gateway Channel Assignment

```
change isdn tsc-gateway                                    Page   1 of   2
                    ISDN TSC GATEWAY CHANNEL ASSIGNMENT

   Sig    Adm'd NCA  Processor  Appli-      Sig    Adm'd NCA  Processor  Appli-
  Group   TSC Index   Channel   cation     Group   TSC Index   Channel   cation
 1: 1_       2_         12_     dcs__    17: __      __         ___     _______
 2: 1_       3_         16_     dcs__    18: __      __         ___     _______
 3: 1_       4_         3__     audix    19: __      __         ___     _______
 4: __       __         ___     _____    20: __      __         ___     _______
 :
```

Routing Patterns

Pattern 102

```
change route-pattern 102
                          Pattern Number: 102

   Grp.  FRL NPA Pfx Hop Toll No. Del Inserted                          IXC
   No.           Mrk Lmt List Digits  Digits
 1:12     0                    3                                      user
 2:                                                                    user
 3:                                                                    user
 4:                                                                    user
 5:                                                                    user
 6:                                                                    user

     BCC VALUE  TSC CA-TSC    ITC  BCIE Service/Feature          Numbering LAR
    0 1 2 3 4 W     Request                                      Format
 1: y y y y y n  n            both ept                                 none
 2: y y y y y n  n            rest                                     none
 3: y y y y y n  n            rest                                     none
 4: y y y y y n  n            rest                                     none
 5: y y y y y n  n            rest                                     none
 6: y y y y y n  n            rest                                     none
```

Pattern 103

```
change route-pattern 103
                          Pattern Number: 103

   Grp.  FRL NPA Pfx Hop Toll No. Del Inserted                          IXC
   No.           Mrk Lmt List Digits  Digits
 1:13     0                    3                                      user
 2:                                                                    user
 3:                                                                    user
 4:                                                                    user
 5:                                                                    user
 6:                                                                    user

     BCC VALUE  TSC CA-TSC    ITC  BCIE Service/Feature          Numbering LAR
    0 1 2 3 4 W     Request                                      Format
 1: y y y y y n  y as needed  both ept
 2: y y y y y n  n            rest                                     none
 3: y y y y y n  n            rest                                     none
 4: y y y y y n  n            rest                                     none
 5: y y y y y n  n            rest                                     none
 6: y y y y y n  n            rest                                     none
```

Pattern 104

```
change route-pattern 104
                          Pattern Number: 104

   Grp.  FRL NPA Pfx Hop Toll No. Del Inserted                          IXC
   No.           Mrk Lmt List Digits  Digits
 1:14     0                     3                                      user
 2:                                                                    user
 3:                                                                    user
 4:                                                                    user
 5:                                                                    user
 6:                                                                    user

     BCC VALUE  TSC CA-TSC    ITC  BCIE Service/Feature          Numbering LAR
    0 1 2 3 4 W     Request                                      Format
 1: y y y y y n  n            both ept
 2: y y y y y n  n            rest                                      none
 3: y y y y y n  n            rest                                      none
 4: y y y y y n  n            rest                                      none
 5: y y y y y n  n            rest                                      none
 6: y y y y y n  n            rest                                      none
```

Node Names

Audix

```
change node-names audix-msa                                  Page   1 of   1
                            AUDIX-MSA NODE NAMES

      Audix Names   IP Address          MSA Names    IP Address
      intuity       192.168.200.10      msa          ___.___.___.___
```

IP

```
change node-names ip                                          Page 1 of 5
                           IP NODE NAMES

   Name               IP Address          Name                IP Address
 1.ppp14              192.168.200.12   17. _________________   ___.___.___.___
 2.ppp41              192.168.200.14   18. _________________   ___.___.___.___
 3.CMS                192.168.201.10   19. _________________   ___.___.___.___
 4.router             192.168.200.1    20. _________________   ___.___.___.___
 5.ethernet1          192.168.200.11
 :
16.
```

Data Modules

x.25 data module

```
add data-module 1992
                                                          Page 1 of 2
                              DATA MODULE

Data Extension: 1992                   Name: x.25 on link 2 to node 2_____
          Type: x.25                         Remote Loop-Around Test? n
          Port: 01C0101          COR: 1           Destination Number: external
     Baud Rate: 9600_____         TN: 1         Establish Connection? n
 Endpoint Type: adjunct                      Connected Data Module: 1900_
          Link: 2_           DTE/DCE: dte              Error Logging? n
                          Enable Link: n


 Permanent Virtual Circuit? y           Highest PVC Logical Channel: 64
  Switched Virtual Circuit? n
```

pdm data module

```
add data-module 1900                                          Page 1 of x
                           DATA MODULE

   Data Extension: 1900          Name:                                BCC: 2
             Type: pdm            COS: 1          Remote Loop-Around Test? n
        Port: 01c2001  COR:1 Secondary Data Module? n
ITC restricted:          TN:1      Connected to dte:

ABBBREVIATED DIALING
   List 1

SPECIAL DIALING OPTION

ASSIGNED MEMBER (Station with a data extension button for this data module)
         Ext             Name
     1.
```

ppp data module

```
add data-module 1994                                          Page 1 of x
                           DATA MODULE

    Data Extension: 1994            Name: _ppp on link 4 to node 4___  BCC: 2
              Type: ppp              COS: 1
              Port: 01c1502          COR: 1
              Link: 4_                TN: 1
       Enable Link? n

         Node Name: ppp14_____
       Subnet Mask: 255.255.255.0


  Establish Connection: y

DESTINATION
            Digits: 7241991_________
         Node Name: ppp41___________
              CHAP? n
```

ethernet data module

```
add data-module 1191                                          Page 1 of X
                        DATA MODULE

   Data Extension: 1191           Name: ethernet on link 1_____________   BCC: 2
             Type: ethernet
             Port: 01c1517_
             Link: 1_

 Network uses 1's for Broadcast Addresses? y
```

IP Interface

```
change ip-interfaces                                  Page   1 of   2

                              IP Interfaces

                                                                        Net
 Enabled Type   Slot  Code Sfx Node Name  Subnet Mask     Gateway Addr    Rgn
    y   C-LAN  01c15 TN799 B  ethernet1  255.255.255.0   192.168.200.1_  1
    _   _____  _____ _____ _  _________  255.255.255.0   ___.___.___.___
    _   _____  _____ _____ _  _________  255.255.255.0   ___.___.___.___  _
    _   _____  _____ _____ _  _________  255.255.255.0   ___.___.___.___  _
    _   _____  _____ _____ _  _________  255.255.255.0   ___.___.___.___  _
    _   _____  _____ _____ _  _________  255.255.255.0   ___.___.___.___  _
    _   _____  _____ _____ _  _________  255.255.255.0   ___.___.___.___  _
    _   _____  _____ _____ _  _________  255.255.255.0   ___.___.___.___  _
```

Processor Channel Assignments .

```
change communications-interface processor-channels
                                                          Page 1 of X
                    PROCESSOR CHANNEL ASSIGNMENT

Proc                    Gtwy          Interface    Destination      Session    Mach
Chan Enable  Appl.      To  Mode  Link/Chan   Node        Port  Local/Remote  ID
  1:  y      audix___        s     1    5002  intuity__   0____   _1   1__    1_
  2:  y      gtwy-tcp 4      _     2    2___  _________   _____   _2   59_    __
  3:  y      gateway_        s     1    5031  intuity_    0____   _3   3__    __
  4:  y      gtwy-tcp 2      s     1    5021  intuity__   0____   _2   2__    __
  :
  :
 10:  y      mis_____        s     1    5001  cms_____    0____   _1   1__    __
 11:  y      dcs_____        _     2    11__  _________   _____   _11  11_    2_
 12:  y      gateway_        _     2    12__  _________   _____   _12  12_    __
 13:  y      gtwy-tcp 15     _     2    13__  _________   _____   _13  13_    __
 14:  y      dcs_____        s     4    5003  ppp41____   0____   _14  14_    4_
 15:  y      gtwy-tcp 13     s     4    5004  ppp41____   0____   _15  15_    __
 16:  y      gateway_        s     4    5005  ppp41____   0____   _16  16_    __
   :
 64:  _      _______         _     ___  ____  _________   0____   ___  ___    __
```

Switch-Node 2 Administration

This section displays the screens for the administration of Switch Node 2.

DS1 Circuit Packs

```
add ds1 1a10
                               DS1 CIRCUIT PACK

           Location: 01a10                          Name: sw 2 to sw 1
           Bit Rate: 1.544                   Line Coding: b8zs
   Line Compensation: 1                     Framing Mode: esf
      Signaling Mode: common-chan


          Idle Code: 11111111
            DMI-BOS? n


      Slip Detection? n
```

Dial Plan

```
change dialplan
                              DIAL PLAN RECORD

                                                    Local Node Number: 2
                                                      ETA Node Number:
       Uniform Dialing Plan: 4-digit              ETA Routing Pattern:
  UDP Extension Search Order: local-extensions-first
FIRST DIGIT TABLE
First                                  Length
Digit  - 1 -       - 2 -       - 3 -       - 4 -       - 5 -       - 6 -
  1:                                    extension
  2:                                    extension
  3:                                    extension
  4:                                    extension
  5:
  6:
  7:                          dac
  8: fac
  9: fac
  0: attd
  *:                          dac
  #:                          dac
```

Synchronization Plan

```
change synchronization                                          Page 1 of X
                              SYNCHRONIZATION PLAN
                    SYNCHRONIZATION SOURCE (circuit pack location)
                          Stratum: 4
                     Port Network: 1
                          Primary: 01a10      Secondary: ___

       Location   Name       Slip   Type     Location   Name          Slip  Type
       01a10 _______________   y    UDS1-BD  _____  _______________   _     ___
       _____ _______________   _             _____  _______________   _     ___
       _____ _______________   _             _____  _______________   _     ___
       _____ _______________   _             _____  _______________   _     ___
       _____ _______________   _             _____  _______________   _     ___
       _____ _______________   _             _____  _______________   _     ___
       _____ _______________   _             _____  _______________   _     ___
       _____ _______________   _             _____  _______________   _     ___
NOTE: TN722B & TN464B DS1 sources result in stratum 4, type II synchronization
```

Trunk Groups

Group 12 — page 1

```
add trunk-group 12                                          Page   1 of  10
                                TRUNK GROUP

Group Number: 12                    Group Type: tie           CDR Reports: y
  Group Name: tg12                       COR: 1        TN: 1        TAC: 712
   Direction: two-way         Outgoing Display? n    Trunk Signaling Type:
 Dial Access? y                 Busy Threshold: 99          Night Service:
Queue Length: 0                                      Incoming Destination:
   Comm Type: avd                    Auth Code? n
                                   Trunk Flash? n
        BCC: 0
TRUNK PARAMETERS
   Trunk Type (in/out): wink/wink        Incoming Rotary Timeout(sec): 5
    Outgoing Dial Type: tone                     Incoming Dial Type: tone
      Wink Timer(msec): 300                  Disconnect Timing(msec): 500
       Digit Treatment:                                      Digits:
                                                 Sig Bit Inversion: none
     Connected to Toll? n      STT Loss: normal       DTT to DCO Loss: normal
    Incoming Dial Tone? y
              Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? n
 Answer Supervision Timeout: 0             Receive Answer Supervision? y
```

Group 12 — Page 2

```
add trunk-group 12                                          Page   2 of  10
TRUNK FEATURES
          ACA Assignment? n            Measured: none
                                Internal Alert? n        Maintenance Tests? y
                              Data Restriction? n
                                Glare Handling: none
            Used for DCS? y  PBX ID: 1
   Suppress # Outpulsing? n
                    Seize When Maintenance Busy: neither-end




Incoming Tone (DTMF) ANI: no                  Per Call CPN Blocking Code:
         Connected to CO? n                 Per Call CPN Unblocking Code:
```

Group 12 — member assignments

```
 add trunk-group 12                                          Page 4 of  10
                              TRUNK GROUP
                                      Administered Members (min/max):   1/3
GROUP MEMBER ASSIGNMENTS                   Total Administered Members:   3

       Port    Code Sfx Name        Night           Mode      Type   Ans Delay
  1: 01a1001  TN767  E
  2: 01a1002  TN767  E
  3: 01a1003  TN767  E
  4:
  5:
  6:
```

Uniform Dialing Plan

```
change udp 2
                                                            Page 1 of 2
                            UNIFORM DIALING PLAN
                               Ext Codes: ddxx

dd   Type       dd   Type       dd   Type       dd   Type       dd   Type
0x: _______ ___ 1x: udpcode 221 2x: local  ___ 3x: udpcode 223 4x: udpcode 224
00: _______ ___ 10: _______ ___ 20: _______ ___ 30: _______ ___ 40: _______ ___
01: _______ ___ 11: _______ ___ 21: _______ ___ 31: _______ ___ 41: _______ ___
02: _______ ___ 12: _______ ___ 22: _______ ___ 32: _______ ___ 42: _______ ___
03: _______ ___ 13: _______ ___ 23: _______ ___ 33: _______ ___ 43: _______ ___
04: _______ ___ 14: _______ ___ 24: _______ ___ 34: _______ ___ 44: _______ ___
05: _______ ___ 15: _______ ___ 25: _______ ___ 35: _______ ___ 45: _______ ___
06: _______ ___ 16: _______ ___ 26: _______ ___ 36: _______ ___ 46: _______ ___
07: _______ ___ 17: _______ ___ 27: _______ ___ 37: _______ ___ 47: _______ ___
08: _______ ___ 18: _______ ___ 28: _______ ___ 38: _______ ___ 48: _______ ___
09: _______ ___ 19: _______ ___ 29: _______ ___ 39: _______ ___ 49: _______ ___
7
```

AAR Digit Analysis

```
change aar analysis 1                                          Page   1 of   2
                          AAR DIGIT ANALYSIS TABLE
                                                             Percent Full:    6

         Dialed          Total      Route    Call   Node  ANI
         String         Min  Max  Pattern   Type   Num   Reqd
    221                 7    7     101      aar    1     n
    223                 7    7     101      aar    3     n
    224                 7    7     101      aar    4     n
```

Routing Patterns

```
change route-pattern 101
                            Pattern Number: 101

   Grp.  FRL NPA Pfx Hop Toll No. Del Inserted                          IXC
   No.           Mrk Lmt List Digits  Digits
 1:12     0                    3
user
 2:                                                                     user
 3:                                                                     user
 4:                                                                     user
 5:                                                                     user
 6:                                                                     user
```

Data Modules

procr-intf data module

```
add data-module 2992                                           Page 1 of 1
                                 DATA MODULE

  Data Extension: 2992_                    Name: x.25 on link 2 to node 1__
            Type: procr-intf          COS: 1       Maintenance Extension: 2002
Physical Channel: 02_                 COR: 1           Destination Number: 7221993
             ITC: Restricted           TN: 1        Establish Connection? y
            Link: 2_                DTE/DCE: dce      Connected Data Module: __________
                                 Enable Link: n
ABBREVIATED DIALING
  List1: _______________

SPECIAL DIALING OPTION: _________________

ASSIGNED MEMBER (Station with a data extension button for this data module)

         Ext               Name
    1.
```

Processor Channel Assignments

Release 6 Processor Channel Assignment screen

```
change communications-interface processor-channels                    Page 1 of 4
                    PROCESSOR CHANNEL ASSIGNMENT
   Proc                Interface                  Remote
   Chan     Appl.      Link  Chan      Priority   Proc Chan        Machine-ID
    1:      ______      _     __         ____        __               __
    :
   11:      dcs___      2     11         ____        11               1
   12:      dcs___      2     12         ____        12               3_
   13:      dcs___      2     13         ____        13               4_
   :
   59:      audix_      2     2_         ____        __               __
```

Release 6 Interface Links screen

NOTE:
You must disable the link before you can make changes to the Interface Links screen.

```
change communications-interface links                          Page 1 of 1
                              INTERFACE LINKS
                 Est   PI                 Destination     DTE/
   Link  Enable  Conn   Ext     Port      Digits      Brd    DCE   Identification
    1:    _       _     _____   ____      __________  _____  ___   ________________
    2:    y       y     2992_   1a1004    1992 _____  _____  dce   ________________
    3:    _       _     _____   ____      __________  _____  ___   ________________
Link 1 [eia] - Connected to : ___ Clocking : _________
```

Hunt Group

```
page 1
add hunt-group 99                                          Page   1 of  10
                                HUNT GROUP

           Group Number: 99                                   ACD? n
             Group Name: Intuity 1                          Queue? n
        Group Extension: 2111                              Vector? n
             Group Type: ucd-mia                     Coverage Path:
                     TN: 1              Night Service Destination:
                    COR: 1                         MM Early Answer? n
          Security Code:
     ISDN Caller Display:
```

page 2

```
add hunt-group 1                                              Page   2 of  10
                                  HUNT GROUP

                             Message Center: rem-audix
                           AUDIX Extension: 1111



    Calling Party Number to INTUITY AUDIX? n
                              LWC Reception: none
```

Switch-Node 3 Administration

This section shows the screens for the administration of Switch Node 3.

DS1 Circuit Packs

```
add ds1 1a11                                                  Page   1 of   2
                                DS1 CIRCUIT PACK

            Location: 01a11                          Name: Switch 3 to Switch 1
            Bit Rate: 1.544                   Line Coding: b8zs
   Line Compensation: 1                       Framing Mode: esf
      Signaling Mode: isdn-pri



Interface Companding: mulaw
           Idle Code: 11111111
             DMI-BOS? n




      Slip Detection? n                 Near-end CSU Type: other
```

Dial Plan

```
change dialplan
                              DIAL PLAN RECORD

                                                    Local Node Number: 3
                                                      ETA Node Number:
       Uniform Dialing Plan: 4-digit                ETA Routing Pattern:
  UDP Extension Search Order: local-extensions-first
FIRST DIGIT TABLE
First                                    Length
Digit  - 1 -       - 2 -       - 3 -       - 4 -       - 5 -       - 6 -
  1:                                   extension
  2:                                   extension
  3:                                   extension
  4:                                   extension
  5:
  6:
  7:                           dac
  8: fac
  9: fac
  0: attd
  *:                           dac
  #:                           dac
```

Synchronization Plan

```
change synchronization                                          Page 1 of X
                                SYNCHRONIZATION PLAN
                    SYNCHRONIZATION SOURCE (circuit pack location)
                          Stratum: 4
                     Port Network: 1
                          Primary: 1a11      Secondary: ___

       Location   Name       Slip   Type      Location   Name          Slip  Type
       01a11 DCS SW1_______   y    UDS1-BD   _____  ________________   _     ___
       _____ ________________   _              _____  ________________   _     ___
       _____ ________________   _              _____  ________________   _     ___
       _____ ________________   _              _____  ________________   _     ___
       _____ ________________   _              _____  ________________   _     ___
       _____ ________________   _              _____  ________________   _     ___
       _____ ________________   _              _____  ________________   _     ___
       _____ ________________   _              _____  ________________   _     ___
NOTE: TN722B & TN464B DS1 sources result in stratum 4, type II synchronization
```

Signaling Group

Page 1

```
add signaling-group next                                        Page 1 of 5

                            SIGNALING GROUP
Group Number: 1
                     Associated Signaling? y            Max number of NCA TSC: 5
                        Primary D-Channel: 01a1124       Max number of CA TSC: 23
                                                    Trunk Group for NCA TSC: 13
       Trunk Group for Channel Selection: ___
          Supplementary Service Protocol: a__
```

Page 2 – Administered NCA TSC Assignment

```
add signaling-group next                                        Page 2 of 5

                         ADMINISTERED NCA TSC ASSIGNMENT

Service/Feature: __________          As-needed Inactivity Time-out (min): __

 TSC   Local                                                 Adj.      Mach.
Index   Ext.  Enabled Established   Dest. Digits    Appl.    Name       ID
  1:   3901_     y     permanent   1901_________  dcs____  _______     1_
  2:   3902_     y     permanent   1902_________  dcs____  _______     2_
  3:   3903_     y     permanent   1903_________  dcs      _______     4_
  4:   3904_     y     permanent   1904_________  audix    _______     1_
```

Trunk Groups

Group 13 (ISDN-PRI) — page 1

```
add trunk-group 13                                          Page   1 of  10
                              TRUNK GROUP

Group Number: 13                    Group Type: isdn-pri      CDR Reports: y
  Group Name: ISDN TG 13 to sw 1          COR: 1        TN: 1        TAC: 713
   Direction: two-way        Outgoing Display? n
 Dial Access? n                Busy Threshold: 99          Night Service:
Queue Length: 0
Service Type: tie                   Auth Code? n            TestCall ITC: rest
                        Far End Test Line No:
TestCall BCC: 4
TRUNK PARAMETERS
         Codeset to Send Display: 6     Codeset to Send TCM,Lookahead: 6
        Max Message Size to Send: 260   Charge Advice: none
  Supplementary Service Protocol: a     Digit Handling (in/out): enbloc/enbloc

            Trunk Hunt: cyclical
     Connected to Toll? n      STT Loss: normal       DTT to DCO Loss: normal
Calling Number - Delete:     Insert:                 Numbering Format:
              Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? n
 Answer Supervision Timeout: 0
```

Group 13 — page 2

```
add trunk-group 13                                          Page   2 of
10
TRUNK FEATURES
          ACA Assignment? n            Measured: none      Wideband Support? n
                                Internal Alert? n        Maintenance Tests? y
                               Data Restriction? n     NCA-TSC Trunk Member: 1
                                    Send Name: n      Send Calling Number: n
            Used for DCS? y  PBX ID: 1
   Suppress # Outpulsing? n                                DCS Signaling: d-chan
 Outgoing Channel ID Encoding: exclusive     UUI IE Treatment: service-provider




                                                    Send Connected Number: n


               Send UCID? n
 Send Codeset 6/7 LAI IE? y
```

Group 13 — member assignments

```
display trunk-group 13                                    Page   4 of  10
                                TRUNK GROUP
                                     Administered Members (min/max):   0/0
GROUP MEMBER ASSIGNMENTS                   Total Administered Members:   0

       Port    Code Sfx Name        Night           Sig Grp
  1: 01a1101  TN464  e                                 1
  2: 01a1102  TN464  e                                 1
  3: 01a1103  TN464  e                                 1
  4: 01a1104  TN464  e                                 1
  5:
  6:
```

Uniform Dialing Plan

```
change udp 2                                                    Page 1 of 2
                                UNIFORM DIALING PLAN
                                   Ext Codes: ddxx

dd   Type        dd   Type        dd   Type        dd   Type        dd   Type
0x: ________ ___ 1x: udpcode 221 2x: udpcode 222 3x: local__ ___ 4x: udpcode 224
00: ________ ___ 10: ________ ___ 20: ________ ___ 30: ________ ___ 40: ________ ___
01: ________ ___ 11: ________ ___ 21: ________ ___ 31: ________ ___ 41: ________ ___
02: ________ ___ 12: ________ ___ 22: ________ ___ 32: ________ ___ 42: ________ ___
03: ________ ___ 13: ________ ___ 23: ________ ___ 33: ________ ___ 43: ________ ___
04: ________ ___ 14: ________ ___ 24: ________ ___ 34: ________ ___ 44: ________ ___
05: ________ ___ 15: ________ ___ 25: ________ ___ 35: ________ ___ 45: ________ ___
06: ________ ___ 16: ________ ___ 26: ________ ___ 36: ________ ___ 46: ________ ___
07: ________ ___ 17: ________ ___ 27: ________ ___ 37: ________ ___ 47: ________ ___
08: ________ ___ 18: ________ ___ 28: ________ ___ 38: ________ ___ 48: ________ ___
09: ________ ___ 19: ________ ___ 29: ________ ___ 39: ________ ___ 49: ________ ___
```

AAR Digit Analysis

```
change aar analysis 1                                      Page   1 of   2
                            AAR DIGIT ANALYSIS TABLE
                                                        Percent Full:    6

          Dialed          Total     Route    Call   Node  ANI
          String        Min  Max  Pattern   Type   Num   Reqd
           221          7    7    101       aar    1     n
           222          7    7    101       aar    2     n
           224          7    7    101       aar    4     n
```

Routing Patterns

```
add route-pattern 101
                           Pattern Number: 101

   Grp.  FRL NPA Pfx Hop Toll No. Del Inserted                              IXC
   No.           Mrk Lmt List Digits  Digits
 1:13     0                    3                                          user
 2:                                                                       user
 3:                                                                       user
 4:                                                                       user
 5:                                                                       user
 6:                                                                       user

     BCC VALUE  TSC CA-TSC    ITC  BCIE Service/Feature          Numbering LAR
    0 1 2 3 4 W     Request                                     Format
 1: y y y y y n  y  as needed both ept                                 none
 2: y y y y y n  n            rest                                     none
 3: y y y y y n  n            rest                                     none
 4: y y y y y n  n            rest                                     none
 5: y y y y y n  n            rest                                     none
 6: y y y y y n  n            rest                                     none
```

Hunt Group

page 1

```
add hunt-group 99                                             Page   1 of  10
                                HUNT GROUP

            Group Number: 99                              ACD? n
              Group Name: Intuity 1                     Queue? n
         Group Extension: 3111                         Vector? n
              Group Type: ucd-mia                 Coverage Path:
                      TN: 1           Night Service Destination:
                     COR: 1                    MM Early Answer? n
          Security Code:
     ISDN Caller Display:
```

page 2

```
add hunt-group 99                                             Page   2 of  10
                                HUNT GROUP

                          Message Center: rem-audix
                        AUDIX Extension: 1111



    Calling Party Number to INTUITY AUDIX? n
                           LWC Reception: none
```

Switch-Node 4 Administration

This section displays the screens for the administration of Switch Node 4.

Bus Bridge

```
change system-parameters maintenance                              Page   2 of   3

                   MAINTENANCE-RELATED SYSTEM PARAMETERS

MINIMUM MAINTENANCE THRESHOLDS ( Before Notification )
        TTRs: 4        CPTRs: 1        Call Classifier Ports: 0
        MMIs: 0          VCs: 0

TERMINATING TRUNK TRANSMISSION TEST ( Extension )
   Test Type 100:          Test Type 102:          Test Type 105:

ISDN MAINTENANCE
   ISDN-PRI Test Call Extension:         ISDN-BRI Service SPID:

DS1 MAINTENANCE
   DS0 Loop-Around Test Call Extension:


SPE OPTIONAL BOARDS
                     Packet Intf1? y     Packet Intf2? y
         Bus Bridge: 01a05_  Inter-Board Link Timeslots  Pt0: 6 Pt1: 1 Pt2: 1
```

DS1 Circuit Packs

page 1

```
add ds1 1a10                                              Page   1 of   2
                              DS1 CIRCUIT PACK

            Location: 01a10                          Name: Switch 4 to Switch 1
            Bit Rate: 1.544                   Line Coding: b8zs
   Line Compensation: 1                      Framing Mode: esf
      Signaling Mode: robbed-bit



Interface Companding: mulaw
           Idle Code: 11111111



      Slip Detection? n                Near-end CSU Type: other
```

Dial Plan

```
change dialplan
                              DIAL PLAN RECORD

                                                    Local Node Number: 4
                                                      ETA Node Number:
       Uniform Dialing Plan: 4-digit                ETA Routing Pattern:
  UDP Extension Search Order: local-extensions-first
FIRST DIGIT TABLE
First                                    Length
Digit  - 1 -       - 2 -       - 3 -       - 4 -       - 5 -       - 6 -
  1:                                     extension
  2:                                     extension
  3:                                     extension
  4:                                     extension
  5:
  6:
  7:                           dac
  8: fac
  9: fac
  0: attd
  *:                           dac
  #:                           dac
```

Synchronization Plan

```
change synchronization                                          Page 1 of X

                              SYNCHRONIZATION PLAN
                    SYNCHRONIZATION SOURCE (circuit pack location)
                          Stratum: 4
                     Port Network: 1
                          Primary: 01a10       Secondary: ___

      Location   Name       Slip   Type      Location   Name          Slip  Type
      01a10 _______________   y    UDS1-BD   _____  _______________   _     ___
      _____ _______________   _              _____  _______________   _     ___
      _____ _______________   _              _____  _______________   _     ___
      _____ _______________   _              _____  _______________   _     ___
      _____ _______________   _              _____  _______________   _     ___
      _____ _______________   _              _____  _______________   _     ___
      _____ _______________   _              _____  _______________   _     ___
      _____ _______________   _              _____  _______________   _     ___
NOTE: TN722B & TN464B DS1 sources result in stratum 4, type II synchronization
```

Trunk Groups

Group 14 — page 1

```
add trunk-group 14                                          Page   1 of  10
                                TRUNK GROUP

Group Number: 14                    Group Type: tie           CDR Reports: y
  Group Name: Node 4 to Node 1 - TG14     COR: 1        TN: 1        TAC: 714
   Direction: two-way        Outgoing Display? n    Trunk Signaling Type:
 Dial Access? y                Busy Threshold: 99          Night Service:
Queue Length: 0                                      Incoming Destination:
   Comm Type: voice                 Auth Code? n
                                  Trunk Flash? n
         BCC: 0
TRUNK PARAMETERS
   Trunk Type (in/out): wink/wink        Incoming Rotary Timeout(sec): 5
    Outgoing Dial Type: tone                      Incoming Dial Type: tone
      Wink Timer(msec): 300                  Disconnect Timing(msec): 500
       Digit Treatment:                                        Digits:
                                                    Sig Bit Inversion: none
     Connected to Toll? n      STT Loss: normal       DTT to DCO Loss: normal
    Incoming Dial Tone? y
             Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? n
 Answer Supervision Timeout: 0             Receive Answer Supervision? y
```

Group 14 — Page 2

```
add trunk-group 14                                           Page   2 of  10
TRUNK FEATURES
          ACA Assignment? n            Measured: none
                                Internal Alert? n        Maintenance Tests? y
                              Data Restriction? n
                                Glare Handling: none
            Used for DCS? y  PBX ID: 1
   Suppress # Outpulsing? n
                    Seize When Maintenance Busy: neither-end




Incoming Tone (DTMF) ANI: no                  Per Call CPN Blocking Code:
         Connected to CO? n                  Per Call CPN Unblocking Code:
```

Group 14 — member assignments

```
add trunk-group 14                                           Page   4 of  10
                                TRUNK GROUP
                                     Administered Members (min/max):   1/3
GROUP MEMBER ASSIGNMENTS                 Total Administered Members:   3

       Port    Code Sfx Name        Night           Mode      Type   Ans Delay
  1: 01a1001  TN767  e                                                  20
  2: 01a1002  TN767  e                                                  20
  3: 01a1003  TN767  e                                                  20
  4:
  5:
  6:
```

Group 24 (data to Switch Node 1) — page1

```
add trunk-group 24                                          Page   1 of  10
                              TRUNK GROUP

Group Number: 24                    Group Type: tie           CDR Reports: y
  Group Name: dcs data to Switch 1        COR: 1        TN: 1        TAC: 124
   Direction: two-way        Outgoing Display? n    Trunk Signaling Type:
 Dial Access? y                Busy Threshold: 99          Night Service:
Queue Length: 0                                     Incoming Destination:
   Comm Type: rbavd                    Auth Code? n
                                  Trunk Flash? n
         BCC: 0
TRUNK PARAMETERS
   Trunk Type (in/out): wink/wink        Incoming Rotary Timeout(sec): 5
    Outgoing Dial Type: tone                      Incoming Dial Type: tone
      Wink Timer(msec): 300                  Disconnect Timing(msec): 500
       Digit Treatment:                                        Digits:
                                                 Sig Bit Inversion: none
     Connected to Toll? n      STT Loss: normal       DTT to DCO Loss: normal
    Incoming Dial Tone? y
              Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? n
 Answer Supervision Timeout: 0             Receive Answer Supervision? y
```

Group 24 — page 2

```
add trunk-group 24                                            Page   2 of  10
TRUNK FEATURES
          ACA Assignment? n            Measured: none
                                 Internal Alert? n        Maintenance Tests? y
                               Data Restriction? n
                                 Glare Handling: none
            Used for DCS? n
   Suppress # Outpulsing? n
                    Seize When Maintenance Busy: neither-end




Incoming Tone (DTMF) ANI: no                  Per Call CPN Blocking Code:
         Connected to CO? n                  Per Call CPN Unblocking Code:
```

Group 14 — member assignments

```
add trunk-group                                                Page   4
24                                                             of  10
                                                  TRUNK GROUP
                                                    Administered Members
(min/max):   1/3
GROUP MEMBER ASSIGNMENTS                        Total Administered
Members:   3

      Port    Code Sfx Name       Night          Mode
Type   Ans Delay
  1: 01a1023  TN767
f                                                              20
  2:
  3:
  4:
```

Uniform Dialing Plan

```
change udp 2                                                   Page 1 of 2
                          UNIFORM DIALING PLAN
                             Ext Codes: ddxx


dd   Type        dd   Type        dd   Type        dd   Type        dd   Type
0x: ________ ___ 1x: udpcode 221 2x: udpcode 222 3x: udpcode 223 4x: local__ ___
00: ________ ___ 10: ________ ___ 20: ________ ___ 30: ________ ___ 40: ________ ___
01: ________ ___ 11: ________ ___ 21: ________ ___ 31: ________ ___ 41: ________ ___
02: ________ ___ 12: ________ ___ 22: ________ ___ 32: ________ ___ 42: ________ ___
03: ________ ___ 13: ________ ___ 23: ________ ___ 33: ________ ___ 43: ________ ___
04: ________ ___ 14: ________ ___ 24: ________ ___ 34: ________ ___ 44: ________ ___
05: ________ ___ 15: ________ ___ 25: ________ ___ 35: ________ ___ 45: ________ ___
06: ________ ___ 16: ________ ___ 26: ________ ___ 36: ________ ___ 46: ________ ___
07: ________ ___ 17: ________ ___ 27: ________ ___ 37: ________ ___ 47: ________ ___
08: ________ ___ 18: ________ ___ 28: ________ ___ 38: ________ ___ 48: ________ ___
09: ________ ___ 19: ________ ___ 29: ________ ___ 39: ________ ___ 49: ________ ___
```

