



Command to Handle Main Server and LSP Server Split Registrations

Abstract

This paper provides information on keeping H.323 phones and H.248 media gateways which are backed up by one LSP from being registered to different servers after an outage.

List of Sections

1.	Introduction	4
1.1.	Terminology and acronyms	5
2.	Command to handle main server and LSP server split registrations	6
2.1.	Administering the feature	6
2.1.1.	system-parameters ip-options	6
2.1.2.	Gatekeeper list and media gateway controller list	7
2.1.3.	Primary search time	10
2.2.	Media gateway status screens	12
2.3.	H.323 phone behavior	14
2.4.	H.248 gateway behavior	15
2.5.	Disable nr-registration and enable nr-registration	15
2.6.	LSP registration algorithm	16
3.	Return to main	16
3.1.	The enable mg-return command	17
3.2.	The entire group of IP network regions	18
3.3.	Return to main for unregistered LSP	19
3.4.	Return to main for phones	19
4.	Design recommendations	20
4.1.	Media gateways should have adequate resources	20
4.2.	IP network regions should have a backup server	20
4.2.1.	On the ip-network-region screen	20
4.2.2.	In DHCP	20
4.3.	Media gateways' LSP entry should match phones' LSP entry	21
4.4.	Using the same time-day-window	22
4.5.	Time-day-windows over multiple hours	22
4.6.	Don't put the ESS PE into an AGL or MGC list	23
5.	Conclusion	25
6.	Additional References	27

List of Figures

Figure 1	Split Registration	4
Figure 2	- system-parameters ip-options	7
Figure 3	- IP Network Region	9
Figure 4	- Station's Survivable GK Node Name	9
Figure 5	- G350 set mgc list	10
Figure 5	- G700 set mgc list	10
Figure 6	- System-parameters IP-options	11
Figure 7	- G350 Reset-times Primary-search	11
Figure 7	- G700 Reset-times Primary-search	11
Figure 8	- list media-gateway	12
Figure 9	- display media-gateway	13
Figure 10	- display media-gateway	13
Figure 11	- status media-gateways	14
Figure 12	- One LSP per Servers List	22
Figure 13	- ESS	24
Figure 14	- List survivable-processor	24

List of Tables

Table 1 - Terminology	6
Table 2 - Phone Failover Times	15

1. Introduction

Some sites may experience a split registration situation after a brief unexpected server or network outage. Split registration occurs when resources, for example H.323 phones and H.248 media gateways, are backed up by one LSP but they end up being registered to different servers after an outage. Media gateways may be registered to an LSP, but some of the H.323 phones in the gateway's IP network region may be registered to the main Avaya Aura™ Communication Manager server. Those H.323 phones would be isolated from their trunk resources. They would also be unable to make or receive calls from the H.323 phones that registered to the other server. The situation could happen even if the main server had some trunk resources in connected IP network regions, but the H.323 phones couldn't use those other trunks because location-based routing rules prevent access to those other trunks. A split registration situation can also happen if a gateway supports circuit switched phones via media modules on the gateway. Those phones would have access to trunks on the same gateway, but may not be able to call to stations on other gateways or use trunks on other gateways.

The following "Figure 1 - Split Registration" shows a split registration situation. After a temporary LAN failure, phone 2 stayed with the Main server, perhaps because phone 2's user was on a call for the duration of the LAN failure. To avoid dropping the call, phone 2 did not attempt to contact the LSP. Phone 1 and the gateways registered with the LSP.

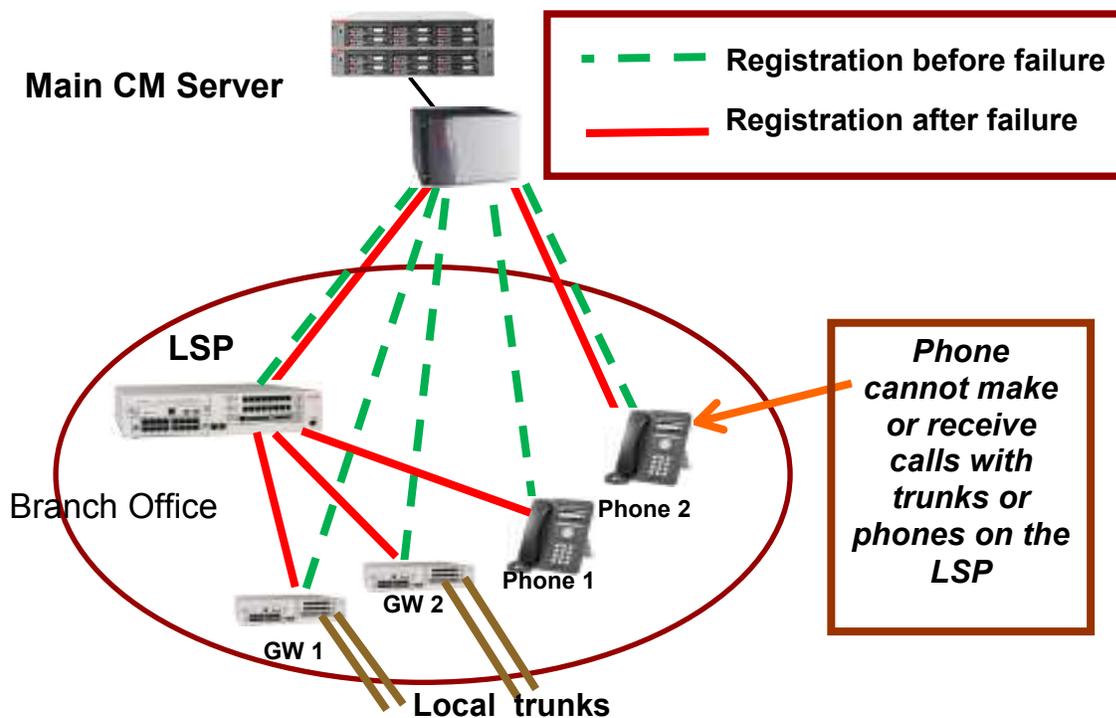


Figure 1 - Split Registration

- When phone 2 registered to the main server, the main server had to control some IP media resources in a connected IP network region. A server will not allow H.323 phones to register if the server does not have some media resources in an IP network region connected to the H.323 phone's IP network region. However, inter-region connection restrictions could block phone 2's access to port networks or gateways in those other IP network regions. If that happened, phone 2 would not be able to place or receive calls.
- Phones with gateways but without available trunks can't make trunk calls. In the above figure, suppose the main server has media processors that phone 2 can access in other IP network regions, but the server's administration has ARS location-based routing rules to allow calls only through trunks in each phone's own location. Phone 2 would be unable to make trunk calls.
- No matter how the main server is configured, phone 2 can only call phone 1 by dialing the full PSTN number if the two phones are in the same IP network region.

