

Avaya Solution & Interoperability Test Lab

Configuring Fax over IP over Frame Relay Between an Avaya™ IP Office Server and an Avaya™ S8700 Media Server with Avaya™ G600 Media Gateway - Issue 1.0

Abstract

These Application Notes describe the configuration of fax over IP between an Avaya™ IP403 Office Server and Avaya™ S8700 Media Server with Avaya™ G600 Media Gateway running Avaya™ Communication Manager. An additional Avaya™ IP403 is co-located with the S8700 Media Server to act as a fax over IP gateway. A Frame Relay network is implemented between a "Branch" IP Office and the "Main" site. These Application Notes were written in response to a specific customer request.

1. Introduction

These Application Notes show the steps needed to configure fax over IP networking between an IP Office Server based site and an S8700 Media Server based site connected via the frame relay network. **Figure 1** shows the equipment configuration described.

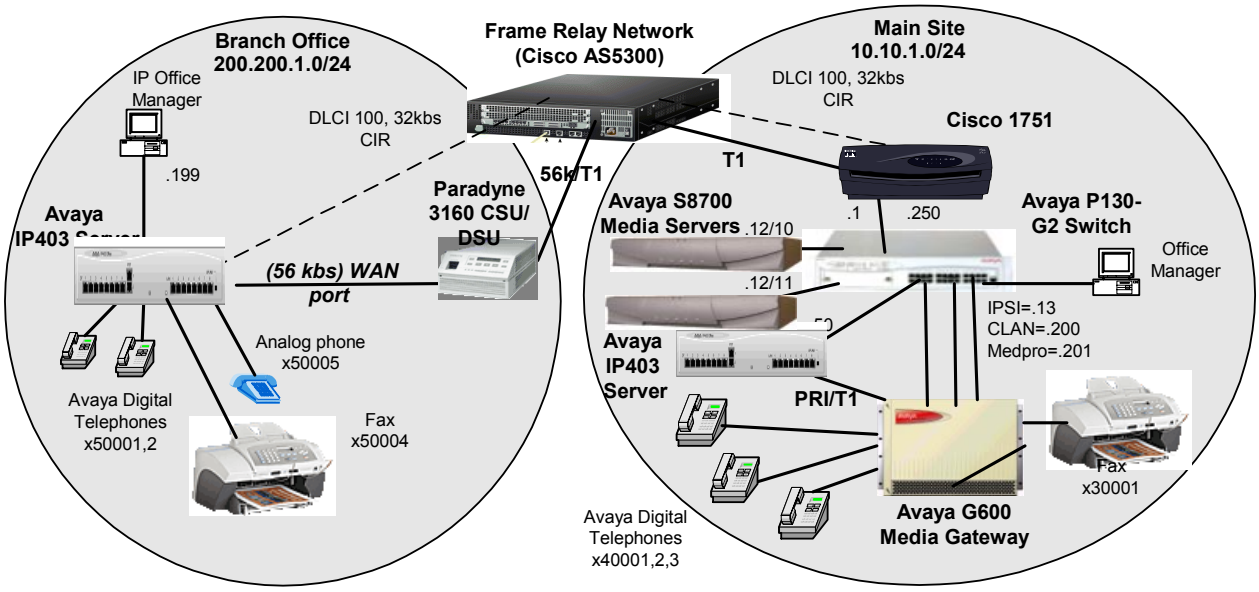


Figure 1: IP Office Fax over IP Configuration

Figure 2 shows the trunking arrangement and fax call path. Trunk Group 30 is used for all calls between the Branch Office and the Main site. The S8700 routes fax calls also through the Main site IP403 server. "Inband" faxing occurs between the branch fax machine and the branch IP403 server and also between the Main Site fax machine and the Main Site IP403 through the G600. Fax over IP occurs between the two IP403 servers.

Calls from the Main Office fax extensions to the Branch fax extensions (e.g., x50004) are routed out Trunk Group 5 PRI to the Main Site IP 403 Server with a translated extension (e.g., x70004). The Main Site IP403 server routes those calls back to the S8700 Media Server/G600 Media Gateway via the H.323 trunk group 11. Finally, the S8700 routes the calls to the Branch site via Trunk Group 30.

Calls from the Branch to the Main Office fax extension (e.g., x30001) are routed out Trunk Group 30 to the S8700 with a translated extension (e.g., x80001). The Main Site S8700 Media Server then routes those calls to the Main Site IP403 server via H.323 Trunk Group 11. The Main Site IP403 routes the calls back to the Main Site S8700 via PRI Trunk Group 5. Finally, the S8700 routes the calls to the destination fax extension.

With 32 kb/s of frame relay bandwidth from the Branch to the Main site, 3 calls can be supported using the G.723 codec. Note that it is recommended that the use of Frame Relay network CIR bandwidth be engineered such that no more than 70 to 80 percent of the bandwidth is required for voice calls.

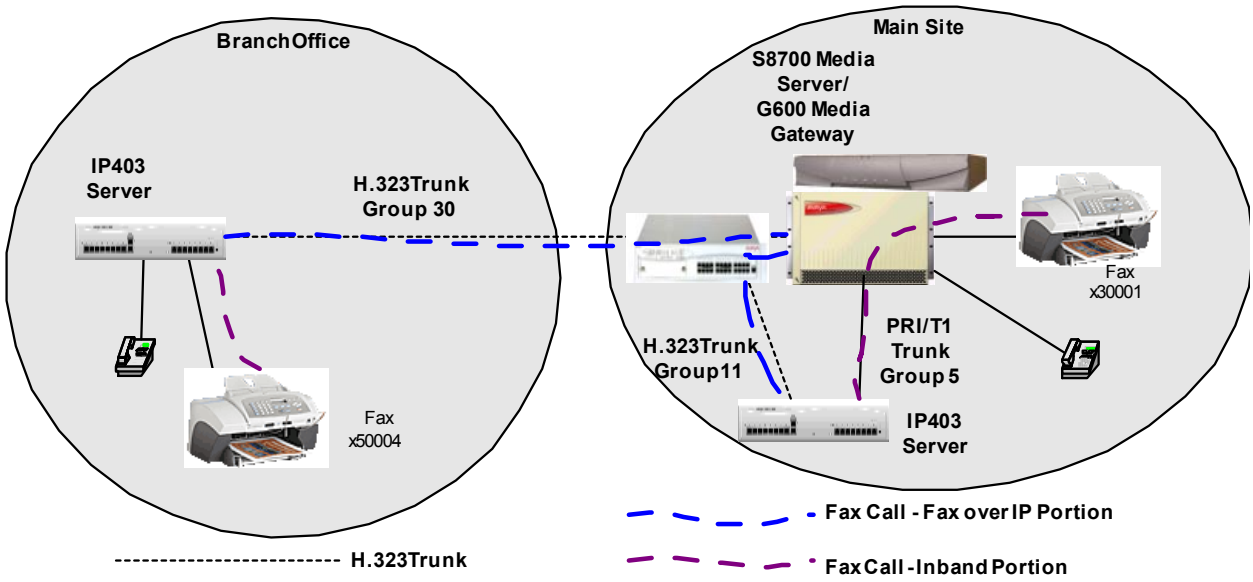


Figure 2: Trunk Group Configuration and Fax path

2. Equipment and Software Validated

The following equipment and software were tested in the configuration described in these Application Notes:

Equipment	Software
Avaya™ IP403 Office Server	1.4(22)
Avaya™ P133-G2 Workgroup Switch	2.9.2
Avaya™ 6408 Digital Telephone	N/A
Avaya™ S8700 Media Server with G600 Media Gateway	1.3
Cisco AS5300 Gateway	IOS 12.2
Cisco 1751 router	IOS 12.2
Paradyne 3160 CSU/DSU	N/A
Hewlett-Packard Fax-310	N/A
OKIFAX 5950	N/A

The Main Site Avaya IP403 Office Server was equipped with a VCM10 (Voice Compression Module-10), which supports a maximum of 10 simultaneous fax calls.

3. Configure the Branch Paradyne CSU/DSU

This section describes the configuration of the Paradyne 3160 to provide the Branch IP403 server WAN port access to a 56 kb/s WAN connection via a T1 line to the Frame Relay network. Configuration of the Paradyne 3160 was made via the front panel softkey-based display.

In this configuration, the IP Office RS449 WAN port is connected to RS-232 Port 1 of the CSU/DSU. The T1 cable to the Frame Relay Network (the AS5300) is connected to the Network jack.

Actual network settings will be specific to Service Provider instruction. Note that changes must be saved from the *Cnfig→Active→Save* menu for each area changed.

1. Cnfig→Activ→Edit→Gen
    a. Clock Src: NET

2. Cnfig→Activ→Edit→Port→Port1
    a. Port Type: RS449
    b. Base Rate: Nx56
    c. Net DCLB: Disab
    d. Port LB: Disab
    e. All Ones: Disab
    f. Rcv Yellow: None
    g. Trans Clock: Int
    h. Invert Txc: Disab
    i. Invert Data: Disab
    j. EDL: Disab

3. Cnfig→Activ→Edit→Port→NET
    a. NET Framing: ESF
    b. NET Coding: B8zs
    c. LBO: 0.0
    d. ANSI PRM: Disab
    e. Mgmt: Disab
    f. NET LLB: Disab
    g. NET PLB: Disab
    h. Circuit Ident: (Clear)

4. Cnfig→Activ→Edit→Chan→Prt1
    a. Assign to: NET
    b. Assign by: Chan
    c. Assign PRT1 to N24 by pressing the right arrow until N24 appears, then press the "F" Key underneath to assign Port 1.

4. Configure the Branch Avaya™ IP403 Office Server

This section describes the configuration of the Branch IP403 office server. It is important to note that configuration changes made through the IP Office Manager are not effective until the configuration has been saved to the IP403 Office server.

Step 1. Run the IP Office Manager from the PC. Enter the login and password. Open the Branch IP Office server and enter its password to reach the Configuration Tree, as shown in **Figure 3**.

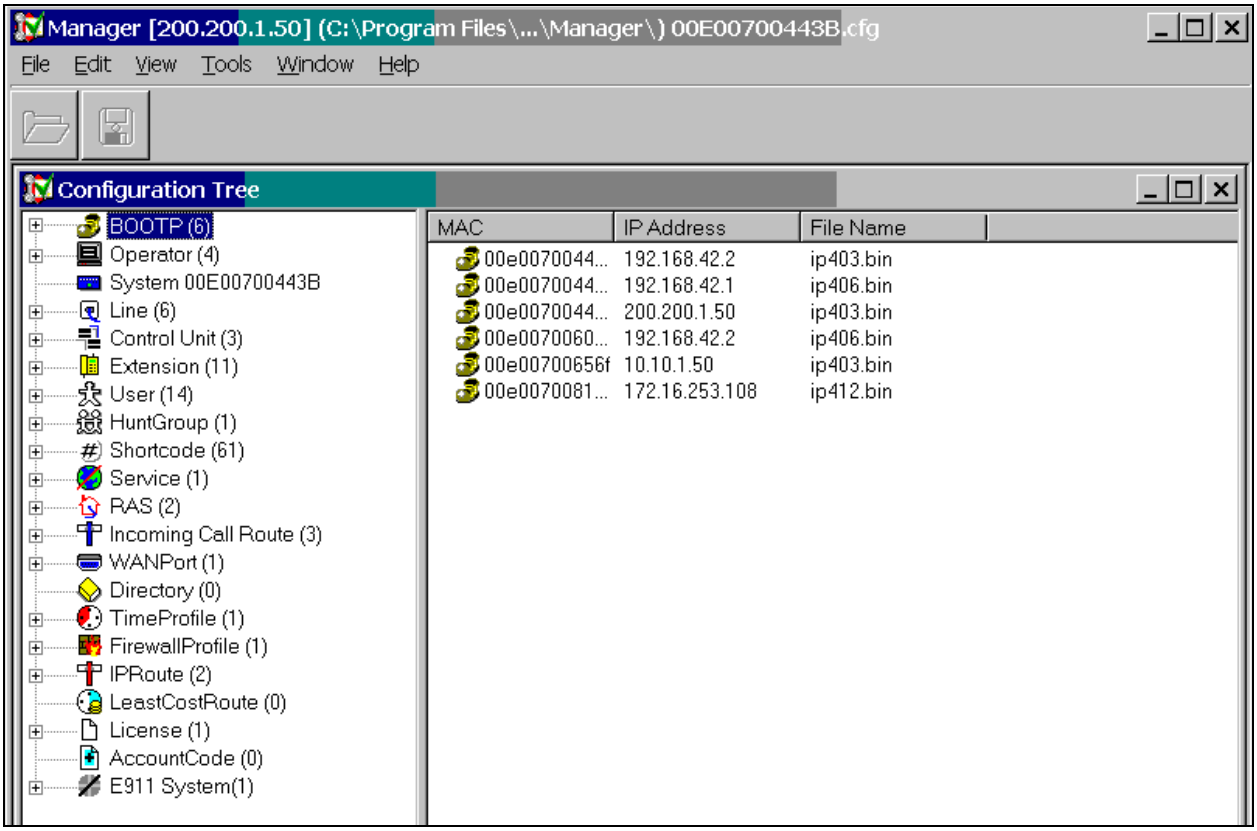


Figure 3: Configuration Tree

Step 2. Select **System** and the **LAN1** tab. Set the IP403 *IP Address* and *IP Mask*, as seen in **Figure 4**.

