Cisco Meeting Server

Load Balancing Calls Across Cisco Meeting Servers

White Paper

04 May, 2026

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Change History

Date	Change Summary
May 04, 2026	Updated for version 3.13. Added content for Load monitoring under section Configuring Call Bridges for load balancing incoming calls.

Introduction

The Cisco Meeting Server software is a scalable software platform for voice, video and web content.

This white paper discusses how to increase the scalability and resilience of the Meeting Servers within a deployment, using Call Bridge grouping to load balance incoming and outgoing calls across clustered Call Bridges. Load balancing is achieved by trying to place calls for a single conference onto as few Call Bridges as possible. This reduces the number of distribution links required to connect the participants in the conference, and therefore reduces the overall load across the system.

Load balancing occurs via two mechanisms. Firstly calls to and from existing conferences are preferentially handled by Call Bridges currently hosting the conference. Secondly, the choice of the first Call Bridge, and subsequent Call Bridges, is done to preferentially use those with lower load.

The examples include using Cisco Unified Communications Manager and Cisco Expressway as the call control device. The primary role of call control is to move SIP calls between Call Bridge Groups as instructed by the Cisco Meeting Servers. Only these two call control systems are supported for load balancing SIP calls.

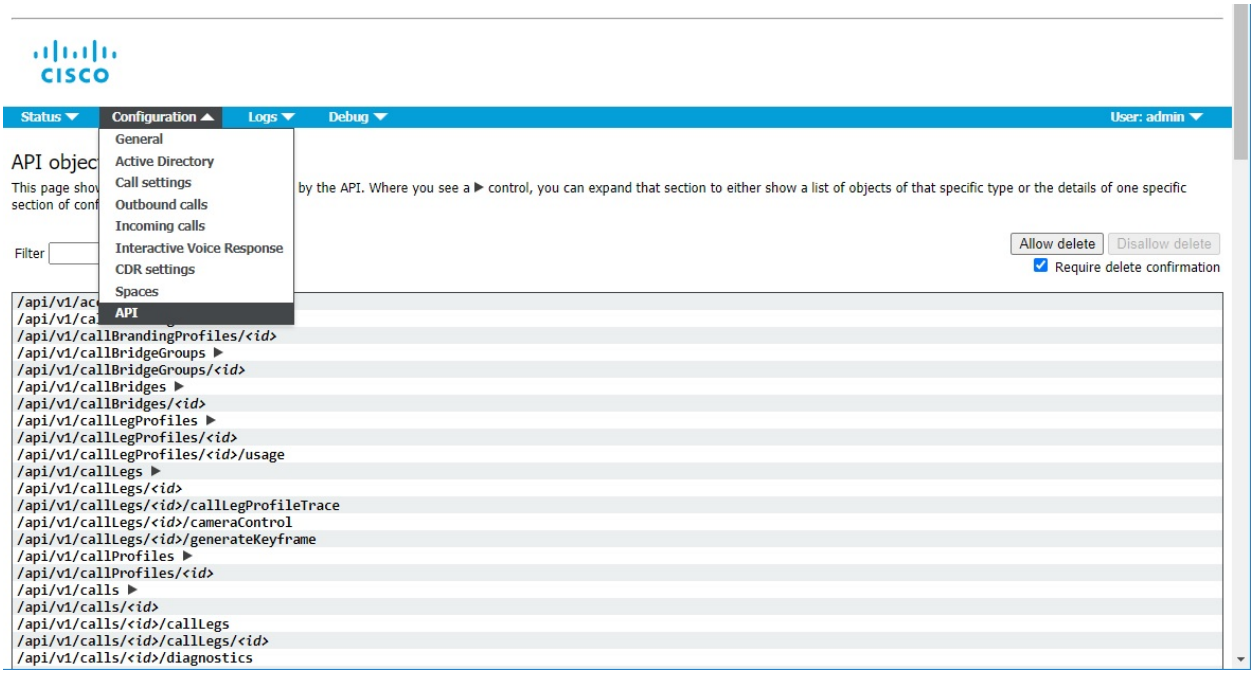
This white paper also covers load balancing media to and from the Cisco Meeting App. A call control device is not required for load balancing calls in deployments where only Cisco Meeting App is used to make calls (no SIP calls).

Note: Throughout this white paper, the Cisco Meeting Server is referred to as the Meeting Server, and the term Expressway refers to the Cisco VCS or Cisco Expressway running X8.11 or later software.

Simplifying How To Use the Meeting Server API

From version 2.9, the API can be accessed using the Meeting Server Web Admin Interface rather than using API Methods and third-party applications. After logging in to the Web Admin interface, navigate to the **Configuration** tab and select **API** from the pull-down list. See Figure 1.

Figure 1: Accessing the API via the Meeting Server web admin interface



Note: To access the API via the web interface you still need to do the initial Meeting Server configuration settings and authentication using the MMP as you would if you were using a third party application.

Load balancing across Cisco Meeting Servers

A typical large scale deployment consists of several Meeting Servers deployed at multiple offices/data centers. For scalability and resilience of the conferencing service, the Call Bridges will typically be configured as a cluster.

This white paper explains how to use Call Bridge grouping to load balance incoming and outbound calls on the Meeting Servers, and avoid overloading individual Meeting Servers in the cluster.

With Call Bridge Groups configured, a Meeting Server cluster can intelligently load balance calls across the Call Bridges within the same location or across nodes in different locations. The intelligent decision making behind where calls end up, is handled by the Meeting Servers. The call control system needs to be able to handle SIP messages from the Meeting Servers, in order to move calls to the correct location. This functionality has been tested using Cisco Unified Communications Manager and Cisco Expressway as call control systems. These are the only Cisco supported call control systems for this functionality. For load balancing with Cisco Expressway, use Cisco Expressway release X8.11 or later with Cisco Meeting Server release 2.4 or later. This white paper covers five scenarios in detail, the technology also works for other scenarios as well; the techniques below can be adapted to multiple Cisco Unified Communications Manager or Cisco Expressway topologies.

Note: There are different call capacities for Meeting Servers in a Call Bridge Group compared to a single or cluster of Meeting Servers. Appendix B provides an overview of the difference in call capacities.

Note: Dual-homed conferences with a Meeting Server cluster are not currently supported with Expressway X8.11 as the edge for the Meeting Server, unless at least some of the Microsoft traffic flows directly between one of the Meeting Servers in the cluster and the Microsoft infrastructure (and not through Expressway). Dual-homing is supported with Expressway X8.11 as the edge for standalone Meeting Servers.

Note: Forwarded calls from SIP endpoints through Meeting Servers are not supported in load balanced deployments.

Call Bridge Groups

The load balancing of calls occurs between a group of Call Bridges that exist in the same location. To configure which Call Bridges are in each location, the concept of Call Bridge Groups is used. A Call Bridge Group defines a subset of cluster nodes that are more closely linked and should be treated as equivalent. This could refer to those in a single data center, or

those in the same continent. The decision of how to group Call Bridges will depend on the specifics of network configuration and the desired behavior.

For the load balancing feature to work correctly, a Round Trip Time (RTT) of less than 100 ms is required for the servers in a Call Bridge Group. The maximum RTT between any two nodes in the same cluster remains as 300 ms.

When using Cisco Unified Communications Manager, call routing relies on the use of route patterns, route groups and route lists across the Cisco Unified Communications Manager deployment. It is assumed that these concepts are understood. For information on configuring these features, please consult the Cisco Unified Communications Manager documentation.

When using Cisco Expressway, call routing relies on the use of dial plans and zones, and it is assumed that these concepts are understood. Ensure the Cisco Expressway can route to the domain of the callee in the event of a replaced call. For information on configuring dial plans and zones, please consult the Cisco Expressway documentation.

Configuring Call Bridges for load balancing incoming calls

There are three aspects to setting up the load balancing of calls across a Meeting Server cluster:

- creating the Call Bridge Groups,
- enabling load balancing,
- and optionally, fine-tuning the load balancing on each Call Bridge. In most deployments this will not be necessary.

In addition, load balancing incoming calls involves outbound calls from Call Bridges to Cisco Unified Communications Manager or Cisco Expressway. For these outbound calls to work, outbound dial plan rules must be configured, see Load balancing outbound SIP calls .

Note: If load balancing incoming calls involves outbound calls from Call Bridges to Cisco VCS, instead of Cisco Expressway, then a traversal license is required on the VCS. There is no requirement for a Rich Media Session license on Cisco Expressway for any load balanced Meeting Server deployments.

Note: If you are not using load balancing with Call Bridge Groups, then calls will not be rejected, but the quality of all calls will be reduced when the load limit is reached. If this happens often, we recommend that you buy additional hardware.

Creating Call Bridge Groups

1. For each Meeting Server cluster, decide how to group the Call Bridges, for instance by data center or by country or region.
2. Using the Web Admin interface of one of the servers in the cluster, select **Configuration**>**API**
3. Create a new Call Bridge Group
   a. From the list of API objects, tap the ► after **/api/v1/callBridgeGroups**
   b. Select the **Create new** button, enter the name of the new callBridgeGroup and set the parameters for the Call Bridge Group. Select **Create**.
   c. The new group will appear in the list of callBridgeGroups.
4. Identify the Call Bridges to be grouped
   a. From the list of API objects, tap the ► after **/api/v1/callBridges**
   b. Select each Call Bridge to be added to the group by clicking on the callBridge id
      i. Click on the **Choose** button beside the **callBridgeGroup** field, and select the callBridgeGroup created in step3b
      ii. Click **Modify**
   c. Repeat step 4b for each Call Bridge that needs to be added to the Call Bridge Group.
5. Repeat for all other Call Bridge Groups.

Specifying the load limit on a cluster and enabling load balancing

1. On each Call Bridge in a cluster, specify the load limit for that server
   a. From the list of API objects, tap the ► after **/system/configuration/cluster**
   b. Select the **View or edit** button, and enter a value for **loadLimit**. Click the **Modify** button. This sets a load limit for the maximum load on the server, see Table 1 for load limits.

Table 1: Load limits for server platforms

System	Load Limit
Meeting Server 2000 M6	1,296,000
Meeting Server 1000 M6	160,000
VM	1250 per vCPU
Cisco Meeting Server 1000 M7	240,000
Cisco Meeting Server Medium M8	450,000

Note: Increased load limits for Meeting Server 1000 M5v2 and Meeting Server 2000 M5v2 require Meeting Server software version 3.2 onwards.

Setting a load limit on any Call Bridge means it will reject calls based on the current load. By default, the rejection of calls from new participants occurs at 80% of the load limit to allow for the distribution of calls. This value can be fine tuned, see below.

2. Enable load balancing on each server in the cluster.

   For Cisco Unified Communications Manager deployments:

   a. From the list of API objects, tap the ► after **/callBridgeGroups**
   b. Click on the **object id** of the Call Bridge Group trunked to Cisco Unified Communications Manager
   c. Set **loadBalancingEnabled**=**true**. Click **Modify**

   For Cisco Expressway deployments:

   a. From the list of API objects, tap the ► after **/callBridgeGroups**
   b. Click on the **object id** of the Call Bridge Group trunked to Cisco Expressway
   c. Set **loadBalancingEnabled**=**true** and set **loadBalanceIndirectCalls**=**true**. Click **Modify**

Fine-tuning the load balancing

It is possible to fine tune the load balancing parameters, but take care as it could impact the availability of the solution. Changing the default values may lead to overloading of servers and a degradation of video quality. This could occur due to either conferences becoming fragmented over multiple Call Bridges, or conferences using too many resources on a single Call Bridge.

Load balancing calls on a Call Bridge is controlled by 3 parameters:

- **loadLimit** – a numeric value for the maximum load on the Call Bridge, as set above.
- **newConferenceLoadLimitBasisPoints** – a numeric value for the basis points (1 in 10,000) of the load limit at which incoming calls to non-active conferences will be disfavored, ranges from 0 to 10000, defaults to 5000 (50% load). Value is scaled relative to **LoadLimit**.
- **existingConferenceLoadLimitBasisPoints** – a numeric value for the basis points of the load limit at which incoming calls to this Call Bridge will be rejected, ranges from 0 to 10000, defaults to 8000 (80% load). Value is scaled relative to **LoadLimit**.

To change the default threshold values for a Call Bridge:

1. From the list of API objects, tap the ► after **/system/configuration/cluster**
2. Select the **View or edit** button, and set values for **newConferenceLoadLimitBasisPoints** and **existingConferenceLoadLimitBasisPoints**. Click **Modify**.

Note: distribution calls are always accepted, and will consume additional resources. If modifying the load balancing parameters, ensure that any necessary overhead for these calls has been included in the calculations.

How load balancing uses the settings

Within each Call Bridge Group there is a particular preference order in which Call Bridges will be chosen for each space. Any call for a space landing anywhere in the Call Bridge Group will be preferentially redirected to Call Bridges based on this order. The redirection is based on two thresholds: the existing conference threshold and the new conference threshold.

The thresholds are defined as:

existing conference threshold = existingConferenceLoadLimitBasisPoints/10000×loadLimit

new conference threshold = newConferenceLoadLimitBasisPoints/10000×loadLimit

When a call lands on a Call Bridge the load limit is checked, if the load limit is above the existing conference threshold, then the call is rejected. Note calls can also be rejected for other reasons. Rejected calls should be redirected by the call control device.

If the load limit is below the existing conference threshold, then the call will be answered and any IVRs traversed. Once the conference is known then the Call Bridge preference order within the group can be determined. This order is used to decide between Call Bridges in cases where there are multiple Call Bridges that could be chosen.

If any Call Bridges within the group are already running the conference, then the load limits of these Call Bridges are checked. If any of these are below the existing conference threshold, then one of these will be used.

If no Call Bridge has yet been chosen, then one of the Call Bridges with a load limit less than the existing conference threshold is chosen.

2.0.1 Load monitoring

Meeting Server periodically records load data and provides real-time load status as a percentage via the load attribute.

2.0.1.1 Load Percentage Calculation:

The load percentage is calculated based on the server's configured **loadLimit** and is displayed in the **System status** under the **General** tab of the Meeting Server web admin interface. Administrators can refresh the Webadmin UI page to view the latest load percentage.

If the **loadLimit** API parameter is not configured by the administrator, the System Status tab for Load will display as " **not configured**" .

2.0.1.2 Parameters used in calculation:

- **mediaProcessingLoad**: The current media processing load on the server.
- **loadLimit**: The maximum load configured for the server.
- **Thresholds values**: the existing conference threshold and the new conference threshold using the values derived from:
  - **existing conference threshold** = existingConferenceLoadLimitBasisPoints/10000×loadLimit
  - **new conference threshold** = newConferenceLoadLimitBasisPoints/10000×loadLimit

2.0.1.3 Eventlogs and Syslogs:

Meeting Server captures the threshold values as Info, Warnings, and Errors every five minutes, in the eventlogs and syslogs.

Severity	Condition	Action
INFO	If Load percentage < New conference threshold	Information will be captured in Event Log and Syslog. LOAD_MONITOR: {" currentLoad" : X," loadLimit" : Y," loadPercentage" : Z%," message" : " NA" }
WARNING	• If Load percentage > New conference threshold • If Load percentage > Existing conference threshold	Warning will be captured in Event Log, Syslog, and Recent Errors & Warnings. LOAD_MONITOR: {" currentLoad" : X," loadLimit" : Y," loadPercentage" : Z%," message" :" Incoming calls to new conferences will be rejected on callbridge <Callbridge hostname> " }
ERROR	If Load percentage > 100%	Error will be captured in Event Log, Syslog, and Recent Errors & Warnings. LOAD_MONITOR: {" currentLoad" : X," loadLimit" : Y," loadPercentage" : Z," message" :" New conferences and participants will be rejected on callbridge <Callbridge hostname> " }

Load balancing outbound SIP calls

Call Bridge Groups supports the load balancing of outbound SIP calls, in addition to inbound SIP calls.

To load balance outbound SIP calls, do the following:

- enable load balancing of outbound SIP calls from spaces,
- set up outbound dial plan rules for load balancing outbound SIP calls,

- supply the Call Bridge Group or a specific Call Bridge for the outbound SIP calls.

Once load balancing is enabled, outbound SIP calls follow the logic:

- Find the highest priority outbound dial plan rule that matches the domain,
  - if this applies to a local Call Bridge, then balance the call within the local Call Bridge Group.
  - if this only applies to remote Call Bridges, then load balance the call within the Call Bridge Group to which the Call Bridge is a member.

Note: Load balancing of calls from/to Lync clients, is not currently supported by Call Bridge Groups.

How to enable load balancing of outbound SIP calls

To configure the Call Bridges in a specific Call Bridge Group, to attempt to load balance outgoing SIP calls from spaces:

1. From the list of API objects, tap the ▶ after **/callBridgeGroups**
2. Click on the **object id** of the selected Call Bridge Group or **Click new** to create a new Call Bridge Group.
3. Set **loadBalanceOutgoingCalls** = **true**. Click **Modify**.

For load balancing of outbound calls, each Call Bridge in the group must have the same dial plan rules.

How to set up an outbound dial plan rule for load balancing outbound SIP calls

There are 3 ways to set up outbound dial plan rules for load balancing outbound SIP calls:

1. Setting the **scope** parameter to **global** in all of the outbound dial plan rules. This ensures that all Call Bridges are able to use all of the outbound dial plan rules to reach a matching domain.
2. Creating identical outbound dial plan rules for each Call Bridge in the Call Bridge Group. Set the **scope** parameter to **callBridge**. Use the **callBridge** parameter to set the **ID** of the Call Bridge.
3. Creating outbound dial plan rules for the specific Call Bridge Group. Set the **scope** parameter to **callBridgeGroup**, and set the **callBridgeGroup** parameter to the **ID** of the Call Bridge Group.

Before using load balancing of outbound calls, review the existing outbound dial plan rules for each Call Bridge in the Call Bridge group:

1. From the list of API objects, tap the ► after **/outboundDialPlanRules**
2. Either create a new outbound dial plan rule or click on the **object id** of an existing outbound dial plan that you plan to use for load balancing outbound SIP calls
3. Select the settings for **scope**, **callBridge** and **callBridgeGroup** depending on how you plan to use the dial plan (see the 3 alternative ways above)

How to supply the Call Bridge Group or specific Call Bridge to use for outbound SIP calls to participants

To make a call from a specific Call Bridge Group,

1. From the list of API objects, tap the ► after **/calls**
2. Click on the **object id** of the individual call
3. Select **api/v1/calls/<call id>/participants** from the **Related objects** at the top of the page
4. Scroll down the parameters to **callBridgeGroup**, tick the box and click **Choose**. Select the **object id** of the Call Bridge Group to use for this call. Click **Create**.

Handling load balancing of active empty conferences

The load balancing algorithm preferentially places new calls onto a Call Bridge where the conference is already active. An empty conference can be started on a Call Bridge by selecting **/calls** from the API object list and then clicking on **Create new**. By default these empty conferences are treated as active. This means that the first call to the empty conference is preferentially load balanced to this Call Bridge. You can prevent the load balancing preferentially using the empty conferences, by setting the parameter **activeWhenEmpty** to **false** when creating the new call.

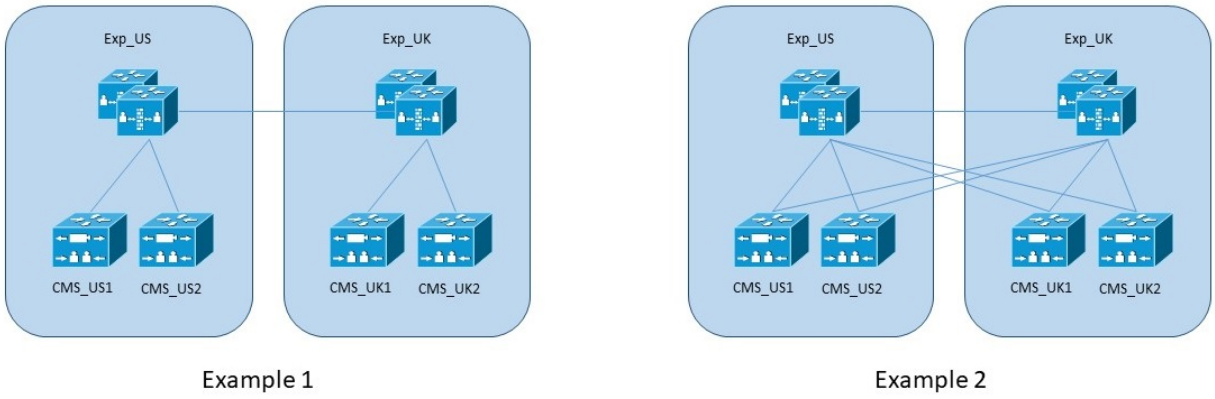
Example deployments of load balancing incoming calls using Cisco Expressway

This section of the white paper discusses two deployment examples to load balance incoming calls when using Cisco Expressway:

- Example 1 has the Meeting Servers trunked to their local Cisco Expressway cluster. The Cisco Expressways connect to each other via a neighbor zone.
- Example 2 has trunks from each Cisco Expressway cluster to every Meeting Server.

Note: Ensure the Cisco Expressway can route to the domain of the callee in the event of a replaced call.

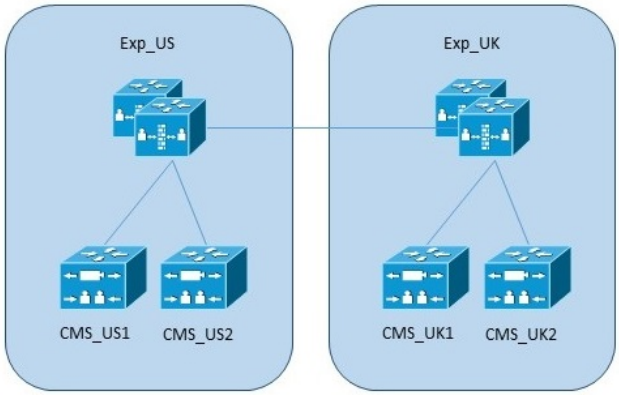
Figure 2: The two example deployments for load balancing incoming calls using Cisco Expressway



Deployment using neighbor zones to reach remote Meeting Servers (example 1)

This example deployment has four Meeting Servers, split over two offices (US, UK). The server names are simply CMS_OfficeNameNumber i.e. CMS_UK1. Cisco Expressway devices are named similarly.