1.1. Terminology and acronyms

Term	Meaning
active	A survivable server is active if it controls at least one gateway. A phone is active if it is on a call.
ad	Automatically disabled
ap	Auto-disabled but pending return to main server
AGL	Alternate Gatekeeper List. A list of the main server's IP addresses, e.g. CLANs and PE, and the LSP's IP address. H.323 phones receive this list during registration. H.323 phones use this list during attempts to re-register. It's similar to the mgc list.
ARS	Automatic Route Selection
CLAN	Control - Local Area Network. An Avaya IP interface circuit pack.
CLI	command line interface
DHCP	Dynamic Host Configuration Protocol
ESS	Enterprise Survivable Server
GA	Generally Available
GK	GateKeeper. The H.248 and H.323 standards' term for the entity that controls access to the network. In this white paper it is represented by an IP interface on a Communication Manager server.
Group of IP network regions	All of the IP network regions that are backed up by the same LSP.
ICC	Internal Call Controller, the call control software that runs on a gateway that is in SLS mode.
Lk	Link
LLDP	Link Layer Discovery Protocol
LSP	Local Spare Processor.
MCIPADD	Media Controller IP Address. A list of the main server's IP addresses, e.g. CLANs and PE, and the LSP's IP address. H.323 phones typically receive this list as a DHCP field. H.323 phones use this list during attempts to register. It's similar to the mgc list.

Term	Meaning
Mgc list	Media gateway controller list. A list of the main server's IP addresses, e.g. CLANs and PE, and the LSP's IP address. Media gateways receive this list from CLI administration. Media gateways use this list during attempts to register. It's similar to the AGL.
PE	Processor Ethernet
PSTN	Public Switched Telephone Network
rd	Region disabled.
Reg	Registered
SLS	Standard Local Survivability
SP-REG-M	Survivable Processor Registrations to Main. It is the title of an alarm.

Table 1 - Terminology

2. New Command to handle main server and LSP server split registrations

The "Force Phones and Gateways to Active LSPs" administration option is intended to handle split registrations between a main server and LSPs, or split registrations between an ESS and LSPs. This option is not intended to handle split registrations between a main server and an ESS.

If the main server is administered with the "Force Phones and Gateways to Active LSPs" option, Communication Manager software attempts to redirect all devices backed up by an active LSP register to that LSP, keeping branch oriented operations intact with local trunk resources.

If an LSP is registered to the main server, the LSP will tell the main server when the LSP goes active. The LSP is active if the LSP has at least one media gateway registered. Once an LSP is active, the main server or an ESS will automatically disable the entire group of IP Network Regions that are administered as backed up by that LSP. This automatic disabling will force registered media gateways and H.323 phones off of that server, as well as block future registrations of media gateways and H.323 phones. They then register to the LSP.

If the LSP was unable to register with the main server, it is likely that the H.323 phones and H.248 media gateways backed up by that LSP will also be unable to communicate with the main server. This situation would be a problem, but it would not be a split registration.

2.1. Administering the feature

2.1.1. system-parameters ip-options

The "Force Phones and Gateways to Active LSPs" administration option is on the system-parameters ip-options form.

```

display system-parameters ip-options
IP-OPTIONS SYSTEM PARAMETERS
Page 2 of 4

Always use G.711 (30ms, no SS) for intra-switch Music-On-Hold? N
Force Phones and Gateways to Active LSPs? Y

IP DTMF TRANSMISSION MODE
Intra-System IP DTMF Transmission Mode: in-band
Inter-System IP DTMF: See Signaling Group Forms

HYPERACTIVE MEDIA GATEWAY REGISTRATIONS
Enable Detection and Alarms? n

```

Figure 2 - system-parameters ip-options

The administration field does have some conditions.

- Administration software will let system administrators set the field to Y while LSPs are Active. If the option is enabled while the LSP is already active, the main server will force the entire group of IP network regions into auto-disabled state when the administration option is turned on.
- Administration software will not let system administrators set the field to N while any LSPs are registered and reporting Active. (Administration software will let them set the field to N while LSPs are Unregistered.)
- Administration software will not let system administrators set the field to Y unless there is no more than one LSP entry under the BACKUP SERVERS (IN PRIORITY ORDER) headings on ip-network-region screens.

To use the "Force Phones and Gateways to Active LSPs" option, system administrators also have to administer one LSP entry in the gatekeeper lists for H.323 phones, and similarly administer one LSP entry in the media gateway controller (mgc) lists for gateways. See the following section 2.1.2 "Gatekeeper list and media gateway controller list" on page 7 for more details. Administering the LSP entry as a backup server on ip-network-region screens ties those IP network regions together. If the LSP goes active, the main server will force all the H.323 phones and H.248 media gateways in all those IP network regions to go to the LSP, as a group. If "Force Phones and Gateways to Active LSPs" is set to Y, software will not let system administrators administer more than one LSP under the BACKUP SERVERS (IN PRIORITY ORDER) heading on any one ip-network-region screen.

2.1.2. Gatekeeper list and media gateway controller list

H.323 phones and H.248 media gateways use a list to determine which servers to try to register to. H.323 phones and H.248 media gateways receive this list during initial setup.

- H.323 phones: The initial gatekeeper list is included in the MCIPADD variable. This variable can come from several sources^{1, 2}:
 - A static or manually programmed address on the H.323 phone.
 - The 46xxsettings.txt file's MCIPADD setting.
 - DHCP using option 242 that includes the MCIPADD setting.
 - Link Layer Discovery Protocol (LLDP).

H.323 phones also receive an updated list from the server when the phones register. This second list is called the alternate gatekeeper list (AGL). The Administrable Alternate Gatekeeper List white paper³ contains detailed information about the AGL for H.323 phones and how administration settings affect it.

- Media gateways: The media gateway controller (MGC) list is administered on the media gateway via its command line interface (CLI). The command is "set mgc list". The Configuring Avaya Media Servers white paper⁴, the Administration for Media Gateways manuals^{5, 6} and the Media Gateway CLI Reference manual⁷ contain detailed information about how to use this command to administer the list on media gateways.

The list of IP interfaces for servers consists of two parts, a primary server part and a survivable server part. The primary server part is at the beginning of the list, while the survivable server part is at the end of the list. The transition point is what divides the primary server part of the list from the survivable server part of the list. Media gateways and H.323 phones first attempt to register to entries in the primary part. These typically correspond to IP interfaces on the main server. The phones and media gateways try the primary part for an administrable amount of time. If the phones and media gateways are unable to register during that time, they then try to register to an entry in the survivable part of the list. These latter entries typically correspond to IP interfaces on an LSP or other survivable server.

The survivable part of the list comes from these sources.

- H.323 phones: the BACKUP SERVERS fields on the station's ip-network-region form,
- H.323 phones: the Survivable GK Node Name field on the station form,
- Media Gateways: the "set mgc list" CLI command.