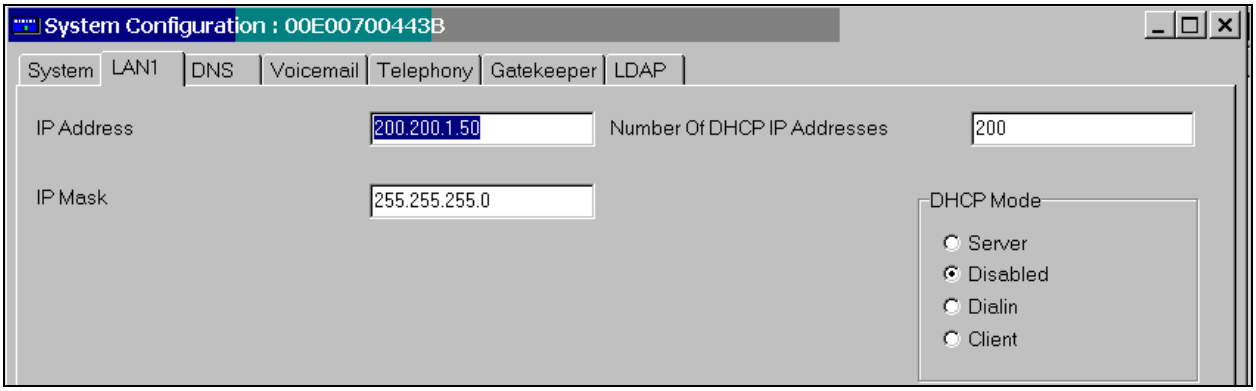


Figure 4: LAN1

Step 3. Select the **System/Gatekeeper** tab. Set the DSCP values for media (*DSCP*) and Signaling (*SIG DSCP*). These values will match the values chosen for the router QOS Service Policy in **Section 7.** The actual DSCP value applied is the 6 most significant bits of the 8-bit number entered. Thus, **0xB8** and **0x98** correspond to 46 and 38 decimal respectively. **0xFC** will match any 6 bit non-zero DSCP value as priority. See **Figure 5.**

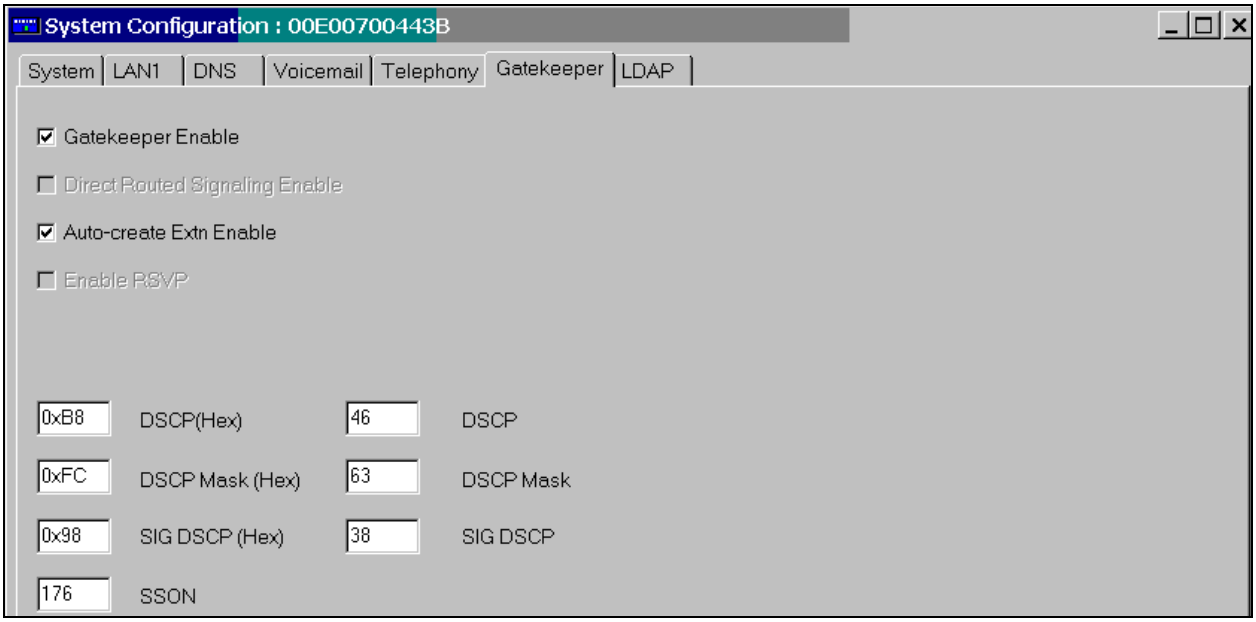


Figure 5: Gatekeeper

Step 4. From the Configuration Tree, select **Line.** With the mouse pointer in the right hand pane, right click **New** to add a new Line and enter the *Outgoing Group ID* to be used for calls to this line group. See **Figure 6.**

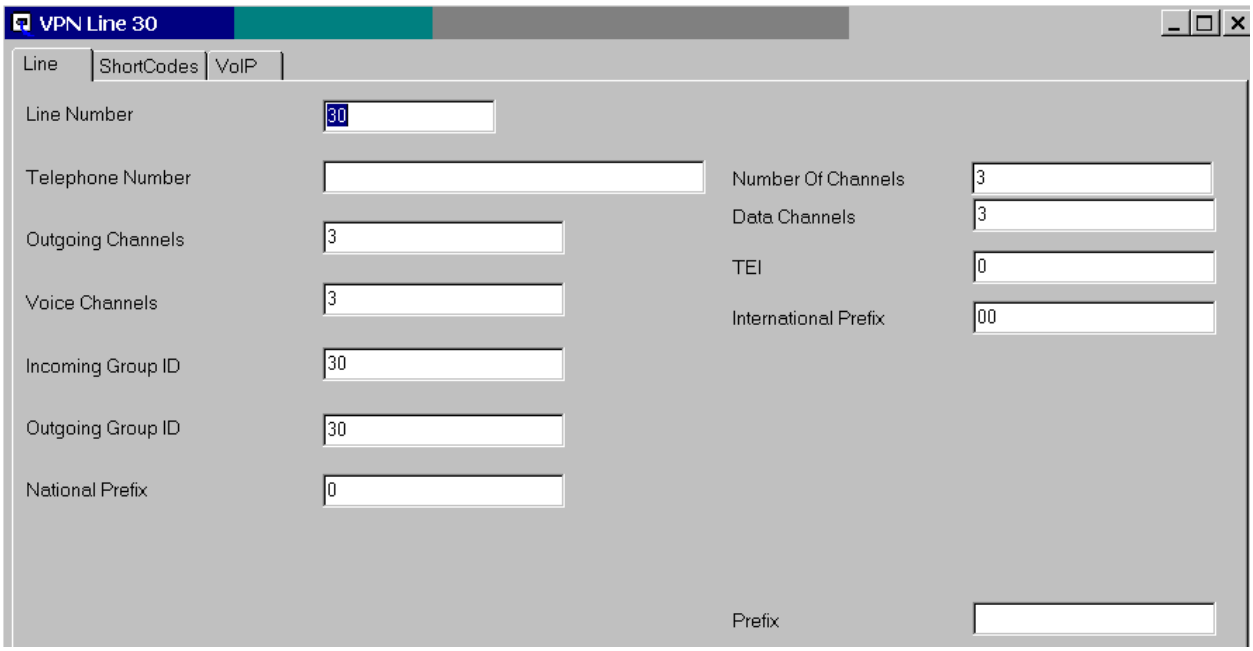


Figure 6: Line

Step 5. Select the **Line/VoIP** Tab. Set the S8700/G600 C-LAN's IP Address as the Line Gateway IP Address. Enable *Enable Faststart*, *Fax Transport Support* and *Out of Band DTMF*. Set the *Compression Mode* as desired for voice calls. Set *H.450 Support* to **None**. See **Figure 7.**

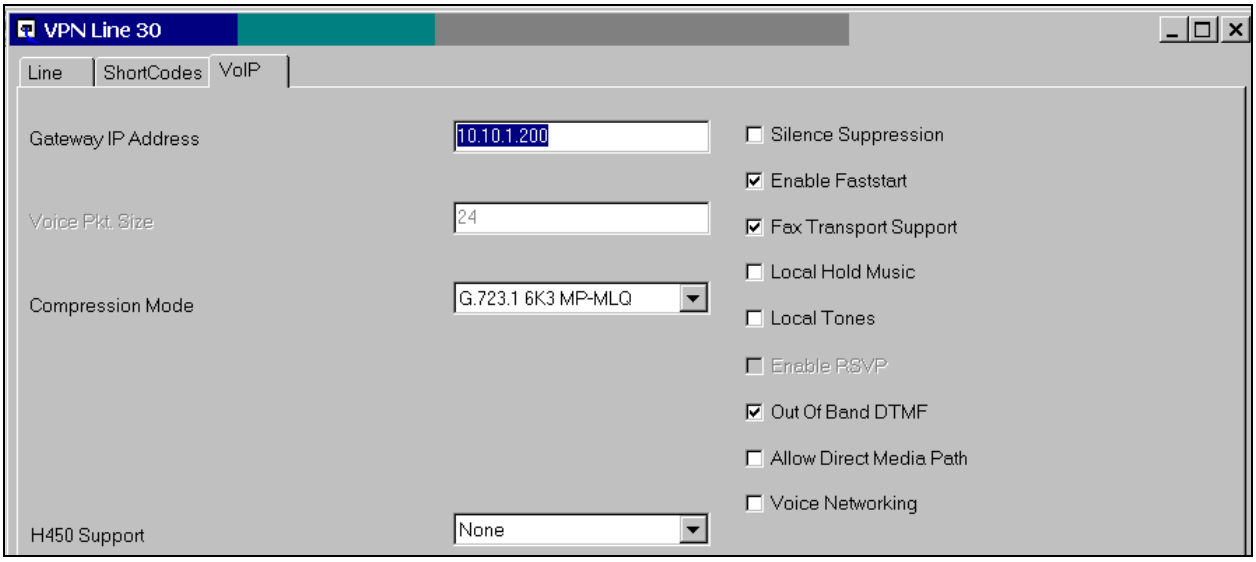


Figure 7: Line Voip Tab

Step 6. From the Configuration Tree, select **Service.** With the mouse in the right hand panel, right click and select **New.** Select *WAN Service* and press **OK**. See **Figure 8.**