AAR Digit Analysis

```
change aar analysis 1                                          Page   1 of   2
                          AAR DIGIT ANALYSIS TABLE
                                                          Percent Full:    6

          Dialed          Total     Route    Call   Node  ANI
          String         Min  Max  Pattern   Type   Num   Reqd
           221           7    7     101      aar    1     n
           222           7    7     101      aar    2     n
           223           7    7     101      aar    3     n
```

Routing Patterns

```
change route-pattern 101
                          Pattern Number: 101

   Grp.  FRL NPA Pfx Hop Toll No. Del Inserted                          IXC
   No.           Mrk Lmt List Digits  Digits
 1:14     0                    3                                       user
 2:                                                                    user
 3:                                                                    user
 4:                                                                    user
 5:                                                                    user
 6:                                                                    user
```

Node Names

page 1

```
change node-names audix-msa                                  Page   1 of   1
                          AUDIX-MSA NODE NAMES

      Audix Names   IP Address          MSA Names    IP Address
      intuity1      192.168.200.10      msa             .   .   .
```

page 2

```
change node-names ip                                          Page 1 of 5
                          IP NODE NAMES

   Name               IP Address          Name               IP Address
 1.ppp41_____        192.168.200.14_   17. _____________    ___.___.___.___
 2.ppp14_____        192.168.200.12_   18. _____________    ___.___.___.___
 3.CMS_______        192.168.201.10_   19. _____________    ___.___.___.___
 4.router____        192.168.200.1__   20. _____________    ___.___.___.___
 5.ethernet1_____    192.168.200.11_   21. _____________    ___.___.___.___
:
16.
```

Data Modules

ppp data module

```
add data-module 4991
                                                          Page 1 of x
                          DATA MODULE

    Data Extension: 4991            Name: _ppp on link 1 to switch 1___  BCC: 2
              Type: ppp              COS: 1
              Port: 01a0515          COR: 1
              Link: 1_                TN: 1
       Enable Link? n

         Node Name: ppp41_________
       Subnet Mask: 255.255.255.0__


Establish Connection: n

DESTINATION
            Digits: 7241994___________
         Node Name: ppp14___________
              CHAP? n
```

Processor Channel Assignments

```
change communications-interface processor-channels
                                                          Page 1 of X
                  PROCESSOR CHANNEL ASSIGNMENT

Proc                Gtwy        Interface    Destination      Session    Mach
Chan Enable  Appl.  To  Mode  Link/Chan   Node        Port  Local/Remote  ID
  1:    n  audix__         s    1  5041  intuity__   0____  4__   4_     1__
  :
 10:    n  mis____         s    1  5001  cms______   0____  1_    1_     __
  :
 14:    n  dcs____         c    1  0_____ ppp14____   5003__ 14_   14_    1_
 15:    n  dcs____         c    1  0_____ ppp14____   5004__ 15_   15_    2_
 16:    n  dcs____         c    1  0_____ ppp14____   5005__ 16_   16_    3_
  :
```

IP Routing

```
add ip-route next                                              Page   1 of   1
                              IP ROUTING


     Route Number: 1
 Destination Node: audix _
          Gateway: ppp14__
      C-LAN Board: 1a05
           Metric: 0
       Route Type: host
```

IP Routing

```
add ip-route next                                              Page   1 of   1
                              IP ROUTING


     Route Number: 2
 Destination Node: cms_____
          Gateway: ppp14___
      C-LAN Board: 1a05
           Metric: 0
       Route Type: host
```

Hunt Group

page 1

```
add hunt-group 99                                              Page   1 of  10
                                HUNT GROUP

           Group Number: 99                               ACD? n
             Group Name: Intuity 1                      Queue? n
        Group Extension: 4111                         Vector? n
             Group Type: ucd-mia                 Coverage Path:
                     TN: 1          Night Service Destination:
                    COR: 1                    MM Early Answer? n
          Security Code:
     ISDN Caller Display:
```

page 2

```
add hunt-group 1                                               Page   2 of  10
                                HUNT GROUP

                          Message Center: rem-audix
                        AUDIX Extension: 1111



    Calling Party Number to INTUITY AUDIX? n
                            LWC Reception: none
```

Intuity Translations for DCS AUDIX

This screen is administered on Intuity, not on the DEFINITY ECS.

```
                          Switch Interface Administration

  Switch Link Type:_LAN_                  Switch:_Definity_____
  Extension Length:_4___                 Country:_United States_
Host Switch Number:_1___
      Audix Number:_1___


Switch  IP Address/Host Name  TCP Port   Switch  IP Address/Host Name  TCP Port
Number                                   Number

 1__   192.168.200.11_______  5002__     11____  ___.___.___._________  ______
 2__   192.168.200.11_______  5021__     12____  ___.___.___._________  ______
 3__   192.168.200.11_______  5031__     13____  ___.___.___._________  ______
 4__   192.168.200.14_______  5041__     14____  ___.___.___._________  ______
 5__   ____________________   ______     15____  ___.___.___._________  ______
 :
 10_   ____________________   ______     20____  ___.___.___._________  ______
```

CMS Administration

See *CentreVu® Call Management System, Software Installation and Setup*, 585-215-866 for administration procedures for the CMS server.

Private Networking

This appendix contains these main sections:

- "Distributed Communications System" is a description of Distributed Communications System (DCS) and the features that can be used transparently on a DCS network
- "ISDN Feature Plus" is a description of ISDN Plus networking capability
- "QSIG" is a description of QSIG and its features
- "Centralized Voice Mail Via Mode Code" is a brief description of Centralized Voice Mail with Mode codes
- "Japan TTC Q931-a Private Networking Protocols" is a brief description of Japan TTC private networking protocols

Distributed Communications System

Distributed Communications System (DCS) allows you to configure 2 or more switches as if they were a single, large DEFINITY ECS. DCS provides attendant and voice-terminal features between these switch locations. DCS simplifies dialing procedures and allows transparent use of some of the DEFINITY ECS features. (Feature transparency means that features are available to all users on DCS regardless of the switch location.)

Configuring a DCS network is a complex process that involves 4 major steps:

- Planning your DCS network
- Connecting the physical equipment in the network
- Administering the physical layer (hardware connections)
- Administering the link layer to create a DCS

Prerequisite DCS Features

Uniform Dial Plan

Uniform Dial Plan (UDP) provides a common 4- or 5-digit dial plan (specified in the Dial Plan Record) that can be shared among a group of switches. Interswitch dialing and intraswitch dialing both require 4- or 5-digit dialing. UDP is used with an electronic tandem network (ETN); main, satellite, and tributary switches; and Distributed Communications Systems (DCS). In addition, UDP can provide uniform 4- or 5-digit dialing between 2 or more private-switching systems without ETN, main, satellite, and tributary switches, or DCS.

How to administer UDP

Screen	Field
Dial Plan Record Second Digit Table	■ Uniform Dial Plan ■ UDP Extension Search Order
Uniform Dial Plan	■ All
AAR and ARS Digit Analysis Table	■ All
AAR and ARS Digit Conversion Table	■ All
Node Number Routing	■ Route Pat
Extension Number Portability Numbering Plan	■ All
Route Pattern	■ All

NOTE:
On the Uniform Dialing Plan screen, if you change the **Ext Code** and **Type** fields from a 4-digit or 5-digit extension number to **none**, a warning message informs you that all UDP extension codes will be lost. The same warning message displays when you change the **Ext Code** and **Type** extension numbers from 4-digits to 5-digits or from 5-digits to 4-digits.

Detailed description

UDP routes calls off the local switch by converting the extension number into a private-network number with 7 digits. This number is formed by prepending a 3-digit code (of the screen XXX) to the (last) 4 digits of the extension number. 3 types of conversion are supported: UDPCode, AARCode, and ENPNode.

- For UDPCode and AARCode, XXX is a 3-digit private-network location code, and the result is analyzed and routed via Automatic Alternate Routing (AAR). UDPCode conversion prohibits digit conversion via AAR; AARCode conversion permits it, just as if you dialed the AAR number instead of the extension.
- For ENPCode, XXX is called an Extension Number Portability (ENP) code. It is not used for routing; node-number routing is used instead. The ENP code is chosen based on the first 1 or 2 digits of the dialed string. Because it is not used for routing, the ENPCode can be independent of location.

UDP conversion is specified for individual extensions or groups of extensions sharing the same leading digits, via the UDP screen and extension codes. An extension code is the desired leading digits of an extension followed by an “x” (wildcard). For example, “123xx” “12345”is the extension code for all 100 possible extensions beginning with “123” plus two wild cards. “12345” is an extension code specifying one extension.

Each extension code can be assigned to 1 of 6 possible treatments.

- UDPCode — Conversion to AAR with given location code, further conversion suppressed
- AARCode — Conversion to AAR with given location code, further conversion allowed
- ENPCode — Conversion to private network number (via ENP screen), route to given node number routing
- TempOOS — Temporarily out of service, give reorder
- Local — Local range of extensions
- blank — Similar to local, however, this extension is not chosen when the system is asked to “add a station”

When a user at a switch that is included in a UDP dials an extension, DEFINITY ECS first checks to see if the extension is assigned to a local station on that switch. If so, the call is routed to the station, and UDP is not invoked. If the extension is not found locally, the system checks to see if the extension matches an assigned extension code. If the extension matches an assigned extension code, the system performs the specified conversion into a private network number and routes the call as specified. If more than one extension code matches, the “best” match (most explicit digits) is used. For example, 1234x is chosen over 123xx if 12345 is dialed. However, 123xx is chosen if 12355 is dialed. If no matching extension code is found, the user receives intercept treatment. Or, if Extended Trunk Access (ETA) is enabled, the call routes via ETA.

Example of how UDP works

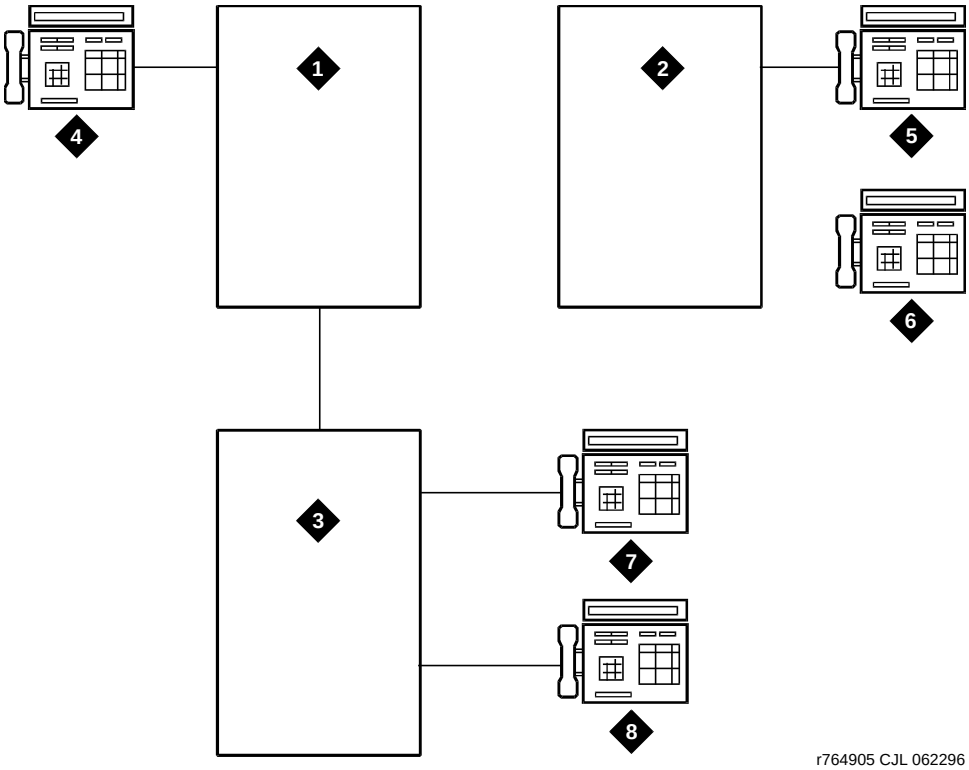
To administer, assign each UDP code:

- To a private network location code (RNX) or node number. (The RNX is equivalent to an office code of a central office in a public network. This RNX determines how a UDP call is routed.)
- Assign each UDP code as either local or remote to the switch.

To understand the function of a UDP, review the following example.

A given station is called using the same 5-digit extension regardless of where in the ETN the call originates. Three switches are included in the example. Each has been assigned a list of RNX and UDP codes. See Figure 6.

SWITCH	RNX	UDP CODE
A	224	41
C	223	51
C	223	52
B	222	60
B	222	61



1. **Switch A**
   Dial Plan for extensions is 41XXX
   RNX=224
2. **Switch B:**
   Dial Plan for Extensions is 60XXX and 61XXX RNX=222
3. **Switch C:**
   Dial Plan for extensions is 51XXX and 52XXX RNX=223
4. **Extension 41000**
5. **Extension 61234**
6. **Extension 60123**
7. **Extension 51234**
8. **Extension 5200**

Figure 6. UDP Example

If a user at extension 41000 wants to call extension 61234, there are two choices:

- Dial 61234
- Dial the AAR access code followed by 222-1234

If 61234 is dialed, the system recognizes 61 as a remote UDP, determines the associated RNX (222), and uses AAR to route the call to 222-1234.

If the AAR access code and 222-1234 are dialed, the system finds the route pattern for RNX 222 and routes the call to the switch associated with that RNX.

Whenever UDP is used to route a call to another switch, the correct digit deletion and insertion must be specified within the route pattern so that the receiving switch gets digits in the format it expects. DEFINITY ECS can be configured in several different ways.

- If AAR is available on the receiving switch, Subnet Trunking can be used to insert the AAR feature access code on the originating switch or digit insertion may be used to insert it on the receiving switch. The receiving switch then uses AAR digit conversion to convert 222 with 7 digits to an extension by deleting 3 digits and inserting a 6.
- If AAR is not available on the receiving switch, Subnet Trunking must be used on the originating switch to delete the 222 and insert the digit 6 at the beginning of the extension number so that the receiving switch can continue to route correctly.

If the user at extension 51234 on Switch C dials extension 61234, the call must first go through Switch A before proceeding to Switch B. When 61234 is dialed, the system recognizes 61 as a UDP code, determines the associated RNX (222), and uses AAR to route the call. The AAR feature access code plus 222-1234 are outpulsed to Switch A. Switch A then recognizes the RNX 222 as a remote switch and routes the call to Switch B and extension 61234. This same type of call routing occurs when an extension at Switch B calls an extension at Switch C.

If extension 61234 on Switch B calls extension 61235, the system recognizes 61 as a local UDP code and routes the call directly to extension 61235.

Considerations

- In North American network environments, extensions beginning with 0 may route to an attendant. You are encouraged to use another number as the leading digit when assigning extensions.
- When you call an extension on another switch, there may be a slight delay before call-progress tones are applied. This delay is due to the trunk signaling necessary to complete the call to the remote switch.
- When you select the option to look at the UDP table first, calls that might otherwise terminate at a local extension route over the network. This is easily reversed. When you remove the extensions from the UDP table, the local extension can be dialed again.
- If AAR is active, FRLs and Traveling Class Marks (TCMs) can be sent along with the private network number. UDPCode and AARCode conversions use the FRL assigned to the caller. ENPNode conversion always raises the FRL to the maximum (7).

  If an FRL is insufficient to access the facility, access is denied. There is no prompt for an authorization code even if authorization codes are enabled and administered.

- If AAR is not active, tandem-tie trunks should not be used to transport UDP numbers. The TCM is not recognized at the terminating switch.

NOTE:
Never use tandem-tie trunks to transport UDP numbers (the TCM and Hop count will not be recognized as such following the extension received at the receiving switch).

Interactions

- Automatic Alternate Routing

  AAR routes UDP calls. (Included with UDP is the required AAR subset.) If AAR is enabled in addition to UDP, then the 7-digit AAR number provides the same routing as UDP.

- Dial Plan

  — All of the extension numbers on a switch are not necessarily part of UDP. Any that do not belong to UDP are handled by a regular, non-UDP Dial Plan associated with the switch.

  — When administering the Dial Plan screen and designating a group of extensions as UDP non-local, you can specify whether you want to search for local extensions first or last. This allows flexibility to change extensions from local to non-local and vice-versa.

- DID Trunk Group

  DID calls to 5-digit UDP extension numbers require that the DID trunk group insert enough digits to make a 5-digit extension number.

- Distributed Communications System

  UDP is required when DCS is provided. The necessary UDP software is provided with the DCS software.

- Extension Number Portability

  If an extension code is administered to use ENP node routing, ENP routes the call to the correct switch. If AAR is enabled in addition to UDP, the 7-digit AAR number provides the same routing as UDP (that is, via ENP).

Private Network Access

Use Private Network Access to allow calls to other switching systems in a private network. These calls do not use the public network. They are routed over customer-dedicated facilities.

How to administer Private Network Access

Screen	Field
Trunk Groups Access APLT ISDN-BRI ISDN-PRI Tandem	■ All
Class of Restriction	■ Advanced Private Line Termination
Feature Access Code (FAC)	■ Automatic Alternate Routing Access Code
AAR and ARS Digit Analysis Table	■ All
AAR and ARS Digit Conversion Table	■ All
Node Number Routing	■ All
Station	■ COR

- Trunk Group Screens — Set the **Group Type** field to **access**, **aplt**, **tandem**, **tie**, or **isdn** and the **Service Type** field to **access**, **tie**, or **tandem**. Complete COR digit treatment and common type fields for tie trunk groups associated with a private network.

Detailed description

Private networks can include:

- Common-control switching arrangement (CCSA)
- Distributed Communications Systems (DCS) and Enhanced DCS (EDCS)
- Electronic tandem network (ETN)
- Enhanced private-switched communications service (EPSCS)
- Tandem-tie-trunk network (TTTN)
- Italian Traslatore Giunzione Uscente/Entrante/Interno (TGU/TGE/TGI) trunks

Unless prohibited by the COR, all incoming private network trunks, except CCSA, can access outgoing trunks without attendant or terminal-user assistance. All incoming CCSA calls must route to an attendant or a terminal user.

When off-network calling is part of the CCSA and EPSCS, long-distance calls route as far as possible over these networks before terminating on the public network. Thus, charges for toll calls are reduced. The COR you administer to individual system users determines whether access to this capability is allowed or denied.

In Italy, TGU/TGE/TGI trunks provide private network access between 2 switching systems. They also provide some feature transparency for COR (Inward Restriction), DID (when reaching busy stations), and Intrusion.

Interactions

- Attendant Call Waiting

  Call Waiting is provided via Italian TGU/TGE (main and satellite) trunks. Call Waiting also is provided in Italy and all other countries through DCS.

- Attendant Intrusion

  Attendant Intrusion is provided on satellite switches via TGU/TGE trunks. Attendant Intrusion also is provided through DCS.

Extension Number Portability

Extension Number Portability (ENP) gives you the ability to assign any extension to any switch in an ENP subnetwork. Stations can be moved across switches while retaining the original extension number, as long as the switches are part of the ENP subnetwork. EPN is used in conjunction with Automatic Alternate Routing (AAR) and Uniform Dial Plan (UDP).

How to administer ENP

Screen	Field
AAR and ARS Digit Conversion Table	■ All
Extension Number Portability Numbering Plan	■ All
Node Number Routing	■ All
Uniform Dialing Plan	■ Ext Code

- AAR Digit Conversion screen — Assign all 3-digit ENP codes as home, and if using a 5-digit UDP, associate the ENP codes with the leading, or 10 thousands, digit (that is, the fifth digit of the extension). For example, for extension number 73446, “7” is the 10 thousands digit.
- ENP Numbering Plan screen — Associate the leading one or two digits of extensions in the ENP subnetwork with a 3-digit ENP code, used to construct a 7-digit AAR-like ENP number.
- Node Number Routing screen — Associate a route pattern with each node in the ENP subnetwork.
- Uniform Dialing Plan screen — Enter the number of digits in the plan (4 or 5) and the Extension Codes for non-home extensions in the ENP subnetwork as ENPNode (node number routed).

Detailed description

The ENP Numbering Plan allows you to set 4- or 5-digit extensions in the ENP subnetwork to a 7-digit AAR-like number that is sent to other nodes in the network. Only the first 1 or 2 leading digits of the extension are significant.

ENP Codes are distinguished from AAR location codes because ENP Codes are home on every node within the ENP subnetwork, and ENP Codes are administered in the ENP Numbering Plan table as well as in the AAR Analysis table. Since ENP Codes are home on every node, they cannot be used as AAR location codes.

UDP extensions are converted to ENP numbers if node number routing is specified for the extensions in the UDP table.

NOTE:
One ENP code is required for a 4-digit ENP subnetwork. A 5-digit UDP requires one ENP code for each leading digit of extensions used within the ENP subnetwork.

DCS message signaling links are not required to support ENP. As a result, many multiple switch configurations are possible with ENP. Typically the ENP network will be a subnetwork of a UDP or Electronic Tandem Network (ETN).

Interactions

- Distributed Communications System

  If you use DCS, the ENP node numbers must correspond to DCS node numbers.

Description of DCS

DCS network configurations can be:

- TCP/IP DCS network — A DCS network configured with 2 or more switches using TCP/IP (PPP or 10/100BaseT Ethernet) signaling for transporting DCS feature transparency information.
- Traditional DCS network — A DCS network configured with 2 or more switches using BX.25 signaling for transporting DCS feature transparency information.
- D-channel DCS network (private network only) — A DCS network that includes DEFINITY ECS using the ISDN-PRI D-channel DCS transparency information (D-channel signaling). ISDN-PRI facilities with this type of network use only private-line facilities.
- D-channel DCS network (public network access/egress) — A DCS network that includes DEFINITY ECS using D-channel signaling. At least one of these ISDN-PRI facilities uses a public network ISDN-PRI.

- Integrated DCS network (private network only) — A DCS network that contains a variety of switches using TCP/IP, BX.25, or D-channel signaling methods. At least one DEFINITY ECS serves as an ISDN-PRI DCS Gateway node. This node can interwork DCS transparency information between the three signaling protocols.

  An ISDN-PRI DCS Gateway node provides backward compatibility to existing traditional DCS networks.

- Integrated DCS network (public network access) — The same as D-channel DCS Network (Private Network Only), but the D-channel of at least one ISDN- PRI facility uses a public network ISDN-PRI.

DCS Connectivity

ISDN/X.25 gateway

DEFINITY ECS can serve as an interface between PBXs that support the D-channel signaling feature and those that do not support this feature. The switch providing this interface is known as the ISDN-DCS Gateway node and provides backward compatibility to existing traditional DCS networks.

It maintains a mapping between processor channels and Administered NCA-TSCs. When a DCS D-channel message arrives on an Administered NCA-TSC acting as a gateway, it is converted to a traditional DCS message and sent out through the processor channel that has been administered to map to this Administered NCA-TSC. Likewise, when a traditional DCS message arrives at the gateway node on a processor channel acting as a gateway, it is converted to a DCS D-channel message and sent out through the Administered NCA-TSC that has been associated with this processor channel on the ISDN Gateway Channel screen.

In summary, a gateway is required whenever a transition is being made from BX.25 signaling to D-channel signaling. When the transition takes place at a switch that sits between that part of the network that supports D-channel DCS and that part that does not, that switch is an ISDN-DCS Gateway. A DCS network consisting entirely of switches that support D-channel DCS never requires an ISDN-DCS Gateway because none of the switches require “translation” to/from BX.25.

DCS Over ISDN-PRI D-channel

DCS Over ISDN-PRI D-channel (DCS+) enhances DCS by allowing access to the public network for DCS connectivity between DCS switch nodes. With this feature, DCS features are no longer restricted to private facilities.

The ISDN-PRI B-channel is used for voice communications, and the ISDN-PRI D-channel transports DCS control information. DCS Over ISDN-PRI utilizes the Message-Associated User-to-User Information (MA-UUI) and Temporary Signaling Connections (TSC) to transport certain DCS control information. MA-UUI allows additional user-specific information to be transported along with certain ISDN call-control messages.

NOTE:
Use this feature only over DS1/E1 or T1 circuit packs that are administered to Country Protocol Option 1, Protocol Version A (even in a private network environment) independent of what country the system is in.

How to administer DCS Over ISDN-PRI D-channel

Screen	Field
Signaling Group	■ Max number of NCA TSC ■ Max number of CA TSC ■ Trunk Group for NCA TSC ■ Administered NCA TSC Assignment fields ■ Service/Feature ■ Inactivity Time-out (min)
ISDN TSC Gateway Channel Assignments	■ All
Trunk Group (ISDN-PRI)	■ Used for DCS Node Number DCS Signaling ■ NCA TSC Trunk Member
Route Pattern	■ TSC ■ CA TSC Request
Processor Channel Assignment	■ Application
Feature-Related System Parameters	■ Record TSCs for CDR

NOTE:
There are several differences in administration between switches. For example, PRI is translated a little differently in G3r when traditional DCS and this feature are used in combination. On systems with AUDIX in a DCS environment, an additional column has been added to the Signaling Group screen so you can specify which AUDIX and switch to use. When traditional DCS and DCS over ISDN are used in combination, translations are also different.

Detailed description

A TSC provides a temporary signaling path through ISDN switches for exchanging supplementary service information on ISDN-PRI D-channels. There is no B-channel related to the connection; no data or voice transmissions take place.

There are two types of temporary signaling connections:

- Call Associated (CA-TSC)
- Non-Call Associated (NCA-TSC)

CA-TSC

A CA-TSC refers to a service for exchanging USER INFORMATION messages associated with an ISDN B-channel connection by the call reference value of the call control data packets. On DEFINITY ECS, this type of TSC is used only for DCS features on ISDN-PRI Signaling Groups administered with Supplementary Service Protocol a.

NCA-TSC

An NCA-TSC is a connection not related with any ISDN B-channel connections. DECINITY ECS supports two types of NCA-TSC that conform to two different protocol standards:

- The QSIG type of NCA-TSC is used for certain QSIG features such as Call Completion (Automatic Call Back). This type of NCA-TSC is referred to in the QSIG protocol standards as a Call-Independent Signaling Connection (CISC). Only ISDN-PRI Signaling Groups administered with Supplementary Service Protocol *b* support QSIG NCA-TSCs. For further information, see NCA-TSC (page 333).
- The AT&T type of NCA-TSC is used for the DCS Over ISDN-PRI D-channel and DCS AUDIX applications. Only ISDN-PRI Signaling Groups administered with Supplementary Service Protocol *a* support AT&T NCA-TSCs.

  An AT&T NCA-TSC is an administered virtual connection established for exchanging USER INFORMATION messages on the ISDN D-channel. Once an AT&T NCA-TSC has been administered and enabled, it is active for an extended period of time. There are two types of administered NCA-TSCs depending on their setup mechanism:

  — Permanent (can be established by Near-end or Far-end)

  — As-needed

  Once enabled, a permanent NCA-TSC remains established while the system is running. If the permanent NCA-TSC drops for any reason, the system attempts to reestablish the connection. An as-needed administered NCA-TSC is established based on user request and the availability of TSC facilities. The connection drops after an administered period of inactivity.

The system can transport DCS or DCS AUDIX messages over an ISDN-PRI D-channel and over BX.25 data links when functioning as a gateway between a switch equipped with DCS Over ISDN-PRI D-channel and a switch equipped with traditional DCS using BX.25 data links. In this situation, the messages travel from the gateway through the NCA-TSCs or CA-TSCs to TSC-capable switches and from the gateway to switches that support only traditional DCS via a BX.25 logical channel.

At least one switch must be configured as an ISDN DCS Gateway node in a DCS network that consists of switches that support DCS Over ISDN-PRI D-channel and PBXs that do not support the feature. Switches directly connected to AUDIX serve as Gateway nodes.

Asynchronous PPP over Analog Trunks

Asynchronous linking also provides the capability of DCS connectivity over analog trunks. A router and an external modem help provide this capability. The router converts the Ethernet IP packets to be transmitted over analog facilities using PPP via the external modem. (For DEFINITY ONE, the Windows NIC interface would provide the LAN interface for the direct connection.)

DCS Features

Once you have connected and set up your DCS network, you can provide the following features across the network:

Alphanumeric Display for Terminals

This feature allows calling-name display, called-name display, and miscellaneous identifiers to be transferred from a terminal on one node to a terminal on another node.

Attendant Control of Trunk Group Access

DCS Attendant Control of Trunk Group Access allows an attendant at any node in the DCS to control an outgoing trunk group at an adjacent node in the cluster. The attendant uses a remote-tgs feature button on the console for this purpose.

To use this feature, you must have a DCS Trunk Group between the local and remote switches, and the trunks in that trunk group cannot insert digits on incoming calls. If you need digit insertion on these trunks, it should be added on the outgoing trunk based on the dialed string.

NOTE:
DCS Attendant Control of Trunk Group Access is not available if you are using D-channel DCS.

Attendant Direct Trunk Group Selection

DCS Attendant Direct Trunk Group Selection allows attendants at one node to have direct access to an idle outgoing trunk at a different node in the DCS. This feature functions the same as regular Direct Trunk Group Selection. However, the attendant uses a remote-tgs feature button on the console for this purpose.

NOTE:
DCS Attendant Direct Trunk Group Selection is not available if you are using D-channel DCS.

To use this feature, you must have a DCS Trunk Group between the local and remote switches, and the trunks in that trunk group cannot insert digits on incoming calls. If you need digit insertion on these trunks, it should be added on the outgoing trunk based on the dialed digits.

You can assign a Trunk Hundreds Select button to access a trunk group at the local node or a trunk group at a remote node. A Trunk Group Select button assigned to access a remote node is referred to as a remote Trunk Hundreds Select button. Pressing a remote Trunk Group Select button is the same as dialing the tie trunk group access code for the remote node and the trunk access code of the selected trunk.

Attendant Display

The DCS attendant console displays calling-party ID and called-party ID information for calls to and from remote switches in the network.

Automatic Callback

DCS Automatic Callback allows a user at one node to make an automatic callback call to a user at another node in the DCS.

A DCS Automatic Callback call can be initiated from a terminal at one node to a terminal at another node in the same way as if at a local node under the following conditions.

- If the called party is at a System 85, Generic 2, or Enhanced DIMENSION PBX node, the callback call can only be activated if the called node is returning busy tone or special audible ringback.
- If the called party is at a Generic 3, Generic 1 or System 75 node, the callback call can be activated if the called node is returning busy tone, Call Waiting ringback tone, or ringback tone.
- The calling party must disconnect within 6 seconds after hearing the confirmation tone for Automatic Callback activation.

NOTE:
If the calling party is on a System 85, Generic 2, or Enhanced DIMENSION PBX node and is unable to receive the callback call (for example, a busy single-line voice terminal without Call Waiting), Automatic Callback is

reactivated by the calling party's node. If the calling party is on a Generic 3, Generic 1, or System 75 node and is unable to receive the callback call, the callback call is canceled.

Automatic Circuit Assurance

DCS Automatic Circuit Assurance (ACA) allows a voice-terminal user or attendant at a node to activate and deactivate ACA referral calls for the entire DCS network. This transparency allows the referral calls to originate at a node other than the node that detects the problem.

If referral calls are generated at a node for one or more remote nodes, the remote nodes are notified when ACA referral is activated or deactivated.

Busy Verification of Terminals and Trunks

DCS Busy Verification of Terminals and Trunks allows attendants and multiappearance voice-terminal users to make test calls to voice terminals and trunk groups that are located at other nodes in the DCS.

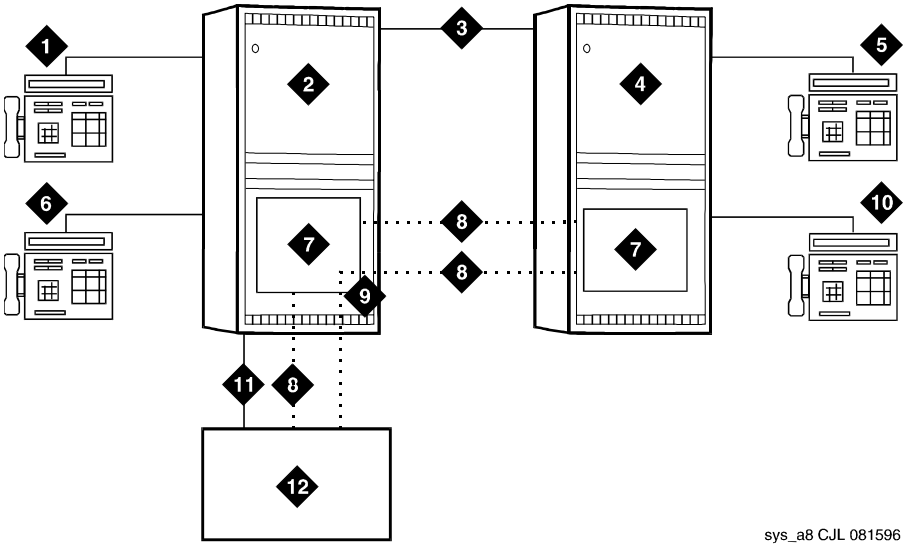
To use this feature, you must have a DCS Trunk Group between the local and remote switches, and the trunks in that trunk group cannot insert digits on incoming calls. If you need digit insertion on these trunks, it should be added on the outgoing trunk based on the dialed digits.