2.1.2.1 H.323 phone AGL source

An H.323 phone obtains the survivable part of its AGL from the entries listed under "BACKUP SERVERS (IN PRIORITY ORDER)" on the station's ip-network-region form, and the entry in the "Survivable GK Node Name" field on the station form. The latter is intended to be used for H.323 phones that might register to gateways that are in Standard Local Survivability (SLS) mode. Communication Manager software puts the node name after the Backup Servers in the AGL that the server sends to H.323 phones.

```

Display ip-network-region 1                               Page 2 of 19
                IP NETWORK REGION

INTER-GATEWAY ALTERNATE ROUTING / DIAL PLAN TRANSPARENCY
Incoming LDN Extension:
Conversion To Full Public Number - Delete:      Insert:
Maximum Number of Trunks to Use for IGAR:
Dial Plan Transparency in Survivable Mode? N

BACKUP SERVERS (IN PRIORITY ORDER)                H.323 SECURITY PROFILES
1 LSP-001                                         1 challenge
2                                                 2
3                                                 3
4                                                 4
5
6                                                 Allow SIP URI Conversion? Y

TCP SIGNALING LINK ESTABLISHMENT FOR AVAYA H.323 ENDPOINTS
Near End Establishes TCP Signaling Socket? Y
Near End TCP Port Min: 61440
Near End TCP Port Max: 61444

```

Figure 3 - IP Network Region

```

display station                                          Page 1 of 4
                STATION

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

STATION OPTIONS

Loss Group:                Time of Day Lock Table:
Personalized Ringing Pattern:
Message Lamp Ext:
Mute Button Enabled?

Survivable GK Node Name:
Survivable COR:                Media Complex Ext:
Survivable Trunk Dest?        IP SoftPhone?

```

Figure 4 - Station's Survivable GK Node Name

2.1.2.2 Media gateway mgc list source

Media gateways obtain the survivable part of their MGC list from the entries added by the "set mgc list" command. The survivable entries are the ones that are lower in the list than the transition point.

```

g350-1-mg-001(super)# set mgc list 11.1.1.1, 11.1.1.2, 11.1.1.3, 22.2.2.22
Done!
g350-1-mg-001(super)# show mgc list

CONFIGURED MGC HOST
-----
11.1.1.1
11.1.1.2
11.1.1.3
22.2.2.22
sls                               disabled

Done!
g350-1-mg-001(super)# set reset-times transition-point 3
g350-1-mg-001(super)# show recovery

RECOVERY TIMES
-----
Primary Search      : 1
Total Search        : 30
Transition Point: 3

Done!
g350-1-mg-001(super)#

```

Figure 5 - Gateways (all but G700) set mgc list

```

MG-002-2(super)# configure
MG-002-2(configure)# set mgc list 11.1.1.1, 11.1.1.2, 11.1.1.3, 22.2.2.22
MG-002-2(configure)# exit
MG-002-2(super)# show mgc list

CONFIGURED MGC HOST
-----
11.1.1.1
11.1.1.2
11.1.1.3
22.2.2.22

MG-002-2(super)# configure
MG-002-2(configure)# set mgp reset-times transition-point 3
MG-002-2(configure)# exit
MG-002-2(super)# show mgp recovery

MGP RECOVERY TIMES
-----
Primary Search      : 1
Total Search        : 30
Transition Point: 3

MG-002-2(super)#

```

Figure 6 - G700 set mgc list

2.1.3. Primary search time

The amount of time media gateways and H.323 phones spend trying the primary part of the AGL is affected by the Primary Search Time.

For H.323 phones, this is administered on the system-parameters ip-options form, via the "Primary Search Time (sec)" field. The value is in seconds.

```

Display system-parameters ip-options                               Page 1 of 4
                        IP-OPTIONS SYSTEM PARAMETERS

IP MEDIA PACKET PERFORMANCE THRESHOLDS
  Roundtrip Propagation Delay (ms)      High: 100      Low: 50
      Packet Loss (%)                   High: 10       Low: 5
      Ping Test Interval (sec): 1
  Number of Pings Per Measurement Interval: 10

RTCP MONITOR SERVER
  Default Server IP Address: 172.16 .1 .120
  Default Server Port: 5005
  Default RTCP Report Period(secs): 5

AUTOMATIC TRACE ROUTE ON
  Link Failure? N

H.248 MEDIA GATEWAY                      H.323 IP ENDPOINT
  Link Loss Delay Timer (min): 5          Link Loss Delay Timer (min): 5
                                          Primary Search Time (sec): 90
                                          Periodic Registration Timer (min): 20

```

Figure 7 - System-parameters IP-options

For gateways, this is administered via the CLI command "set reset-times primary-search". For all gateways but the G700, the primary search timer value can be viewed by typing "show recovery." For G700 gateways, the primary search timer value can be viewed by typing "show mgp recovery." The value is between 1 and 60 minutes, default 1 minute.

```

g350-1-mg-001(super)# set reset-times primary-search 1
g350-1-mg-001(super)# show recovery

RECOVERY TIMES
-----
Primary Search: 1
Total Search      : 30
Transition Point: 3

Done!
g350-1-mg-001(super)#

```

Figure 8 - Gateways (all but G700) Reset-times Primary-search

```

MG-002-2(super)# configure
MG-002-2(configure)# set mgp reset-times primary-search 1
MG-002-2(configure)# exit
MG-002-2(super)# show mgp recovery

MGP RECOVERY TIMES
-----
Primary Search: 1
Total Search      : 30
Transition Point: 3

MG-002-2(super)#

```

Figure 9 - G700 Reset-times Primary-search

2.2. Media gateway status screens

When a server automatically disables an IP network region, software shows that status on media-gateway forms by the letters "ad" (automatically disabled) or "ap" (auto-disabled but pending return to main). These states are new starting in release 5.2. They differ from the state rd (region disabled) that is available with release 5.1 and some older releases. Briefly, the differences are as follows.

- "rd" means the system administrator has previously run "disable nr-registration". The administrator will need to run "enable nr-registration" to enable the IP network region.
- "ad" means the server has automatically disabled the IP network region. The system administrator does not need to do anything to enable the IP network region if it has a gateway administered for automatic recovery rule time-day-window. The IP network region will eventually re-enable itself, assuming that the temporary network outage is over.
- "ap" means Auto-disabled but Pending re-registration. It is almost the same thing as "ad", but in addition the media gateway has communicated with the main server within the last minute. It is useful to know when media gateways are in the state "ap". When multiple media gateways are in this state, they would likely be able to return to the main server at about the same time. For example, they would do so if the system administrator enters the command described in section 3.2 "The enable mg-return command" on page 17. It's desirable for all the gateways backed up by the same LSP to return at about the same time in order to avoid creating another split registration during the return. While there isn't a command to list the states only of media gateways backed up by one LSP, there are commands to show the states of media gateways.