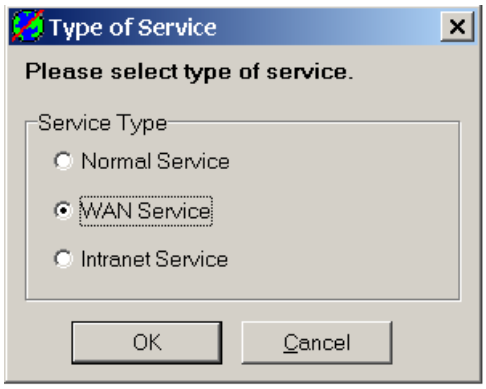


Figure 8: WAN Service

Step 7. Assign a unique *Name* to the Service, as shown in **Figure 9**, and press **OK.**

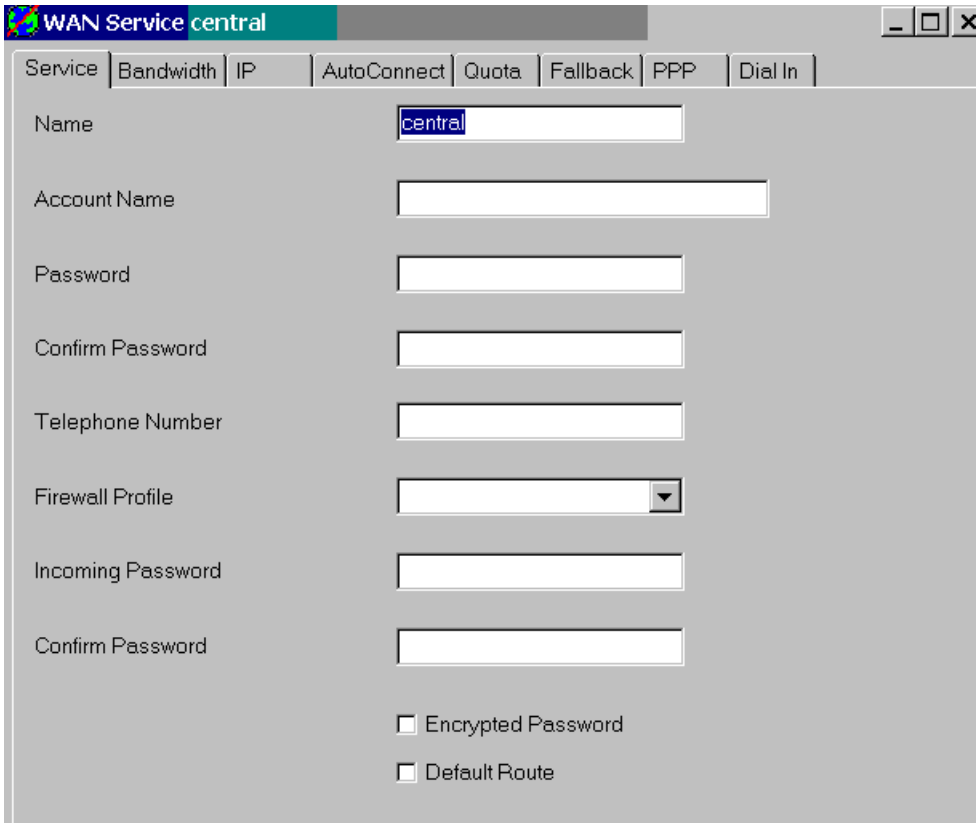


Figure 9: WAN Service

Step 8. From the Configuration Tree, select **WANPort** and then **WAN1.** Set the *Speed* to **56000** and the *Mode* to **SyncFrameRelay.** See **Figure 10.**

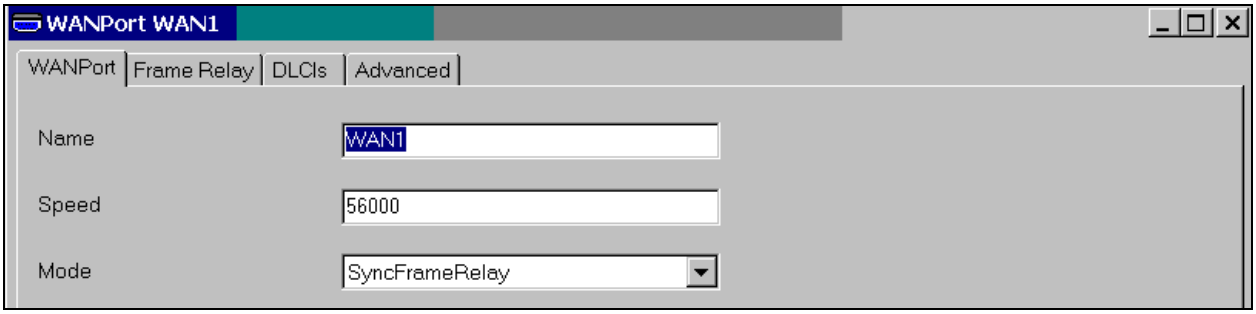


Figure 10: WAN1

Step 9. Select the **Frame Relay** tab and set *Frame Management Type* to **AnsiAnnexD** and *Frame Learn Mode to* **NetworkMgmt**. Set *Max. Frame Length* to **1600** bytes, as seen in **Figure 11.**

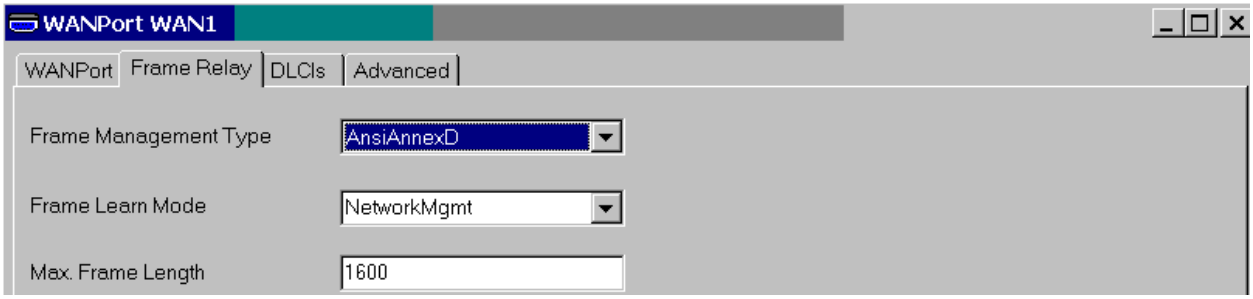


Figure 11: WAN1 - Frame Relay

Step 10. Select the **DLCIs** tab. Right-click on **New** to configure DLCI 100 as shown. Press **OK**. See **Figure 12.**

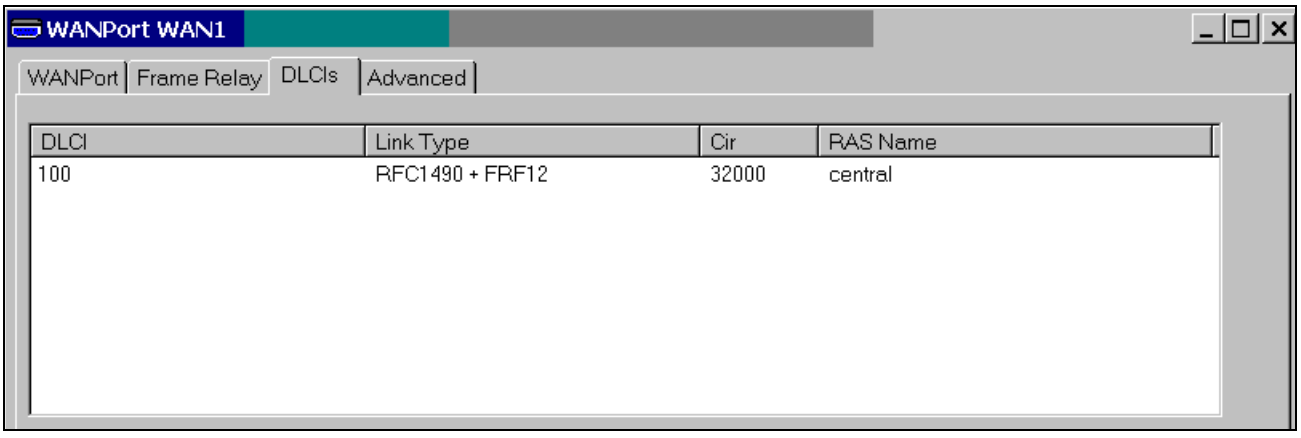


Figure 12: WAN1-DLCI

Step 11. Select the **Advanced** tab and ensure that the settings are as shown in **Figure 13**. Press **OK.**

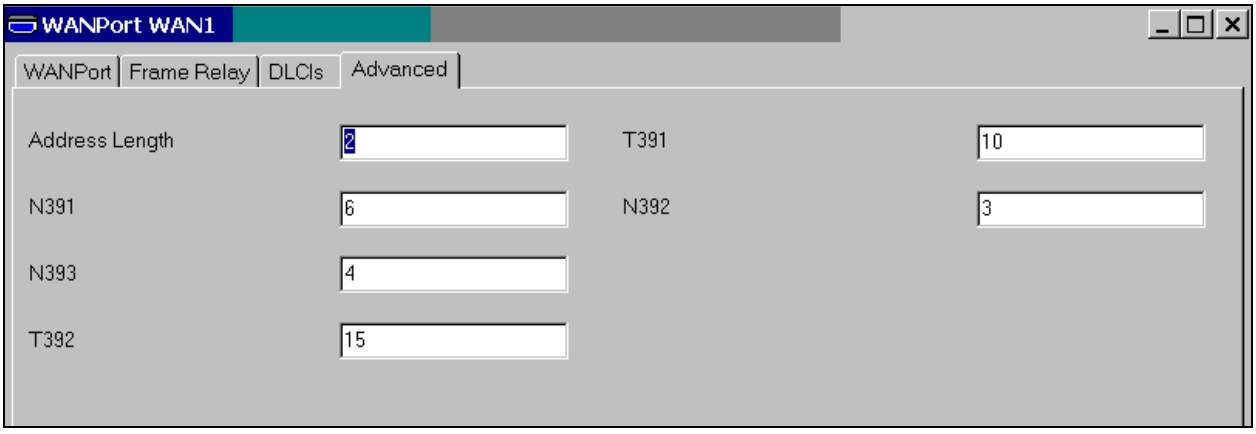


Figure 13: WAN1 Advanced

Step 12. From the Configuration Tree, select **IP Route**. With the mouse pointer in the right hand pane, right click to add a new static route to reach the Main site subnet via the Cisco 1751, as seen in **Figure 14**. Press **OK.**

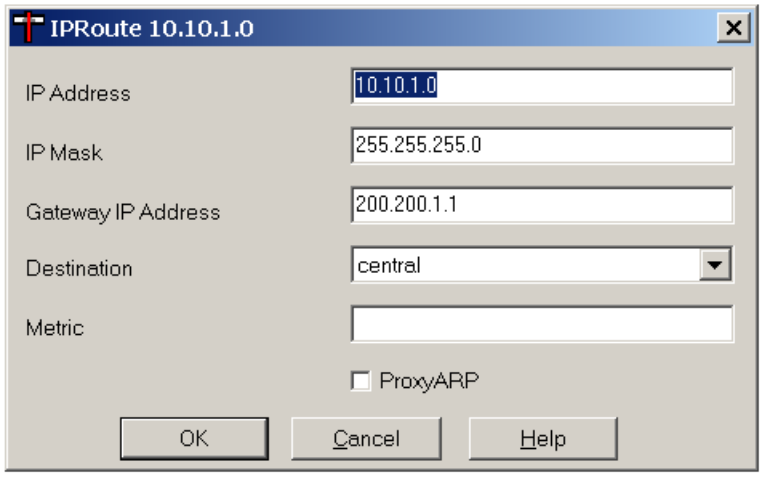


Figure 14: IP Route

Step 13. From the Configuration Tree, select **Shortcode**. With the mouse pointer in the right hand pane, right click **New** to add a new short code for each number range to be routed through to the Main Site. Enter "**.**" to pass all dialed digits to Least Cost Routing, to be set up in the next steps. See **Figure 15.**