Figure 3: Deployment model with neighbor zones to reach remote Meeting Servers.



This deployment uses neighbor zones to allow a Cisco Expressway to connect to a remote Meeting Server via another Cisco Expressway cluster. Meeting Servers are trunked to the local Cisco Expressway devices. Endpoints in the US all connect to the call control in the US (EXP_ US), and similarly for the UK. Ideally calls originating in the US should use the US Call Bridges and similarly the UK endpoints should end up connected to the UK Call Bridges.

Dial plan configuration

To reduce inter-office bandwidth, the Cisco Expressways in these offices use dial plans to favor sending calls to the local Meeting Server resources. If the local resources are busy, or not available, then remote resources can be configured for use, if available. Only when nothing is available is a Busy response given.

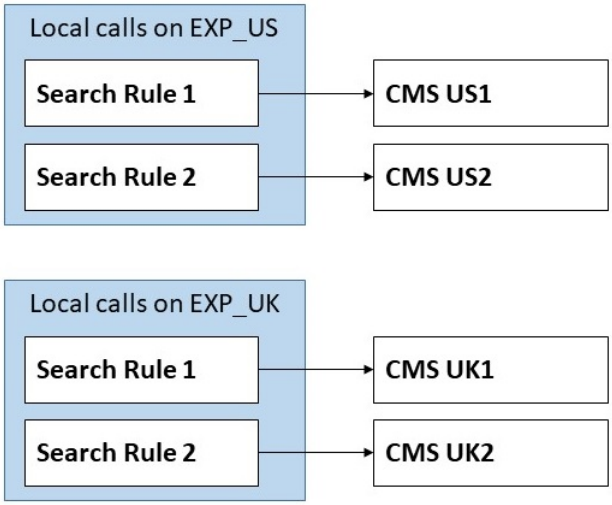
Load balancing calls over local Call Bridges

Balancing calls over local Call Bridges is achieved by configuring a zone per local Call Bridge on the Cisco Expressway, the zone contains a single link to a single local conference resource in that location. The zone should be set up with a custom zone profile enabling Meeting Server load balancing. For more information see Appendix A

A search rule per local Call Bridge is then required. These are associated with zones created above. Each rule must have a different priority value, be set for "**Source**" = "**Any**" and "**On successful match**" = "**Continue**".

The same rules can be configured on each cluster, see Figure 4.

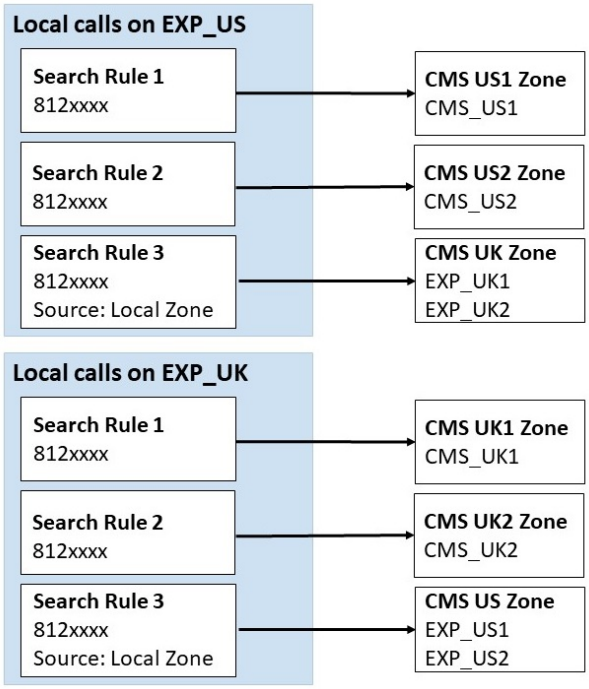
Figure 4: Load balancing over local Call Bridges



Configuring failover to remote Call Bridges via Cisco Expressway clusters

Failover to remote Call Bridges is achieved by using additional search rules per Expressway cluster. These additional search rules target the neighbor zones to other Cisco Expressway clusters. Note that to prevent call loops, the "source" value of these search rules may need to be set. This may mean multiple search rules need to be configured to cover all possible sources.

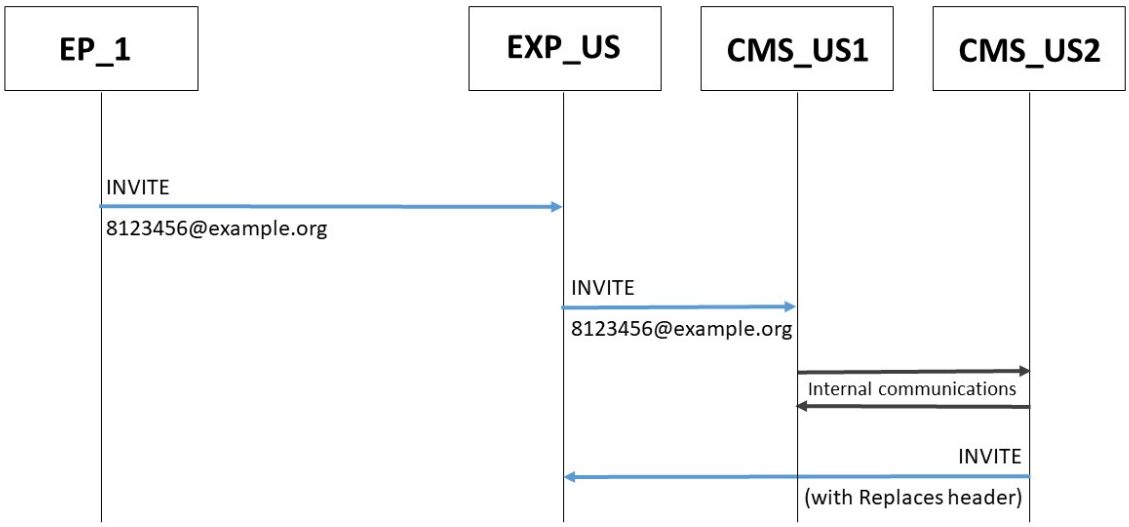
Figure 5: Load balancing over remote Call Bridges using neighbor zones



Call flow for calls load balanced between servers in the same location

Within each Call Bridge Group, the aim is to have calls for the same conference placed on the same server whenever possible. The call control system doesn't need to know about the existing placement or loading, and will only need to redirect calls as required by the Meeting Server. This redirect will occur via a second Meeting Server node sending a new INVITE message back to the Cisco Expressway. This message contains the necessary information for the Cisco Expressway to replace any existing connection to the first Meeting Server with this new connection. The user's device does not need to participate in this transfer at all, see Figure 6.

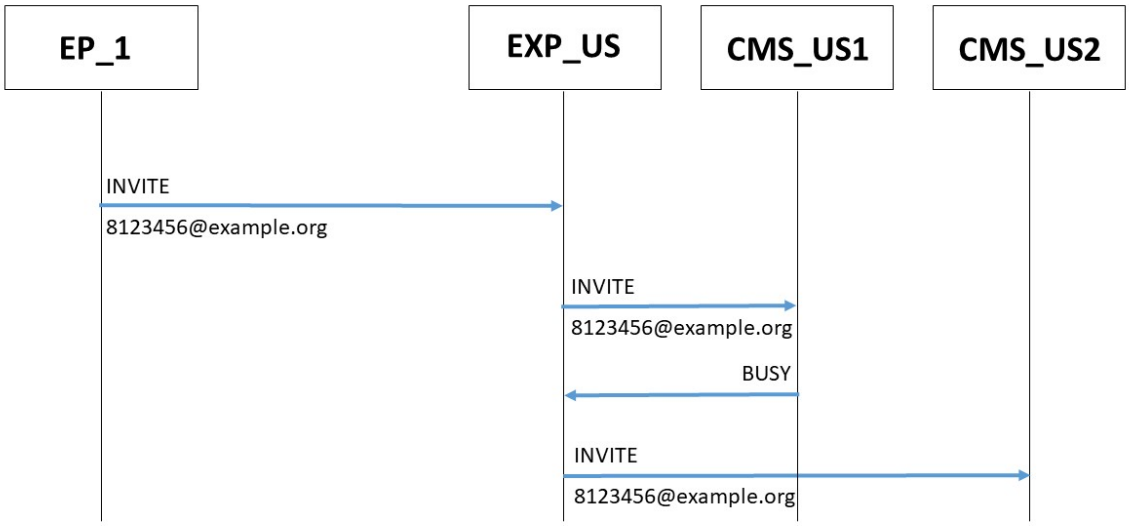
Figure 6: Call flow for calls load balanced between servers in the same location



Call flow for calls redirected within a location

If the first Call Bridge contacted is too busy to receive the initial call, then it will reject that call and then the call control system will reroute the call to another Call Bridge based on the dial plan, see Figure 7.

Figure 7: Call flow for calls redirected within a location 1.



In this example the call flow is:

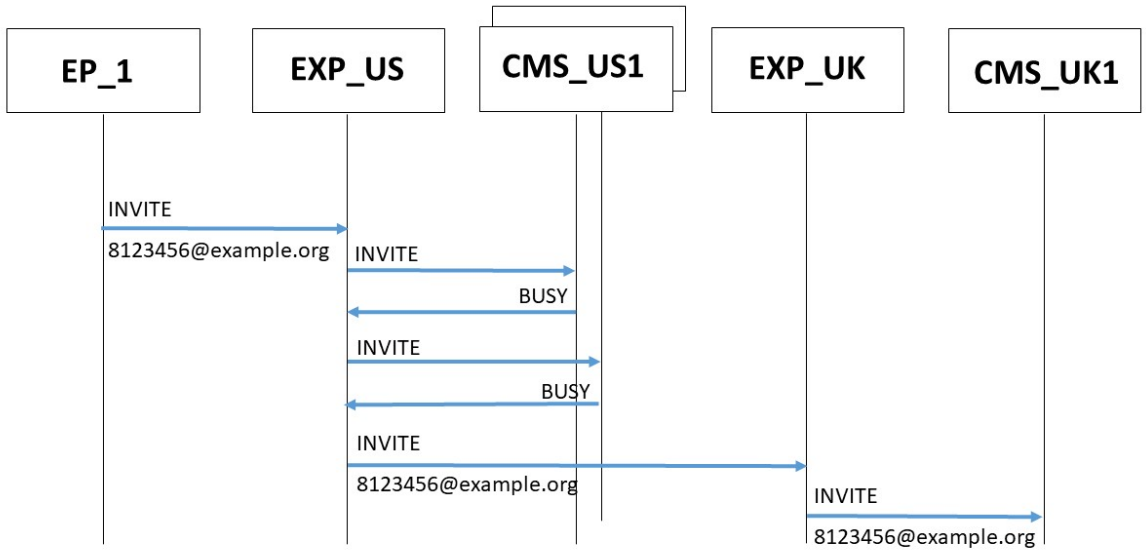
1. An incoming call from a US endpoint to 8123456@example.com lands on EXP_US
2. EXP_US matches this against a search rule, resolves that to “CMS_US1”.
3. EXP_US makes a call to “CMS_US1”.
4. This server returns a SIP 488 error code.
5. EXP_US continues to another search rule and makes a call to “CMS_US2”

Note: If CMS_US2 returns a SIP 488 error code, then the above process is repeated with the next search rule. If all Call Bridges in the group return a SIP 488 error code, then a BUSY will be sent back to the endpoint.

Call flow for calls redirected between regions

It is possible that all local Call Bridges are in use. In this case, it is possible to redirect the call to another Call Bridge or a Call Bridge Group. This is a deployment choice and the Meeting Servers can be deployed to either reject calls when all local resources are in use, or to try other Call Bridges, see Figure 8. The Dial plan configuration section explains how to use dial plans to redirect calls between regions.

Figure 8: Call flow for calls redirected between regions



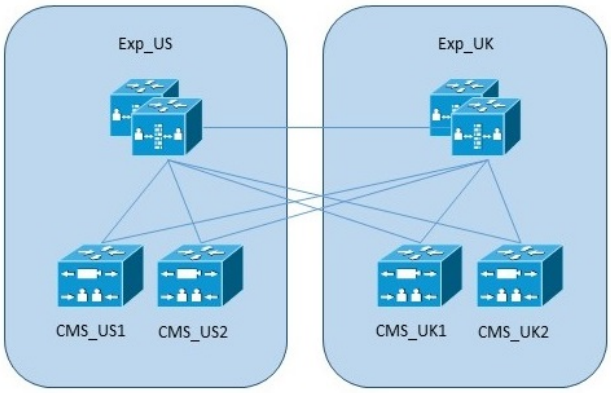
In this example the call flow is:

1. An incoming call from a US endpoint to 8123456@example.com lands on EXP_US
2. EXP_US uses search rules to resolve this to “CMS_US1”.
3. EXP_US makes a call to “CMS_US1”.
4. This server returns a SIP 488 error code.
5. EXP_US continues to another search rule and makes a call to “CMS_US2”
6. This server returns a SIP 488 error code.
7. EXP_US continues to another search rule and makes a call to “EXP_UK”
8. EXP_UK starts searching its search rules and resolves this to “CMS_UK1”

Deployment with zones direct to remote Call Bridges (example 2)

This example deployment has four Meeting Servers, split over two offices (US, UK). The server names are simply CMS_OfficeNameNumber i.e. CMS_UK1. Cisco Expressway devices are named similarly, see Figure 9.

Figure 9: Deployment model with neighbor zones to reach remote Meeting Servers



This deployment uses zones to allow a Cisco Expressway to directly connect to a remote Meeting Server. Meeting Servers are trunked to the local Cisco Expressway devices. Endpoints in the US all connect to the call control in the US (EXP_US), and similarly for the UK. Ideally calls originating in the US should use the US Call Bridges and similarly the UK endpoints should end up connected to the UK Call Bridges.

Dial plan configuration

To reduce inter-office bandwidth, the Cisco Expressways in these offices use dial plans to favor sending calls to the local Meeting Server resources. If the local resources are busy, or not available, then remote resources can be configured for use, if available. Only when nothing is available is a Busy response given.

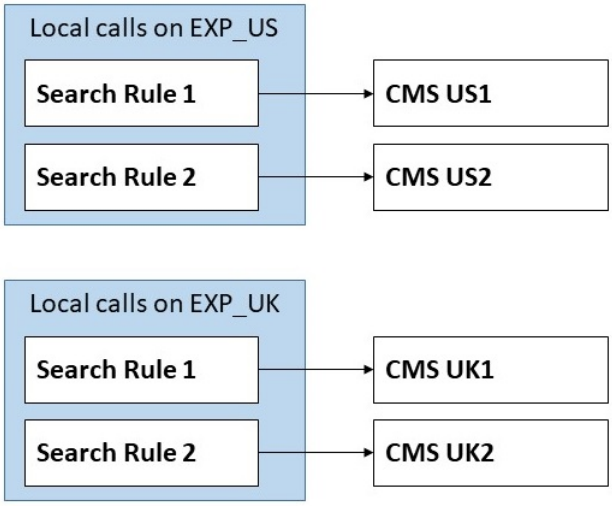
Load balancing calls over local Call Bridges

Balancing calls over local Call Bridges is achieved by configuring a zone per local Call Bridge on the Cisco Expressway, the zone contains a single link to a single local conference resource in that location. The zone should be set up with a custom zone profile enabling Meeting Server load balancing. For more information see Appendix A.

A search rule per local Call Bridge is then required. These are associated with zones created above. Each rule must have a different priority value, be set for "**Source**" = "**Any**" and "**On successful match**" = "**Continue**".

The same rules can be configured on each cluster, see Figure 10.

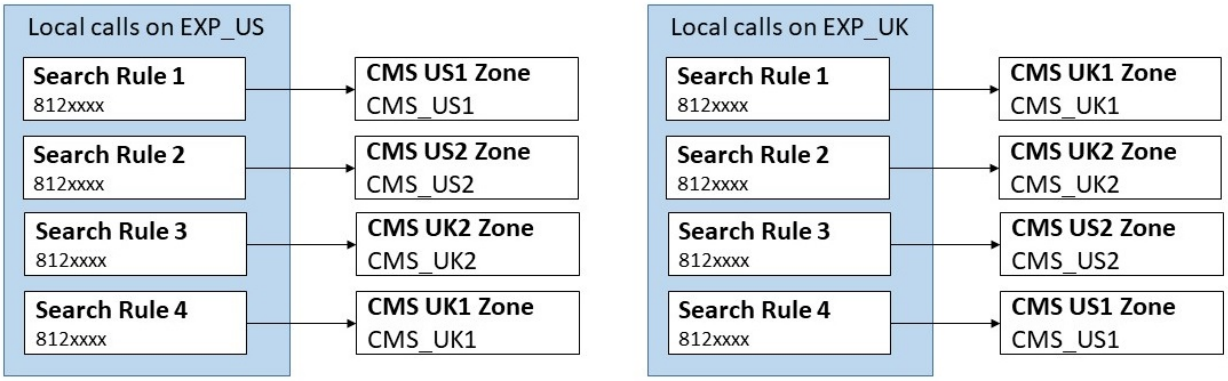
Figure 10: Load balancing over local Call Bridges



Configuring failover to remote Call Bridges via direct connections

Failover to remote Call Bridges is achieved by using additional search rules per Expressway cluster. These additional search rules target the neighbor zones directly to the remote Meeting Server nodes.

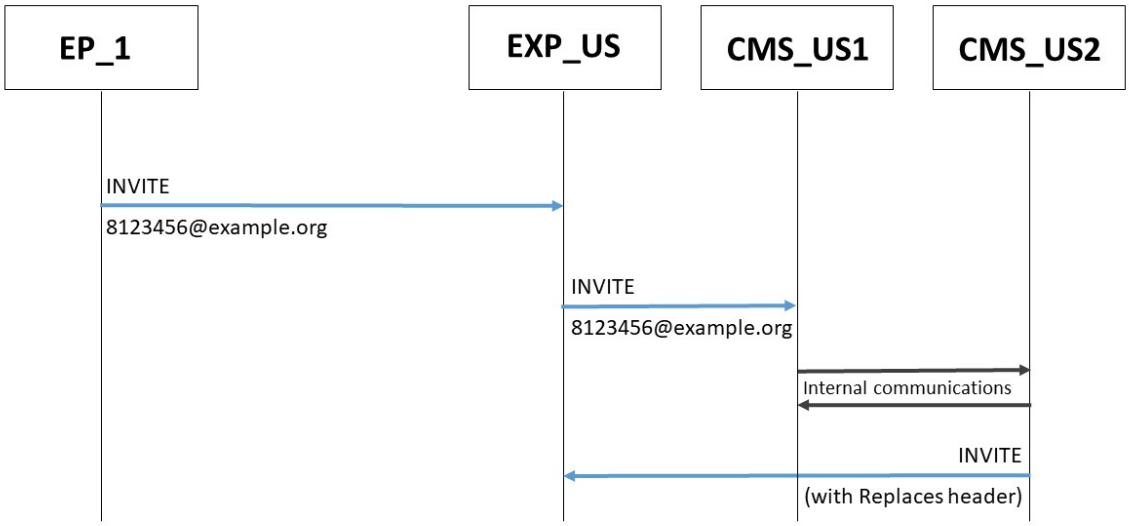
Figure 11: Load balancing over remote Call Bridges using direct connections



Call flow for calls load balanced between servers in the same location

Within each Call Bridge Group, the aim is to have calls for the same conference placed on the same server whenever possible. The call control system doesn't need to know about the existing placement or loading, and will only need to redirect calls as required by the Meeting Server. This redirect will occur via a second Meeting Server node sending a new INVITE message back to the Cisco Expressway. This message contains the necessary information for the Cisco Expressway to replace any existing connection to the first Meeting Server with this new connection. The user's device does not need to participate in this transfer at all, see Figure 12.

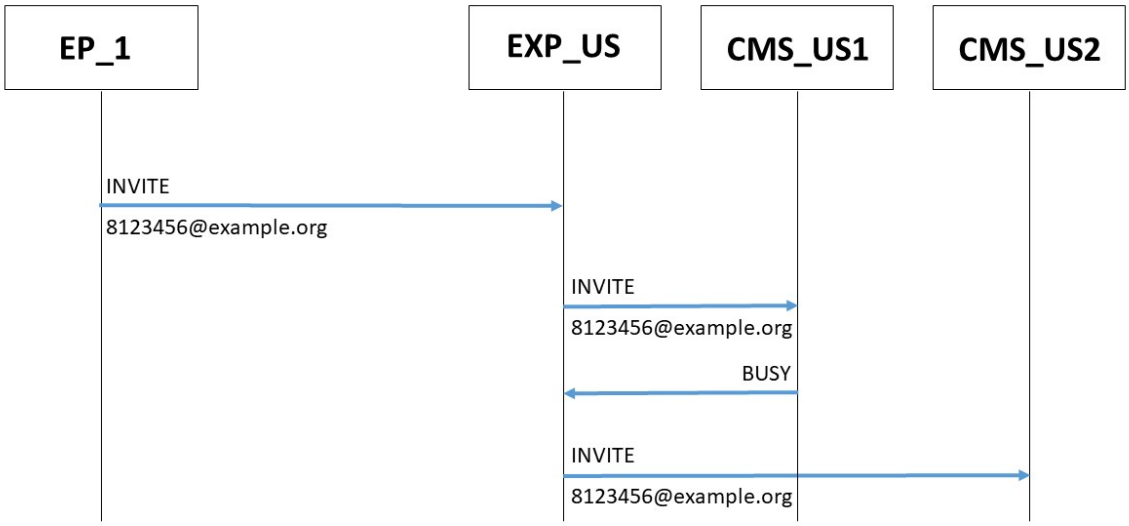
Figure 12: Call flow for calls load balanced between servers in the same location



Call flow for calls redirected within a location

If the first Call Bridge contacted is too busy to receive the initial call, then it will reject that call and then the call control system will reroute the call to another Call Bridge based on the dial plan, see Figure 13.

