Avaya G450 Branch Gateway Overview and Specification

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Virtualization

The following applies if the product is deployed on a virtual machine. Each product has its own ordering code and license types. Note that each Instance of a product must be separately licensed and ordered. For example, if the end user customer or Avaya Channel Partner would like to install two Instances of the same type of products, then two products of that type must be ordered.

How to Get Help

For additional support telephone numbers, go to the Avaya support Website: http://www.avaya.com/support. If you are:

- Within the United States, click the Escalation Contacts link that is located under the Support Tools heading. Then click the appropriate link for the type of support that you need.
- Outside the United States, click the Escalation Contacts link that is located under the Support Tools heading. Then click the International Services link that includes telephone numbers for the international Centers of Excellence.

Providing Telecommunications Security

Telecommunications security (of voice, data, and/or video communications) is the prevention of any type of intrusion to (that is, either unauthorized or malicious access to or use of) your company's telecommunications equipment by some party.

Your company's "telecommunications equipment" includes both this Avaya product and any other voice/data/video equipment that could be accessed via this Avaya product (that is, "networked equipment").

An "outside party" is anyone who is not a corporate employee, agent, subcontractor, or is not working on your company's behalf. Whereas, a "malicious party" is anyone (including someone who may be otherwise authorized) who accesses your telecommunications equipment with either malicious or mischievous intent.

Such intrusions may be either to/through synchronous (time-multiplexed and/or circuit-based), or asynchronous (character-, message-, or packet-based) equipment, or interfaces for reasons of:

- Utilization (of capabilities special to the accessed equipment)
- Theft (such as, of intellectual property, financial assets, or toll facility access)
- Eavesdropping (privacy invasions to humans)
- Mischief (troubling, but apparently innocuous, tampering)
- Harm (such as harmful tampering, data loss or alteration, regardless of motive or intent)

Be aware that there may be a risk of unauthorized intrusions associated with your system and/or its networked equipment. Also realize that, if such an intrusion should occur, it could result in a variety of losses to your company (including but not limited to, human/data privacy, intellectual property, material assets, financial resources, labor costs, and/or legal costs).

Responsibility for Your Company's Telecommunications Security

The final responsibility for securing both this system and its networked equipment rests with you - Avaya's customer system administrator, your telecommunications peers, and your managers. Base the fulfillment of your responsibility on acquired knowledge and resources from a variety of sources including but not limited to:

- Installation documents
- System administration documents
- Security documents
- Hardware-/software-based security tools
- Shared information between you and your peers
- Telecommunications security experts

To prevent intrusions to your telecommunications equipment, you and your peers should carefully program and configure:

- Your Avaya-provided telecommunications systems and their interfaces
- Your Avaya-provided software applications, as well as their underlying hardware/software platforms and interfaces
- Any other equipment networked to your Avaya products

TCP/IP Facilities

Customers may experience differences in product performance, reliability and security depending upon network configurations/design and topologies, even when the product performs as warranted.

Product Safety Standards

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

- IEC 60950-1 latest edition, including all relevant national deviations as listed in the IECEE Bulletin—Product Category OFF: IT and Office Equipment.

- CAN/CSA-C22.2 No. 60950-1 / UL 60950-1 latest edition.

This product may contain Class 1 laser devices.

- Class 1 Laser Product
- Luokan 1 Laserlaite
- Klass 1 Laser Apparat

Electromagnetic Compatibility (EMC) Standards

This product complies with and conforms to the following international EMC standards, as applicable:

- CISPR 22, including all national standards based on CISPR 22.
- CISPR 24, including all national standards based on CISPR 24.
- IEC 61000-3-2 and IEC 61000-3-3.

Avaya Inc. is not responsible for any radio or television interference caused by unauthorized modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by Avaya Inc. The correction of interference caused by such unauthorized modifications, substitution or attachment will be the responsibility of the user. Pursuant to Part 15 of the Federal Communications Commission (FCC) Rules, the user is cautioned that changes or modifications not expressly approved by Avaya Inc. could void the user's authority to operate this equipment.

Federal Communications Commission Part 15 Statement:

For a Class A digital device or peripheral:

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.

For a Class B digital device or peripheral:

Note:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Equipment With Direct Inward Dialing ("DID"):

Allowing this equipment to be operated in such a manner as to not provide proper answer supervision is a violation of Part 68 of the FCC's rules.

Proper Answer Supervision is when:

1. This equipment returns answer supervision to the public switched telephone network (PSTN) when DID calls are:
   - answered by the called station,
   - answered by the attendant,
   - routed to a recorded announcement that can be administered by the customer premises equipment (CPE) user
   - routed to a dial prompt
2. This equipment returns answer supervision signals on all (DID) calls forwarded back to the PSTN.

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.

Automatic Dialers:

When programming emergency numbers and (or) making test calls to emergency numbers:

- Remain on the line and briefly explain to the dispatcher the reason for the call.
- Perform such activities in the off-peak hours, such as early morning or late evenings.

Toll Restriction and least Cost Routing Equipment:

The software contained in this equipment to allow user access to the network must be upgraded to recognize newly established network area codes and exchange codes as they are placed into service.

Failure to upgrade the premises systems or peripheral equipment to recognize the new codes as they are established will restrict the customer and the customer's employees from gaining access to the network and to these codes.

For equipment approved prior to July 23, 2001:

This equipment complies with Part 68 of the FCC rules. On either the rear or inside the front cover 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.

For equipment approved after July 23, 2001:

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the Administrative Council on Terminal Attachments (ACTA). On the rear of this equipment is a label that contains, among other information, a product identifier in the format US:AAAEQ##TXXX. If requested, this number must be provided to the telephone company.

The REN is used to determine the quantity of devices that 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.

L'indice d'équivalence de la sonnerie (IES) sert à indiquer le nombre maximal de terminaux qui peuvent être raccordés à une interface téléphonique. La terminaison d'une interface peut consister en une combinaison quelconque de dispositifs, à la seule condition que la somme d'indices d'équivalence de la sonnerie de tous les dispositifs n'excède pas cinq.

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. For products approved after July 23, 2001, the REN for this product is part of the product identifier that has the format US:AAAEQ##TXXX. The digits represented by ## are the REN

without a decimal point (for example, 03 is a REN of 0.3). For earlier products, the REN is separately shown on the label.

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 premises station	OL13C	9.0F	RJ2GX, RJ21X, RJ11C
DID trunk	02RV2.T	AS.2	RJ2GX, RJ21X, RJ11C
CO trunk	02GS2	0.3A	RJ21X, RJ11C
	02LS2	0.3A	RJ21X, RJ11C
Tie trunk	TL31M	9.0F	RJ2GX
Basic Rate Interface	02IS5	6.0F, 6.0Y	RJ49C
1.544 digital interface	04DU9.BN	6.0F	RJ48C, RJ48M
	04DU9.1KN	6.0F	RJ48C, RJ48M
	04DU9.1SN	6.0F	RJ48C, RJ48M
120A4 channel service unit	04DU9.DN	6.0Y	RJ48C

If this 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.

A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ACTA. A compliant telephone cord and modular plug is provided with this product. It is designed to be connected to a compatible modular jack that is also compliant.

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

Installation and Repairs

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. It is recommended that repairs be performed by Avaya certified technicians.

FCC Part 68 Supplier's Declarations of Conformity

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/DoC.

Canadian Conformity Information

This Class A (or B) digital apparatus complies with Canadian ICES-003.

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

This product meets the applicable Industry Canada technical specifications/Le présent materiel est conforme aux specifications techniques applicables d'Industrie Canada.

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 (2004/108/EC) and Low Voltage Directive (2006/95/EC).

Copies of these Declarations of Conformity (DoCs) can be obtained by contacting your local sales representative and are available on the following Web site: http://support.avaya.com/DoC.

European Union Battery Directive

Avaya Inc. supports European Union Battery Directive 2006/66/EC. Certain Avaya Inc. products contain lithium batteries. These batteries are not customer or field replaceable parts. Do not disassemble. Batteries may pose a hazard if mishandled.

Japan

The power cord set included in the shipment or associated with the product is meant to be used with the said product only. Do not use the cord set for any other purpose. Any non-recommended usage could lead to hazardous incidents like fire disaster, electric shock, and faulty operation.

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If this is a Class A device:

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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If this is a Class B device:

This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

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Chapter 1: Introduction

Purpose

This document describes tested characteristics and capabilities of Branch Gateway, including feature descriptions, interoperability, performance specifications, security, and licensing requirements.

This document is intended for anyone who wants to gain a high-level understanding of Branch Gateway features, functions, capacities, and limitations within the context of solutions and verified reference configurations.

Change history

The following changes have been made to this document since the last issue:

Issue	Date	Summary of changes
2.0	May 2016	• Merged the Purpose and Intended Audience sections per GIS Content Evolution Updated Document Standards. • Heading name for this section renamed from *Document changes since last issue* to *Change history*. • Updated the *Training* reference library under the heading *Related Resources*.

Note:

This section only talks about what's new in the document structure. To learn what's new in Avaya Aura® Application Enablement Services 7.1, see *Chapter 3: New in this release* later in this guide.

Related resources

Documentation

Title	Description	Number
Installation		
Quick Start for Hardware Installation for the Avaya Branch Gateway G450	Describes how to install the Avaya Branch Gateway G450. This document includes content for G450 assembly and basic configuration.	03-602053
Deploying and Upgrading Avaya G450 Branch Gateway	Describes how to install and upgrade G450 , prepare it for software configuration, and perform certain basic configurations. Also describes how to insert media modules and connect external devices to G450 and media module ports.	03-602054
Administration		
Administering Avaya G450 Branch Gateway	Describes how to configure and manage the G450 after installation. Contains detailed information about all the features of G450 and how to implement them.	03-602055
Avaya Branch Gateway G450 CLI Reference	Describes the commands in the G450 CLI.	03-602056
Maintenance		
Maintenance Alarms for Avaya Aura® Communication Manager, Branch Gateways and Servers	Describes MOs and how to resolve alarms.	03-300430
Maintenance Commands for Avaya Aura® Communication Manager, Branch Gateways and Servers	Describes all the commands across platforms.	03-300431
Maintenance Procedures for Avaya Aura® Communication Manager, Branch Gateways and Servers	Describes maintenance procedures such as network recovery.	03-300432

Finding documents on the Avaya Support website

About this task

Use this procedure to find product documentation on the Avaya Support website.

Procedure

1. Use a browser to navigate to the Avaya Support website at http://support.avaya.com/.
2. At the top of the screen, enter your username and password and click **Login**.

3. Put your cursor over **Support by Product**.
4. Click **Documents**.
5. In the **Enter your Product Here** search box, type the product name and then select the product from the drop-down list.
6. If there is more than one release, select the appropriate release number from the **Choose Release** drop-down list.
7. Use the **Content Type** filter on the left to select the type of document you are looking for, or click **Select All** to see a list of all available documents.

   For example, if you are looking for user guides, select **User Guides** in the **Content Type** filter. Only documents in the selected category will appear in the list of documents.
8. Click **Enter**.

Training

The following courses are available on https://www.avaya-learning.com. To search for the course, in the **Search** field, enter the course code and click **Go**.