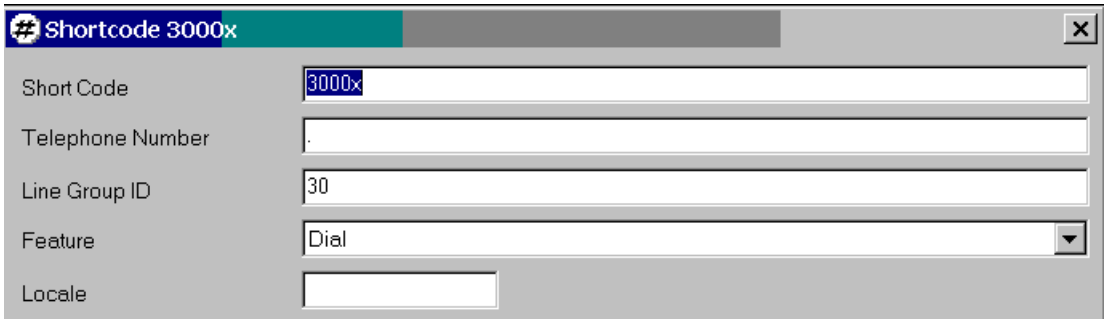


Figure 15: Short Code

Step 14. From the Configuration Tree, select **Time Profile**. With the mouse pointer in the right hand pane, right click **New** to add a new Time Profile. Enter a name in *Name,* then right click in the panel to select **Add** to configure, in this case, a constant schedule. Press **OK** on each panel to enter. See **Figure 16.**

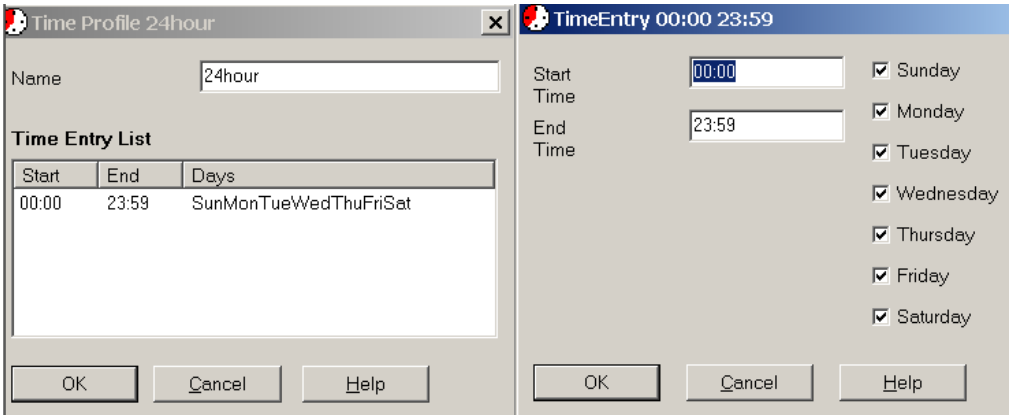


Figure 16: Time Profile and Time Entry Forms

Step 15. From the Configuration Tree, select **Least Cost Route**. With the mouse pointer in the right hand pane, right click **New** to add a new Least Cost Route. Assign a *Name* and a *Time Profile*.

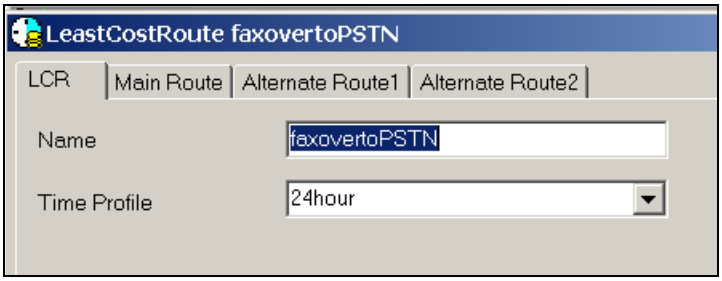


Figure 17: Least Cost Route

Step 16. From the Configuration Tree, select the **Main Route** tab, and right click in the panel to add the short codes for the Main route. The S8700 Media Server translates calls to the fax extension range to a special number for treatment. See **Figure 18.**

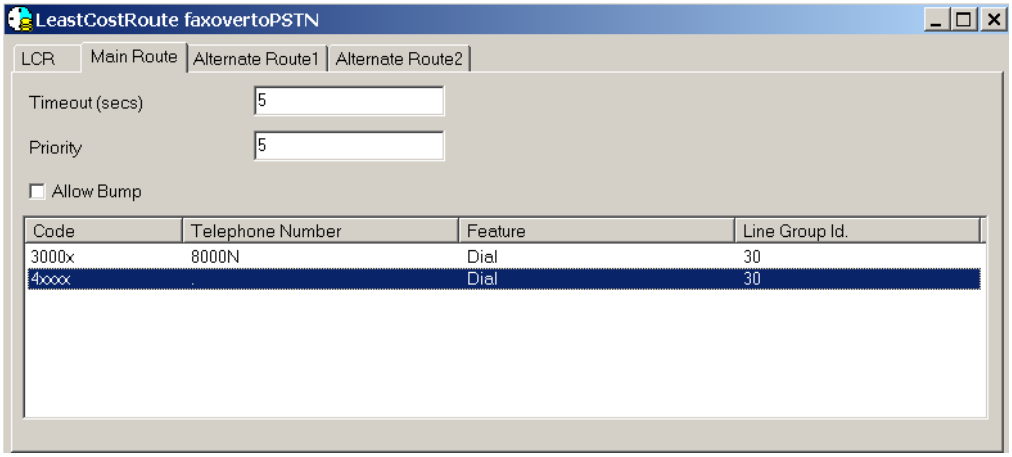


Figure 18: Least Cost Route-Main Route

Step 17. Select the **Alternate Route1** tab and enter short codes for any alternate routes, if the main route is busy.

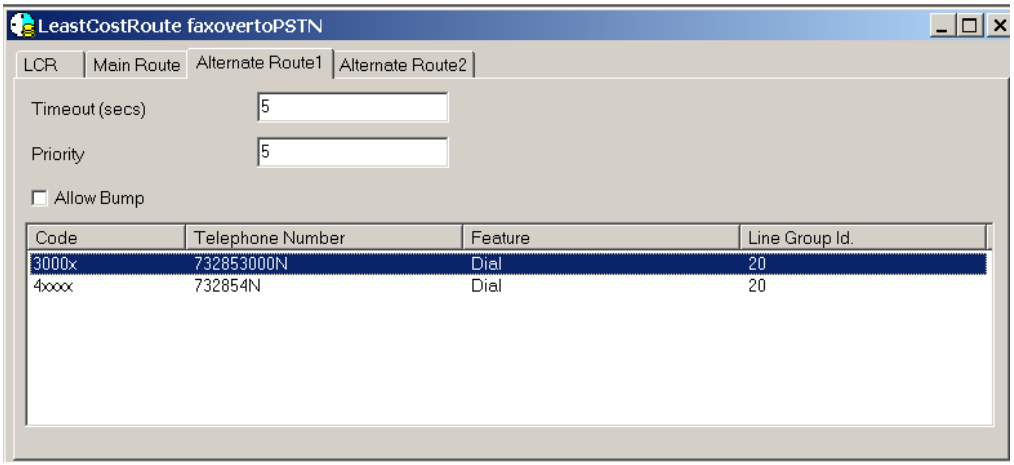


Figure 19: Alternate Route

Step 18. From the **File** submenu, select **Save** to send these configuration changes to the IP403 server. Press **OK** at each panel to proceed.

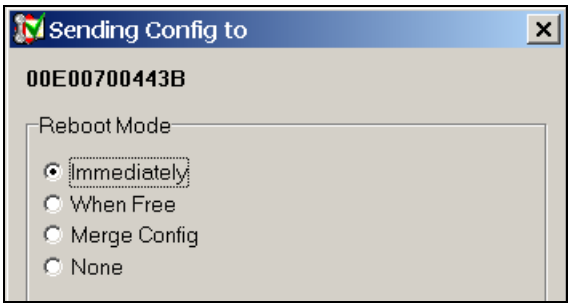


Figure 20: Saving the Configuration

5. Configure the Main Site IP403 Office Server

This section describes the configuration of the Main site IP403 server. It is important to note that configuration changes through the IP Office Manager are not effective until the configuration has been saved to the IP Office server.

Step 1. Run the IP Office Manager from the PC. Enter the login and password. Open the Main Site IP Office server and enter its password to reach the Configuration Tree.

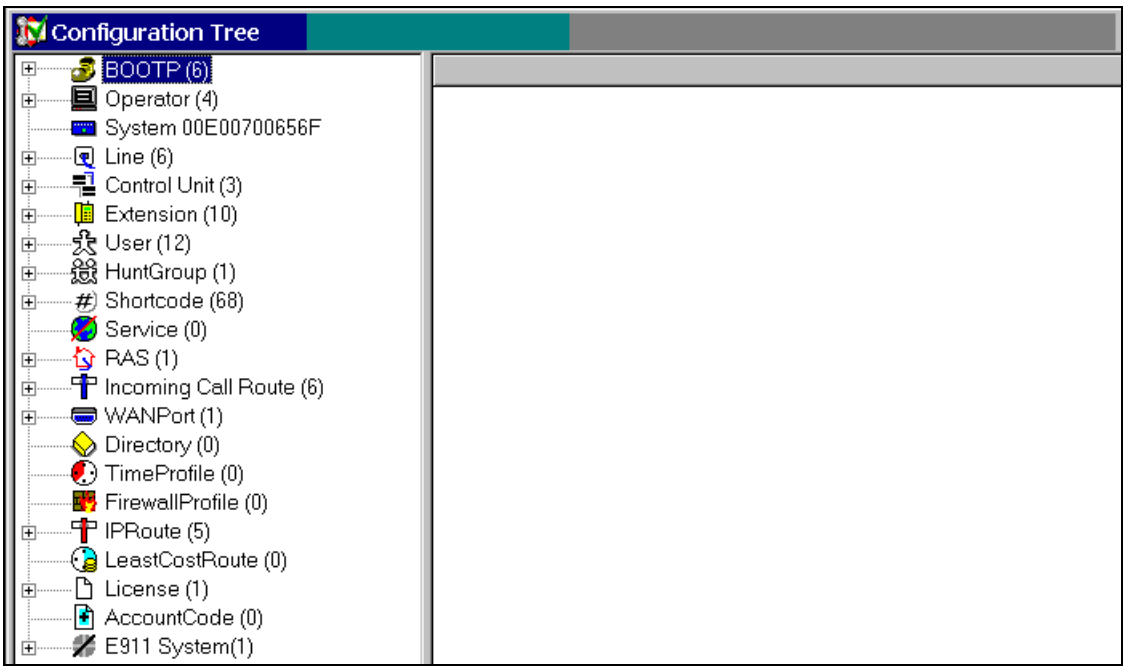


Figure 21: Configuration Screen

Step 2. Select **System** and the **LAN1** tab. Set the IP403 *IP Address* and *IP Mask*, as seen in **Figure 22**. Press **OK**.

