



Cisco Meeting Server

Cisco Meeting Server Release 2.2.6

Release Notes

August 18, 2017

Contents

What's changed	4
1 Introduction	5
1.1 Interoperability with other Cisco products	6
2 New Features/Changes in 2.2	7
2.1 Cisco Meeting Server 2000	7
2.2 Displaying security icons on endpoints	8
2.3 Office 365 Dual Homed Experience with OBTP Scheduling	9
2.3.1 Joining the meeting	9
2.3.2 In-conference experience	9
2.4 Enhanced support for dual screen endpoints	10
2.4.1 Enabling dual screen endpoint support	10
2.4.2 Disabling dual screen endpoint support	11
2.5 Load balancing outbound SIP calls	12
2.5.1 How to enable load balancing of outbound SIP calls	12
2.5.2 How to set up an outbound dial plan rule for load balancing outbound SIP calls	12
2.5.3 How to supply the Call Bridge Group or specific Call Bridge to use for outbound SIP calls to participants	13
2.5.4 Handling load balancing of active empty conferences	13
2.6 Setting maximum quality levels for main video and content	13
2.7 Improved DTMF comma handling	14
2.8 Layout and screen changes to improve user experience	15
2.8.1 Removing and showing the on-screen Participant Counter	15
2.8.2 Using the importance level of participants to control which participants are displayed onscreen	15
2.9 Enabling and disabling UDP signaling for SIP	16
2.10 Diagnostic tools to help Cisco Support troubleshoot issues	17
2.10.1 Log bundle	17
2.10.2 Ability to generate a keyframe for a specific call leg	18
2.10.3 Reporting registered media modules in syslog	18
2.11 Summary of MMP changes	18
2.12 Summary of API Additions & Changes	18
2.12.1 Office 365 Dual Homed Experience with OBTP Scheduling	18
2.12.2 Setting the maximum quality levels for main video and content	18

2.12.3	Additional support for Dual Video Endpoints	19
2.12.4	Support for load balancing of outbound calls to SIP endpoints	19
2.12.5	Assigning an Importance level to participants to control the screen layout .	19
2.12.6	Retrieving diagnostics on a Recorder/Streamer/Web Bridge	19
2.12.7	Support to disable and re-enable the on-screen participant counter	20
2.12.8	Miscellaneous additions	20
2.13	Summary of CDR Additions & Changes	20
3	Notes on Upgrading Cisco Meeting Server software to version 2.2	21
3.1	Upgrading to Release 2.2	21
3.2	Downgrading	23
3.3	Cisco Meeting Server 2.2 Deployments	23
3.3.1	Deployments using a single host server	24
3.3.2	Deployments using a single split server hosted on a Core server and an Edge server	24
3.3.3	Deployments for scalability and resilience	24
4	Bug search tool and resolved and open issues	25
4.1	Resolved issues	25
4.2	Open issues	30
	Cisco Legal Information	31
	Cisco Trademark	32

What's changed

Version	Change
2.2.6	Added section "Resolved in 2.2.6"
2.2.5	Added section "Resolved in 2.2.5"
2.2.4	Added section "Resolved in 2.2.4"
2.2.3	Added section "Resolved in 2.2.3". Added section on "Enhanced support for dual screen endpoints"
2.2.2	Added section "Resolved in 2.2.2".
2.2.1, June 2nd	Added support for Cisco Meeting Server 2000
2.2.1	Added section "Resolved in 2.2.1".
2.2.0	New release.

1 Introduction

This release note describes the new features, improvements and changes in release 2.2.6 of the Cisco Meeting Server software for: specified servers based on Cisco UCS technology, Acano X-Series Servers, and virtualized deployments.

The Cisco Meeting Server was formerly called the Acano Server. The Cisco Meeting Server can be hosted on:

- the Cisco Meeting Server 2000, based on Cisco UCS technology running Cisco Meeting Server software as a physical deployment.
- the Cisco Meeting Server 1000, a Cisco UCS server preconfigured with VMware and the Cisco Meeting Server installed as a VM deployment.
- the Acano X-Series hardware.
- or on a specification based VM server.