Multiappearance voice terminal users can busy-verify an adjunct at a remote location by pressing Verify and dialing the TAC of the tie trunk group to the remote node. Then they must press Verify a second time and dial the desired TAC and the trunk group member number to be verified. Verification of the trunk then continues as if the trunk is on the same node.

Call Coverage

DCS Call Coverage provides DCS messaging required for calls to be covered on remote systems when there is a DCS signaling link (BX.25, PPP, or ISDN-PRI) for the trunk groups. Calls to an extension on one system are covered by extensions on remote systems that are administered as coverage points.

Figure 7 shows an example of DCS Call Coverage.



1. Station A
2. System A - DEFINITY ECS
3. DCS Tie Trunk Groups
4. System B - DEFINITY ECS
5. Station C
6. Station B
7. PGATE or PI Board
8. X.25 or ISDN PRI DCS Signaling Link
9. Hop or ISDN TSC Gateway
10. Station D
11. AUDIX Voice Lines
12. AUDIX - x34000

Figure 7. DCS Call Coverage

In Figure 7, calls to Station A can be covered first by Station B, then by Station C or D, and finally by the AUDIX on system A. Alternatively, calls could be covered by Station C, then Station B, then Station D, and so on.

If the called party answers after the call goes to coverage and the coverage point has answered, then the called party, calling party, and coverage point are all conferenced together.

If the called party answers and the coverage point has not answered, the call to the coverage point drops and the called party connects to the calling party.

Exceptions to DCS Call Coverage

DCS Call Coverage is similar to Call Coverage, with the following exceptions:

— Coverage Answer Groups across nodes are not supported.

— Under the following error conditions, a call follows the coverage point's coverage path.

Error Condition	Action
DCS link not up. or DCS trunk is not available. or DCS Call Coverage feature is not activated on the remote system.	The call is routed to the remote coverage point. If the call is answered, it is treated as Call Coverage Off Premises (also called Remote Call Coverage). If the call is redirected at the remote coverage point before the DCS SRI expires, the remote point's path is followed. If the call is not answered within the DCS SRI time-out period, the next coverage point is tried with DCS Call Coverage from the local system.
All trunks to the remote system, DCS or otherwise, are busy	The next coverage point is tried with DCS Call Coverage from the local system.

— When the DCS link is down, call consult operates differently. If Station A calls Station B but the call covers to Station C, then Station C consults back to Station B and Station B receives the consult call on the next call appearance.

— DCS Call Coverage does not support Coverage Call Back from a remote node.

Additionally, in some DCS Call Coverage situations, call coverage operation may deviate, including:

— A call to the principal redirects to the remote coverage point, which is unavailable. The coverage point is considered unavailable when:

- The coverage point is not a valid extension, QDN, or VDN.
- The coverage point is busy with no hunting, forwarded, or has send all calls activated, or activates send all calls after ringing.
- The coverage point has no staffed agents or an invalid vector.

  When the coverage point is unavailable, the local system determines the availability status from a time-out or from a message from the remote system. When the local system discovers that the coverage point is unavailable, it tries the next coverage point. If the last coverage point is unavailable, the previous coverage point rings until it is answered or until the caller hangs up. If only one coverage point exists in the path and it is unavailable, the principal's station rings until it is answered or until the caller hangs up.

— A call to the principal is forwarded and the forwarded-to extension is not available. In this case, the first coverage point in the principal's path is tried. Note that the coverage does not follow the forwarded-to extension's coverage path.

— A call to the principal redirects to the remote coverage point, which answers. Subsequently, the principal goes off hook. In this case, the local system bridges the principal onto the call between the calling party and coverage point creating a conference among the three. The principal receives the call on the same call appearance as the original call.

— A call to the principal redirects to the remote coverage point. While the remote coverage point is ringing, the principal answers the call. In this case the call is not cut through to the coverage point. Instead, ringing and ringback is removed from the coverage point and the call is cut through to the principal.

Call Forwarding

DCS Call Forwarding allows all calls to an extension to be forwarded to a selected extension in the DCS network or to an external (off-premises) number.

If the Call Forwarding and DCS Call Forwarding are both active, and if a call is forwarded between extensions on the same node, the Call Forwarding coverage path is used. If the nodes are different, the DCS Call Forwarding coverage path is used.

Voice-terminal users in the DCS can activate/deactivate this feature with a dial access code or with a Call Forwarding button.

NOTE:
Calls can be forwarded to a Vector Directory Number (VDN) anywhere in the DCS network. An attendant cannot activate/deactivate Call Forwarding for a VDN.

Call Waiting

DCS Call Waiting allows calls from one node to busy single-line voice terminals at another node to wait until the called party is available to accept the call. With DCS Call Waiting, a single-line voice terminal user, by knowing a call is waiting, can quickly process calls from locations within the DCS. DCS Call Waiting functions the same as normal Call Waiting.

DCS Call Waiting includes the following features:

— Attendant Call Waiting

— Call Waiting — Termination

— Priority Calling

DCS priority calling from the attendant station is *not* available.

Distinctive Ringing

DCS Distinctive Ringing activates the called-terminal alerting or ringing device to indicate the type of incoming call to the user before they answer it. Distinctive Alerting functions in a DCS environment the same as it does within a single system.

By default, internal calls are identified by a1-burst ringing pattern, external calls by a 2-burst ringing pattern, and priority calls by a 3-burst ringing pattern. However, you can administer these patterns.

Leave Word Calling

LWC transparency in a DCS configuration allows messages from a DEFINITY switch to another node, depending on the storage capability of the remote node.

Multiappearance Conference/ Transfer

DCS Multiappearance Conference/Transfer provides transparency for transferring calls and conferencing calls within a DCS network. A user in the DCS can initiate conference calls among or transfer calls originated from extensions in the DCS network to another extension within the DCS by dialing the UDP extension. (For transferred calls, the destination need not be within the DCS.)

In a DCS, if a party in a conference hangs up or completes a transfer leaving only outgoing trunks on the call, the system attempts to preserve the connection if any of the remaining parties on the call is a DCS tie trunk.

Trunk Group Busy/Warning Indication

DCS Trunk Group Busy/Warning Indication provides attendants with a visual indication that the number of busy trunks in a remote group reached an administered level. A visual indication is also provided when all trunks in a trunk group are busy.

NOTE:
DCS Trunk Group Busy/Warning Indication is not available if you are using DCS over ISDN-PRI.

To use this feature, you must have a DCS Trunk Group between the local and remote switches, and the trunks in that trunk group cannot insert digits on incoming calls. If you need digit insertion on these trunks, it should be added on the outgoing trunk based on the dialed digits.

Except for System 75, System 85, and DEFINITY G2 switches, you can administer DCS Trunk Group Busy/Warning Indication only for remote trunk groups that are directly connected to the local switch. Trunk group access codes for these trunk groups must be 3 digits or less and cannot include trunk members 100 through 999.

DCS with Rerouting

DCS with Rerouting allows a call's connection between two DEFINITY systems to be replaced by a new connection. All of the trunks used in the original path must be DCS and the new path utilizes only DCS trunks. DCS with Rerouting provides the following capabilities:

- Attempts to obtain a better (generally less expensive) connection.
- May replace the current path of a call with a route that is better in terms of Automatic Alternate Routing/Automatic Route Selection (AAR/ARS) routing preferences administered on a DEFINITY ECS.
- Frees up resources being used unnecessarily.

DCS with Rerouting must be enabled on a switch-wide basis and the trunk groups involved must be administered as SSE. DCS with Rerouting primarily provides you with the ability to be more effective with the usage of Trunk groups administered for Supplementary Services Protocol Option E (SSE) during the existence of an active call. This means using a more preferred route (in terms of UDP/AAR/ARS routing preferences administered on the PBX) between the PBXs involved.

Starting with DEFINITY R9, DCS with Rerouting can be invoked after Call Coverage. This Call Coverage will also apply to AUDIX. To invoke DCS with Reroute in R9, perform the following administration:

1. On the System-Parameters Coverage screen, enter **n** in the Maintain SBA at Principal field. DCS with rerouting can only occur if you do not need to maintain a simulated bridged appearance at the principal.
2. On the System-Parameters Customer-Options screen, enter **y** in a new field called DCS with Rerouting. (The default for this field is **n**.)
3. On page 1 of the Trunk Group screen, enter **e** in the Supplementary Services Protocol field. This new SSE option will allow limited QSIG signaling over DCS trunks. To enable this value (**e**), review the following fields on this screen for the appropriate values:
   - DCS with Rerouting must be set to **y**.
   - Service Type must not be set to **dmi_mos** or **SDDN**.
4. On page 2 of the Trunk Group screen, review the following fields for the appropriate values:
   - Used for DCS must be set to **y.**
   - Send Name can only be set to **y** or **n**. You cannot use **restricted**.

Beginning in Release 6.1, users invoked DCS with Rerouting by Call Transfer, Transfer out of AUDIX, and dial 0 out of AUDIX.

Feature Interactions

- When interworking with non-ISDN trunks or non-Supplementary Service Option E ISDN trunks, DEFINITY acts as a gateway in the following sense:
  - When a call is tandeming through a DEFINITY system from a non-ISDN trunk to an SSE trunk or from a non-Option E to an SSE trunk, the system acts as an incoming gateway.
  - When a call is tandeming through a DEFINITY system from an SSE trunk to a non-ISDN trunk or from an SSE trunk to a non-Option E trunk, the system acts as an outgoing gateway.

    As an example, when calls come in from the public network to the DCS network and then are transferred to another extension within the private network, DEFINITY functions as an incoming gateway and rerouting occurs.
- If a conference call is transferred, rerouting will not occur.

Italian DCS Protocol

Italian DCS Protocol (also known as Enhanced DCS) adds features to the existing DCS capabilities.EDCS is used primarily in Italy. EDCS adds the following features:

- Exchanging information to provide class of restriction (COR) checking between switches in the EDCS network
- Providing call-progress information for the attendant
- Allowing attendant intrusion between a main and a satellite
- Allowing a main PBX to provide DID/CO intercept treatment rather than the satellite PBX.

NOTE:
EDCS is not compatible with DCS Over/Under ISDN-PRI. With EDCS, all nodes must use EDCS. If used with ISDN-PRI, configure the switch as a DCS node. Also, DCS-ISDN display enhancements are not currently available in EDCS.

How to administer Enhanced DCS

Screen	Field
Feature-Related System Parameters	■ Enhanced DCS Enabled ■ Apply Intercept Locally ■ Enforce PNT-to-PNT Restrictions

DCS feature considerations

Attendant

- If you call an attendant on another switch in the DCS network, your display shows the attendant's name, but does not show the attendant's extension, instead you see a zero where the extension should be.

Alphanumeric Display considerations

- On outgoing DCS calls, display of the called name may be delayed for a few seconds until the required information arrives from the distant node. The called name display only works between DEFINITY ECS, DEFINITY Generic 1 and Generic 3 Systems, and System 75s.

Attendant Control of Trunk Group Access considerations

- This feature is not available for trunk groups with 4-digit trunk access codes or for trunk members 100 through 999.
- If the remote node (where the trunk group to be controlled resides) is a System 75, Generic 1, or Generic 3, it is not necessary for that node to have an attendant console with corresponding three-lamp Trunk Hundreds Select button. However, if the remote node is a System 85, Generic 2.1, or Enhanced DIMENSION PBX, control of the trunk group is not allowed unless an attendant at that node has a corresponding three-lamp Trunk Group Select button.
- The attendant must use the Remote Trunk Hundreds Select button to directly access the controlled remote trunk group. If an attendant controls a remote trunk group, and that attendant dials the trunk access codes of the DCS tie trunk and the controlled remote trunk group, the call is routed to the attendant at the node where the trunk group resides.
- If Attendant Control of Trunk Group Access is activated, and no attendant is assigned, or the attendant is later removed, calls to a controlled trunk group route to the attendant queue.

Attendant Direct Trunk Group Selection considerations

- This feature is not available for trunk groups with 4-digit trunk access codes or for trunk members 100 through 999.

Attendant Display considerations

- CORs for a DEFINITY switch may not correspond to those used by an Enhanced DIMENSION PBX, System 85, or DEFINITY system Generic 2.1. Therefore, if the DCS network contains nodes other than Generic 1 or Generic 3, the display CORs may be misinterpreted. If it is important that certain CORs between various systems correspond with each other, those CORs should be administered accordingly.
- On outgoing calls, the display of called party information may be delayed a few seconds until the required information arrives from the remote node. The called party information is displayed only if both nodes are Generic 1 or System 75.
- DCS tie trunks between nodes must be administered with the Outgoing Display enabled. This enables the called party's name to be displayed at the calling attendant's display.

Automatic Callback considerations

- An Automatic Callback request is canceled automatically if the called party does not become available within 40 minutes, or if the calling party does not hang up within six seconds after activating Automatic Callback.

DCS Over ISDN-PRI D-channel considerations

- The gateway node serves as the terminating node to the D-channel DCS network as well as the terminating node to the traditional DCS network.

  A PBX serving as an ISDN DCS Gateway node introduces some interesting situations when administering processor channels in an associated traditional DCS PBX. In a traditional DCS network, (BX.25 processor channel links) **Remote Port** in the "Processor Channel Assignments" screen refers to the processor channel of the destination PBX. In an Integrated DCS network, **Remote Proc Chan** in the "Processor Channel Assignments" screen refers to the processor channel of the Gateway PBX (if the destination PBX is an ISDN DCS PBX), *not* the destination PBX.

  On the contrary, **Machine-ID** in the "Processor Channel Assignments" screen refers to the destination PBX, either an ISDN DCS PBX or a traditional DCS PBX. The Gateway PBX number must not be used in this field if the destination PBX is an ISDN DCS PBX.

Enhanced DCS considerations

- If the DCS link fails, the administrator can choose to allow calls to continue without class of restriction checking or to block all DCS calls to inward-restricted stations.

LWC considerations

- LWC cannot be successfully activated toward any system that is not capable of storing the messages, either internally or in an associated adjunct.
- Messages from one node, through an intermediate node, to a remote node do not require storage capability at the intermediate node.
- LWC transparency is supported for all DCS configurations except for cases when either the activating node or the remote node is either an ENHANCED DIMENSION PBX or a System 85 R2V1.
- Retrieval of LWC messages is permitted only from a terminal at the node where the messages are stored.
- DCS LWC cannot be activated from an attendant console.

Trunk Group Busy/Warning Indication considerations

- Trunk Group Busy and Trunk Group Warning Indication is particularly useful with the Attendant Control of Trunk Group Access feature. The indicators alert the attendant when control of access to local and remote trunk groups is necessary.

DCS Interactions

Alphanumeric Display

The following features allow transparency with respect to Calling or Called Name Display and miscellaneous ID.

- Call Coverage

  At the calling terminal, the miscellaneous id “cover” is not displayed.

- Call Forwarding

  When a system user calls a party on a different node in the DCS and the call is forwarded, the miscellaneous ID “forward” is not displayed. At the covering (forwarded-to) user’s terminal, only the calling party’s name is shown; the called party’s name is not displayed.

- Call Park

  When a DCS call between a local system user and a user on another node is parked by the remote user, the miscellaneous ID “park” is not displayed at the local terminal.

- Call Pickup

  When a DCS call from a system user to another node is answered by way of Call Pickup, the miscellaneous ID “cover” is not displayed at the caller’s terminal.

- Call Waiting

  When a DCS call from a system user to another node is waiting at the called terminal, the miscellaneous ID “wait” is not displayed at the caller’s terminal.

- CAS

  When a user dials the extension for CAS, a RLT is seized or the caller is queued for an RLT. The caller’s terminal displays the trunk group identifier, such as OPERATOR.

- ISDN-PRI

  If both DCS and ISDN-PRI features are provided with a system, the ISDN-PRI display information displays in DCS format.

DCS Attendant Control of Trunk Group Access

- DCS Attendant Display

  When a user attempts to access a controlled trunk group and is routed to the local attendant, the display shows the reason the call was redirected. If the call is routed via CAS or the Inter-PBX Attendant Calls feature, the display does not show the reason the call was redirected.

- UDP

  DCS tie trunks should not be attendant controlled. This would result in all UDP calls on the controlled tie trunk being routed to the controlling attendant instead of to the desired destination.

Attendant Display

- When both ISDN and DCS display information, or only DCS display information, is received, the switch displays the DCS display information in the DCS format. If ISDN display information is received, and no DCS display information is received, then the ISDN display information displays in the ISDN formats.

Automatic Callback

- Attendant Control of Trunk Group Access and DCS Attendant Control of Trunk Group Access

  Automatic Callback cannot be activated if the call uses a controlled trunk group.

Busy Verification

- If the Trunk Identification by Attendant feature is used during busy verification of a trunk (Trunk ID button is pressed), the trunk access code and trunk group member number of the DCS tie trunk being used is displayed.
- DCS Busy Verification of Terminals and Trunks transparency is lost if the routing pattern is administered to not delete the RNX and the AAR prefix is inserted on the terminating switch trunk group. The voice terminal display at the terminating switch displays only **a=station name**. **Extension** is left blank.

Call Coverage

DCS Call Coverage has the same interactions as Call Coverage plus the following additional interactions.

- Call Coverage Off Premises

  If the coverage point is a non-UDP number in the remote call coverage table, Call Coverage Off Premises is applied to the call rather than DCS Call Coverage, even if a DCS link exists to the remote system.

- Coverage Answer Groups

  DCS Call Coverage to Coverage Answer Groups on remote systems are not supported by DCS Call Coverage. Coverage answer groups cannot be administered on a system other than the principal's system.

- Coverage Call Back

  DCS Call Coverage does not support Coverage Call Back from a remote node.

- Displays

  The displays on the DCS Call Coverage point's terminal may be different than those associated with the Call Coverage feature in the following situations:

  — When the call from the calling party to the principal or the redirected call to the coverage point travel over ISDN-PRI trunk groups.

  — When the calling party is on a System 85 or Generic 2.

  — When the DCS name message is not received by the remote (coverage point's) system.

- Go to Cover

  Go to Cover is not supported over DCS and therefore is not supported with DCS Call Coverage.

- Leave Word Calling Back to Principal

  With DCS Call Coverage, a covering user on a different node cannot press their LWC button to leave a message for the principal to call the covering user.

- Queuing

  DCS Call Coverage interacts with queuing in the following way. If a call is queued to a coverage point, such as a queue to a hunt group or an ACD split, and the queue is not full, the call remains in the queue without subsequent redirection until answered or until the caller hangs up.

Call Forwarding

- If the forwarding extension and the designated extension are at different nodes, and the designated extension's coverage criteria are met on a forwarded call, the call is redirected to a point in the designated extension's coverage path.
- If the forwarding extension and the designated extension are at different nodes, LWC and Coverage Callback cannot be activated at the designated extension for a forwarded call.
- There is a 30-second interval during which calls forwarded from the DEFINITY switch to another DCS node is denied. This prevents forwarded incoming trunk calls from being forwarded ad infinitum between two extensions.

Call Waiting

- DCS Call Waiting is denied when the following features are activated at the single-line voice terminal:
  - Automatic Callback (to or from the voice terminal)
  - Data Privacy
  - Data Restriction
- On incoming trunk calls to the attendant extended over DCS trunks, Attendant Call Waiting interacts with the EDCS feature.

DCS Over ISDN-PRI D-channel

- ASAI

  For incoming calls on DCS over ISDN-PRI, ASAI applications receive the ISDN-PRI Calling Party Information, not the DCS Calling Party Information.

- Attendant DXS with Busy Lamp Field

  An attempt by the attendant to directly select an extension that has been previously administered as belonging to a administered NCA-TSC results in intercept tone being received.

- CDR

  CDR records both the status and the utilization of TSCs. Both CA-TSCs and NCA-TSCs can be recorded. For more information, consult the CDR description in this manual or the CDR manual.

- D-channel Backup

  In the event of a D-channel switchover (primary to secondary or secondary back to primary) in a private network, administered NCA-TSCs that were active are assumed to have remained active. Any unacknowledged user-user service requests are assumed to be rejected, and administered NCA-TSCs which were in the process of being established at the time of the switchover are dropped when the switchover occurs. Those administered NCA-TSCs that were dropped are reattempted again.

  If a D-channel switchover occurs on a D-channel going to the public network then all TSCs are dropped. A maintenance-provided “heartbeat” message periodically is sent over each permanent administered NCA-TSC to ensure that such a situation is detected and recovered from.

- Distributed Communications System AUDIX (DCS AUDIX)

  The DCS over ISDN-PRI D-channel feature can be used to support DCS AUDIX. (The connection between G3si and AUDIX should be BX.25.)

- GRS

  GRS selects TSC compatible facilities when routing NCA-TSCs. In other words, a NCA-TSC request can only select a routing preference that supports TSCs.

  In a tandem node, GRS first selects facilities that support TSCs if the call falls into any one of the following two conditions:

  — It requests a CA-TSC explicitly

  — It contains a DCS information element in the SETUP message

  Once a trunk group with available members is selected, the call proceeds even if all the TSCs belonging to the associated signaling group are active. In other words, the completion of a call is given priority over DCS transparency.

- SDN

  The DCS over ISDN-PRI D-channel feature allows the system to access public networks such as SDN. SDN supports all DCS features except for the following:

  — DCS Attendant Control of Trunk Group Access

  — DCS Attendant Direct Trunk Group Selection

  — DCS Busy Verification of Terminals and Trunks

- Voice Terminals

  An attempt to dial an extension that has been previously administered as belonging to an administered NCA-TSC results in intercept tone being received.

Distinctive Ringing

- Distinctive Ringing

  Distinctive Ringing treats a call from another switch in a DCS arrangement as external; DCS Distinctive Ringing treats such calls as internal. If both features are administered, DCS Distinctive Ringing takes precedence. If EDCS is activated, DID treatment may be different. See Example DCS configurations (page 295).

Enhanced DCS

- Class of Restriction

  When a call goes to coverage, it is the called party's (not the covering party's) restrictions that are used.

LWC

- DCS Multi-appearance Conference/Transfer

  Activation of LWC is denied after a DCS call has been conferenced or transferred.

Multiappearance Conference/Transfer

- Voice Terminal Display

  No display transparency is provided for DCS Multi-Appearance Conference/Transfer.

- EDCS

  On calls to or from Public Network Trunks, calling/called party restrictions are checked when EDCS is active.

Trunk Group Busy/Warning Indication

- Loudspeaker Paging Access

  If Trunk Hundreds Select buttons are assigned for Loudspeaker Paging Access zones, Trunk Group Busy Indicators provide a visual indication of the busy or idle status of the zones at the remote location as well as at the local node.

Example DCS configurations

The following two examples provide details for setting up two basic DCS networks. The first is a two-node network and the second is a three-node network. These examples use BX.25 and D-Channel signaling connections. For examples of TCP/IP signaling for DCS, see Chapters 2 and 3 in this book.

2-Node private network with AUDIX

Figure 8 shows a 2-node DCS/AUDIX D-channel network. In this configuration, DCS feature transparency is achieved exclusively through the exchange of user-to-user information on the D-channel using one of the three methods discussed earlier — MA-UUI, CA-TSCs or NCA-TSCs. Although NCA-TSCs are nothing more than virtual connections on the D-channel, they are shown as independent entities in the diagram for the purposes of clarity. Administered TSC 2/1 (that is, the first Administered NCA-TSC of signaling group 2) of Switch A is connected to TSC 4/1 of Switch B. This virtual connection is used in the exchange of user-to-user information for DCS features not associated with any current B-channel connection.

Notice that for AUDIX, a BX.25 data link is no longer required between the host switch and the remote switch(es). AUDIX messages between the AUDIX and the remote switch will use the AUDIX Gateway functionality of the host switch and will be transported to the remote switch via an NCA-TSC. Specifically, AUDIX messages destined for Switch B will arrive at Switch A on Link 1, Channel 2 (processor channel 57), be converted to ISDN-PRI Q.931 format and sent out via Administered NCA-TSC 2/2.

This is accomplished by administering processor channel 57 as a gateway and mapping it on the gateway screen to Administered NCA-TSC 2 of signaling group 2 that is also administered as a gateway.

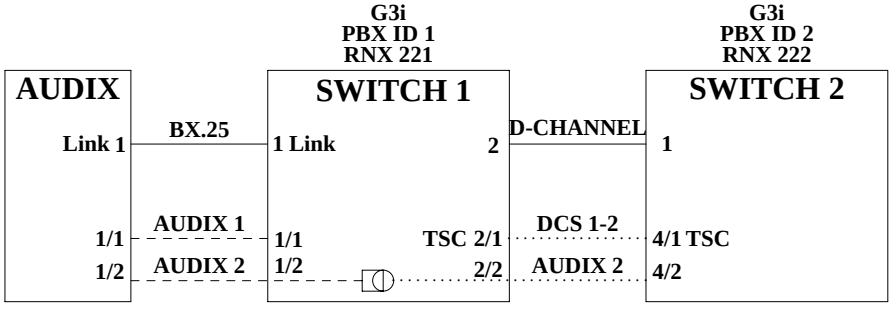


Figure 8. 2-Node private network

The following tables show you how you would complete each of the necessary screens.

AUDIX administration

- AUDIX Translations screen

Switch Number	AUDIX Port	Switch Port[1]	Logical Channel	Data Link
1	1	59	1	1
2	2	57	2	1

1. Switch Port refers to the processor channel that is used for AUDIX in the PBX.

Administration for switch 1

- Dial Plan screen

Start Dig.	Len	Usage
4	4	ext
5	4	ext

- Uniform Dial Plan screen

Ext Code	Type	Location Code
5xxx	UDPcode	222

- AAR Digit Conversion screen

Matching Pattern	Min	Max	Del	Replacement String	Net	Conv
221	7	7	3	-	ext	n

- AAR Analysis Table

Dialed String	Min	Max	Rte Pat	Call Type	Node Num
222	7	7	2	aar	2

- Signaling Group screen (signaling group 2)

TSC	Local	Enabled	Establish	Dest.	Far-end	Appl.
Index	Ext.			Ext.	PBX-ID	
1	4900	y	permanent	5900	2	dcs
2	4901	y	permanent	5901	-	gateway

- Trunk Group screen

Group #	Grp Type	Used for DCS	DCS Sig. Method	PBX ID
2	isdn-pri	y	d-chan	2

- Routing Pattern screen

Routing Pattern #	Trunk Group #	FRL	Del	TSC	CA-TSC Request
2	2	0	3	y	at-setup

- Gateway Channel screen

Signaling Group	TSC Index	Processor Channel	Application
2	2	57	audix

- Processor Channel screen

Proc Channel	Application	Inter. Link	Channel	Remote Proc. Channel	PBX ID
57	gateway	1	2	2	-
59	audix	1	1	1	1

Administration for switch 2

- Dial Plan screen

Start Dig.	Len	Usage
4	4	ext
5	4	ext

- Uniform Dial Plan screen

Ext Code	Type	Location Code
4xxx	UDPcode	221

- AAR Digit Conversion screen

Matching Pattern	Min	Max	Del	Replacement String	Net	Conv
222	7	7	3	-	ext	n

- AAR Analysis Table

Dialed String	Min	Max	Rte Pat	Call Type	Node Num
221	7	7	1	aar	1

- Signaling Group screen (signaling group 4)

TSC Index	Local Ext.	Enabled	Establish	Dest.	Far-end Ext.	Appl PBX-ID
1	5900	y	permanent	4900	1	dcs
2	5901	y	permanent	4901	-	audix

- Trunk Group screen

Group #	Grp Type	Used for DCS?	DCS Sig. Method	PBX ID
1	isdn-pri	y	d-chan	1

- Routing Pattern screen

Routing Pattern #	Trunk Group #	FRL	Del	TSC	CA-TSC Request
1	1	0	3	y	at-setup

3-Node public/private network with AUDIX

The D-channel signaling feature expands the domain of DCS networks by supporting configurations that include public network ISDN facilities utilizing network services including Software Defined Network (SDN). By eliminating the need for dedicated private line facilities, this feature allows geographically dispersed DCS networks to be cost effective. Figure 9 shows a 3-node network.

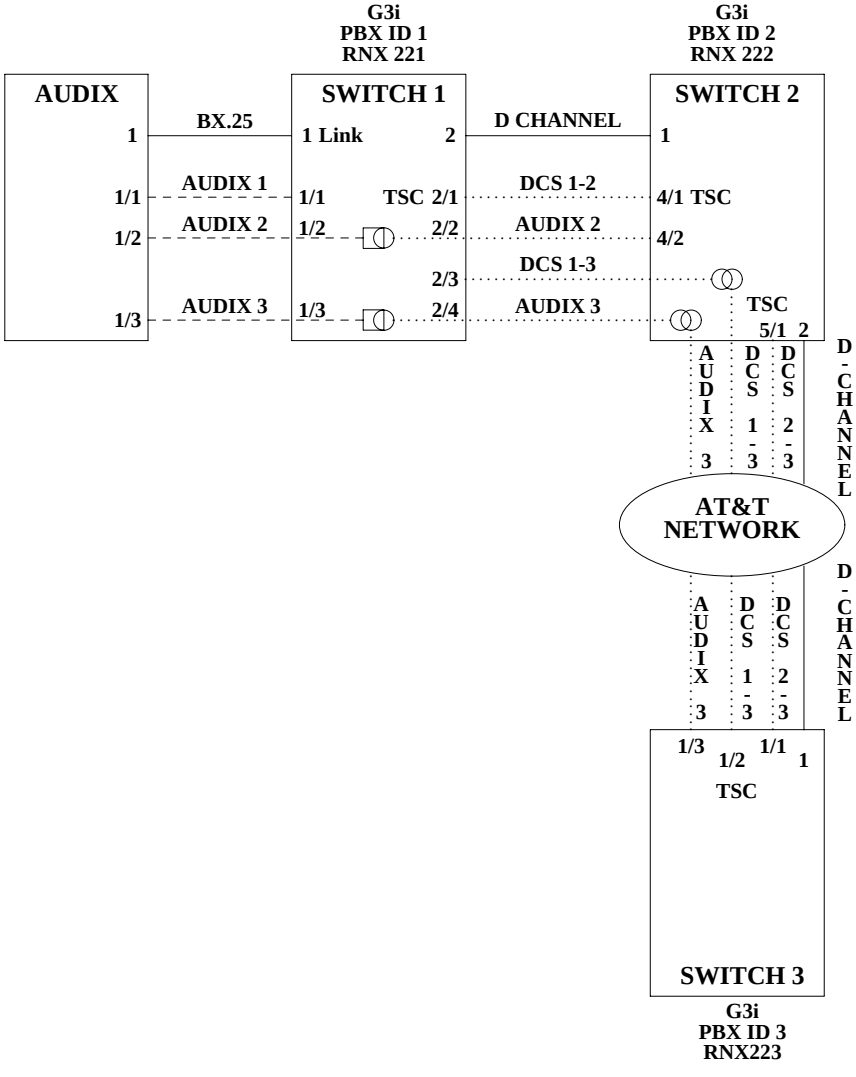


Figure 9. 3-Node public/private network

The following tables show you how you would complete each of the necessary screens.

