



Cisco Expressway Cluster Creation and Maintenance

Deployment Guide

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Cisco Expressway X8.7

Introduction

Cisco Expressway (Expressway) clusters are designed to extend the resilience and capacity of an Expressway installation. Expressway peers in a cluster share bandwidth usage as well as routing, zone and other configuration among themselves.

Call licensing is carried out on a per-cluster basis. Any call licenses that have been installed on a cluster peer are available for use by any peer within the cluster. If a cluster peer becomes unavailable, the call licenses installed on that peer will remain available to the rest of the cluster peers for two weeks from the time the cluster lost contact with the peer. This will maintain the overall license capacity of the cluster – however, note that each peer is limited by its physical capacity.

Every Expressway peer in the cluster must have the same routing capabilities – if any Expressway can route a call to a destination it is assumed that all Expressway peers in that cluster can route a call to that destination. If the routing is different on different Expressway peers, then separate Expressways / Expressway clusters must be used.

This guide describes how to create and maintain Expressway clusters. It provides information on:

- [Create a New Cluster of Expressway Peers, page 8](#)
- [Add a Peer to a Cluster, page 11](#)
- [Peer-Specific Items , page 15](#)
- [Remove a Live Peer From a Cluster \(Permanently\), page 18](#)
- [Remove a Dead Peer From a Cluster \(Permanently\), page 20](#)
- [Disband a Cluster, page 22](#)
- [Change the Primary Peer, page 24](#)
- [Change the IP address of a Peer, page 25](#)
- [Replace a Peer, page 26](#)

Prerequisites

Before setting up a cluster of X8.7 Expressway peers or adding an X8.7 Expressway to a cluster, ensure that:

Platform and Software Versions Match

- All clusters peers are running the same version of code. The only occasion where different peers are allowed to run different versions of code is for the short period of time while a cluster is being upgraded from one version of code to another, during which time the cluster will operate in a partitioned fashion.
- Each peer is using a hardware platform (appliance or virtual machine) with equivalent capabilities; for example, you can cluster peers that are running on standard appliances with peers running on 2 core Medium VMs, but you cannot cluster a peer running on a standard appliance with peers running on 8 core Large VMs.

Network Conditions Are Met

- Each peer has a different LAN configuration (a different IPv4 address and a different IPv6 address, where enabled).
- Each peer in a cluster is within a 15ms hop (30ms round trip delay) of each and every other Expressway in or to be added to the cluster.
- Each peer in a cluster is directly routable to each and every other Expressway in or to be added to the cluster. (There must be no NAT between cluster peers - if there is a firewall ensure that the required ports are opened.)

Basic Configuration Is Done

- Each peer has a different system name.
- All peers have the same set of option keys installed:
 - The number of call license keys may be different on different peers; all other license keys must be identical on each peer.
 - The Expressway must be restarted after installing some option keys in order to fully activate them.
- H.323 mode is enabled on each peer (**Configuration > Protocols > H.323**, and for **H.323 mode** select *On*).
The cluster uses H.323 signaling between peers to determine the best route for calls, even if all endpoints are SIP endpoints.

DNS Configuration is Done

- The DNS servers used by the Expressway peers must support both forward and reverse DNS lookups of all Expressway peer addresses; the DNS servers must also provide address lookup for any other DNS functionality required, such as:
 - NTP servers or the external manager if they configured using DNS names
 - Microsoft Lync Server FQDN lookup
 - LDAP server forward and reverse lookup (reverse lookups are frequently provided through PTR records)

Note: DNS server configuration does not replicate and you must configure the DNS server address on each peer.

- A DNS SRV record is available for the cluster which contains A or AAAA records for each peer of the cluster.
This configuration is advised for video interoperability and business to business (B2B) video calling, but is **not required for Mobile and Remote Access**.
- (For MRA) Create a `collab-edge` SRV record for each peer in the Expressway-E cluster
- (For B2B only) The Expressway-E cluster has a DNS SRV record that defines all cluster peers

Upgrade an X8.n Cluster to X8.7

This procedure describes how to upgrade an existing X8.n cluster to X8.7.

When you select an upgrade window:

- Choose a period of low activity
- Allow time to upgrade all peers in the same window. The cluster will not reform correctly until the software versions match on all peers

Prerequisites

For each Expressway peer (including the primary), check the **Alarms** page (**Status > Alarms**) and ensure that all alarms are acted upon and cleared.

Upgrade Expressway Cluster Peers to X8.7

Note: To avoid the risk of configuration data being lost, in addition to maintaining service continuity, it is important that you follow the upgrade instructions in the order specified here. In summary, we recommend that you:

1. Upgrade and restart the primary peer first.
2. Upgrade the other subordinate peers and then restart them one at a time.

Full instructions are provided below.

Upgrade the Primary Peer

1. Log in to the primary peer as admin on the web interface.
2. Backup the Expressway (**Maintenance > Backup and restore**).
You should backup your system before upgrading. If at a later date you need to downgrade to an earlier version, to restore the configuration you will need to restore a backup made against that previous release.
3. Enable maintenance mode:
 - a. Go to **Maintenance > Maintenance mode**.
 - b. Set **Maintenance mode** to *On*.
 - c. Click **Save** and click **OK** on the confirmation dialog.
This will stop the primary peer processing any new calls (existing calls will be dropped only if a restart occurs; other cluster peers will continue processing calls)
4. Wait for all calls to clear on this peer.
If necessary, manually remove any calls on this peer that do not clear automatically (using the web browser go to **Status > Calls**, then select the check box next to the calls you want to terminate and click **Disconnect**).
5. Upgrade and restart the primary Expressway (**Maintenance > Upgrade**).
For any further details see the "Upgrading Software" section of *Expressway Administrator Guide*.
Note that the web browser interface may timeout during the restart process, after the progress bar has reached the end. This may occur if Expressway carries out a disk file system check - which it does approximately once every 30 restarts, or if it has not checked its disks in the last 6 months.

Upgrading of the software on the primary Expressway is now complete.

Cluster-related alarms

You can ignore any cluster-related alarms that occur during the upgrade process, for example:

- "Cluster communication failure" alarm on the primary or any subordinate peers - this is expected.
- "Cluster replication error: cannot find master or this slave's peer configuration file, manual synchronization of configuration is required"

These alarms and warnings are expected and will clear when all cluster peers are upgraded and cluster data synchronization has occurred (they should clear within 10 minutes of the complete upgrade).

On the Primary Expressway Peer:

1. Check that configuration data exists as expected (**System**, **Configuration** and **Application** menus).
2. Backup the Expressway (**Maintenance > Backup and restore**).

Note: While Expressway peers are running different versions of code, do not make any changes except what you need to do to upgrade. The cluster does not replicate changes to any peers that are on different versions to the primary Expressway.

Upgrade Subordinate Peers

You can ignore any cluster-related alarms that occur during the upgrade process - these are expected.

1. Log in to the subordinate peer as admin on the web interface.
2. Backup the Expressway (**Maintenance > Backup and restore**).

You should backup your system before upgrading. If at a later date you need to downgrade to an earlier version, to restore the configuration you will need to restore a backup made against that previous release.

3. Enable maintenance mode:
 - a. Go to **Maintenance > Maintenance mode**.
 - b. Set **Maintenance mode** to *On*.
 - c. Click **Save** and click **OK** on the confirmation dialog.
4. Wait for all calls to clear on this peer.