The Cisco Meeting Server software is referred to as the Meeting Server throughout the remainder of this guide.

If you are upgrading from 2.1.x, you are advised to take a configuration backup using the **backup snapshot <filename>** command, and save the backup safely on a different device. See the MMP Command Reference document for full details.

Note about SIP edge: The Cisco Expressway X8.9 supports traversal of SIP traffic at the edge of the network, to and from the Cisco Meeting Server. You are advised to use the Cisco Expressway between remote Lync deployments and the Meeting Server, see the [Cisco Expressway with Cisco Meeting Server and Microsoft Federation deployment guide](#).

The SIP and Lync Call Traversal feature first introduced in Acano Server release 1.8, is still a beta feature in Cisco Meeting Server 2.2, it is not intended for a production environment. This SIP edge feature will be withdrawn in version 2.3 of the Cisco Meeting Server software.

Cisco does not guarantee that a beta feature will become a fully supported feature in the future. Beta features are subject to change based on feedback, and functionality may change or be removed in the future.

Note about a single Edge solution for Cisco collaboration products: In line with Cisco's goal of a single Edge solution across the Cisco Meeting Server and Cisco Expressway, Cisco plans to end of life the Cisco Meeting Server H.323 Gateway component. From version 2.3 of the Meeting Server software, there will be no further development or feature releases related to the H.323 Gateway component, and in version 2.5 the component will be removed from the Meeting Server software. Customers are encouraged to start evaluation of the more mature H.323 Gateway component in the Cisco Expressway, and plan their migration over.

Any H.323 endpoints registered to Expressway-E or Expressway-C will not consume Rich

Media Session (RMS) licenses when calling into the Cisco Meeting Server from Expressway version X8.10 onwards.

Note about rebranding the background image to the login page for the WebRTC app: From Meeting Server 2.1.2 the Meeting Server no longer supports the redesigned Web Bridge 2.0. Instead it supports Web Bridge 1.9 which does support rebranding the background image for the login page to the WebRTC app.

Note about message board chat: For existing deployments that use message board chat, chat will remain enabled when you upgrade to 2.2. Otherwise, you will need to use the API to create a callProfile with parameter messageBoardEnabled set to true.

1.1 Interoperability with other Cisco products

Interoperability test results for this product are posted to <http://www.cisco.com/go/tp-interop>, where you can also find interoperability test results for other Cisco conferencing products.

2 New Features/Changes in 2.2

Release 2.2 of the software Meeting Server comprises:

- [the capability to determine whether to display security icons on endpoints](#)
- [support for Office 365 dual homed experience with OBTP scheduling](#)
- [enhanced support for dual screen endpoints](#)
- [load balancing for outbound calls to SIP endpoints](#)
- [support for setting the maximum quality levels for main video and content](#)
- [improved DTMF comma handling](#)
- [layout and screen changes to improve user experience](#)
- [more control over UDP signaling for SIP](#)
- [diagnostic tools to help Cisco Support troubleshoot issues](#)
- [additional API objects and parameters to support these new features](#)
- [additional CDR support for new features.](#)

Note: The term spaces is used throughout the documentation apart from the API guide which still uses the old terminology of coSpaces.

2.1 Cisco Meeting Server 2000

The Cisco Meeting Server 2000 is a high performance, scalable platform for voice, video and web content, which integrates with a wide variety of third-party products from Microsoft, Avaya and other vendors. With the Cisco Meeting Server 2000, people connect regardless of location, device, or technology.

The Cisco Meeting Server 2000 is based on Cisco UCS technology running Cisco Meeting Server software as a physical deployment, not as a virtualized deployment. This gives better performance and utilizes the high performance capabilities of the UCS platform; a single Cisco Meeting Server 2000 supports up to 500 720p HD calls.

The Cisco Meeting Server 2000 is a core network device designed to handle a large number of calls. To support this capability only the Call Bridge, Web Bridge and XMPP server components are available for configuration. The Cisco Meeting Server 2000 is not suitable as an Edge server in a split Meeting Server deployment, because the TURN server and Load Balancer edge components are not available. Deployments that need firewall traversal support for external Cisco Meeting App clients must deploy the TURN server and Load Balancer components on a separate Cisco Meeting Server 1000 or specification-based VM server.