AUDIX administration

- AUDIX Translations screen

Switch Number	AUDIX Port	Switch Port[1]	Logical Channel	Data Link
1	1	59	1	1
2	2	57	2	1
3	3	58	3	1

1. Switch Port refers to the processor channel that is used for AUDIX in the PBX.

Administration for switch 1

- Dial Plan screen

Start Dig.	Len	Usage
4	4	ext
5	4	ext
6	4	ext

- Uniform Dial Plan screen

Ext Code	Type	Location Code
5xxx	UDPcode	222
6xxx	UDPcode	223

- AAR Digit Conversion screen

Matching Pattern	Min	Max	Del	Replacement String	Net	Conv
221	7	7	3	-	ext	n

- AAR Analysis Table

Dialed String	Min	Max	Rte Pat	Call Type	Node Num
222	7	7	2	aar	2
223	7	7	3	aar	3

- Signaling Group screen (signaling group 2)

TSC Index	Local Ext.	Enabled	Establish	Dest. Ext.	Far-end PBX-ID	Appl
1	4900	y	permanent	5900	2	dcs
2	4901	y	permanent	5901	-	gateway
3	4902	y	permanent	6902	3	dcs
4	4903	y	permanent	6903	-	gateway

- Trunk Group screen

Group #	Grp Type	Used for DCS?	DCS Sig. Method	PBX ID
2	isdn-pri	y	d-chan	2
3	isdn-pri	y	d-chan	3

- Routing Pattern screen

Routing Pattern #	Trunk Group #	FRL	Del	TSC	CA-TSC Request
2	2	0	3	y	at-setup
3	3	0	3	y	at-setup

- Gateway Channel screen

Signaling Group	TSC Index	Processor Channel	Application
2	2	60	audix
2	4	61	audix

- Processor Channel screen

Proc Channel	Application	Inter. Link	Channel	Remote Proc. Channel	PBX ID
59	audix	1	1	1	1
57	gateway	1	2	2	-
58	gateway	1	3	3	-

Administration for switch 2

- Dial Plan screen

Start Dig.	Len	Usage
4	4	ext
5	4	ext
6	4	ext

- Uniform Dial Plan screen

Ext Code	Type	Location Code
4xxx	UDPcode	221
6xxx	UDPcode	223

- AAR Digit Conversion screen

Matching Pattern	Min	Max	Del	Replacement String	Net	Conv
222	7	7	3	-	ext	n

- AAR Analysis Table

Dialed String	Min	Max	Rte Pat	Call Type	Node Num
221	7	7	1	aar	1
223	7	7	3	aar	3

- Signaling Group screen

  Signaling group 4

TSC	Local	Enabled	Establish	Dest.	Far-end	Appl.
Index	Ext.			Ext.	PBX-ID	
1	5900	y	permanent	4900	1	dcs
2	5901	y	permanent	4901	-	audix

  Signaling group 5

TSC	Local	Enabled	Establish	Dest.	Far-end	Appl.
Index	Ext.			Ext.	PBX-ID	
1	5905	y	permanent	6905	3	dcs

- Trunk Group screen

Group #	Grp Type	Used for DCS?	DCS Sig. Method	PBX ID	NCA-TSC Sig. Group[1]
1	isdn-pri	y	d-chan	1	-
3	isdn-pri	y	d-chan		5

1. This field is only used for tandeming.

- Routing Pattern screen

Routing Pattern #	Trunk Group #	FRL	Del	TSC	CA-TSC Request
1	1	0	3	y	at-setup
3	3	0	3	y	at-setup

Administration for switch 3

- Dial Plan screen

Start Dig.	Len	Usage
4	4	ext
5	4	ext
6	4	ext

- Uniform Dial Plan screen

Ext Code	Type	Location Code
4xxx	UDPcode	221
5xxx	UDPcode	222

- AAR Digit Conversion screen

Matching Pattern	Min	Max	Del	Replacement String	Net	Conv
223	7	7	3	-	ext	n

- AAR Analysis Table

Dialed String	Min	Max	Rte Pat	Call Type	Node Num
221	7	7	1	aar	1
222	7	7	2	aar	2

- Signaling Group screen (signaling group 4)

TSC Index	Local Ext.	Enabled	Establish	Dest. Ext.	Far-end PBX-ID	Appl.
1	6905	y	permanent	5905	2	dcs
2	6902	y	permanent	4902	1	dcs
3	6903	y	permanent	4903	-	audix

- Trunk Group screen

Group #	Grp Type	Used for DCS?	DCS Sig. Method	PBX ID
1	isdn-pri	y	d-chan	

- Routing Pattern screen

Routing Pattern #	Trunk Group #	FRL	Del	TSC	CA-TSC Request
1	1	0	3[1]	y	at-setup

1. Should be blank if SDN network routing requires 7 digits.

Centralized Attendant Service

Centralized Attendant Service (CAS) allows attendants in a private network of switching systems to be concentrated at a central or main location. Thus, CAS reduces the number of attendants required at a branch. For example, a chain of department stores can have a centralized attendant location at the main store to handle calls for the branch stores.

Screen	Field	Page
System-Parameters Customer-Options	Async. Transfer Mode (ATM) PNC?	5-289
Synchronization Plan	Synchronization Source Synchronization Reference Stratum	
Duplication-Related System Parameters	Enable Operation of PNC Duplication	5-106
Fiber Link Administration		
ATM-PNC	All	
Circuit Packs		
Cabinet		

How to administer CAS

Screen	Field	Page
Attendant Console	■ Feature Button Assignments — cas-backup -trunk-name	5-38
Console-Parameters	■ CAS ■ RLT Trunk Group Number ■ CAS Back-Up Ext ■ Timed Reminder on Hold ■ Return Call Timeout (sec)	5-90
Station (multi-appearance)	■ Feature Button Assignments — cas-backup — flash — trunk name — night serv	6-30
Trunk Group (RLT)	■ All	7-238
Feature Access Code (FAC)	■ CAS Remote Hold Access Code	5-120

Detailed description

Each branch in a CAS has its own LDN or other type of access from the public network. Incoming trunk calls to the branch, as well as attendant-seeking voice terminal calls, route to the centralized attendants over release link trunks (RLT).

The CAS attendants are at the main location. The main location can be a DEFINITY ECS, a DEFINITY System Generic 1 or 3, a DEFINITY System Generic 2.1, a System 85, a DIMENSION PBX, or a System 75 (V3).

The CAS main switch operates independently of the CAS branch switches. Operation for CAS main-switch traffic is identical to operation of a stand-alone switch.

Each branch in a CAS network connects to the main by way of RLTs. These trunks provide paths for:

- Sending incoming attendant-seeking trunk calls at the branch to the main for processing and extending them back to the branch (both parts of a call use the same trunk)
- Returning timed-out waiting and held calls from the branch to the main
- Routing calls from the branch to the main

A branch can connect to only one main.

CAS Queues

Two queues are associated with CAS calls: one at the main and one at the branch. If idle RLTs are available from the branch to the main, RLTs are seized and CAS calls are queued at the main along with other attendant-seeking calls. If all RLTs are in use, CAS calls to the attendant are queued at the branch in a RLT queue. The length of the queue can vary from 1 to 100, as set during administration of the RLT group.

CAS Backup Service

Backup service sends all CAS calls to a backup extension in the branch if all RLTs are maintenance-busy or out of service, or if the attendant presses a backup button that is not lighted.

- To activate the feature and provide notification that backup service is in effect, assign the backup extension to a Backup button and associated status lamp.
- The status lamp remains lighted as long as backup service is in effect.
- To deactivate the feature, the attendant presses the Backup button while the status lamp is lighted.

Calls are not sent to the backup extension unless all RLTs are maintenance-busy or out of service.

CAS Remote Hold

The attendant can put a CAS call from a branch on Remote Hold. The branch holds the call and drops the RLT. After a time-out (same as the timed reminder for an attendant-held call), the branch automatically attempts to route the call back to the attendant. The returning call can queue for the RLT. Attendants should use Remote Hold when they have to put a call on hold to keep RLTs from being tied up unnecessarily.

Branch-generated call-identification tones

The branch in a CAS network generates call-identification tones and transmits them to the CAS attendant by way of the RLT. These tones indicate the type of call coming from the branch or the status of a call extended to or held at the branch. The attendant hears these tones in the console handset before being connected to the caller. The tones may vary by country. See *DEFINITY ECS Console Operations* for information on these tones.

CAS Outgoing Call Routing

The centralized attendant at the main has access, through RLTs, to all outgoing trunk facilities at the branches in a CAS network. The attendant can extend an incoming LDN call to an outgoing trunk at a branch by dialing the access code and allowing the caller to dial the rest of the number or by dialing the complete outgoing number.

CAS Incoming Call Routing

Calls extended to busy single-line voice terminals at the branch wait automatically. If there is a call in queue, the user hears a busy signal. When station hunting and send all calls is administered, the call routes along the administered path. Not answering any waiting extended call within an administered interval causes the branch switch to return the call to the attendant. Call Waiting does not apply to multiappearance terminals; if no appearances are available, busy tone is sent to the attendant, who tells the caller that the line is busy.

Calls from voice terminals at the branch to an attendant also route over RLTs seized by the branch switch. A branch caller reaches the attendant by dialing the attendant-group access code. The access code is administrable; the default is **0**. The conversation between the branch caller and the attendant ties up the seized RLT, but calls of this type are usually short.

If an extended call returns to the main attendant unanswered, the called party at the branch does not drop but continues to be alerted until the caller releases. This allows the attendant to talk to the caller, then extend the call again, if the caller wishes, without redialing the number.

Considerations

Branch Attendants

- A branch can have an attendant. Access to the branch attendant must be by way of an individual attendant extension. Incoming trunk calls in a CAS network can bypass branch attendants but can be routed back to them by the centralized attendant.
- Branch calls terminate on the CAS main switch based on the incoming RLT trunk-group day-destination or night-service destination. An attendant console is not always answering or extending incoming CAS calls. If someone other than an attendant answers a CAS call, that person can extend the call back to the branch by pressing the FLASH button on a multiappearance voice terminal or flashing the switchhook on a single-line voice terminal. The branch reaction to Flash Signals and the branch application of tones is the same whether an attendant or someone other than an attendant answers or extends the call.
- When an analog-station call goes to coverage, the station drops from the call. This is the exception to the branch leaving the extended-to party ringing. If the main attendant extends a call to an analog station and that call goes to coverage and later returns to the main attendant, the call is treated as an incoming LDN call and the attendant must re-extend the call, if requested by the user.
- On an incoming CAS call to the main attendant, the Name field from the trunk-group screen for that RLT displays to the attendant. Therefore, you should administer the field to provide meaningful branch identification information.
- Music-on-Hold feature at branch applies to two stages of LDN calls: during call extension and Remote Hold.

Interactions

- Abbreviated Dialing

  The main attendant can use an Abbreviated Dialing button to extend CAS calls after obtaining branch dial tone.

- Attendant Auto-Manual Splitting

  The SPLIT lamp and button do not function on CAS main calls extended via the RLT trunk. Attendant conference does not function on CAS calls.

- Attendant Control of Trunk-Group Access

  If a branch attendant has control of an outgoing RLT trunk group, new attendant-seeking calls route to the branch attendant.

- Attendant Override of Diversion

  Use Attendant Override of Diversion with CAS.

- Attendant Serial Calling

  Attendant Serial Calling does not work for CAS calls.

- Automatic Alternate Routing and Automatic Route Selection

  CAS calls can be routed using AAR and ARS.

- Busy-Indicator Buttons

  Busy indicators can identify incoming calls over an RLT. You can also use Busy indicators to dial after the attendant starts to extend a call.

- Call Coverage

  Redirect calls to a centralized attendant by Call Coverage. Do not redirect calls to a CAS backup extension for backup service via Send All Calls to the backup extension's coverage path.

- Call Detail Recording

  If the CAS main RLT trunk has the CDR option selected, CDR records generate for incoming CAS calls.

- Call Forwarding

  Do not forward calls to a CAS extension.

- DCS Operation

  If an RLT trunk group is administered as a DCS trunk, the following interaction applies: On an incoming CAS call to the attendant, the DCS message displays instead of the name of the incoming RLT trunk group. Upon answering the call, the attendant hears call-identification tones, indicating that the call is a CAS call. Use a TRUNK-NAME button to obtain the name of the RLT trunk group.

- DXS and DTGS Buttons

  DXS and DTGS buttons at the main attendant console can be used with CAS. However, with DXS buttons, it takes a few seconds before the attendant hears ringback tone.

- Emergency Access to the Attendant

  CAS Branch Emergency Access calls generated by a Feature Access Code route Off-Hook Alert to the branch attendant group. If there is no attendant in the branch, the call routes to the branch's administered Emergency Access Redirection Extension. When the branch switch is in CAS Backup Service, the calls route to the backup station and the call is treated as a normal call.

- Hunt Groups

  If an incoming CAS call directs to a hunt group, the call does not redirect to the hunt group's coverage path. Depending on the circumstances, the attendant can get a busy tone or ringing.

- Leave Word Calling

  If a message is left for a branch user and the attendant at the CAS switch tries to retrieve the message by using LWC message retrieval, permission is denied.

- Night Service — Night Console Service

  When the CAS main enters night service, CAS calls terminate at the CAS main night-service destination. When the branch enters Night Service, CAS calls route to the branch night console, the LDN night station, or the TAAS.

- Night Service — Trunk Answer from Any Station

  In a multiswitch DCS environment with CAS, the result of transferring incoming trunk calls via Night Service Extension or Trunk Answer from Any Station varies depending on the home switch of the transferred-to station, the home switch of the connected trunk, and the type of night-service function chosen (Night Service Extension, Trunk Answer From Any Station, or both).

- Nonattendant Console Handling of CAS Calls

  The CAS branch calls terminate at the CAS main based on the incoming RLT trunk-group day destination or night-service destination. You can also answer a CAS call by the Trunk Answer Any Station feature.

Emergency (911) Calls and CAMA trunks

The Enhanced 911 (E911) systems installed in many jurisdictions in the U.S. are equipped so that by dialing a service code (911 in the U.S.), a victim of a fire, accident, crime, or medical emergency may quickly access a public safety agency that will dispatch the appropriate response. The public E911 system maintains a database that stores location and background information to aid public safety agencies in responding quickly with the appropriate assistance. Information about the calling party can be triggered by the transmission of a Caller's Emergency Service Identification (CESID) number over Centralized Automatic Message Accounting (CAMA) trunks when the call originates from behind a PBX. 911 calls from a station on a PBX not equipped with CAMA trunks (or an adjunct computer system associated with CAMA trunks) will not provide the E911 system with the information required to identify the location of the person placing the call. Instead, the E911 system will only be able to identify the location of the trunk termination at the PBX.

This feature allows transmission of identifying information in the form of the CESID over CAMA trunks as to the extension number of a DID station associated with the calling party. The calling party may be at or near a station on a remote port network, or may be at a remote location served by an off-premises station.

For more information, see the *DEFINITY ECS Administrator's Guide*.

Extended Trunk Access

Use Extended Trunk Access (ETA) in conjunction with Uniform Dial Plan (UDP) to allow DEFINITY ECS to send any unrecognized number (such as an extension not administered locally) to another switch for analysis and routing. Such unrecognized numbers can be Facility Access Codes, Trunk Access Codes, or extensions that are not in the UDP table. Non-UDP numbers are administered on either the First Digit Table (on the Dial Plan Record screen) or the Second Digit Table. They also are not administered on the ETA Call Screening Table. ETA helps you make full use of automatic routing and UDP.

How to administer ETA

Screen	Field
Dial Plan Record (First Digit and Second Digit Tables)	■ ETA Routing Pattern ■ ETA Node Number
ETA Call Screening Table	■ Call Screening Entry

CAUTION:

Switches can be chained together using ETA. However, you must ensure that switches do not route in a circular ETA call setup. Switch A can route to switch B, and switch B can route to switch C. But, if switch A routes to switch B and switch B routes to switch A, you create a circular ETA call setup.

Detailed description

Historically, ETA has been used by satellite switches to access stations, trunks, and features at the main switch. ETA frees you from having to enumerate the entire dial plan for the main or satellite complex. Calls that would get intercept treatment without ETA are routed to a remote switch to be reprocessed. The following processing takes place when ETA is administered:

- ETA call is identified because it fails all other routing possibilities.
- The dialed string is not in the ETA Call Screening Table.
- An available route pattern is selected based on the Dial Plan screen ETA Routing Pattern or ETA Node Number entries.
- The dialed string is sent to the remote switch.

Examples of ETA administration

CASE #1

- ETA Route Pattern — Not administered
- ETA Node Number — Not administered

In this case, ETA is not active. It is not used to route undefined dialed strings.

CASE #2

- ETA Route Pattern — Administered
- ETA Node Number — Not administered

In this case, the ETA Route Pattern routes undefined dialed strings. However, since an ETA Node Number is not specified, non-call-related DCS messages are not routed.

CASE #3

- ETA Route Pattern — Not administered
- ETA Node Number — Administered

In this case, the ETA Node Number provides the route pattern. Non-call-related DCS messages also can route since a node number is supplied.

CASE #4

- ETA Route Pattern — Administered
- ETA Node Number — Administered

In this case, the ETA Route Pattern routes undefined dialed strings while the ETA Node Number routes DCS messages. Nodes themselves do not have to be administered for ETA. ETA should not be used over tandem-tie trunks.

Interactions

- Abbreviated Dialing

  Abbreviated Dialing calls are routed via ETA.

- Attendant

  Attendants calls are routed via ETA.

- Data-Call Setup

  Analog and digital endpoints can access ETA. The digit string goes to the remote switch like any other digit string is sent. The remote switch handles the data-call setup from that point forward.

- Facility Restriction Levels

  It is possible to restrict trunks that are being used in conjunction with ETA by assigning FRLs.

- Last Number Dialed

  If a number is routed via ETA to a remote switch and you want to reaccess that number, then reaccess uses ETA.

- Modem Pooling

  Modems in Modem Pools are treated like all other trunks.

- Remote Access

  Remote-access trunks are able to access the ETA feature just as any other trunk or station does.

Inter-PBX Attendant Service

Inter-PBX Attendant Service (IAS) allows attendants for multiple branches to be concentrated at a main location. Incoming trunk calls to the branch, as well as attendant-seeking voice-terminal calls, route over tie trunks to the main location.

How to administer Inter-PBX Attendant Service

Screen	Field
Tie Trunk Group (Main)	■ Incoming Destination
Console Parameters (Branch)	■ IAS (Branch) ■ IAS Tie Trunk Group No. ■ IAS Att. Access Code
Tie trunk group (Branch)	■ All

Detailed description

Inter-PBX Attendant Service calls are incoming tie-trunk calls from a branch location to the main-location attendant group. If no attendant in the group is immediately available, the calls are queued. When an attendant becomes available, the call routes to that attendant. Extended calls are treated as incoming calls to the main location.

DEFINITY ECS can be a branch or main location. Users at each branch can access other branch locations through the main location. A branch can have local attendants. Users access these local attendants normally.

Interactions

- Attendant Control of Trunk-Group Access

  If a call at a branch attempts to access a controlled trunk group, the call routes to a branch attendant, if there is one. If there is no branch attendant, the call routes to the attendant group at the main location.

- Attendant Display and DCS Attendant Display

  In a DCS environment, an incoming call from a branch displays at the attendant console at the main location as a local call.

  In a non-DCS environment, an incoming call displays at the attendant console at the main location as an incoming tie-trunk call.

- Attendant Recall

  If an attendant at the main location holds a call, the calling parties at the branch cannot recall the attendant.

- Call Coverage

  A call redirected to a coverage path with the attendant group as a coverage point skips that coverage point. It goes to the next coverage point at the branch, if administered, or continues to ring at the previous coverage point. If the attendant group 0 is the only coverage point, it continues to ring at the principal's extension.

- Centralized Attendant Service

  CAS and Inter-PBX attendant calling cannot be used at the same time.

- Dial Access to Attendant

  Administer Dial Access to Attendant via the dial platform to the same digit on both the IAS main switch and the IAS branch switch. On the branch switch, administer the PBX attendant access code (Console Parameters screen) to match the main PBX attendant-group dial access code.

- Night Service

  Inter-PBX Attendant Calls deactivates when a branch goes into night service, and reactivates when the branch comes out of night service.

ISDN Feature Plus

This feature allows you to have basic feature transparency over public networks without having a dedicated leased line. This provides a lower cost option for using the switched public network.

How to administer ISDN Feature Plus

NOTE:
Starting with Release 10, the system software release, Offer Category, features, and system capacities are controlled through the License File. The init login does not have the ability to change the customer options, offer options, and special applications screens. However, these screens are still available through the display system-parameters customer-options command.

1. On the System-Parameters Customer-Options screen, verify that the:

   — **G3 Version** field is set to **V10**.

   — **ISDN Feature Plus** field is set to **y**.

2. On the same screen, verify either one or both of the following:
   — **ISDN-PRI** field is set to **y**, or
   — **ISDN-BRI Trunks** field is set to **y**.
3. Verify either one or both of the following:
   — ISDN-BRI Trunk Group — Verify the **Supplementary Service Protocol** field is set to **f**
   — ISDN-PRI Trunk Group — Verify the **Supplementary Service Protocol** field is set to **f**.
4. On the Feature Related System Parameters screen, set the **Feature Plus Ext** field to the local extension used to terminate Feature Plus signaling for ISDN Feature Plus.
5. On the Hunt Group screen, to add a centralized AUDIX, set the **Message Center** field to **fp-mwi**.

To start administration for Message Waiting Indication at the Message Center PBX:

1. On the Feature Related System Parameters screen, set the **MWI - Number of Digits per AUDIX Subscriber** field to the desired number.
2. On the Processor Channel Assignment, set the **Application** field to **fp-mwi**.
3. Administer the Message Waiting Indication Subscriber Number Prefixes screen. To start the Calling Name feature:
4. On the ISDN-BRI or ISDN-PRI trunk group screen (whichever you are using), set the **Send Name** field to **y**.

Description

ISDN Feature Plus uses a DEFINITY ECS proprietary signaling protocol. The features do not function in the same way as their QSIG or DCS counterparts.

To use Feature Plus, Phase I, you need DID extensions. In addition to the general Feature Plus call handling, Feature Plus includes the following features:

- Centralized AUDIX — A simple, one step “coverage” to voice mail. If voice mail is unavailable for any reason, the call does not cover elsewhere.
- Call Diversion — You can divert (or forward) calls unconditionally, upon busy or no reply, to another extension including forwarding voice mail.
- Calling Number ID — You can display the calling party’s number to the called party during alerting and after answer.
- Calling Name — You can assign the Calling Name Feature Plus identifier with a maximum size of 15 bytes or the maximum network subaddress size, whichever is lower.

- Connected Line Identification Presentation (COLP) — You can assign display forwarded-to party information to the calling user's display.
- Call Transfer - Basic — You can assign transfer calls between parties across the public network is supported. Display updates at the time of transfer or upon completion of transfer, however, are not supported.
- Served User PBX for Centralized AUDIX — Determines where to send messages destined for the AUDIX hunt group.
- Message Waiting Indication — You can assign display a message waiting indication on a user's voice terminal.

Differences in Inserted Digits field

There is a difference in how the Inserted Digits to form Complete Number field on the Message Waiting Indication Subscriber Number Prefixes screen is used for QSIG and Feature Plus. This difference is due to the difference in how the Feature Plus and QSIG-TSC platforms operate.

For Feature Plus, the Feature Plus extension must be included in the **Inserted Digits to form Complete Number** field, while for QSIG, only the higher order digits need to be included. (In QSIG MWI, the subscriber number is appended to the inserted digits and the resulting number is used to route over a QSIG TSC.) For example, Dallas is a Message Center PBX and Chicago is a remote PBX:

- If Feature Plus is running between Dallas and Chicago and the Feature Plus extension in Chicago is 82000, the **Inserted Digits to form Complete Number** field administered in Dallas to get to Chicago must be 3035382000. The **Routing Digits (AAR/ARS Access Code)** field also needs to be filled in appropriately.
- If QSIG is running between Chicago and Dallas, the **Inserted Digits to form Complete Number** field must contain 30353. The **Routing Digits (AAR/ARS Access Code**) field also must be filled in appropriately.)

Interrogation

When performing an audit, the Served User PBX sends a request towards the Message Center PBX. As a Message Center PBX, the DEFINITY ECS receives the request message, maps it into a MW STATUS REQUEST - SINGLE STATION message, and sends it to AUDIX on the BX.25 link. When AUDIX replies to the DEFINITY on the BX.25 link with a MW STATUS UPDATE, the Message Center PBX sends the information on to the appropriate Served User PBX.

- If it is a Message Center PBX, the MW STATUS UPDATE indicates whether there are any messages waiting, not how many messages are waiting or what media types are these messages. If the MW STATUS UPDATE indicates that there are new messages, then the Message Center PBX sends a message telling the Served User PBX to activate the message waiting indication. Similarly, if the MW STATUS UPDATE indicates that there are no new messages, then the Message Center PBX sends a message telling the Served User PBX to deactivate the message waiting indication.
- If it is a Served User PBX, when the Served User PBX receives the result, it makes sure that the result received from the Message Center matches the state of the Served User's light.

Interactions

- Automatic Circuit Assurance

  Automatic Circuit Assurance (including Referrals) is not activated for calls terminating at the Feature Plus extension.

- Distributed Communication System (DCS)

  Feature Plus signaling links do not support DCS.

- Feature Plus Centralized AUDIX

  — Calling Line Identification Presentation (CLIP)

  If the public network supports CLIP and the called user has subscribed to the service, calling party information is available to the called user when messages are retrieved.

  — Feature Plus Diversion

  Feature Plus Centralized AUDIX relies upon Feature Plus Diversion. When a call covers to AUDIX, it must invoke Feature Plus Diversion to identify the called party to AUDIX.

  — Feature Plus Message Waiting

  When a calling party leaves a message using Feature Plus Centralized AUDIX, Feature Plus Message Waiting engages and turns on that subscriber's message waiting indicator.

- Feature Plus Forwarding (Diversion)

  — Calling Line Identification Presentation (CLIP)

  If the public network supports CLIP and the forwarded-to user has subscribed to the service, then calling party information is available to the forwarded-to user's display.

— Connection Line Identification Presentation (COLP)

If the public network supports COLP and the calling user has subscribed to the service, then forwarded-to party information is available to the calling user's display.

— Feature Plus Centralized AUDIX

Feature Plus Centralized AUDIX relies upon Feature Plus Diversion. Invoke Feature Plus Diversion first to enable the Centralized AUDIX feature.

— Call Coverage

- Terminating call has coverage active

  If a call is forwarded off-switch, and the terminating switch has call coverage activated and the criteria is met, the call will not go to the forwarding coverage path. It goes to the terminating coverage path.

- Forwarding and Coverage

  If the last coverage point in the coverage path is a number that routes over an ISDN SSF trunk, no Feature Plus Diversion information passes to the coverage PBX.

— Automatic Callback

If automatic callback was activated before the called voice terminal user activated Call Forwarding over an ISDN SSF trunk, the callback call attempt is redirected to the forwarded-to party over the SSF trunk.

— Call Park

If a forwarded-to (diverted-to) extension user parks a call that has been forwarded from an ISDN SSF trunk, the call normally is parked on the forwarded-to extension, not on the forwarded-from (called user) of the ISDN SSF trunk.

- Feature Plus Message Waiting Indication

— Audio Information Exchange (AUDIX)

Feature Plus MWI depends on the presence of a Message Center. Whenever DEFINITY ECS acts as a Message Center switch, there is an interaction between DEFINITY ECS and AUDIX. DEFINITY ECS must be able to receive messages from AUDIX then, if applicable, send the appropriate Feature Plus MWI message to the network. Similarly, if DEFINITY ECS receives a Feature Plus MWI message, DEFINITY ECS translates the Feature Plus message into the appropriate AUDIX message and passes it to AUDIX.

The only messages that DEFINITY ECS handles are AUDIX messages along the BX.25 link. Feature Plus MWI can interwork with Basic AUDIX, including INTUITY AUDIX, and with DEFINITY AUDIX with the DCIU control link. Feature Plus MWI does not work with the DEFINITY AUDIX that emulates a DCP voice terminal or with versions of AUDIX that communicate to DEFINITY ECS mode codes.

DEFINITY ECS implementation requires that all users on a Served User PBX use the same Feature Plus Message Center. Some of the served users can use a Feature Plus Message Center, while others use a local message center and/or a DCS Remote Message Center and/or a QSIG Message Center. However, some served users on a PBX cannot use one Feature Plus Message Center while other served users on the same PBX use a different Feature Plus Message Center.

— Off-Premise Station

Feature Plus MWI does not work with an off-premise station implemented with a DS1 circuit pack.

- QSIG

  Feature Plus signaling links do not support QSIG.

QSIG

QSIG is the generic name for a family of signaling protocols. The Q reference point or interface is the logical point where signaling is passed between two switches in a private network. QSIG signaling allows certain features to work in a single-vendor or multi-vendor network. QSIG complies with the International Organization for Standardization (ISO) Integrated Services Digital Network (ISDN) private-networking specifications. QSIG is defined by ISO as the worldwide standard for private networks. QSIG uses ISO standard protocols as well as call independent signaling connections (CISCs), administered as non-call-associated temporary signal (NCA-TSCs).

DEFINITY ECS provides six levels of QSIG functionality. You can view the status of each level on the System Parameters Customer Options screen.

QSIG Category	Supported Features
Basic Call Setup	■ Basic Call Setup ■ Number Transport
Basic Supplementary Services	■ Called/Busy Name ■ Name Identification Services ■ Call Forwarding (Diversion) ■ Call Transfer ■ Centralized AUDIX ■ Call Offer ■ Call Completion (Automatic Callback)
Centralized Attendant	■ Centralized Attendant Service (CAS).
Supplementary Services with Rerouting	■ Call Forwarding (Diversion) with Reroute (using Path Replacement) ■ Call Transfer with Reroute (using Path Replacement)
Transfer into Lucent QSIG Voice Mail	■ Call Transfer into QSIG Voice Mail
Value-Added Lucent (VALU)	■ Displays of called party number to the calling party when the called number is ringing or busy (Called/Busy Number) ■ Distinctive Ringing to identify internal/external and priority calls ■ Call Coverage to networked switches.

QSIG Basic Call Setup

Transit Counter (ANF–TC)

DEFINITY ECS provides QSIG ANF-TC as defined in ISO/IEC 6B032 and 6B033. It prevents indefinite looping, connections giving poor transmission performance, and inefficient use of network resources.

ANF-TC is invoked automatically for ISDN basic calls and the Route Pattern screen indicates the number of switches through which a call may be routed.

QSIG Basic Supplementary Services

Called/Busy Name

Enables the calling party to see the name of the called party at the following times:

- while the call is ringing at the called party's terminal.
- while listening to a busy tone because the called party's terminal was busy.

Called/Busy Name is similar to the display provided for local on-switch calls, as well as for the DCS calls, with the following exceptions:

- Names longer than 15 characters are truncated; only the first 15 characters display.
- The number does not display unless QSIG VALU is enabled.

QSIG Name and Number Identification

QSIG Name and Number Identification allows a switch to send and receive the calling number, calling name, connected number, and connected name. QSIG Name and Number Identification displays up to 15 characters for the calling and connected name and up to 15 digits for the calling and connected number across ISDN interfaces.

You can administer outgoing calls as "yes", "no", or "restricted." Restricted means that DEFINITY ECS sends the information but sends it "presentation restricted," which indicates to the receiving switch that the information should not be displayed. A received restricted number is included on the Call Detail Record (CDR).

Transit switch information

When DEFINITY ECS acts as a transit switch, the QSIG standards require it to pass on all supplementary service information that is not addressed to it. This includes name information. (A "transit" switch is a switch that routes an incoming call administered for Supplementary Services Protocol Bto a trunk also administered for Supplementary Services Protocol B.) However, Basic Call Setup and number information is subject to modification by the transit switch. This means that trunk group administration on a transit switch does not override incoming name information, but may override incoming number information (as long as this does not lower the restriction on the information).

Example

If a non-restricted calling name and number are received by a DEFINITY ECS acting as a transit switch, and if the outgoing trunk is administered for presentation restricted for both name and number, the number is passed on as "restricted" and name is passed on as "unrestricted."

Tandem switch information

However, in the case of tandemed calls (calls involving two ISDN trunks that are not both administered for Supplementary Service Protocol B), trunk group administration may override both incoming name and number information, as long as doing so does not lower the restriction on the information. For example, a tandemed call that comes in with restricted name information is sent out with restricted name information even if the outgoing trunk is administered for presentation unrestricted. However, non-restricted data is sent restricted if the trunk group administration is set for “presentation restricted.”

ISDN numbering formats

Numbering is specified on the ISDN Public-Unknown-Numbering and/or ISDN Private-Numbering screens. The numbering screen you use depends on how you administer the ISDN trunk group Numbering Format field.

However, if you format the Called Party Number with public numbering, the Calling/Connected Party Number is created in the public format even if you specify “private” on the ISDN trunk group screen. This provides the caller or called party a number that can be used to reach the other party. Since the call routes through the public network, the public Calling/Connected Party Number is a more accurate address.

Call Forwarding (Diversion)

Call Forwarding works over a QSIG network.

When a call has already been forwarded 3 times over a QSIG trunk, it is not forwarded again but instead terminates at the final forwarded-to terminal. Remote activation and deactivation of this feature are not supported.

Call Transfer

QSIG Call Transfer is based on the current DEFINITY ECS Transfer and Trunk-to-Trunk Transfer features. QSIG Transfer signaling occurs as long as one of the calls involves a QSIG trunk between the two switches.

Once a call is transferred, the transferring switch is unnecessary. Additional Network Feature-Path Replacement (ANF-PR) is invoked automatically to connect the transferred call more efficiently in the private network. QSIG Call Transfer attempts to connect the two parties more efficiently and drops the unnecessary switches.

When you use this feature, you see no difference between QSIG Call Transfer and the standard DEFINITY ECS Transfer or Trunk-to-Trunk Transfer features.

QSIG Call Transfer differs from DCS Call Transfer in that additional call information is available for the connected parties after the transfer completes.

Depending upon QSIG Identification Services administration, the connected parties' displays show each other's name and/or number. If the name and number are not available, the display of a connected party updates with the name of the involved trunk group.

Call Offer

This feature is the QSIG equivalent of Call Waiting.

A Private Telecommunication Network (PTN) offers up to four ways of invoking QSIG Supplementary Service - Call Offer (SS-CO) (listed below). *DEFINITY ECS uses only the first way.*

- Network invocation (immediate) — the PTN automatically invokes SS-CO whenever the calling user makes a call to a user that is busy, if required by the service profile of the calling user.
- Consultation — the calling user, on being informed that a call has failed because it is busy at the destination and that SS-CO may be possible, is able, within a defined time period (consultation timer), to request invocation of SS-CO.
- Immediate invocation — the calling user is able to request invocation of SS-CO as part of the initial call set-up.
- Network invocation (delayed) — the network, having informed the calling user that a call has failed because it is busy at the destination, invokes SS-CO automatically unless the calling user initiates call clearing within a defined time period (automatic call offer invocation timer).

DEFINITY ECS The effect of QSIG SS-CO on the terminating end is similar to the DCS Call Waiting feature with the exception that for Call Waiting, the calling side (user or PBX) does not have to convey any special message to invoke the feature. The Call Waiting Termination feature is driven based on the terminating user (for instance, single line analog set user with Call Waiting enabled).

For QSIG Call Offer, DEFINITY takes advantage of the additional information available from the far end, if QSIG Call Offer invokes successfully, and provides similar information to the calling user as the Call Waiting feature provides for on internal calls, with the exception that the display update will be "offered" instead of "wait" to reflect invocation of QSIG Call Offer service.

On successful invocation of the QSIG Call Offer service, DEFINITY provides the following:

- To the busy analog set user, the same tone as Call Waiting Termination feature, or
- To the busy Multi call-appearance set (for instance, at least one call-appearance is busy for an active call and at least one call-appearance is available for incoming calls) user, the available appearance rings normally.