Figure 13: Call flow for calls redirected within a location



In this example the call flow is:

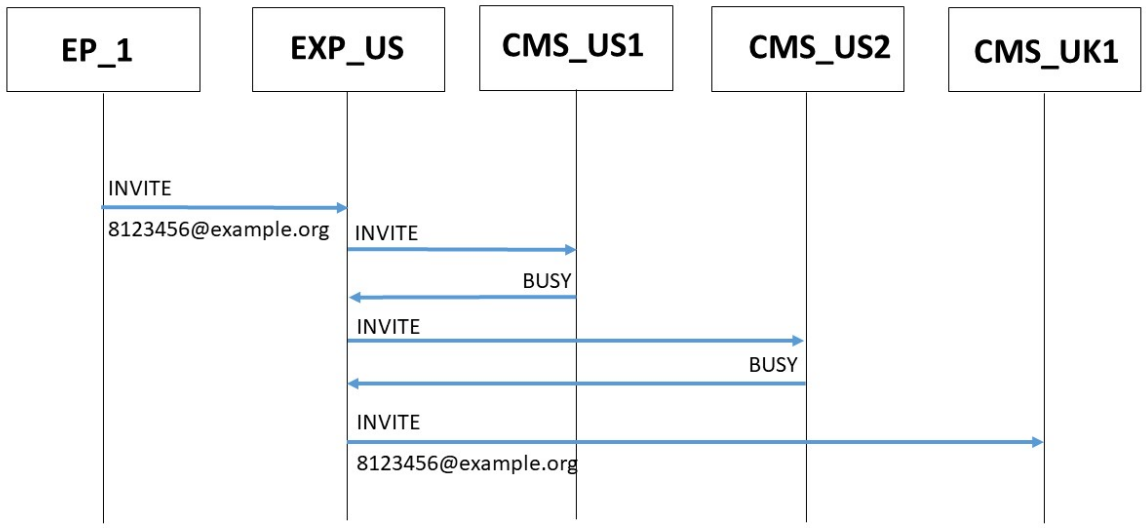
1. An incoming call from a US endpoint to 8123456@example.com lands on EXP_US
2. EXP_US matches this against a search rule, that resolves to “CMS_US1”.
3. EXP_US makes a call to “CMS_US1”.
4. This server returns a SIP 488 error code.
5. EXP_US continues to another search rule and makes a call to “CMS_US2”

Note: If CMS_US2 returns a SIP 488 error code, then the above process is repeated with the next search rule. If all Call Bridges in the group return a SIP 488 error code, then a BUSY will be sent back to the endpoint.

Call flow for calls redirected between regions

It is possible that all local Call Bridges are in use. In this case, it is possible to redirect the call to another Call Bridge or a Call Bridge Group. This is a deployment choice and the Meeting Servers can be deployed to either reject calls when all local resources are in use, or to try other Call Bridges, see Figure 14. The Dial plan configuration section explains how to use dial plans to redirect calls between regions.

Figure 14: Call flow for calls redirected between regions



In this example the call flow is:

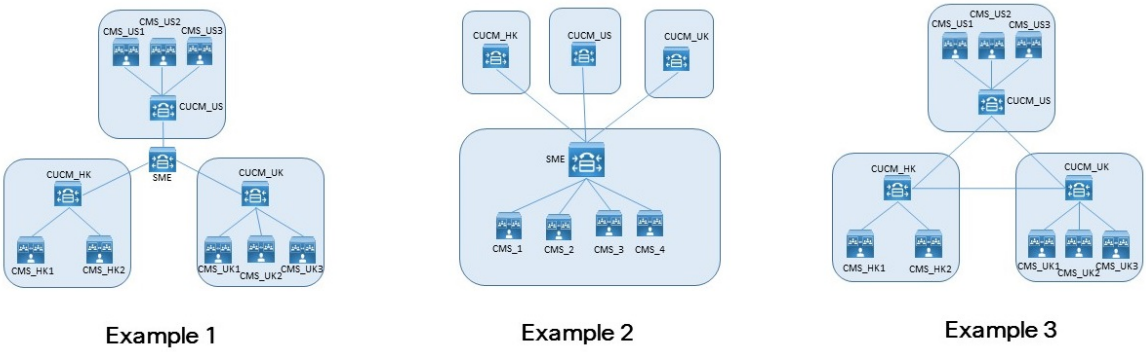
1. An incoming call from a US endpoint to 8123456@example.com lands on EXP_US
2. EXP_US uses search rules to resolve this to “CMS_US1”.
3. EXP_US makes a call to “CMS_US1”.
4. This server returns a SIP 488 error code.
5. EXP_US continues to another search rule and makes a call to “CMS_US2”
6. This server returns a SIP 488 error code.
7. EXP_US continues to another search rule and makes a call to “CMS_UK1”

Example deployments of load balancing incoming calls using Cisco Unified Communications Manager

This section of the white paper discusses three deployment examples to load balance incoming calls using Cisco Unified Communications Manager:

- Example 1 has the Meeting Servers trunked to their local Cisco Unified Communications Manager. The Cisco Unified Communications Managers connect to a Cisco Unified Communications Manager Session Management Edition (SME) as leaf nodes. The SME routes calls between the nodes.
- Example 2 has centralized Meeting Servers trunked to an SME and a global Cisco Unified Communications Manager deployment.
- Example 3 has the Meeting Servers trunked to their local Cisco Unified Communications Manager. The Cisco Unified Communications Managers are simply trunked together, there is no SME to centrally route the calls.

Figure 15: The three example deployments for load balancing incoming calls



Example 1 Example 2 Example 3

For any deployment, there are three options for how calls from different devices are mapped to specific resources:

- Multiple partitions with Calling Search Spaces used to select the correct partition.
- Single partition with Local Route Groups. Selection of routes is done via multiple device pools.
- Dial string manipulation within a single partition per cluster.

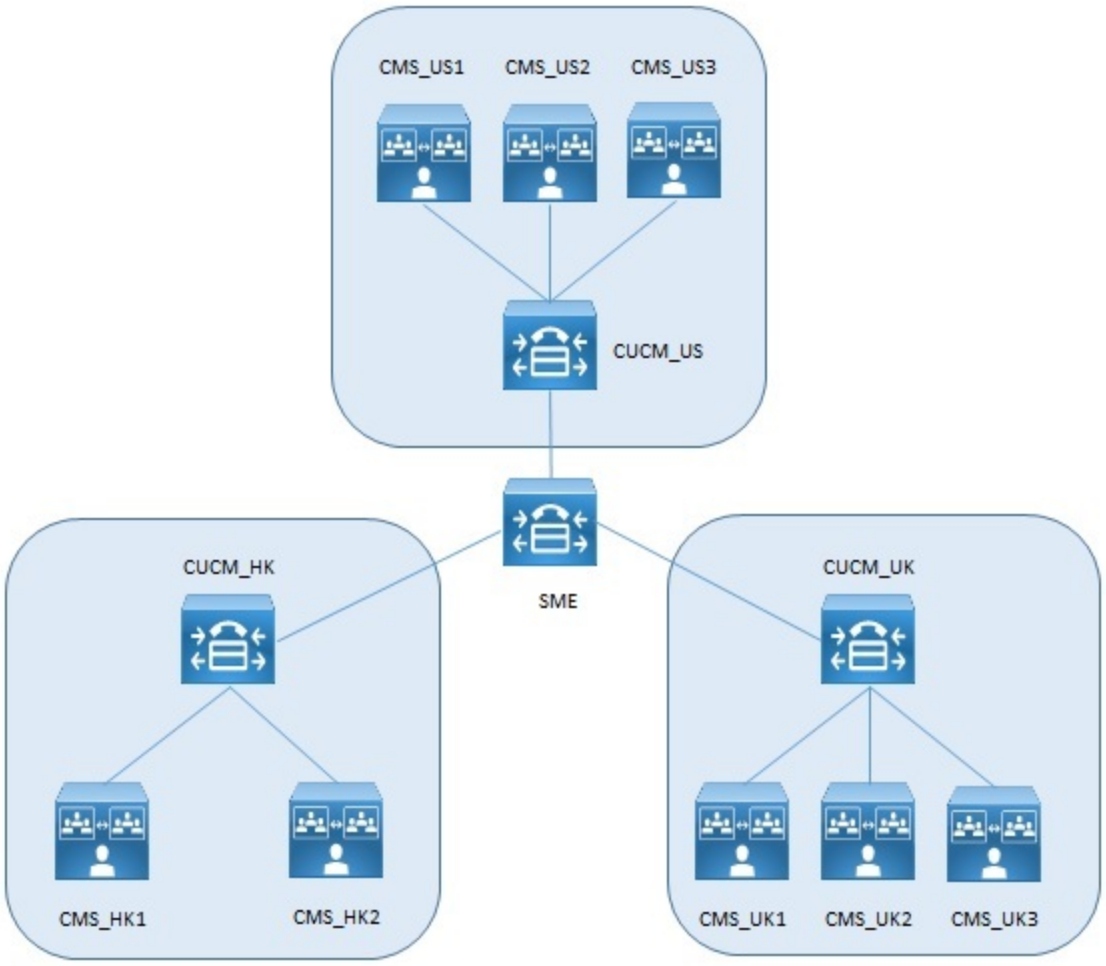
Each of these options can be used with any of the deployments.

The last option is easy to do for numeric dial plans, but for URI dialing, LUA scripts will be required. The other two options work equally well for numeric and URI dialing.

Deployment uses an SME for centralized call routing between Cisco Unified Communications Managers (example 1)

This example deployment has 8 Meeting Servers, split over three offices (US, UK and HK). The server names are simply CMS_OfficeNameNumber i.e. CMS_UK1. Cisco Unified Communications Manager devices are named similarly.

Figure 16: Deployment model with Meeting Servers on leaf Cisco Unified Communications Manager nodes when using an SME for centralized routing of calls



This deployment uses a Cisco Unified Communications Manager Session Management Edition (SME) for centralized routing of conferencing traffic, all other Cisco Unified Communications Managers connect to the SME as leaf nodes. Meeting Servers are trunked to the local Cisco Unified Communications Manager devices. Endpoints in the US all connect to the call control in the US (CUCM_US), and similarly for the UK. Ideally calls originating in the US should use the US Call Bridges and similarly the UK endpoints should end up connected to the UK Call Bridges.

Dial plan configuration

To reduce inter-office bandwidth, the Cisco Unified Communications Manager in these offices use dial plans to favor sending calls to the local Meeting Server resources. If the local resources are busy, or not available, then remote resources can be configured for use, if available. Only when nothing is available is a Busy response given.

Load balancing calls over local Call Bridges

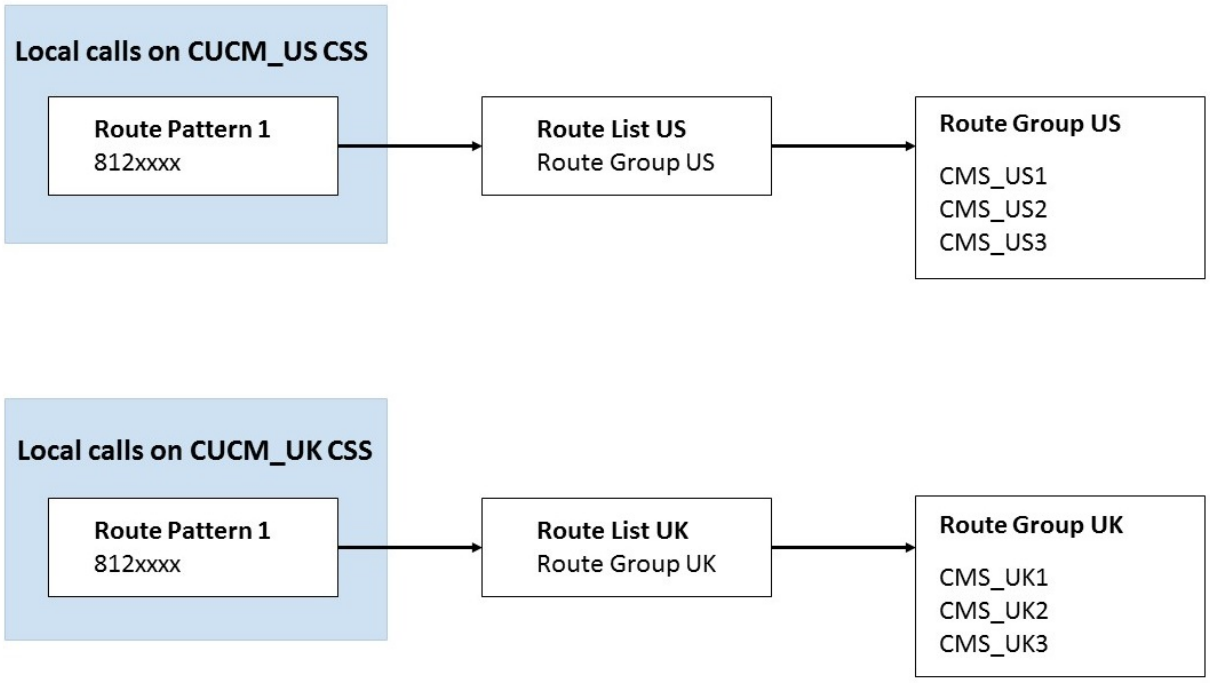
Balancing calls over local Call Bridges is achieved by configuring a route group per location on the Cisco Unified Communications Manager, the route group contains links to the local conference resources in that location. The route group should be set up with circular distribution to load balance calls across the Meeting Servers.

Each trunk to a local Call Bridge must be configured to use a SIP Trunk Security Profile that has the "Accept Replaces Header" checkbox selected. For more information see the Security Guide for Cisco Unified Communications Manager.

A route list is then required for calls that originate in that location. This is associated with a route pattern as dialed by the users. This route list contains the route group.

Route patterns should be pointed to each of these route lists. If no failover to remote Call Bridges is required then only one partition is required per cluster. The same route pattern can be configured on each cluster, see Figure 17.

Figure 17: Load balancing over local Call Bridges



Configuring failover to remote Call Bridges using an SME

Failover to remote Call Bridges is achieved by configuring additional route groups into the route lists per location. Then additional route groups and lists are added for calls to and from the SME.

Two partitions should be used per location for the leaf nodes, and one partition per location on the SME. These allow the same route patterns to be used everywhere, with a Calling Search Space used on the local calls and also on the trunks between each location.

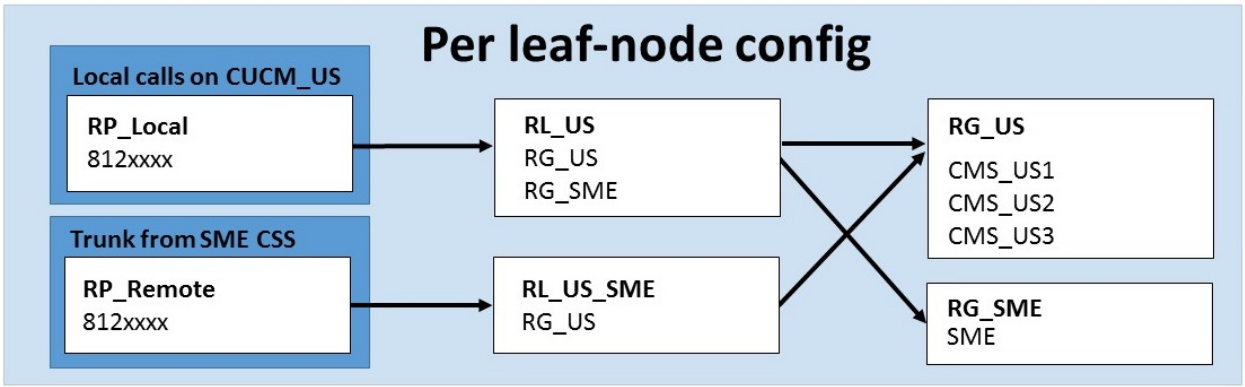
Each trunk to a Call Bridge needs to have the rerouting Calling Search Space set to include a partition containing the trunks to the Call Bridges.

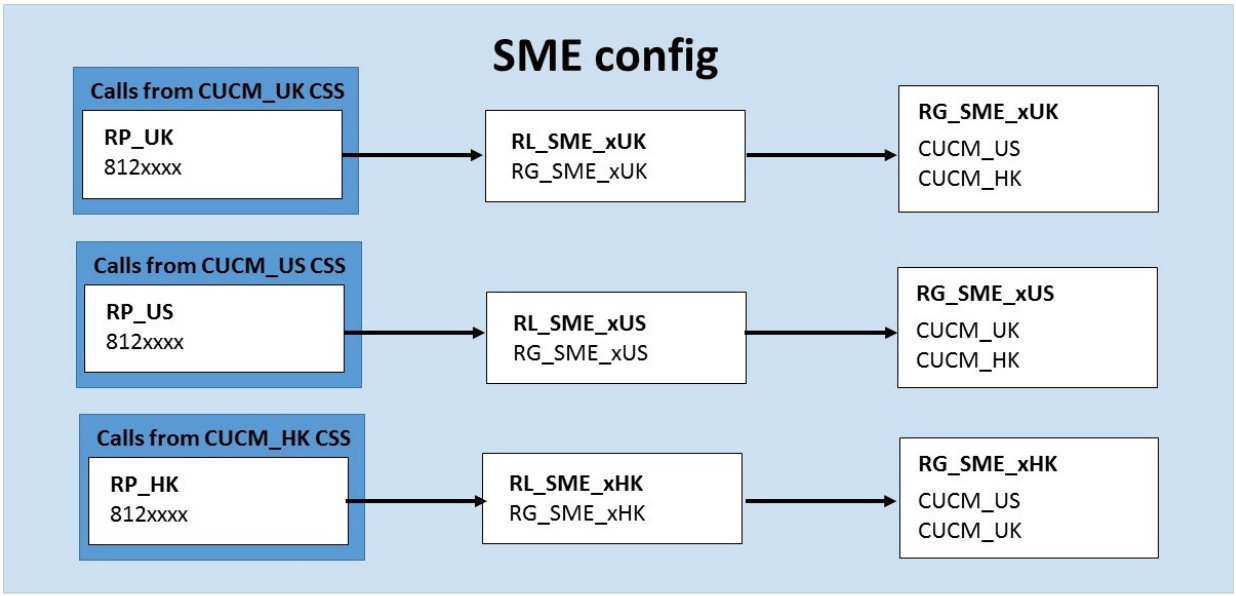
On each leaf cluster there is a new route group consisting of the trunk to the SME. This is used for local calls that could not be handled on a local resource.

On the leaf nodes there are route lists for calls coming from the SME. These only point to the route group containing local resources.

The SME has a route group per leaf cluster. This route group contains trunks to all the other leaf clusters. Incoming calls from one leaf cluster are mapped to a route group that contains the trunks to all other leaf clusters.

Figure 18: Load balancing over remote Call Bridges using the SME





Key:
RP = Route Pattern
RL = Route List
RG = Route Group

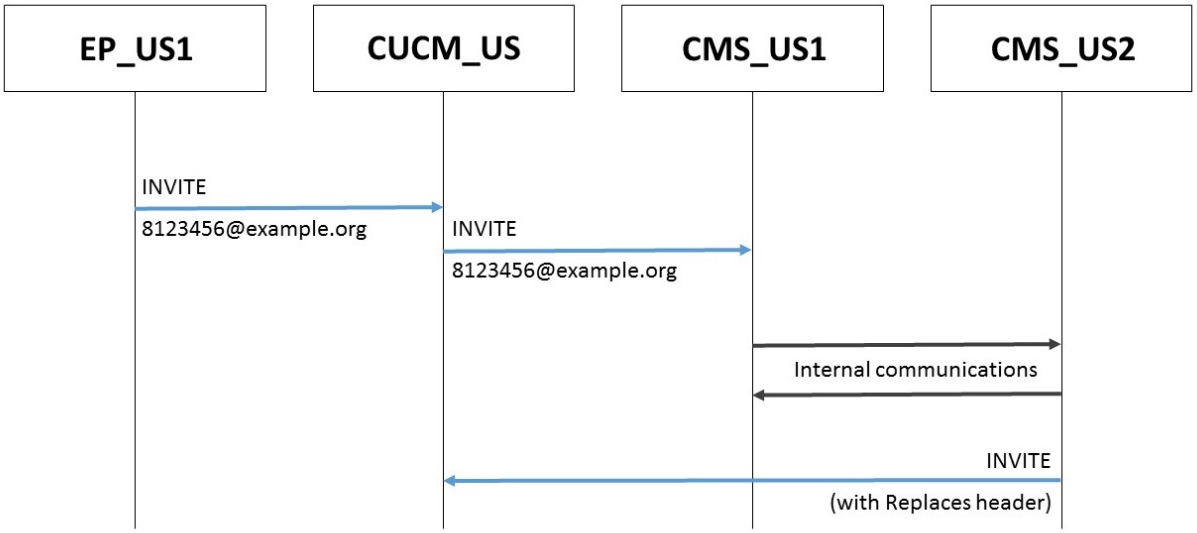
Call flow for calls load balanced between servers in the same location

Within each Call Bridge Group, the aim is to have calls for the same conference placed on the same server whenever possible. The call control system doesn't need to know about the existing placement or loading, and will only need to redirect calls as required by the Meeting Server.