Course code	Course title
4U00030E	Knowledge Access: Avaya Aura® Communication Manager and CM Messaging - Embedded Implementation.
4301W	Avaya Unified Communications - Core Components.
7120V	Integration Basics for Avaya Enterprise Team Engagement Solutions (Virtual Instructor Led).
4302W	Avaya Unified Communications - Gateways and Endpoints.

Viewing Avaya Mentor videos

Avaya Mentor videos provide technical content on how to install, configure, and troubleshoot Avaya products.

About this task

Videos are available on the Avaya Support website, listed under the video document type, and on the Avaya-run channel on YouTube.

Procedure

- To find videos on the Avaya Support website, go to http://support.avaya.com and perform one of the following actions:
  - In **Search**, type `Avaya Mentor Videos` to see a list of the available videos.
  - In **Search**, type the product name. On the Search Results page, select **Video** in the **Content Type** column on the left.

- To find the Avaya Mentor videos on YouTube, go to www.youtube.com/AvayaMentor and perform one of the following actions:
  - Enter a key word or key words in the **Search Channel** to search for a specific product or topic.
  - Scroll down Playlists, and click the name of a topic to see the available list of videos posted on the website.

  Note:

  Videos are not available for all products.

Support

Go to the Avaya Support website at http://support.avaya.com for the most up-to-date documentation, product notices, and knowledge articles. You can also search for release notes, downloads, and resolutions to issues. Use the online service request system to create a service request. Chat with live agents to get answers to questions, or request an agent to connect you to a support team if an issue requires additional expertise.

Warranty

Avaya provides a 90-day limited warranty on Branch Gateway. To understand the terms of the limited warranty, see the sales agreement or other applicable documentation. In addition, the standard warranty of Avaya and the details regarding support for Branch Gateway in the warranty period is available on the Avaya Support website at https://support.avaya.com under **Help & Policies> Policies & Legal > Warranty & Product Lifecycle**. See also **Help & Policies > Policies & Legal > License Terms**.

Chapter 2: G450 Branch Gateway overview

Avaya Branch Gateway G450

The Avaya Branch Gateway G450 is a multipurpose gateway that can be deployed in medium to large sized branch locations or in wiring-closets servicing buildings and floors, in a campus environment.

The G450 can support up to 450 users when deployed as a Branch Gateway in a mid-to-large branch office of a large enterprise or a call center. This requires Avaya Aura® Communication Manager IP telephony software running on one or more Avaya servers. The Avaya S8300 servers support 50 Branch Gateways and other Avaya servers support up to 250 Branch Gateways.

Branch Gateway functions

The Branch Gateway:

- Works in conjunction with Avaya Aura® Communication Manager IP telephony software running on Avaya Servers to help deliver intelligent communications to enterprises of all sizes
- Combines telephone exchange and data networking, by providing PSTN toll bypass, and routing data and VoIP traffic over the WAN
- Features a VoIP engine, an optional WAN router, and Ethernet LAN connectivity.
- Provides full support for Avaya IP and digital telephones, as well as analog devices such as modems, fax machines, and telephones.

Telephone services on a Branch Gateway are controlled by an Avaya Server operating either as an External Call Controller (ECC) or as an Internal Call Controller (ICC). The Branch Gateway supports:

- The Avaya S8300 Server as an ICC, or as an ECC when the S8300 is installed in another Branch Gateway

An ICC can be used in addition to an ECC with the ICC installed as a Survivable Remote Server (SRS) designed to take over call control in the event that the ECC fails or the WAN link between the branch office and main location breaks. The SRS provides full featured telephone service survivability for the branch office. The Branch Gateway also features Standard Local Survivability (SLS) (IPv4 only), which provides basic telephone services in the event that the connection with the primary ECC is lost.

Branch Gateway specifications

The G450 is a scalable device with a basic configuration consisting of one power supply unit (PSU) and 256 MB RAM, and a single DSP childboard supporting either 20, 80, or 160 VoIP channels. This configuration can be enhanced by adding a redundant PSU, increasing RAM to 512 MB, and up to three additional DSP childboards, increasing the number of VoIP channels to 320 channels. You can also add an external compact flash, increasing the number of announcement files to 1024.

The Branch Gateway is a modular device, adaptable to support different combinations of endpoint devices. While fixed front panel ports support the connection of external LAN switches, network data ports, Ethernet WAN lines, and external routers, eight slots are provided for plugging in optional media modules. Pluggable media modules provide interfaces for different types of telephones, trunks, and WAN links. A combination is selected to suit the needs of the branch. A range of telephony modules provides full support for legacy equipment such as analog and digital telephones. IP phones are supported via an external LAN switch.

The G450 chassis features field replaceable RAM, external compact flash, DSPs, PSUs, fan tray, and main board module for enhanced reliability.

Minimum firmware requirements for G450

Firmware version	Build	v1a	v2b	v2d	v3b	Recommended CM Version
BGW 5.2.1	30.28.0 +	Yes	Yes	Yes	Yes (min FW load 30.28.0)	CM 5.2.1 (SP 16) or higher AA 6.3 FP3, CM6.3 .2 +
BGW 6.1	31.26.0	Yes	Yes	Yes	No - require new FW (base not supported)	CM 6.0.1 - Nov 2010
BGW 6.2.1	32.26.0	Yes	Yes	Yes	No - require new FW (base not supported)	AA 6.2 FP1-CM 6.2 sp4 - Dec 2012
BGW 6.3	33.13.0	Yes	Yes	Yes	No - require new FW (base not supported)	AA 6.2 FP2-CM 6.3 - May 2013
BGW 6.1 JITC	33.13.1	Yes	Yes	Yes	Would require JITC request	CM 6.3.1.1 (JITC SP)
BGW 6.3.1	34.6.0 +	Yes	Yes	Yes	Yes (min FW load 34.6.0)	AA 6.2 FP3 CM 6.3.2 + (Oct 2013) AA 6.2 FP 2, CM 6.3 & CM 5.2.1 SP 16+
BGW 6.3.5	35.x.y	Yes	Yes	Yes	Yes	AA 6.2 FP3, CM 6.3.2 +

Table continues…

Firmware version	Build	v1a	v2b	v2d	v3b	Recommended CM Version
						AA 6.2 FP 2, CM 6.3 & CM 5.2.1 SP 16+
BGW 6.3.6 JITC	36.x.y	Yes	Yes	Yes	Yes	AA 6.2 FP 4, CM 6.3.6 AA 6.2 FP3, CM 6.3.2 & CM 5.2.1 SP 16+
BGW 6.3.7	36.16.0 +	Yes	Yes	Yes	Yes	AA 6.2 FP 4 CM 6.3.6 +
BGW 6.3.8	36.16.0 +	Yes	Yes	Yes	Yes	AA 6.2 FP 4 CM 6.3.6 +
BGW 6.3.9	36.16.0 +	Yes	Yes	Yes	Yes	AA 6.2 FP 4 CM 6.3.6 +
BGW 6.3.10	36.16.0 +	Yes	Yes	Yes	Yes	AA 6.2 FP 4 CM 6.3.6 +
BGW 6.3.11	36.16.0 +	Yes	Yes	Yes	Yes	AA 6.2 FP 4 CM 6.3.6 +
BGW 6.3.12	36.16.0	Yes	Yes	Yes	Yes	AA 6.2 FP 4 CM 6.3.6 +
BGW 6.3.13	36.17.0	Yes	Yes	Yes	Yes	AA 6.2 FP 4 CM 6.3.6 +
BGW 7.0	37.20.0	Yes	Yes	Yes	Yes	AA 7.0, CM 7.0 AA 6.2 FP 4 CM 6.3.6 +
BGW 7.0.0.1	37.20.0	Yes	Yes	Yes	Yes	AA 7.0, CM 7.0 AA 6.2 FP 4 CM 6.3.6 +
BGW 7.0.0.2	37.21.0	Yes	Yes	Yes	Yes	AA 7.0, CM 7.0 AA 6.2 FP 4 CM 6.3.6 +
BGW 7.0.1	37.38.0	Yes	Yes	Yes	Yes	AA 7.0 FP 1, CM 7.0.1 AA 6.2 FP 4, CM 6.3.6 AA 7.0, CM 7.0

Branch Gateway features

Some features are supported only in IPv4 as indicated in the following table that summarizes the Branch Gateway features.

Feature type	Description
Hardware features	• 9-slot chassis (one slot for main board and eight slots for media modules) • Swappable main board module • Hot-swappable media modules • Support for hot-swappable external compact flash • Support for two load sharing hot-swappable power supply units • Hot-swappable fan tray

Table continues…

Feature type	Description
	• VoIP DSPs (up to 320 channels) • Memory SIMMs
Voice features	• H.248 gateway • Voice line interfaces: - IP phones - Analog phones - Avaya DCP phones - BRI Phones - FXS/Fax - VoIP - Fax and modem over IP • Voice trunk interfaces: - FXO - BRI - T1/E1 • Supported CODECs: G.711A/µLaw, G.729a, G.726, Opus codec. • Survivability features for continuous voice services: - Local Survivable Processor (LSP) (with S8300) - Standard Local Survivability (SLS) (IPv4 only) - Emergency Transfer Relay (ETR) - Modem Dial Backup - Dynamic Call Admission Control (CAC) for Fast Ethernet, Serial, and GRE tunnel interfaces - Inter-Gateway Alternate Routing (IGAR) • DHCP and TFTP server to support IP phones images and configuration (IPv4 only) • Announcements support • Contact Closure support • International tone detection and generation for DTMF, R1-MF, R2-MFC, call classification • Custom tone detection and generation
Routing and WAN features	**Note:** IPv6 is not supported on the WAN. • Two WAN 10/100 Ethernet ports with traffic shaping capabilities • T1/E1 and USP interfaces

Table continues…

Feature type	Description
	• PPPoE (IPv4 only), Frame-relay, and PPP (IPv4 only) • Routing Protocols: Static, OSPF, RIP • VRRP (IPv4 only) • Equal Cost Multi Path routing (ECMP) • IPSec VPN • cRTP • WAN Quality of Service (QoS) • Policy-based routing • DHCP relay • GRE tunneling • Dynamic IP addressing (DHCP client/PPPoE) • Object tracking • Backup Interface
LAN features	• Two LAN 10/100/1000 RJ-45 Ethernet ports (w/o POE) • Auto-negotiation • 4K MAC table with aging • 64 VLANs • Multi-VLAN binding, 802.1Q support • Ingress VLAN Security • Broadcast/Multicast storm control • Automatic MAC address aging • Rapid Spanning Tree • Port mirroring • RMON statistics • Port redundancy • LLDP (IPv4 only)
Security hardened hardware features	• Media and signaling encryption • Secured management • Digitally signed gateway firmware • Managed security service support • Access list support
Management features	• Avaya Device Manager • Embedded Web Manager (IPv4 only)

Table continues…

Feature type	Description
	• RADIUS Authentication support (IPv4 only) • SNMPv1 traps and SNMPv3 notifications • Telnet (IPv4 only) and SSHv2 support • SCP, TFTP, and FTP clients • Syslog client • Modem access for remote administration • Packet Sniffing • RTP-MIB • Backup and Restore on USB Flash drive

G450 physical description

The G450 Branch Gateway has three hardware versions, referred to as *G450 1.x* , G450 2.x, and *G450 3.x*. The versions 1.x, 2.x, and 3.x refer to the hardware suffix of the G450, which is printed on the label displayed on the rear of the chassis.