For incoming QSIG calls, the QSIG Call Offer service may use path retention which is a generic mechanism to retain the signaling connection so that the originating party can decide whether to invoke the supplementary service. The network connection can be retained for more than one of the supplementary services for which path retention has been invoked.

Call Completion

Use this feature to provide QSIG Supplementary Service - Call Completion (SS-CC).

The Supplementary Service - Completion of Calls to Busy Subscribers (SS-CCBS) and Supplementary Service - Completion of Calls on No Reply (SS-CCNR) are the equivalent QSIG features of Automatic Callback On Busy and Automatic Callback on No Answer, respectively.

An analog voice terminal user activates SS-CCBS or SS-CCNR by pressing the Recall button or flashing the switchhook and then dialing the Automatic Callback (ACB) Activation feature access code. An analog user can activate only one ACB call at any given time.

A multiappearance voice terminal user can activate SS-CCBS or SS-CCNR for the number of ACB buttons assigned to the terminal.

SS-CC Options

QSIG SS-CC has the following major options that are negotiated between the Originating and the Terminating PBX:

1. Path reservation — there are two methods of establishing the CC call:
    a. path reservation method
    b. non-reservation method
2. Retention of signaling connection — there are two ways in which SS-CC uses call independent signaling connections:
    a. connection retention method
    b. connection release method
3. Service retention — there are two possible behaviors when User B is found to be busy again after User A responds to SS-CC Recall:
    a. service retention method
    b. service cancellation method

As an originating PBX for QSIG SS-CC, DEFINITY ECS will select the following major options:

- non-reservation method for the Path Retention option
- connection release method for the Retention of Signaling connection option
- service cancellation method for the Service Retention option

As a Terminating PBX for QSIG SS-CC, DEFINITY ECS will select the following major options:

- non-reservation method for the Path Retention option
- either the connection release method or the connection retention method for the Retention of Signaling connection option depending on which the originating PBX requests.
- service cancellation method for the Service Retention option

QSIG Centralized AUDIX

QSIG allows users on a remote node to “cover” to an AUDIX on another node. The original calling and called party information is provided to AUDIX so that each is identified properly during message recording/retrieval.

To use centralized AUDIX, you must use QSIG Diversion. On a remote switch, the call covers using Diversion to the hunt group assigned to AUDIX on the host switch. Then the host switch sends all the appropriate information to AUDIX so that AUDIX correctly answers the call.

As of Release 9, Centralized AUDIX has two new features: 6 Audix Messaging Centers and path optimization using QSIG Diversion with Reroute. Prior to Release 9, only one Audix Message Center was available, and routing to a voice mail adjunct involved Diversion forward switching with no rerouting capability.

Other QSIG Centralized Messaging

With a QSIG centralized messaging system, the remote switch is called a served user switch. When an AUDIX system supports a QSIG network, the served user switch does not need to be a DEFINITY ECS, but the host, or message center, switch must be.

QSIG allows a DEFINITY switch to be a served user switch of a non-DEFINITY message center switch. Therefore, the messaging system connected to the message center switch can serve the DEFINITY switch if that messaging system has a QSIG interface. Octel Serenade is such a messaging system.

As of Release 9, the users on a served user switch in a QSIG messaging network may use up to six Message Centers (QSIG voice mail adjuncts) on all DEFINITY platforms. (Prior to Release 9, only one message center could be administered for one or more server switches.) So, for example, a G3R switch with 30,000 users can have 3 Octel Serenade Message Centers with 10,000 users each, instead of only one center with 10, 000 users. The driving force behind this enhancement is to provide integration with QSIG Octel Serenade.

To administer multiple QSIG voice mail servers per switch, enable the following options:

- ISDN-PRI or ISDN BRI
- QSIG Basic Call Setup
- QSIG Basic Supplementary Services

Another enhancement for Release 9 is path optimization using QSIG Diversion with Reroute. In R9, DEFINITY will attempt to reroute a call when the following options are enabled:

- ISDN-PRI or ISDN-BRI (qsig-mwi type of hunt group)
- QSIG Basic Call Setup
- QSIG Supplementary Services with Rerouting

Currently, routing to a voice mail adjunct involves the Diversion forward switching with no rerouting capability.

What you get with QSIG Centralized AUDIX

- Calls to users on a remote PBX cover or forward correctly and are answered by AUDIX.
  - With a personalized greeting
  - With appropriate busy or not available greeting, depending upon the reason the call was redirected
  - Caller can leave a message for the called party
- Once a subscriber logs into AUDIX (by dialing the AUDIX number and entering the extension and password), the subscriber can perform the following activities:
  - Listen to or delete messages (voice, fax, or text)
  - Leave a message for other subscribers on the same AUDIX without calling them
  - Forward a message to another subscriber on the same AUDIX
  - Access the AUDIX directory to address a message (*A)
  - Access the AUDIX directory to find a subscriber’s extension (**N)
  - Record or change your greeting
  - Transfer out of AUDIX (*T or 0)

- Message Waiting Indication (typically a lamp, but may be a stutter dial tone or display) indicates the presence of new messages. I

  If another vendor's switch, acting as a served user switch, does not provide this functionality, the call will not cover properly to a DEFINITY ECS message center switch complex.

- When a remote subscriber logs in to AUDIX from the subscriber's phone, the subscriber does not need to enter his or her extension. Instead of entering the extension, *, the password, and *, the subscriber can enter *, the password, and then #.

What you do not get with QSIG Centralized AUDIX

- Leave Word Calling does not work between served user switches, though users on the same switch can use it.
- Transfer into AUDIX does not work from a served user switch.

Path Retention

Path Retention is a generic mechanism for retaining a network connection that can be used by supplementary services during call establishment.

The Originating PBX invokes path retention for one supplementary service or for several simultaneous supplementary services. Invoking a particular supplementary service means retaining the network connection if the Terminating PBX encounters the appropriate conditions. The Originating PBX is informed of the reason for retaining the connection. It then decides (for example, by consulting the calling user) whether to invoke the supplementary service. Under some circumstances in which the network connection is retained, more than one of the supplementary services for which path retention has been invoked may be applicable.

Successive retentions of the network connection by the Terminating PBX following a single path-retention invocation by the Originating PBX are possible. This is a result of different conditions being encountered at the Terminating PBX. When an attempt is made to invoke a supplementary service for which the network connection has been retained, a further condition can be encountered that can cause the network connection to be retained again for the same or a different supplementary service.

Path retention is specified in terms of a Path Retention entity existing within the Coordination Function at the Originating PBX and at the Terminating PBX.

QSIG Centralized Attendant Services

QSIG Centralized Attendant Service (QSIG-CAS)

DEFINITY ECS supports two versions of CAS: RLT-CAS and QSIG-CAS.

The CAS feature enables one or more Branch PBXs to concentrate their attendants on one Main PBX. CAS provides transparency between PBXs of most features that are normally available to the basic attendant service.

RLT-CAS uses an analog RLT network to optimized trunk utilization. QSIG-CAS does not use RLT. By using QSIG Transfer and QSIG Path Replacement or QSIG Diversion with Rerouting, the same optimization as using RLT can be accomplished with QSIG-CAS. Using QSIG CAS, you eliminate the need to have a separate analog RLT network.

All current QSIG features and RLT-CAS features are available with QSIG-CAS.

Potential QSIG-CAS Drawbacks

There are a few potential drawbacks when using QSIG-CAS:

1. Unlike RLT, QSIG Path Replacement does not work immediately. This means that resources are being utilized longer during QSIG-CAS as opposed to RLT-CAS.
2. Unlike RLT, QSIG Path Replacement is not guaranteed.
3. Like RLT, QSIG Path Replacement does not enable a branch PBX to act as a gateway PBX.
4. No path replacement functionality takes place during or after a conference.

QSIG CAS functions in RLT-CAS

The following QSIG-CAS functions are currently in RLT-CAS:

- Attendant-seeking calls at a branch reach the attendant at the main
- Attendant splitting away and calling the extended to party
- Night Service
- Monitoring agents, per attendant group

QSIG CAS functions not in RLT CAS

The following QSIG-CAS functions are currently *not* in RLT-CAS:

- Announcements for attendant seeking calls
- Attendant calls enter the attendant queue, with priorities (calls that originate from the branch do not have different priorities in the queue)
- Attendant display of user’s COR

- Attendant split/swap
- QSIG Path Replacement kicking in after the transfer
- Attendant Return Call (Release Loop Operation, returns to same attendant if available. If not, then attendant group)
- Display Enhancements
- Attendant Conference

QSIG Supplementary Services with Rerouting

QSIG Stand-alone Path Replacement

Path Replacement (PR) is the process of routing an established call over a new, more efficient path, after which the old call is torn down leaving those resources free. Path Replacement offers customers potential savings by routing calls more efficiently, saving resources and trunk usage.

Prior to R9.5, path replacement only occurred with QSIG Call Transfer. Now, path replacement can exist as a stand-alone feature, or occur in the following additional cases:

- Call Forwarding by Forward Switching supplementary service, including the case where Call Diversion by Rerouting fails, and Call Forwarding is accomplished via forward switching
- Gateway scenarios where DEFINITY ECS, serving as an incoming or outgoing gateway, invokes PR to optimize the path between the gateways
- Calls in queue/vector processing even though no true user is on the call yet
- QSIG Lookahead Interflow call, Best Service Route call, or adjunct route

CAUTION:
Depending on the version of Call Management System (CMS) you are using, some calls may go unrecorded if you administer your system for Path Replacement in queue/vector processing. Please see your Avaya representative for more information.

QSIG Path Replacement with Path Retention

DEFINITY ECS provides QSIG Additional Network Feature Path Replacement (ANF-PR) as defined in ISO/IEC 13863 and 13874. With this feature, a call's connections between switches in a private network can be replaced with new connections while the call is active.

ANF-PR is invoked when a call is transferred and improvements may be made in the routes. For example, after a call is transferred, the two parties on the transferred call can be connected directly and the unnecessary trunks are dropped off the call.

The routing administered at the endpoints allows for a more efficient route connection. If ANF-RR is turned off at either endpoint switch, then ANF-RR will not occur. In some cases where the all or some of the original route is the most effective route, Path Retention is invoked.

ANF-PR selects the best route based on the preference assigned to routes in the Route Pattern form. Least cost Supplementary Service B (SSB) routes must be first, followed by more expensive routes.

NOTE:
When routes to SSB trunks are included with routes to non-SSB trunks, SSB trunks must appear first on the Route Pattern screen. This is because as soon as ANF-PR encounters a non-SSB trunk in the route pattern, it stops looking.

Class of Restriction (COR) and Facility Restriction Levels (FRL) are adhered to in routing calls. ANF-PR is not invoked on data calls because there is a period of time when information can be lost.

QSIG Call Forwarding (Diversion with Rerouting)

A forwarded call can be rerouted in a private network to find a more cost-effective or resource-efficient path.

QSIG/DCS Voice Mail Interworking

QSIG/DCS Voice Mail Interworking is an enhancement to the current QSIG feature. It integrates DCS and QSIG Centralized Voicemail via the new “DCS+/QSIG gateway”. Switches labeled “DCS+/QSIG” integrate multi-vendor PBXs into a single voice messaging system.

This is an Offer Category A enhancement and works on G3r, G3si, and G3csi. It provides network flexibility, DCS functionality without a dedicated T1 and vendor independence.

QSIG Transfer into Lucent QSIG Voice Mail

Transfer into QSIG Voice Mail

This feature uses QSIG Call Transfer, along with a manufacturer-specific information (MSI) message, to transfer a call directly into a subscriber’s mailbox when the voice mail system is connected to the Message Center PBX via a QSIG link.

The voice mail system must be an Avaya system that supports the QSIG Transfer Into QSIG Voice Mail MSI operation.

NOTE:
This feature currently works only with the Serenade voice mail system. This feature does not work with QSIG Centralized AUDIX.

The entire route from the PBX activating Transfer Into Voice Mail to the voice mail system must be QSIG.

QSIG Value-Added Lucent (VALU)

Value-Added Lucent (VALU) adds three forms of feature transparency to QSIG networks.

- Called/Busy Number — The system sends and displays across the network the called party's number to the calling party during alerting. It updates the display to "connected number" when the called party answers the call. It also sends and displays a busy party's number. This serves to confirm to the caller that he or she dialed the correct number.

  The Called/Busy Number feature is an extension to QSIG Called/Busy Name. For additional information, see QSIG Name and Number Identification (page 321).

  The Called/Busy Number never displays alone; it displays only if the Called/Busy Name is available (for instance, received from the far end and marked "presentation allowed"). In contrast, upon receipt of a Calling Number without a Calling Name, the number displays with the words "CALL FROM."

- Distinctive Ringing — QSIG VALU provides two kinds of distinctive ringing across the network: internal and external.

- Call Coverage — The system allows calls to be covered by extensions across the network. This coverage operates similarly to DCS Call Coverage (page 280), though the connectivity of the network itself differs. If administered, path replacement is invoked after coverage.

These features work with phone users as well as for a centralized attendant service.

QSIG Protocols

QSIG signaling protocols are based on ITU-T (formerly CCITT) Q.931 access protocols across the Q reference point. QSIG standards are also supported by the ISDN Private Networking Specification (IPNS) Forum. DEFINITY ECS QSIG complies with a number of international regulations. For example, QSIG:

- Complies with ISO standard 11572 for layer 3 to support private-network connectivity.
- Meets requirements for the ISO Private Network Generic Functional Procedures (ISO standard 11582) for call-related supplementary services.
- Supports call-related supplementary service transport, Abstract Syntax Notation 1 (ASN.1)/Basic Encoding Rules (BER), and Remote Operation Service Element (ROSE) services/protocols.
- Provides the Name and Number Identification supplementary service as defined by ISO Standards 13864, 13868, and 11572.
- Provides Call Forwarding (Diversion) as defined by ISO Standards 13872 and 13873.
- Provides Call Transfer as defined by ISO Standards 13865 and 13869.

Temporary Signaling Connection (TSCs)

A Temporary Signaling Connection (TSC) provides a temporary signaling path through ISDN switches for exchanging supplementary service information (for example, exchange Facility Information Elements in call control messages, FACILITY messages, or a combination of both on ISDN D-channels. There is no B-channel related to the connection; no data or voice transmissions take place.

There are two types of temporary signaling connections:

- Call Associated (CA-TSC)
- Non-Call Associated (NCA-TSC)

CA-TSC (DCS only)

A CA-TSC refers to a service for exchanging USER INFORMATION messages associated with an ISDN B-channel connection by the call reference value of the call control data packets. On DEFINITY ECS, this type of TSC is used only for DCS features on ISDN-PRI Signaling Groups administered with Supplementary Service Protocol *a*.

NCA-TSC

An NCA-TSC is a connection not related with any ISDN B-channel connections. DECINITY ECS supports two types of NCA-TSC that conform to two different protocol standards:

- The *non-QSIG* AT&T type of NCA-TSC is used for the DCS over ISDN-PRI D-channel and DCS AUDIX applications. Only ISDN-PRI Signaling Groups administered with Supplementary Service Protocol **a** support AT&T NCA-TSCs. For further information, see Page 277.

CAUTION:

*The QSIG type of NCA-TSC is used for certain QSIG features such as Call Completion (Automatic Call Back). This type of NCA-TSC is referred to in the QSIG protocol standards as a Call-Independent Signaling Connection (CISC). Only ISDN-PRI Signaling Groups administered with Supplementary Service Protocol **b** support QSIG NCA-TSCs. In addition, BRI trunk D-channels support QSIG NCA-TSCs.*

An NCS-TSC for QSIG is not administered ahead of time, but is invoked dynamically by the QSIG feature that needs it. Some QSIG features remove the NCA-TSC when it is no longer needed; others leave the it active for a longer period of time.

DEFINITY ECS does not provide gateway functionality between a QSIG NCA-TSC and an AT&T NCA-TSC. For example, although a call can be routed from a DCS network into a QSIG network, it is not possible for the caller in this case to invoke an automatic callback.

Setting Up QSIG

Follow these steps to set up QSIG.

1. Verify with your sales representative or project manager what QSIG capabilities the system should have. The following capabilities apply:

Table 20. QSIG capabilities

Capability Categories	Cross-Networking Features
QSIG Basic	■ Calling/Connected Number ■ Calling Number Identification ■ Transit Counter
Interworking with DCS	■ Called/Calling Name/Number delivered to and received from DCS networked switches

Continued on next page

Table 20. QSIG capabilities — *Continued*

Capability Categories	Cross-Networking Features
Basic Supplementary Service	■ Called/Busy Name ■ Call Completion ■ Call Forwarding (Diversion) ■ Calling Name Identification ■ Call Offer ■ Centralized AUDIX ■ Call Transfer ■ Path Retention ■ Message Waiting Indication
Centralized Attendant Service	■ Centralized Attendant
Supplementary Service with Rerouting	■ Call Forwarding (Diversion) with Rerouting ■ Path Replacement
Transfer into Lucent QSIG Voice Mail	■ Transfer into QSIG Voice Mail
Value-Added Lucent (VALU)	■ Called/Busy Number Display ■ Distinctive Ringing ■ Call Coverage

2. Determine whether the system is using ISDN-PRI, ISDN-BRI, or ATM for the QSIG network connections. Your sales representative or project manager should know this. (If the system is using ATM trunking for QSIG, see *DEFINITY ECS R8.2 - ATM Installation, Upgrades, and Administration*, 555-233-124.)
3. Enter **display system-parameters customer-options** on the command line of your system administration screen.
4. On page 1, verify fields as follows:
   — **G3 Version** field is **V8** or later.
5. If the system is using ATM for QSIG, go to page 2 and verify the following field:
   — **Async. Transfer Mode (ATM) Trunking** field is **y**.

6. On page 3, verify fields as follows:

   If the system is using ISDN-BRI for QSIG:

   — **ISDN-BRI Trunks** field is **y**.

   If the system is using ISDN-PRI for QSIG:

   — **ISDN-PRI** field is **y**.

   If the system is using QSIG Supplementary Services with or without Rerouting:

   — **Restrict Call Forward Off Net** field is **n**.

7. On page 4, verify fields as follows:

   — **Basic Call Setup** field is **y**.

   If the system is using QSIG Supplementary Services:

   — **Basic Supplementary Services** field is **y**.

   If the system is using QSIG Supplementary Services with Rerouting:

   — **Supplementary Services with Rerouting** field is **y**.

   If the system is using QSIG VALU:

   — **Value-Added Lucent (VALU)** field is **y**.

8. (For ISDN-PRI only). Administer or check the QSIG DS-1 circuit pack. Check for the following field entries:

   - Connect field - **pbx**
   - Interface - **peer-master** or **peer-slave**
   - Peer protocol - **q-sig**
   - Signaling mode - **isdn-pri** or **isdn-ext**
   - Channel Numbering - **sequential** or **timeslot** (This item must match between the local switch and receiving switch.)

9. (For ISDN-BRI only). Administer or check the QSIG ISDN-BRI circuit pack.

10. Administer or check the QSIG ISDN trunk group(s) (PRI or BRI) connected to the DS-1 or BRI circuit pack. Check for the following field entries on Page 1:

    - Group type - **isdn**
    - Supplementary service protocol- **b** or **d** where:

b	ISO QSIG standards (including the ETSI Version 2 and European Computer Manufacturer's Association (ECMA) standards aligned with the ISO standards)
d	ETSI Version 1 and ECMA standards issued prior to the ISO standards for QSIG private network (supports only Name Identification and Additional Network Feature Transit Counter (ANF-TC))

    (For Supplementary Services with or without Rerouting)

    - Outgoing Display? - y
    - QSIG Value-Added Lucent - y

    On Page 2 (Also for Supplementary Services with or without Rerouting and Path Replacement with Retention):

    - Hop Dgt - y
    - Disconnect Supervision - y
    - Numbering Format - public, private, unknown, unk-pvt
    - NCA - TSC Trunk Member - The trunk member whose D-channel routes CISCs.
    - Send Called/Busy/Connected Number - y
    - Send Calling Number - y
    - Send Name - y
    - Path Replacement with Retention - y

Setting Up QSIG Supplementary Services

Follow these steps to set up QSIG Supplementary Services

1. Administer or check the ISDN Numbering - Public/Unknown screen.
2. Administer or check the ISDN Numbering - Private screen.
3. Administer or check the Signaling Group screen. Check for the following field entries to ensure proper operation of Call Completion:

    - Supplementary Service Protocol - **b**
    - Max Number of NCA TSC - greater than 0

4. Administer or check the Route Pattern screen. Check for the following field entries to ensure proper operation of Call Completion and Transit Counter:
   - TSC - **y** (necessary if switch is a transit node for TSC)
   - Hop Lmt - between 1 and 32
5. Administer or check the Feature-Related System Parameters screen. Check for the following field entries to ensure proper operation of Call Completion and Call Transfer:
   - Trunk-to-Trunk Transfer - **y**
   - QSIG TSC Extension - valid extension number to serve as TSC for both incoming and outgoing QSIG network calls.
   - Automatic Callback - No Answer Timeout Interval (rings) - enter the number of times, 2 to 9, a callback call should ring at the caller's phone before the callback is cancelled
   - (For AUDIX/Octel Serenade support only) MWI - Number of Digits per AUDIX Subscriber - enter the number of digits in messaging subscriber extensions, if any. The value in this field must match the value of the **Extension Length** field on the Switch Interface Administration screen of AUDIX.
   - (For AUDIX/Octel Serenade support only) Unknown numbers internal for AUDIX - **y** if, when the switch cannot identify a calling number as internal or external, the switch should treat it as internal for AUDIX use.
6. Administer or check the Class of Service (COS) screen for each COS that may be using the QSIG network. Check for the following field entries to ensure proper operation of Call Completion, Call Offer, and Call Forward:
   - Restrict Call Forward Off-Net - n
   - Auto Callback- y
   - QSIG Call Offer Originations - y

Call Completion

In addition to the Basic QSIG Supplementary Services administration described above, complete the following administration:

- On the Trunk Group screen, page 1, set the Supplementary Service Protocol field to **b** and administer the trunk for Call Independent Signalling Connections.

Transfer into Voice Mail

In addition to the Basic QSIG Supplementary Services administration described above, complete the following administration:

- On the System-Parameters Customer-Options screen, page 6, the Transfer Into Lucent QSIG Voice Mail field must be set to **y**.
- On the Feature Access Code (FAC) screen, page 3, assign a Feature Access Code in the Transfer to Voice Mail Access Code field. (This field is called “Transfer to AUDIX Access Code” in pre-R8 systems).
- A hunt group must be in the coverage path of the user’s mailbox to be transferred into, as administered on the Station and Coverage Path screens. On the hunt group screen, page 2, for this hunt group, **qsig-mwi** must be entered in the Message Center field and the number for the voice mail system must be entered in the Voice Mail Number field.

Setting Up Centralized Attendant Services

Follow these steps to set up Centralized Attendant Services.

1. Enable QSIG Supplementary Services with Rerouting on the System Parameters Customer Options screen, page 6, as described above.
2. On the System Parameters Customer Options screen, page 6, enter **y** in the Centralized Attendant field.
3. On the Console Parameters screen, enter **QSIG-main** or **QSIG-branch** in the CAS field.
    a. If **QSIG-branch** is entered in the CAS field, then enter a number for QSIG CAS Number.
    b. If **QSIG-branch** is entered in the CAS field, then the field AAR/ARS Access Code is optional.
4. Administer the QSIG ISDN trunk groups screen with option **b** for Supplementary Service Protocol
5. Console Parameters screen.
6. Attendant Console screen.
7. Assign an extension to Attd on the Dial Plan Record screen at the main PBX.
8. Administer each QSIG Supplementary Service that will be used by attendants.

Setting Up QSIG VALU Call Coverage

Follow these steps to set up QSIG VALU Call Coverage.

1. Enable the QSIG Basic Supplementary Services on the Customer Options screen, page 6, described above.
2. Enable (enter **y**) Value-Added Lucent (VALU) on the System-Parameters Customer-Options screen, page 6, as described above.
3. On a Trunk Group screen, enter **y** in the QSIG Value-Added Lucent field, page 1, and sent **b** in the supplementary Service Protocol Option field, page 1.
4. Administer the System Parameters Call Coverage/Call Forwarding screen as normal, with the inclusion of the following fields:
   - Immediate Redirection on Receipt of PROGRESS Inband Information, page 1 — Enter **y** to speed up redirection of subsequent coverage points or call processing. This may be necessary in cases where coverage path endpoints over non-Avaya switches are unavailable but the QSIG networked switch (or the public network) sends PROGRESS messages that delay the local switch from redirecting the call elsewhere. If the QSIG network contains only DEFINITY switches, enter **n**.
   - QSIG VALU Coverage Overrides QSIG Diversion with Rerouting, page 1 — Enter **y** to ensure that the “coverage after forwarding” activation/deactivation defined at a user’s phone (via Station screen) takes precedence over the system-wide “coverage after forwarding” activation/deactivation selection (via the System Parameters Call Coverage/Call Forwarding screen). With QSIG Diversion with Rerouting active, the system-wide selection takes precedence unless you enter **y**.

     See the examples in the following table:

Cvg. After Fwd (Station Screen)	Cvg. After Fwd (Sys Params. Coverage Screen)	QSIG VALU Coverage Overrides QSIG Diversion	Then
y	n	n	Call doesn’t go to local user’s coverage after failed forward attempt. Call control passed to switch to which call forwarded.
y	n	y	Call goes to local user’s coverage after failed forward attempt.
n	y	n	Call goes to local user’s coverage after failed forward attempt.
n	y	y	Call doesn’t go to local user’s coverage after failed forward attempt. Call control passed to switch to which call forwarded.

NOTE:
If Maintain SBA at Principal is enabled (**y**), then Path Replacement is disabled.

5. Define the remote QSIG users that you may include in coverage paths using the Remote Call Coverage Table. See *Defining Coverage for Calls Redirected to External Numbers* in the *Handling Incoming Calls* chapter of the Administrator's Guide. See also the Remote Call Coverage Table screen in the Administrator's Guide.
6. Define coverage paths for users as required.

Related Phone Administration

As you set up each user's phone, QSIG networking features allow the following.

- QSIG displays the user's name as entered in the Name field on the Station screen, both on the display of another networked phone when called by that user or when calling that user.
- QSIG allows call waiting from networked phone calls if you set the Call Waiting Indication field to **y**.
- QSIG allows auto callback from networked phones if you create an auto callback button for the user.

Related Hunt Group Administration

As you set up each hunt group, you must enter either grp-name or mbr-name in the ISDN Caller Disp field, page 1. This entry determines which of the following the system displays on a QSIG networked phone that calls the hunt group:

- The hunt group name/extension
- The hunt group member's name/extension

Related Administration of Terminating Extension Groups

As you set up each terminating extension group, you must enter either grp-name or mbr-name in the ISDN Caller Disp field. This entry determines which of the following the system displays on a QSIG networked phone that calls the terminating extension group:

- The group name/extension
- The group member's name/extension

Related Administration of AUDIX/Message Centers

NOTE:
For AUDIX administration generally, see one of the following:

- *Installation and Switch Administration for the DEFINITY AUDIX System R4.0*, 585-300-122, which appears on the CD-ROM entitled *DEFINITY AUDIX System R4.0 Documents*, 585-300-803.
- *Intuity Messaging Solutions LAN Integration with DEFINITY ECS*, 585-313-602.
- Switch integration section of the CD-ROM entitled *Intuity Messaging Solutions Release 5 Documentation*, 585-313-803

NOTE:
See the Octel Serenade documentation for Serenade administration.

Follow these steps to set up Related Administration of AUDIX/Message Centers.

NOTE:
Set up QSIG TSCs before you administer messaging. See "Call Completion".

1. (Local node message center switch only) Complete the Processor Channel Assignment screen.
2. (Local node message center switch only) Complete the Message Waiting Indication Subscriber Number Prefixes screen.
3. (Local node message center switch only) Complete the Station screen as specified in the Intuity or DEFINITY AUDIX documentation. Verify the following field entry:
   - MWI Served User Type - **qsig-mwi**
4. (Served user switch only) On the Hunt Group screen, set the following fields for the AUDIX hunt group:
   - Message Center - **qsig-mwi**
   - Voice Mail Number - the desired number
   - Routing Digits (for example, AAR/ARS Access Code) - the desired number.

     Digits entered in these fields should be selected so that the processing of these digits by the served user switch results in a call being redirected to the message center switch by an ISDN-PRI supplementary service protocol “b” facility. For example, if the message center switch is a DEFINITY ECS, the digits entered should reroute the call to the AUDIX hunt group on the message center DEFINITY ECS switch.
   - Calling Party Number to AUDIX? - **y**

QSIG Interactions

Consider the following feature interactions when configuring QSIG on your system.

Call Forwarding (Diversion)

The interactions that apply to the standard DEFINITY ECS Call Forwarding features also apply to Call Forwarding (Diversion) with QSIG. The following are additional interactions.

- Alternate Facilities Restriction Levels

  The AFRL of the original call is the AFRL used for Call Forwarding with Reroute.

- Authorization Codes

  Call Forwarding with Reroute is denied to calls that require an Authorization Code.

- Automatic Alternate Routing and Automatic Route Selection

  Call Forwarding with Reroute uses AAR and ARS to reroute the original call.

- Call Detail Recording

  Call Forwarding with Reroute is denied to calls that require Forced Entry of Account Codes.

- Call Transfer

  When a forwarded call transfers, the forwarding indication displays to the caller until the call is answered. This display includes the trunk group name and word “forward.” When the call is answered, the word “forward” is removed and the name and number of the answering party displays.

- Distributed Communications Systems

  Call Forwarding feature transparency does not exist on calls tandemed between a QSIG (Supplementary Service protocol b) network and a traditional DCS network. However, the basic call continues.

- Facility Restriction Levels and Traveling Class Marks

  The FRL (and TCM) of the original call is the FRL used for Call Forwarding with Reroute.

- Forwarding and Coverage

  If a coverage point is a number that routes over an ISDN (Supplementary Service protocol b) trunk, QSIG diversion information is not passed to the coverage switch.

- QSIG Name and Number Identification

  Availability of name and/or number display at the originating and diverted-to users depends upon how QSIG Name and Number Identification has been administered for the switches involved.

- Terminating Call has Coverage Active

  If a call is forwarded off switch, the terminating switch has call coverage activated, and the criteria are met, the call does not route to the forwarding party's coverage path. It routes to the terminating station's coverage path.

Call Transfer

- Call Forwarding (Diversion)

  When a call is forwarded and transferred or transferred and forwarded, the forwarding indication displays to the caller until the call is answered. This display includes the trunk group name and word "forward." When the call is answered, the word "forward" is removed and the name and number of the answering party displays.

- Distributed Communications Systems

  The only DCS transparency that exists when a call is transferred in a DCS network and passed over a QSIG administered trunk is calling name.

- QSIG Path Replacement

  ANF-PR is invoked whenever a QSIG transferred call is answered.

- QSIG Name and Number Identification

  Availability of name and/or number display at the connected parties depends upon how QSIG Name and Number Identification has been administered for the switches involved.

Transfer Into QSIG Voice Mail

- QSIG Path Replacement

  After a call is transferred into QSIG voice mail and the voice mail system answers the call, Path Replacement is attempted.

QSIG Name and Number Identification interactions

- Distributed Communications Systems (DCS)

  DEFINITY ECS can display DCS called name/number information or ISDN connected name/number information in a DCS (ISDN) network.

  When an incoming ISDN call is routed back out over a non-ISDN trunk group, DEFINITY ECS can send the name of the non-ISDN trunk group as the connected name if the **Send Non-ISDN Trunk Group Name as Connected Name** field is **y** on the Feature-Related System-Parameters screen.

Path Replacement

- Basic Call Management System

  If the old connection is monitored by a BCMS entity, ANF-PR is blocked due to BCMS measurements.

- Call Detail Recording

  Codes for recording the new connections of ANF-PR calls are code J for incoming trunk calls and code K for outgoing trunk calls. When a path is replaced, you also may receive records for short-duration calls that are not directly linked to the J and K records.

- Call Management System

  If the old connection is monitored by a CMS entity, ANF-PR is blocked due to CMS measurements.

- Call Vectoring
- A transferred call that terminates at a vector and is answered cannot have its path replaced.
- Data-Call Setup

  A data call is denied ANF-PR.

- Data Privacy

  If Data Privacy is active, ANF-PR is denied.

- Data Restriction

  If Data Restriction is active, ANF-PR is denied.

- Malicious Call Trace

  If MCT is active, ANF-PR is denied.

- Recorded Announcement

  A call that is receiving a recorded announcement cannot have its path replaced.

- Trunk Access Code

  If the old connection was made using a TAC, ANF-PR is denied.

- Restriction Features

  ANF-RR is denied when restriction features such as COR or Voice Terminal does not allow new connection to be established from PBX, unless the COS assigned to the old/new connection overrides the restrictions.

- Voice Terminals

  Voice terminal displays that show trunk group name should update with new trunk group information after ANF-PR occurs. Calling and connected party displays are not disturbed when ANF-PR takes place if the original display shows the connected party name, number, or both.

Transit Counter

- Call Forwarding (Diversion)

  When call forwarding (Diversion) occurs and the ANF-TC feature is enabled, the transit counter is set to zero.

- ISDN Trunk Group Administration

  If all of the conditions are satisfied for both the Tandem Hop Limitation and ANF-TC, ANF-TC takes precedence. In situations where DEFINITY ECS is an Incoming or Outgoing Gateway, either makes use of the hop count/transit count information provided by the other.