This redirect will occur via a second Meeting Server node sending a new INVITE message back to the Cisco Unified Communications Manager. This message contains the necessary information for the Cisco Unified Communications Manager to replace any existing connection

to the first Meeting Server with this new connection. The user's device does not need to participate in this transfer at all, see Figure 19.

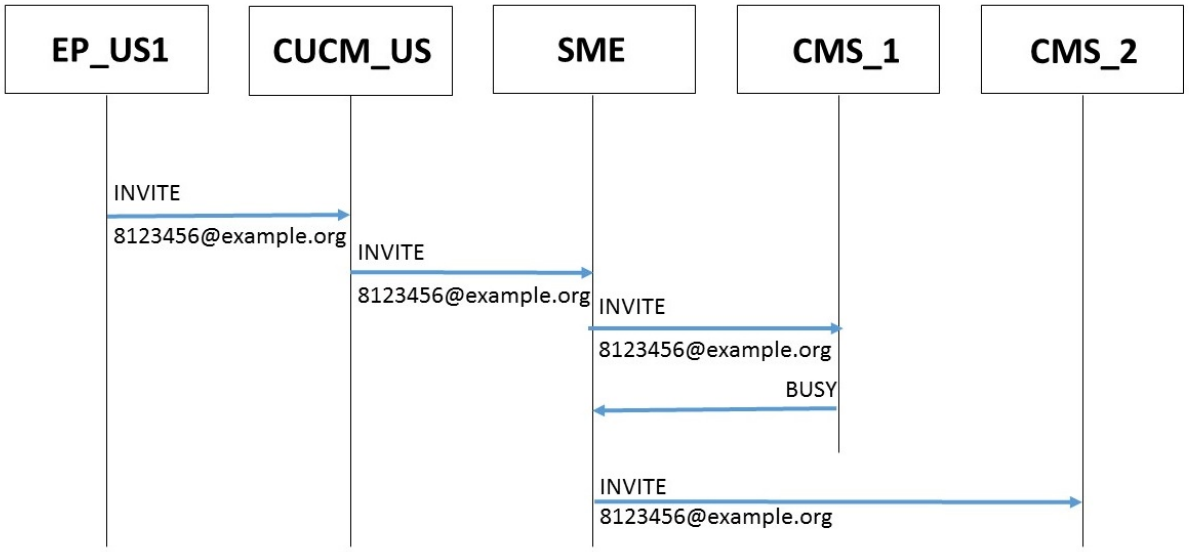
Figure 19: Call flow for calls load balanced between servers in the same location



Call flow for calls redirected within a location

If the first Call Bridge contacted is too busy to receive the initial call, then it will reject that call and then the call control system will reroute the call to another Call Bridge based on the dial plan, see Figure 20.

Figure 20: Call flow for calls redirected within a location



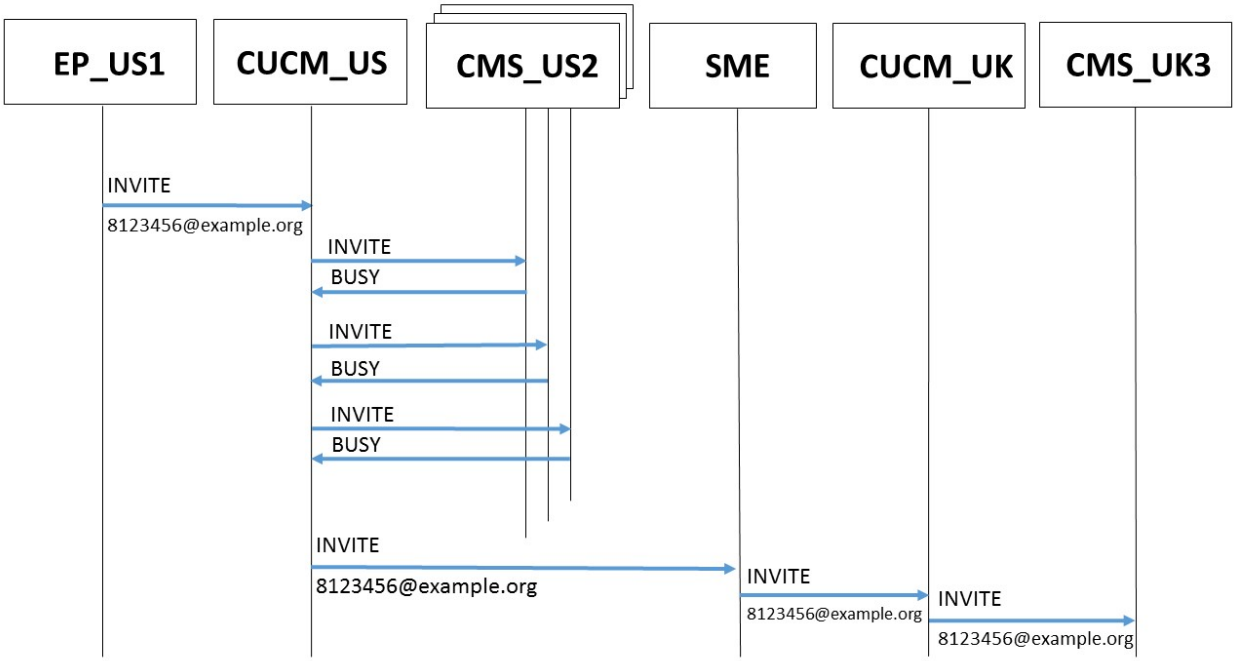
1. An incoming call from a US endpoint to 8123456@example.com lands on CUCM_US
2. CUCM_US matches this against a route pattern, resolves that to “RL_US” and then to the “RG_US”.
3. CUCM_US makes a call to one of the servers in that route group “CMS_US1”.
4. This server returns a SIP 488 error code.
5. CUCM_US understands that this call may be routable to another element in the route group and makes a call to “CMS_US2”

Note: If CMS_US2 returns a SIP 488 error code, then the above process is repeated with the next Call Bridge in the group. If all Call Bridges in the group return a SIP 488 error code, then a BUSY will be sent back to the endpoint.

Call flow for calls redirected between regions

It is possible that all local Call Bridges are in use. In this case, it is possible to redirect the call to another Call Bridge or a Call Bridge Group. This is a deployment choice and the Meeting Servers can be deployed to either reject calls when all local resources are in use, or to try other Call Bridges, see Figure 21. *Dial plan configuration* on page 29 explains how to use dial plans to redirect calls between regions.

Figure 21: Call flow for calls redirected between regions



In this example,

1. An incoming call from a US endpoint to 8123456@example.com lands on CUCM_US
2. CUCM_US uses Calling Space Search to match this against a route pattern, resolves that to "RL_US" and then to the "RG_US".
3. CUCM_US makes a call to one of the servers in that route group "CMS_US2".
4. This server returns a SIP 488 error code.
5. CUCM_US understands that this call may be routable to another element in the route group and makes a call to "CMS_US3"
6. This server returns a SIP 488 error code.
7. CUCM_US understands that this call may be routable to another element in the route group and makes a call to "CMS_US1"
8. This server returns a SIP 488 error code.
9. CUCM_US understands that this call may be routable to another element in the route list. All of "RG_US" has been tried, so it moves to the second item in the route list, "RG_SME".
10. "RG_SME" only contains one entry, so CUCM_US sends the call to SME.
11. SME uses Calling Search Space rules to determine that the call should use route list "RL_SME_xUS". It then tries making a call to the first route group in this list ("RG_SME_xUS")

and calls CUCM_UK.

12. CUCM_UK uses Calling Search Space to determine that this call should use route list “RL_SME_xUK”. This only contains one route group “RG_SME_xUK” which has just the local bridges.
13. CUCM_UK makes a call to one of the servers in that route group “CMS_UK3”.

Using Local Route Groups

The above configuration introduces the use of the same Route Pattern in multiple partitions, each one addressed through a specific Calling Search Space for each trunk. The number of Partitions and Calling Search Spaces on the SME cluster equals the number of trunks. There are also two partitions and Calling Search Spaces on each leaf cluster. In order to simplify the configuration and reduce to a single Partition and Calling Search Space per cluster, it’s possible to use the Local Route Group approach.

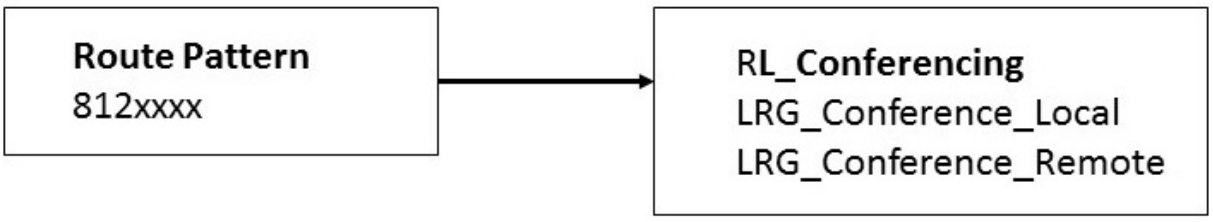
A Local Route Group is a variable that can assume any configured Route Group value based on the Device Pool setting for the calling device.

A Route Pattern or SIP Route Pattern is connected to a Route List, the Route List includes a series of Local Route Groups (instead of Route Groups), and the Local Route Groups are populated accordingly to the settings on the Device Pool of the calling device. In this case the actual route groups are unchanged from the above configuration.

To set this up, the administrator needs to create two Local Route Groups. In this example they are called LRG_Conferencing_Local and LRG_Conferencing_Remote. See Figure 41 in Appendix B. Once these have been created by the administrator, they appear as a list in any Device Pool. These Local Groups should be set up on the SME and all leaf clusters, and for simplicity the same Local Route Group names are used on all systems.

On each CUCM cluster the administrator should create a route pattern pointing to a Route List containing these two Local Route Groups. See Figure 42 and Figure 43. For this example ensure the configuration is identical on every cluster.

Figure 22: Local Remote Groups



Route groups should then be defined on each cluster. These Route Groups are the same as above.

Table 2: Route Groups used in examples

Route Group	Trunks to	Cluster where configuration is active
RG_US	CMS_US1,CMS_US2,CMS_US3	US
RG_UK	CMS_UK1,CMS_UK2,CMS_UK3	UK
RG_HK	CMS_HK1,CMS_HK2	HK
RG_SME	SME	US, UK, HK
RG_SME_xUS	CUCM_UK,CUCM_HK	SME
RG_SME_xUK	CUCM_US,CUCM_HK	SME
RG_SME_xHK	CUCM_US,CUCM_UK	SME

For each device pool, the values for LRG_Conferencing_Local and LRG_Conferencing_Remote should be set. Where appropriate, the first of these should point to a Route Group containing local trunks to resources that will be used first. The second should point to a Route Group containing trunks to other CUCM nodes through which conferencing resources could be used. Not all device pools will have both set. Incoming trunks from SME to a leaf node should not loop back to the SME, and there are no local resources on the SME in this example. See Figure 44 to Figure 52 in Appendix B.

All trunks and local devices should be added to the appropriate Device Pool as shown in the table below.

Table 3: Device Pools used in examples

Device Pool	LRG_Conferencing_Local	LRG_Conferencing_Remote	Cluster where configuration is active
US endpoints	RG_US	RG_SME	US
UK endpoints	RG_UK	RG_SME	UK
HK endpoints	RG_HK	RG_SME	HK
Trunk to SME on US	RG_US	<None>	US
Trunk to and from SME	RG_UK	<None>	UK
Trunk to and from SME	RG_HK	<None>	HK
Calls to SME from US	<None>	RG_SME_xUS	SME
Calls to SME from UK	<None>	RG_SME_xUK	SME
Calls to SME from HK	<None>	RG_SME_xHK	SME

The Route List specifies which Local Route Group will be chosen based on dialled digits or URI. When a Route Pattern that points to RL_Conferencing is matched, the LRG_Conferencing_Local and LRG_Conferencing_Remote Route Groups will be populated with the corresponding content in the Device Pool.

For example,

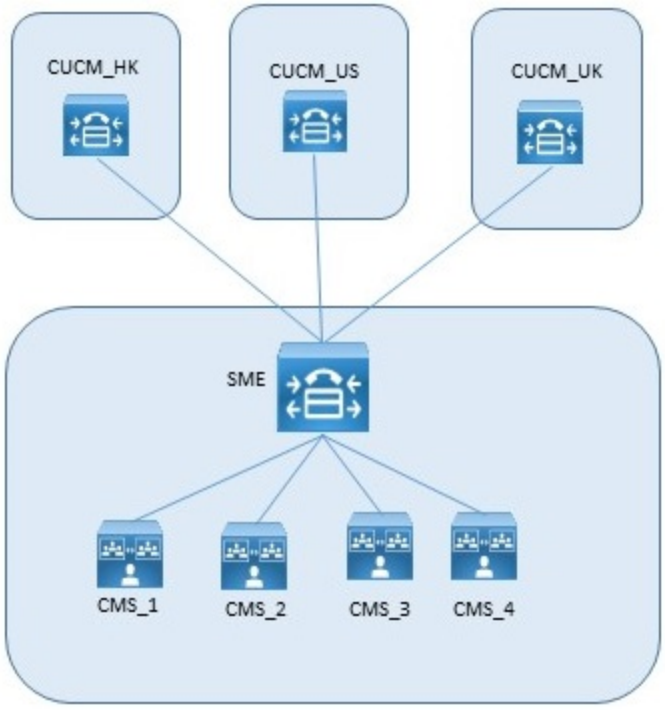
1. an incoming call from a US endpoint to 8123456@example.com lands on CUCM_US
2. CUCM_US matches this against a route pattern, resolves that to “RL_Conferencing” and then to the “LRG_Conferencing_Local”.
3. CUCM_US uses the device pool of the endpoint to populate “LRG_Conferencing_Local” with “RG_US”
4. CUCM_US makes a call to one of the servers in that route group “CMS_US2”.
5. This server returns a SIP 488 error code.
6. CUCM_US understands that this call may be routable to another element in the route group and makes a call to “CMS_US3”
7. This server returns a SIP 488 error code.
8. CUCM_US understands that this call may be routable to another element in the route group and makes a call to “CMS_US1”
9. This server returns a SIP 488 error code.
10. CUCM_US understands that this call may be routable to another element in the route list. All of “RG_US” has been tried, so it moves to the second item in the route list “LRG_Conferencing_Remote”.
11. CUCM_US uses the device pool of the endpoint to populate “LRG_Conferencing_Remote” with “RG_SME”
12. This only contains one entry, so CUCM_US sends the call to SME
13. SME uses the route pattern to match this to the route list “RL_Conferencing” and then to the Local Route Groups “LRG_Conferencing_Local” and “LRG_Conferencing_Remote”.
14. SME uses the device pool of the trunk to populate these. “LRG_Conferencing_Local” is empty and “LRG_Conferening_Remote” is “RG_ SME_xUS”
15. SME selects one of the trunks in “RG_SME_xUS” and calls CUCM_UK.
16. CUCM_UK uses uses the route pattern to match this to the route list “RL_Conferencing” and then to the Local Route Groups “LRG_Conferencing_Local” and “LRG_Conferencing_Remote”.
17. CUCM_UK uses the device pool of the trunk to populate these. “LRG_Conferencing_Local” is “RG_UK” and “LRG_Conferencing_Remote” is empty.
18. CUCM_UK makes a call to one of the servers in that route group “CMS_UK3”.

If you want to know more on Local Route Groups, see the Preferred Architecture for Collaboration, Call Control section: http://www.cisco.com/c/en/us/td/docs/solutions/CVD/Collaboration/enterprise/11x/collbcvd/control.html

Deployment with centralized Meeting Servers and an SME to route calls (example 2)

This example deployment has 4 Meeting Servers all centrally deployed. The server names are simply CMS_Number i.e. CMS_1. Cisco Unified Communications Manager devices are named based on their location.

Figure 23: Deployment model with centralized Meeting Servers and an SME to route calls



This deployment uses a Cisco Unified Communications Manager Session Management Edition (SME) to route calls between the Cisco Unified Communications Manager and the centralized Meeting Servers. All trunks to Meeting Servers come from the SME rather than local Cisco Unified Communications Manager devices. All Meeting Servers exist in a single Call Bridge Group in a common location. Endpoints in the US all connect to the call control in the US (CUCM_US), and similarly for the UK.

Dial plan configuration

When all conferencing resources are centrally located in a single Call Bridge Group the balancing over the Call Bridges is achieved by configuring a single route group on the SME containing all of the Meeting Servers. The route group should be set up with circular distribution to load balance calls across the Meeting Servers.

Each trunk to a local Call Bridge must be configured to use a SIP Trunk Security Profile that has the "Accept Replaces Header" checkbox selected. For more information see the Security Guide for Cisco Unified Communications Manager.

A single route list is then required for all calls. This is associated with a route pattern as dialed by the users. This route list contains the route group.

Figure 24: Load balancing over centrally located Call Bridges

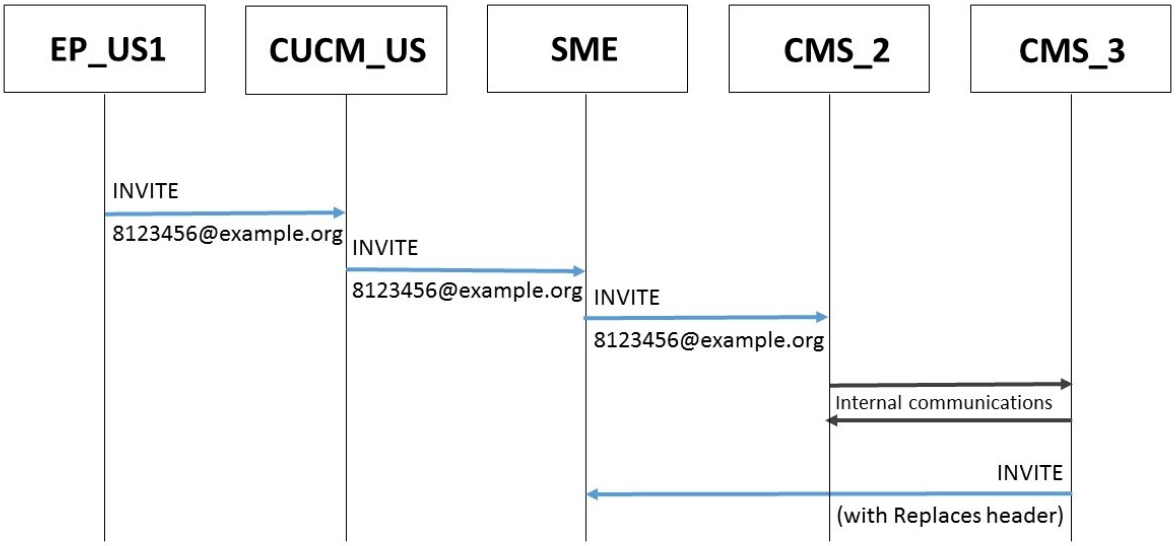


Call flow for a call being load balanced

The aim is to have calls for the same conference placed on the same Meeting Server whenever possible. The call control system doesn't need to know about existing placement or loading, and will only need to redirect calls as required.

This redirect will occur via a second Meeting Server node sending a new INVITE message back to the SME. This message contains the necessary information for the SME to replace any existing connection to the first Meeting Server with this new connection. The user's device does not need to participate in this transfer at all.

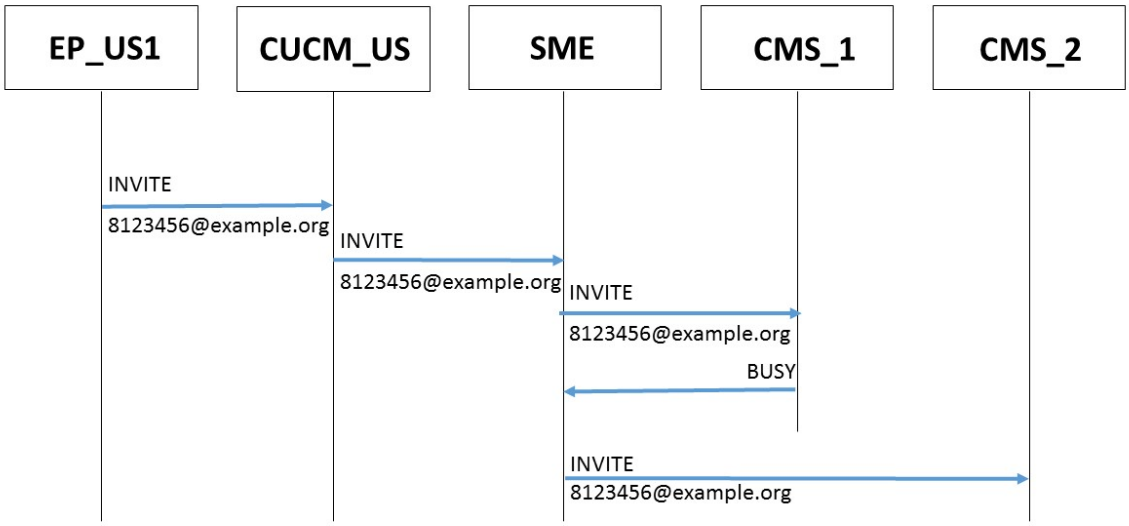
Figure 25: Call flow for load balancing a call



Call flow for call being redirected

If the first Call Bridge contacted is too busy to receive the initial call, then it will reject that call and then the call control system will reroute the call to another Call Bridge based on the dial plan, see Figure 26.