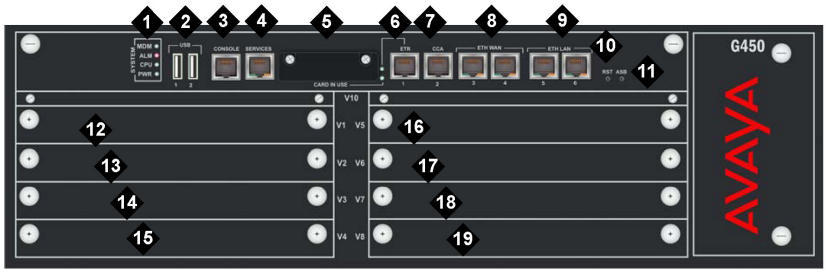


Figure 1: The Branch Gateway G450 1.x Chassis

No	Name	Description
1	System LEDs	LEDs that indicate status of the system
2	USB	USB ports for the system
3	CONSOLE	RS-232 port for services and maintenance access. RJ-45 connector.
4	SERVICES	Ethernet 10/100 port for services and maintenance access. RJ-45 connector.
5	CARD IN USE	Compact flash slot
6	ETR	Emergency Transfer Relay port. Controls two external 808A emergency transfer panels. RJ-45 connector.
7	CCA	RJ-45 port for ACS (308) contact closure adjunct box.

Table continues…

No	Name	Description
8	ETH WAN	Two 10/100 Base TX Ethernet WAN ports. RJ-45 connectors.
9	ETH LAN	Two 10/100/1000 Base TX Ethernet LAN ports. RJ-45 connectors.
10	RST	Reset button. Resets chassis configuration.
11	ASB	Alternate Software Bank button. Reboots the G450 with the software image in the alternate bank.
12	V1	Slot for standard media module or S8300 server.
13	V2	Standard media module slot.
14	V3	Standard media module slot.
15	V4	Standard media module slot.
16	V5	Standard media module slot.
17	V6	Standard media module slot.
18	V7	Standard media module slot.
19	V8	Standard media module slot.

For information about the different media modules that can be housed in the G450 media module slots, see Chapter 2: Optional components on page 21.

Chapter 3: New in this release

What's new in Branch Gateway

This chapter provides an overview of the new features and enhancements for Branch Gateway 7.1.

CLI Commands

Two new CLI Commands are introduced in Release 7.1:

- **`set allow-unencrypted`**: System administrator can use this command to allow or disallow media encryption requests from Communication Manager.
- **`set link-encryption`**: System administrator can use this command to specify what TLS versions will be offered by the gateway when connecting to a server.

FIPS-mode

FIPS-mode is a feature that is currently not supported in Release 7.1 for use by our customers since it is pending FIPS certification by a 3rd-party at this time. It is targeted to be available in a post 7.0.1 release after achieving FIPS certification.

OPUS Codec

The MP120 and MP160 VOIP modules are now capable of supporting the Opus codec in narrowband mode.

Chapter 4: Optional components

Optional components

The Branch Gateway is a versatile device with powerful capabilities. To implement the various services that are supported, a variety of swappable internal components called media modules are available.

Supported media modules

Table 1: Supported media modules

Media module	Description
S8300	Communication Manager server
Telephony media modules	
MM711	8 universal analog ports
MM714	4 analog telephone ports and 4 analog trunk ports
MM714B	4 analog telephone ports, 4 analog trunk ports, and an emergency transfer relay
MM716	24 analog ports
MM712	8 DCP telephone ports
MM717	24 DCP telephone ports
MM710 MM710B	1 T1/E1 ISDN PRI trunk port
MM720	8 ISDN BRI trunk or endpoint (telephone or data) ports
MM721	8 ISDN BRI trunk or endpoint (telephone or data) ports
MM722	2 ISDN BRI trunk ports
WAN media modules (discontinued)	
MM340	1 E1/T1 data WAN port
MM342	1 universal serial data WAN port

S8300D Server hardware requirements

The hardware for S8300D Server as a primary controller is identical to the hardware for S8300D Server as a survivable remote server. The difference between the two configurations is only in software.

S8300D Server components

For a list of S8300D components used in each S8300D configuration, see the S8300D Server configuration section.

S8300D Server configuration

The S8300D Server is supported by Communication Manager Release 5.2 and later.

An S8300D Server is an Intel Core 2 Duo U5700 processor that runs on the Linux operating system. The S8300D Server resides in Slot V1 of a gateway and includes:

- 250-GB hard disk
- 8-GB DRAM (with one 1 GB DIMM)
- 4-GB Internal Solid State Drive (SSD)
- One USB ports and a 10/100 Base-T port
  - One USB port supports a readable DVD/CD-ROM drive, which is used for system installations and upgrades.
- One services port
- One internal Compact Flash drive, which is used as the primary reboot device
- Modem support for alarming

S8300D Server software

S8300D Server supports the following:

- A web server that is used for:
  - Backing up and restoring customer data
  - Viewing current alarms
  - Maintaining the server
  - Enabling and disabling the modem
  - Starting and stopping the FTP server

  - Viewing the software license
  - Accessing SNMP to configure trap destinations and to start and stop the master agent
  - Viewing the configuration information
  - Upgrading
- A Linux operating system
- Trivial File Transfer Protocol (TFTP)
- A secure HTTP server for IP phone file downloads
- H.248 Branch Gateway Signaling Protocol
- Control messages over H.323 Signaling Protocol

S8300E Server hardware requirements

The hardware for S8300E Server as a primary controller is identical to the hardware for S8300E Server as a survivable remote server. The difference between the two configurations is only in software.

S8300E Server components

For a list of S8300E components used in each S8300E configuration, see the S8300E Server configuration section.

S8300E Server configuration

The S8300E server is supported by Communication Manager Release 5.2 and later.

An S8300E server is an dual core Intel Ivy Bridge processor.

The S8300E server resides in Slot V1 of a gateway and includes:

- 320–GB hard disk
- Two 8-GB of DDR3 SDRAM
- 512-KB L2 cache and 4-MB L3 cache
- Three USB 2.0 ports
- Ethernet LAN port reserved for future use
- USB port for DVD Drive
- Two DIMM sockets
- USB compact flash reader
- One services Ethernet port

S8300E Server software

S8300E server supports the following:

- A web server that is used for:
  - Backing up and restoring customer data
  - Viewing current alarms
  - Maintaining the server
  - Enabling and disabling the modem
  - Starting and stopping the FTP server
  - Viewing the software license
  - Accessing SNMP to configure trap destinations and to start and stop the master agent
  - Viewing the configuration information
  - Upgrading
- Linux operating system
- Trivial File Transfer Protocol (TFTP)
- Secure HTTP server for IP phone file downloads
- H.248 branch gateway signaling protocol
- Control messages over H.323 and SIP signaling protocol

Utility Services overview

From Utility Services Release 7.0, you can deploy Utility Services as a standalone OVA.

Out of Band Management

Out of Band Management is a physically and logically separate network connection. It connects to a customer's private IT management network and provides for secure management and administration of Avaya products.

From Utility Services Release 7.0.1, you can activate out-of-band management even after deployment.

Utility Services Release 7.0.1 and later support a full out of band management configuration. Therefore, you can deploy Utility Services with two IP addresses and split the user and management traffic to different Ethernet interfaces on different IP networks.

When Utility Services is set for out of band management, the following services are allocated for full or Utility Services-only mode:

Application	Interfaces for traffic
Phone firmware download	Public
Phone settings file	Public
Gateway firmware download	Public
DHCP Server	Public
Myphone User	Public
SSH	Out of Band Management / Services
Myphone Admin	Out of Band Management
CDR connection to CM	Out of Band Management
Main admin web pages	Out of Band Management / Services
Alarm source	Out of Band Management
SAL connection (SSH, HTTP)	Out of Band Management

When Utility Services is set for out of band management, the following services are allocated for services port-only mode:

Application	Interfaces for traffic
SSH	Out of Band Management / Services
Alarm source	Out of Band Management
SAL connection (SSH, HTTP)	Out of Band Management
Main admin web pages	Disabled
Phone firmware download	Disabled
Gateway firmware download	Disabled
Phone settings	Disabled
Gateway firmware download	Disabled
DHCP Server	Disabled
Myphone Server	Disabled
CDR connection to CM	Disabled
Myphone admin	Disabled

Note:

If a network is not mentioned for service when Out of Band Management is enabled, the service must be disabled on that interface.

Utility Admin

With Utility Services 7.0.1, the Utility Services Administration Web Pages are accessible on port 543.

The URL is https:// <Utility Services IP> :543/admin.html.

‘Utility Services IP’ is the Public IP address of Utility Services when OOBM is disabled. This is the OOBM IP address of Utility Services when OOBM is enabled.

With the Utility Admin page, you can configure and gain access to the following elements:

- Software Version: Displays the software versions of packages, operating system, IP telephone firmware, media module firmware, and gateway firmware that are active on Utility Services.
- Firewall Rules: Displays the IPv4 and IPv6 firewall rules of Utility Services.
- IP Phone file server: Supports the download of the IP telephone firmware and the settings files. The server also supports backing up and restoring of IP telephone user configuration, for example, speed dial configurations.
- ADVD Settings Editor: Provides a Web-based tool for configuring the Avaya Desktop Video Device (ADVD) settings file. ADVD Settings Editor provides enhanced validation to avoid wrong configurations.
- IP Phone Settings Editor: Provides a Web-based tool for configuring the IP telephone settings file. IP Phone Settings Editor provides enhanced validation to avoid wrong configurations.
- IP Phone firmware management: Supports the upload of the new telephone firmware to the file server.
- DHCP server: Provides basic DHCP server capabilities for supporting IP telephones.
- IPv6 DHCP server: Provides IPv6 DHCP server capabilities for supporting IP telephones.
- IP Phone Push Server: Displays the content from Push Server Database.
- Log viewer: Provides access of the log files for the Utility Services applications.
- CDR tools: Provides a Call Detail Record (CDR) collection capability. The CDR tool collects the CDR records from Communication Manager and imports the records into the Utility Services database. The CDR tool also provides simple examples on using the CDR data in the database.

MyPhone Admin

With Utility Services 7.0.1, the Utility Services MyPhone Administration Web Pages are accessible on port 9443.

The URL is `https://<Utility Services IP>:9443/MyPhoneAdmin`.

‘Utility Services IP’ is the Public IP address of Utility Services when OOBM is disabled. This is the OOBM IP address of Utility Services when OOBM is enabled.

With the MyPhone Admin page, you can gain access to the following configuration elements of MyPhone and IP telephone operations:

- MyPhone Feature Buttons: Enable or disables the features available to the MyPhone users.
- WML Links: Displays the default Wireless Markup Language (WML) page on the IP telephones. You can use this element to configure the default WML page.
- System Message: Configures the WML page. This element contains a block of text that is relevant to every IP telephone user.

For more information about MyPhone Admin, see *Accessing and Managing Avaya Aura® Utility Services*, 03-603628.

MyPhone

With the MyPhone page, you can:

- Configure the IP telephones.
- Configure buttons, language settings, EC500, Enhanced Call forwarding, and other features.
- Configure the security codes and other parameters.

For more information about MyPhone, see *Accessing and Managing Avaya Aura® Utility Services*, 03-603628.