- Trunk Access Code

  ANF-TC does not apply to TAC calls.

Call Completion

- Adjunct Switch Applications Interface (ASAI)

  ASAI cannot invoke/initiate QSIG-CC.

- Attendant Calling Waiting and Call Waiting Termination

  If you activate QSIG SS-CC to a single line voice terminal, the Attendant Call Waiting and Call Waiting Termination features are denied.

- Attendant Console Group

  You cannot activate QSIG SS-CC toward the attendant console group or towards the individual attendant.

- Attendant Control of Trunk Group Access

  You cannot activate QSIG SS-CC if the call uses a controlled trunk group.

- AUDIX

  You cannot activate QSIG SS-CC towards AUDIX. SS-CC to any transferred-to station is not allowed.

- Automatic Call Distribution (ACD)

  You cannot activate QSIG SS-CC towards a voice terminal after dialing the ACD group extension. It is possible to invoke SS-CC towards a station when dialing the individual's extension number. You can activate SS-CC from any ACD agent.

- Bridged Call Appearance

  You cannot activate QSIG SS-CC from a bridged call appearance. When a call originates from a primary extension number, the return call notification rings at all bridged call appearances.

- Busy Verification

  After the called party in a QSIG SS-CC call hags up, neither extension number can be busy-verified until both the calling and called parties are connected or the callback attempt is canceled (by the activating party or by time-out of the callback interval).

- Call Coverage

  QSIG SS-CC requests are always activated at the principal user and not coverage points. Similar to ACB, QSIG SS-CC Call Completion calls to the called user can redirect to coverage.

- Call Forwarding

  You cannot activate SS-CCBS or SS-CCNR towards a called station that has Call Forwarding enabled.

- Call Pickup

  On recall at the originating side, a group member cannot answer a QSIG SS-CC call for another group member.

- Call Waiting

  Call Waiting is denied when QSIG SS-CC is activated to the single-line voice terminal.

- Conference and Transfer

  You cannot activate QSIG SS-CC towards a transferred-to party.

- Hold

  A single-line voice terminal cannot receive a QSIG SS-CC call while it has a call on hold.

- Hotline Service

  A hotline service cannot request SS-CC.

- Internal Automatic Answer (IAA)

  If the IAA feature is enabled, QSIG SS-CC calls are not answered automatically.

- Manual Originating Line Service

  A manual originating service cannot request QSIG SS-CC.

- Multimedia Endpoints

  You cannot activate QSIG-CC towards multimedia data endpoints.

- Restriction Features

  — Class of restriction (COR): Any terminal that is Origination-restricted cannot activate SS-CC. Any terminal that is Termination-restricted cannot have SS-CC activated towards it.

  — Class of Service (COS): To invoke SS-CC, the ACB field on the Class of Service screen of the calling terminal must be set to *yes*.

- Ringback Queuing

  Ringback Queueing and ACB share the same button to indicate that they are active. If the user has only one ACB button, then both features cannot be active at the same time.

- Outgoing Trunk Queuing

  Outgoing Trunk Queueing cannot be invoked after the calling party answers the priority call back call and no trunks are available. The SS-CCBS and SS-CCNR request cancels at both PBXs.

- Termination Extension Group (TEG)

  You cannot activate QSIG SS-CC towards a TEG extension, but QSIG-CC requests can be activated towards a single member in the group.

- Uniform Call Distribution and Direct Department Calling

  You cannot activate QSIG SS-CC towards a uniform call distribution group or a direct department calling group extension, but you can activate towards a single member in the group.

- Vector Directory Number (VDN)

  You cannot activate SS-CC towards a VDN extension.

Message Waiting Indications

- AAR/ARS Partitioning

  All QSIG MWI messages use Partition Group 1 for routing.

- Alternate Facilities Restriction Levels

  QSIG MWI messages have unrestricted COR.

- DCP and Mode Code links to AUDIX

  QSIG MWI does not work with the DEFINITY AUDIX that emulates a DCP phone. A ProLogix that communicates with AUDIX by using mode codes cannot be a QSIG message center switch complex.

- Authorization Codes

  The authorization codes do not block routing because the routing of TSCs used for QSIG MWI uses FRL 7.

- Automatic Alternate Routing (AAR)

  AAR may be used to route the QSIG TSCs.

- Automatic Route Selection (ARS)

  ARS may be used to route the QSIG TSCs.

- Call Coverage Features

  The served user switch uses call coverage paths to route calls to users in the served user switch to the AUDIX hunt group on the Message Center switch.

- Class of Restriction

  QSIG MWI messages use the default COR of unrestricted.

- Class of Service

  QSIG MWI messages use the default COS of unrestricted.

- Facility Restriction Levels and Traveling Class Marks

  A QSIG MWI TSC always uses FRL 7 (unrestricted).

- Generalized Route Selection

  GRS uses the “TSC” column on the Route Pattern screen to select a preference for carrying QSIG MWI TSCs.

- ISDN - QSIG - BRI

  QSIG MWI is dependent on QSIG TSCs. QSIG MWI is possible over QSIG BRI lines.

- Message Sequence Tracer

  MST traces QSIG MWI messages.

- Off-Premises Station

  If a DS1 is used to implement an off-premises station, QSIG MWI does not work with the off-premises station. DS1 off-premise stations do not receive system message waiting indicators.

- Uniform Dial Plan (UDP)

  It is possible to route QSIG MWI messages by using UDP.

Called/Busy Name

- Adjunct Switch Applications Interface (ASAI)

  A Connected Number is sent in the Connected Event to ASAI adjuncts. Therefore, upon receipt of a Called/Busy Number, it is stored in such a way that it is not be sent accidentally as a Connected Number if no actual Connected Number is received in the CONNECT message when the call is answered.

- ISDN - QSIG

  Call Diversion (including Reroute)

  Both the Called Name and Called Number are sent to the ringing/busy extension.

  Call Transfer

  As is done for the Called Name, the Called Number of a ringing party is sent to the transferred-to party in the QSIG “Call Transfer Complete” message.

- Message Sequence Tracer (MST)

  MST records facility IEs containing Manufacturer Specific Information (MSI), but is not yet able to decode this information.

VALU Call Coverage

The interactions that apply to DCS call coverage apply to VALU call coverage, with the exceptions listed below. See Call Coverage (page 291)

- Call Coverage Off Premises

  Unlike DCS, QSIG-VALU can handle non-UDP numbers in the remote call coverage table. It is not limited to route only on UDP numbers.

- Coverage Answer Groups

  Same as DCS Call Coverage (i.e. Coverage Answer Groups across nodes (on a remote system) are not supported).

- Consult

  Consult from the remote covering user to principal user is not supported.

- Displays

  When a Principal user bridges on the call, its display is updated with “CONFERENCE” and counted for the number of parties on the call. The remote covering user and calling user (local and remote) display is not updated with the word “CONFERENCE”.

- Leave Word Calling back to Principal from Covering User

  Same as DCS Call Coverage — not supported.

- Go to Cover

  Same as DCS Call Coverage — not supported.

- Queuing (UDC/DDC/ACD/VDN)

  Same as DCS Call Coverage.

- QSIG Call Forwarding/Diversion

  Same as DCS Call Coverage — call forwarding has a higher priority than Call Coverage with QSIG-VALU.

- QSIG Centralized Attendant Service (CAS)

  The calls that cover from a QSIG CAS branch to main are not treated as QSIG-VALU Coverage calls. This is because calls covered to “attd” (administered as a coverage point on a Coverage Path screen) do not utilize Remote Call Coverage table and QSIG-VALU Call Coverage is supported only for coverage points associated with Remote Call Coverage table. The implication of this is that the attendant on the main will lose QSIG-VALU Call Coverage display information and QSIG Path Replacement will not be invoked after the call is answered by the covering attendant.

- Coverage of Calls Redirected Off-Net (CCRON)

  If both QSIG-VALU coverage is enabled and CCRON is enable, the QSIG-VALU coverage will have a higher precedence then CCRON.

- Privacy - Manual Exclusion

  With Call Coverage feature, when the principal user bridges onto a call that went to coverage and has been answered at the coverage point, the user is not dropped when Privacy - Manual Exclusion is activated by the Covering user.

  With QSIG-VALU Coverage, if the Principal bridges on the call after the remote covering user has answered the call. then the remote coverage user stays bridged until the call clears or the covering user goes on-hook.

- Simulated Bridge Appearance (SBA)

  With QSIG-VALU, maintaining SBA for Principal user will be based on the administration of the field “Maintain SBA at Principal” on the System Parameters - Call Coverage / Call Forwarding screen.

- Temporary Bridge Appearance (TBA)

  Same interaction as Simulated Bridge Appearance.

- AUDIX / Centralized AUDIX

  AUDIX is usually specified as the last coverage point. When a call is routed to AUDIX (local or remote centralized place), the TBA (Temporary Bridge Appearance) is not maintained for the Principal user (i.e. the Principal user can not bridge on to the call after it routes to AUDIX).

  For the last coverage point, which do not require control at the Principal user's PBX, the QSIG-VALU Coverage shall route the call as QSIG Diversion by Rerouting instead of QSIG Diversion by forward-switching and let the remote calling user's PBX route the call directly to the remote covering number. If the Rerouting PBX indicates failure, then the Principal user's PBX (i.e. Served User's PBX in terms of QSIG Diversion) shall revert to the normal QSIG-VALU Coverage handling. The advantage of this approach is that it saves the trunk resources and provide path optimization without QSIG Path Replacement.

- QSIG Call Transfer

  If a call that is transferred using QSIG Call Transfer transfer-by-join to a secondary user (i.e. Principal user for QSIG VALU Call Coverage) and the call is routed to a covering user by QSIG VALU Call Coverage and if the Principal user has a Simulated Bridge Appearance (SBA) and if a call goes through a QSIG Path Replacement successfully, the Principal user will loose the SBA.

- Integrated IP Trunking

  An incoming call over an IP trunk that goes through more than 2 tandem nodes, and is compressed and decompressed at each entry and exit point on the trunk, may suffer voice-quality degradation.

Centralized Attendant Service (CAS)

- Abbreviated Dialing

  The main attendant can use abbreviated dialing buttons to extend QSIG-CAS calls.

- Administration without Hardware

  Administration without hardware for attendant consoles for QSIG-CAS functions as for RLT-CAS.

- Attendant Auto-manual Splitting

  The attendant can split away from a call to privately call another party by pressing the START button.

- Attendant Auto Start and Don't Split

  Attendant Auto Start and Don't Split functions as for RLT-CAS. The attendant can initiate a call while on an active call by pressing any button, without pressing the START button first. The system automatically splits the call and dials the next call. To deactivate Auto Start, press the Don't Split button.

- Attendant Backup Alerting

  Attendant Backup Alerting for QSIG-CAS functions as for RLT-CAS. If attendant backup alerting is turned on, other users on the main PBX may have the ability to answer attendant seeking calls.

- Attendant Call Waiting

  Attendant call waiting is available for calls that originate on the main.

- Attendant Calling of Inward Restricted Stations

  Attendant calling of inward restricted stations for QSIG-CAS functions as for RLT-CAS. That is, a user who is inward restricted cannot receive an attendant originated or extended call unless that user has field Restriction Override on the COR screen set to “attd.”

- Attendant Conference

  By using the attendant split/swap feature, it is possible for the attendant to conference join the attendant, calling party, and extended party together in conference. If the attendant drops out of the conference, leaving just the calling party and extended party, path replacement is not attempted.

- Attendant Control of Trunk Group Access

  Attendant control of trunk group access for QSIG-CAS functions as for RLT-CAS.

- Attendant Crisis Alert

  Attendant crisis alert for QSIG-CAS functions as for RLT-CAS.

- Attendant Direct Extension Selection With Busy Lamp (standard and enhanced)

  For QSIG-CAS the DXS allows attendants to use the DXS for monitoring and placing calls to users on the main PBX and for placing calls to users on a branch PBX only when UDP is used.

- Attendant Group and Tenant Partitioning

  Attendant Group and Tenant Partitioning are local features that do not require QSIG signaling on the main.

  Attendant Group and Tenant Partitioning do not function on a CAS branch. You can administer tenant partitioning and multiple attendant groups on a branch PBX. However, all attendant-seeking calls at the branch PBX are directed to the QSIG-CAS number, as administered on the console-parameters screen, regardless of any tenant partition. If the QSIG-CAS number corresponds to the Dial Access to Attendant number at the main or to a VDN that eventually routes to the Dial Access to Attendant number at the main, the call is directed to the attendant group assigned to the tenant partition of the incoming trunk to the main.

- Attendant Interposition Calling and Transfer

  Attendant Interposition calling and transfer is a local feature that remains unchanged by QSIG-CAS. Attendants on the main still have the ability to call and transfer to each other using Individual Attendant Extensions.

- Attendant Intrusion

  As with RLT-CAS, Intrusion is not be available in QSIG-CAS to calls that are incoming from a branch.

- Attendant Misoperation

  Misoperation is used only in France and Italy. It is a local feature and functions as for RLT-CAS. If the system goes into Night Service while an attendant has a call on hold, the call realerts at the attendant console. If it is unanswered after an administrable amount of time, the call begins alerting at the night service destination.

- Attendant Override of Diversion

  As with RLT-CAS, Override of Diversion is not available in QSIG-CAS for calls incoming from a branch.

- Attendant Recall

  As with RLT-CAS, Attendant Recall is not available in QSIG-CAS to calls incoming from the branch.

- Attendant Release Loop Operation

  Attendant Release Loop Operation is a local switch feature. It allows an unanswered extended call on the main to return to the attendant after an administrable amount of time. The call first tries to return to the same attendant that originally answered the call and, if that attendant is not available, the call goes to the next available attendant (waiting in the Attendant Queue if necessary).

- Attendant Return Call

  Attendant Return Call functions in the following manner: Suppose a call comes into the attendant from a branch PBX. If the attendant extends the call and it is unanswered after an administrable amount of time the call returns to the attendant. Initially, the call attempts to return to the same attendant that originally handled the call. If that attendant is unavailable, then the call goes to the next available attendant (waiting in the Attendant Queue if necessary).

- Attendant Serial Calling

  As with RLT-CAS, Attendant Serial Calling is not available in QSIG-CAS to calls incoming from the branch.

- Attendant Tones

  Call identification tones are not heard by attendants answering calls from a QSIG-CAS branch.

- Attendant Trunk Group Busy/Warning Indicators

  As with RLT-CAS, the attendant can only receive busy/warning indicators for trunks at the main PBX. The attendant cannot receive information about branch PBX trunks.

- Attendant Vectoring

  The attendant vectoring feature is available to QSIG-CAS at the branch and the main. An attendant-seeking call terminating at the main PBX follows any vector steps that are defined at the main.

  The QSIG-CAS Number should not contain the number of a remote VDN. Note that there is no admin check to block such administration, but QSIG CAS may not function correctly.

- Automatic Circuit Assurance

  As for RLT-CAS, the CAS attendant cannot receive ACA referral calls from a branch because any administered ACA referral extension must be on the local PBX.

- Call coverage

  The attendant group is allowed to be a coverage point.

  If the call covers from the branch to the main over a non-QSIG ISDN trunk, then the call is treated as a forwarded call. That is, Call Coverage Off Net (CCRON) procedures do not apply and the call is not brought back to the branch PBX.

NOTE:
In order to obtain the full functionality of QSIG CAS, it is recommended that routing patterns are set up so that a QSIG trunk is used when sending a call from the branch to the main.

If the call covers from the branch to the main over a QSIG trunk (not QSIG VALU), then QSIG Diversion procedures apply.

If the call covers from the branch to the main over a QSIG VALU trunk, then QSIG VALU Call Coverage procedures apply.

- Call forwarding

  Forwarding calls to the QSIG-CAS number is allowed.

- Call park

  If a call is parked and the Call Park Timeout Interval (as set on the Feature Related System Parameters screen) expires, the call is sent to the attendant. This works the same as for RLT-CAS.

- Call Detail Recording (CDR)

  CDR functions with QSIG-CAS as for RLT-CAS.

- Call Record Handling Option

  Calls are sent to the attendant as non-CDR calls if the following conditions all hold:

  — the call is subject to CDR, **and**

  — the CDR buffer is full, **and**

  — the attendant is administered as the Call Record Handling Option on the CDR system parameters screen.

- CDR Reports

  The format of the CDR data report is an administrable option on the CDR systems parameters screen. Customers can select from a list of pre-defined formats or create their own. The content of the CDR records is unchanged by QSIG-CAS.

  CDR records generated at the main are covered by existing procedures. Calls incoming to the attendant look like incoming trunk calls. Calls originated or extended by the attendant look like outgoing calls.

- CAS Back-Up Extension

  The CAS Back-Up Extension is used in an RLT-CAS environment but has no benefit in QSIG-CAS.

- Conference

  If a user on a branch calls the attendant and conferences the attendant onto the call, the attendant's display is not updated with "conference". There is no QSIG standard defined for Conference and DEFINITY has not implemented conference via MSI.

- Centralized AUDIX

  When a user zero's out of AUDIX, if the host PBX is a QSIG-CAS branch, then the call is sent to the QSIG-CAS attendant.

- DCS+

  On an incoming attendant-seeking call, calling-party information may be received at the branch if a call comes from another PBX in the network over a DCS ISDN trunk.

- Dial Access to Attendant

  When a user on a branch PBX dials the Dial Access to Attendant number, as administered on the Dial Plan Record screen, the call is sent to an attendant on the main PBX.

- DID/Tie/ISDN Intercept

  DID, Tie, and ISDN trunk calls that are intercepted are sent to the attendant on the main.

- Emergency access to attendant

  Emergency access may be administered so that if stations are off hook for an extended period of time, then a call is placed to the attendant, or a user can dial an Emergency access to attendant feature access code. Emergency access to the attendant does not go to the attendant on the main PBX. Instead, the call goes to an attendant on the branch PBX. If there is no branch attendant, the call is denied.

- Facility Busy Indication

  Facility Busy indication functions as for RLT-CAS.

- Individual Attendant Access

  An attendant may be assigned an individual extension so that it is possible to dial that attendant directly rather than dialing the attendant group.

- ISDN (non-QSIG)

  On an incoming attendant-seeking call, calling party information may be received at the branch for a call coming in over an ISDN trunk.

- Leave word calling

  LWC Message Retrieval is not available for the branch PBX.

- Malicious Call Trace (MCT)

  MCT is a feature that is performed on existing calls. MCT does not generate new attendant seeking calls. MCT will work in QSIG-CAS provided the attendants performing MCT-Activate, MCT-Control, and MCT-Deactivate are all on the same PBX. That is, an attendant on the main cannot work with an attendant on the branch to perform MCT.

- Multifrequency Signaling

  Calls coming into a branch over Multifrequency trunks are subject to intercept and may be sent to the attendant at the main. Multifrequency signaling can indicate that an incoming call on an MF trunk terminate at the attendant, regardless of the dialed extension.

- Night Service

  Night Service is available to QSIG-CAS. If a branch PBX is in night service, then all attendant-seeking calls for that branch are routed to the night service destination, not the CAS attendant. If the main PBX is in night service, then all attendant seeking calls at the main (either incoming from the main or branch) are routed to the night service destination. The night service destination for a PBX needs to be on that same PBX.

  DEFINITY supports the following night service features:

  — Hunt Group Night Service — allows an attendant to assign a hunt group to night service

  — Night Console Service — allows a console to be designated as the night service destination

- Night Station Service — allows a station to be designated as the night service destination
- Trunk Answer from Any Station (TAAS) — allows voice terminal users to answer attendant seeking calls
- Trunk Group Night Service — allows an attendant or designated night service terminal user to assign one or more trunk groups to night service

- Non-attendant handling of CAS calls

  Non-attendant handling of CAS calls functions as for RLT-CAS.

- Outgoing Trunk Queuing

  Attendant-seeking calls from branch to main can be queued at the outgoing branch trunk group.

- QSIG

  All the existing QSIG features and services are available in QSIG-CAS. QSIG-CAS is available in any QSIG-CAS ISDN network (PRI, BRI, and PRI/ATM).

- QSIG Call Offer

  Calls extended by the attendant can invoke Call Offer. If a call invokes Call Offer, attendant return call procedures still apply.

- Extending a Call

  QSIG CAS ensures that QSIG Path Replacement is attempted after split/swap, provided that all three parties (original calling party, the attendant, and the called party) are never conferenced together. That is, if the attendant toggles between the other two parties for any number of times, never conferencing all three together, and then joins the two parties together (with the attendant now out of the picture and ready to go on and handle other calls), Path Replacement is attempted.

- Remote Hold

  Remote Hold is used in an RLT-CAS environment and has no benefit in QSIG-CAS.

- Controlled Restriction

  As for RLT-CAS, Controlled Restriction is not available in QSIG-CAS for users on the branch.

- Security Violation Notification

  As for RLT-CAS, the CAS attendant cannot receive SVN referral calls from a branch because any administered SVN referral extension must be on the local PBX.

- Special Application 8140 - Attendant Dial 0 Redirect

  Attendant Dial 0 Redirect allows calls to the attendant group to be routed to one of two attendant groups based on their call priority level, and to alert with emergency ring. The two groups are the default attendant group and the priority attendant group. Administration of whether a priority level routes to the priority group is done on the console parameters screen.

  Administration on the console parameters screen at the main determines which attendant group the priority level routes to and whether calls of that priority level alert with emergency tone.

- Special Application 8141 - LDN Attendant Queue Priority

  Calls coming to the main from a QSIG-CAS branch cannot be queued by LDN Priority at the main. Note that QSIG-CAS does not change the ability to of LDN Queue Priority to function for calls coming directly into the main.

- Special Application 8156 - Attendant Queuing by COR

  Calls coming to the main from a QSIG-CAS branch cannot be queued by COR Priority at the main. Note that QSIG-CAS does not change the ability to of Attendant Queueing by COR to function for calls coming directly into or originating at the main.

- Timed reminder and Attendant timers

  Attendant timers are:

  — Timed Reminder on Hold — starts when an attendant puts a call on hold. When this timer expires, the held call alerts the attendant.

  — Return Call Timeout — starts when a call is extended and then released from an attendant console. If this timer expires, the call is returned to the attendant.

  — Time In Queue Warning — indicates the amount of time a call can wait in the attendant queue before activating an alert.

  — No Answer Timeout — Calls that terminate at an attendant console ring with primary alerting until this timeout value is reached. When this timeout value is reached, the call rings with a secondary, higher pitch.

  — Alerting — notifies, via secondary alerting, other attendants in an attendant group of an unanswered call. The Attendant Alerting Timed Reminder starts when a call reaches the Attendant No Answer Timeout maximum value.

- Transfer Out of AUDIX by Dialing 0

  Attendant seeking calls that transfer out of AUDIX by dialing 0, whose host switch is a branch PBX, are sent to the QSIG-CAS attendant on the main PBX whenever the dial 0 out of AUDIX destination corresponds to the attendant group.

Centralized Voice Mail Via Mode Code

You can use a single voice mail system to support multiple DEFINITY and Merlin Legend/Magix systems in a network via mode code. This capability is available for:

- DEFINITY ECS R8
- Prologix R3
- BCS Issue 6
- Merlin Legend R6.1
- Merlin Magix 1.0

NOTE:
DEFINITY One and Guestworks are not supported.

Voice mail systems that support these connections are:

- Intuity AUDIX R4.4 or higher running on a MAP5, with up to 18 ports
- Octel 100, with up to 16 ports

Configuration requirements

Centralized voice mail via mode code requires the following:

- A DEFINITY ECS switch as the hub of the voice mail network, with the voice mail system directly connected to it.
- Direct ISDN PRI tandem trunk connections, using DS1 service between the DEFINITY ECS hub and the switches the voice mail supports. The system uses the D-channel to transmit mode code signals to light message waiting lights on remote extensions.
- A uniform dial plan for all switches in the network, with a 4-digit plan if Merlin Legend/Magix is part of the network.
- One and only one mailbox for each extension in the network.

NOTE:
DCS software, X.25 hardware, and CLAN hardware/software are not required for this type of network. Additionally, you cannot network switches simultaneously using both mode code and DCS.

Configuration example

Figure 10 shows what a configuration of centralized voice mail via mode might look like.

In this configuration, DEFINITY system A is the hub. Voice mail system X is the centralized voice mail system. All other systems in the network are supported by voice mail system X *except* Legend system E and DEFINITY system D. These switches do not have a direct ISDN-PRI connection to the hub.

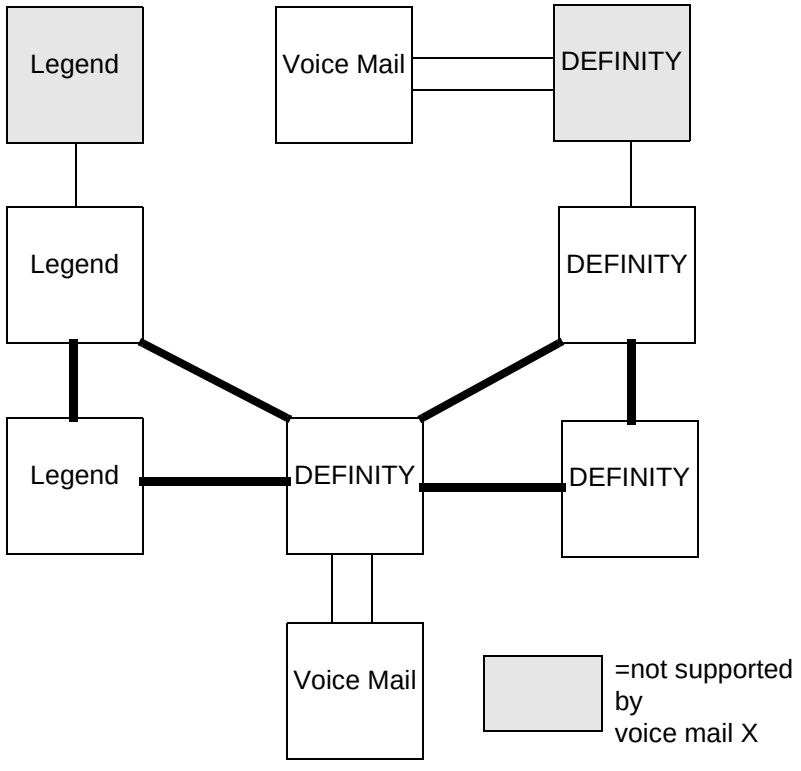


Figure 10. Centralized Voice Mail Via Mode Code Example Configuration

Feature Support

Features that are supported are:

- Calling party name/number sending/retrieval
- Message waiting light activation
- Remote coverage to voice mail
- Fax, as well as voice, mail

Features Not Supported

The following capabilities are not supported via mode code.

- Most DCS feature transparency.
- Centralized voice mail for a tandem switch (does not have a direct connection to the hub switch).
- Transfer into voice mail

Setting Up Centralized Voice Mail Via Mode Code

The following step describe how to set up DEFINITY switches to support centralized voice mail. For information on setting up Merlin Legend/Merlin Magix, see *Merlin Magix Integrated Systems Network Reference*, 555-715-114. For information on setting up INTUITY Messaging Solutions, see *INTUITY Messaging Solutions Integration with System 75, Generic 1 and 3, and R5/6.*

1. Enter **change system-parameters customer-options** on the command line of your system administration screen.
2. On page 3, verify fields as follows:
   - **ISDN-PRI** field is **y**.
   - **Mode Code for Centralized Voice Mail?** field is **y**.
   - **Mode Code Interface?** field is **y**.
   - **UDP** field is **y**.
3. On the hub switch, enter **add trunk group xxxx** on the command line of your system administration screen, where **xxxx** is the number of the ISDN-PRI trunk group connecting the hub with the remote switch.
4. On page 1, verify fields as follows:
   - **Group Type** field is **ISDN**.
   - **Service Type** field is **TIE**.
5. On page 2, verify fields as follows:
   - **Send Name** field is **y.**
   - **Send Calling Number** field is **y.**
   - **Numbering Format** field is **Private.**
   - **Send Connected Number** field is **y.**
6. On each remote switch, repeat steps 3-5.
7. On each DEFINITY switch in the network, enter **change dialplan** on the command line of your system administration screen.

8. Administer the dial plan for each node in the network (see Chapter 4 in this document for examples). Usually the hub is considered Node 1.

   If the network contains Merlin Legend/Magix systems:

   — **Uniform Dialing Plan** field is **4** for each node.

   If the network contains only DEFINITY systems:

   — **Uniform Dialing Plan** field is **4** or **5**.

9. For each DEFINITY node, enter **change feature-access-codes** on the command line.
10. On page 2, verify fields as follows:

    — **Leave Word Calling Send a Message** field is **#90**.

    — **Leave Word Calling Cancel a Message** field is **#91.**

NOTE:
All nodes in the system and the Voice Mail system must match this setting

11. For each DEFINITY node, enter **add ds1*UUCSS*** on the command line, where ***UUCSS*** is the address of the DS1 circuit pack.
12. On page 1, verify fields as follows:

    — **Line Code** field is **B8ZS**.

    — **Framing** field is **extended superframe.**

    — **Signaling Mode** field is **ISDN/PRI.**

    — **Connect** field is **PBX.**

    — **Interface** field is **network** (for the hub) and **user (**for the remote switch).

NOTE:
Mode Codes *will not work* with D4 or SuperFrame

13. For each DEFINITY node, enter change sign next on the command line. Administer the signaling group (see example in Chapter 4 of this document).
14. For each DEFINITY node, enter change isdn private-numbering, and verify fields as follows:

    — Set Network Level field is 0

      This setting overrides the signaling on the D channel, allowing the Message Waiting lamp activation signal to be sent

15. On the DEFINITY node, enter change sys params mode-code on the command line.
16. On the hub switch, set the VMS Hunt Group Extension field to the voice mail hunt group extension.

17. On the remote switches, repeat Step 15. Enter the voice mail hunt group extension in the Remote VMS Extension - First field.
18. For each DEFINITY node, enter change aar an on the command line.
19. Verify the following:
    - Call Type field is lev0
20. On the hub switch, enter change station extension for each port extension in the voice mail hunt group.
21. On Page 1, verify the following:
    - Type field is vmi.
22. On Page 2 of the Station screen, administer or verify the following:
    - LWC Reception field is msa-spe (Message Server Adjunct-System Processing Element).
    - Leave Word Calling field is y.
    - Adjunct Supervision field is y.
    - Distinctive Audible Alert field is n.
    - Switchhook Flash field is y.
    - LWC Activation field is y.
23. For each remote DEFINITY node, enter **change coverage remote** on the command line.
24. Administer or verify the following:
    - **01** contains the extension of the voice mail hunt group.

Japan TTC Q931-a Private Networking Protocols

The Telecommunications Technology Committee (TTC) of Japan defines national standards that are to be used in domestic public and private network facilities. The TTC typically modify other international standards as defined by ITU-T for use in Japan with additional national protocols to enhance operation for their customers.

Overview

The TTC has defined a family of Q931-a private networking protocols that allows for a level of feature transparency between different switches within a single vendor or multi-vendor private network. DEFINITY ECS provides connectivity into the Japanese private networking environment via two methods

- CAS (Channel Associated Signaling) — first developed in DEFINITY ECS R7 for the Japan market (See the description of TN2242 Japan 2Mbit Trunk in *DEFINITY ECS R8 System Description*, 555-233-200.)
- ISDN (Integrated Services Digital Network) PRI (Primary Rate Interface) — TTC specific protocol newly support in DEFINITY ECS R8. DEFINITY ECS supports Basic Call with Number Identification services.

TTC Basic Call Setup with Number Identification Supplementary Service

DEFINITY ECS allows the display of the calling party number to the called party. DEFINITY ECS also displays the connected number to the calling party after the call connects to the called number of another destination. For many protocols, Number Identification is considered to be part of Basic call; however, the TTC protocol defines Number Identification services to be part of their supplementary services offering. No additional supplementary services are supported at this time.

You can administer outgoing calls as “yes”, “no”, or “restricted.” Restricted means that DEFINITY ECS sends the information but sends it “presentation restricted,” which indicates to the receiving switch that the information should not be displayed. A received restricted number is included on the Call Detail Record (CDR).

TTC Q931-a Protocols

The TTC defined private networking ISDN protocol is largely based upon ITU-T Q.931 protocol. DEFINITY ECS supports the following TTC defined protocols:

Basic Call support as defined in JT-Q931-a “Digital Interface between PBXs (Common Channel Signaling) — Layer 3”

Number Identification Services as defined in JT-Q951-a “Digital Interface between PBXs (Supplementary Services) — Number Identification Services”

Differences from ITU-T Q.931 include:

- symmetrical operation as Peers similar to QSIG protocol, i.e. No Network/User definition
- different protocol discriminator
- Progress Indicator IE not supported in DISCONNECT messages

- Timers T310 and T313 are disabled
- Sending Complete IE not supported
- NOTIFY messages are not supported.

Setting Up TTC Q931-a

Complete the following steps to set up TTC connections.

Steps

1. Verify that you have the appropriate DEFINITY circuit pack for integration
2. Enter "**change system-parameters customer-options**" on the command line of your system administration screen.
3. On page 1, verify that the G3 Version field is **V8** or later
4. On page 2, verify that ISDN-PRI field is **y**.
5. Administer the TTC DS-1 circuit pack.

   Check for the following field entries:

   — Connect field — **pbx**

   — Interface — **peer-master** or **peer-slave**

   — Peer Protocol — **TTC**

   — D-channel: (*This item must match between the local and receiving switches*)

   — Channel Numbering — **sequential** or **timeslot** (*This item must match between the local and receiving switches*)
6. Administer or check the TTC ISDN trunk group(s) associated with the DS1 circuit pack.