Figure 26: Call flow for call redirected within a location



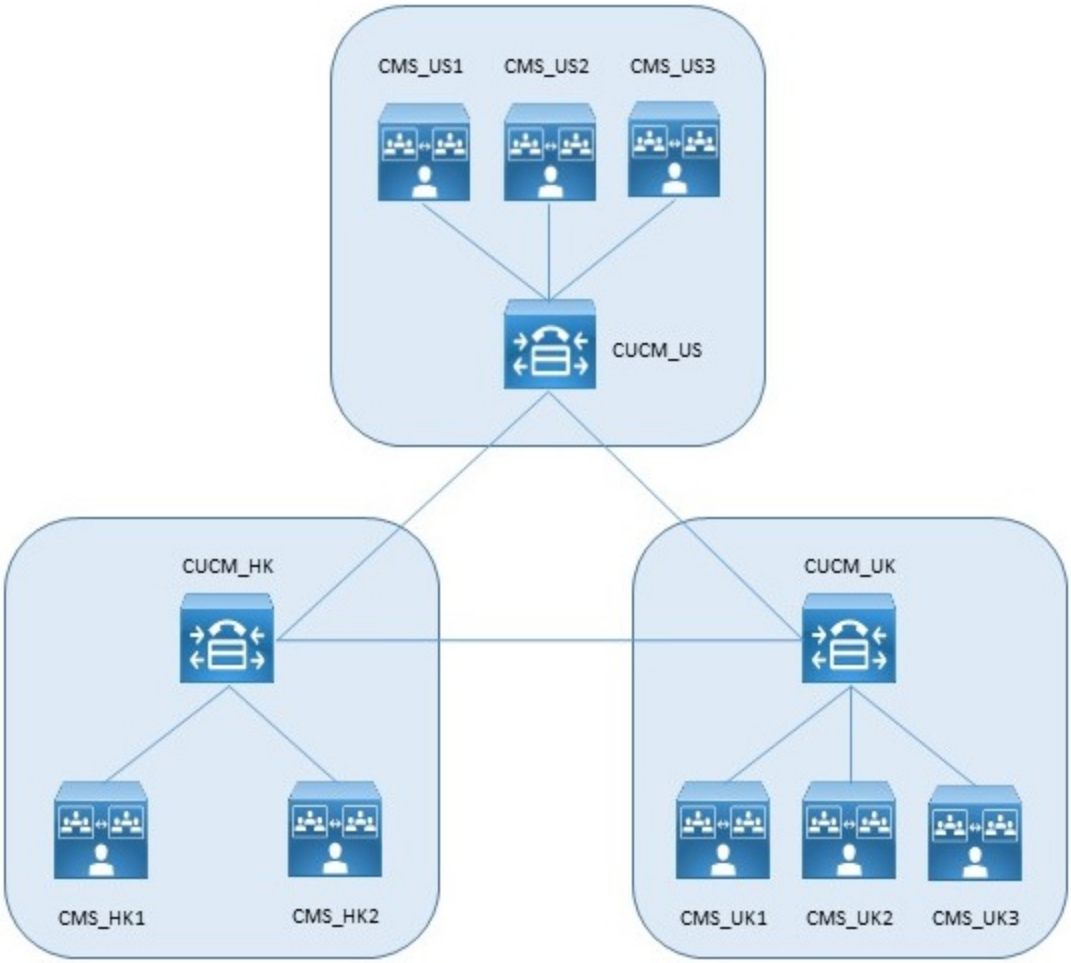
1. An incoming call from a US endpoint to 8123456@example.com lands on CUCM_US
2. CUCM_US matches this against a route pattern, resolves that to trunk to SME.
3. SME matches this against a route pattern, resolves that to “Route List” and then to the “Route Group”
4. SME makes a call to one of the servers in that route group “CMS_1”.
5. This server returns a SIP 488 error code.
6. SME understands that this call may be routable to another element in the route group and makes a call to “CMS_2”

This process could be repeated until all Call Bridges return the SIP 488 error code, in which case a BUSY will be sent back to the endpoint.

Deployment without an SME to route calls (example 3)

This example deployment has 8 Meeting Servers, split over three offices (US, UK and HK). The server names are simply CMS_OfficeNameNumber i.e. CMS_UK1. Cisco Unified Communications Manager devices are named similarly. In this example, no SME is deployed.

Figure 27: Deployment model of Meeting Servers without an SME to route calls



Call control is configured to preferentially route calls from endpoints to the local Call Bridge Group. Endpoints in the US all connect to the call control in the US (CUCM_US), and similarly endpoints in the UK connect to CUCM_UK, and endpoints in HK connect to CUCM_HK.

Dial plan configuration

To reduce inter-office bandwidth, the Cisco Unified Communications Manager in these offices use dial plans to favor sending calls to the local Meeting Server resources. If the local resources are busy, or not available, then remote resources can be configured for use, if available. Only when nothing is available is a Busy response given.

Load balancing calls over local Call Bridges

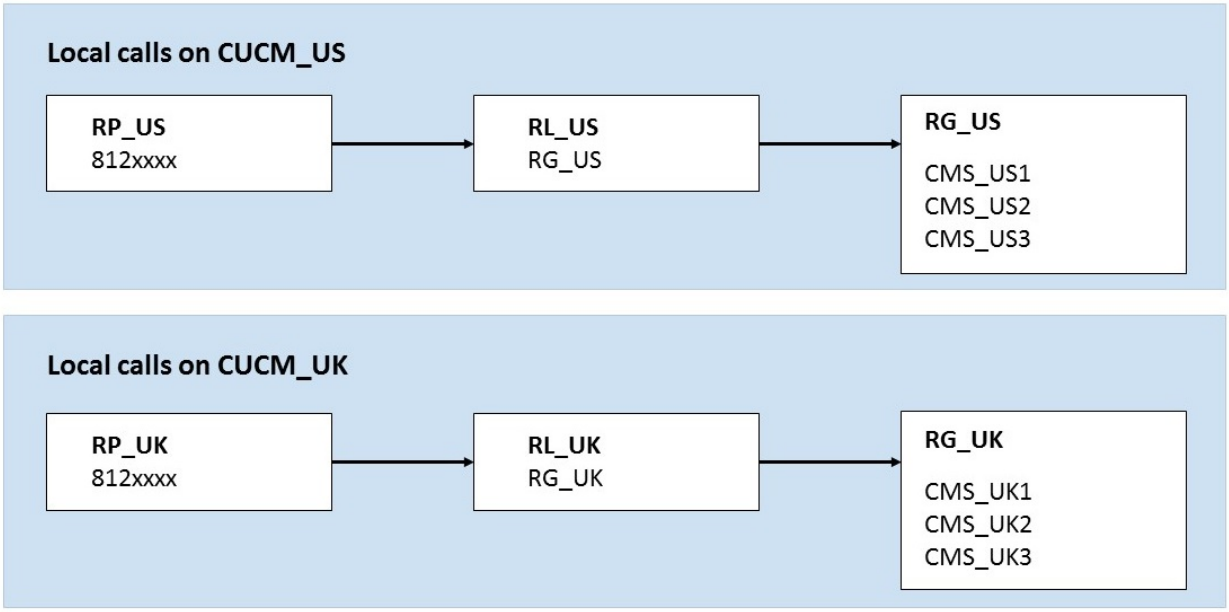
Load balancing calls over local Call Bridges is achieved by configuring a route group per location containing the local resources. The route group should be set up with circular distribution to load balance calls across the servers.

Each trunk to a local Call Bridge must be configured to use a SIP Trunk Security Profile that has the "Accept Replaces Header" checkbox selected. For more information see the Security Guide for Cisco Unified Communications Manager.

A route list is then required for calls that originate in that location. This is associated with a route pattern as dialed by the users. This route list contains the route group.

On each cluster, a route pattern should point to the route list, see Figure 28.

Figure 28: Load balancing over local Call Bridges



Key:
RP = Route Pattern
RL = Route List
RG = Route Group

Configuring failover to remote Call Bridges without using an SME

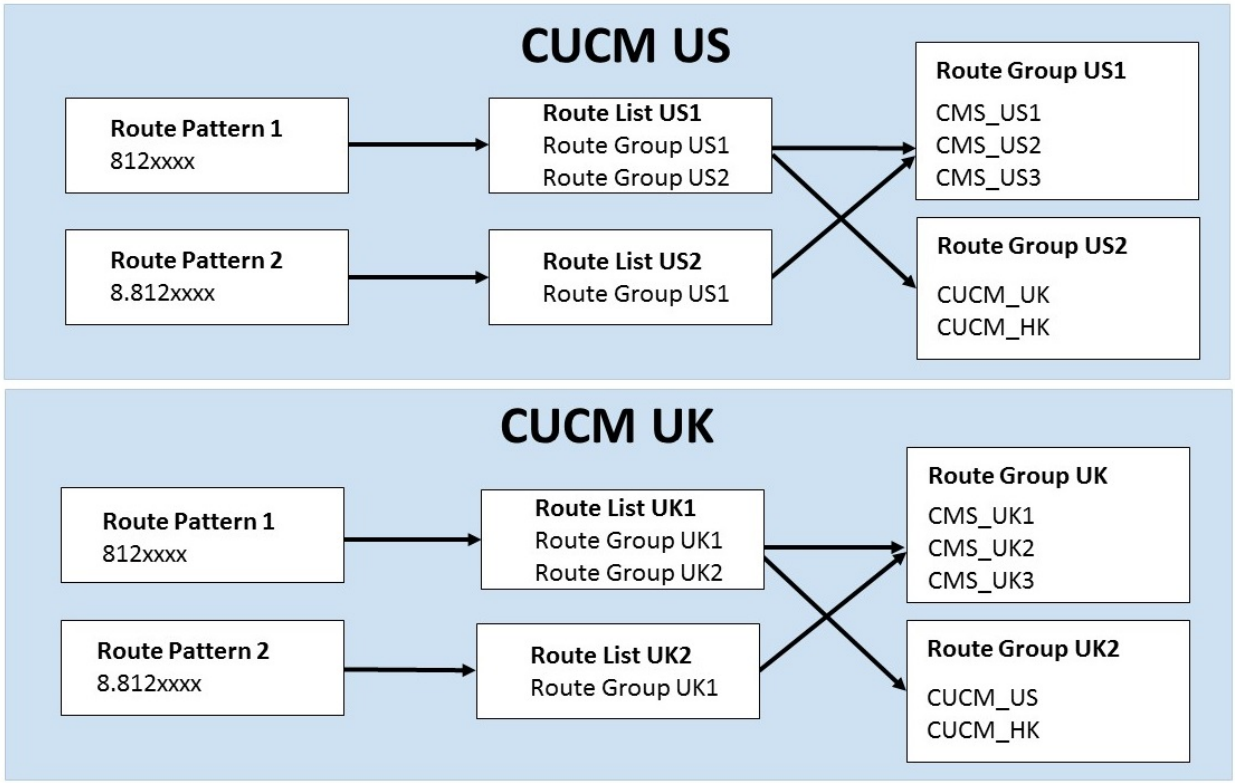
Failover to remote Call Bridges is achieved by configuring a route group per location containing the local resources, and a second route group containing the trunks to the other Cisco Unified Communications Manager clusters. Both route groups should be set up with circular distribution to load balance calls across the servers and locations.

Two route lists are required. The first is used for calls that originate in that location. This is associated with a route pattern as dialed by the users. This route list contains both route groups. Since route lists have an order in which route groups are used, the group containing local resources must be first. The second route group lists the trunks to the other locations. Calls using this second route group must be transformed before sending. In this example the calls are prefixed with an '8' before being forwarded to other clusters.

The second route list is for calls that originate in other locations. For these only the local resources should be queried, and no further distribution to other trunks should be possible. This is done by only adding the route group for local resources to this route list. This route list should be associated with the transformed dial pattern created when forwarding a call between regions. Any changes to add digits or other transforms must be reversed before the call reaches the Meeting Servers.

On each cluster, route patterns should be pointed to each of these route lists, see Figure 29.

Figure 29: Load balancing over remote Call Bridges without using an SME

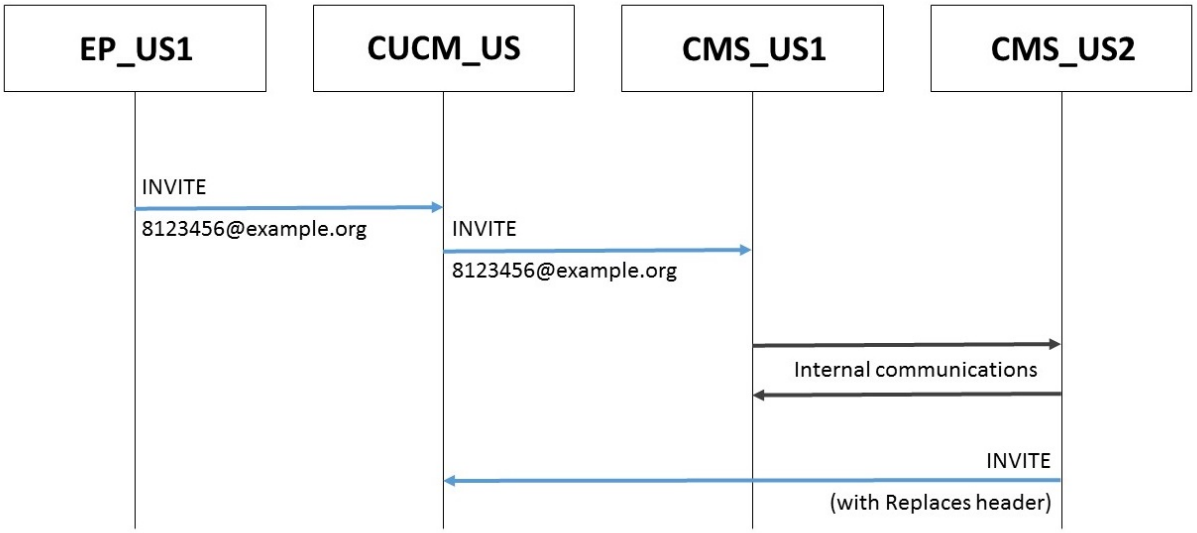


Call flow for a call load balanced between servers in the same location

Within each Call Bridge Group, the aim is to have calls for the same conference placed on the same server whenever possible. The call control system doesn't need to know about the existing placement or loading, and will only need to redirect calls as required by the Meeting Server.

This redirect will occur via a second Meeting Server node sending a new INVITE message back to the Cisco Unified Communications Manager. This message contains the necessary information for the Cisco Unified Communications Manager to replace any existing connection to the first Meeting Server with this new connection. The user's device does not need to participate in this transfer at all, see Figure 30.

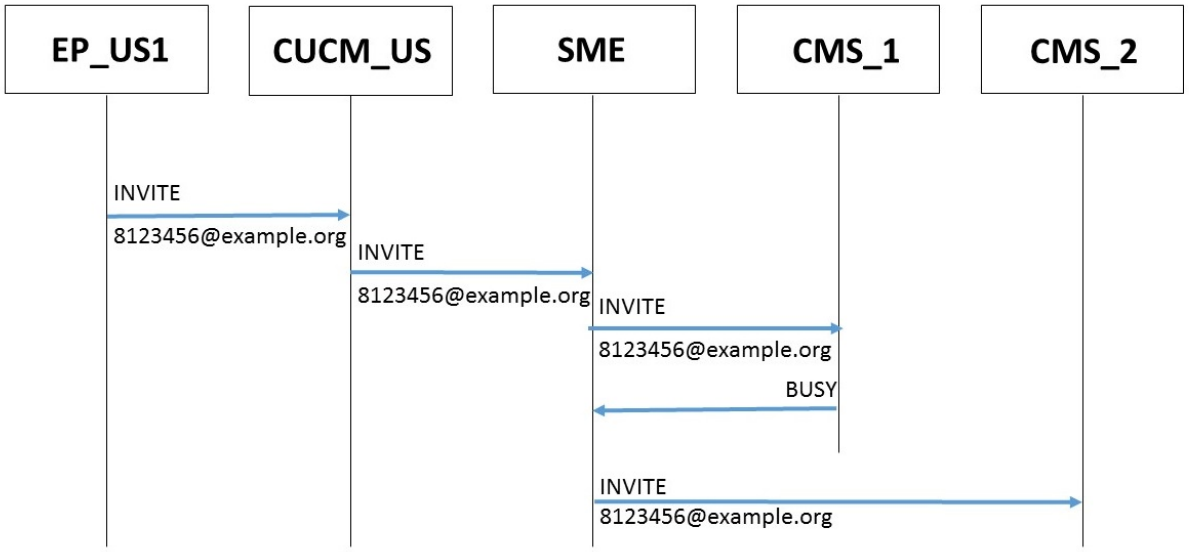
Figure 30: Call flow for load balancing between servers in the same location



Call flow for a call redirected within a location

If the first Call Bridge contacted is too busy to receive the initial call, then it will reject that call and then the call control system will reroute the call to another Call Bridge based on the dial plan, see Figure 31.

Figure 31: Call flow for call redirected within a location



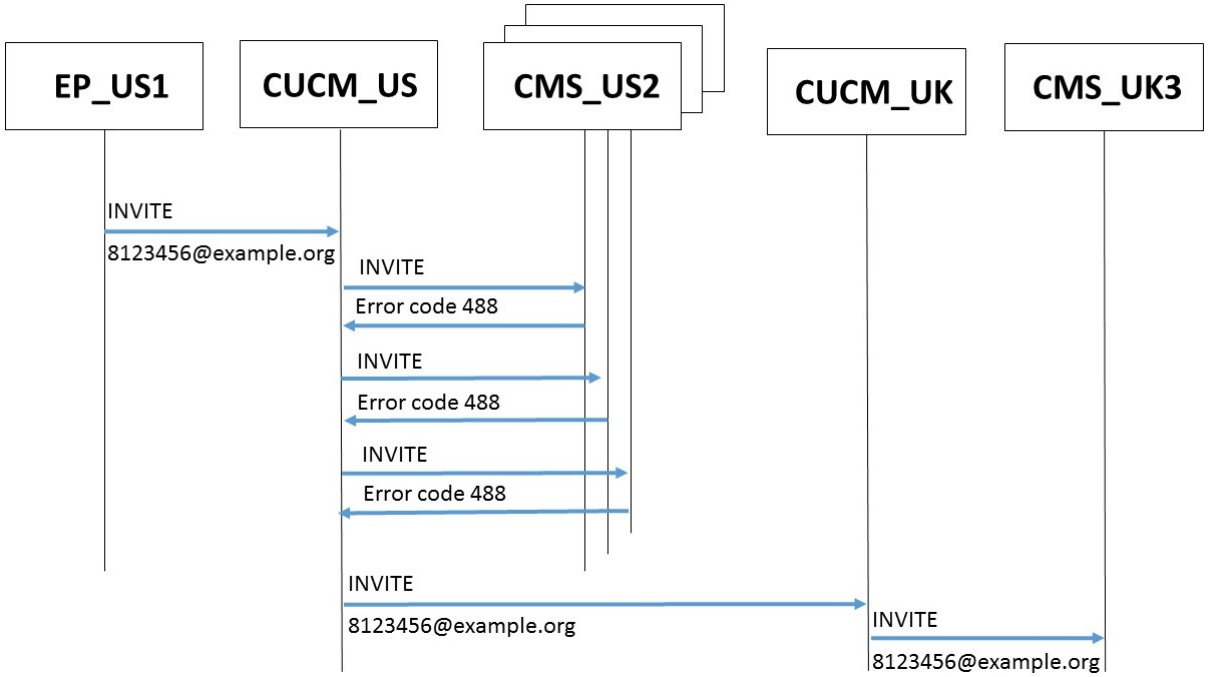
1. An incoming call from a US endpoint to 8123456@example.com lands on CUCM_US
2. CUCM_US matches this against a route pattern, resolves that to “RL_US” and then to the “RG_US”.
3. CUCM_US makes a call to one of the servers in that route group “CMS_US1”.
4. This server returns a SIP 488 error code.
5. CUCM_US understands that this call may be routable to another element in the route group and makes a call to “CMS_US2”

Note: If CMS_US2 returns a SIP 488 error code, then the above process is repeated with the next Call Bridge in the group. If all Call Bridges in the group return a SIP 488 error code, then a BUSY will be sent back to the endpoint.

Call flow for a call redirected between regions

It is possible that all local Call Bridges are in use. In this case, it is possible to redirect the call to another Call Bridge or a Call Bridge group. This is a deployment choice and the Meeting Servers can be deployed to either reject calls when all local resources are in use, or to try other Call Bridges, see Figure 32. *Dial plan configuration* on page 44 explains how to use dial plans to redirect calls between regions.