If necessary, manually remove any calls on this peer that do not clear automatically (using the web browser go to **Status > Calls**, then select the check box next to the calls you want to terminate and click **Disconnect**).

5. Upgrade and restart the Expressway (**Maintenance > Upgrade**).

If multiple peers need restarting: restart each peer in turn, waiting for the peer to be accessible through the web interface before restarting the next peer.

For any further details see the "Upgrading Software" section of *Expressway Administrator Guide*.

Note that the web browser interface may timeout during the restart process, after the progress bar has reached the end. This may occur if Expressway carries out a disk file system check - which it does approximately once every 30 restarts, or if it has not checked its disks in the last 6 months.

Upgrading the software on this subordinate Expressway peer is now complete.

Cluster-related alarms

You can ignore any cluster-related alarms that occur during the upgrade process, for example:

- "Cluster communication failure" alarm on the primary or any subordinate peers - this is expected.
- "Cluster replication error: cannot find master or this slave's peer configuration file, manual synchronization of configuration is required"

These alarms and warnings are expected and will clear when all cluster peers are upgraded and cluster data synchronization has occurred (they should clear within 10 minutes of the complete upgrade).

On this subordinate Expressway peer:

1. Go to **Status > Alarms** and ensure that all alarms are acted upon and cleared.
2. Check that configuration data exists as expected (**System**, **Configuration** and **Application** menus).
3. Repeat these steps for each subordinate peer.

Check Cluster Status

Do this after you have completed upgrading all peers .

On each Expressway (including the primary), go to **System > Clustering** and check that the cluster database status reports as Active.

Your cluster is now upgraded to X8.7.

Create a New Cluster of Expressway Peers

Note: This procedure requires a period of downtime for the Expressway service. Ensure that these instructions are followed in a scheduled maintenance window.

Process Summary

This process initiates a cluster of a single Expressway. Do not use this process if the cluster already exists.

To complete the cluster containing multiple Expressways, when this section is complete, follow the instructions in [Add a Peer to a Cluster, page 11](#) to add the subordinate peers to the cluster.

Prerequisites

- If a firewall exists between cluster peers, it must be configured to permit the traffic documented in [Appendix 2: IP Ports and Protocols, page 29](#).
- All Expressways to be included in the cluster must be running the same version (X8.7) of Expressway software.

Configure the Primary Peer

This process sets up the first (primary) peer of this new cluster - additional peers are added afterwards using the [Add a Peer to a Cluster, page 11](#) process.

Before proceeding, the Expressway that will be the primary must be determined. The primary Expressway will be the source of the configuration information for all Expressway peers in the cluster. Subordinate Expressway peers will have their configuration deleted and replaced by that from the primary.

On other Expressways:

Check that no other Expressway (anywhere in the organization) has this Expressway's IP address in its clustering peers list.

On this primary Expressway:

1. Check that the Expressway is running X8.7 software.
2. Backup the Expressway (**Maintenance > Backup and restore**).
3. Using the web interface, review the configuration to ensure that the Expressway has:
 - A valid Ethernet speed (**System > Network interfaces > Ethernet**).
 - Valid IP address and IP gateway (**System > Network interfaces > IP**).
 - The same set of option keys installed as those that will be installed on all other peers of the cluster (**Maintenance > Option keys**).

Note that the number of call license keys may be different on different peers; all other license keys must be identical on each peer.

- At least one valid DNS server configured, and that if unqualified DNS names are used elsewhere (e.g. for the NTP server), that the correct **Domain name** is also configured (**Domain name** is added as a suffix to an unqualified DNS name to make it into an FQDN) (**System > DNS**).
- A valid and working NTP server configured (**System > Time**; in the Status section, the State should be "Synchronized").
- No peers configured (**System > Clustering** - all Peer x IP address fields on this page should be blank. If not, delete any entries and click **Save**).
- **H.323 Mode** set to *On* (**Configuration > Protocols > H.323**)

4. Ensure that this Expressway does not list any of the Expressways that are to be peers in this new cluster in any of its neighbor zones or traversal zones (**Configuration > Zones > Zones** then check each neighbor and traversal zone).
5. Go to **System > DNS** and ensure that **System host name** is the DNS hostname for this Expressway (typically the same as the **System name** in **System > Administration**, but excluding spaces, and unique for each Expressway in the cluster). If it is not configured correctly, set it up appropriately and click **Save**.
Note: <System host name>.<DNS domain name> = FQDN of this Expressway
6. Go to **Configuration > Call routing** and set **Call signaling optimization** to *On*.
7. Click **Save**.
8. Enable maintenance mode:

- a. Go to **Maintenance > Maintenance mode**.
- b. Set **Maintenance mode** to *On*.
- c. Click **Save** and click **OK** on the confirmation dialog.

9. Wait for all calls to clear on this peer.
If necessary, manually remove any calls on this peer that do not clear automatically (using the web browser go to **Status > Calls**, then select the check box next to the calls you want to terminate and click **Disconnect**).
10. (Not applicable to MRA) Go to **System > Clustering** and ensure that **Cluster name** is the routable Fully Qualified Domain Name used in SRV records that address this Expressway cluster, for example `cluster1.example.com`. (See [Appendix 3: Cluster Name and DNS SRV Records, page 30](#)).
Change the **Cluster name** if necessary.

11. Click **Save**.
12. On the **Clustering** page configure the fields as follows:

Configuration master	1
Cluster pre-shared key	Enter a password (any characters)
Peer 1 IP address	Set to the IP address of this (the primary peer) Expressway

Note: If the Expressway has advanced networking, the **Peer IP address** MUST specify the LAN 1 interface address. Also, this interface must not have NAT enabled on it.

13. Click **Save**.
To the right of the **Peer 1 IP address** field the words “**This system**” should appear (though this may require the page to be refreshed before they appear).
14. Restart the Expressway (go to **Maintenance > Restart options**, then click **Restart** and confirm **OK**).

After the restart, on the primary Expressway web interface:

1. Check that configuration data exists as expected (**System**, **Configuration** and **Application** menus).
2. Backup the Expressway (**Maintenance > Backup and restore**).

On other devices:

If you have any other Expressways neighbored (or connected via a traversal zone) to this primary Expressway peer, ensure that their zone configuration for this cluster is updated to only include the address of this primary Expressway.

On this primary Expressway peer:

1. Log in to the web browser of this Expressway.
2. Go to **Status > Alarms**.
If there is an alarm that the Expressway must be restarted, go to **Maintenance > Restart options** and then click **Restart**.
3. If the Expressway did not need to be restarted, ensure that maintenance mode is disabled.
 - a. Go to **Maintenance > Maintenance mode**.
 - b. Set **Maintenance mode** to *Off*.
 - c. Click **Save**.

Next Steps

Go to **Status > Alarms** and ensure that all alarms are acted upon and cleared.

The setup of the new cluster (of one Expressway) is complete; add other Expressways to the cluster using [Add a Peer to a Cluster, page 11](#).

If Microsoft Lync is to be connected to this cluster, see [Appendix 5: Impact of Clustering on Other Expressway Applications, page 35](#).

Add a Peer to a Cluster

Follow this process if you have an existing X8.7 cluster (of one or more peers) to which you want to add another Expressway peer. If you do not have an existing cluster, following the instructions in the section [Create a New Cluster of Expressway Peers](#), page 8.