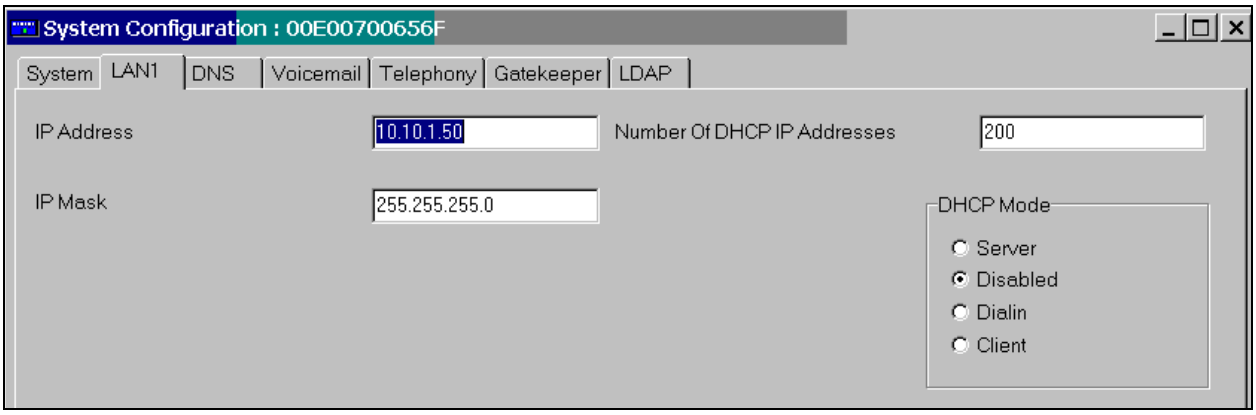


Figure 22: System/LAN1

Step 3. Select the **System/Gatekeeper** tab. Set the DSCP values for media (*DSCP*) and Signaling (*SIG DSCP*). These values will match the values chosen for the router QOS Service Policy in **Section 7.** The actual DSCP value applied is the 6 most significant bits of the 8-bit number entered. Thus, **0xB8** and **0x98** correspond to 46 and 38 decimal respectively. **0xFC** will match any 6 bit non-zero DSCP value as priority. See **Figure 23.**

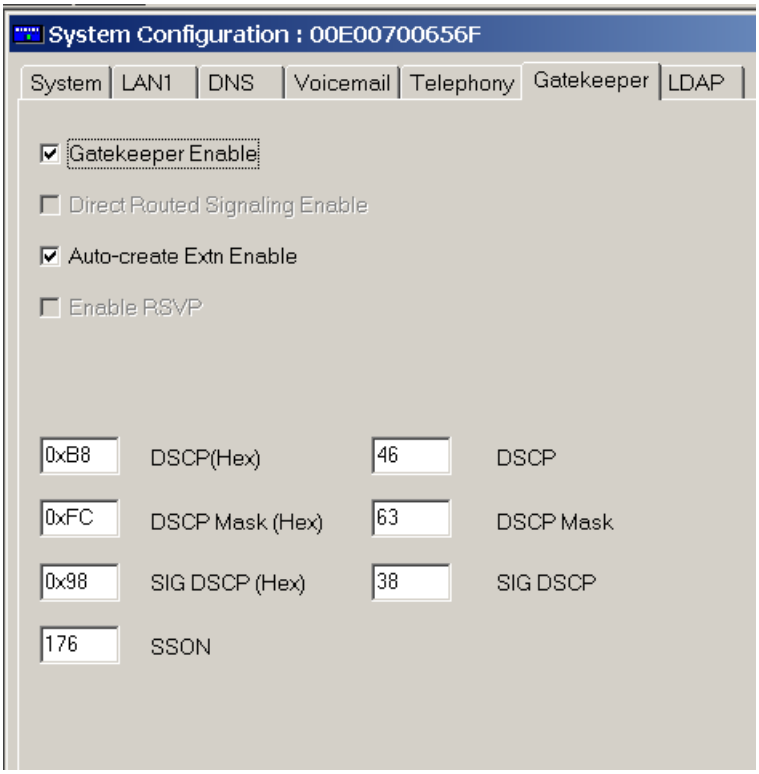


Figure 23: Gatekeeper

Step 4. From the Configuration Tree, select **Line** and select the PRI line to the S8700/G600. In the **Line** tab, set the *Channel Allocation, Switch Type, Line Sub Type* and *Provider as shown*. Select from the end of the channel list, the number of channels to handle the desired numbers of fax calls and set as shown. Press **OK**.

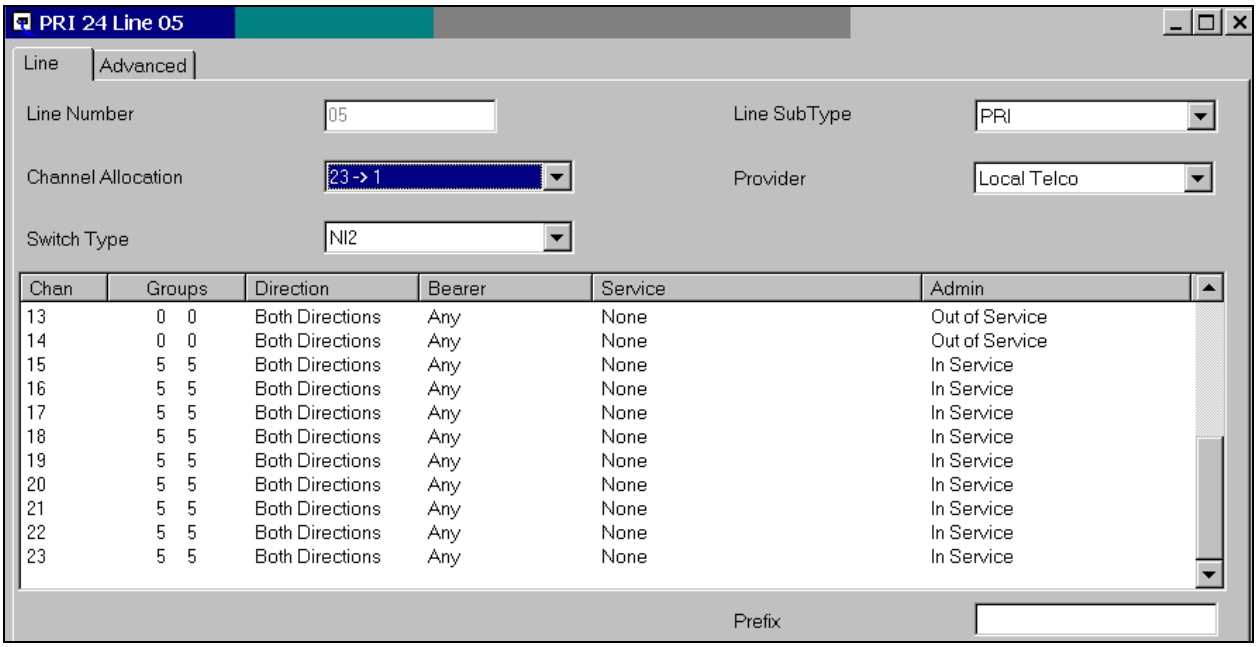


Figure 24: Line-Line Tab

Step 5. Select the **Advanced** tab to ensure that the default settings are appropriate. Press **OK**.

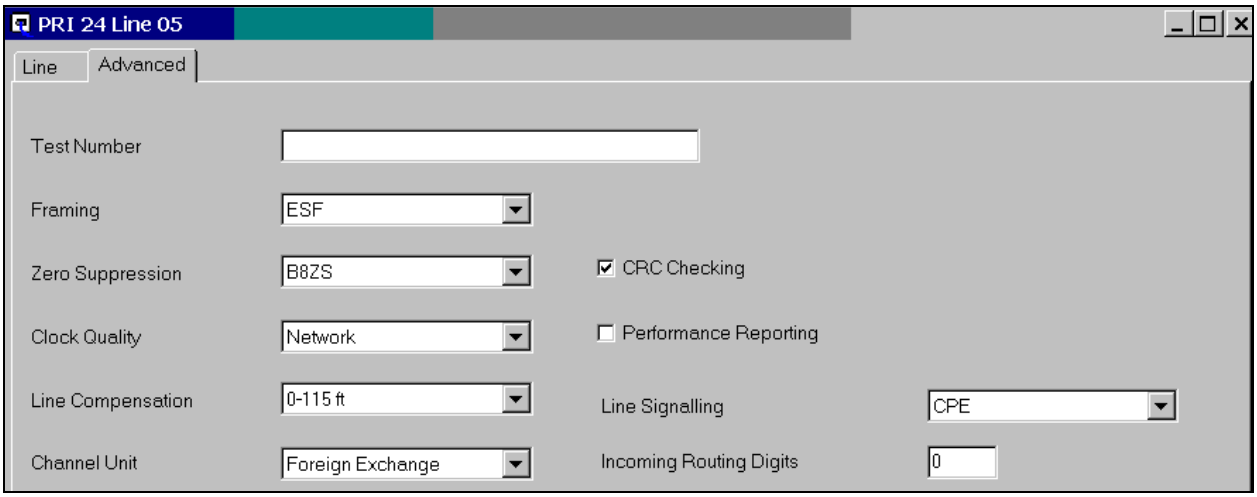


Figure 25: Line-Advanced

Step 6. From the Configuration Tree, select **Line**. With the mouse pointer in the right hand pane, right click to add a **New** Line and enter the *Outgoing Group ID* to be used for calls to this line group. Also set the Channels parameters to the maximum number of simultaneous fax calls. Press **OK**.

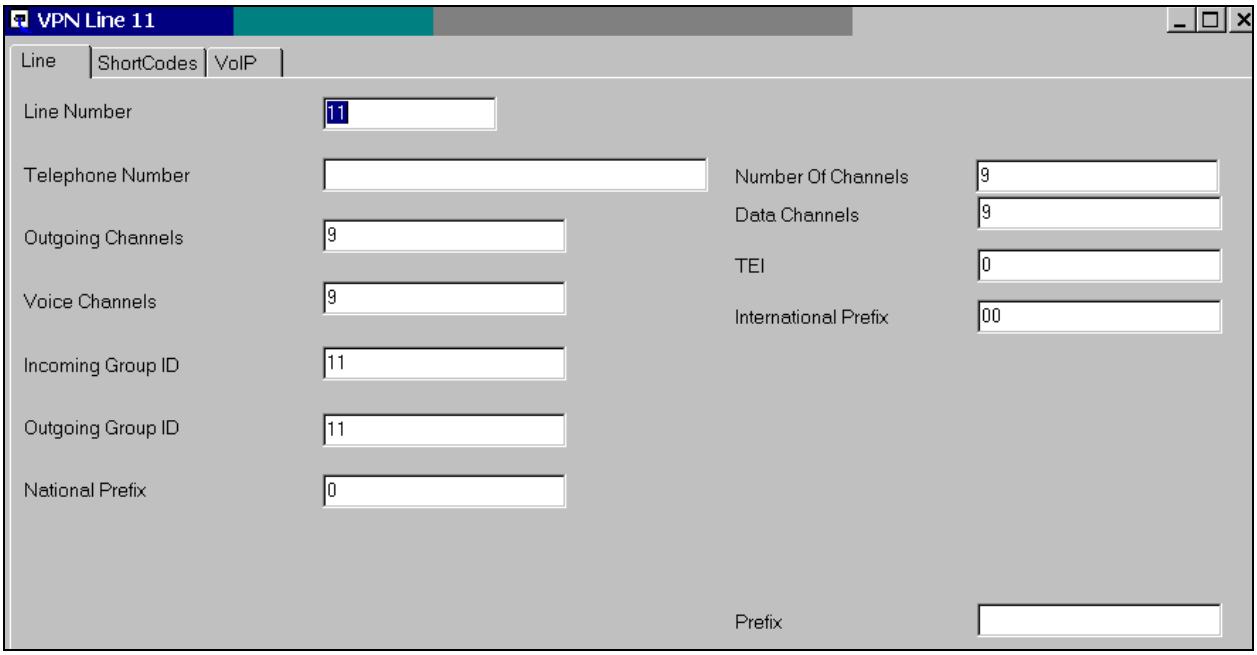


Figure 26: H.323 Line

Step 7. Select the **Line/VoIP** Tab. Set the S8700/G600 C-LAN IP Address as the Line *Gateway IP Address*. Enable *Enable Faststart, Fax Transport Support and Out of Band DTMF*. Set the *Compression Mode* as desired for voice calls. Set *H.450 Support* to **None**. Press **OK.**