MyPhone User Guide

You can download a PDF file or an online HTML file to view the MyPhone documentation.

Deploying Utility Services

You can deploy Utility Services on the following:

- VMware

  For more information, see *Deploying Avaya Aura® Utility Services* guide.
- Appliance Virtualization Platform through Solution Deployment Manager (SDM)

  For more information, see *Deploying Avaya Aura® applications from System Manager*.

Audit Account Addition

Utility Services supports an auditor account. You can use the auditor account to view the configuration and log files on Utility Services. However, you cannot alter any configuration. During the time of installation, the default password for the auditor account is `audit01`. You can change the default password at any given instance by starting an SSH session to Utility Services.

IP Phone Firmware Removal

Utility Services no longer bundles the IP Phone firmware within the build. To ensure that Utility Services has the correct IP Phone firmware for the installation, you must download the latest version of the firmware from PLDS. You can download the latest IP Phone firmware to store on Utility Services at any time. The IP Phone firmware management features remain unchanged from the previous versions.

Telephony media modules

The Branch Gateway supports the MM711, MM714, MM714B, and MM716 analog media modules, the MM712 and MM717 DCP media modules, the MM710B E1/T1 media module, and the MM720, MM721 and MM722 BRI media modules.

MM711 analog media module

The MM711 provides analog trunk and telephone features and functionality.

MM711 ports

The administrator can configure any of the eight ports of the MM711 as follows:

- Central office trunk, either loop start or ground start
- Analog Direct Inward Dialing (DID) trunks, either wink-start or immediate-start
- 2-wire analog Outgoing CAMA E911 trunks for connectivity to the PSTN
- MF signaling is supported for CAMA ports
- Analog, tip/ring devices, such as single-line telephones with or without LED message waiting indication

Other MM711 features and functionality

- Three ringer loads, which is the Ringer Equivalency Number (REN), for the following loop lengths for all eight ports.
  - 20,000 feet (6096 meters) with 0.65 mm wire
  - 16,000 feet (4877 meters) with 0.5 mm wire
  - 10,000 feet (3048 meters) with 0.4 mm wire

  At .1 or less ringer loads, the supported loop length is 20,000 feet (6096 meters) with 0.65 mm, 0.5 mm and 0.4 mm wire.
- Up to eight simultaneously-ringing ports

  Note:

  The Branch Gateway achieves this number of ports by staggering the ringing and pauses between two sets of up to four ports.
- Type 1 Caller ID
- Ring voltage generation for a variety of international frequencies and cadences

Figure 2: The MM711 media module

MM714 analog media module

The MM714 analog media module provides four analog telephone ports and four analog trunk ports.

Note:

The four analog trunk ports *cannot* be used for analog DID trunks. Instead, the four analog telephone ports must be used.

MM714 ports

The MM714 provides you with the capability to configure any of the four trunk ports as:

- A loop start or a ground start central office trunk with a loop current of 18 to 120 mA
- A two-wire analog Outgoing CAMA E911 trunk, for connectivity to the PSTN. MF signaling is supported for CAMA ports.

MM714 line ports

The MM714 provides you with the capability to configure any of the four telephone ports as:

- A wink-start or an immediate-start DID trunk
- Analog tip/ring devices such as single-line telephones with or without LED message waiting indication

Other MM714 features and functionality

- Three ringer loads, which is the Ringer Equivalency Number (REN), for the following loop lengths for all eight ports.
  - 20,000 feet (6096 meters) with 0.65 mm wire
  - 16,000 feet (4877 meters) with 0.5 mm wire
  - 10,000 feet (3048 meters) with 0.4 mm wire

  At .1 or less ringer loads, the supported loop length is 20,000 feet (6096 meters) with 0.65 mm, 0.5 mm and 0.4 mm wire.
- Up to four simultaneously-ringing ports
- Type 1 caller ID and Type 2 caller ID
- Ring voltage generation for a variety of international frequencies and cadences

Figure 3: The MM714 media module

MM714B analog media module

The MM714B analog media module provides all the features provided by the MM714 (see MM714 analog media module on page 28), and in addition provides an emergency transfer relay.

MM714B and ETR

In the event of system failure, the MM714B provides emergency transfer relay (ETR) services by connecting trunk port 5 and line port 4.

Figure 4: The MM714B media module

MM716 analog media module

The MM716 provides 24 analog ports supporting telephones, modem, and fax. These ports can also be configured as DID trunks with either wink-start or immediate-start. The 24 ports are provided via a 25 pair RJ21X amphenol connector, which can be connected by an amphenol cable to a breakout box or punch-down block.

MM716 ports

The MM716 provides you with the capability to configure any of the 24 ports as:

- Analog tip/ring devices such as single-line telephones with or without LED message waiting indication
- A wink-start or an immediate-start DID trunk

Other MM716 features and functionality

- Three ringer loads, which is the Ringer Equivalency Number (REN), for the following loop lengths for all 24 ports.
  - 20,000 feet (6096 meters) with 0.65 mm wire
  - 16,000 feet (4877 meters) with 0.5 mm wire
  - 10,000 feet (3048 meters) with 0.4 mm wire

  At .1 or less ringer loads, the supported loop length is 20,000 feet (6096 meters) with 0.65 mm, 0.5 mm and 0.4 mm wire.
- Up to 24 simultaneously-ringing ports
- Type 1 caller ID
- Ring voltage generation for a variety of international frequencies and cadences

The MM716 is compatible with Avaya Aura® Communication Manager release 3.1 and higher, and Branch Gateway firmware version 29.x.x and higher.

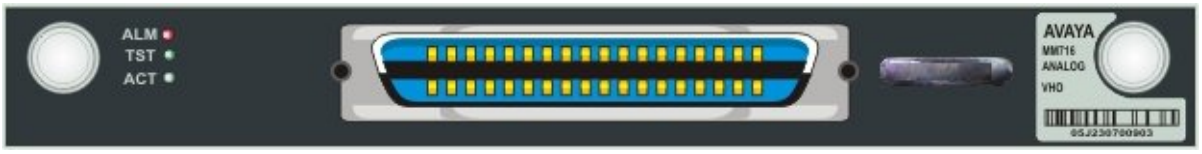


Figure 5: The MM716 media module

MM712 DCP media module

The MM712 DCP media module provides eight DCP telephone ports. The ports support two-wire Digital Communications Protocol (DCP) telephones. See Supported Avaya telephones on page 59 for a list of compatible DCP telephones.

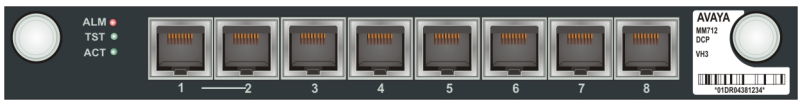


Figure 6: The MM712 media module

MM717 DCP media module

The MM717 DCP media module provides 24 DCP ports of two-wire DCP functionality exposed as a single 25-pair amphenol connector. The DCP ports are exposed by connecting the module via a standard amphenol cable to a punch-down block with RJ-11 jacks. The MM717 allows you to use one of the smaller media module slots for a large number of DCP telephones.

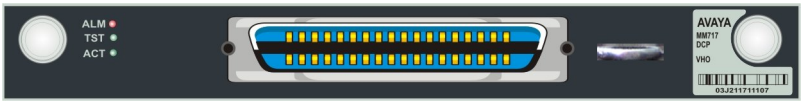


Figure 7: The MM717 media module

MM710B E1/T1 media module

Note:

This information applies to the MM710 as well.

The MM710B E1/T1 media module terminates an E1 or T1 trunk. The MM710 has a built-in Channel Service Unit (CSU) so an external CSU is not necessary. The CSU is only used for the T1 circuit.

The MM710B features:

- ISDN PRI capability (23B+D or 30B+D)
- Trunk signaling to support US and International CO or tie trunks
- Echo cancellation in either direction

Figure 8: The MM710B media module

MM720 BRI media module

The MM720 BRI media module provides eight ports with RJ-45 jacks that can be administered either as BRI trunk connections or BRI endpoint (telephone and data module) connections.

Note:

The MM720 BRI media module cannot be administered to support both BRI trunks and BRI endpoints at the same time. However, the MM720 BRI Media Module supports combining both B-channels together to form a 128-kbps channel. Communication Manager 3.1 enables combining B-channels, using BONDing, to form a higher bandwidth connection. Finally, if the MM720 BRI Media Module is administered to support BRI endpoints, it cannot be used as a clock synchronization source.

For BRI trunking, the MM720 BRI media module supports up to eight BRI interfaces to the central office at the ISDN TE reference point. Information is communicated in two ways:

- Over two 64-kbps channels, called B1 and B2, that can be circuit-switched simultaneously
- Over a 16-kbps channel, called the D-channel, that is used for signaling. The MM720 occupies one time slot for all eight D channels.

The circuit-switched connections have an A- or Mu-law option for voice operation. The circuit-switched connections operate as 64-kbps clear channels when in the data mode.

For BRI endpoints, the MM720 BRI media module supports up to 16 BRI stations and data modules that conform to AT&T BRI, World Class BRI, and National ISDN NI1/NI2 BRI standards. The MM720 BRI media module provides -40 volt phantom power to the BRI endpoints.

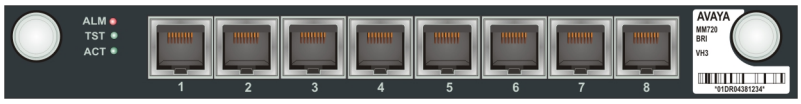


Figure 9: The MM720 media module

MM721 BRI media module overview

The MM721 Basic Rate Interface (BRI) media module contains eight ports. You can administer these ports either as BRI trunk or BRI endpoint connections, such as a telephone and data module.

Note:

You cannot administer the MM721 BRI media module to support both BRI trunks and BRI endpoints at the same time. You can use all eight ports on the MM721 for just stations or just trunks. You cannot use a mixture of ports for both applications.

For BRI trunking, the MM721 BRI media module supports up to eight BRI interfaces to the central office at the ISDN S/T reference point.

For BRI endpoints, each of the eight ports on the MM721 BRI media module supports integrated voice and data endpoints for up to 2 BRI stations or data modules or both. The MM721 BRI media module provides -48 volt phantom power to the BRI endpoints.

The MM721 BRI media module supports 4-wire S/T ISDN BRI on each interface.

The MM721 BRI media module communicates information in two ways:

- Over two 64-kbps channels called B1 and B2. You can circuit-switch these channels simultaneously
- Over a 16-kbps channel called the D-channel that is used for signaling

The circuit-switched connections have an A-law or Mu-law option for voice operation. In the data mode, circuit-switched connections operate as 64-kbps clear channels.

The MM721 supports the G450 and G430 Branch Gateways with Communication Manager Release 6.0.1 build 31_18_1.

The MM721 is supported by Communication Manager release 6.0.1 and later and Gateway firmware version 31.18.1 and later.

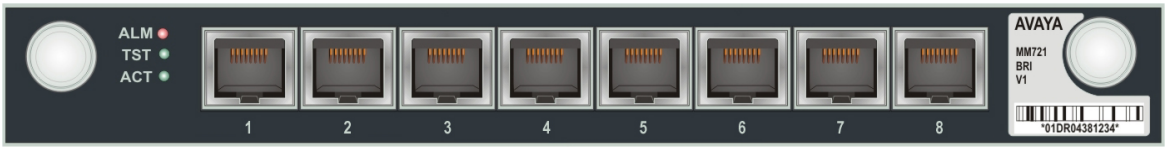
Note:

If you replace the MM720 media module, first uninstall the MM720 media module before installing the MM721 media module.