In addition, the Recorder and Streamer components are not available on the Cisco Meeting Server 2000, as they are more suited to the lower capacity Cisco Meeting Server 1000 and specification-based VM servers.

The Cisco Meeting Server 2000 can be deployed as a single server on the internal network, as the core server in a single split server deployment, or one of multiple core nodes of a scalable deployment. It can be part of a deployment that includes Cisco Meeting Server 1000s, Acano X-series servers and specification-based VM servers, providing they are all running the same software version. The functionality, and user experience for participants, is identical across all platforms running the same software version.

For information on installing the Cisco Meeting Server 2000, see the [Cisco Meeting Server 2000 Installation Guide](#). The Cisco Meeting Server 2000 is shipped with Cisco UCS Manager version 3.1(2f), and a version of Cisco Meeting Server software pre-installed. For information on upgrading UCS Manager to the latest version see this [link](#) and the [download software](#) page. For information on upgrading Cisco Meeting Server software refer to [Section 3.1](#). Note that the software for the Cisco Meeting Server 2000 is in a different upgrade file to VM deployments or the Acano X-series server.

2.2 Displaying security icons on endpoints

Some endpoints have the capability to render secure and unsecure padlocks to indicate whether the connection with the Meeting Server is secure. Prior to version 2.2, the Meeting Server also rendered an icon in the conference video to show whether the conference as a whole was secure. This could result in a user seeing two padlock icons, a closed one rendered by the endpoint and an open one rendered by the Meeting Server.

From version 2.2, the Meeting Server determines whether a connecting endpoint has the capability to render a security padlock representing the security status of the conference as a whole. If the endpoint does have the capability, then the Meeting Server will not send the icon to the endpoint. This ensures that the user will only ever see one padlock icon, and the endpoint controls whether a secure or unsecure icon is displayed. If the endpoint does not have the capability, then the Meeting Server will continue to send the appropriate padlock icon to the endpoint.

2.3 Office 365 Dual Homed Experience with OBTP Scheduling

Note: This feature requires the Call Bridge to connect to the public internet in order to contact Office 365. You need to open TCP port 443 on your firewall for outgoing traffic.

Version 2.2 supports “Office 365 Dual Homed Experience with OBTP (One Button To Push) Scheduling” allowing participants to join Office 365 meetings using Cisco endpoints that support OBTP. The feature requires version 2.2 on the Meeting Server combined with Cisco TMS 15.5, and Cisco TMS XE 5.5.

To set up this method of joining Office 365 meetings, configure the Meeting Server with an incoming dial plan rule with request parameter `resolveToLyncSimpleJoin` set to “true”. This tells the Meeting Server how to resolve the Lync Simple Meet URL sent in the Office 365 invite. To have the ability to call participants as well as meetings, use an existing outbound dial plan rule to route the outbound calls, or create a new outbound dial plan rule.

Note: If using Office 365, only invited OBTP-enabled endpoints or Skype for Business clients with Office 365 can join the Lync meeting; Cisco endpoints cannot join the meeting manually, via the Meeting Server IVR. This is a key difference to an on-premise Lync deployment, which allows any Cisco endpoint to join manually via the Meeting Server IVR.

2.3.1 Joining the meeting

The host schedules a meeting using Microsoft Outlook with Skype for Business plugin, and adds participants and conference rooms (including OBTP-enabled endpoints) and a location to meet in.

To join the meeting, participants using a OBTP-enabled endpoint simply push the OBTP button on the endpoint or touchscreen. Skype for Business clients click a link to join the meeting as normal.

2.3.2 In-conference experience

“Office 365 Dual Homed Experience with OBTP Scheduling” provides the “dual homed experience” with 2-way audio, video and content sharing. Office 365 clients have the familiar in-conference experience determined by the Lync AVMCU, and participants using OBTP-enabled endpoints have a video conferencing experience determined by the Meeting Server. All see the combined participants lists.