Figure 32: Call flow for call redirected between regions



In this example,

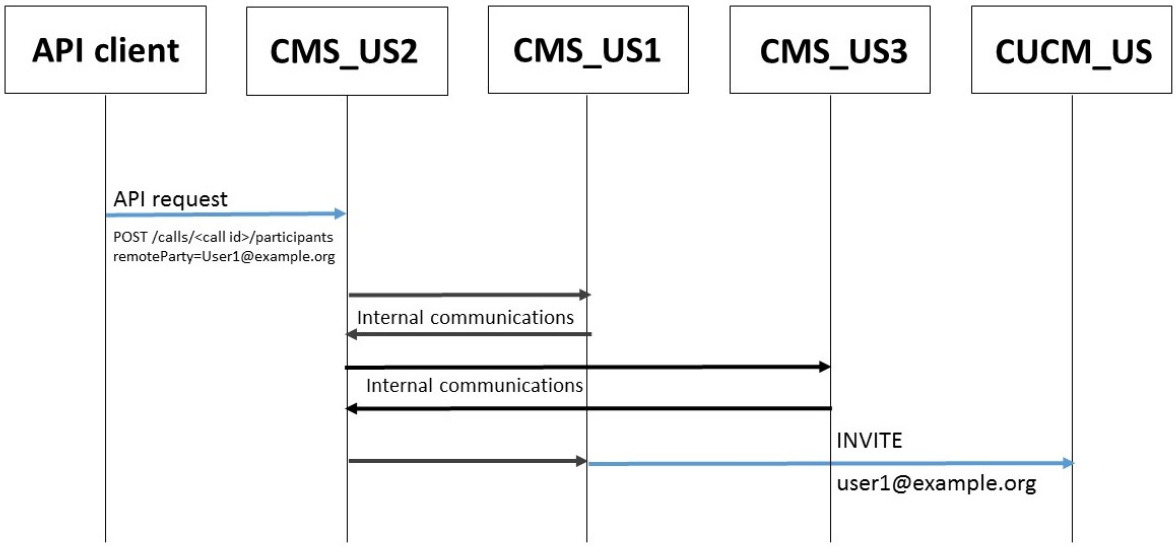
1. An incoming call from a US endpoint to 8123456@example.com lands on CUCM_US
2. CUCM_US matches this against a route pattern, resolves that to “RL_US” and then to the “RG_US”.
3. It makes a call to one of the servers in that route group “CMS_US2”.
4. This server returns a SIP 488 error code.
5. CUCM_US understands that this call may be routable to another element in the route group and makes a call to “CMS_US3”
6. This server returns a SIP 488 error code.
7. CUCM_US understands that this call may be routable to another element in the route group and makes a call to “CMS_US1”
8. This server returns a SIP 488 error code.
9. CUCM_US understands that this call may be routable to another element in the route list. All of “RG_US” has been tried, so it moves to the second item in the route list, “Route Group US 2”, transforms the dial string to add a leading ‘8’ and makes a call to “CUCM_UK”
10. CUCM_UK matches the call to 88123456@example.com to a route pattern, and then to “RL_UK” and in turn to “RG_UK”. It also strips the leading 8.
11. It makes a call to one of the servers in that route group “CMS_UK3”.

Examples of load balancing outbound calls

Load balancing outbound calls with local dial plan rule

In this example, the API client is making a call to a user that is reachable from any server. The API client sends an API request to one of the Meeting Server nodes (CMS_US2). This determines that the node can make the call based on the domain. Since the node is part of a Call Bridge Group, it communicates with the other nodes in this group and then selects a node to make the outbound call from. This call behaves in the same way as any outbound call.

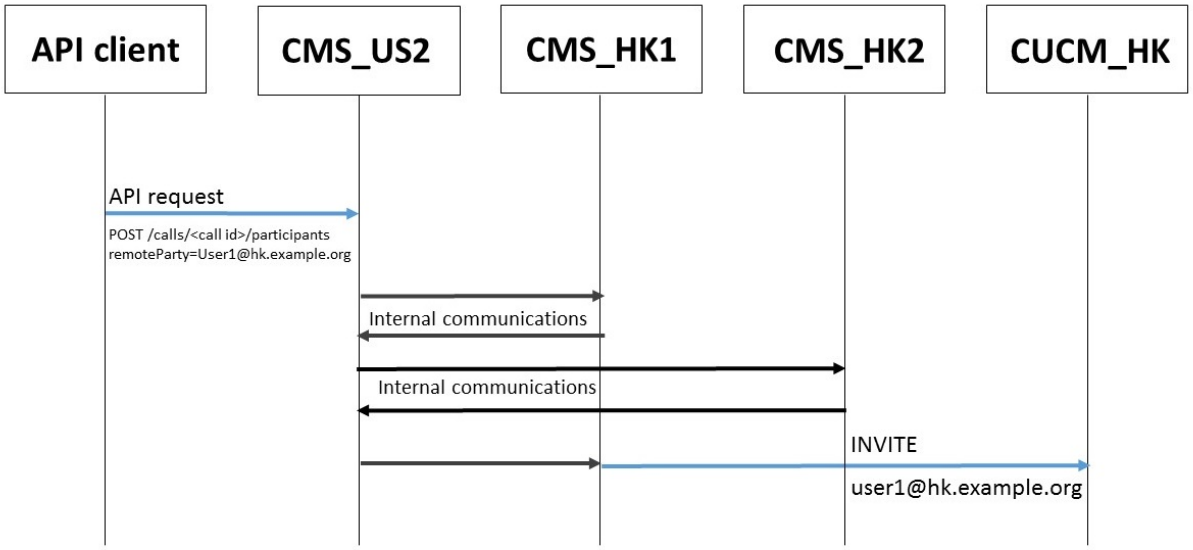
Figure 33: Call flow for load balancing outbound calls with local dial plan rule



Load balancing outbound calls with no local dial plan rule

In this example, the API client is making a call to a user that is reachable from only servers based in Hong Kong. The API client sends an API request to one of the Meeting Server nodes (CMS_US2). This determines that the node can't make the call based on the domain. Using the dial plan rules the node determines that nodes in HK can make the call. It communicates with the other nodes in that Call Bridge Group and then selects a node to make the outbound call from. This call behaves in the same way as any outbound call.

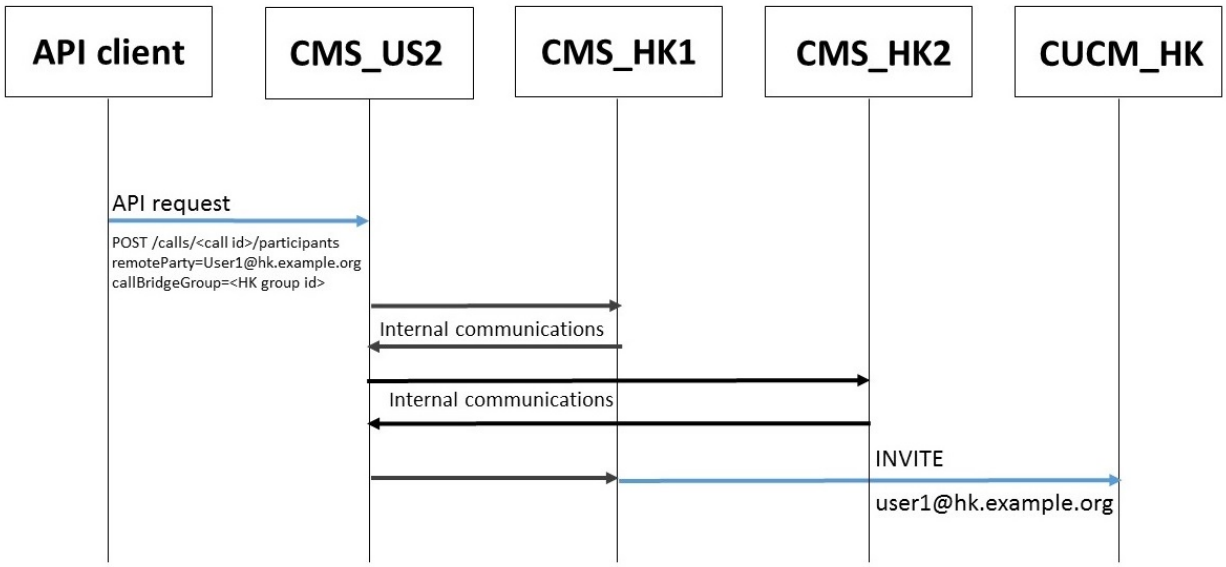
Figure 34: Call flow for load balancing outbound calls with no local dial plan rule



Load balancing outbound calls with explicit choice of Call Bridge Group

In this example, the API client is making a call to a user, but the API client wants to only use servers based in Hong Kong. The API client sends an API request to one of the Meeting Server nodes (CMS_US2). Based on the parameters in this API request, the node communicates with the other nodes in the specified Call Bridge Group and then selects a node to make the outbound call from. This call behaves in the same way as any outbound call.

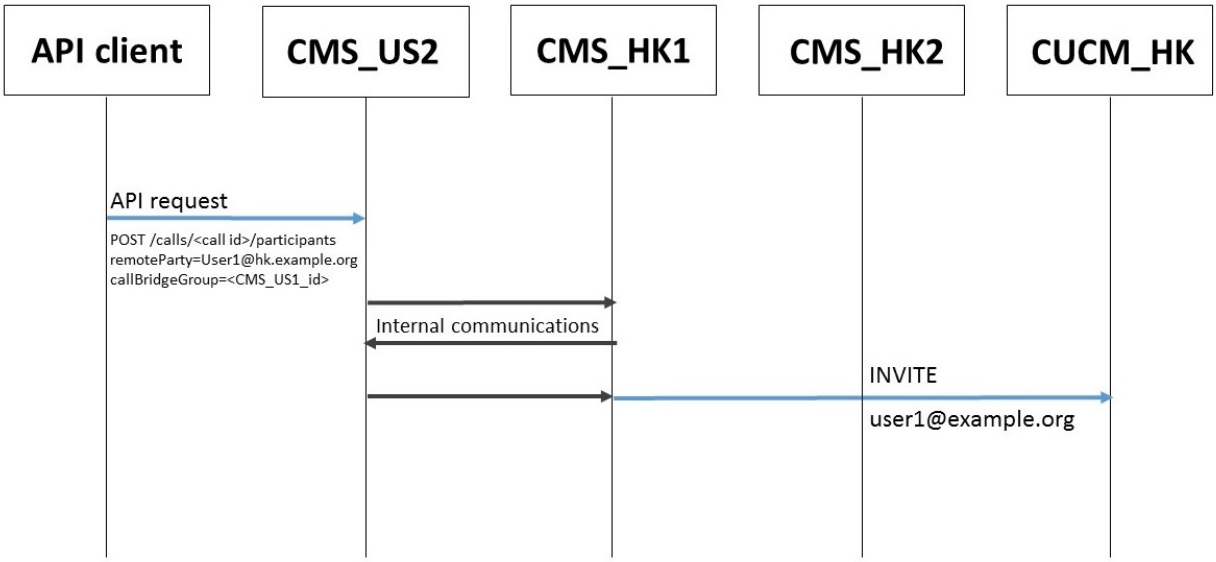
Figure 35: Call flow for load balancing outbound calls with explicit choice of Call Bridge Group



Load balancing outbound calls with explicit choice of Call Bridge

In this example, the API client is making a call to a user, but the API client wants to only use a specific server. The API client sends an API request to one of the Meeting Server nodes (CMS_US2). Based on the parameters in this API request, it communicates with the specified node and uses this node to make the outbound call from. This call behaves in the same way as any outbound call.

Figure 36: Call flow for load balancing outbound calls with explicit choice of Call Bridge



Appendix A Configuring a Cisco Expressway dial plan

A.0.1 Configuring a Cisco Expressway dial plan

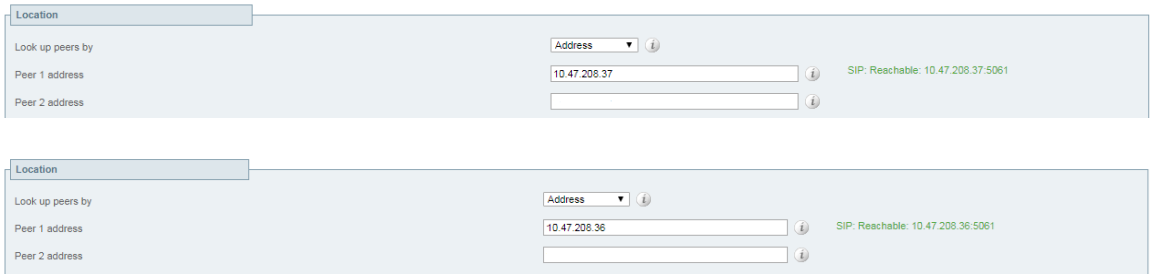
Call routing in Cisco Expressway deployments relies on the use of dial plans and zones, and it is assumed that these concepts are understood. Ensure the Cisco Expressway can route to the domain of the callee in the event of a replaced call. For information on configuring dial plans and zones, please consult the Expressway documentation.

Dial plans are used by the call control system to favor sending calls to local Meeting Server resources, thereby reducing inter-office bandwidth.

On the call control device:

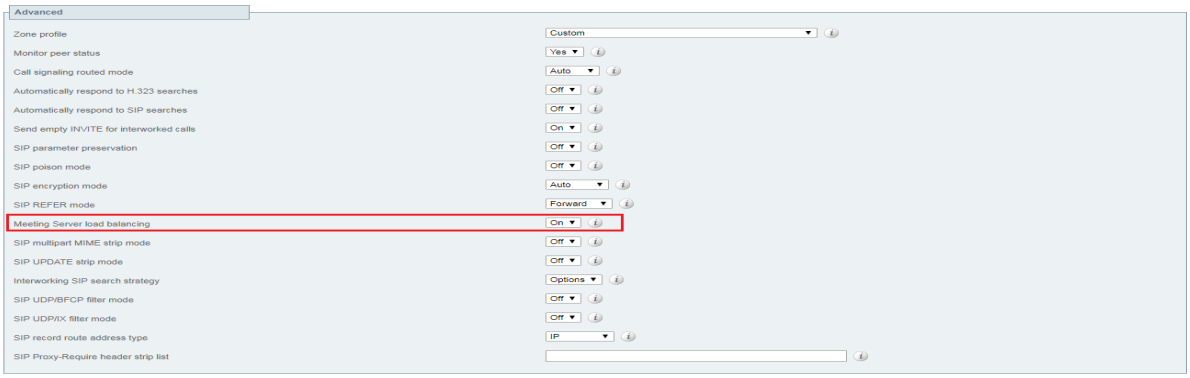
1. Configure a zone for each Call Bridge in the Call Bridge Group.
   a. Navigate to **Configuration** > **Zones** and create a **New** zone of type **Neighbor**, that this cluster will be directly communicating with. You need one zone per Call Bridge node.

Figure 37: Creating new zones on Expressway



2. In the **Advanced** section, select the **Zone profile** as **Custom** and set the **Meeting Server load balancing** parameter to **On**.

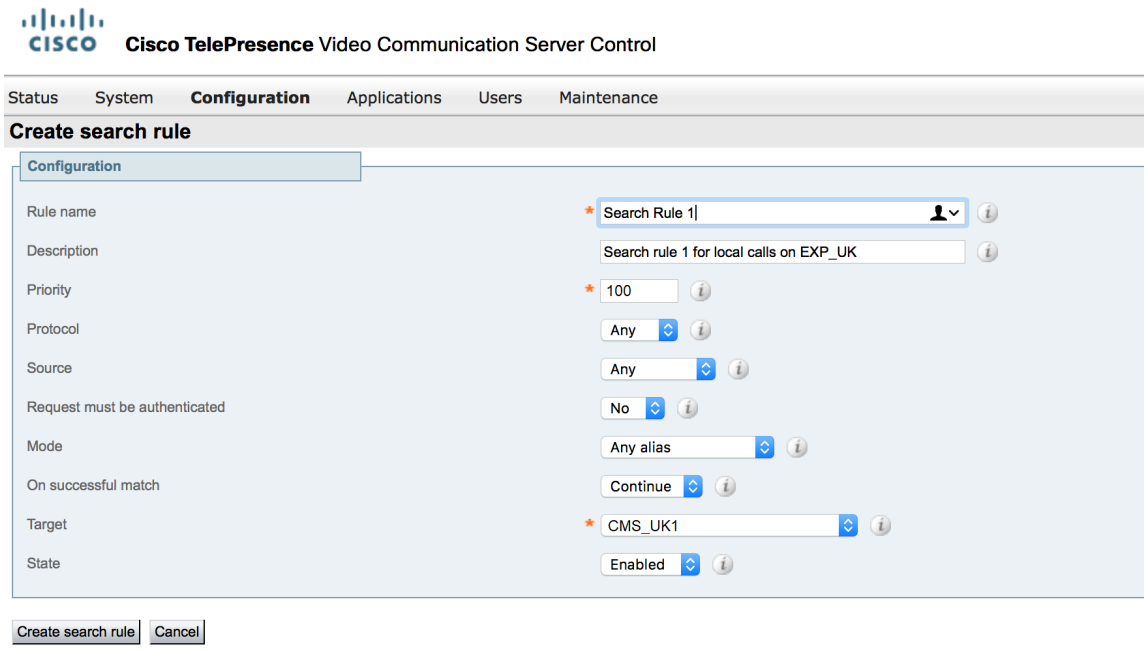
Figure 38: Setting the Meeting Server load balancing parameter



3. For each zone, create a search rule pointing to the zone. Navigate to **Configuration** > **Dial plan** > **Search rules** and create a **New** search rule. Each search rule must have a different priority, and **On successful match** must be set to **Continue**.

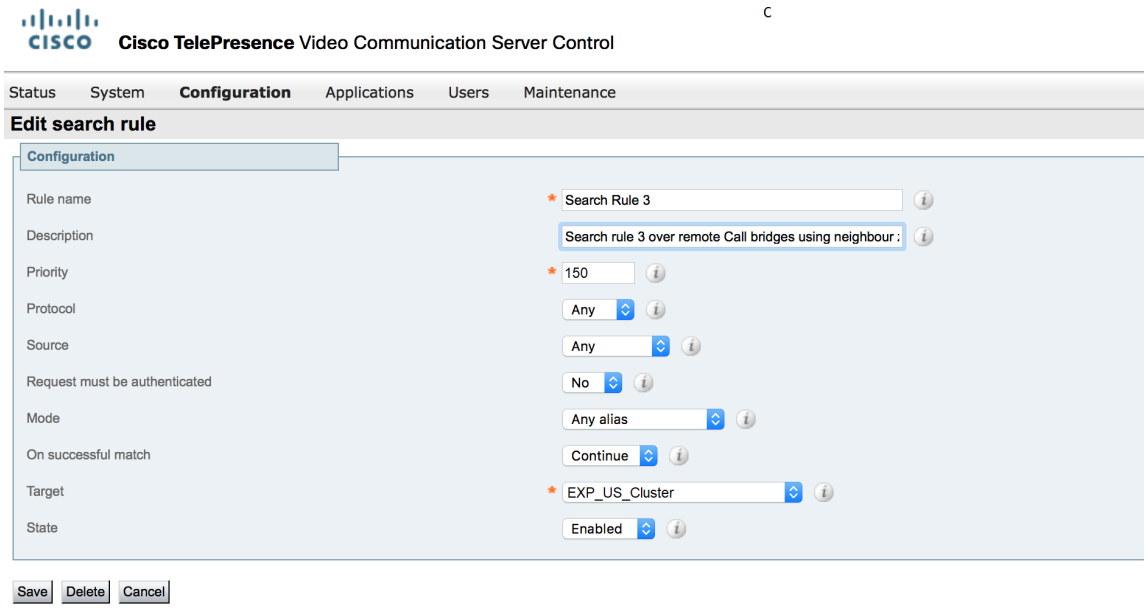
   When choosing priorities it is important to consider the order in which you want this Cisco Expressway to use resources. Local resources would typically have higher priority than remote resources.

   Figure 39: Creating a search rule for connections to local resources



   If remote resources are going to be used via other Cisco Expressway clusters, configure search rules that resolve to these. These rules would typically have a lower priority than rules to local Meeting Servers, and typically have a source set to avoid call loops.

Figure 40: Creating search rules for connections to other Cisco Expressway clusters



Appendix B Setting up Local Route Groups on Cisco Unified Communications Manager

This appendix provides example screen shots related to setting up Local Route Groups on Cisco Unified Communications Manager.