The following table provides the MM721 media module display information on different Communication Manager releases.

Release	5.2.1/6.0.1 and earlier	5.2.1 SP7/6.0.1 SP1	6.2 and later
Administer	MM720 (non-native admin)	MM720 (non-native admin)	MM721 (Native)
Insert	MM721	MM721	MM721
Result	No Board	MM720X	MM721

Front panel of the MM721 media module



MM722 BRI media module

The MM722 BRI media module provides two 4 wire S/T ISDN BRI 2B+D access ports with RJ-45 jacks. Each port interfaces to the central office at the ISDN T reference point. Information is communicated in the same manner as for the MM720. See MM720 BRI media module on page 31.

Figure 10: The MM722 media module

Note:

The MM722 media module does not support BRI stations or combining both B channels together to form a 128-kbps channel.

WAN media modules

The Branch Gateway supports the MM340 E1/T1 WAN and MM342 Universal Serial Port WAN media modules.

MM340 E1/T1 WAN media module

Note:

The MM340 is no longer sold.

The MM340 E1/T1 WAN media module provides a data WAN access port for the connection of an E1 or T1 WAN.

Figure 11: The MM340 media module

MM342 universal serial data WAN media module

Note:

The MM342 is no longer sold.

The MM342 media module provides one universal serial data WAN access port. The MM342 supports the following WAN protocols:

- V.35/ RS449
- X.21

Required cable

For these connections, one of the following cables is required:

- Avaya Serial Cable DTE V.35 (Universal Serial Port to V.35)
- Avaya Serial Cable DTE X.21 (Universal Serial Port to X.21)

Figure 12: The MM342 media module

VOIP Modules in G450

A media processor or a VOIP module provides the resources/channels to support a voice call.

A G450 has four VOIP slots. It supports the VOIP modules listed in the table below:

VOIP Modules	Description
MP20	Supports a maximum of 20 channels. • Provides 25 VOIP channels for G.711 and G.726. • Provides 20 VOIP channels for G.729.
MP80	Supports a maximum of 80 channels.
MP160	The MP160 is capable of supporting new media services such as V.150.1 and Opus codec. In the past, all DSP cards were capable of supporting all codec types, albeit with various performance differences in terms of point costs. However, the V.150.1 protocol is not supported on the older VOIP modules. MP160 supports a maximum of 160 channels. Supports a maximum of 80 channels with the Opus codec.

Configuration matrix

A G450 can support MP20 and MP80 in any configuration for the 4 slots. G450 supports a maximum of 320 channels.

The following are permitted combinations of optional VoIP (MP) modules on G450 Branch Gateway only.

Combination of Cards	MP80 Card	MP20 Card	MP160 Card
Combination # 1	-	-	2
Combination # 2	-	2	1
Combination # 3	2	-	1
Combination # 4	1	1	1

Note:

Once the installation for MP160 is determined, the MP80/20s can be installed in any of the remaining slots.

Media module slot configurations

When choosing a combination of media modules to install in the Branch Gateway chassis, consider the slots in which each module type can be housed, and the limitations and recommendations regarding combinations of media modules.

Permitted slots

The Branch Gateway G450 chassis has eight media module slots, marked V1, V2, V3, V4, V5, V6, V7, and V8. Each media module is restricted to certain slots.

Table 2: Permitted slots for media modules

Media module	Permitted slots
MM340	V3, V4, V8
MM342	V3, V4, V8
MM710	Any media module slot, V1-V8
MM711	Any media module slot, V1-V8
MM712	Any media module slot, V1-V8
MM714	Any media module slot, V1-V8
MM714B	Any media module slot, V1-V8
MM716	Any media module slot, V1-V8
MM717	Any media module slot, V1-V8
MM720	Any media module slot, V1-V8
MM721	Any media module slot, V1-V8
MM722	Any media module slot, V1-V8
S8300	V1

G450 media module capacity

The G450 chassis is designed to accommodate:

- Up to eight telephony media modules (MM710, MM711, MM712, MM714, MM714B, MM716, MM717, MM720, MM722)
- Up to three WAN media modules (MM340, MM342)
- Up to one S8300 server

Chapter 5: Summary of services

Summary of services

The Branch Gateway offers various services, which are described in Branch Gateway services on page 38 , LAN services on page 47 and WAN services on page 48.

IPv6

Internet Protocol version 6 (IPv6) is the successor to IPv4. IPv6 supports 128–bit addresses and satisfies the rapidly growing demand for IP addresses. In contrast, IPv4 supported 32–bit. IPv6 also improves security, ease of configuration, and routing performance. IPv6 can coexist with IPv4 networks, easing the transition process.

The IETF (Internet Engineering Task Force) published RFC 2460, the internet standard specification that defines IPv6, in December 1998.

Addressing

By using 128-bit addresses, IPv6 has about $3.4x10^{38}$ unique IP addresses, more than enough for every network device. This eliminates the IPv4 mechanisms, such as NAT (network address transitions), that are used to relieve IP address exhaustion. IPv6 addresses are normally written as hexadecimal digits with colon separators, for example: 2005:af0c:168d::752e:375:4020. The double colon "::" represents a string of zeroes, according to RFC4291.

Simplicity

IPv6 simplifies the routing process by changing the packet header and packet forwarding:

- Simplified packet header, despite enhanced functionality.
- IPv6 routers do not perform fragmentation. This is carried out by IPv6 hosts.
- IPv6 routers do not need to recompute a checksum when header fields change.
- Routers no longer need to calculate the time a packet spent in a queue.
- IPv6 supports stateless address configuration, so IPv6 hosts can be configured automatically when connected to a routed IPv6 network through ICMPv6. Stateful configuration using DHCPv6 and static configuration are also available.

Deployment and transition

There are several mechanisms that ease the deployment of IPv6 running alongside IPv4. The key to the transition is dual-stack hosts. Dual-stack hosts refers to the presence of two IP software implementations in one operating system, one for IPv4 and one for IPv6. These dual-stack hosts

can run the protocols independently or as a Hybrid. The Hybrid is the common form on recent server operating systems and computers.

When an IPv6 host or network must use the existing IPv4 infrastructure to carry IPv6 packets, *Tunneling* provides the solution. Tunneling encapsulates IPv6 packets within IPv4. Tunneling can be either *automatic* or *configured*, the latter being more suitable for large, well-administered networks.

Key differences between IPv4 and IPv6

Parameter	IPv4	IPv6
Address space	32-bit, about $4.3x10^9$	128-bit, about $3.4x10^{38}$
Configuration	Requires DHCP or manual configuration.	Stateless auto-configuration. Does not require DHCP or manual configuration.
Address format	Decimal digits with colon separators, for example: 192.168.1.1	Hexadecimal digits with colon separators. For example: 2005:af0c:168d::752e:375:4020. The double colon "::" represents four zeros "0000"
Broadcast and Multicast support	Yes	No Broadcast. Various forms of Multicast — better network bandwidth efficiency
QoS support	ToS using DIFFServ	Flow labels and flow classes, more granular approach.

Feature Support in Avaya Branch Gateways

Certain Branch Gateway features are not supported in IPv6.

Branch Gateway services

The Branch Gateways provide a telephone exchange service, supporting the connection of various types of telephones and outside telephone lines. Telephones and lines are connected to the Branch Gateways through media modules on the chassis. Different media modules provide access ports for different types of telephones and lines.

Telephony services are controlled by a Media Gateway controller (MGC) running Communication Manager call processing software. You can use the Communication Manager to configure advanced telephone exchange functions. For more information, see *Administering Avaya Aura® Communication Manager*.

This section describes the services the Branch Gateway provides as a gateway.

Voice over IP (VoIP)

The Branch Gateway:

- Features up to four VoIP DSPs that provide voice services over IP data networks.
- Allows you to use many types of telephones and trunks that do not directly support VoIP.

- Translates voice and signalling data between VoIP and the system used by the telephones and trunks, as follows: Avaya media modules convert the voice path of traditional circuits such as analog trunk, T1/E1, and DCP to a TDM bus inside the Branch Gateway. The VoIP engine then converts the voice path from the TDM bus to a compressed or uncompressed and packetized VoIP on an Ethernet connection.

The Branch Gateway provides VoIP services over the LAN and WAN. The G450 supports up to four VoIP DSP childboards. The maximum number of active channels supported is 105.All channels can be bi-directional FAX, G.711 u/A, G.726A calls, in case of G.729A/AB the maximum number of channels on the on-board DSP is 20.

Physical media

There are various types of telephones and lines supported by the Branch Gateway and access ports provided for their connection.

Telephones

The Branch Gateway supports IP telephones, Avaya DCP telephones, analog telephones, and BRI telephones. For information about which Avaya telephones are supported, see Appendix B: Supported Avaya telephones on page 59.

Telephones must be connected to the correct type of port for the telephone type. Different types of telephone ports are provided by different media modules. The table below lists which ports you can use to connect each type of telephone. See Chapter 2: Optional components on page 21 for more information about each type of port and media module.

Table 3: Telephones supported and ports provided

Telephone type	Ports
IP telephones and softphones	An external LAN switch must be connected to one of the front panel ETH LAN ports. **Note:** The registration and signaling control information is under the direct control of the Avaya Aura® Communication Manager server.
Avaya DCP digital telephones	DCP ports on the MM712 and MM717 media modules.
Analog telephones	Analog line ports on the MM711, MM714, MM714B, and MM716 analog media modules.

Outside telephone lines

The table below lists which modules you can use to connect each type of outside line. See Chapter 2: Optional components on page 21 for more information about each type of port and media module.

Table 4: Outside telephone lines supported and ports provided

Line Type	Ports
ISDN line	ISDN ports on the MM720, MM721 and MM722 BRI media modules.
Analog trunks	Analog trunk ports on the MM714 or MM714B analog media module. Universal analog ports on MM711. DID trunk ports with wink-start and immediate-start only on MM716.
T1/E1 voice lines	The T1/E1 port on the MM710 T1/E1 media module.

Media Gateway Controllers

A Media Gateway Controller (MGC) controls telephone services on a Branch Gateway. An MGC may be internal or external to the Branch Gateway. An Internal Call Controller (ICC) is an internal MGC. An External Call Controller (ECC) is an external MGC that communicates with the Branch Gateway over the network.

An Avaya server managed with Avaya Aura® Communication Manager (Communication Manager) software acts as an MGC for the Branch Gateway.

Supported Avaya servers

The MGCs supported by the Branch Gateway include both ECCs and ICCs. The Branch Gateway supports the following MGCs:

Table 5: MGCs supported by the Branch Gateways

MGCs	Type	Usage
Avaya S8300E Server	Media module	ICC, ECC or LSP
Avaya S8300D Server	Media module	ICC, ECC or LSP
Avaya S8800 Server	External	ECC
Dell™ PowerEdge™ R610 Dell™ PowerEdge™ R620 Dell™ PowerEdge™ R630	External	ECC
HP ProLiant DL360 G7 HP ProLiant DL360 G8 HP ProLiant DL360 G9	External	ECC

Configuration rules for Branch Gateway options

The Branch Gateway provides the following configuration options to help you ensure continuous telephone services:

- You can configure the Media Gateway to use up to four MGCs. Each controller can be configured with one IPv4 and/or one IPv6 address. Each address configured is either the IPv4

address of a TN799 (C-LAN) board connected to the server or the IPv4/IPv6 address of the Processor Ethernet interface of Avaya Aura® Communication Manager. The four addresses are grouped into primary and secondary controllers, using the transition point to separate the two groups.