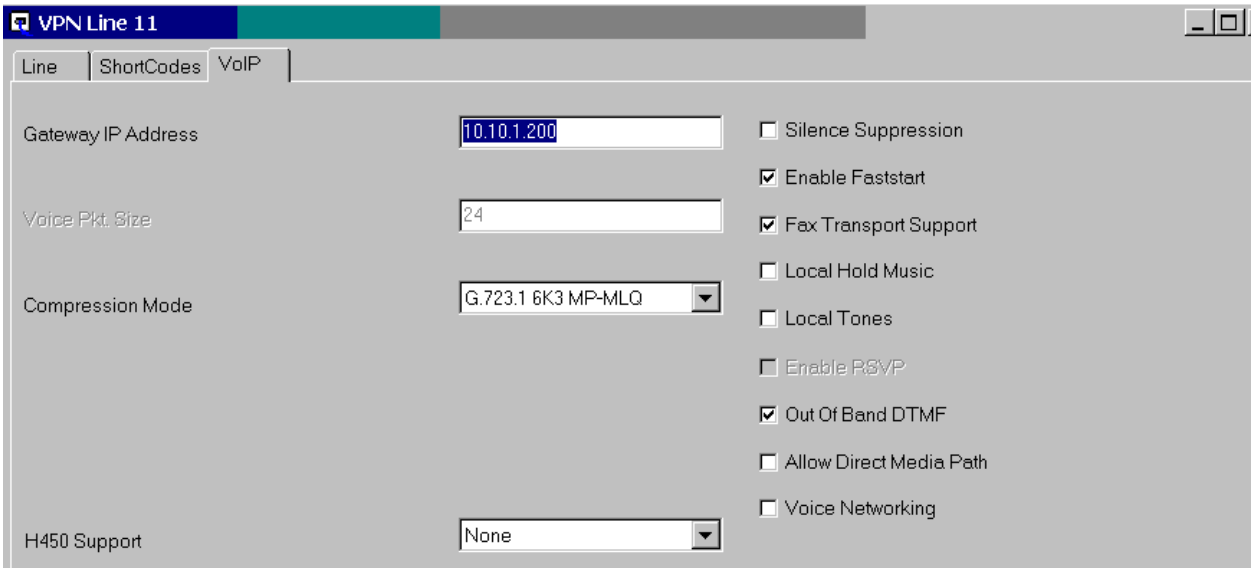


Figure 27: VPN Line-VOIP

Step 8. From the Configuration Tree, select **Shortcode.** Right-click on **New** to add a short code for each branch fax extension as converted by the S8700. Route these calls to the S8700 H.323 Line group. Press **OK.**

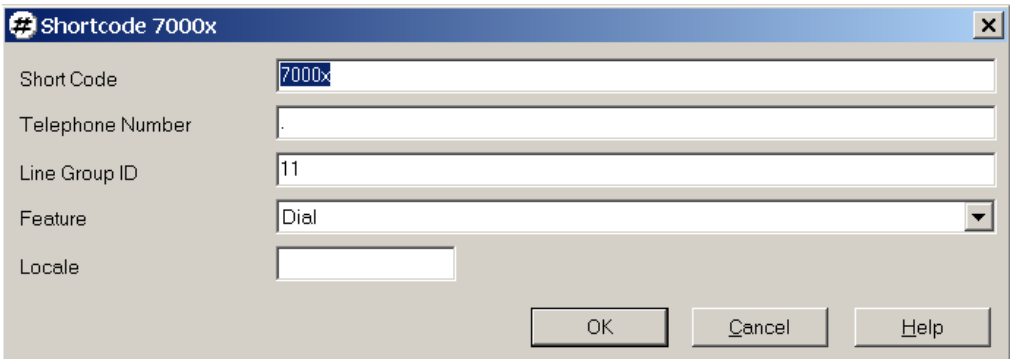


Figure 28: Short Code

Step 9. From the Configuration Tree, select **Shortcode.** Right-click on **New** to add a short code for each main fax extension as converted by the Branch IP Offices. Select the PRI Line Group connected to the S8700. Press **OK.**

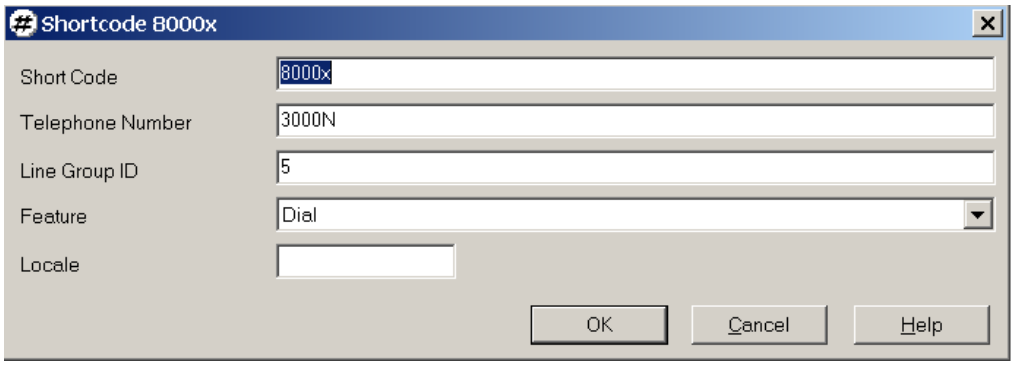


Figure 29: Short Code

Step 10. From the Configuration Tree, select **Incoming Call Routes.** Right-click on **New** to add an Incoming Call Route for each branch fax extension as converted by the S8700. Route these to the corresponding Short Code. Press **OK.**

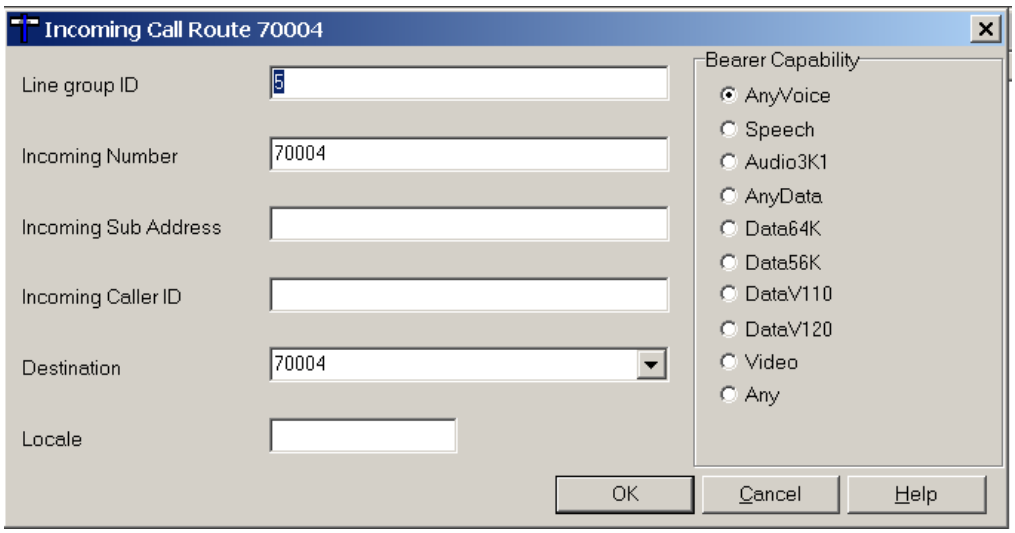


Figure 30: Incoming Call Route

Step 11. From the **File** Submenu, select **Save** to send these configuration changes to the IP403 server. Press **OK** at each panel to proceed.

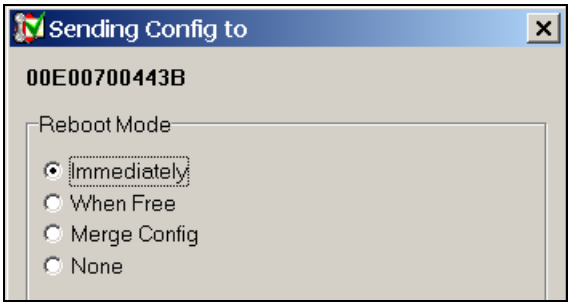


Figure 31: Sending the Configuration

6. Configure the Avaya™ Communication Manager S8700/G600

This section describes the steps needed to establish call routing with the Main Site S8700/G600. Assumptions include:

- The S8700 and G600 have been basically configured including IPSI to S8700 communication
- The necessary networking License options and capacities are installed and enabled for:
  - ISDN PRI
  - Uniform Dial Plan
  - AAR
  - IP Trunking

- Basic C-LAN and MEDPRO configuration has been completed
- The Dial Plan is established, including feature access codes.

From the S8700 System Access Terminal:

Step 1. Type **change node-names ip** to add the Branch and Main IP Office endpoints.

```
change node-names ip                                        Page   1 of   1
                                IP NODE NAMES
   Name                IP Address          Name              IP Address
GW1-CLAN1             10 .10 .1  .200                         .   .   .
GW1-IPSI              10 .10 .1  .13                          .   .   .
GW1-MEDPRO            10 .10 .1  .201                         .   .   .
IP-office             10 .10 .1  .50                          .   .   .
IP-office-branc       200.200.1  .50                          .   .   .
default               0  .0  .0  .0                          .   .   .
```

Figure 32: Node Names

Step 2. Type **change ip-interfaces** to ensure that the C-LAN and Medpro cards have a default gateway that can route to the Branch IP Offices. In this case, they are also on the same subnet as the Main IP403.

```
change ip-interfaces                                        Page   1 of  19

                                IP INTERFACES

                                                                      Net
ON Type    Slot   Code Sfx Node Name       Subnet Mask     Gateway Address Rgn VLAN
y C-LAN    01A03 TN799  D GW1-CLAN1       255.255.255.0   10 .10 .1  .1   1   1
y MEDPRO   01A04 TN2302   GW1-MEDPRO      255.255.255.0   10 .10 .1  .1   1   1
```

Figure 33: IP Interfaces

Step 3. Type **change ip-network-region 1.** Ensure, in particular, the settings for *IP Audio Hairpinning* and *DiffServ* are as shown in **Figure 34**. The *UDP port range* must be consistent with the Frame Relay router's (in this case the Cisco 1751) range that will be recognized as RTP and therefore, header compressed. In this simple example, this same region is used for all calls. Alternatively, other regions could be set up to apply separately to the signaling groups of the branch H.323 trunks.

```
change ip-network-region 1                                    Page   1 of   3
                              IP NETWORK REGION

      Region: 1                Name: Branch Region
    Location:
                               Intra-region IP-IP Direct Audio: yes
AUDIO PARAMETERS               Inter-region IP-IP Direct Audio: yes
   Codec Set: 1                           IP Audio Hairpinning? y
  UDP Port Range
         Min: 49152                     RTCP Reporting Enabled? n
         Max: 65535


DIFFSERV/TOS PARAMETERS
 Call Control PHB Value: 38
        Audio PHB Value: 46
                              AUDIO RESOURCE RESERVATION PARAMETERS
                                                RSVP Enabled? n
          802.1P/Q PARAMETERS
 Call Control 802.1p Priority: 6
        Audio 802.1p Priority: 6
```

Figure 34: IP Network Region

Step 4. Type **change ip-codec-set 1** to set the codec for voice calls within the region.

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

                         IP Codec Set

    Codec Set: 1

    Audio      Silence      Frames   Packet
    Codec      Suppression  Per Pkt  Size(ms)
 1: G.723-6.3K      n          1        30
 2:
 3:
 4:
 5:
 6:
 7:
```

Figure 35: IP Codec Set

Step 5. Type **add** or **change ds1 01a09** to set the basic PRI parameters for the PRI to the Main IP403 server. Note in particular, *Connect:* **pbx**, *Interface:* **network** and *Protocol Version* **b** (National ISDN-2).