   Check for the following field entries on page 1 of the Trunk Group screen:

   — Group type: **isdn**

   — Supplementary Service protocol — **a**

   — Outgoing Display? **y**

   Check for the following field entries On page 2

   — Disconnect Supervision — **y**

   — Numbering format — **public, private, unknown, unk-pvt**

   — Send Called/Busy/Connected Number — **y**

   — Sending Calling Number — **y**

   — Send Name — **n**

Interworking between TGU/TGE Trunks and ISDN (Italy)

The feature modifies ISDN messaging operations in systems that use TGE/TGU trunks to network satellite switches. Messaging from the DEFINITY ECS provides appropriate ringback or busy tone to the calling party.

IP Routes

Using IP routes

On LANs that connect to other networks or subnetworks, Avaya recommends that you define a default gateway. See "Default gateway" for more information. Only in rare cases should you add other routes to define specific network paths through other gateways.

NOTE:
Avaya recommends that routing is defined on your data network, rather than in the DEFINITY system. This section should only be used under exceptional circumstances.

This table describes the network configurations that require explicit IP routes:

Connection Type	Use IP routes when:
Ethernet	■ you want the local node to communicate to a remote subnet without routing through the default gateway ■ you want the local node to communicate with any node a remote network but not with nodes on other networks (this is a network route type)
ppp	there are one or more intermediate nodes between endpoints

IP routing screen

The following diagram shows the IP Routing screen.

```
display ip-route 1                          Page   1 of   1
                        IP ROUTING


     Route Number: 1
 Destination Node: clan-a2_____
          Gateway: router-1_____
      C-LAN Board: 1b01
           Metric: 0
       Route Type: host
```

To set up an IP route, enter the node names for the destination and the gateway, and enter the slot location of the C-LAN on the local switch. The destination and gateway node names and their associated IP addresses must be specified on the Node Name screen.

The Route Type is a display-only field that appears on the screen for the display, list, and change ip-route commands. This field indicates whether the route is a *host* or *network* route. It is a host route if the destination address (associated with the Destination Node on the Node Names screen) is the address of a single host, or node. It is a network route if the destination address is the address of a network, not a single node. (see "Network IP addresses" for a description of a network address)

Advanced IP routing

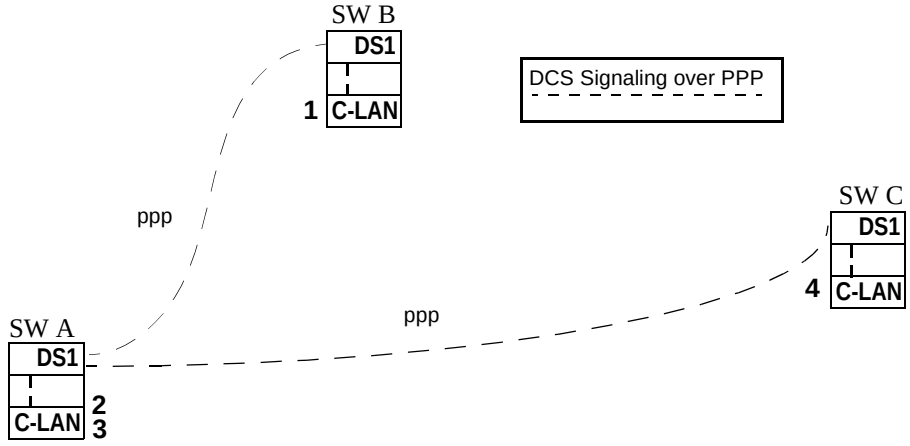
If you wanted the local C-LAN node to be able to communicate with the nodes on the 192.168.1.64 subnetwork and not with others, you could do the following:

1. Leave blank the Gateway Address field on the IP Interfaces screen
2. Enter a node name — for example, “subnet-1” — and the IP address, 192.168.1.64, on the Node Names screen
3. Set up an IP route with “subnet-1” in the Destination Node field

See the description of the subnet mask in "Subnetting" for more information on subnet addresses. See DEFINITY ECS Administrator’s Guide for a description of the Metric field.

IP route example: PPP connections

The diagram below shows three switches in a DCS network with PPP signaling connections between switches A & B and between switches A & C. All nodes in this diagram are C-LAN ports. PPP data modules are administered between nodes 1 & 2 on switches A & B, and between nodes 3 & 4 on switches A & C. With these connections, switch A can communicate with switches B and C without using the IP Routing screen to administer explicit host IP routes. However, switches B and C need host IP routes to communicate with each other because they are not directly connected.



NOTE:
The IP routes between nodes for this example are listed in the following table. The Destination Node and Gateway Node columns in the table show the nodes to enter on the IP Routing screen to administer a host IP route. On the IP Routing screen, enter the node names assigned on the Node Names screen for these nodes.

Switch	Node Connections	Destination Node	Gateway Node	Route Type	Comments
B	1 —> 4	4	2	host	IP route needed because there is an intermediate node between nodes 1 & 4.
C	4 —> 1	1	3	host	IP route needed because there is an intermediate node between nodes 4 & 1.

NOTE:
The PPP data modules on switches B and C for the connections to A must be enabled before the IP routes can be administered.

NOTE:
Nodes 2 and 3 in this example are two ports on the same C-LAN board. Messages from node 1 destined for node 4 arrive at node 2; the C-LAN ARP software routes the messages to node 4 through node 3.

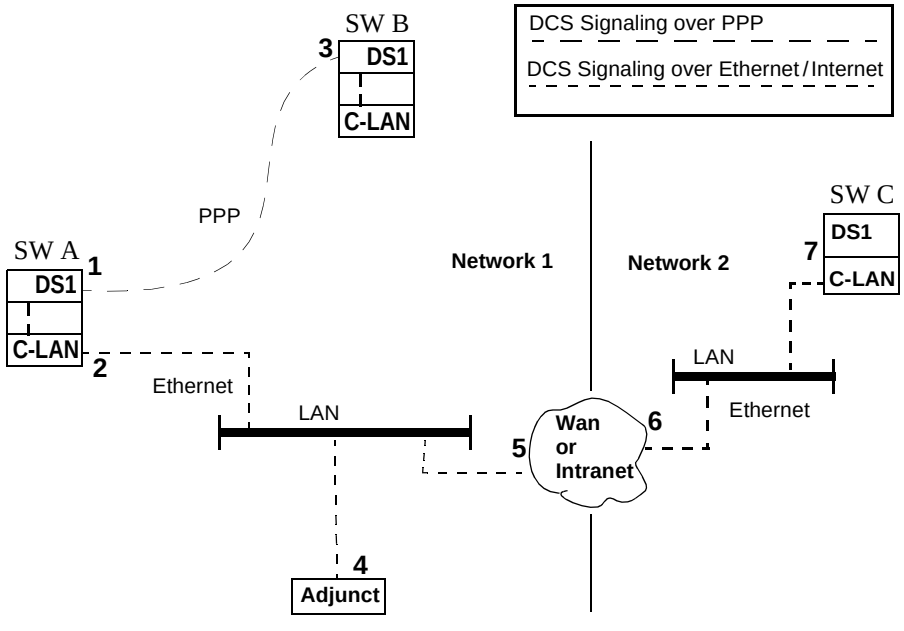
IP route example: PPP with Ethernet Connections

The diagram below shows two interconnected (sub)networks. There are three switches in a DCS network with a ppp signaling connection between switches A & B and an ethernet signaling connection between switch A and the adjunct. Switches A & B and the adjunct are on one (sub)network and switch C is on another (sub)network.

Switch A acts as a gateway to convert between the two signaling protocols. PPP data modules are administered between nodes 1 & 3 on switches A & B and ethernet data modules are administered on switches A & C for the C-LAN ethernet port interfaces to their LANs. With these connections, switch A can communicate with switch B and with the adjunct without using the IP Routing screen to administer explicit IP routes.

Normally, node 5 is defined as the default gateway for node 2 on the IP Interfaces screen, which enables switch A to communicate with switch C without an explicit IP route defined. However, if node 5 is not assigned as the default gateway for node 2, switch A needs an IP route to communicate with switch C because these switches are on different (sub)networks. Node 6 is normally defined as the default gateway for node 7. If it is not, switch C needs an IP route to communicate with switch A.

Also, switch B needs an IP route to communicate with switch C because B is connected to A via ppp and there are intermediate nodes between B & C.



The following table shows the IP routes needed if nodes 5 and 6 are not defined as default gateways for nodes 2 and 7.

Table 21. IP route examples

Switch	Node Connections	IP Route Destination Node	IP Route Gateway Node	Comments
A	2 —> 7	7	5	IP route needed because nodes 2 & 7 are on different subnets and the Gateway Address field for the node-2 C-LAN is blank on the IP Interfaces screen.
B	3 —> 4	4	1	IP route needed because 3 is connected to 1 via ppp and there are intermediate nodes between 3 & 4. The data module for the ppp connection between nodes 3 and 1 must be enabled before administering this route.
	3 —> 7	7	1	IP route needed to because 3 is connected to 1 via ppp and there are intermediate nodes between 3 & 7. The data module for the ppp connection between nodes 3 and 1 must be enabled before administering this route.

Continued on next page

Table 21. IP route examples — *Continued*

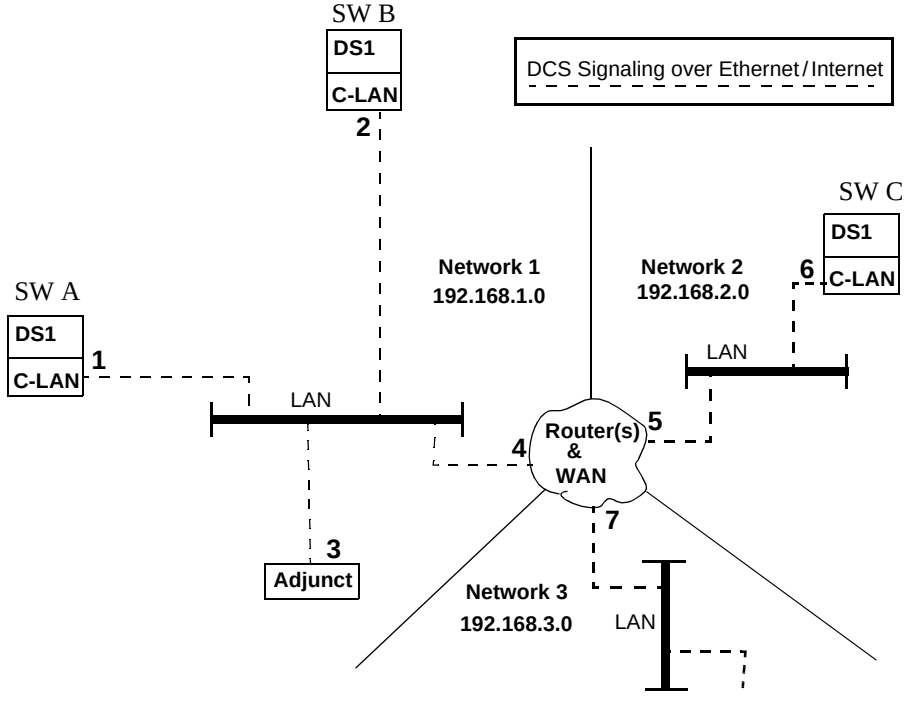
Switch	Node Connections	IP Route Destination Node	IP Route Gateway Node	Comments
C	7 —> 4	4	6	IP route needed because nodes 4 & 7 are on different subnets and the Gateway Address field for the node-7 C-LAN is blank on the IP Interfaces screen.
	7 —> 2	2	6	IP route needed because nodes 2 & 7 are on different subnets and the Gateway Address field for the node-7 C-LAN is blank on the IP Interfaces screen.
	7 —> 3	3	2	IP route needed because nodes 3 & 7 are on different subnets. This route depends on route 7—>2. **Note:** this route is not be needed if node 6 is administered for proxy ARP to act as a proxy agent for node 3.

IP route example: Ethernet-only connections

The diagram below shows three interconnected (sub)networks. There are three switches in a DCS network with ethernet signaling connections between them. Switches A & B and the adjunct are on one (sub)network and switch C is on another (sub)network. Nodes 1, 2, and 6 are C-LAN ports. Node 3 is the adjunct interface port to the LAN. Nodes 4, 5, and 7 are interfaces to the WAN/Internet cloud and have IP addresses that are on different (sub)networks. An ethernet data module and IP Interface is administered for the C-LAN ethernet port on each switch.

Switches A and B can communicate with each other and with the adjunct without using the IP Routing screen to explicitly administer host IP routes. Normally, node 4 is defined as the Gateway Address for node 1 on the IP Interfaces screen, which enables switch A to communicate with switch C without an explicit host IP route defined. However, if node 4 is not assigned as the Gateway Address for node 1, switch A needs an IP route to communicate with switch C because these switches are on different (sub)networks. Similarly, node 5 is normally defined as the default gateway for node 6. If it is not, switch C needs an IP route to communicate with switch A.

In this configuration, network IP routes can be used alone, or in combination with host IP routes, to tailor access among nodes. For example, if you want node 1 to be able to communicate with any node on (sub)networks 2 and 3, define node 4 as the Gateway Address for node 1. Then you do not need any IP routes defined for node 1. If you want node 1 to be able to communicate with all nodes on (sub)network 3 but none on (sub)network 2, define a network IP route to (sub)network 3 (and *not* assign node 4 as the Gateway Address for node 1). Then node 1 can communicate with any node on (sub)network 3 without defining host IP routes to them.



The following table shows the IP routes if node 4 is not defined as the Gateway Address (on the IP Interfaces screen) for nodes 1, 2, and 3, but node 5 is defined as the Gateway Address for node 6.

Table 22. IP route examples (if node 4 is not defined)

Switch	Node Connections	IP Route Destination Node	IP Route Gateway Node	Route Type	Comments
A	1 —> 6	6	4	host	IP route needed because nodes 1 & 6 are on different subnets and no Gateway Address is specified for the node-1 C-LAN on the IP Interfaces screen.
	1—> network 3	network-3	4	network	This route enables node 1 to communicate with any node on Network 3. Associate the node name *network-3* with the IP address 192.168.3.0 on the Node Names screen.
B	2 —> 6	6	4	host	IP route needed because nodes 2 & 6 are on different subnets and no Gateway Address is specified for the node-1 C-LAN on the IP Interfaces screen.
C					No IP routes are needed on Switch C because node 5 is defined as the Gateway Address for node 6.

IP Addressing

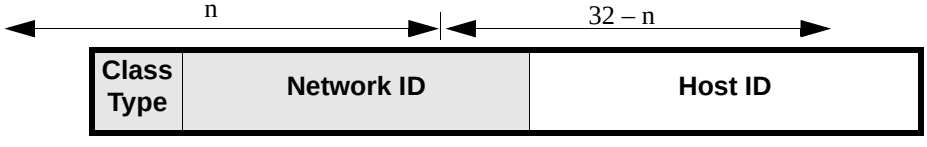
IP Addressing

This section describes IP addressing, subnetting, and routing.

Logical Addressing

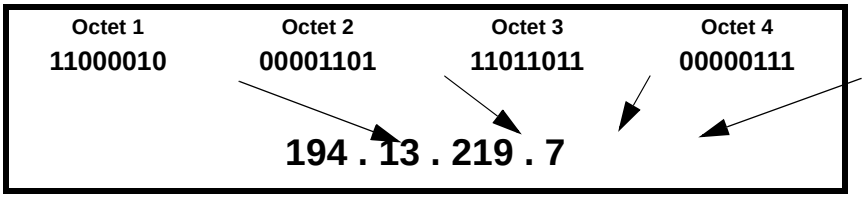
An IP address is a software-defined 32-bit binary number that identifies a network node. The IP address has two main parts -- the first n bits specify a “network ID” and the remaining 32 – n bits specify a “host ID.”

Format



Dotted Decimal notation

The 32-bit binary IP address is what the computer understands. For human use, the address is typically expressed in dotted decimal notation — the 32 bits are grouped into four 8-bit octets (bytes) and converted to decimal numbers separated by decimal points, as in the example below.



The eight binary bits in each octet can be combined to represent decimal numbers ranging from 0 to 255.

Conversion between binary and decimal

Conversion from binary to decimal notation is accomplished by adding the powers of 2 corresponding to the 1's positions in each byte:

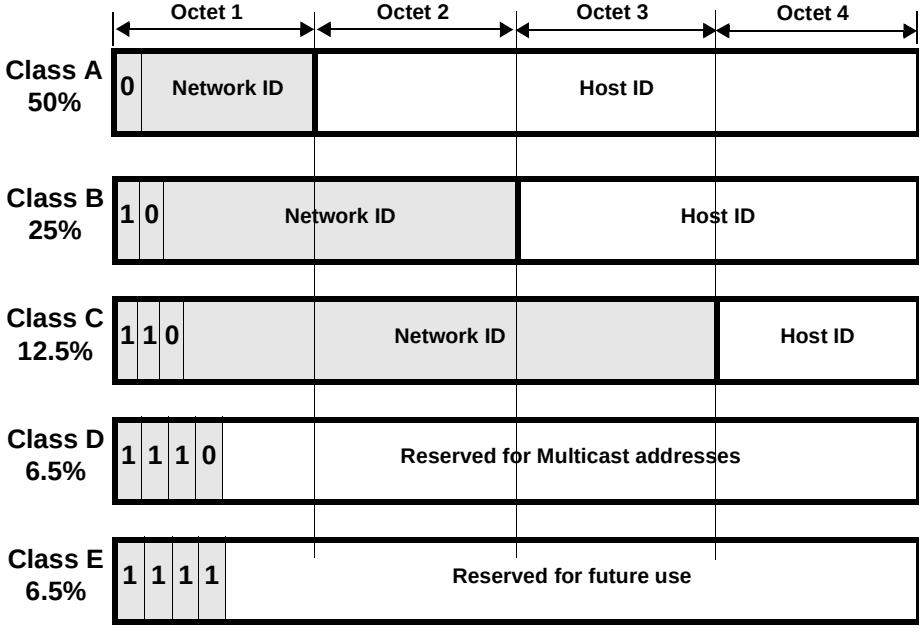
	2^7 = 128	2^6 = 64	2^5 = 32	2^4 = 16	2^3 = 8	2^2 = 4	2^1 = 2	2^0 = 1
194 =	1	1	0	0	0	0	1	0
13 =	0	0	0	0	1	1	0	1
219 =	1	1	0	1	1	0	1	1
7 =	0	0	0	0	0	1	1	1

IP Address Classes

The IP address space (2^{32} or about 4.3 billion addresses) has been divided into five groups, Classes A–E, to accommodate the need for different network sizes. Each class has a different allocation of bits between the network and host IDs. The classes are identified by a fixed pattern of leading bits.

In Class A addresses, the first (leftmost) bit is always 0. So Class A IP addresses have 7 bits to define network IDs; 7 bits can define a total of 128 (0-->127) Class A networks. The remaining 24 bits of a Class A IP address are used to define host IDs. So for each of the 126 networks, there are 2^{24} or 16,777,216 possible hosts.

The following table shows how IP addresses are the allocated among the five classes.



Address classes A, B, and C cover 87.5% of the address space. These addresses are assigned by the ISP or the Internet Assigned Number Authority (IANA) to organizations for their exclusive use. The remaining 12.5% of addresses, designated classes D and E, are reserved for special purposes.

The IANA assigns a network address to an organization and a network administrator in the organization assigns the Host IDs associated with that Network ID to nodes within the organization's network.

Table 23 shows the ranges of network and host IDs, and the total number of IP addresses (# network IDs times # host IDs), for each class.

Table 23. Network and host IDs.

Class	Network ID Range	Host ID Range	Total IP Addresses
A	7 bits 126 Networks: 1 to 126	24 bits 16.8 Million Hosts per network: 0.0.1 to 255.255.254	2.1 Billion 50%
B	14 bits 16,382 Networks: 128.0 to 191.255	16 bits 65,534 Hosts per network 0.1 to 255.254	1.1 Billion 25%
C	21 bits 2.1 Million Networks: 192.0.0 to 233.255.255	8 bits 254 Hosts per network: 1 to 254	0.5 Billion 12.5%
D&E			0.5 Billion 12.5%

You can tell the class of an IP address by the first octet. For example, 191.221.30.101 is a Class B address and 192.221.30.101 is a Class C address.

Private IP Address

Addresses on the Internet need to be unique to avoid ambiguity in message routing over the Internet. To insure uniqueness, the Internet Assigned Number Authority (IANA) controls the use of IP addresses. Organizations that maintain private networks that never communicate with the Internet can use arbitrary IP addresses as long as they are unique within the private network. To help prevent the duplication of IP addresses on the Internet, the IANA has reserved the following ranges of IP addresses for private networks:

1 Class A networks: 16.6 Million addresses: 10.0.0.0 --> 10.255.255.255

16 Class B networks: 1 Million addresses: 172.16.0.0 --> 172.31.255.255

256 Class C networks: 65,000 addresses:192.168.0.0 --> 192.168.255.255

These IP addresses can be used repeatedly in separate private networks, which are not connected to the Internet. Routing tables prohibit the propagation of these addresses over the Internet. (See RFC 1918). All other IP addresses are unique and must be assigned by the IANA or ISP.

Subnetting

Subnetting is the grouping of IP addresses associated with a network ID into two or more subnetworks. The subnets of a network ID are visible only within the organization that owns the network ID; Internet routers route messages based on the network ID and the routers within the private organization differentiate between the individual subnets.

Reasons for subnetting

Subnetting is desirable because it enables a more efficient allocation and management of IP addresses.

The three-class hierarchy of IP addresses results in an inefficient allocation of addresses in many cases because addresses are assigned and managed in blocks by network ID. For example, a company that needs 10,000 IP addresses in each of two locations might be assigned two Class B network IDs, each of which provides 65,534 IP addresses. Even though one Class B network ID would provide more than enough addresses for both locations, having a separate network ID for each location is easier to manage. If the company uses only 20,000 of these addresses, about 100,000 go unused.

In this case, subnetting would enable the company to use one Class B network ID and subdivide the addresses into two subnets, one for each location. Each subnet would have a unique “extended network ID” that would enable them to be managed as if they had unique network IDs.

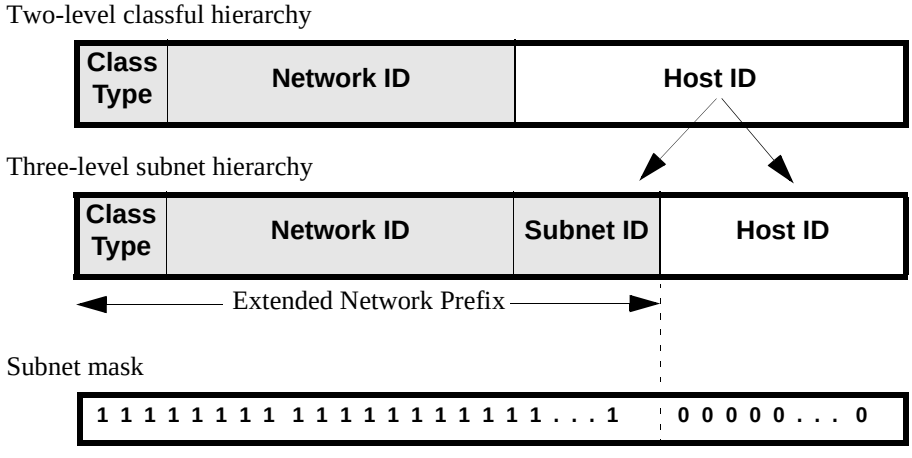
Typically, organizations need to manage IP addresses in separate groups based on several criteria in addition to location:

- different types of LANs
- different server applications
- different work projects
- security

The grouping of IP addresses provided by the three-Class structure does not allow nearly enough flexibility to meet the needs of most organizations. Subnetting allows the N IP addresses associated with a network ID to be divided into as few as 2 groups, each with N/2 addresses, or into as many as N/2 groups, each with 2 addresses, if desired.

How subnets are created

RFC 950 defines a standard procedure to divide a Class A, B, or C network ID into subnets. The subnetting adds a third level of hierarchy to the two-level hierarchy of the Class A, B, and C network ID number. An “extended network prefix” is formed by using two or more bits of the Host ID as a subnet number, and appending this subnet number to the network ID.



The extended network prefix is then treated as a normal network ID. The remaining host ID bits define the host IDs within each subnet. For example, a block of IP addresses could be subdivided into four subnets by using 2 host bits to “extend” the network ID. Now there are 4 times as many (extended) networks and 1/4 as many hosts per network.

NOTE:
In adding up the number of network and host IDs, certain addresses cannot be counted. In general, addresses with all ones or all zeros in either the network portion or the host portion of the address are not usable. These are reserved for special uses, such as broadcasting or loopback.

Subnet Masks

Routing protocols use a *subnet mask* to determine the boundary between the extended network ID and the host ID in an IP address. The subnet mask is a 32-bit binary number consisting of a string of contiguous 1’s followed by a string of contiguous 0’s. The 1’s part corresponds to the extended network prefix and the 0’s part corresponds to the host ID of the address.

Each of the three classes of addresses has a default subnet mask that specifies the end of the 1st, 2nd, and 3rd octet as the boundary between the extended network prefix and the host ID. The default subnet mask in each case means “no subnetting.”

	Default Subnet Mask
Class A	11111111.00000000.00000000.00000000 255.0.0.0
Class B	11111111.11111111.00000000.00000000 255.255.0.0
Class C	11111111.11111111.11111111.00000000 255.255.255.0

In addition to the default subnet masks, which divide the network and host IDs at the octet boundaries in the IP address, subnets can be formed by using 2 or more bits from the host octets to define the subnet ID.

Class-C subnets

Table 24 shows that Class-C IP addresses can have 5 subnetting schemes, each with a different number of subnets per network. The first and last subnet, formed by using 1 and 7 bits respectively, are unusable because they result in either the subnet ID or the host ID having all zeros or all ones.

Table 24. Subnetting schemes for Class-C IP addresses.

No. Sub-net bits	No. of Usable Subnets per NW	No. of Hosts per Subnet	No. of Usable IP Addresses	Binary Subnet ID (4th Octet)	Decimal Subnet ID	Class C Subnet Masks
1	0	126	0	10000000	128	255.255.255.128
2	2	62	124	11000000	192	255.255.255.192
3	6	30	180	11100000	224	255.255.255.224
4	14	14	196	11110000	240	225.225.225.240
5	30	6	180	11111000	248	255.255.255.248
6	62	2	124	11111100	252	255.255.255.252
7	126	0	0	11111110	254	255.255.255.254

3-bit subnets

As an example, the third row of the table shows the results of using 3 bits for the subnet ID. Three bits are “borrowed” from the host ID leaving 5 bits for the host IDs. The number of subnets that can be defined with three bits is $2^3 = 8$ (~~000~~, 001, 010, 011, 100, 101, 110, ~~111~~). Of these, only 6 are usable (all ones and all zeros are not usable). The remaining 5 bits are used for the host IDs. Of these, $2^5 – 2 = 30$ are usable. As shown in columns 2–4 (row 3), by using 3 bits for subnetting, a Class C network can be divided into 6 subnets with 30 host IDs in each subnet for a total of 6 X 30 = 180 usable IP addresses.

Subnet mask

The subnet mask is defined as follows. The subnet bits “borrowed” from the host ID are the highest-order bits in the octet of the host ID. The 5th and 6th columns of the table show the binary and decimal subnet IDs, formed by using the subnet bits as the highest-order bits in an octet. For example, in the third row of the table, the binary bit pattern is 11100000, which is decimal 224. This is the highest number that can be formed with the 3 high-order bits in the octet. The subnet mask is formed by putting this number in the 4th octet of the default subnet mask (shown in the last column of the table).

The mask, 255.255.255.224, corresponds to a bit pattern of 27 ones followed by 5 zeros. This mask would be used to check that two IP addresses are on the same or different subnets by comparing the first 27 binary digits of the two addresses. If the first 27 binary digits are the same, the two addresses are on the same subnet.

Example

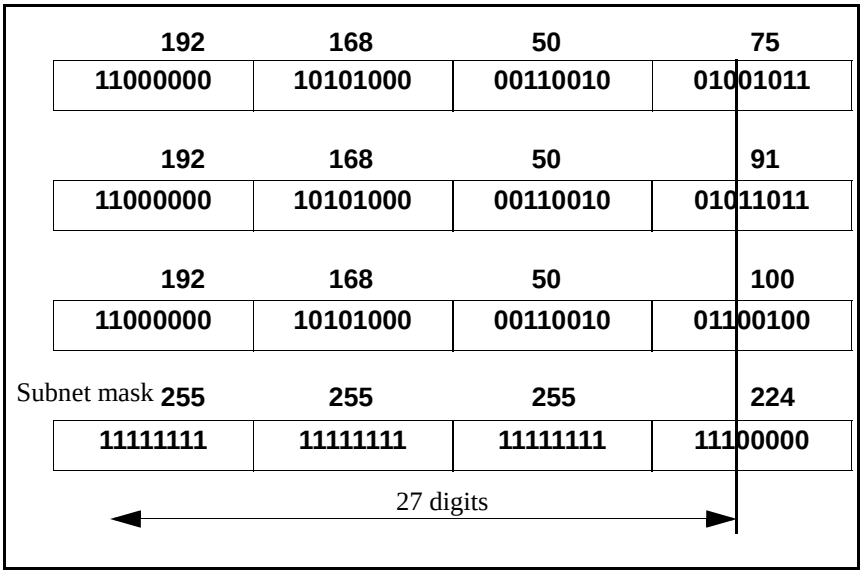
To continue the example using a 3-bit subnet ID, assume a Class C network ID of 192.168.50.xxx. This network ID can provide 254 usable IP addresses, all on the same network — from 192.168.50.1 to 192.168.50.254. If we divide this network into 3-bit subnets, we will have 6 usable subnets with 30 usable IP addresses in each subnet. Note that we have lost 74 usable IP addresses in the process because we had to discard the all-ones and all-zeros subnet IDs (62 addresses) and host IDs (12 addresses). There is always a loss of usable IP addresses with subnetting.

Table 25 shows the subnet boundaries for the six subnets formed with 3 bits. The boundaries are the numbers formed by using all combinations of 3 bits as the highest-order bits in an octet (Columns 1 and 2) and then using these numbers in the 4th octet for the host IDs.

Table 25. Subnet Boundaries

Binary Subnet Boundaries (for 3 bits)	Decimal Subnet Boundaries	Range of usable IP Addresses in the Subnet
00000000	0	not usable
00100000	32	192.168.50.**33** to 192.168.50.**62**
01000000	64	192.168.50.**65** to 192.168.50.**94**
01100000	96	192.168.50.**97** to 192.168.50.**126**
10000000	128	192.168.50.**129** to 192.168.50.**158**
10100000	160	192.168.50.**161** to 192.168.50.**190**
11000000	192	192.168.50.**193** to 192.168.50.**222**
11100000	224	not usable

For example, the IP addresses 192.168.50.75 and 192.168.50.91 are on the same subnet but 192.168.50.100 is on a different subnet. This is illustrated in the following diagram where the subnet mask, 255.255.255.244 is used to compare the first 27 binary digits or each address.



The other four possible subnetting schemes for Class C addresses, using 2, 4, 5, and 6 subnet bits, are formed in the same way. Which of the 5 subnetting schemes to use depends on the requirements for the number of subnets and the number of hosts per subnet.

Class-A and Class-B subnets

For Class A and Class B IP addresses, subnets can be formed in the same way as for Class C addresses. The only difference is that many more subnets per network can be formed. For Class B networks, subnets can be formed using from 2 to 14 bits from the 3rd and 4th octets. For Class A networks, subnets can be formed using from 2 to 22 bits from the 2nd, 3rd and 4th octets.

The Subnet Mask field on the ppp Data Module screen (used for ppp connections) and on the IP Interfaces screen (used for ethernet connections) enables the specification of a subnet for the IP address.

Valid subnet masks

The valid subnets for each Class of address are:

Table 0-1. Valid subnets.

Heading		q
Class A (default 255.0.0.0)	**Class B: (default 255.255.0.0)**	**Class C (default 255.255.255.0)**
255.192.0.0	255.255.192.0	255.255.255.192
255.224.0.0	255.255.224.0	255.255.255.224
255.240.0.0	255.255.240.0	255.255.255.240
255.248.0.0	255.255.248.0	255.255.255.248
255.252.0.0	255.255.252.0	255.255.255.252
255.254.0.0	255.255.254.0	
255.255.0.0	255.255.255.0	
255.255.128.0	255.255.255.128	
255.255.192.0	255.255.255.192	
255.255.224.0	255.255.255.224	
255.255.240.0	255.255.255.240	
255.255.248.0	255.255.255.248	
255.255.252.0	255.255.255.252	
255.255.254.0		
255.255.255.0		
255.255.255.128		
255.255.255.192		
255.255.255.224		
255.255.255.240		
255.255.255.248		
255.255.255.252		
255.254.0.0	255.255.254.0	

Notice that all 5 valid Class C subnet masks can also be valid Class B or Class A subnet masks, and all 13 valid Class B subnet masks can also be valid Class A subnet masks.

For example, 255.255.255.224 is a valid subnet mask for all three address classes. It allows 6 (2^3–2) subnetworks for Class C addresses, 2046 (2^{11}–2) subnetworks for Class B addresses and 524,286 (2^{19}–2)subnetworks for Class A addresses. Each of these subnetworks can have 30 (2^5–2) hosts.

Network IP addresses

An IP address for a network has the network ID in the network portion and 0 in the host portion. For example, 192.168.1.0 is the network address for the 192.168.1 network.