Figure 41: Adding local route groups

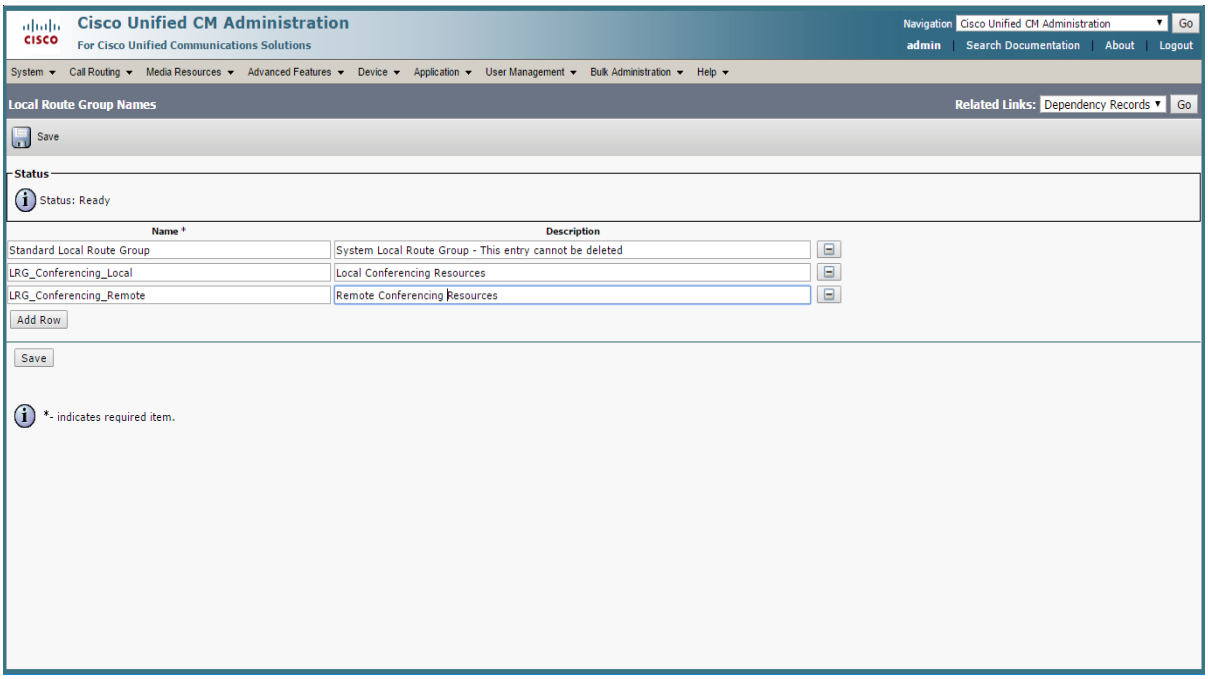


Figure 42: Adding a route list that uses local route groups

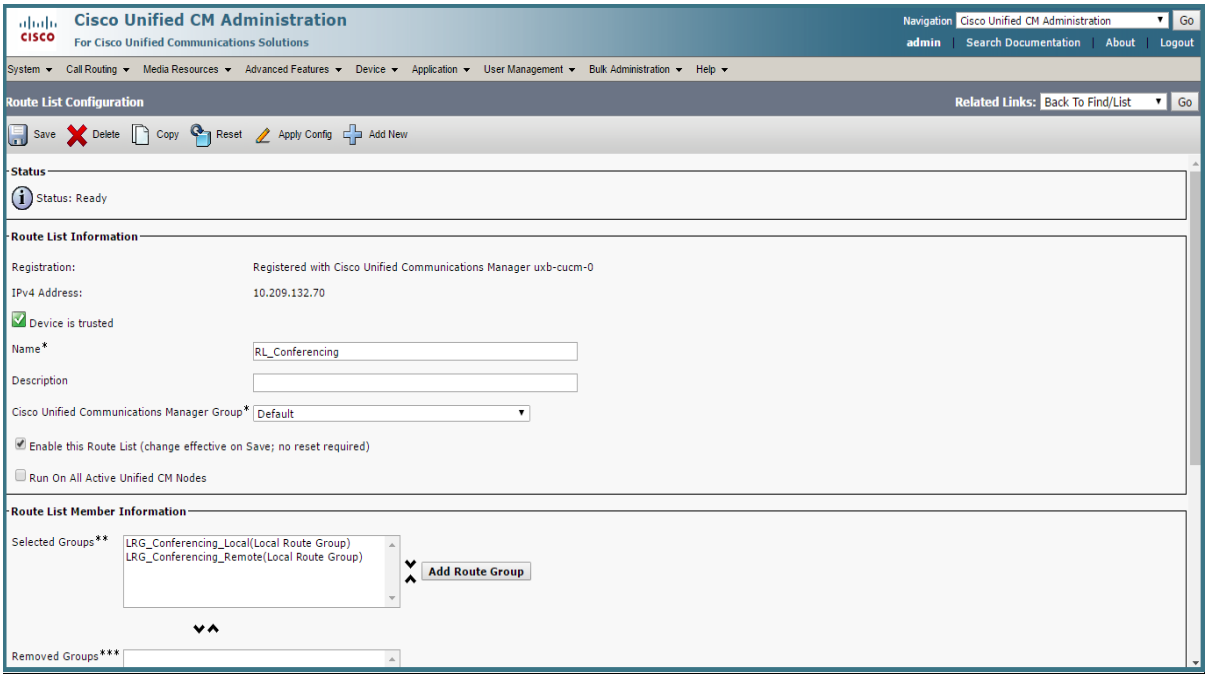


Figure 43: Creating a route pattern using the route list

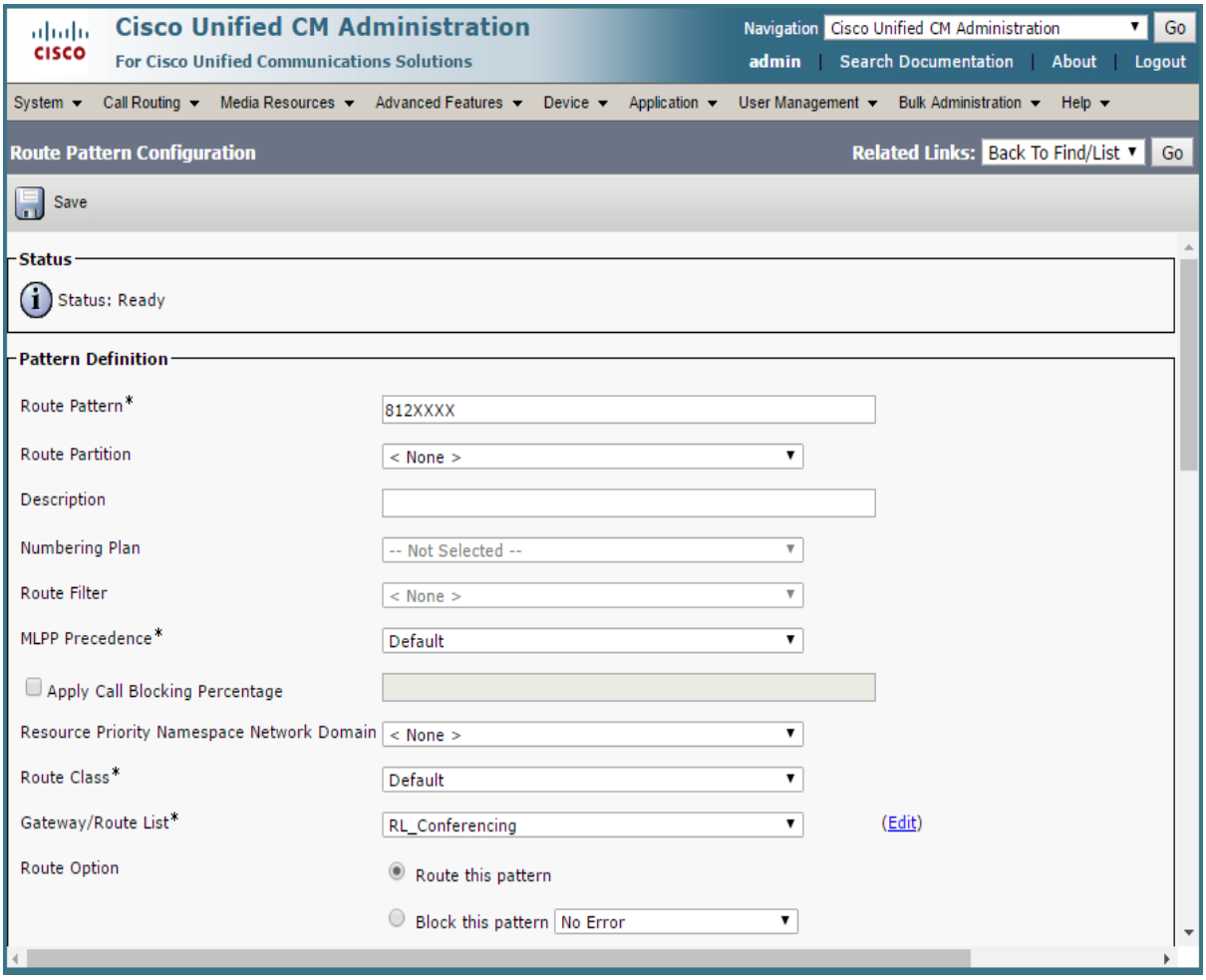


Figure 44: Creating a route group

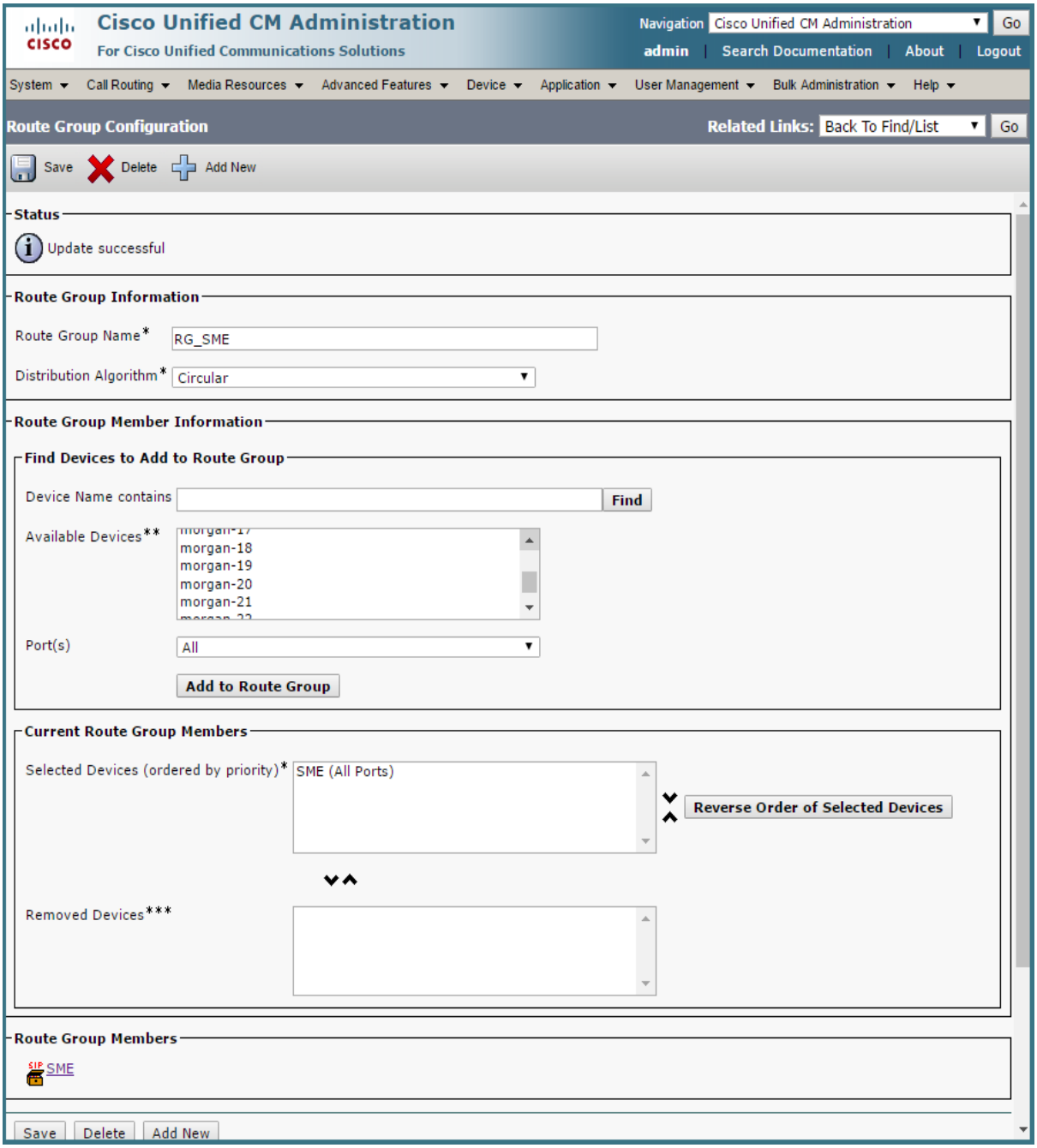


Figure 45: Setting the local route groups for the US Endpoint device pool

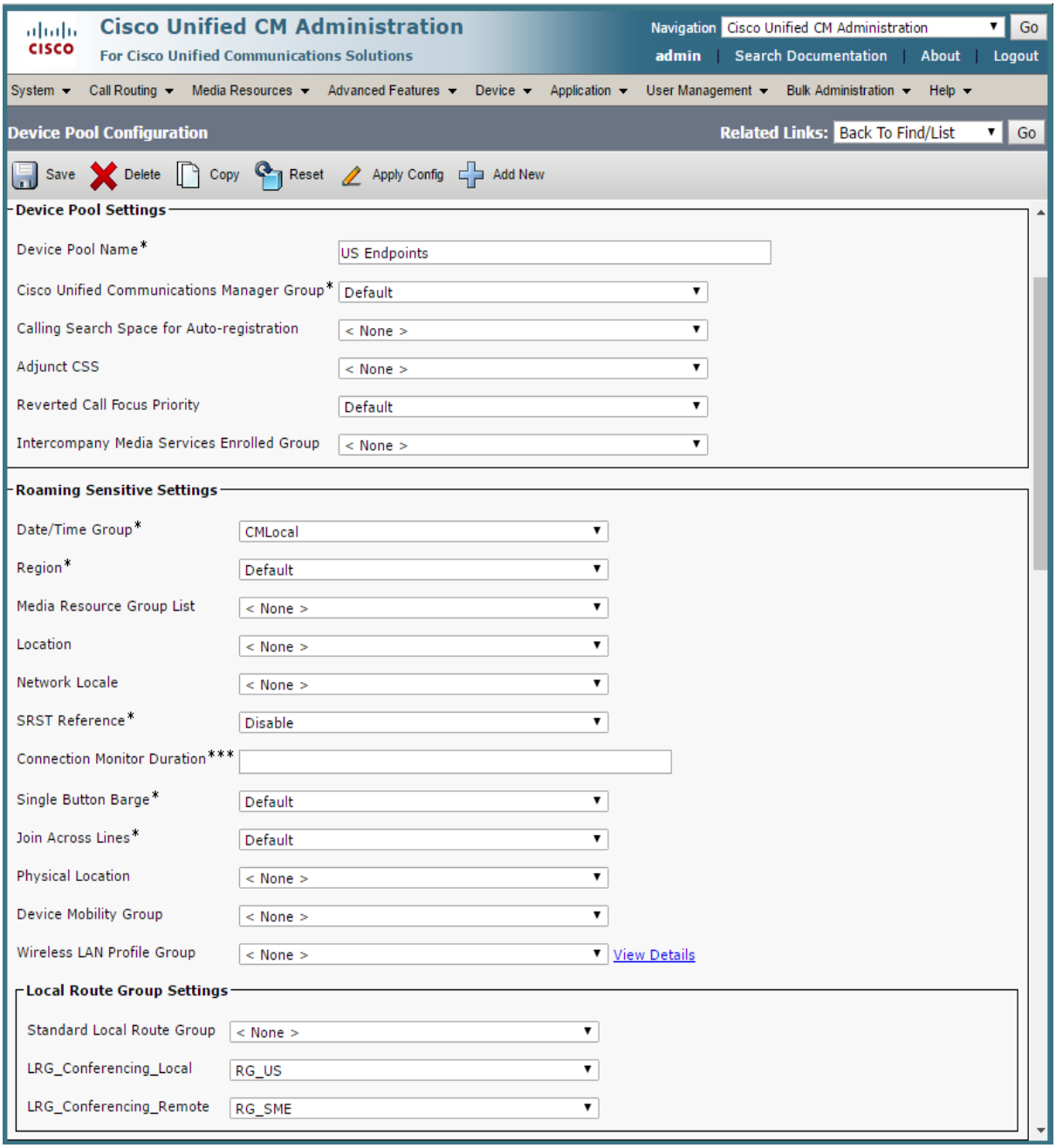


Figure 46: Setting the local route groups for the trunk to SME device pool

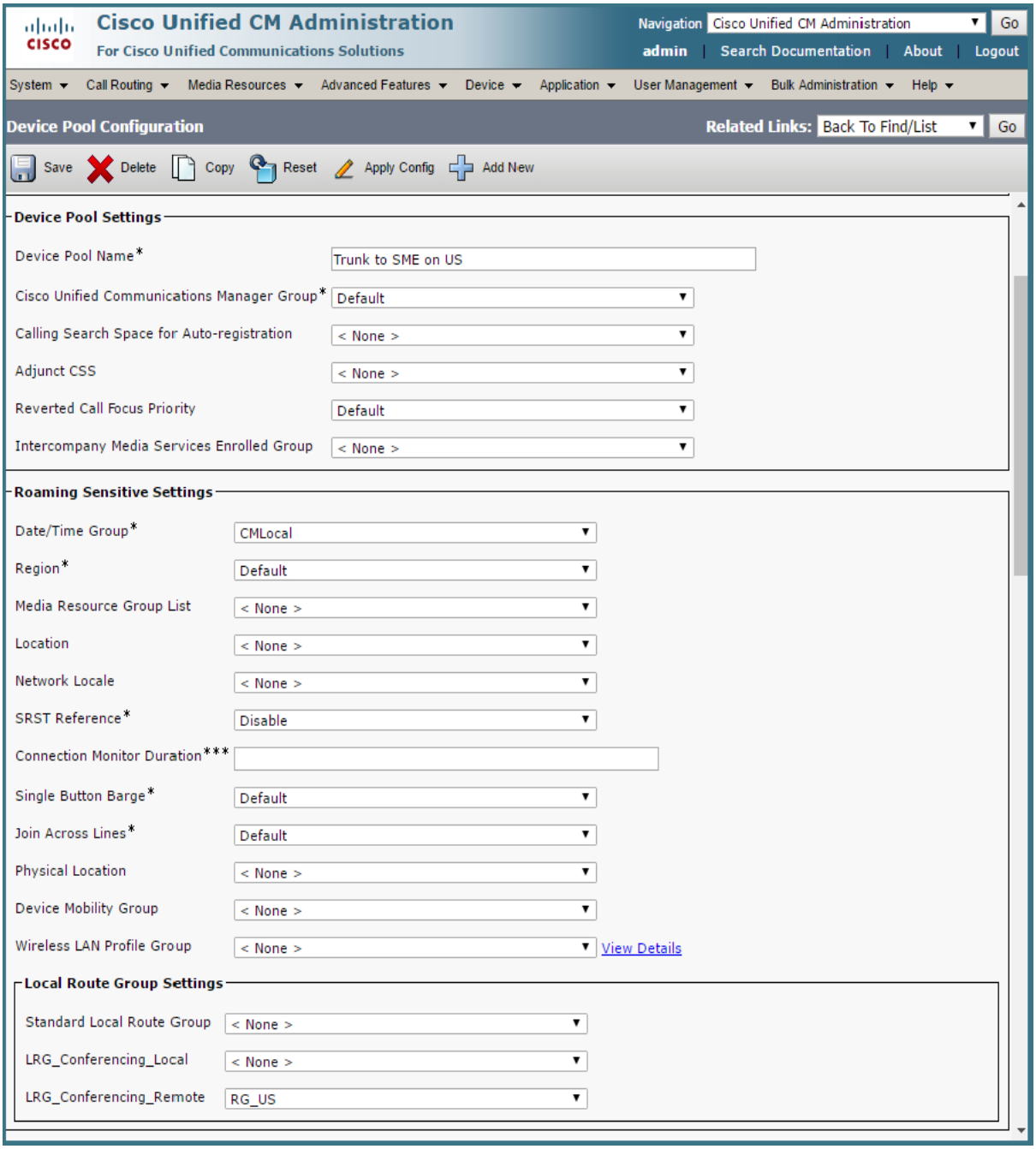


Figure 47: Setting the device pool on the trunk to/from SME

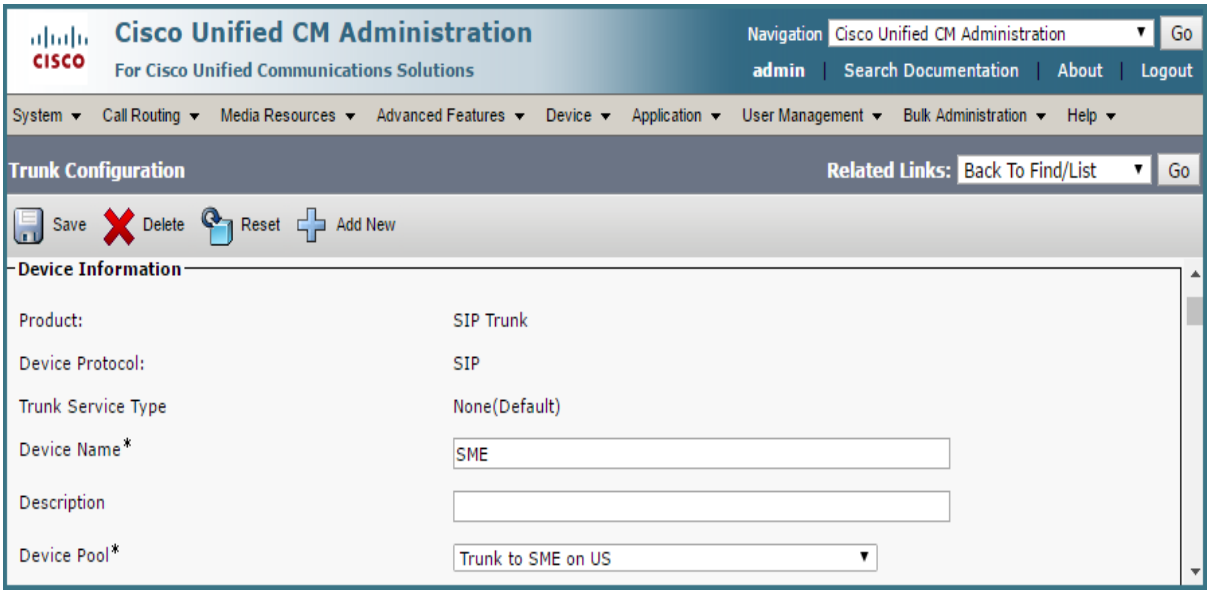


Figure 48: Partitions on a leaf cluster

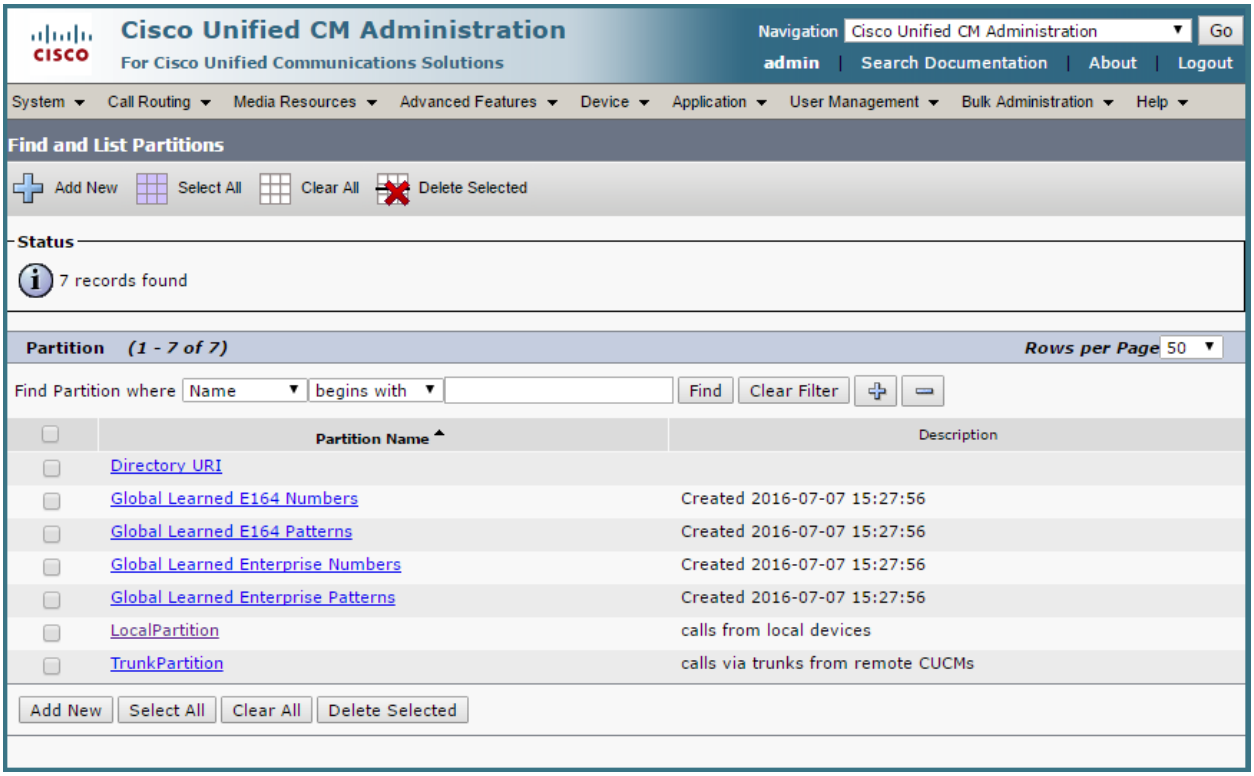


Figure 49: Creating a route list for calls from the SME

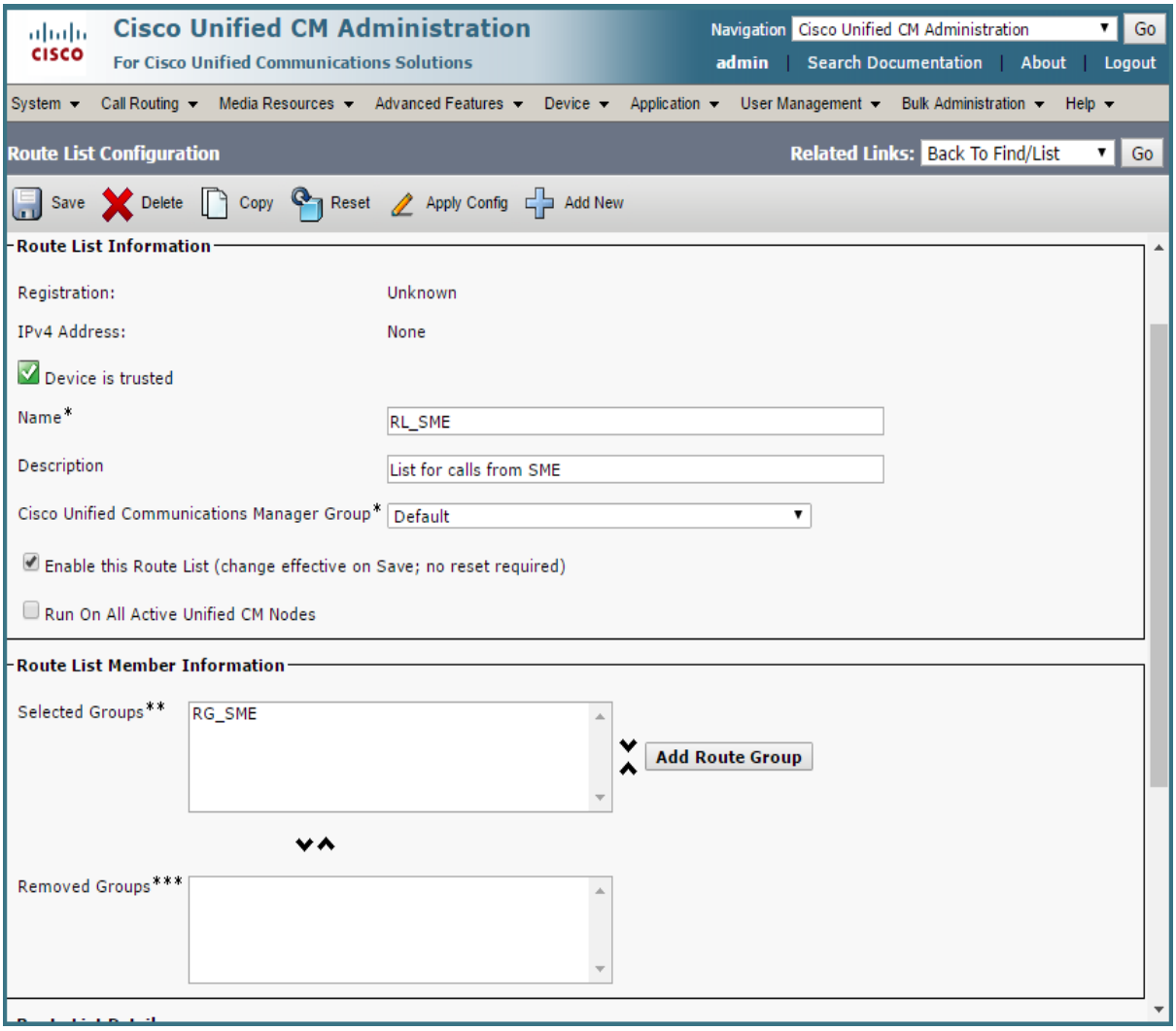


Figure 50: Setting up a route pattern for a particular partition

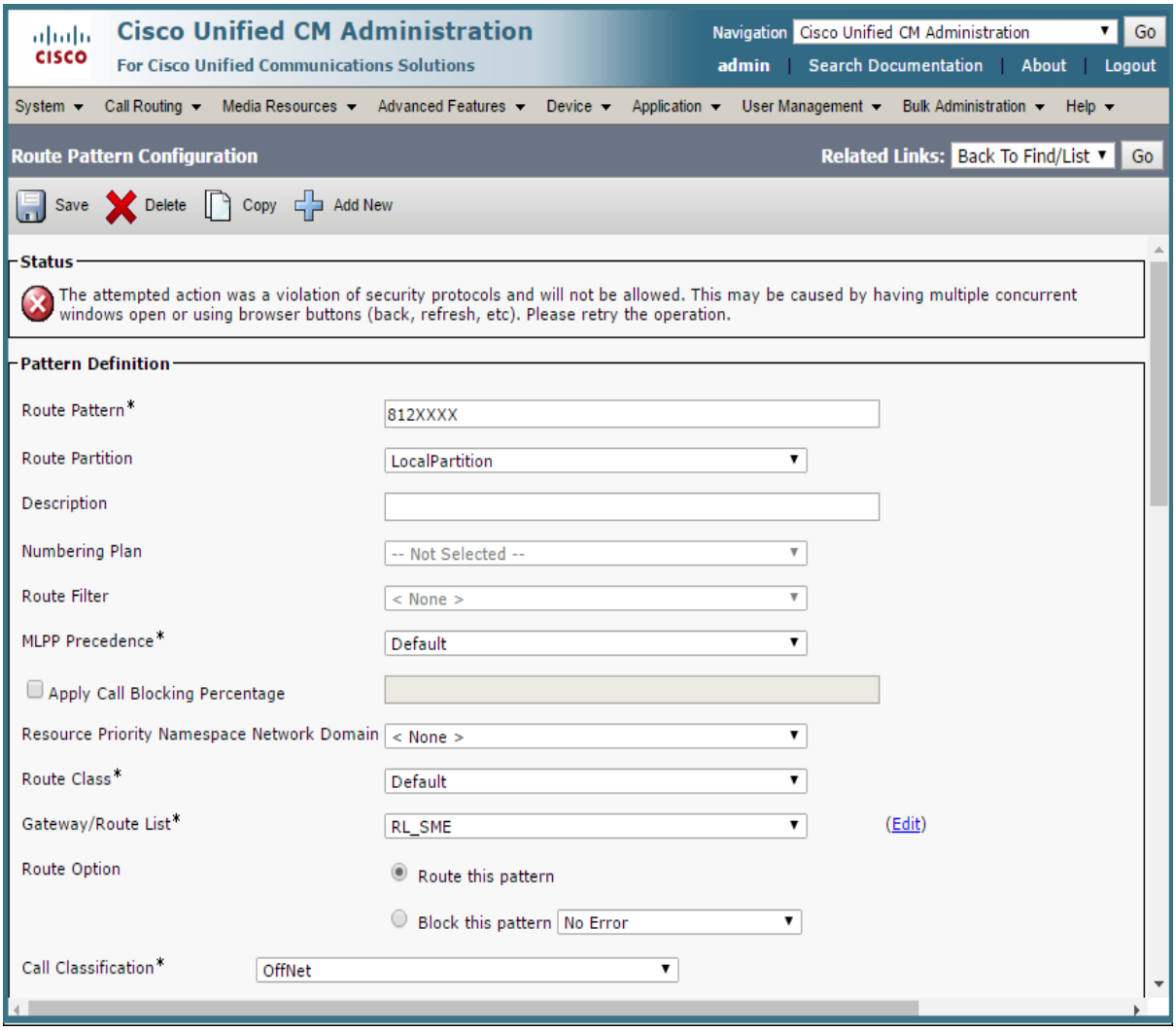


Figure 51: Setting the partitions for a CSS

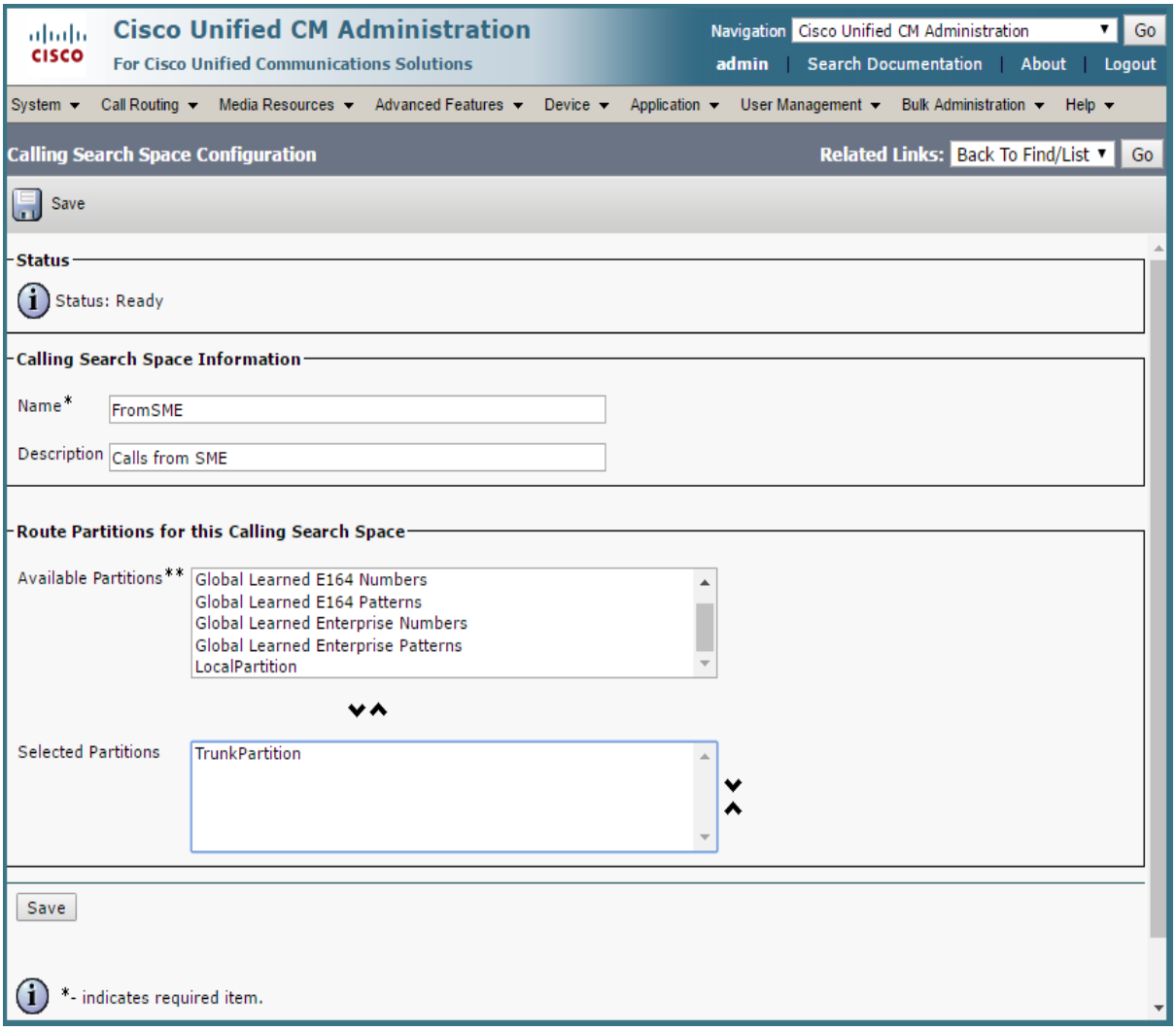
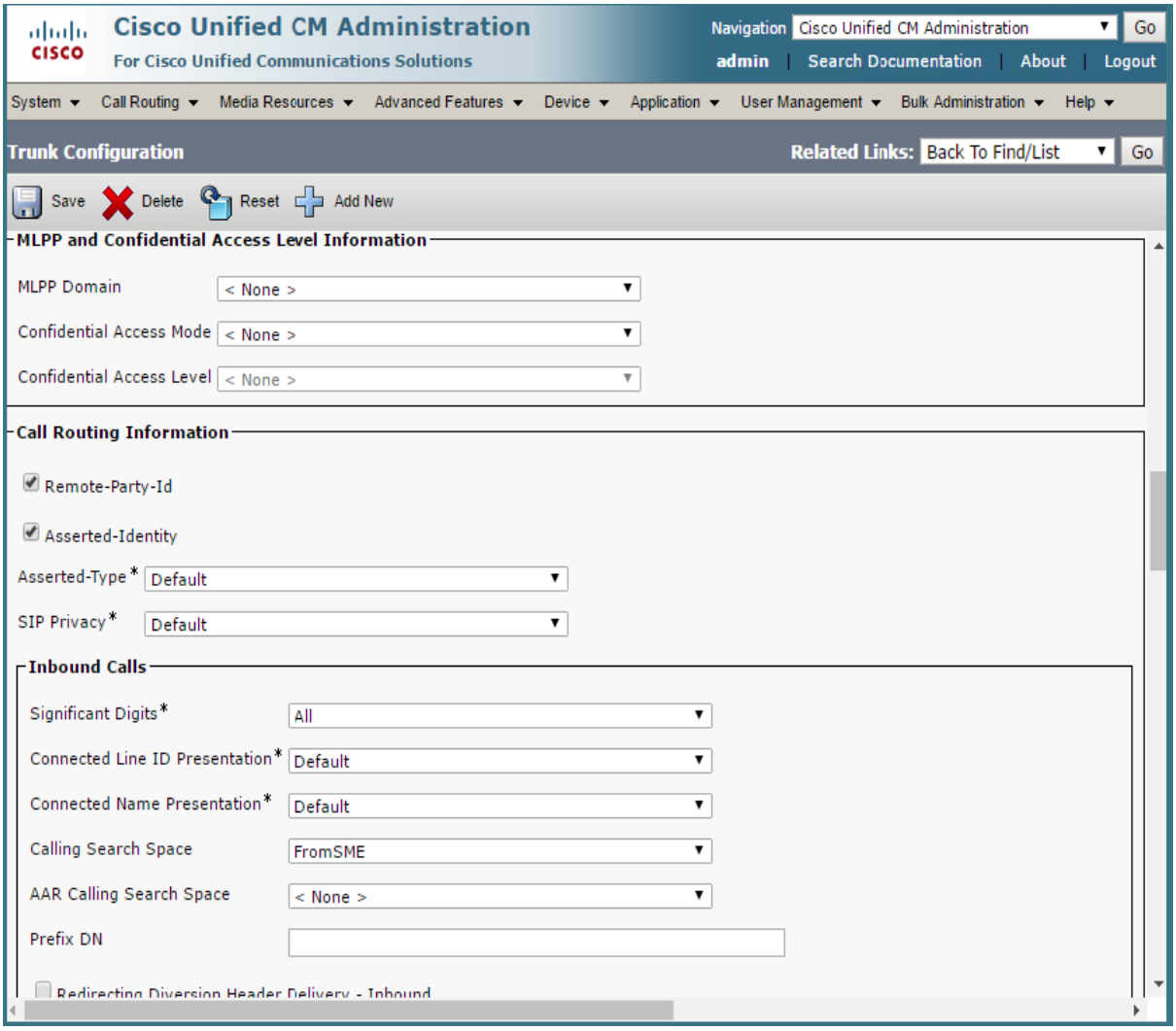


Figure 52: Setting the Calling Search Space for calls from a trunk



Appendix B Call capacities by Cisco Meeting Server platform

Table 4 below details maximum call capacities on Meeting Servers by upgrading to later software versions. Note that there are different capacities for a single or cluster of Meeting Servers compared to load balancing calls within a Call Bridge Group.

Table 4: Meeting Server call capacity for clusters and Call Bridge groups

Cisco Meeting Server platform		Cisco Meeting Server Small M7 (per node)	Cisco Meeting Server 2000 M6(per node)	Cisco Meeting Server Medium M8(per node)
Individual Meeting Servers or Meeting Servers in a cluster (notes 1, 2, 3, and 4) and Meeting Servers in a Call Bridge Group	1080p30 720p30 SD Audio calls	120 240 480 3000	648 1296 1875 3200	225 450 850 3000
	HD participants per conference per server			
	web app call capacities (internal calling & external calling on CMS web edge): Full HD HD SD Audio calls	120 240 480 3000	648 1296 1875 1875	225 450 850 3000
Meeting Servers in a Call Bridge Group	Call type supported			
	Load limit	240,000	1,296,000	450,000

Points to Note:

- Maximum of 24 Call Bridge nodes per cluster; cluster designs of 8 or more callbridge nodes need to be approved by Cisco, contact Cisco Support for more information.
- Clustered Cisco Meeting Server 2000's without Call Bridge Groups configured, support integer multiples of maximum calls, for example integer multiples of 700 HD calls.

- A maximum of 2600 participants per conference per cluster depending on the Meeting Servers platforms within the cluster.
- Table 4 assumes call rates up to 2.5 Mbps-720p5 content for video calls and G.711 for audio calls. Other codecs and higher content resolution/framerate will reduce capacity. When meetings span multiple call bridges, distribution links are automatically created and also count against a server's call count and capacity. Load limit numbers are for H.264 only.
- The call setup rate supported for the cluster is up to 40 calls per second for SIP calls and 20 calls per second for Cisco Meeting Server web app calls.