These three states rd, ad, and ap are shown on the media gateway status screens.

```
list media-gateway
```

MEDIA-GATEWAY REPORT								Page	1
Num	Name	Serial No/ FW Ver/HW Vint	IP Address/ Cntrl IP Addr	Type	NetRgn RecRule	Reg?			
1	mg1	04J207704038 29 .11 .0 /3	172.31 .7 .112 11. 1 .1 .1	g350	1 1	ad			
2	mg2	01DR10315572 29 .11 .0 /0	172.32 .250.14 11. 1 .1 .1	g700	2 1	ap			
3	mg3	04IS33635515 29 .11 .0 /0	172.33 .22 .40 11. 1 .1 .1 1	g250	3 1	rd			
4	mg4	05IS04678485 29 .11 .0 /1	172.34 .7 .117 11. 1 .1 .1	g250-ds1	4 1	y			

Figure 10 - list media-gateway

```

display media-gateway 1
                                MEDIA GATEWAY
    Number: 1                    Registered? ad
    Type: g350                   FW Version/HW Vintage: 29 .11 .0 /3
    Name: mg1                    MGP IP Address: 172.31 .7 .112
    Serial No: 04J207704038     Controller IP Address:
    Encrypt Link? y             MAC Address:
    Network Region: 1
    Location: 1                 Site Data:
    Recovery Rule: 1

Slot  Module Type              Name
V1:
V2:
V3:
V4:
V5:
V6:
V7:                               Max Survivable IP Ext: 8
V8:
V9:

```

Figure 11 - display media-gateway state ad

```

display media-gateway 2
                                MEDIA GATEWAY
    Number: 2                    Registered? ap
    Type: g700                   FW Version/HW Vintage: 29 .11 .0 /0
    Name: mg2                    MGP IP Address: 172.32 .250.14
    Serial No: 01DR10315572     Controller IP Address:
    Encrypt Link? y             MAC Address:
    Network Region: 2
    Location: 1                 Site Data:
    Recovery Rule: 1

Slot  Module Type              Name
V1:
V2:
V3:
V4:
V5:
V6:
V7:                               Max Survivable IP Ext: 8
V8:
V9:

```

Figure 12 - display media-gateway state ap

```

status media-gateways

ALARM SUMMARY          BUSY-OUT SUMMARY          H.248 LINK SUMMARY
Major:      0          Trunks:      0          Links Down:  3          # Logins: 1
Minor:      3          Stations:    0          Links Up:    1
Warning:    0

GATEWAY STATUS

Alarms                Alarms                Alarms                Alarms                Alarms
MG Mj Mn Wn Lk  MG Mj Mn Wn Lk
1 0| 1| 0| ad  9 0| 0| 0| up  17 0| 0| 0| up  25 0| 0| 0| up  33 0| 0| 0| up
2 0| 1| 0| ap  10 0| 0| 0| up  18 0| 0| 0| up  26 0| 0| 0| up  34 0| 0| 0| up
3 0| 1| 0| rd  11 0| 0| 0| up  19 0| 0| 0| up  27 0| 0| 0| up  35 0| 0| 0| up
4 0| 0| 0| up  12 0| 0| 0| up  20 0| 0| 0| up  28 0| 0| 0| up  36 0| 0| 0| up
5 0| 0| 0| up  13 0| 0| 0| up  21 0| 0| 0| up  29 0| 0| 0| up  37 0| 0| 0| up
6 0| 0| 0| up  14 0| 0| 0| up  22 0| 0| 0| up  30 0| 0| 0| up  38 0| 0| 0| up
7 0| 0| 0| up  15 0| 0| 0| up  23 0| 0| 0| up  31 0| 0| 0| up  39 0| 0| 0| up
8 0| 0| 0| up  16 0| 0| 0| up  24 0| 0| 0| up  32 0| 0| 0| up  40 0| 0| 0| up

```

Figure 13 - status media-gateways

2.3. H.323 phone behavior

When a main server disables an IP network region, the server and the H.323 phone work together so the phone unregisters from the main server and registers to the LSP. The exact signaling mechanism used depends on whether the H.323 phones are idle or active, whether they are TTS-capable or not, whether they are using Annex H or not, and several other factors listed in "Table 2 - H.323 phone Failover Times" on page 15. The end result is largely the same: the H.323 phones move to the LSP. How long the H.323 phones take to move to the LSP depends on the type of H.323 phone and its state. When a main server disables an IP network region, active H.323 phones don't successfully register to the LSP until they are idle. Idle H.323 phones start trying to register to the LSP very quickly. The following table contains some examples using the latest generally available firmware for various H.323 phone types.

H.323 phone type	Time before trying the LSP*
96xx with current (3.0+) firmware loads. Annex H is off.	Immediately
96xx with current (3.0+) firmware loads. Annex H is on.	Typically less than a minute.
46xxSW hardware with 2.8+ firmware	Immediately
46xx with non-SW hardware. The AGL column on the ip-network-region screen has been set to numeric values, or the IP network region has 27 or fewer IP interfaces.	Immediately

H.323 phone type	Time before trying the LSP*
46xx with non-SW hardware. The AGL column on the ip-network-region screen has been set to only blanks or value 'all', and the IP network region has 28 or more IP interfaces.	Forever. The H.323 phones never try to register to the LSP.
IP Softphone, IP Agent, and One-X Communicator in H.323 mode	Immediately
Non-Avaya H.323 phones.	Not applicable. The main server does not unregister non-Avaya H.323 phones when an IP network region is disabled.

Table 2 - H.323 phone Failover Times

* More precisely, this is the time after the region is disabled, and after the call ends if the H.323 phone was active on a call, before the phone tries to register to the LSP.

2.4. H.248 gateway behavior

When a main server automatically disables an IP network region, the server and the H.248 media gateways work together so the gateway unregisters from the main server, and registers to the LSP. How long the gateways take to move to the LSP depends on the gateway's firmware load.

- The Communication Manager 5.2 GA firmware load: Immediately
- Older firmware loads: The H.248 media gateway Primary Search time. This value is administered on the gateway. See section 2.1.3 "Primary search time" on page 10 for more information about administering this value.

2.5. Disable nr-registration and enable nr-registration

The command 'disable nr-registration' causes all gateways and Avaya H.323 telephones in an IP network region to unregister from the server on which the command is executed. In release 5.2 and newer, the command also applies to IP softphone and IP Agent. Also in release 5.2 and newer, if the command is run on a main server, the server tells the gateways and H.323 phones to attempt next to register to survivable servers.

The commands 'disable nr-registration' and 'enable nr-registration' don't apply to the entire group of IP network regions backed up by a single LSP. These commands apply to the IP network region specified on the command line. However, if the "Force Phones and Gateways to Active LSPs" field on system-parameters ip-options is set to Y, it is likely that the disable nr-registration command, when run on one IP network region, could affect more than one IP network region. That can happen as follows. A single LSP is the backup server for multiple IP network regions, for example network region 1 and network region 2. A system administrator runs "disable nr-registration 1". The main

server disables IP network region 1. A media gateway in network region 1 is unregistered from the main server, and registers to the LSP. The LSP reports to the main server that the LSP is active. The main server then also auto-disables network region 2.

The command 'enable nr-registration' also behaves differently if the "Force Phones and Gateways to Active LSPs" field on system-parameters ip-options is set to Y than if the field is set to N. If the LSP is active, the command does not immediately enable the IP network region. Instead, if the LSP is active, the enable command puts the IP network region into auto-disabled state. The command works this way so that if the LSP is backing up more than one IP network region, the 'enable nr-registration' command won't cause a split registration by allowing endpoints in that one IP network region to return to the main server while endpoints in other IP network regions backed up by the same LSP stay on the LSP.