This process will add an X8.7 Expressway to the cluster and replicate the cluster primary's configuration onto that Expressway. Note that:

- You can have up to 6 Expressways, including the primary Expressway, in a cluster.
- Only one Expressway must be added to the cluster at a time.

You should only make configuration changes on the primary Expressway.

Caution: Do not adjust any cluster-wide configuration until the cluster is stable with all peers running. Cluster database replication will be negatively impacted if any peers are upgrading, restarting, or out of service when you change the cluster's configuration.

Any changes made on other peers are not reflected across the cluster, and will be overwritten the next time the primary's configuration is replicated across the peers. The only exceptions to this are some [peer-specific configuration items](#).

You may need to wait up to one minute before changes are updated across all peers in the cluster.

Prerequisites

All Expressways to be included in the cluster must be running the same version (X8.7) of Expressway software.

Add the New Peer

On the primary Expressway:

Ensure that the primary Expressway does not list this new Expressway peer in any of its neighbor zones or traversal zones (**Configuration > Zones > Zones**).

Note: The primary Expressway will be the source of the configuration for this new Expressway peer and all other Expressway peers in the cluster. When an Expressway is added to the cluster, its configuration will be deleted and replaced by that from the primary.

On the Expressway to be added to the cluster:

1. Check that no other Expressway (anywhere in the organization) has this Expressway's IP address in its clustering peers list.
2. Backup the Expressway (**Maintenance > Backup and restore**).

3. Using the web interface, review the configuration to ensure that the Expressway has:
 - A valid Ethernet speed (**System > Network interfaces > Ethernet**).
 - Valid IP address and IP gateway (**System > Network interfaces > IP**).
 - The same set of option keys installed as those that will be installed on all other peers of the cluster (**Maintenance > Option keys**).

Note that the number of call license keys may be different on different peers; all other license keys must be identical on each peer.
 - At least one valid DNS server configured, and that if unqualified DNS names are used elsewhere (e.g. for the NTP server), that the correct **Domain name** is also configured (**Domain name** is added as a suffix to an unqualified DNS name to make it into an FQDN) (**System > DNS**).
 - A valid and working NTP server configured (**System > Time**; in the Status section, the State should be "Synchronized").
 - No peers configured (**System > Clustering** - all Peer x IP address fields on this page should be blank. If not, delete any entries and click **Save**).
 - **H.323 Mode** set to *On* (**Configuration > Protocols > H.323**)

Go to **Status > Alarms**. If there is an alarm that the Expressway must be restarted, go to **Maintenance > Restart options** and then click **Restart**.

If multiple peers need restarting: restart each peer in turn, waiting for the peer to be accessible through the web interface before restarting the next peer.

1. Enable maintenance mode:
 - a. Go to **Maintenance > Maintenance mode**.
 - b. Set **Maintenance mode** to *On*.
 - c. Click **Save** and click **OK** on the confirmation dialog.
2. Wait for all calls to clear on this peer.

If necessary, manually remove any calls on this peer that do not clear automatically (using the web browser go to **Status > Calls**, then select the check box next to the calls you want to terminate and click **Disconnect**).

On the primary Expressway:

1. Go to **System > Clustering**.

One or more of the **Peer x IP address** fields should be empty.
2. In the first empty field, enter the IP address of the new Expressway peer.

Note:

- Only one Expressway must be added to the cluster at a time (repeat the whole process if multiple Expressway peers are being added).
- If the new Expressway peer has advanced networking, the Peer IP address MUST specify the LAN 1 interface address - also this interface must not have NAT enabled on it.

3. Click **Save**.

Peer 1 should indicate 'This system'. The new peer may indicate 'Unknown' and then with a refresh should indicate 'Failed' as the Expressway is not completely added to the cluster.

Note:

- A cluster communication failure alarm will be raised on the primary and on other peers already in the cluster advising that this new Expressway peer is not communicating - this will clear later.
- Cluster configuration replication is suspended at this point until the new Expressway has been completely added. Any changes made to the configuration of the cluster will not be replicated until this Expressway has been completely added.

On every other subordinate Expressway already in the cluster (not the Expressway being added):

1. Go to **System > Clustering** and configure the fields as follows:

Cluster name	Identical to the Cluster name configured on the primary Expressway
Cluster pre-shared key	Identical to that configured on the primary Expressway
Configuration master	Identical to that configured on the primary Expressway
Peer 1 IP address ...Peer 6 IP address	Identical to those configured on the primary Expressway

2. Click **Save**.

On the additional subordinate Expressway being added to the cluster:

1. Log in as admin on an SSH or other CLI interface. At the Expressway command prompt, type:

```
xcommand DefaultValueSet Level: 2
xcommand DefaultLinksAdd
```

Note: This command removes any LDAP authentication configuration - ensure that you have the web admin password before executing this command.

2. Go to **Users > Administrator accounts**.

3. Delete all entries except the default admin account.

4. Go to **System > DNS** and ensure that **System host name** is the DNS hostname for this Expressway (typically the same as the **System name** in **System > Administration**, but excluding spaces, and unique for each Expressway in the cluster). If it is not configured correctly, set it up appropriately and click **Save**.

Note: <System host name>.<DNS domain name> = FQDN of this Expressway

5. Go to **System > Clustering** and configure the fields as follows:

Cluster name	Identical to the Cluster name configured on the primary Expressway
Cluster pre-shared key	Identical to that configured on the primary Expressway
Configuration master	Identical to that configured on the primary Expressway
Peer 1 IP address ...Peer 6 IP address	Identical to those configured on the primary Expressway

6. Click **Save**.

Note that a cluster communication failure alarm will be raised on this Expressway peer advising that this new Expressway is not communicating - this will clear after the restart.

7. Restart the Expressway (go to **Maintenance > Restart options**, then click **Restart** and confirm **OK**).
If multiple peers need restarting: restart each peer in turn, waiting for the peer to be accessible through the web interface before restarting the next peer.
8. After the restart, wait approximately 2 minutes - this is the frequency with which configuration is copied from the primary.
9. Go to **Status > Alarms**. If there is an alarm that the Expressway must be restarted, go to **Maintenance > Restart options** and then click **Restart**.
If multiple peers need restarting: restart each peer in turn, waiting for the peer to be accessible through the web interface before restarting the next peer.
10. Check that configuration data exists as expected (**System, Configuration** and **Application** menus).

On other devices:

If you have any other Expressways neighbored (or connected via a traversal zone) to this cluster of Expressway peers, ensure that their zone configuration for this cluster is updated to include the address of this new peer.

On each Expressway peer (including the primary and this new Expressway peer):

Go to **Status > Alarms**. If there is an alarm that the Expressway must be restarted, go to **Maintenance > Restart options** and then click **Restart**.

If multiple peers need restarting: restart each peer in turn, waiting for the peer to be accessible through the web interface before restarting the next peer.

Check Replication Status

It can take 5 or more minutes before Expressway reports the successful status. If problems are seen, refresh the screen after waiting 5 minutes.

Go to **System > Clustering** and check that the cluster database status reports as Active.

Next Steps

If the cluster has non-default trusted CA certificate and / or non default server certificate ensure that the added peer is configured with the required trusted CA certificate and an appropriate server certificate.

Adding an X8.7 Expressway to an Expressway X8.7 cluster is now complete.