When a network is subnetted, and you want to set up a network IP route to a subnetwork, the IP address of the subnetwork is the first address in that subnetwork, which has all 0's for the host portion of the address. For example, the subnet mask formed by using 2 bits of the host portion of a Class C address is 255.255.255.192 (1100000 = 192). For the 192.168.1 network, this subnet mask creates 2 usable subnetworks whose IP addresses are 192.168.1.64 (0100000 = 64) and 192.168.1.128 (1000000 = 128), with 62 usable host addresses in each subnetwork.

Glossary

A

AAR
See Automatic Alternate Routing (AAR).

Abbreviated Dialing (AD)
A feature that allows callers to place calls by dialing just one or two digits.

AD
See Abbreviated Dialing (AD)

ADU
See Asynchronous data unit (ADU).

adjunct
A processor that does one or more tasks for another processor and that is optional in the configuration of the other processor. Intuity AUDIX and CentreVu CMS are considered adjuncts to the DEFINITY ECS.

Administration Without Hardware (AWOH)
A feature that allows administration of ports without associated terminals or other hardware.

ANSI
American National Standards Institute**.** A United States professional/technical association supporting a variety of standards.

APLT
Advanced Private-Line Termination.

ARP
Address Resolution Protocol.

ARS
See Automatic Route Selection (ARS).

ASCII
American Standard Code for Information Interchange. The standard code for representing characters in digital form. Each character is represented by an 8-bit code (including parity bit).

asynchronous data transmission
A method of transmitting data in which each character is preceded by a start bit and followed by a stop bit, thus permitting data characters to be transmitted at irregular intervals. This type transmission is advantageous when transmission is not regular (characters typed at a keyboard). Also called asynchronous transmission.

Asynchronous data unit (ADU)
A device that allows direct connection between RS-232C equipment and a digital switch.

Asynchronous Transfer Mode (ATM)
A connection-oriented, digital service optimized for fiber-optic lines at speeds up to 622.08 mbps. ATM networks set up a virtual circuit (virtual connection) between the transmitter and the receiver before sending any data. Data is then sent in a continuous stream of fixed-length, 58-byte cells, each of which contains a 48-byte payload and a 5-byte header. The header contains the virtual circuit number that identifies the pre-negotiated path through the network.

ATM
See Asynchronous Transfer Mode (ATM)

Audio Information Exchange (AUDIX)
A fully integrated voice-mail system. Can be used with a variety of communications systems to provide call-history data, such as subscriber identification and reason for redirection.

Automatic Alternate Routing (AAR)
A feature that routes calls to other than the first-choice route when facilities are unavailable.

Automatic Route Selection (ARS)
A system for automatically routing telephone calls by the least costly route. A feature of the Avaya DEFINITY Enterprise Communications Server.

auxiliary trunk
A trunk used to connect auxiliary equipment, such as radio-paging equipment, to a communications system.

AWOH
See Administration Without Hardware (AWOH).

B

B8ZS
See Bipolar 8 Zero Substitution (B8ZS).

Basic Rate Interface (BRI)
A standard ISDN frame format that specifies the protocol used between two or more communications systems. As used in North America, BRI provides 23 64-kbps B-channels (voice or data) and one 64-kbps D-channel (signaling). The D-channel is the 24th channel of the interface and contains multiplexed signaling information for the other 23 channels.

bandwidth
The amount of data that a given channel can transmit in a given period of time, measured in bits per second (not bytes per second) on digital networks or in Hertz (cycles per second) on analog networks. For analog transmission, the band width can be measured as the difference, expressed in hertz, between the highest and lowest frequencies transmitted.

baud
A unit of transmission rate equal to the number of signal events per second. See also bit rate.

BCC
See bearer capability class (BCC)

bearer capability class (BCC)
Code that identifies the type of a call (for example, voice and different types of data). Determination of BCC is based on the caller's characteristics for non-ISDN endpoints and on the Bearer Capability and Low-Layer Compatibility Information Elements of an ISDN endpoint. Current BCCs are 0 (voice-grade data and voice), 1 (DMI mode 1, 56 kbps data transmission), 2 (DMI mode 2, synchronous/asynchronous data transmission up to 19.2 kbps) 3 (DMI mode 3, 64 kbps circuit/packet data transmission), 4 (DMI mode 0, 64 kbps synchronous data), 5 (temporary signaling connection, and 6 (wideband call, 128–1984 kbps synchronous data).

BER
Bit error rate.

Bipolar 8 Zero Substitution (B8ZS)
B8ZS line coding substitutes a mix of 1s and 0s for every group of eight consecutive 0s in a stream of AMI-encoded data (see line coding). The encoded string contains consecutive ones with the same polarity. These intentional, bipolar violations of the AMI coding scheme let the receiving end identify, decode, and restore the long zero strings in the original message. B8ZS line coding does not corrupt digital data, so it is commonly used with T-1 lines.

bit (binary digit)
One unit of information in binary notation, having two possible values: 0 or 1.

bit rate
The speed at which bits are transmitted, usually expressed in bits per second. Also called data rate.

bps
Bits per second.

BOS
Bit-oriented signaling.

BRI
See Basic Rate Interface (BRI)

bridge
A device that connects two or more packet-switched networks and directs packets sent from one to the other. See router.

bus bridge
A connection between the TDM bus and the packet bus built into the C-LAN circuit pack for use with DEFINITY ECS R7csi. Bus bridge connectivity is not used with any other DEFINITY switch model.

BX.25
A version of the CCITT X.25 protocol for data communications. BX.25 adds a fourth level to the standard X.25 interface. This uppermost level combines levels 4, 5, and 6 of the ISO reference model.

byte
A sequence of (usually eight) bits processed together.

C

Call Detail Recording (CDR)
A feature that uses software and hardware to record call data. (Same as station message detail recording — SMDR).

Call Detail Recording utility (CDRU)
Software that collects, stores, optionally filters, and outputs call-detail records.

Call Management System (CMS)
An application, running on an adjunct processor, that collects information from an ACD unit. CMS enables customers to monitor and manage telemarketing centers by generating reports on the status of agents, splits, trunks, trunk groups, vectors, and VDNs, and enables customers to partially administer the ACD feature for a communications system.

call redirection
See restricted facilities.

CALLed Party Number IE
The ISDN information element containing the digits sent to the called party.

capture rate
The number of frames contained in a one-second video sample, used as a measure of video quality.

CA-TSC
Call-Associated Temporary Signaling Connection.

CCIS
Common-Channel Interoffice Signaling

CCITT
Comitte Consultatif International Telephonique et Telegraphique. Now called *International Telecommunications Union* (ITU).

CCMS
Control-Channel Message Set.

CDR
See Call Detail Recording (CDR). (Same as SMDR and CMDR).

CDRU
Call Detail Record Unit.

CDRP
Call Detail Record Poller.

CEPT1
European Conference of Postal and Telecommunications Rate 1.

channel
A communication path linking two points for transmitting voice and data. Also:

1. A circuit-switched call.
2. In wideband, all of the time slots (contiguous or noncontiguous) necessary to support a call. Example: an H0-channel uses six 64-kbps time slots.
3. A DS0 on a T1 or E1 facility not specifically associated with a logical circuit-switched call; analogous to a single trunk.

circuit
1. An arrangement of electrical elements through which electric current flows.
2. A channel or transmission path between two or more points.

circuit pack
A card on which electrical circuits are printed, and IC chips and electrical components are installed. A circuit pack is installed in a switch carrier.

Class of Restriction (COR)
A feature that allows up to 64 classes of call-origination and call-termination restrictions for voice terminals, voice-terminal groups, data modules, and trunk groups.

Class of Service (COS)
A feature that uses a number to specify if voice-terminal users can activate the Automatic Callback, Call Forwarding All Calls, Data Privacy, or Priority Calling features.

circuit-switched network
A network that sets up and maintains a connection for the exclusive use of two or more communicating parties for the duration of their call. The familiar, voice telephone network is circuit-switched. See packet switching.

clear-channel facility
A digital circuit that requires no in-channel framing or control bits. The whole bandwidth is thus available for data transmission.

client
An application that runs on one processor while drawing on data or other resources that are on a server located elsewhere. **MMCX client:** a workstation capable of making MMCX calls. Such a workstation is a client of one or more MMCX servers. See dial-plan table.

CMDR
Centralized Message Detail Recording. (Same as CDR and SMDR).

CMS
Call Management System.

COR
See Class of Restriction (COR).

COS
See Class of Service (COS).

CP
Circuit pack.

CSN
See circuit-switched network.

CSU
Channel service unit.

cyclic redundancy checking (CRC)
A method for detecting read, transmit, and write errors in data. At the transmission end, the system treats a block of data as a single binary number, divides it by some specified binary number, and appends the remainder (called the CRC character) to the data. At the receiving end, the system recalculates the remainder and compares the result to the CRC character. If the two agree, there are no errors.

D

data channel
A communications path between two points used to transmit digital signals.

data-communications equipment (DCE)
The equipment (usually a modem, data module, or packet assembler/disassembler) on the network side of a communications link that makes the binary serial data from the source or transmitter compatible with the communications channel.

datagram
In packet switching, a packet that carries information sufficient for routing from the originating data terminal equipment (DTE) without the necessity of establishing a connection between the DTEs and the network. Connectionless, unreliable.

data link
The configuration of physical facilities enabling end terminals to communicate directly with each other.

data path
The end-to-end connection used for a data communications link. A data path is the combination of all elements of an interprocessor communication in a DCS.

data port
A point of access to a computer that uses trunks or lines for transmitting or receiving data.

data service unit (DSU)
A device that transmits digital data on transmission facilities.

data terminal equipment (DTE)
Equipment consisting of the endpoints in a connection over a data circuit. In a connection between a data terminal and host, the terminal, the host, and their associated modems or data modules make up the DTE.

DCE
Data-communications equipment.

D-channel backup
Type of backup used with Non-Facility Associated Signaling (NFAS). A primary D-channel provides signaling for an NFAS D-channel group (two or more PRI facilities). A second D-channel, on a separate PRI facility of the NFAS D-channel group, is designated as backup for the D-channel. Failure of the primary D-channel causes automatic transfer of call-control signaling to the backup D-channel. The backup becomes the primary D-channel. When the failed channel returns to service, it becomes the backup D-channel.

DCIU
Data communications interface unit.

DCP
Digital Communications Protocol.

DCS
Distributed Communications System.

dial-plan table
A data structure that defines how a switch or server (such as MMCX) interprets dialed digits and routes calls. The dial-plan table performs two tasks. First, it identifies a dial plan rule that applies to the kind of input it has received. Then it applies the rule and translates the dialed input into a corresponding extension or public-network telephone number. (MMCX interserver calls are handled differently; see interserver routing table.)

DID
Direct Inward Dialing.

digital communications protocol (DCP)
A proprietary protocol used to transmit both digitized voice and digitized data over the same communications link. A DCP link is made up of two 64-kbps information (I-) channels and one 8-kbps signaling (S-) channel. The DCP protocol supports 2 information-bearing channels, and thus two telephones/data modules.

digital signal level 0 (DS0)
A single 64-kbps voice channel. A DS0 is a single 64-kbps channel in a T1 or E1 facility and consists of eight bits in a T1 or E1 frame every 125 microseconds.

digital signal level 1 (DS1)
A single 1.544-Mbps (United States) or 2.048-Mbps (outside the United States) digital signal carried on a T1 transmission facility. A DS1 converter complex consists of a pair, one at each end, of DS1 converter circuit packs and the associated T1/E1 facilities.

digital terminal data module (DTDM)
An integrated or adjunct data module that shares with a digital telephone the same physical port for connection to a communications system. The function of a DTDM is similar to that of a PDM and MPDM in that it converts RS-232C signals to DCP signals.

distributed application
A computer application that runs on one or more clients and uses shared resources, such as databases. These resources reside on a common server. Distributed design lets multiple users run programs using common, centrally maintained files.

domain
An addressable location on a network, such as a group of computers, single computer, or subdirectory. See Domain Name Server (DNS).

Domain Name Server (DNS)
An Internet computer that maintains a database of domain names.

Provides a mapping of alphanumeric names to IP addresses; for example, xxx.xxx.xxx.xxx --> www.avaya.com.

DNS
See Domain Name Server (DNS).

DSU
Data service unit.

DTDM
Digital-terminal data module.

DTE
Data-terminal equipment.

E

E-1
A digital transmission link with a capacity of 2.048 Mbps (2,048,000 bits per second). The European equivalent of the T-1. It can support 30 multiplexed 64-Kbps voice and data channels plus separate 64-Kbps channels for signalling and framing (synchronization). Also spelled **E1**.

EIA
See Electronics Industries Association (EIA).

EIA-232
A physical interface specified by the EIA. EIA-232 transmits and receives asynchronous data at speeds of up to 19.2 kbps over cable distances of up to 50 feet. EIA-232 replaces RS-232 protocol in some DEFINITY applications.

electronic tandem network (ETN)
A tandem tie-trunk network that has automatic call-routing capabilities based on the number dialed and the most preferred route available. Each switch in the network is assigned a unique private network office code (RNX), and each voice terminal is assigned a unique extension.

Electronics Industries Association (EIA)
A trade association of the electronics industry that establishes electrical and functional standards.

Ethernet
A local area network (LAN) that works over short distances on twisted-pairs or coaxial cables at speeds up to 10 mbps or 100 mbps. One of the two LAN protocols MMCX supports. See ATM, LAN emulation (LANE).

Ethernet Source Address
A 48-bit physical address of the NIC; also called the MAC address.

ETN
Electronic tandem network

F

facility
A telecommunications transmission pathway and associated equipment.

facility-associated signaling (FAS)
Signaling for which a D-channel carries signaling only for those channels on the same physical interface.

FAS
Facility-associated signaling

framing
The data-formatting conventions that allow a receiver to synchronize with the transmitting end of a circuit. For example, T-1 frames contain an 8-bit sample from each of the 24 channels on the interface (192 bits total) plus a framing bit (for a total of 193 bits). Each framing bit marks the end of a timed sample the input at the transmission end.

FRL
Facilities Restriction Level.

FX
Foreign exchange.

G

Gateway
(1) protocol converter (2) a node between network segments.

H

H.320
The most common standard for videoconferencing over ISDN BRI circuits. H.320-compatible systems can communicate with each other even when they rely on dissimilar hardware and software.

H.323
A specification that sets standards for multimedia communications between LANs and telephony networks, such as ISDN.

HDB3
See High Density Bipolar 3-Bit Substitution (HDB3).

High Density Bipolar 3-Bit Substitution (HDB3)
HDB3 line coding is similar to Bipolar 8 Zero Substitution (B8ZS) in some ways. It replaces every 4 consecutive zero in a stream of AMI-encoded data (see line coding) with either of two sequences. If there has been an even number of 1s since the last substitution, it substitutes the pattern **1 0 0** ***BipolarViolation***, where ***BipolarViolation*** is a 3-volt pulse (a **1**) of the same polarity as the preceding 3-volt pulse. If there has been an odd number of 1s since the last substitution, HDB3 coding substitutes the pattern **0 0 0** ***BipolarViolation*** for the 4-zero string. This system does not corrupt binary data, and is commonly used with E-1 lines.

host
A server.

host name
See server name.

I

IANA
Internet Assigned Number Authority.

INADS
Initialization and Administration System

Information element (IE)
The data fields in ISDN messages.

in-service state
The condition or state of an MMCX server that is ready to handle calls.

International Standards Organization (ISO)
A body that defines and/or adopts protocols widely used in the computer and telecommunications industries.

International Telecommunications Union (ITU)
Formerly known as International Telegraph and Telephone Consultative Committee (CCITT), ITU is an international organization that sets universal standards for data communications, including ISDN. ITU members are from telecommunications companies and organizations around the world.

Internet
The decentralized network of networks that grew from ARPAnet and supported by TCP/IP.

interserver routing table
A database that keeps track of the interserver routing tables on a multiserver MMCX network. When a server sets up a Point-to-Point Protocol connection with a remote server, the local server looks up the dialed-digit sequences in the interserver routing table. (Calls that involve only one MMCX server are routed using the dial-plan table.)

I/O base address
The place in memory where a given computer peripheral places and picks up messages that travel over a computer's system bus.

IP
Internet Protocol.

IP (Internet Protocol) address
A 32-bit number that uniquely identifies endpoints on the Internet, commonly specified in the form ***n1.n2.n3.n4*** where each n_n is a decimal number between **0** and **255**. Part of the IP address represents the address of a local network's gateway to the Internet and part represents the host-machine address within that local network. The available bits are apportioned to the network address or local address using a system of classes. The Class A addresses used by the largest organizations on the Internet reserve the first 8 bits for the network portion of the address and remaining 24 for the host machine. Class B addresses, the most common class, assign 16 bits to the network and 16 to the host machine. The Class C addresses used by small networks reserve the first 24 bits for the network and the remaining 8 bits for the host.

IP user
An H.323 endpoint on an MMCX network. Such users do not have log ins, so the MMCX server identifies them using an extension number and an IP address.

ISDN
Integrated Services Digital Network, a digital, voice and data service. You get ISDN in either of two forms. Primary Rate Interface (PRI) service has a capacity of 1.544 mbps, divided into 23 or 29 B-channels (23 on a North American T-1 connection, 29 on a European E-1) and 1 D-channel, each with a capacity of 64 kbps. Basic Rate Interface (BRI) service has a capacity of 144 kbps, divided into 2 B-channels at 64 kbps each and 1 D-channel at 16 kbps.

ISDN trunk
A trunk administered for use with ISDN-PRI. Also called ISDN facility.

L

LAN
See local area network.

LAN emulation (LANE)
A technique that lets ATM networks communicate with Ethernet LAN cards. ATM service is not widely available at the desktop and ATM interface cards are expensive, so ATM networks usually emulate LANs when communicating with user terminals. Typically, a **LAN-emulation configuration server (LECS)** keeps track of the relationships between ATM-network addresses and IP addresses on the LAN. Each ATM card is then treated as a client of a **LAN-emulation server**, which connects the ATM cards to the LAN cards on the user terminals.

LAP-D
See link-access procedure on the D-channel (LAPD).

LECS (LAN-emulation configuration server)
See LAN emulation (LANE).

LES (LAN-emulation server)
See LAN emulation (LANE).

line coding
Line coding is the data format that lets either end of a communications channel correctly interpret messages from the other. Line coding systems specify the voltage levels and patterns that represent binary digits (1s and 0s), based on the requirements of the transmission network. The AT&T network has two: it demands that the net voltage on the line equal 0 volts DC and it demands a minimum Open System Interconnect (OSI) Model. The T-carrier system meets the first requirement by using a bipolar line-coding scheme called Alternate Mark Inversion (AMI). It meets the second with one of several supplementary coding schemes, including ZCS, Bipolar 8 Zero Substitution (B8ZS), and High Density Bipolar 3-Bit Substitution (HDB3).

line compensation
An allowance for pulse distortions in the cable that connects the MMCX server to the first channel service unit (CSU) on the PRI span. It is proportional to the length of the cable. T1 circuit packs adjust the outgoing signal so that it arrives at the far end without distortion.

link
A transmitter-receiver channel that connects two systems.

link-access procedure on the D-channel (LAPD)
A link-layer protocol on the ISDN-BRI and ISDN-PRI data-link layer (level 2). LAPD provides data transfer between two devices, and error and flow control on multiple logical links. LAPD is used for signaling and low-speed packet data (X.25 and mode 3) on the signaling (D-) channel and for mode-3 data communications on a bearer (B-) channel.

local area network
A short-range data communication network providing high-speed carrier service with low error rates. Generally, a LAN is limited in range to a maximum of 6.2 miles. Ethernet and Token-Ring are common LAN architectures. See wide area network, Ethernet.

looparound testing
Checking an interface by sending a signal through the output, across a medium (the loop), and back through the input. Internal looparound tests run against the internal circuitry of the card. External looparound tests check the connectors at the edge of the card using a fiber or wire loop. PRI, Ethernet, and ATM cards are tested this way.

M

MAC
Media Access Control; a sublayer of the OSI Data Link layer, provides an interface with the network adapter.

main-satellite-tributary
A private network configuration that can either stand alone or access an ETN. A main switch provides interconnection, via tie trunks, with one or more subtending switches, called satellites; all attendant positions for the main/satellite configuration; and access to and from the public network. To a user outside the complex, a main/satellite configuration appears as one switch, with one listed directory number (LDN). A tributary switch is connected to the main switch via tie trunks, but has its own attendant positions and LDN.

Management Information Base (MIB)
A virtual database used by the Simple Network Management Protocol (SNMP).

MAPD
Multiapplication platform for DEFINITY.

MA-UUI
Message-Associated User-to-User Signaling.

M-Bus
Memory bus.

MDR
Message detail record.

MIB
See Management Information Base (MIB).

MMCH
Multimedia call handling.

MSA
Message Server Adjunct.

multicasting
A transmission method that promotes efficient bandwidth utilization on a multimedia data network when several parties are transmitting and receiving simultaneously. Normally, each party sends a separate video stream to each of the other parties and receives a separate video stream from each in return (this is called unicasting). Multicasting substitutes a single broadcast transmission (addressed to all parties) for the separate transmissions addressed to each. Each party then continues to receive multiple data streams while sending only one. For best results, multicast messages should be restricted to one or more subnet.

N

National Television Standards Committee (NTSC) standard
The standard format and transmission method for television signals in North America, Central America, and Japan. The NTSC is a division of the Electronic Industries Association (EIA). MMCX video transmissions conform with NTSC requirements.

national number
The full dialed number minus the country code. The national number is composed of office code plus subscriber code. In North America, this means area code plus seven digits. For example, 303-538-1234 is a national number.

NCA/TSC
Noncall-associated/temporary-signaling connection.

NCOSS
Network Control Operations Support Center.

NCSO
National Customer Support Organization.

NEC
National Engineering Center.

NEMA
National Electrical Manufacturer's Association.

NETCON
Network-control circuit pack.

Network
A collection of computer-like devices ("nodes") that are connected by, and can communicate across, a common transmission medium.

Network Adapter
The interface between a node and the network; has a unique physical address.

Network Interface Card (NIC)
A circuit board that can be fitted to a personal computer (PC) to allow the PC to communicate with other machines on a network. MMCX works with Ethernet cards and with asynchronous transfer mode (ATM) cards running Ethernet emulation. Also called a network adapter.

NFAS
See Nonfacility-associated signaling (NFAS).

NIC
See Network Interface Card (NIC).

Node
1. A point on a network that provides an interface to a communications device.

2. A switch or adjunct in an Avaya DCS network.

Nonfacility-associated signaling (NFAS)
A method that allows multiple T1 and/or E1 facilities to share a single D-channel to form an ISDN-PRI. If D-channel backup is not used, one facility is configured with a D-channel, and the other facilities that share the D-channel are configured without D-channels. If D-channel backup is used, two facilities are configured to have D-channels (one D-channel on each facility), and the other facilities that share the D-channels are configured without D-channels.

NTSC
See National Television Standards Committee (NTSC) standard.

O

Open System Interconnect (OSI) Model
An International Standards Organization (ISO) interoperability specification. OSI defines standard services that compliant communications networks and equipment must provide, rather than specific implementations. It divides network operations into 7 steps, called layers, and arranges them hierarchically, in a protocol stack. The rules (protocols) in each layer of the stack specify a service that other parts of a communications system can always get, as long as they make their requests in a standard way. This approach leaves designers free to implement the internal details of the service in whatever way seems best to them. The OSI layers are **1 Physical** (transmission medium), **2 Datalink** (link-level signaling and error control), **3 Network** (computer-to-computer signaling, routing, etc.), **4 Transport** (delivery, end-to-end error control, and flow control), **5 Session** (dialog management), **6 Presentation** (data-format compatibility), and **7 Application** (file-transfer services, virtual terminals, etc.).

OSI
See Open System Interconnect (OSI) Model.

out-of-service state (OOS)
The condition or state of an MMCX server that is operating but not ready to accept or place calls.

P

PACCON
Packet controller.

packet
A group of bits (including a message element, which is the data, and a control information element (IE), which is the header) used in packet switching and transmitted as a discrete unit. In each packet, the message element and control IE are arranged in a specified format.

packet bus
A wide-bandwidth bus that transmits packets.

packet switching
A data-transmission technique whereby user information is segmented and routed in discrete data envelopes called packets, each with its own appended control information, for routing, sequencing, and error checking. The packets can travel to their destinations by varying routes. For data transmissions, a packet switched network can make more efficient use of available bandwidth than a circuit-switched network, because it does not dedicate a channel for the duration of a call. Instead, packets are queued and sent on a standby basis, as channel capacity becomes available. The Internet is a good example of a packet-switching network.

PBX
Private Branch Exchange: a customer-owned telephone switch that connects a company's internal telephone network with the local telephone service provider's central office. Avaya's DEFINITY ECS system is a good example.

PDM
See processor data module (PDM).

PGATE
Packet gateway.

Point-to-Point Protocol
A TCP/IP implementation tailored for use over telephone lines. It supports router-to-router and host-to-network connections over both synchronous and asynchronous circuits. PPP replaces SLIP, the older Serial Line Interface Protocol.

Port
(1) Interface between an application and the TCP/IP network. A port is a predefined internal address (port number) that serves as a pathway from the application to the Transport layer (or from T to A). (2) circuit-pack port.

PPP
See Point-to-Point Protocol.

PRI
Primary Rate Interface. See ISDN.

Primary Rate Interface
See ISDN.

private network
A network used exclusively for the telecommunications needs of a particular customer.

private network office code (RNX)
The first three digits of a 7-digit private network number.

processor data module (PDM)
A device that provides an RS-232C DCE interface for connecting to data terminals, applications processors (APs), and host computers, and provides a DCP interface for connection to a communications system.

protocol
A set of conventions or rules governing the format and timing of message exchanges to control data movement and correction of errors.

PSDN
Packet-switch public data network.

PSTN
See Public Switched Telephone Network (PSTN).

PSN
Packet-switched network.

Public Switched Telephone Network (PSTN)
The worldwide voice telephone system.

Q

QPPCN
Quality Protection Plan Change Notice.

QSIG
A set of open standards for Enterprise Networking. QSIG is a protocol defining message exchanges (signalling) at the “Q” reference point between two PBXs.

R

RBS
Robbed-bit signaling.

RFC
Request for comment.

restricted facilities
PRI spans that use ZCS line coding, the opposite of unrestricted facilities.

RNX
Route-number index (private network office code)

router
An interface between different networks. Routers support network management, including load balancing, route optimization, prioritizing of calls, and troubleshooting. They are thus more capable than bridges.

routing plan
Routing plans direct outgoing voice-interworking and interserver calls to the first available PRI trunk group in a list. This arrangement lets you allow for trunk groups that are busy, out of service, or out of bandwidth. Each routing plan is identified by a routing-plan number in the range **1-32**.

RPN
Routing-plan number.

RTP
Real-time protocol.

S

Socket
An address formed by concatenating the IP address and the port number.

server
1. Any system that maintains and administers files that are used by independent, client applications. 2. the MMCX server, the computer that sets up, maintains, and administers MMCX network communications. See dial-plan table.

server name
The name that identifies the MMCX server on your local area network. You enter the server name in the boot-time administration menu. See server number.

server number
The ISDN international number that uniquely identifies your MMCX server on the PBX and/or the public telephone network. See server name, interserver routing table.

signaling
The control information that a network uses to set up and maintain connections. On-hook and off-hook are, for instance, the familiar voice-telephone signals that tell the central office that you have picked up the telephone handset or hung up at the end of a call.

In-channel signalling reserves part of the available data -communication bandwidth for control information (see restricted facilities). Out-of-channel signalling schemes use a separate channel for signals, so that data transmissions can use all of the bandwidth available to them (see clear-channel facility).

Simple Network Management Protocol (SNMP)
An International Standards Organization (ISO) protocol that sets standards for communications between network components and network management stations. SNMP handles network resources using the information contained in a management information base (MIB), a virtual database resident on the various parts of the network. SNMP supports security, configuration, performance, fault management, and accounting management. SNMP is part of the ISO Open System Interconnect (OSI) Model specification.

SMDR
Station Message Detail Recording. (Same as call detail recording — CDR).

SNMP
See Simple Network Management Protocol (SNMP).

SPE
Switch Processing Element

subnet
A network within a larger network. Subdividing a network into subnets improves the efficiency of routing and makes the best use of the limited number of addresses available with any given addressing scheme. Subnetworks are defined by using part of the host-machine portion of the IP (Internet Protocol) address as an additional layer of network information. Routers can then distinguish between a networking part that is significant for internet/intranet routing and a host-machine part, which is significant only within the local subnet.

subnet mask
A bit pattern that lets a network administrator define subnets using the host-machine portion of the IP (Internet Protocol) address. The subnet mask has binary ones in positions corresponding to the network and subnet parts of the address and zeros in the remaining, host-address positions. During IP-address resolution, zero fields in the mask hide corresponding host-address fields in the address, causing the router to ignore them. The router resolves only the networking part of the address, leaving the host part for the local subnet to resolve. This increases speed and makes multicasting more efficient. Subnet masks are usually written in the decimal notation used for IP addresses.

T

T-1
A 4-wire (2 twisted pair), digital communications link with a capacity of 1.544 Mbps (1,544,000 bits per second). A T-1 provides 24 separate 64-Kbps channels. These can support up to 23 concurrent voice and data channels plus a separate channel for signalling and framing (synchronization). T-1 is the standard for data communications in North America and Japan. Also spelled **T1**. See E-1.

T-carrier
A hierarchy of digital voice- and data-transmission systems used in North America and based on multiples of the capacity of the T-1 line.

tandem switch
A switch within an electronic tandem network (ETN) that provides the logic to determine the best route for a network call, possibly modifies the digits outpulsed, and allows or denies certain calls to certain users.

tandem-through
The switched connection of an incoming trunk to an outgoing trunk without human intervention.

tandem tie-trunk network (TTTN)
A private network that interconnects several customer switching systems.

TCP
Transmission Control Protocol — Transport layer; Connection oriented, reliable.

TCP/IP
Transmission Control Protocol/Internet Protocol. A standard that lets different computer hardware and different operating systems (such as PCs, Apple computers, UNIX workstations, and mainframes) communicate with each other over a network. TCP/IP is the most complete, most widely accepted network protocol currently available.

TDM
See time-division multiplexing.

tie trunk
A telecommunications channel that directly connects two private switching systems.

time-division multiplexing
A way of interleaving digitized voice, video, and/or data so that several calls can be sent concurrently over the same spread of frequencies. TDM systems distribute the available bandwidth across a series of time slots and divide each input stream into a set of samples. They then assign successive time slots to the first sample in each input stream. They repeat the process until all time slots have been assigned or all inputs sent. At the far end, the receiver demultiplexes the transmission and reconstructs the original sequence of samples. Time-division multiplexing is typically used on circuit-switched networks.

time slot
64 kbps of digital information structured as eight bits every 125 microseconds. In the switch, a time slot refers to either a DS0 on a T1 or E1 facility or a 64-kbps unit on the TDM bus or fiber connection between port networks.

trunk
A communication line linking two switches (public-network, PBX, or MMCX-server).

trunk group
A collection of trunks that all terminate at the same public switch, PBX, or MMCX server.

U

UDP
1. User Datagram Protocol — Transport layer; Connectionless, unreliable, fast.

2. Uniform Dial Plan.

UNP
Uniform numbering plan

unrestricted data
Data that has to travel over an unrestricted facilities, because it can be corrupted by Zero Code Suppression (ZCS) line coding. Digital data is unrestricted data.

unrestricted facilities
PRI spans that use non-ZCS line coding, such as B8ZS or HDB3, end-to-end. See Zero Code Suppression (ZCS).

V

VCI
The ATM virtual channel identifier. ATM is a connection-oriented service that sets up a virtual circuit between the transmitter and the receiver. The two endpoints negotiate an agreed route through the network before sending any data. VCI and VPI together constitute the virtual circuit number that identifies this route.

virtual channel identifier
See VCI.

virtual circuit (virtual connection)
The pre-arranged route through the ATM network that all cells in an ATM transmission follow.

virtual circuit number
The route identifier contained in an ATM cell header. A VCI and a VPI together constitute the virtual circuit number.

virtual path identifier
See VPI.

VPI
The ATM virtual path identifier. ATM is a connection-oriented service that sets up a virtual circuit between the transmitter and the receiver. The two endpoints negotiate an agreed route through the network before sending any data. VCI and VPI together constitute the virtual circuit number that identifies this route. The VPI is analogous in some ways to an ISDN trunk group.

W

WAN
See wide area network.

well-known address
The default network address for a given type of network component, as specified by a communications protocol or standards body. For example, the ATM Forum defines well-known addresses for LAN-emulation servers and LAN-emulation configuration servers.

well-known port
port numbers that are assigned to specific applications by IANA. For example, 21 for FTP, 23 for Telnet, 110 for pop3.

wide area network
A data network that connects local area networks (LANs) using common-carrier telephone lines, bridges, and routers.

wideband
A circuit-switched call at a data rate greater than 64 kbps. A circuit-switched call on a single T1 or E1 facility with a bandwidth between 128 and 1536 (T1) or 1984 (E1) kbps in multiples of 64 kbps. H0, H11, H12, and N x DS0 calls are wideband.

Z

ZCS
See Zero Code Suppression (ZCS).

Zero Code Suppression (ZCS)
ZCS line coding substitutes a 1 for the second least-significant bit of every all-zero byte in AMI-encoded data (see line coding). ZCS encoding has no effect on voice communications, but it corrupts digital data (see restricted facilities). In MMCX communications, ZCS corrupts the ISDN D-channel.

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