For more information about the enable and disable nr-registration commands, see the section titled "nr-registration" on page 425 to 427 of the Maintenance Commands manual⁸.

2.6. LSP registration algorithm

As noted at the beginning of this section 2. "New Command to handle main server and LSP server split registrations" on page 6, if an LSP is registered to a main server, the LSP will tell that server when the LSP goes active. Release 5.2 changes the algorithm by which LSPs register to main servers. Before release 5.2, LSPs tried to register to every administered IP interface. The LSPs kept on trying until the LSP found the main server that the LSP could register to. For large systems, this could take a long time. Starting with release 5.2, unregistered LSPs try to register using the H.323 phone AGL algorithm. The LSPs try IP interfaces in the LSP's IP network region first, then in directly connected IP network regions. For consistency, and to speed up ESS registrations to main servers, ESS registering to the main server now uses the H.323 phone AGL algorithm too.

3. Return to main

Communication Manager software provides some return to main server options that can be used with the "Force Phones and Gateways to Active LSPs" option. They are listed below. However, as useful as automatic media gateway recovery is, some customers prefer not to use it. They have at least these reasons for not using a recovery rule. First, if the Main hub resets or there is a WAN outage, some customers want to understand why the outage happened. They don't want remote locations coming back to the main server until customers analyze and resolve any root cause problems. Second, some customers want to manually coordinate the return back to the Main, individually choosing when each IP network region returns.

The return to main server options that can be used with the "Force Phones and Gateways to Active LSPs" option are as follows.

1. Time-day-window. Section 3.1 "Media Gateway recovery rule: time-day-window" on page 17 describes this method.
2. The enable mg-return command. Section 3.2 "The enable mg-return command" on page 17 describes this method.
3. Return to the main server if an LSP is unregistered. Section 3.4 "Return to main for unregistered LSP" on page 19 describes this method.

Communication Manager software also provides other return to main server options, but those others can not be used with the "Force Phones and Gateways to Active LSPs" option. One of those, "Immediate", resolves split registrations between any types of servers. For more information about those options and about automatic recovery in general, see these references.

- The section titled "Auto fallback to primary controller for H.248 media gateways" on page 262 to 273 of the Administration for Network Connectivity manual⁹.
- The sections titled 5.3 "Failover to Secondary Call Server – Connection Preservation" and 5.4 "Recover to Primary Call Server – Connection Preservation" on pages 24 to 27 of the Network Region Configuration Guide¹⁰.

3.1. Media Gateway recovery rule: time-day-window

The time-day-window option allows media gateways to return to the main server during a pre-administered time and day. Section 3.3 "The entire group of IP network regions" on page 18 describes how this method is changing in release 5.2 to work with the "Force Phones and Gateways to Active LSPs" option. The two references listed in the two bullet items in the previous paragraph further describe this method.

3.2. The enable mg-return command

Release 5.2 provides a command for returning media gateways to the main server. The command is

- enable mg-return network-region R,
- enable mg-return all.

This command temporarily over-rides the recovery rules for H.248 gateways' return to main servers as administered on the system-parameters mg-recovery-rule form, for the specified IP network region(s). This command does not override "disable nr-registration." The enable mg-return command allows the gateways to return to the main server immediately, regardless of the current recovery rule administration. The command is usable by the same administration logins that can use the commands "disable nr-registration" and "enable nr-registration".

Once the enable mg-return command is run on a server, that server allows media gateways to register to the server at least until one of the following events happen.

- 1) The LSP reports to the main server that the LSP is inactive, then the LSP reports that it is active again; or
- 2) One hour passes since the command was run, or
- 3) The system administrator runs "disable mg-return".

The above says 'at least' because once either of the above conditions (2) or (3) is satisfied, the main server could continue letting gateways register. For example,

suppose that before one hour passes since the command was run, a time-day-window arrives that allows media gateway registrations. When the 'enable mg-return' command's one hour timer ends, there would be nothing on the main server to prevent media gateway registrations from continuing.

If the current time is in the middle of the time-day-window for media gateway return to the main server, and the system administrator runs "disable mg-return", the server disables the time-day-window for the remainder of the current hour. For example, suppose the time-day-window is administered to be midnight to 4:00 AM. Suppose the system administrator runs "disable mg-return" at 1:30 in the morning. The main server would respond by blocking media gateway registrations from 1:30 AM to 1:59 AM. The server would again allow media gateway registrations starting at 2:00 AM, and let them continue to the end of the time-day-window at 4:00 AM.

The enable mg-return command only changes the behavior of the server that the command is run on. To that server, it doesn't make any difference whether the media gateways that might return, based on this command, are currently registered to an LSP or to an ESS or an to an ICC.

3.3. The entire group of IP network regions

When the "Force Phones and Gateways to Active LSPs" administration option is set, Communication Manager software attempts to prevent split registrations both when endpoints move to an LSP, and when they return from the LSP to the main server. All of the endpoints backed up by a single LSP are treated as a unit. Suppose an LSP was active, and the main server had put the IP network regions backed up by that LSP into auto-disabled state. If one media gateway re-registers to a main server, then the auto-disabled state ('ad' state) does not prevent media gateways in any of the IP network regions backed up by that LSP from re-registering to the main server. All of the IP network regions for which the LSP is administered under the IP network region's 'BACKUP SERVERS' heading will return together, as a group.

This 'entire group' behavior happens under the following circumstances

- The media gateways in one IP network region are manually allowed to register via the 'enable mg-return' command, as described in the previous section.
- The 'time-day-window' arrives for one media gateway.
- The LSP is unregistered from the main server, as described in the next section.

As stated in section 2.5 "Disable nr-registration and enable nr-registration" on page 15, if the LSP is active and the system administrator runs 'enable nr-registration' after having previously run 'disable nr-registration', the IP network region typed into the 'enable' command line is put into auto-disabled ('ad') state. The rest of the IP network regions in the group are likely already in this state.

When the first media gateway backed up by an LSP registers to the main server because the gateway's time-day-window has arrived, the main server sets a timer to expire near the end of the current hour. When that timer expires, the main server

checks whether any media gateways haven't registered. If any are found to be unregistered and the LSP is still registered, the IP network regions backed up by that LSP are then disabled again, forcing the endpoints in that group of IP network regions to unregister. They will likely register to the LSP again. They could re-register to the main server, if any of the conditions for return to main are currently satisfied at that time.

3.4. Return to main for unregistered LSP

If an LSP is unregistered, then the main server does not know whether the LSP is active or inactive. In this case, the main server will allow media gateways in the IP network regions for which the LSP is administered under the IP network region's 'BACKUP SERVERS' heading to re-register to the main server.