Peer-Specific Items

Most items of configuration are applied via the primary peer to all peers in a cluster. However, the following items (marked with a † on the web interface) must be specified separately on each cluster peer.

Note: You should not modify configuration data that applies to all peers on any peer other than the primary peer. At best it will result in the changes being overwritten from the primary; at worst it will cause cluster replication to fail.

Cluster configuration (System > Clustering)

The list of **Peer IP addresses** (including the peer's own IP address) that make up the cluster has to be specified on each peer and they must be identical on each peer.

The **Cluster name** and **Cluster pre-shared key** have to be specified on each peer and must be identical for all peers.

Ethernet speed (System > Network interfaces > Ethernet)

The **Ethernet speed** is specific to each peer. Each peer may have slightly different requirements for the connection to their Ethernet switch.

IP configuration (System > Network interfaces > IP)

LAN configuration is specific to each peer.

- Each peer must have a different **IPv4 address** and a different **IPv6 address**.
- **IP gateway** configuration is peer-specific. Each peer can use a different gateway.

Note that the IP protocol is applied to all peers, because each peer must support the same protocols.

IP static routes (System > Network interfaces > Static routes)

Any static routes you add are peer-specific and you may create different routes on different peers if required. If you want all peers in the cluster to be able to use the same static route, you must create the route on each peer.

System name (System > Administration)

The **System name** must be different for each peer in the cluster.

DNS servers and DNS host name (System > DNS)

DNS servers are specific to each peer. Each peer can use a different set of DNS servers.

The **System host name** and **Domain name** are specific to each peer.

NTP servers and time zone (System > Time)

The **NTP servers** are specific to each peer. Each peer may use one or more different NTP servers.

The **Time zone** is specific to each peer. Each peer may have a different local time.

SNMP (System > SNMP)

SNMP settings are specific to each peer. They can be different for each peer.

Logging (Maintenance > Logging)

The Event Log and Configuration Log on each peer only report activity for that particular Expressway. The **Log level** and the list of **Remote syslog servers** are specific to each peer. We recommend that you set up a remote syslog server to which the logs of all peers can be sent. This allows you to have a global view of activity across all peers in the cluster.

Security certificates (Maintenance > Security certificates)

The trusted CA certificate, server certificate and certificate revocation lists (CRLs) used by the Expressway must be uploaded individually per peer.

Administration access (System > Administration)

The following system administration access settings are specific to each peer:

- Serial port / console
- SSH service
- Web interface (over HTTPS)
- Redirect HTTP requests to HTTPS
- Automated protection service

Option keys (Maintenance > Option keys)

Option keys are specific to each peer. Each peer must have an identical set of option keys installed, but you must purchase these separately for each peer in the cluster. However, this does not apply to rich media session and TURN relay licenses; these licenses can be installed on any cluster peer and are available for use by any peer in the cluster.

Neighboring Between Expressway Clusters

You can neighbor your local Expressway (or Expressway cluster) to a remote Expressway cluster; this remote cluster could be a neighbor, traversal client, or traversal server to your local Expressway. In this case, when a call is received on your local Expressway and is passed via the relevant zone to the remote cluster, it will be routed to whichever peer in that neighboring cluster has the lowest resource usage. That peer will then forward the call as appropriate to one of its external zones.

Lowest resource usage is determined by comparing the number of available media sessions (maximum - current use) on the peers, and choosing the peer with the highest number. Peers that are in maintenance mode are not considered.

When configuring a connection to a remote cluster, you create a single zone and configure it with details of all the peers in the cluster. Adding this information to the zone ensures that the call is passed to that cluster regardless of the status of the individual peers.

You also need to enter the IP address of all peers in the remote cluster when the connection is via a **neighbor** or **traversal client** zone. You do not do this for **traversal server** zones, as these connections are not configured by specifying the remote system's IP address.

Note: Systems that are configured as peers must **not** also be configured as neighbors to each other, and vice versa.

Neighboring your clusters

To neighbor your local Expressway (or Expressway cluster) to a remote Expressway cluster, you create a single zone to represent the cluster and configure it with the details of all the peers in that cluster:

1. On your local Expressway (or, if the local Expressway is a cluster, on the primary peer), create a zone of the appropriate type. This zone will represent the connection to the cluster.
2. In the **Location** section, enter the IP address or FQDN of each peer in the remote cluster in the **Peer 1** to **Peer 6** address fields.

Note that:

- Ideally you should use IP addresses in these fields. If you use FQDNs instead, each FQDN must be different and must resolve to a single IP address for each peer.
- The order in which the peers in the remote Expressway cluster are listed here does not matter.
- Whenever you add an extra Expressway to a cluster (to increase capacity or improve redundancy, for example) you will need to modify any Expressways which neighbor to that cluster to let them know about the new cluster peer.

Remove a Live Peer From a Cluster (Permanently)

This process removes one Expressway peer from an existing cluster. Configuration replication to this Expressway will be stopped and the Expressway will no longer be included in the list of peers in the cluster.

- If the whole cluster is to be disbanded then use the [Disband a Cluster, page 22](#) procedure instead.
- If the cluster peer to be removed is not accessible, use the procedure defined in [Remove a Dead Peer From a Cluster \(Permanently\), page 20](#).

Before starting:

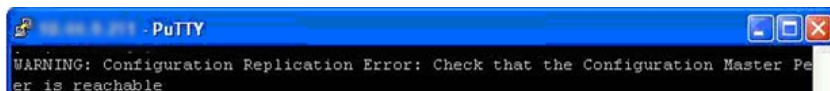
1. Ensure that the Expressway to be removed from the cluster is not indicated as the primary peer. If it is the primary, see [Change the Primary Peer, page 24](#) for instructions.

On the Expressway that is being removed:

1. Log into the web interface.
2. Go to **System > Clustering**:
 - a. Change the **Cluster name** to a unique ID for this Expressway (ideally to the routable Fully Qualified Domain Name used in SRV records that address this individual Expressway, for example "expe1.example.com". See [Appendix 3: Cluster Name and DNS SRV Records, page 30](#).)
 - b. Delete the **Cluster pre-shared key**.
 - c. Delete all entries in the **Peer x IP address** fields.
3. Click **Save**.

Note that:

- An alarm similar to that shown below may appear on the web interface and CLI of the Expressway being removed. This is not a problem, the alarm will be cleared when the Expressway is restarted:



4. If Microsoft Lync B2BUA was used in the cluster:
 - a. Go to **Applications > B2BUA > Microsoft Lync > Configuration**.
 - b. If **Microsoft Lync B2BUA** is *Enabled*, change it to *Disabled* and click **Save**.
5. Restart the Expressway (go to **Maintenance > Restart options**, then click **Restart** and confirm **OK**).

On the primary Expressway:

1. Go to **System > Clustering**.
2. Delete the IP address of the Expressway that has been removed.
3. If the Expressway being removed is not the last field in the list, move any other IP addresses up the list so that there are no empty fields between entries.
4. If the primary Expressway peer's IP address has been moved up the list in the previous step, alter the **Configuration master** value to match its new location.
5. Click **Save**.

On all the remaining subordinate Expressway peers:

1. Go to **System > Clustering**.
2. Edit the **Peer x IP address** and **Configuration master** fields so that they are identical to those configured on the primary Expressway.

3. Click **Save**.
4. Repeat for all remaining subordinate Expressway peers until they all have identical clustering configuration.