- Using the connection preserving migration feature, you can configure the Branch Gateway to preserve the bearer paths of stable calls if the Branch Gateway migrates to another MGC (including an SRS), including migration back from an SRS to the primary MGC. A call for which the talk path between parties in the call is established is considered stable. A call consisting of a user listening to announcements or music is not considered stable and is not preserved. Any change of state in the call prevents the call from being preserved. For example, putting a call on hold during MGC migration causes the call to be dropped. Special features, such as conference and transfer, are not available on preserved calls. Connection preserving migration preserves all types of bearer connects except BRI. PRI trunk connections are preserved.
- You can configure Standard Local Survivability (SLS) to enable a local Branch Gateway to provide a degree of MGC functionality when no link is available to an external MGC. You configure SLS from the Branch Gateway using the CLI. SLS is supported for all analog interfaces, ISDN BRI/PRI trunk interfaces, non-ISDN digital DS1 trunk interfaces (T1 Robbed Bit and E1-CAS), IP telephones, IP softphones, and DCP telephones. SLS is available on IPv4 only
- You can configure Enhanced Local Survivability (ELS) by installing an S8300 in the Branch Gateway as a Survivable Remote Server (SRS). In this configuration, the S8300 is not the primary MGC but takes over to provide continuous telephone service if all external MGCs become unavailable. Calls in progress continue without interruption when the S8300 takes over.
- You can configure the dialer interface to connect to the Branch Gateway's primary MGC by a serial modem if the connection between the Branch Gateway and the MGC is lost.
- You can configure Avaya Communication Manager to support the auto fallback feature, which enables an Branch Gateway being serviced by an SRS to return to the primary MGC automatically when the connection is restored between the Branch Gateway and the MGC. When the Branch Gateway is being served by the SRS, it automatically attempts to register with the MGC at periodic intervals. The MGC can deny registration in cases in which it is overwhelmed with call processing, or in other configurable circumstances. By migrating the Branch Gateway to the MGC automatically, a fragmented network can be unified more quickly, without the need for human intervention.

  Note:

  Auto fallback does not include survivability. Therefore, there is a short period during registration with the MGC during which calls are dropped and service is not available. This problem can be minimized using the connection preserving migration feature.

- The Branch Gateway features a dynamic trap manager that enables you to ensure that the Branch Gateway sends traps directly to the currently active MGC. If the MGC fails, the dynamic trap manager ensures that traps are sent to the backup MGC.

Branch Gateway management

Branch Gateway is managed by Communication Manager Release 7.0.

Communication Manager features

Communication Manager is an open, scalable, highly reliable, and secure telephony application. Communication Manager provides user and system management functionality, intelligent call routing, application integration and extensibility, and enterprise communications networking. Communication Manager offers over 700 features, in the following categories:

- Telephony features
- Localization
- Collaboration
- Mobility
- Messaging
- Telecommuting
- System management
- Reliability
- Security, privacy, and safety
- Hospitality
- Attendant features
- Networking
- Intelligent call routing
- Application programming interfaces

Communication Manager software applications

- Determine where to connect your telephone call based on the number you dial.
- Assign numbers to local telephones.
- Play dial tones, busy signals, and prerecorded voice announcements.
- Allow or prohibit access to outside lines for specific telephones.
- Assign telephone numbers and buttons to special features.
- Exchange call switching information with older telephone switches that do not support VoIP.

For more information about Communication Manager software, see *Administering Avaya Aura® Communication Manager*.

Audio and Video features

Branch gateways also provide the following audio and video related features:

Call center capabilities

With large announcement storage including optional compact flash, large voice trunk capacity, and 64 announcement ports for announcement record and playback, the Branch Gateway supports call center features.

Emergency Transfer Relay (ETR)

The Emergency Transfer Relay (ETR) feature provides basic telephone services in the event of a power outage or a failed connection to Communication Manager. ETR services are provided on the MM714B media modules by connecting the module's trunk port 5 to line port 4. You can also optionally connect two external 808A ETR panels to the Branch Gateway. Each 808A Emergency Transfer Panel provides emergency trunk bypass or power-fail transfer for up to five incoming trunk loops to five analog phones and maintains connections on return from emergency transfer mode.

Contact closure

The contact closure feature is a controllable relay providing dry contacts for various applications. To implement the contact closure feature, connect an Avaya Partner Contact Closure Adjunct box to the CCA port on the Branch Gateway chassis. The adjunct box provides two contact closures that can be operated in either a "normally closed" or "normally open" state. The contact closures can control devices such as devices that automatically lock or unlock doors or voice recording units. The CCA port can be configured so that the connected devices can be controlled by an end device, such as a telephone. For example, a user can unlock a door by keying a sequence into a telephone keypad.

Fax, modem, TTY over IP

The Branch Gateway supports fax, modem, and TTY over IP.

Service Level Agreement Monitor

Service Level Agreement (SLA) Monitor is an integrated set of tools designed to help obtain highest end-to-end audio and video performance on a converged network. SLA Monitor communicates with agents embedded in the components of IP telephony and other sources through a web-based server application. With the data gathered by SLA Monitor through this communication, you can check the network contribution to the performance of audio and video applications.

SLA Monitor performs analysis on the following network elements:

- Correct Differentiated Services (DiffServ) issues.
- Handle rogue applications.
- Provide real-time visibility to live sessions.

The SLA Monitor agent is a component of SLA Monitor. The agent participates in the enterprise end-to-end monitoring and troubleshooting of various types of network problems that affect IP telephony. The SLA Monitor agent can trace packets from source to destination. The SLA Monitor agent can also monitor the DiffServ markings at each hop as the packets travel through the network.

The SLA Monitor server, which is also part of SLA Monitor, collects router flow data as well as data from the SLA Monitor agents to help produce a clear picture of how the network and the media elements contribute to end-to- end quality.

G430 Branch Gateway and G450 Branch Gateway act as the SLA Monitor agents.

For more information on the SLA Monitor server and agent, see *Operations Intelligence Suite Advanced Implementation Guide for SLA Mon*.

T.38 Fax with Fallback to G.711 Pass-Through

T.38 Fax with Fallback to G.711 Pass-Through feature provides the functionality to enterprise networks managed by Communication Manager to interoperate with the older Verizon networks that currently do not support T.38 Fax for fax transport. A new codec type, T.38 Fax with Fallback to G. 711 Pass-Through, is added to the IP codec set for fax mode.

The operation of T.38 Fax with Fallback to G.711 Pass-Through is summarized as follows:

- The call connection is signaled for standard T.38 fax relay.
- In the event of a failure to successfully negotiate T.38 fax relay, Communication Manager issues a re-INVITE to a G.711 mode of operation.
  - With PCM (G.711) codec sampling, there is an effort made to simulate a circuit-switched clear channel transport.
- The fax call is in the G.711 mode until the user disconnects.

Note:

This feature only works over SIP trunks.

For more information about the T.38 Fax Fallback to G.711 feature, see *Avaya Aura*® *Communication Manager Feature Description and Implementation*, 555-245-205.

T.38 with Error Correction Mode

Prior to Release 6.3, the T.38 Fax feature had no error correction capability. This is a problem for many customers and reduces the overall success rate of large fax transmissions. T.38 with Error Correction Mode (ECM) corrects errors without retransmitting multiple pages.

The operation of T.38 with ECM is summarized as follows:

- Communication Manager instructs the gateway to use ECM as part of the T.38 Fax capabilities exchange if:
  - The local media gateway indicates support for this feature through capability exchange.
  - IP codec set is set to **T.38-standard** .
  - ECM is set to **yes**.

- Fax machines with the memory to store page data can use ECM for error-free page transmission.
  - When ECM is enabled, a fax page is transmitted in a series of blocks that contain frames with packets of data.
  - After receiving the data for a complete page, a receiving fax machine notifies the transmitting fax machine of any frames with errors.
  - The transmitting fax machine then retransmits the specified frames.
  - This process is repeated until all frames are received without errors.
  - If the receiving fax machine is unable to receive an error free page, the fax transmission fails and one of the fax machines is disconnected.

For more information about the T.38 with Error Correction Mode feature, see *Administering Network Connectivity on Avaya Aura® Communication Manager*.

List Trace and List Measurement

The List Trace and the List Measurement commands include additional performance and diagnostic information for V.150 / Modem over IP calls.

The standard List Trace command provides enhanced information for the V.150.1 call state information. The goal is to avoid dependency on Wireshark captures and other logging tools. The List Trace command provides easy to read logging information.

The List Measurement command aggregates the usage for V.150.1 calls and provides this in the summary for G.711 equivalent call statistics.

For more information about the List Trace and List Measurement commands, see *Maintenance Commands for Avaya Aura® Communication Manager, Branch Gateways and Server*, 03-300431.

V.150.1 Modem over IP

The V.150.1 Modem over IP (MoIP) feature is an industry-standard compliant V-series MoIP transport for carrying modem traffic over an IP network and for supporting interoperability with secure third-party terminal devices.

The V.150.1 MoIP supports the following modem modulation modes:

- V.32 and V.34 up to 33.6 Kbps.
- V.90 and V.92 up to 56 Kbp.

Benefits of V.150.1 MoIP:

- Can transform analog tone events into digital control messages, so that the protocol can pass over hops.
- Can recover from loss and operate at higher speeds up to V.92 as the protocol is sent in sequenced packets.
- Can interoperate with many different vendors.
- Can eliminate extra trunking because of convergence of data, voice, and fax.

For more information about V.150.1 (MoIP), see *Configuring V.150.1 on the Avaya G450 and G430 Branch Gateway*.

MP160 DSP daughter board

To support the V.150.1 Modem over IP feature on the G450 Branch Gateway, a new DSP card MP160 is introduced in Release 6.3. MP160 supports up to 160 VoIP channels on the G450 Branch Gateway. MP160 is used for V 150.1 and non V 150.1 calls on the G450 Branch Gateway. The G450 supports mixed DSP boards of different DSP channel capacities. The DSP channel count on G450 Branch Gateway must not exceed 320.

For more information about MP160 DSP daughter board, see *Configuring V.150.1 on the Avaya G450 Branch Gateway*.

Additional features

H.248 Registration Source Port

You can define the source port range that the gateway uses when registering with Communication Manager by using the following CLI commands:

- **set registration source-port-range**
- **show registration source-port-range**
- **set registration default source-port-range**

If you do not specify a range, the gateway selects a port within the default range of 1024 to 65535.

For more information about the CLI commands, see *CLI Reference Avaya Branch Gateway G450*, 03-602056.

Accessing diagnostic logs

With the following CLI commands, you can obtain diagnostic logs.

- **show all logs**
- **show event-log**
- **system show reset-log**
- **show dev log file**

For troubleshooting, you must send the diagnostic logs to Avaya technical support team.

For more information about accessing diagnostic logs and the CLI commands, see *Administering Avaya G450 Branch Gateway*, 03-603234 and *CLI Reference Avaya Branch Gateway G450*, 03-602056.