3.5. Return to main for H.323 phones

When there are no more media gateways registered to an LSP, i.e. all gateways on that LSP have recovered to the primary call server, the LSP automatically unregisters all H.323 phones registered to that LSP. This causes the H.323 phones to return to the primary call server. As is the case with failover from the main to the LSP, an H.323 phone does not change servers while the phone is on an active call. The phone waits until the user terminates the call, and then the phone registers with the main call server.

There may be no more media gateways registered to an LSP for these reasons:

- The media gateways re-registered to the main server, or
- The system administrator ran 'reset system' while logged into the LSP.
- While logged into the LSP, the system administrator ran "disable nr-registration" for all the IP network regions backed up by the LSP.

Note: This command should not be run via the LSP's administration terminal unless it is run against all the IP network regions which have gateways registered to the LSP. Otherwise, some H.323 phones would be unregistered by the LSP, but the LSP, still having some gateways registered, would continue to report "active" to the main server. The main server would react by leaving all the IP network regions backed up by that LSP in auto-disabled state. The H.323 phones would be unable to re-register to the main server, and be unable to register to the LSP. It is better to run "enable mg-return" on the main server.

H.323 phones can also return to the main server if they unregister from the LSP for some other reason besides being forced to unregister by the LSP. For example, the LAN connection between the H.323 phone and the LSP could temporarily fail and then recover. Under these and similar circumstances, the main server would allow the H.323 phones to re-register provided the IP network region is not currently disabled on the main server.

4. Design recommendations

If the customer does not want any split registrations, and if the "Force Phones and Gateways to Active LSPs" administration option is set, then follow these design recommendations.

- A group of media gateways should have adequate resources
- IP network regions should have a backup server
- The Media gateways' LSP entry should match the H.323 phones' LSP entry
- Gateways backed up by one LSP should use the same time-day-window
- Avoid time-day-windows that span multiple hours
- Don't put the ESS PE into an AGL or MGC list

4.1. A group of media gateways should have adequate resources

The media gateways backed up by a single LSP should have among them adequate trunks and VoIP resources for the phones in that group of IP network regions. If gateways lacking those resources were the only H.248 media gateways registered to an LSP, the LSP would accept H.323 phone registrations, but the phones would be unable to make trunk calls. A similar situation would happen if G650 gateways lacking those resources were the only port networks under the control of an ESS.

4.2. IP network regions should have a backup server

4.2.1. The ip-network-region screen

All IP network regions that contain H.323 phones should have a backup server, preferably an LSP, listed under BACKUP SERVERS (IN PRIORITY ORDER) on the ip-network-region screen. If someone chose not to put any backup servers into that list, the following would happen. If the system administrator were to run "disable nr-registration" against that IP network region, the H.323 phones would be unable to register to the main server. Having no other server to register to, they would continually try, once every 5 seconds, to re-register to the main server. The main server would have to continue interpreting those requests, but not accepting them. This isn't a good use of network bandwidth nor of the main server's processor.

The above wouldn't happen if the IP network region was backed up by an ESS or by gateways with Standard Local Survivability⁵ (SLS) administered. If a system administrator were to run "disable nr-registration" against that IP network region, the H.323 phones would register to one of those servers.

4.2.2. In DHCP

After a power failure, H.323 phones receive their initial gatekeeper list from DHCP, in a variable called MCIPADD¹¹. The option in DHCP can be modified per scope to send a different set of values. Scope 1 may be able to have a different LSP in it than Scope 2. Such a strategy uses the IP address of the closest LSP to the corresponding H.323 phones. Section "Creating a DHCP Scope for the IP Telephones" in the 9600 Series IP Telephones Administrator Guide¹² describes setting up the scope appropriately.

If the MCIPADD did not have an LSP and the main server were still without power, H.323 phones with current firmware loads would try forever to register to the main server. For these phone firmware loads, make sure the MCIPADD contains an LSP address. The H.323 phones try to register to every entry in the MCIPADD, so phones won't go directly to the LSP if forced off the main server by a power failure, but they will get there. Once there, they'll register to the LSP, and get an AGL from the LSP.

4.3. Media gateways' LSP entry should match phones' LSP entry

The one entry in the media gateway's mgc list that is below the Transition Point must match the one entry under the ip-network-region's BACKUP SERVERS (IN PRIORITY ORDER) heading. Here's why.

- It wouldn't make much sense to put CLANs under the BACKUP SERVERS (IN PRIORITY ORDER) heading on any ip-network-region screen. CLANs typically connect to the main server.
- The design recommendation in section 4.6 "Don't put the ESS PE into an AGL or MGC list" on page 23 means that the entries in both the H.323 phone's AGL and in the media gateway's mgc list won't be ESS Processor Ethernet interfaces.

The above two bullet items together mean the list, if it's not empty, should contain only LSP entries.

- Design recommendation 4.2 "IP network regions should have a backup server" on page 20 says the ip-network-region's will not be empty.

The above bullet items together mean the list, since it can't be empty, must contain only LSP entries.

- If "Force Phones and Gateways to Active LSPs" is set to Y, the IP network region can have at most one LSP listed under the backup servers heading, as stated in section 2.1 "Administering the feature" on page 6.

Putting the above bullet items together, the result is that the H.323 phones' list should contain a single entry, an LSP.

Here's what could happen if the media gateway's list contained more than that one LSP. Refer to "Figure 14 - One LSP per Servers List" on page 22.

1. Media gateway 1 is the only media gateway in IP network region 1.
2. The only entry under the BACKUP SERVERS' heading for IP network region 1 is LSP 1. The only entry under the BACKUP SERVERS' heading for IP network region 2 is LSP 2.
3. Media gateway 1 has both LSP 1 and LSP 2 in its mgc list.
4. Location-based ARS routing is administered so that H.323 phones in IP network region 1 can only use trunks on media gateway 1.
5. The network fails and then recovers. For some unlikely reason media gateway 1 fails to register with LSP 1. Media gateway 1 then registers to LSP 2. The H.323

phones in IP network region 1 stay registered to the main server, because the LSP for IP network region 1 is still inactive. However, they can no longer place trunk calls.

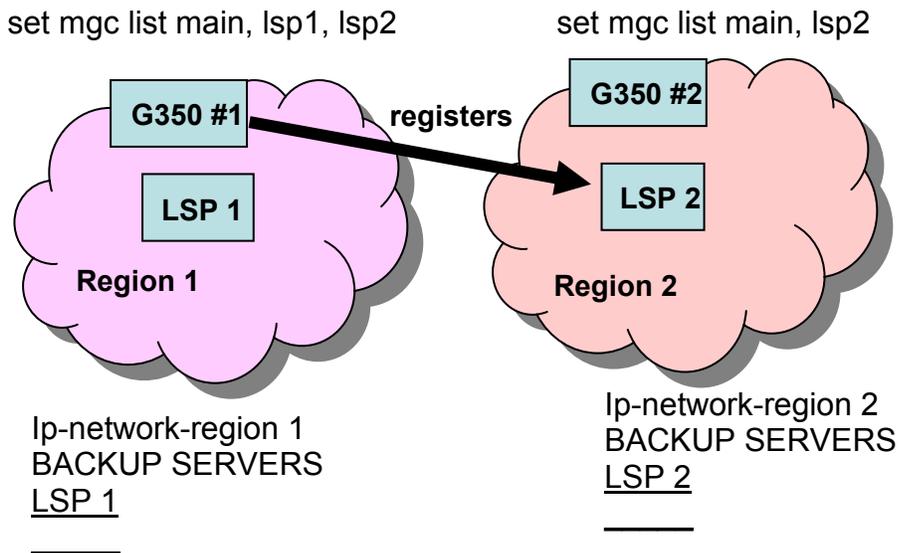


Figure 14 - One LSP per Servers List

The same kind of problem would happen if one were to do all of the following.