```
change ds1 01a09                                              Page   1 of   2
                              DS1 CIRCUIT PACK

            Location: 01A09                          Name: IP Office PRI
            Bit Rate: 1.544                   Line Coding: b8zs
   Line Compensation: 1                      Framing Mode: esf
      Signaling Mode: isdn-pri
             Connect: pbx                       Interface: network
   TN-C7 Long Timers? n                  Country Protocol: 1
Interworking Message: PROGress           Protocol Version: b
Interface Companding: mulaw                         CRC? n
           Idle Code: 11111111
                             DCP/Analog Bearer Capability: 3.1kHz




      Slip Detection? n                Near-end CSU Type: other
```

Figure 36: DS1 Circuit Pack

Step 6. Type **add** or **change trunk-group 5** and ensure the settings as shown in **Figure 37** and **Figure 38**:

```
 change trunk-group 5                                          Page   1 of  22
                                TRUNK GROUP

Group Number: 5                     Group Type: isdn          CDR Reports: y
  Group Name: Main Site IP Office PRI     COR: 1        TN: 1        TAC: 105
   Direction: two-way        Outgoing Display? n         Carrier Medium: PRI/BRI
 Dial Access? y                Busy Threshold: 255       Night Service:
Queue Length: 0
Service Type: tie                    Auth Code? n            TestCall ITC: rest
                         Far End Test Line No:
TestCall BCC: 4
TRUNK PARAMETERS
         Codeset to Send Display: 0     Codeset to Send National IEs: 6
        Max Message Size to Send: 260   Charge Advice: none
  Supplementary Service Protocol: a     Digit Handling (in/out): enbloc/enbloc

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

Figure 37: Trunk-Group, page 1

```
change trunk-group 5                                          Page   2 of  22
TRUNK FEATURES
          ACA Assignment? n           Measured: none      Wideband Support? n
                                Internal Alert? n        Maintenance Tests? y
                              Data Restriction? n     NCA-TSC Trunk Member:
                                     Send Name: y      Send Calling Number: y
            Used for DCS? n
   Suppress # Outpulsing? n    Numbering Format: private
 Outgoing Channel ID Encoding: preferred     UUI IE Treatment: service-provider

                                              Replace Restricted Numbers? n
                                             Replace Unavailable Numbers? n
                                                   Send Connected Number: y
              Send UUI IE? y
                Send UCID? n
 Send Codeset 6/7 LAI IE? y                        Ds1 Echo Cancellation? n

                                         US NI Delayed Calling Name Update? n

                      SBS? n  Network (Japan) Needs Connect Before Disconnect? n
```

Figure 38: Trunk-Group, page 2

Step 6 a. Type **add or change signaling-group 5** to set the PRI signaling settings as shown in **Figure 39**.

```
                      SIGNALING GROUP
 Group Number: 5              Group Type: isdn-pri
                    Associated Signaling? y          Max number of NCA TSC: 0
                       Primary D-Channel: 01A0924     Max number of CA TSC: 0
                                                    Trunk Group for NCA TSC:
       Trunk Group for Channel Selection: 5       X-Mobility/Wireless Type: NONE
          Supplementary Service Protocol: a
```

Figure 39: Signaling Group

Step 6 b. Type **change trunk-group 5** and add in the B-channels that correspond to the IPOffice Line 5 In-service channels. Each trunk-group 5 channel is associated with Signaling Group 5.

```
change trunk-group 5                                          Page   6 of  22
                               TRUNK GROUP
                                    Administered Members (min/max):   1/9
GROUP MEMBER ASSIGNMENTS                Total Administered Members:   9

       Port    Code Sfx Name        Night           Sig Grp
  1: 01A0923  TN464  F  faxline1                      5
  2: 01A0922  TN464  F                               5
  3: 01A0921  TN464  F                               5
  4: 01A0920  TN464  F                               5
  5: 01A0919  TN464  F                               5
  6: 01A0918  TN464  F                               5
  7: 01A0917  TN464  F                               5
  8: 01A0916  TN464  F                               5
  9: 01A0915  TN464  F                               5
```

Figure 40: Trunk Group

Step 7. Type **add** or **change trunk-group 11** with the settings as shown in **Figure 41** and **Figure 42**:

```
    change trunk-group 11                                          Page   1 of  22
                                TRUNK GROUP

Group Number: 11                    Group Type: isdn          CDR Reports: y
  Group Name: H.323 to Main IP Office     COR: 1        TN: 1        TAC: 111
   Direction: two-way        Outgoing Display? n         Carrier Medium: IP
 Dial Access? y                Busy Threshold: 255       Night Service:
Queue Length: 0
Service Type: tie                    Auth Code? n            TestCall ITC: rest
                          Far End Test Line No:
TestCall BCC: 4
TRUNK PARAMETERS
         Codeset to Send Display: 0     Codeset to Send National IEs: 6
        Max Message Size to Send: 260   Charge Advice: none
  Supplementary Service Protocol: a     Digit Handling (in/out): enbloc/enbloc

            Trunk Hunt: cyclical
                                                    Digital Loss Group: 18
Calling Number - Delete:     Insert:                  Numbering Format:
              Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? y
 Answer Supervision Timeout: 0
```

Figure 41: Trunk Group, page 1

```
     change trunk-group 11                                         Page   2 of  22
                                TRUNK FEATURES
          ACA Assignment? n            Measured: none      Wideband Support? n
                                 Internal Alert? n        Maintenance Tests? y
                               Data Restriction? n     NCA-TSC Trunk Member:
                                     Send Name: y      Send Calling Number: y
            Used for DCS? n
   Suppress # Outpulsing? n    Numbering Format: private
 Outgoing Channel ID Encoding: preferred     UUI IE Treatment: service-provider

                                               Replace Restricted Numbers? n
                                              Replace Unavailable Numbers? n
                                                   Send Connected Number: y

              Send UUI IE? y
                Send UCID? n
 Send Codeset 6/7 LAI IE? y



                    SBS? n  Network (Japan) Needs Connect Before Disconnect?
```

Figure 42: Trunk Group, page 2

Step 7 a. Type **add** or **change signaling-group 11** to set the signaling group parameters as shown.

```
change signaling-group 11                                       Page   1 of   5
                              SIGNALING GROUP

Group Number: 11             Group Type: h.323
                           Remote Office? n          Max number of NCA TSC: 0
                                     SBS? n           Max number of CA TSC: 0
                                                   Trunk Group for NCA TSC:
      Trunk Group for Channel Selection: 11
         Supplementary Service Protocol: a


       Near-end Node Name: GW1-CLAN1        Far-end Node Name: IP-office
     Near-end Listen Port: 1720           Far-end Listen Port: 1720
                                       Far-end Network Region: 1
             LRQ Required? n            Calls Share IP Signaling Connection? n
             RRQ Required? n
                                            Bypass If IP Threshold Exceeded? n

            DTMF over IP: out-of-band        Direct IP-IP Audio Connections? n
                                                       IP Audio Hairpinning? y
                                             Interworking Message: PROGress
```

Figure 43: Signaling Group, page 1

Step 7 b. Type **change trunk-group 11** to add in enough trunk members to sustain the maximum number of simultaneous fax calls by typing **IP** as the port entry and associating each member with Signaling-group 11 as shown in Figure 44.

```
change trunk-group 11                                           Page   6 of  22
                                TRUNK GROUP
                                     Administered Members (min/max):   1/9
GROUP MEMBER ASSIGNMENTS                 Total Administered Members:   9

       Port    Code Sfx Name        Night           Sig Grp
  1: T00001                                          11
  2: T00003                                          11
  3: T00004                                          11
  4: T00005                                          11
  5: T00006                                          11
  6: T00007                                          11
  7: T00008                                          11
  8: T00009                                          11
  9: T00010                                          11
 10:
```

Figure 44: Trunk Group, page 6

Step 8. Type **add** or **change trunk-group 30** to set up a trunk to a branch Office IP403.

```
change trunk-group 30                                          Page   1 of  22
                                TRUNK GROUP

Group Number: 30                    Group Type: isdn          CDR Reports: y
  Group Name: Branch IP Office-H.323      COR: 1        TN: 1        TAC: 130
   Direction: two-way        Outgoing Display? n         Carrier Medium: IP
 Dial Access? n                Busy Threshold: 255       Night Service:
Queue Length: 0
Service Type: tie                    Auth Code? n            TestCall ITC: rest
                         Far End Test Line No:
TestCall BCC: 4
TRUNK PARAMETERS
         Codeset to Send Display: 0     Codeset to Send National IEs: 6
        Max Message Size to Send: 260   Charge Advice: none
  Supplementary Service Protocol: a     Digit Handling (in/out): enbloc/enbloc

           Trunk Hunt: cyclical
                                                  Digital Loss Group: 18
Calling Number - Delete:     Insert:                Numbering Format:
             Bit Rate: 1200         Synchronization: async    Duplex: full
 Disconnect Supervision - In? y  Out? y
 Answer Supervision Timeout: 0
```

Figure 45: Trunk Group, page 1

```
change trunk-group 30                                          Page   2 of  22
TRUNK FEATURES
          ACA Assignment? n            Measured: none      Wideband Support? n
                                 Internal Alert? n        Maintenance Tests? y
                               Data Restriction? n     NCA-TSC Trunk Member:
                                      Send Name: y      Send Calling Number: y
            Used for DCS? n
   Suppress # Outpulsing? n    Numbering Format: private
 Outgoing Channel ID Encoding: preferred     UUI IE Treatment: service-provider

                                              Replace Restricted Numbers? n
                                             Replace Unavailable Numbers? n
                                                   Send Connected Number: y

             Send UUI IE? y
               Send UCID? n
 Send Codeset 6/7 LAI IE? y



                    SBS? n  Network (Japan) Needs Connect Before Disconnect? n
```

Figure 46: Trunk Group, page 2

Step 8 a. Type **add** or **change signaling-group 30** to set parameters as shown in **Figure 47.**

```
                            SIGNALING GROUP

 Group Number: 30             Group Type: h.323
                            Remote Office? n          Max number of NCA TSC: 10
                                      SBS? n           Max number of CA TSC: 0
                                                    Trunk Group for NCA TSC:
       Trunk Group for Channel Selection: 30
          Supplementary Service Protocol: a


        Near-end Node Name: GW1-CLAN1        Far-end Node Name: IP-office-branc
     Near-end Listen Port: 1720           Far-end Listen Port: 1720
                                       Far-end Network Region: 1
              LRQ Required? n            Calls Share IP Signaling Connection? n
              RRQ Required? n
                                            Bypass If IP Threshold Exceeded? n

             DTMF over IP: out-of-band        Direct IP-IP Audio Connections? n
                                                        IP Audio Hairpinning? y
                                             Interworking Message: PROGress
```

Figure 47: Signaling Group 30

Step 8 b. Type **change trunk-group 30** to add members by typing **IP** for the port and associating each member with signaling group 30 as shown in **Figure 48**. Note that the number of members must match the corresponding number on the IP Office side.

```
change trunk-group 30                                          Page   6 of  22
                                TRUNK GROUP
                                     Administered Members (min/max):   1/3
GROUP MEMBER ASSIGNMENTS                 Total Administered Members:   3

       Port    Code Sfx Name        Night           Sig Grp
  1: T00002                                          30
  2: T00011                                          30
  3: T00012                                          30
```

Figure 48: Trunk Group 30, Page 6

Step 9. Type **change uniform-dialplan 1** and add the entries shown to route the following calls:

- General calls to the 5xxxx extensions to route via AAR code 555 to the Branch via Trunk 30.
- Calls to the Branch fax extension (x50004) to route via AAR code 775 to the Main IP403 via PRI Trunk Group 5.
- Calls received from the Main Site IP 403 with extension x7000x to route via AAR code 777 to the Branch via Trunk 30
- Calls received from the Main Site with translated extension x8000x to route via AAR code 888 to the Main Site IP403 via Trunk group 11.

```
change uniform-dialplan 1                                       Page   1 of   2
                     UNIFORM DIAL PLAN TABLE
                                                              Percent Full: 0

  Matching          Insert          Node   Matching          Insert          Node
  Pattern  Len Del  Digits Net Conv Num    Pattern  Len Del Digits Net Conv Num
  5         5   1   555    aar  n                                      n
  50004     5   1   775    aar  n                                      n
  7000      5   1   777    aar  n                                      n
  8000      5   1   888    aar  n                                      n
```