On other devices:

If you have any other systems neighbored (or connected via a traversal zone) to this cluster of Expressway peers, ensure that their zone configuration for this cluster is updated to exclude the address of the removed peer.

Caution: The removed Expressway will retain its configuration at the time it is removed from the cluster, and will continue to function as a non-clustered Expressway. After it has been removed from the cluster, we recommend that it is taken out of service (e.g. perform a factory reset as documented in [Remove a Dead Peer From a Cluster \(Permanently\)](#), page 20 before reconnecting the out-of-service Expressway back to the network) or an alternative configuration is applied to the Expressway, so that other devices no longer try to use it as a cluster peer.

Removing a live Expressway from a cluster is now complete.

Remove a Dead Peer From a Cluster (Permanently)

Use the following procedure if:

- the Expressway is dead and needs to be RMA'd, or
- the Expressway cannot be accessed for some other reason

If the whole cluster is to be disbanded then use the procedure defined in [Disband a Cluster, page 22](#).

If the cluster peer to be removed is accessible, use the procedure defined in [Remove a Live Peer From a Cluster \(Permanently\), page 18](#) which clears up the removed Expressway as well as its previous peers.

Note: This procedure does not delete clustering configuration from the removed Expressway. When removed, you must not reconnect the out-of-service Expressway without first deleting all of its peers and stopping configuration replication (see [Clear Configuration From This Peer, page 20](#) below).

Before starting:

If it is the primary Expressway, see [Change the Primary Peer, page 24](#) for instructions on how to make a different peer the primary.

On the primary Expressway:

1. Go to **System > Clustering**.
2. Delete the IP address of the Expressway that has been removed.
3. If the Expressway being removed is not the last field in the list, move any other IP addresses up the list so that there are no empty fields between entries.
4. If the primary Expressway peer's IP address has been moved up the list in the previous step, alter the **Configuration master** value to match its new location.
5. Click **Save**.

On all the remaining subordinate Expressway peers:

1. Go to **System > Clustering**.
2. Edit the **Peer x IP address** and **Configuration master** fields so that they are identical to those configured on the primary Expressway.
3. Click **Save**.
4. Repeat for all remaining subordinate Expressway peers until they all have identical clustering configuration.

On other devices:

If you have any other systems neighbored (or connected via a traversal zone) to this cluster of Expressway peers, ensure that their zone configuration for this cluster is updated to exclude the address of the removed peer.

Removing an out-of-service Expressway from a cluster is now complete.

Clear Configuration From This Peer

If you ever recover the peer that you removed, you must clear its configuration before you reconnect it to the network. The easiest way to do this:

1. Log into the Expressway as root (over serial or SSH - serial connection will show more details as the factory reset progresses).
2. Type `factory-reset`

3. Answer the prompts as follows:

- a. Keep option keys = YES
- b. Keep IP configuration = YES or NO - depends on whether the Expressway has been replaced with another at the same IP address
- c. Keep SSH keys = NO
- d. Keep root and admin passwords = YES or NO ... as desired
- e. Save log files = NO ... unless specifically requested for analysis purposes
- f. Replace hard disk = NO
- g. Are you sure you want to continue = YES

Some messages will be displayed, then connection over serial / SSH will be lost.

It may take some 20 or more minutes before Expressway is available to access again.

4. Log into the Expressway as admin over SSH.

5. Type `xcommand DefaultLinksAdd`

This ensures that the configuration of the recovered Expressway is returned to default and it will not interact with its ex-peers.

Disband a Cluster

This process removes all Expressway peers from an existing cluster.

Each Expressway will retain its configuration at the time the cluster was disbanded, and will function as a stand-alone Expressway.

Before you start:

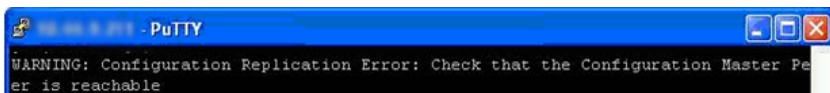
If any Expressway is not accessible, firstly remove it using the procedure [Remove a Dead Peer From a Cluster \(Permanently\)](#), page 20.

On each subordinate Expressway peer:

1. Log into the web interface.
2. Go to **System > Clustering**:
 - a. Change the **Cluster name** to a unique ID for this Expressway (ideally to the routable Fully Qualified Domain Name used in SRV records that address this individual Expressway, for example "expe1.example.com". See [Appendix 3: Cluster Name and DNS SRV Records](#), page 30.)
 - b. Delete the **Cluster pre-shared key**.
 - c. Delete all entries in the **Peer x IP address** fields.
3. Click **Save**.

Note that:

- An alarm similar to that shown below may appear on the web interface and CLI of the Expressway being removed. This is not a problem, the alarm will be cleared when the Expressway is restarted:



4. If Microsoft Lync B2BUA was used in the cluster:
 - a. Go to **Applications > B2BUA > Microsoft Lync > Configuration**.
 - b. If **Microsoft Lync B2BUA** is *Enabled*, change it to *Disabled* and click **Save**.
5. Restart the Expressway (go to **Maintenance > Restart options**, then click **Restart** and confirm **OK**).

If multiple peers need restarting: restart each peer in turn, waiting for the peer to be accessible through the web interface before restarting the next peer.

6. Repeat for each subordinate Expressway.

On the primary Expressway:

1. Log into the web interface.
2. Go to **System > Clustering**:
 - a. Optionally, change the **Cluster name** to a unique ID for this Expressway (ideally to the routable Fully Qualified Domain Name used in SRV records that address this individual Expressway, for example "expe1.example.com". (See [Appendix 3: Cluster Name and DNS SRV Records](#), page 30.))
 - b. Delete the **Cluster pre-shared key**.
 - c. Delete all entries in the **Peer x IP address** fields.

3. Click **Save**.

Note that:

- An alarm similar to that shown below may appear on the web interface and CLI of the Expressway being removed. This is not a problem, the alarm will be cleared when the Expressway is restarted:



4. Restart the Expressway (go to **Maintenance > Restart options**, then click **Restart** and confirm **OK**).

On other devices:

If you have any other systems neighbored (or connected via a traversal zone) to this cluster of Expressway peers, ensure that they have those zones removed, or modified appropriately.

Disband a cluster of Expressways is now complete.

Change the Primary Peer

You can do this procedure even if the current primary peer is not accessible.

Note: Follow this process in the order listed, to avoid putting the cluster in a state where multiple peers are contending to be the primary.

On the "new" primary Expressway:

1. Go to **System > Clustering**.
2. From the **Configuration master** drop-down menu select the ID number of the peer entry that says 'This system'.
3. Click **Save**.

While changing the primary peer, ignore any alarms on Expressway that report 'Cluster master mismatch' or 'Cluster replication error' - they will be rectified as part of this procedure.

On all other Expressway peers, starting with the "old" primary peer (if it is still accessible):

1. Go to **System > Clustering**.
2. From the **Configuration master** drop-down menu select the ID number of the "new" primary Expressway.
3. Click **Save**.

On each Expressway in the cluster (including the primary):

1. Confirm that the change to the **Configuration master** has been accepted by going to **System > Clustering** and refreshing the page.
2. If any Expressways have not accepted the change, repeat the steps above.
3. Check that the cluster database status reports as Active.

Note that any alarms raised on the Expressway peers that relate to 'Cluster master mismatch' and 'Cluster replication error' should clear automatically after approximately 2 minutes.