LAN services

You can use the Branch Gateway as a LAN switch. You can also integrate the Branch Gateway into an existing LAN.

LAN physical media

The Branch Gateway provides LAN services through the fixed LAN ports on the chassis front panel for the connection of external LAN switches or local data devices. The LAN ports are connected to the internal LAN switch and support HP auto-MDIX, which automatically detects and corrects the polarity of crossed cables. This results in simplified LAN installation and maintenance.

VLANs

In the Branch Gateway, you can configure VLANs on the fixed LAN ports.

The Branch Gateway G450 supports up to 64 VLANs. The following VLAN features are supported:

- VLAN port grouping. Port VLANs can be used to group LAN ports into logical groups.
- Ingress VLAN Security. You configure a list of ingress VLANs on each port. Any packets tagged with an unlisted VLAN are dropped when received on the port.
- Class of Service (CoS) tagging. Packets are tagged with VLANs per CoS.
- Inter-VLAN routing. You can configure specific VLANs to permit access to the WAN while others can be configured to deny access to the WAN.

Rapid Spanning Tree Protocol (RSTP)

The IEEE 802.1D (STP) and IEEE 802.1w (RSTP) Spanning Tree Protocols are supported on the ETH LAN ports.

Port mirroring

The Branch Gateway supports network traffic monitoring by port mirroring. You can configure port mirroring on any LAN port. You implement port mirroring by connecting an external traffic probe device to one of the LAN ports. The probe device monitors traffic that is sent and received through other ports by copying the packets and sending them to the monitor port.

Port redundancy

You can configure port redundancy on the Branch Gateway. Port redundancy enables you to provide both a primary link and a backup link to an important resource.

Link Layer Discovery Protocol (LLDP)

LLDP simplifies network troubleshooting and enhances the ability of network management tools to discover and maintain accurate network topologies in multi-vendor environments. LLDP defines a set of advertisement messages (TLVs), a protocol for transmitting the TLVs, and a method for storing the information contained in the received TLVs. This allows stations attached to a LAN to advertise information about the system and about the station's point of attachment to the LAN to other stations attached to the same LAN. These can be reported to the management station via SNMP MIBs.

LLDP is supported on the front panel ETH LAN ports.

WAN services

The Branch Gateway has an internal router and provides direct access to outside WAN lines. You can use the Branch Gateway as the endpoint device for a WAN line. You can also use the Branch Gateway as the router for a WAN line with an external endpoint device.

Note:

Certain WAN services are supported on IPv4 only.

WAN physical media

To use the Branch Gateway as the endpoint device for a WAN, install a WAN media module and connect the WAN line to a port on the media module. When you connect a WAN line to a media module, the Branch Gateway serves as the router for the WAN line.

You can also use the fixed ETH WAN Fast Ethernet port as a WAN endpoint by configuring the port's interface for PPPoE encapsulation (ADSL modem) or Ethernet-DHCP/static IP (cable modem).

To use the Branch Gateway as a router, connect the external endpoint device to the ETH WAN port on the Branch Gateway front panel using a standard network cable.

WAN line support

The Branch Gateway supports the following types of data WAN line:

- E1/T1
- Universal Serial Port
- PPPoE (ADSL modem)
- Ethernet-DHCP/static IP (cable modem)

Media modules necessary for each WAN line

The table below lists which media modules to install to connect each type of outside WAN line. For more information about each type of media module, see Chapter 2: Optional components on page 21.

Table 6: Outside WAN lines supported and matching media modules

WAN line	Media modules
Universal Serial Port	MM342
E1/T1 data lines	MM340
PPPoE (ADSL modem)	Chassis
Ethernet (DHCP/static IP) (cable modem)	Chassis

WAN features

The Branch Gateway supports the following WAN features:

Note:

These features are only available on IPv4.

- Traffic shaping. The traffic shaping function estimates the parameters of the incoming traffic and takes action if it measures traffic exceeding agreed parameters. The action could be to drop the packets or mark them as being high drop priority.
- PPP over channeled and fractional E1/T1. The Branch Gateway has the ability to map several PPP sessions to a single E1/T1 interface.
- PPP over Universal Serial Port
- PPPoE
- Unframed E1 for enabling full 2.048 Mbps bandwidth usage
- Point-to-Point Frame Relay encapsulation over channelized/fractional/unframed E1/T1 ports or over a Universal Serial Port interface
- Frame Relay LMI types supported: ANSI (Annex D), ITU-T:Q-933 (Annex A0), LMI-Rev1, and No LMI
- Backup functionality supported between any type of Serial Layer 2 interface
- Dynamic Call Admission Control (CAC) for Fast Ethernet, Serial, and GRE tunnel interfaces. Dynamic CAC provides enhanced control over WAN bandwidth. When Dynamic CAC is

enabled on an interface, the Branch Gateway informs the MGC of the actual bandwidth of the interface and tells the MGC to block calls when the bandwidth is exhausted.

- Quality of Service (QoS). The Branch Gateway uses Weighted Fair VoIP Queuing (WFVQ) as the default queuing mode for WAN interfaces. WFVQ combines weighted fair queuing (WFQ) for data streams and priority VoIP queuing to provide the real-time response time that is required for VoIP. The Branch Gateway also supports the VoIP Queue and Priority Queue legacy queuing methods.
- Weighted Random Early Detection (WRED). The Branch Gateway uses WRED on its ingress and egress queues to improve the performance of the network when overloaded. The purpose of WRED is to indicate to transmitting hosts to reduce their transmission speed when the ingress Branch Gateway queues are congested.
- Policy. Each interface on the Branch Gateway can have four active policy lists:
  - Ingress Access Control List
  - Ingress QoS List
  - Egress Access Control List
  - Egress QoS List

  Access control lists define which packets should be forwarded or denied access to the network. QoS lists change the DSCP and 802.1p priority of routed packets according to the packet characteristics.
- Policy-based routing. The Branch Gateway features policy-based routing, which uses a policy list structure to implement a routing scheme based on traffic source, destination, type, and other characteristics. You can use policy-based routing lists (PBR lists) to determine the routing of packets that match the rules defined in the list. Common applications include separate routing for voice and data traffic, routing traffic originating from different sets of users through different Internet connections (Internet Service Providers), and defining backup routes for defined classes of traffic.
- RTP Header Compression. The Branch Gateway saves up to 60% of the bandwidth necessary using RTP compression. It also enhances the efficiency of voice transmission over the network by compressing the headers of Real Time Protocol (RTP) packets, thereby minimizing the overhead and the delays involved in RTP implementation.
- TCP Header Compression. The Branch Gateway uses Transmission Control Protocol (TCP) header compression to reduce the amount of bandwidth needed for non-voice data. TCP header compression can be applied either as part of RTP Header Compression via IPCH, or using the Van Jacobson method defined in RFC 1144.
- Inter-Gateway Alternate Routing (IGAR). The Branch Gateway uses IGAR as a means to use the PSTN as an alternative to the WAN interface under certain definable conditions. In providing an alternate routing mechanism, IGAR preserves the internal makeup of the call so that the call can be successfully terminated to its original internal destination.

Data and Routing features

The Branch Gateway has an internal router. You can configure the following routing features on the router:

Note:

Features labelled * are only available on IPv4.

- Interfaces*
- Routing table
- VPN
- GRE tunneling*
- DHCP and BOOTP relay*
- DHCP server
- DHCP client*
- Broadcast relay
- ARP table
- ICMP errors
- RIP*
- OSPF*
- Route redistribution
- VRRP*
- Fragmentation
- Static routes
- Policy-based routing*
- Distribution lists
- Dynamic IP addresses
- DNS resolver
- Unnumbered IP interfaces
- SYN cookies
- Keepalive packets
- Object tracking
- Backup interfaces

Chapter 6: Management, Security, Alarms and Troubleshooting

Management, Security, Alarms and Troubleshooting

Management applications

Use any of the following applications to manage the Branch Gateway:

- Command Line Interface
- Branch Gateway Manager and Embedded Web Manager
- Avaya Integrated Management

Branch Gateway Command Line Interface (CLI)

You can use the Branch Gateway CLI to configure the Branch Gateway and its media modules. The CLI is a textual command prompt interface. It is similar to the CLI of many other network devices.

You can access the CLI with any of the following:

Note:

Telnet and the Services port are supported on IPv4 only.

- Telnet through the network
- Telnet through dialup, using a dialup PPP network connection

  Note:

  Telnet is disabled by default on the Branch Gateway

- A console device connected to the Console port or Services port on the Branch Gateway front panel
- SSH (Secure Shell), which enables you to establish a secure remote session over the network, Services port, or dial in modem (PPP).
- SSH is enabled by default.

For information about each command in the CLI, see *Avaya Branch Gateway G450 CLI Reference*.

For information about how to use the CLI to perform specific configuration tasks, see *Administration for the Avaya Branch Gateway G450*.

Avaya Branch Gateway Manager and Embedded Web Manager

Note:

Avaya management tools are supported in IPv4 only.

The Avaya Branch Gateway Manager is a web-enabled graphical administration tool for configuring a single Branch Gateway device. You can use the Gxxx Manager to configure the Branch Gateway chassis and media modules. You can also use it for status monitoring and troubleshooting. You can open Avaya Branch Gateway Manager in one of the following ways:

- From Avaya Integrated Management software
- From a web browser on a computer on the same network as the device

For information about Avaya Branch Gateway Manager, see *Administering Avaya G450 Branch Gateway*.

Management access security features

The Branch Gateway features the following management security mechanisms:

- A basic authentication mechanism in which users are assigned passwords and privilege levels
- Support for user authentication provided by an external RADIUS server
- SNMPv3 user authentication
- Secure data transfer via SSH and SCP with user authentication
- ASG authentication for remote service logins. ASG is a challenge-response authentication method that is more secure than password authentication and does not require a static password.
- Management access can be restricted to an Out of Band Interface, LAN or WAN.

Network security features

The Branch Gateway provides the following network security features:

- Private secure connections can be configured between the Branch Gateway and a remote peer, using VPN (Virtual Private Network). VPN at the IP level is deployed using a standards-based set of protocols defined by the IETF called IPSec. IPSec provides privacy, integrity, and authenticity to information transferred across IP networks.
- Protection against DoS (Denial of Service) attacks via:
  - MSS notifications (IPv4 only). The Branch Gateway identifies predefined or custom-defined traffic patterns as suspected DoS attacks and generates SNMP notifications, referred to as Managed Security Services (MSS) notifications. MSS notifications are intercepted and, if

certain conditions are met, may be forwarded to the Avaya Security Operations Center (SOC) as INADS alarms. The SOC is an Avaya service group that handles DoS alerts, responding as necessary to any DoS attack or related security issue.

- SYN cookies, which protect against a well-known TCP/IP attack in which a malicious attacker targets a vulnerable device and effectively prevents it from establishing new TCP connections.

- From Release 7.0, Branch Gateway supports Transport Layer Security (TLS) 1.2.
- TLS 1.2 provides a higher level of security than earlier versions to protect users from known attacks
- The TLS protocol provides three essential services to all the applications running above it:
  - Encryption
  - Authentication
  - Data integrity
- TLS Certificate validation is now time-zone aware based on the values one has administered in Communication Manager.