- Put one LSP in an ip-network-region's backup servers list.
- Put more than one LSP physically in the IP network region.
- Put those other LSPs in some media gateway's mgc list.

If someone made this particular mistake, the H.323 phones would all register to the one LSP listed in the ip-network-regions' backup servers list, while the media gateways could register to other LSPs. That would be a split registration.

4.4. Using the same time-day-window

As section 3.3 "The entire group of IP network regions" on page 18 says, if the "Force Phones and Gateways to Active LSPs" administration option is set, all media gateways backed up by the same LSP will return together to the main server. Proper configuration dictates that all media gateways backed up by the same LSP that are using time-day-window media gateway recovery rules should use the same rule. Communication Manager software will handle it if this recommendation is violated, but if the recovery rules varied people could easily become confused about what should happen.

4.5. Time-day-windows over multiple hours

As section 3.3 "The entire group of IP network regions" on page 18 says, while endpoints are returning to the main server, the software checks whether any media gateways haven't succeeded in returning by the end of each hour. If any are found to

be unregistered and the LSP is still registered, the IP network regions backed up by that LSP are then disabled, forcing the endpoints in that group of IP network regions off to the LSP again. If a time-day-window for allowing endpoints to return to the main server spanned multiple hours, the following could happen.

1. The time-day-window for returning to the main server arrives. All media gateways re-register to the main server, except for one media gateway that can't communicate with the main server. All the H.323 phones have permission to re-register to the main, but they stay on the LSP because the LSP doesn't unregister them. It's still active.
2. A few minutes before the end of the hour, the main server counts media gateways, notices that one is missing, and unregisters all the media gateways. They all re-register to the LSP.
3. A few minutes later, the next time-day-window for returning to the main server arrives. The cycle repeats itself, an hour later.

4.6. Don't put the ESS PE into an AGL or MGC list

If customers do not want any split registrations, not even split registrations between a main server and an ESS, system administrators should not put ESSs' processor Ethernet addresses into any H.323 phone's AGL or media gateway's mgc list. If they did so, there could be split registrations between the main server and the ESS. It's ok to put CLANs that might be controlled by the ESS into phones' AGLs. If an H.323 phone registers to a CLAN, the phone will be able to use trunks on same G650 port network that holds the CLAN.

The "Force Phones and Gateways to Active LSPs" administration option can be useful to handle split registrations between the ESS and LSPs. If customers want to use this option with an ESS, they would have to manually take care of any split registrations that might happen between the main server and the ESS.

If a media gateway registers to an ESS, that event will not cause the main server to force phones and media gateways off of the server. H.323 phones registered to the main server will no longer have access to that media gateway's resources. This is true even if the ESS is a S8400-based ESS with its Processor Ethernet enabled and without any port networks. Such a small ESS, backing up only one small branch, behaves very similarly to an LSP from a user's point of view, but the server software doesn't see it that way. It's still an ESS, not an LSP.

The "Force Phones and Gateways to Active LSPs" administration option works the same way on ESSs as it does on main servers. See the following diagram.

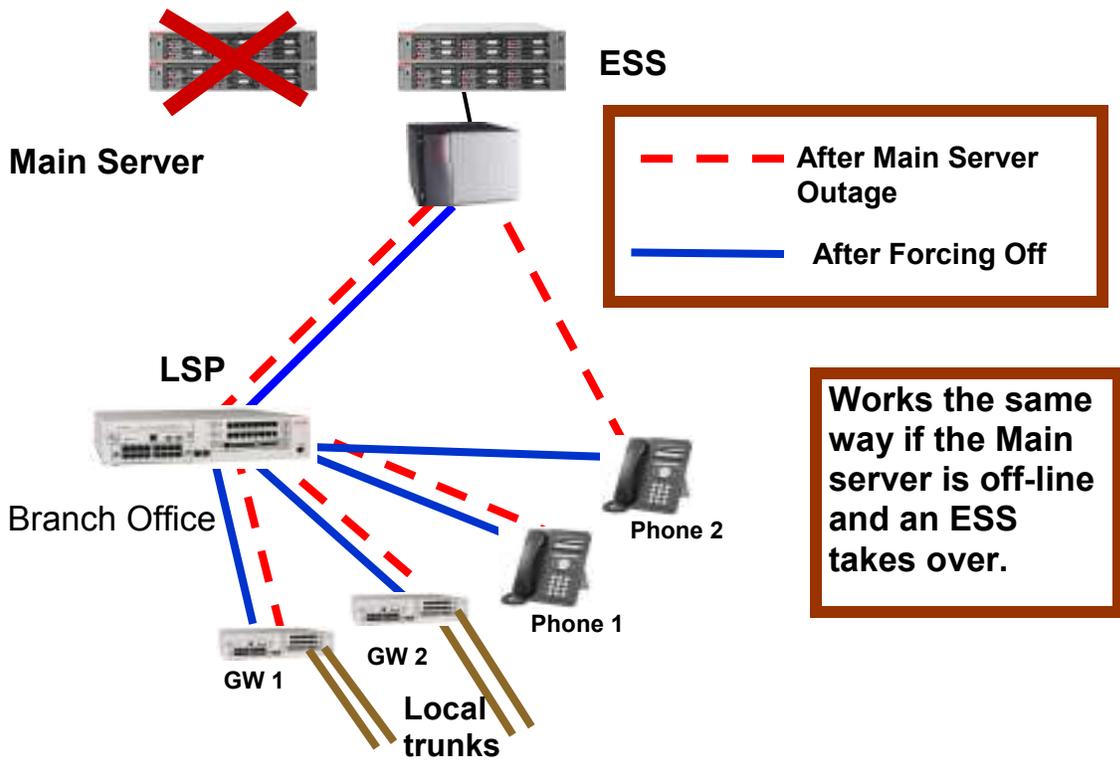


Figure 15 - ESS

After the main server is cut from the network, the endpoints may split between the ESS and the LSP. In the above figure, phone 2 is on the ESS, while gateway 1, gateway 2, and phone 1 are on the LSP. If the "Force Phones and Gateways to Active LSPs" field is set to Y, all of the following would apply, in the same way they do on a main server.