If the old primary is not available

If you are changing the primary peer because the "old" primary is not accessible, see [Remove a Dead Peer From a Cluster \(Permanently\), page 20](#) procedure.

If the "old" primary was not accessible when you changed the cluster's primary peer, but later that Expressway becomes available, you must clear its configuration and then bring it back into the cluster using the [Add a Peer to a Cluster, page 11](#) procedure.

Changing the primary peer of an Expressway cluster is now complete.

Change the IP address of a Peer

To change the IP address of an Expressway peer you must remove the Expressway from the cluster, change its IP address, and then add the Expressway back into the cluster.

The process is as follows:

1. Ensure that the Expressway whose IP address is to be changed is not the primary Expressway.
If it is the primary Expressway, follow the steps in [Change the Primary Peer, page 24](#) to make a different peer the primary.
2. Carry out the process documented in [Remove a Live Peer From a Cluster \(Permanently\), page 18](#).
3. Change the IP address of the Expressway.
4. Carry out the process documented in [Add a Peer to a Cluster, page 11](#).

Changing the IP address of an Expressway peer is now complete.

Replace a Peer

This section summarizes the procedure for replacing a cluster peer Expressway with a different unit.

1. Ensure that the Expressway to be replaced is not the primary Expressway.
If it is the primary Expressway, follow the steps in [Change the Primary Peer, page 24](#) to make a different peer the primary.
2. Remove the existing peer from the cluster:
 - a. If the cluster peer to be replaced is not accessible, use the procedure defined in [Remove a Dead Peer From a Cluster \(Permanently\), page 20](#).
 - b. If the cluster peer to be replaced is accessible, use the procedure defined in [Remove a Live Peer From a Cluster \(Permanently\), page 18](#).
3. Add the replacement peer to the cluster using the procedure defined in [Add a Peer to a Cluster, page 11](#).

Replace a Peer And Keep Its Configuration

This procedure assumes that you are replacing an accessible Expressway peer with a different Expressway.

1. Ensure that the Expressway to be replaced is not the primary Expressway.
If it is the primary Expressway, follow the steps in [Change the Primary Peer, page 24](#) to make a different peer the primary
2. **Remove the peer safely**, as described in [Remove a Live Peer From a Cluster \(Permanently\), page 18](#).
You must clear the clustering configuration from the peer, and update the clustering configuration on all the other peers (primary first), before you take the backup
3. Backup the configuration of the removed peer
4. Generate and apply option keys for the new Expressway. You must apply the same set of keys that are applied to the other peers
5. Restore the backup onto the new Expressway
6. Check the DNS configuration of the new Expressway is the same as the other peers, and synchronize it with the same NTP servers
7. Add the replacement peer to the cluster using the procedure defined in [Add a Peer to a Cluster, page 11](#)
You already have much of the configuration described in the linked procedure. The most important steps described there are summarized here:
 - a. Add the new peer's address to the clustering configuration on the primary
 - b. Add the new peer's address to the clustering configuration on other existing peers
 - c. Enter the clustering configuration on the new peer (cluster name, shared secret, ordered peer list)
8. Restart the new peer
9. Wait for approximately five minutes, then check the cluster status and resolve any alarms

Note: If you replaced a peer in a cluster of Expressway-Cs, and that cluster was configured for SSO of MRA clients, then SSO will fail some of the time until you update the IDP with the cluster's new SAML metadata.

This is because one of the peers has a new serial number, and the serial numbers of the peers are used to generate the cluster's metadata.

You must export the cluster's SAML metadata and copy it to the IDP. See *Mobile and Remote Access via Cisco Expressway*, at [Cisco Expressway Series Configuration Guides page](#).

Appendix 1: Troubleshooting

Expressway Alarms and Warnings

" Cluster name not configured: if clustering is in use a cluster name must be defined"

Ensure that the same cluster name is configured on each Expressway in the cluster.

The **Cluster name** should be the routable Fully Qualified Domain Name used in SRV records that address this Expressway cluster, for example "cluster1.example.com". (See [Appendix 3: Cluster Name and DNS SRV Records](#), page 30).

" Cluster replication error: <details> manual synchronization of configuration is required"

This may be:

- "Cluster replication error: manual synchronization of configuration is required"
- "Cluster replication error: cannot find master or this slave's peer configuration file, manual synchronization of configuration is required"
- "Cluster replication error: configuration master ID is inconsistent, manual synchronization of configuration is required"
- "Cluster replication error: this peer's configuration conflicts with the master's configuration, manual synchronization of configuration is required"

If a subordinate Expressway reports an alarm: "Cluster replication error - <details> synchronization of configuration"

On that subordinate Expressway:

1. Log in as admin on an SSH or other CLI interface.
2. At the command prompt type:

```
xcommand ForceConfigUpdate
```

This will delete the subordinate Expressway configuration and then force it to update its configuration from the primary Expressway.

Caution: Only use this command if the configuration on the primary Expressway is known to be in a good state. We recommend that you take a backup before running this command.

" Cluster replication error: the NTP server is unreachable"

Configure an accessible NTP server on the Expressway **System > Time** page.

" Cluster replication error: the local Expressway does not appear in the list of peers"

Check and correct the list of peers for this Expressway on the primary Expressway, and copy to all other Expressway peers (**System > Clustering**).

" Cluster replication error: automatic replication of configuration has been temporarily disabled because an upgrade is in progress"

Wait until the upgrade has completed.

" Invalid clustering configuration: H.323 mode must be turned On - clustering uses H.323 communications between peers"

Ensure that H.323 mode is on (see **Configuration > Protocols > H.323**).

" Expressway database failure: Please contact your Cisco support representative"

The support representative will help you work through the following steps:

1. Take a system snapshot and provide it to your support representative.
2. Remove the Expressway from the cluster using: [Remove a Live Peer From a Cluster \(Permanently\)](#), page 18.
3. Restore that Expressway's database by restoring a backup taken on that Expressway previously.
4. Add the Expressway back to the cluster using [Add a Peer to a Cluster](#), page 11.

A second method is possible if the database does not recover:

1. Take a system snapshot and provide to TAC.
2. Remove the Expressway from the cluster using: [Remove a Live Peer From a Cluster \(Permanently\)](#), page 18.
3. Log in as root and run `clusterdb_destroy_and_purge_data.sh`
4. Restore that Expressway's database by restoring a backup taken on that Expressway previously.
5. Add the Expressway back to the cluster using [Add a Peer to a Cluster](#), page 11.

Note: `clusterdb_destroy_and_purge_data.sh` is as dangerous as it sounds - only use this command in conjunction with instructions from your support representative.

Cluster With Advanced Networking is Not Replicating Correctly

Expressway-Es with Advanced Networking are only designed to replicate through their LAN 1 interface. Ensure that the **Peer x IP Address** entries specified in **System > Clustering** all refer to LAN 1 interfaces.

Also, this replicating interface (LAN 1) must not have NAT enabled on it.

Cluster With Static NAT is Not Replicating Correctly

When using Expressway-Es with static NAT, the cluster replication must occur on the LAN interface which is not behind the NAT device. Therefore LAN interface 1 must be the non-NAT interface and the **Peer x IP Address** entries specified in **System > Clustering** must all refer to LAN 1 interfaces. LAN interface 2 must be configured for static NAT.