Figure 49: Uniform Dial Plan

Step 10. Type **change aar analysis 5** and add the entries as shown to route the calls to the associated route-pattern.

```
change aar analysis 5                                           Page   1 of   2
                          AAR DIGIT ANALYSIS TABLE
                                                          Percent Full:    3

          Dialed           Total     Route    Call   Node  ANI
          String          Min  Max  Pattern   Type   Num   Reqd
    555                   7    7    30        aar          n
    775                   7    7    5         aar          n
    777000                7    7    30        aar          n
    885                   7    7    30        aar          n
    888                   7    7    11        aar          n
```

Figure 50: AAR Analysis

Step 11. Type **change route-pattern 5** to route outgoing fax calls through the Main IP403 via the PRI trunk group as shown in **Figure 51**.

```
change route-pattern 5                                        Page   1 of   3
                  Pattern Number: 5   Pattern Name: MainIP403-PRI

   Grp FRL NPA Pfx Hop Toll No.  Inserted                          DCS/ IXC
   No          Mrk Lmt List Del  Digits                          QSIG
                            Dgts                                 Intw
1: 5    0                    3   7                                n   user
2:                                                                n   user
3:                                                                n   user
4:                                                                n   user
5:                                                                n   user
6:                                                                n   user

    BCC VALUE  TSC CA-TSC    ITC BCIE Service/Feature BAND  No. Numbering LAR
   0 1 2 3 4 W     Request                                  Dgts Format
                                                         Subaddress
1: y y y y y n  n           rest                                 lev0-pvt  none
2: y y y y y n  n           rest                                           none
3: y y y y y n  n           rest                                           none
4: y y y y y n  n           rest                                           none
5: y y y y y n  n           rest                                           none
6: y y y y y n  n           rest                                           none
```

Figure 51: Route-Pattern

Step 12. Type **change route-pattern 11** to route incoming fax calls through the Main IP403 via the H.323 trunk group.

```
change route-pattern 11                                       Page   1 of   3
                  Pattern Number: 11  Pattern Name: MainIP403-H.323

   Grp FRL NPA Pfx Hop Toll No.  Inserted                          DCS/ IXC
   No          Mrk Lmt List Del  Digits                          QSIG
                            Dgts                                 Intw
1: 11   0                    2                                    n   user
2:                                                                n   user
3:                                                                n   user
4:                                                                n   user
5:                                                                n   user
6:                                                                n   user

    BCC VALUE  TSC CA-TSC    ITC BCIE Service/Feature BAND  No. Numbering LAR
   0 1 2 3 4 W     Request                                  Dgts Format
                                                         Subaddress
1: y y y y y n  n           rest                                 lev0-pvt  none
2: y y y y y n  n           rest                                           none
3: y y y y y n  n           rest                                           none
4: y y y y y n  n           rest                                           none
5: y y y y y n  n           rest                                           none
6: y y y y y n  n           rest                                           non
```

Figure 52: Route Pattern 11

Step 13. Type **change route-pattern 30** to configure route pattern 30 as the general route to the Branch office via Trunk-Group 30 as shown in **Figure 53**.

```
change route-pattern 30                                        Page   1 of   3
                  Pattern Number: 30  Pattern Name: Branch IPO H323

    Grp FRL NPA Pfx Hop Toll No.  Inserted                          DCS/ IXC
    No          Mrk Lmt List Del  Digits                          QSIG
                             Dgts                                 Intw
 1: 30   0                    3   5                                n   user
 2:                                                                n   user
 3:                                                                n   user
 4:                                                                n   user
 5:                                                                n   user
 6:                                                                n   user

     BCC VALUE  TSC CA-TSC    ITC BCIE Service/Feature BAND  No. Numbering LAR
    0 1 2 3 4 W     Request                                  Dgts Format
                                                          Subaddress
 1: y y y y y n  n           rest                                 lev0-pvt  none
 2: y y y y y n  n           rest                                           none
 3: y y y y y n  n           rest                                           none
 4: y y y y y n  n           rest                                           none
 5: y y y y y n  n           rest                                           none
 6: y y y y y n  n           rest                                           none
```

Figure 53: Route Pattern 30

Step 14. Type **save translation** to ensure that translations are retained.

7. Configure the Cisco 1751 Router

This section describes the key items in the configuration of the 1751 Router at the main site.

Cisco 1751 Configuration File	Comments
Current configuration : 2472 bytes ! version 12.2 service timestamps debug uptime service timestamps log uptime no service password-encryption ! hostname 1750-PN3 ! enable password cisco ! username cisco password 0 cisco username 1234 password 0 1234 ip subnet-zero ! ! no ip domain lookup !	

Cisco 1751 Configuration File	Comments

ip cef
!
class-map match-all voice-signaling
  match access-group 103
class-map match-all voice-media
  match access-group 102
  match ip dscp ef
 	
!
!
	These commands configure the H.323 signaling and media (rtp) packets into classes to be used for the bandwidth usage policy, based on access lists defined at the end of the configuration file.

policy-map voice-policy
  class voice-signaling
   bandwidth 8
  class voice-media
    priority 24
  class class-default
   fair-queue
!
	The bandwidth usage policy to be applied at the Frame Relay DLCI interface described below, allows signaling to use up to 8 kb/s (the smallest setting) of reserved bandwidth, then media the next 24. Otherwise bandwidth is assigned by priority.

frame-relay switching ! !	Frame relay switching is enabled.
voice call carrier capacity active ! ! ! ! ! ! ! ! ! interface Loopback0 ip address 10.1.1.1 255.255.255.0 !	
interface FastEthernet0/0 ip address 10.10.1.1 255.255.255.0 no keepalive speed auto !	This is the interface to the Main site subnet. 10.10.1.1 is the default gateway interface defined for the devices on that network.
interface Serial0/0 no ip address encapsulation frame-relay no ip mroute-cache max-reserved-bandwidth 100	This is the Wide Area Interface card with the T1 connection to the Frame Network. The max-reserved bandwidth setting allows all bandwidth to be assigned via

Cisco 1751 Configuration File	Comments
service-module t1 clock source internal service-module t1 timeslots 1-24 frame-relay traffic-shaping frame-relay lmi-type ansi ! interface Serial0/0.1 point-to-point ip address 200.200.1.1 255.255.255.0 frame-relay class Frame_Class_1 frame-relay interface-dlci 100 CISCO frame-relay ip rtp header-compression frame-relay ip rtp compression-connections 60 ! interface Async5 no ip address no peer default ip address ! ip classless no ip http server ! ! !	voice-policy. The T1 is configured for all 24 64 kb/s timeslots. The "lmi-type" is set consistently with the AS5300. This is the logical DLCI interface for traffic to the Branch IP403. The class Frame_Class_1 is applied which contains the bandwidth policy. Rtp header compression is enabled, for up to 60 sessions, but tcp is not enabled.
map-class frame-relay Frame_Class_1 frame-relay cir 32000 frame-relay bc 320 frame-relay be 0 frame-relay mincir 32000 frame-relay fair-queue service-policy output voice-policy frame-relay fragment 320 ! access-list 102 permit udp any any range 49152 65535 access-list 103 permit tcp any eq 1720 any access-list 103 permit tcp any any eq 1720 !	This frame-relay map class contains the bandwidth specifications for DCLI 100 to the branch and the bandwidth service policy to be applied to output packets. Fragments of large data packets are set so that their transmission blocks voice packets for no more than 10 ms. These access lists will be used in the packet classification for the application of bandwidth policy. RTP packets sent by the IP Office and S8700/G600 will be sent in the range from 49152 to 65535. H.323 TCP traffic will either be coming to or from port 1720.

8. Configure the Cisco AS5300 Router

The AS5300 is a Frame Relay Switch to serving as a stand-in for a "real-world" Frame Relay WAN network. The configuration file has been edited to show the most pertinent commands.

Cisco AS5300 Configuration File	Comments
Current configuration : 1706 bytes ! version 12.2 hostname 5300 !	
frame-relay switching ! ! !	Enable Frame Relay switching as needed between the interfaces.
controller T1 0 framing esf linecode b8zscablelength short 133 channel-group 0 timeslots 24 !	Controller T1 0 is configured, as is the CSU/DSU at the Branch to use the 24th timeslot for 56kb/s service.
controller T1 1 framing esf linecode b8zs cablelength short 133 channel-group 1 timeslots 1-24 speed 64 !	Controller T1 1 is configured, as is the Cisco 1751 Router at the Main site, to use all 24 channels at 64 kb/s.
interface Serial0:0 no ip address rate-limit input 32000 100000 100000 conform-action transmit exceed-action drop encapsulation frame-relay frame-relay lmi-type ansi frame-relay intf-type dce frame-relay route 100 interface Serial1:1 100 !	The logical interface associated with the 56 kb/s line from the Branch is configured to be the "dce" side of the LMI protocol and to limit the traffic to 32kbs. All frames arriving with a DLCI of 100 are forwarded to the Logical interface associated with the Main Site.
interface Serial1:1 no ip address rate-limit input 32000 100000 100000 conform-action transmit exceed-action drop encapsulation frame-relay frame-relay lmi-type ansi frame-relay intf-type dce frame-relay route 100 interface Serial0:0 100	The logical interface associated with the T1 line from the Main site Branch is configured to be the "dce" side of the LMI protocol and to limit the traffic to 32kbs. All frames arriving with a DLCI of 100 are forwarded to the Logical interface associated with the Branch site.

9. Verification Steps

- The S8700 **status trunk <**Trunk Group #> command indicates the general health of the trunk groups.

```
status trunk 99

                            TRUNK GROUP STATUS

Member    Port      Service State       Mtce Connected Ports
                                        Busy

99/01     01A0701   in-service/idle     no
99/02     01A0702   in-service/idle     no
```

Figure 54: Status Trunk Group

- The S8700 **list trace tac <**TAC #> command can be activated to follow a basic incoming or outgoing call.

```
list trace tac 109                                                  Page   1
                                LIST TRACE
time            data

03:47:12     Calling party station    50001 cid 0x280
03:47:12     Calling Number & Name 50001 S8100 IP
03:47:12     dial 70201
03:47:12     term trunk-group 99    cid 0x280
03:47:13     dial 70201
03:47:13     route-pattern  99 preference 1  cid 0x280
03:47:13     seize trunk-group 99 member 1  cid 0x280
03:47:14     dial 70201
03:47:14     outpulse done 70201
03:47:15     active trunk-group 99 member 1  cid 0x280
```

Figure 55: List Trace Tac

- The IP Office System Monitor is an excellent tool for trouble shooting Voice over IP connections. Enable H.323 monitoring as shown from the System Monitor **Settings H323 submenu.** Also, the **Frame Relay** submenu can be used to see if Link Integrity messages are being both sent and received on the Frame Relay Link.
- Checking the status lights on the front of the IP403 is the prime indication as to whether a particular WAN link or other interface is in service and configured properly.
- The Cisco Router command line **show interface serial0/0** will show the status of the interface associated with the T1 and **show interface serial0/0.1** will show status of that particular DLCI.
- Cisco's **show ip route** will show its current routing table, including the interfaces that are up.
- Be sure to test the setup by making the maximum number of calls over the Branch to Main trunk group. Also, make the maximum number of simultaneous fax calls through the Main site IP403 server.

10. Conclusion

These Application Notes show the steps needed to configure fax over IP networking between an IP Office Server based site and an S8700 Media Server/G600 Media Gateway based site connected via a Frame Relay Network.

11. Additional References

From www.avaya.com

"How to configure an H.323 IP trunk between an Avaya™ IP600 Internet Protocol Communication Server and Avaya™ IP Office Server - Issue 1.2"

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