- The ESS allows LSPs to register to itself. The list survivable-processor command, when run on an ESS, shows the LSPs that are registered to the ESS.

```
list survivable-processor
```

SURVIVABLE PROCESSORS						
Name	Type	IP Address	Reg	Act	Translations Updated	Net Rgn
ESS-001	ESS S	22.2.2.21	n	y	13:57 3/2/2009	1
LSP-001	LSP	22.2.2.22	n			1

Figure 16 - List survivable-processor

However, Communication Manager software does not create new alarms on the ESS if some LSPs do not register to the ESS. In particular, ESSs do not raise "Error Type 257: no keep-alive signal from an LSP" against maintenance object SP-REG-M (Survivable Processor Registrations to Main) on an ESS. An ESS is not a main server. It is likely that if an LSP is not registered to the ESS, the LSP is registered to the main server or to another ESS. The ESS does not alarm this.

- If a gateway ever registers to the LSP, the LSP reports 'active' to the ESS.
- The ESS responds by forcing all the H.323 phones and H.248 media gateways backed up by that LSP to unregister. They then register to the LSP.

- The commands "list media-gateway", "display media-gateway", and "status media-gateways", when run on the ESS, show the auto-disabled (ad) or auto-disabled but pending re-registration to the ESS (ap) states.
- Media gateways can return from the LSP to ESS when any of the following conditions are true.
 - The system administrator runs "enable mg-return" on the ESS,
 - OR
 - The day and time arrives for the administered "Migrate H.248 MG to primary" time-day-window for one of the gateways.
 - OR
 - The LSP unregisters from the ESS.

Even though all of the above works, for customers who do not want any split registrations it can be better not to put ESSs' processor Ethernet addresses into H.323 phones' AGLs or media gateways' mgc lists. Consider the following example. Suppose a network has one main server, one S85xx based ESS backing up the entire network, and lots of LSPs: one LSP in each branch. The network does not use any CLANs; instead the Processor Ethernet interfaces on the servers are all enabled. All media gateways and H.323 phones are registered through those. The scenario goes as follows.

- 1) All media gateways and H.323 phones are registered to the main server.
- 2) The wire connecting the main server's PE to the LAN accidentally gets cut.
- 3) All the H.323 phones and all the media gateways register to the ESS's PE.
- 4) The Ethernet connection from the ESS to the network goes down temporarily.
- 5) One gateway registers to the LSP.
- 6) The Ethernet connection from the ESS to the network restores.
- 7) The other media gateways and H.323 phones re-register to the ESS.

The "Force Phones and Gateways to Active LSPs" administration option works on ESSs. Does this mean all the media gateways and H.323 phones will soon move to the LSPs? No, it doesn't happen. Why not? The reason is that the option only applies if the LSPs can report to the ESS that the LSPs have gone active. It is true that LSPs are now allowed to register to ESSs, but for this scenario there isn't any way the LSPs can use that permission. The list of servers that LSPs use to try to register to doesn't contain the ESS PE. The list only contains the main server's PE. Ordinarily the list would contain CLANs too, in port networks connected to the ESS, but in this example the network did not have any CLANs.

5. Conclusion

Communication Manager software has features for handling split registrations. The "Force Phones and Gateways to Active LSPs" administration option handles split registrations between a main server and LSPs, or split registrations between an ESS and LSPs. The option does not handle split registrations between a main server and an ESS. The Immediate Auto fallback to primary controller option for H.248 media gateways handles split registrations between any types of servers, including between a main server and an ESS.

©2009 Avaya Inc. All Rights Reserved.

Avaya and the Avaya Logo are trademarks of Avaya Inc. All trademarks identified by ® and ™ are registered trademarks or trademarks, respectively, of Avaya Inc. All other trademarks are the property of their respective owners. While reasonable efforts were made to ensure that the information in this document was complete and accurate at the time of printing, Avaya Inc. can assume no liability for any errors. The information provided in this document is subject to change without notice. The configurations, technical data, and recommendations provided in this white paper are believed to be accurate and dependable, but are presented without express or implied warranty. Users are responsible for their application of any products specified in this document.

6. Additional References

- ¹ Avaya one-X™ Deskphone Edition for 9600 Series IP Telephones Administrator Guide Release 2.0 16-300698 Issue 5 May 2008, http://support.avaya.com/elmodocs2/one-X_Deskphone_Edition/R2.0/16_300698_5.pdf
- ² Avaya one-X™ Deskphone Edition for 9600 Series IP Telephones Installation and Maintenance Guide Release 2.0 16-300694 Issue 6 May 2009, http://support.avaya.com/elmodocs2/9670G/16-300694_6.pdf
- ³ Administrable Alternate Gatekeeper List for IP Endpoints using Avaya Communication Manager – Issue 1.0, Avaya Solution & Interoperability Test Lab, 07/07/2008, <https://avaya.com/master-usa/en-us/resource/assets/applicationnotes/ALT-GK.pdf>
- ⁴ Configuring Avaya Media Servers as Local Survivable Processors for Avaya Media Gateways and Standard Local Survivability on Avaya G250 Media Gateway – Issue 1.0, Avaya Solution & Interoperability Test Lab, 4/13/06, <https://avaya.com/master-usa/en-us/resource/assets/applicationnotes/lsp-sls.pdf>
- ⁵ Administration of the Avaya G350 Media Gateway, 555-245-501, Issue 3, January 2005, http://support.avaya.com/elmodocs2/comm_mgr/r2_2/pdfs/245501_3.pdf
- ⁶ Administration for the Avaya G250 and Avaya G350 Media Gateways, 03-300436, Issue 1, June 2005, http://support.avaya.com/elmodocs2/comm_mgr/r3/pdfs/03_300436_1.pdf
- ⁷ Avaya G700 Media Gateway CLI Reference 03-602563 Issue 1 January 2008, http://support.avaya.com/elmodocs2/comm_mgr/r5.0/03-602563_1.pdf
- ⁸ Maintenance Commands for Avaya Communication Manager, Media Gateways and Servers 03-300431 Issue 4 January 2008, http://support.avaya.com/elmodocs2/comm_mgr/r5.0/03-300431_4.pdf
- ⁹ Administration for Network Connectivity for Avaya Communication Manager 555-233-504 Issue 13 January 2008, http://support.avaya.com/elmodocs2/comm_mgr/r5.0/233504_13.pdf
- ¹⁰ Avaya Communication Manager Network Region Configuration Guide, Communication Manager 3.0 Avaya Labs, Application Note, October 2005, http://support.avaya.com/elmodocs2/comm_mgr/r3/netw-region-tutorial-cm30-1005.pdf
- ¹¹ Avaya Solution & Interoperability Test Lab, Configuring DHCP and TFTP Servers On Avaya G350 and G250 Media Gateways for Avaya IP 4600 Series Telephones - Issue 1.0, 4/18/2005, <http://www.avaya.com/master-usa/en-us/resource/assets/applicationnotes/gw-dhcp-tftp.pdf>
- ¹² Avaya one-X™ Deskphone Edition for 9600 Series IP Telephones Administrator Guide Release 1.1 16-300698 Issue 2 September 2006, support.avaya.com/elmodocs2/one-X_Deskphone_Edition/16_300698_2.pdf