Appendix 2: IP Ports and Protocols

External firewalls between peers

It is unusual to have any sort of external firewall between cluster peers, but if there is, the IP protocols and ports that must be open between each and every Expressway peer in the cluster are listed below.

For cluster communications between Expressway peers:

- UDP port 500 (ISAKMP) is used for PKI (Public Key Infrastructure) key exchange
- IP protocol 51 (IPSec AH) is used for database synchronization

For calls between Expressway peers:

- Standard SIP and H.323 signaling ports are used for calls
- UDP port 1719 is used for bandwidth updates between Expressway peers

Firewall rules on the peers

(This section does not apply to external firewalls)

If you are using the Expressway's built-in **Firewall rules** feature, make sure that your rules do not prevent the following connections:

Table 1 Clustering connections

Purpose	Protocol	Source	Port	Destination	Port
Cluster communication	TCP	Other peers	Ephemeral	This peer	4369-4380
Cluster recovery	UDP	Other peers	Ephemeral	This peer	4371

Cisco TelePresence Management Suite Provisioning Extension

IPSec Communications

For IPSec between Expressway cluster peers:

- AES256 is used for encryption, SHA256 (4096 bit key length) is used for authentication; peers are identified by their IP address and are authenticated using a pre-shared key
- Main mode is used during the IKE exchange
- diffie-hellman group 'modp4096' is used

MTU Size

The default MTU size on the Expressway is 1500 bytes. Under normal conditions this has no effect on the cluster. However, if there are network elements between the cluster peers (which is not recommended), you must ensure consistent MTU size throughout the path. Cluster replication could fail if the MTU is lower on the path between peers, because the synchronization packets are not allowed to fragment.

Determine which network element in the paths between peers has the lowest MTU value, then adjust each peer's cluster interface to use that value.

Appendix 3: Cluster Name and DNS SRV Records

Using DNS SRV to convert a domain to an IP address has a number of benefits:

- The structure of the lookup includes service type and protocol as well as the domain, so that a common domain can be used to reference multiple different services which are hosted on different machines (e.g. HTTP, SIP, H.323).
- The DNS SRV response includes priority and weighting values which allow the specification of primary, secondary, tertiary etc groups of servers, and within each priority group, the weighting defines the proportion of accesses that should use each server.
- As the DNS SRV response contains details about priorities and weights of multiple servers, the receiving device can use a single lookup to search for an in-service server (where some servers are inaccessible) without the need to repeatedly query the DNS server. (This is in contrast to using round robin DNS which does require repeated lookups into the DNS server if initial servers are found to be inaccessible.)

The generic format of a DNS SRV query is:

- `_service._protocol.<fully.qualified.domain>`

The DNS SRV response is a set of records in the format:

- `_service._protocol.<fully.qualified.domain>. TTL Class SRV Priority Weight Port Target`
where Target is an A-record defining the destination.

Further details on DNS SRV can be found in *Expressway Administrator Guide* and *RFC 2782*.

DNS SRV Configuration for Mobile and Remote Access

This section summarizes the public (external) and local (internal) DNS requirements. For more information, see the *Cisco Jabber Planning Guide* (for your version) on the [Jabber Install and Upgrade Guides page](#).

Public DNS

The public (external) DNS must be configured with `_collab-edge._tls.<domain>` SRV records so that endpoints can discover the Expressway-Es to use for mobile and remote access. SIP service records are also required (for general deployment, not specifically for mobile and remote access). For example, for a cluster of 2 Expressway-E systems:

Domain	Service	Protocol	Priority	Weight	Port	Target host
example.com	collab-edge	tls	10	10	8443	expe1.example.com
example.com	collab-edge	tls	10	10	8443	expe2.example.com
example.com	sips	tcp	10	10	5061	vcse1.example.com
example.com	sips	tcp	10	10	5061	vcse2.example.com

Local DNS

The local (internal) DNS requires `_cisco-uds._tcp.<domain>` SRV records. For example:

Domain	Service	Protocol	Priority	Weight	Port	Target host
example.com	cisco-uds	tcp	10	10	8443	cucmserver1.example.com
example.com	cisco-uds	tcp	10	10	8443	cucmserver2.example.com

Ensure that the `cisco-uds` SRV records are NOT resolvable outside of the internal network, otherwise the Jabber client will not start mobile and remote access negotiation via the Expressway-E.

Note: We strongly recommend that you create internal DNS records, for both forward and reverse lookups, for all Unified Communications nodes used with Mobile and Remote Access. This should allow Expressway-C to find the nodes when IP addresses are used instead of FQDNs.

DNS SRV Configuration for Legacy Video Conferencing Deployments

The format of DNS SRV queries for sip (RFC 3263) and H.323 used by Expressway are:

- `_sips._tcp.<fully.qualified.domain>`
- `_sip._tcp.<fully.qualified.domain>`
- `_sip._udp.<fully.qualified.domain>` - not recommended for video calls, only use for audio-only calls
- `_h323ls._udp.<fully.qualified.domain>` - for UDP location (RAS) signaling, such as LRQ
- `_h323cs._tcp.<fully.qualified.domain>` - for H.323 call signaling

The format of DNS SRV queries for sip (RFC 3263) and H.323 typically used by an endpoint are:

- `_sips._tcp.<fully.qualified.domain>`
- `_sip._tcp.<fully.qualified.domain>`
- `_sip._udp.<fully.qualified.domain>` - not recommended for video calls, only use for audio-only calls
- `_h323ls._udp.<fully.qualified.domain>` - for UDP location (RAS) signaling, such as LRQ
- `_h323cs._tcp.<fully.qualified.domain>` - for H.323 call signaling

Note that UDP is not a recommended transport medium for video signaling; SIP messaging for video system is too large to be reliably carried on datagram-based (rather than stream-based) transports.

The Expressway **Cluster name** (configured on the **System > Clustering** page) should be the `<fully.qualified.domain>` specified in the DNS SRV records that point to the Expressway cluster.

Example

DNS SRV records for 2 peers of an Expressway-E cluster for `example.com`

where:

- FQDN of Expressway-E peer 1: `expe1.example.com`
- FQDN of Expressway-E peer 2: `expe2.example.com`
- FQDN of Expressway-E cluster: `example.com`

```
_sips._tcp.example.com. 86400 IN SRV 1 1 5061 expe1.example.com.
_sips._tcp.example.com. 86400 IN SRV 1 1 5061 expe2.example.com.
```

```
_sip._tcp.example.com. 86400 IN SRV 1 1 5060 expe1.example.com.
_sip._tcp.example.com. 86400 IN SRV 1 1 5060 expe2.example.com.
```

```
_h323ls._udp.example.com. 86400 IN SRV 1 1 1719 expe1.example.com.
_h323ls._udp.example.com. 86400 IN SRV 1 1 1719 expe2.example.com.
```

```
_h323cs._tcp.example.com. 86400 IN SRV 1 1 1720 expe1.example.com.
_h323cs._tcp.example.com. 86400 IN SRV 1 1 1720 expe2.example.com.
```

Note that:

- Priorities are all the same. Only use different priorities if you have different clusters allowing failover from one primary cluster to another (secondary) cluster. In that case the primary cluster's peers should have one value and the other (secondary) cluster's peers a (larger) value.
- Weights should be the same - so that there is equal use of each peer.