- Up to 16,800 HD concurrent calls per cluster (24 nodes x 700 HD calls) applies to SIP or web app calls.
- Table 4 assumes call rates up to 2.5 Mbps-720p5 content for video calls and G.711 for audio calls. Other codecs and higher content resolution/framerate will reduce capacity. When meetings span multiple call bridges, distribution links are automatically created and also count against a server's call count and capacity. Load limit numbers are for H.264 only.
- Meeting Server 1000 M7(Meeting Server Small) variants support a maximum of 94 vCPU and 128 GB RAM.

B.1 Cisco Meeting Server web app call capacities

This section details call capacities for deployments using Web Bridge 3 and web app for external and mixed calling. (For internal calling capacities, see Table 4.)

B.1.1 Cisco Meeting Server web app call capacities – external calling

Expressway (Large OVA or CE1200) is the recommended solution for deployments with medium web app scale requirements (i.e. 800 calls or less). Expressway (Medium OVA) is the recommended solution for deployments with small web app scale requirements (i.e. 200 calls or less). However, for deployments that need larger web app scale, from version 3.1 we recommend Cisco Meeting Server web edge as the required solution which will scale up to SIP capacity (see Table 4).

External calling is when clients use Cisco Expressway as a reverse proxy and TURN server to reach the Web Bridge and Call Bridge.

When using Expressway to proxy web app calls, the Expressway will impose maximum calls restrictions to your calls as shown in Table 5.

Note: Deployments of Web Bridge 3 and the web app have been validated on Expressway version X15.4, earlier Expressway versions may not be supported by Web Bridge 3.

Table 5: Cisco Meeting Server web app call capacities – external calling

Setup	Call Type	CE1200 Platform	Large OVA Expressway	Medium OVA Expressway
Per Cisco Expressway (X14.3 or later)	Full HD	150	150	50
	Other	200	200	50

The Expressway capacity can be increased by clustering the Expressway pairs. Expressway pairs clustering is possible up to 6 nodes (where 4 are used for scaling and 2 for redundancy), resulting in a total call capacity of four times the single pair capacity.

Note: The call setup rate for the Expressway cluster should not exceed 6 calls per second for Cisco Meeting Server web app calls.

B.1.2 Cisco Meeting Server web app capacities – mixed (internal + external) calling

Both standalone and clustered deployments can support combined internal and external call usage. When supporting a mix of internal and external participants the total web app capacity will follow Appendix B for Internal Calls, but the number of participants within the total that can connect from external is still bound by the limits in Table 5.

For example, a single standalone Meeting Server 2000 with a single Large OVA Expressway pair supports a mix of 1000 audio-only web app calls but the number of participants that are external is limited to a maximum of 200 of the 1000 total.

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