Alarms and troubleshooting features

The Branch Gateway has extensive features for error detection, alarms, and troubleshooting. Detailed diagnostic information and troubleshooting are provided by software-based solutions accessible by laptops in the field or remotely from an administrator's computer. *Administration for the Avaya Branch Gateway G450* provides a comprehensive guide to configuring and using these solutions.

Front panel LEDs

LEDs on the front panel of the Branch Gateway and their media modules give a quick overall understanding of the health of the system and subsystems. When alarms or problems occur, LEDs indicate that a technician's attention is needed.

Automatic error detection

During normal operations, software or firmware automatically detects and attempts to fix or circumvent error conditions. Errors are detected in two ways:

- Firmware on a system component during ongoing operations
- A "periodic test" or a "scheduled test" started by software

A technician can run more comprehensive tests on demand.

SNMP

Note:

SNMP is supported on IPv4 only.

The Branch Gateway reports alarms using SNMP traps. The Branch Gateway fully supports SNMP versions SNMPv1 and SNMPv3.

Packet sniffing

The Branch Gateway features packet sniffing on IPv4 and IPv6. All IP and ARP packets that pass through the Branch Gateway are recorded. The recorded packets are stored in a file that can be uploaded either to the Avaya server or to a PC and read by Ethereal for troubleshooting purposes.

VoIP debugging using RTP-MIB

The Branch Gateway includes the RTP-MIB feature for debugging QoS-related problems across the VoIP network without any dedicated hardware. During each RTP stream, counters representing various QoS metrics increment whenever configured thresholds for the metrics are exceeded. A limited history of the QoS metric statistics is stored on the Branch Gateway for active and terminated RTP streams. Statistics can be displayed via the Branch Gateway CLI. In addition, the Branch Gateway can be configured to send SNMP traps to the SNMP trap manager on the Avaya server at the termination of each RTP stream that has QoS problems. The traps are converted to syslog messages and stored for viewing in the messages file on the Avaya server hard disk.

Chapter 7: Branch Gateway capacities

Branch Gateway capacities

G450 maximum Branch Gateway capacities

Table 7: G450 Branch Gateway capacities

Description	Capacity	Comments
Maximum number of G450 Branch Gateways controlled by an S85XX or S87XX server	250	This number also applies if the same external server controls a combination of Avaya G450, G430, G350, G250, and G700 Branch Gateways.
Maximum number of G450 Branch Gateways controlled by an S8300 server housed in another G450 Branch Gateway.	50	This number also applies if the same external server controls a combination of Avaya G450, G430, G350, G250, and G700 Branch Gateways.
Maximum number of G450 Branch Gateways controlled by an S8300 server housed in a G700 Branch Gateway. **Note:** The G700 is no longer sold.	50	This number also applies if the same external server controls a combination of Avaya G450, G430, G350, G250, and G700 Branch Gateways.
Maximum total number of telephones supported by the G450	450	Assumes that the MGC is an S8300 installed in the G450 as an ICC. Otherwise, the capacity is greater.
Maximum number of IP telephones per G450 Branch Gateway	450	Assumes that the MGC is an S8300 installed in the G450 as an ICC. Otherwise, the capacity is greater.
Maximum number of analog phones per G450 Branch Gateway	192	
Maximum number of DCP phones G450 Branch Gateway	192	

Table continues…

Description	Capacity	Comments
Maximum number of BRI endpoints per G450 Branch Gateway	128	
Simultaneous two-way conversations with TDM transcoding from IP phone to legacy telephone or trunk.	206	
Simultaneous two-way conversations with TDM transcoding from TDM phones to IP phones	206	
Maximum number of BRI trunks	64	
Maximum number of PSTN trunks	184 (T1) 240 (E1)	For E1 trunks: 240 channels are supported in Tandem mode; 206 channels are supported for IP to PSTN
Miscellaneous		
Simultaneous fax transmissions	240	Fax transmissions using VoIP resources
Touch-tone recognition (TTR)	64	
Tone Generation	unlimited	
Announcements ports	63 ports for playback 1 for record	

S8300 maximum capacities

Table 8: S8300 capacities

Item	Quantity Supported
Number of Users per S8300	2400
Number of Trunks per S8300	2400
Total Endpoints (Trunks and Users) per S8300	900
MGs per S8300	50
LSPs per S8300	49
MGs per LSP	50
Announcement Sources per S8300	50
Busy Hour Calls (Maximum, non-call center)	10,000
Locations	50

For a complete list of capacities, see *Avaya Aura® Communication Manager System Capacities Table*.

H.323 stations using TLS

H.323 stations using TLS are supported since Avaya Aura 6.2 FP4 with up to 2,000 endpoints per Communication Manager (CM). This feature was, however, limited to USA Department of Defense (DOD) customers.

Beginning with Avaya Aura® Release 7.0.1, support for H.323 stations using TLS is now generally available (GA) for all customers. The capacity is now increased up to 18,000 endpoints per CM. For a Branch Gateway with S8300 the capacity is limited up to 1,000 H.323 TLS endpoints.

See *Avaya Aura ® Communication Manager System Capacities Table* for detailed information regarding capacities.

Chapter 8: Supported Avaya telephones

Supported Avaya telephones

Avaya Branch Gateways support various Avaya telephones, including IP, DCP digital, and analog telephones.

Avaya IP telephones

The Branch Gateway G450 supports all Avaya IP telephones, including the Avaya 1602, 1608, and 1616 H.323 IP phones.

Avaya DCP digital telephones

The DCP media modules supported by the Branch Gateway support the following DCP telephones:

- Avaya 1408 DCP Telephone
- Avaya 1416 DCP Telephone
- Avaya 2402 Digital Telephone
- Avaya 2410 Digital Telephone
- Avaya 2420 Digital Telephone
- Avaya 2490 DCP Speakphone
- Avaya 6402 and Avaya 6402D Digital Telephones
- Avaya 6408+ and Avaya 6408D+ Digital Telephones
- Avaya 6416D+ and 6416D+M Digital Telephone
- Avaya 6424D+ and 6424D+M Digital Telephone
- Avaya 75xx and 8510T ISDN BRI endpoints
- Avaya 8403 Digital Telephone
- Avaya 8405B and Avaya 8405D+ Digital Telephones
- Avaya 8410 and 8410D Digital Telephones
- Avaya 8411D Digital Telephone

- Avaya 8434DX Digital Telephone
- IP softphones that are configured as “Road Warrior” and “Take Over” a DCP station
- Definity Extender – Analog single endpoint
- Definity Extender – ISDN single endpoint 302 series Attendant Console (302D)
- Avaya 603E Call Master III
- Avaya 603F Call Master IV
- Avaya 607A Call Master V
- Avaya 606B1 Call Master VI
- Avaya eConsole R1 (PC Console R3 with 8411 digital telephone)
- Avaya IP eConsole
- Avaya 9404 DCP Telephone
- Avaya 9408 DCP Telephone

Avaya analog telephones

The Branch Gateway supports the following Avaya analog telephones:

- Avaya 6210 Analog Telephone
- Avaya 6211 Analog Telephone
- Avaya 6218 Analog Telephone
- Avaya 6219 Analog Telephone
- Avaya 6220 Analog Telephone
- Avaya 6221 Analog Telephone

Replace with your title

Supported Avaya telephones

Avaya Branch Gateways support various Avaya telephones, including IP, DCP digital, and analog telephones.

Avaya IP telephones

The Branch Gateway G450 supports all Avaya IP telephones, including the Avaya 1602, 1608, and 1616 H.323 IP phones.

Avaya DCP digital telephones

The DCP media modules supported by the Branch Gateway support the following DCP telephones:

- Avaya 1408 DCP Telephone
- Avaya 1416 DCP Telephone
- Avaya 2402 Digital Telephone
- Avaya 2410 Digital Telephone
- Avaya 2420 Digital Telephone
- Avaya 2490 DCP Speakphone
- Avaya 6402 and Avaya 6402D Digital Telephones
- Avaya 6408+ and Avaya 6408D+ Digital Telephones
- Avaya 6416D+ and 6416D+M Digital Telephone
- Avaya 6424D+ and 6424D+M Digital Telephone
- Avaya 75xx and 8510T ISDN BRI endpoints
- Avaya 8403 Digital Telephone
- Avaya 8405B and Avaya 8405D+ Digital Telephones
- Avaya 8410 and 8410D Digital Telephones
- Avaya 8411D Digital Telephone
- Avaya 8434DX Digital Telephone
- IP softphones that are configured as “Road Warrior” and “Take Over” a DCP station
- Definity Extender – Analog single endpoint
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- Avaya 603E Call Master III
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- Avaya 607A Call Master V
- Avaya 606B1 Call Master VI
- Avaya eConsole R1 (PC Console R3 with 8411 digital telephone)
- Avaya IP eConsole
- Avaya 9404 DCP Telephone
- Avaya 9408 DCP Telephone

Avaya analog telephones

The Branch Gateway supports the following Avaya analog telephones:

- Avaya 6210 Analog Telephone
- Avaya 6211 Analog Telephone
- Avaya 6218 Analog Telephone
- Avaya 6219 Analog Telephone
- Avaya 6220 Analog Telephone
- Avaya 6221 Analog Telephone

Chapter 9: Technical specifications

Specifications

The following table of technical specifications provides detailed information on the physical dimensions and tolerances.

Table 9: Avaya Branch Gateway G450 specifications

Description	Value
Height	5.25 in. (3U, 133.3 mm)
Width	19 in. (482.6 mm)
Depth	18 in. (460 mm)
Weight of empty chassis	16.5 pounds (7.5 kg)
Weight of chassis with basic configuration, including main board, power supply unit, fan tray, one DSP, and blank panels on the media module slots	31 pounds (14 kg)
Ambient working temperature	32° to 104°F (0° to 40°C)
Storage temperature	–40°F to 150°F (–40°C to 66°C)
Left air inlet	up to 104°F (40°C)
Operation altitude	up to 10,000 ft. (3000 m)
Front clearance	2 in (5 cm)
Rear clearance	4 in (10 cm)
Side clearance	3 in (7.6 cm)
Humidity	10 to 90% relative humidity, non-condensing
Voltage	90-264 VAC, 47-63 Hz
Power rating	1780 BTU/h (522 W)
Max current	7 A

Power cord specifications

For North America

The cord set must be UL Listed/CSA Certified, 16 AWG, 3-conductor (3rd wire ground), type SJT. One end is to be terminated to an IEC 60320, sheet C13 type connector rated 10A, 250V. The other end is to be terminated to either a NEMA 5-15P attachment plug for nominal 125V applications or a NEMA 6-15P attachment plug for nominal 250V applications.

For outside North America

The cord must be VDE Certified or Harmonized (HAR), rated 250V, 3-conductor (3rd wire ground), 1.0 mm^2 minimum conductor size. The cord is to be terminated at one end to a VDE Certified/CE Marked IEC 60320, sheet C13 type connector rated 10A, 250V and the other end to a 3-conductor grounding type attachment plug rated at a minimum of 10A, 250V and a configuration specific for the region/country in which it will be used. The attachment plug must bear the safety agency certifications mark(s) for the region/country of installation.

Media module specifications

Table 10: Media modules

Description	Value
Height	0.79 in. (2 cm)
Width	6.69 in. (17 cm)
Depth	12.20 in. (31 cm)
Weight	0.7-0.9 lb. (300-400 grams)

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