Checking DNS SRV Settings

Checking DNS SRV settings via web interface

1. Go to **Maintenance > Tools > Network utilities > DNS lookup**.
2. Enter the SRV path in the **Host** field.
3. Click **Lookup**.

DNS lookup You are here: [Maintenance](#) > [Tools](#) > [Network utilities](#) > [DNS lookup](#)

DNS lookup

Host

Query type

Check against the following DNS servers

nslookup

```
nslookup -query=SRV _sip._tcp.example.com
```

Dig

```
dig _sip._tcp.example.com SRV
```

```

; <<>> DiG 9.4.1 <<>> _sip._tcp.example.com SRV
;; global options: printcmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 44952
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 2, ADDITIONAL: 4

;; QUESTION SECTION:
_sip._tcp.example.com.      IN      SRV

;; ANSWER SECTION:
_sip._tcp.example.com. 1183    IN      SRV     1 0 5060 expe1.example.com.
_sip._tcp.example.com. 1183    IN      SRV     1 0 5060 expe2.example.com.

;; AUTHORITY SECTION:
example.com.          87450   IN      NS      ns1.mydyndns.org.
example.com.          87450   IN      NS      ns2.mydyndns.org.

;; ADDITIONAL SECTION:
expe1.example.com.    1536    IN      A       194.73.59.53
expe2.example.com.    1376    IN      A       194.73.59.54
ns1.mydyndns.org.     75      IN      A       204.13.248.76
ns2.mydyndns.org.    10037   IN      A       204.13.249.76

;; Query time: 0 msec
~ #

```


Appendix 4: NAPTR Records

NAPTR records are typically used to specify various methods to connect to a destination URI, for example by email, by SIP, by H.323. They can also be used to specify the priority to use for those connection types, for example to use SIP TLS in preference over using SIP TCP or SIP UDP.

NAPTR records are also used in ENUM, when converting a telephone number into a dialable URI. (For further details on ENUM see [ENUM Dialing on Expressway Deployment Guide](#)).

NAPTR Record Format

Example: SIP access to example.com, and for enum lookups for 557120, 557121, and 557122.

```
$ORIGIN example.com.
```

```
IN  NAPTR  10  100  "s"  "SIPS+D2T"  ""  _sips._tcp.example.com.
IN  NAPTR  12  100  "s"  "SIP+D2T"   ""  _sip._tcp.example.com.
IN  NAPTR  14  100  "s"  "SIP+D2U"   ""  _sip._udp.example.com.
```

```
$ORIGIN www.example.com.
```

```
IN  NAPTR  10  100  "s"  "http+I2R"  ""  _http._tcp.example.com.
IN  NAPTR  10  100  "s"  "ftp+I2R"   ""  _ftp._tcp.example.com.
```

```
$ORIGIN 0.2.1.7.5.5.enum.lookup.com.
```

```
IN  NAPTR  10  100  "u"  "E2U+sip"   "!^.*$!john.smith@tandberg.com!" .
IN  NAPTR  12  100  "u"  "E2U+h323"  "!^.*$!john.smith@tandberg.com!" .
IN  NAPTR  10  100  "u"  "mailto+E2U" "!^.*$!mailto:john.smith@tandberg.com!" .
```

```
$ORIGIN 1.2.1.7.5.5.enum.lookup.com.
```

```
IN  NAPTR  10  100  "u"  "E2U+sip"   "!^.*$!mary.jones@tandberg.com!" .
```

```
$ORIGIN 2.2.1.7.5.5.enum.lookup.com.
```

```
IN  NAPTR  10  100  "u"  "E2U+h323"  "!^.*$!peter.archibald@myco.com!" .
```

```
IN = Internet routing
  NAPTR = record type
    10 = order value (use lowest order value first)
    100 = preference value if multiple entries have the same order value
    "u" = the result is a routable URI
    "s" = the result is a DNS SRV record
    "a" = the result is an 'A' or 'AAAA' record
    "E2U+sip" to make SIP call
    "E2U+h323" to make h.323 call
    Regular expression:
    ! = delimiter
    "" = no expression used
    ... usual Regex expressions can be used
    Replace field; . = not used
```

Looking up an ENUM NAPTR record

```
dig 4.3.7.8.enum4.example.com. NAPTR
; <<>> ;; global options: printcmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 38428
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 1, ADDITIONAL: 2

;; QUESTION SECTION:
;4.3.7.8.enum4.example.com. IN  NAPTR
```

```
;; ANSWER SECTION:
4.3.7.8.enum4.example.com. 60 IN NAPTR 10 100 "u" "E2U+sip" "!^.*$!bob@example.com!" .
4.3.7.8.enum4.example.com. 60 IN NAPTR 10 100 "u" "E2U+h323" "!^.*$!bob@example.com!" .

;; AUTHORITY SECTION:
enum4.example.com. 60 IN NS int-server1.example.com.

;; ADDITIONAL SECTION:
int-server1.example.com. 3600 IN A 10.44.9.144
int-server1.example.com. 3600 IN AAAA 3ffe:80ee:3706::9:144

;; Query time: 0 msec
```

Looking up a domain NAPTR record

Example: NAPTR record allowing endpoints to detect that they are in the public (external) network. The flag “s” is extended to “se” to indicate that it is “external”.

```
~ # dig -t NAPTR example.com

; <<>> DiG 9.4.1 <<>> -t NAPTR example.com
;; global options: printcmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 1895
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 6, ADDITIONAL: 4

;; QUESTION SECTION:
;example.com. IN NAPTR

;; ANSWER SECTION:
example.com. 2 IN NAPTR 50 50 "se" "SIPS+D2T" "" _sips_tcp.example.com.
example.com. 2 IN NAPTR 90 50 "se" "SIP+D2T" "" _sip_tcp.example.com.
example.com. 2 IN NAPTR 100 50 "se" "SIP+D2U" "" _sip_udp.example.com.

;; AUTHORITY SECTION:
example.com. 320069 IN NS nserver2.example.com.
example.com. 320069 IN NS nserver.euro.example.com.
example.com. 320069 IN NS nserver.example.com.
example.com. 320069 IN NS nserver3.example.com.
example.com. 320069 IN NS nserver4.example.com.
example.com. 320069 IN NS nserver.asia.example.com.

;; ADDITIONAL SECTION:
nserver.example.com. 56190 IN A 17.111.10.50
nserver2.example.com. 57247 IN A 17.111.10.59
nserver3.example.com. 57581 IN A 17.22.14.50
nserver4.example.com. 57452 IN A 17.22.14.59

;; Query time: 11 msec
```

Appendix 5: Impact of Clustering on Other Expressway Applications

Microsoft Lync

If Lync Server is to be configured to operate with an Expressway cluster, see [Microsoft Lync and Expressway Deployment Guide](#).

Document Revision History

The following table summarizes the changes that have been applied to this document.

Table 2 Summary of Changes to This Document

Date	Description
November 2015	Updated for X8.7.
July 2015	Updated for X8.6. New procedure for replacing a peer.
April 2015	Menu path changes for X8.5 onwards. Republished with X8.5.2.
December 2014	Updated for X8.5.
June 2014	Republished for X8.2.
April 2014	Updated for Expressway X8.1.1: <ul style="list-style-type: none">■ New 'Upgrading a cluster' section■ New 'Replacing an Expressway peer' section■ Updates to 'IP ports and protocols' appendix
December 2013	Initial release.

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