Note: Controls on clients do not work conference wide, and can give rise to some strange behavior. For example, if a Skype for Business client mutes an endpoint connected to the Meeting Server then the endpoint will mute, but no notification is sent to the endpoint to say it

has been muted; the endpoint cannot unmute itself. If a Skype for Business client mutes all endpoints connected to the Meeting Server and then unmutes them, all the endpoints will remain muted.

Note: ActiveControl functionality such as muting and dropping participants only affect participants on the local Call Bridge and not on the Lync AVMCU.

2.4 Enhanced support for dual screen endpoints

From version 2.2.3, the Meeting Server supports showing video across both screens of a dual screen endpoint running CE9.1.1 (or later), in local calls within your network and calls over Cisco Expressway (X8.9).

When content is being shared with a dual screen endpoint, either one video and one content stream is sent, or in the case of a dual screen endpoint with a 3rd monitor connected, two video streams and one content stream are sent.

All layouts that are supported in ActiveControl are supported in dual screen endpoint mode, where:

- **single** (also known as speakerOnly) has the two most active speakers full screen, one on each screen.
- **overlay** (also known as telepresence) has the two active speakers in full screen, and up to 12 pips overlaid at the bottom of the two screens.
- **1plusN** (also known as Prominent) has the active speaker full screen on the left endpoint and the right endpoint has an NxN layout which grows automatically up to 3x3.
- **equal** (also known as allEqual) has participants evenly distributed between the left and right screen with up to two 3x3 grids on both screens.

The default layout is the existing prevailing layout applied to the callLegProfile or space.

2.4.1 Enabling dual screen endpoint support

Support for dual screen endpoints is disabled by default. To enable support:

1. POST to `/compatibilityProfiles` or PUT to `/compatibilityProfiles/<compatibility profile id>` the parameter `sipMultistream` set to true.
2. Add the compatibilityProfile to the system profile. PUT the `compatibilityProfile` parameter and `ID` to `/system/profiles`.

- In addition to the Meeting Server configuration, the dual screen endpoints also require configuration. On the web interface of the endpoint, navigate to **Setup>Conference** and select **Multistream mode**.

Table 1: Configuring Multistream mode on the endpoint

The screenshot shows the 'System Configuration' web interface. On the left is a navigation menu with categories like Audio, Bluetooth, CallHistory, Cameras, Conference (highlighted), FacilityService, H323, Logging, Network, NetworkServices, Peripherals, Phonebook, Provisioning, Proximity, RoomAnalytics, RoomReset, RTP, Security, and SerialPort. The main content area is titled 'Conference' and contains various settings:

- ActiveControl Mode: Auto
- CallProtocolIPStack: IPv4
- DoNotDisturb DefaultTimeout: 60 (1 to 1440)
- Encryption Mode: BestEffort
- IncomingMultisiteCall Mode: Allow
- MaxReceiveCallRate: 6000 (64 to 6000)
- MaxTotalReceiveCallRate: 6000 (64 to 6000)
- MaxTotalTransmitCallRate: 6000 (64 to 6000)
- MaxTransmitCallRate: 6000 (64 to 6000)
- MicUnmuteOnDisconnect Mode: On
- Multipoint Mode: MultiSite
- MultiStream Mode: Auto (selected), Off
- VideoBandwidth Mode: (partially visible)

At the top right of the configuration area are 'Refresh' and 'Collapse all' buttons.

Note: Endpoints that support ActiveControl render participant count and the recorder indicator locally on the endpoints and touch panels. Endpoints not supporting ActiveControl will have the labels and indicators sent from the Meeting Server to one of the endpoints.

2.4.2 Disabling dual screen endpoint support

To re-disable dual screen endpoint support after enabling it:

- Identify the compatibilityProfile that is applied to `/system/profiles` with `sipMultistream` set to true.
- PUT to `/compatibilityProfiles/<compatibility profile id>` the parameter `sipMultistream` set to false, where `<compatibility profile id>` is the ID of the compatibilityProfile identified in step 1.

2.5 Load balancing outbound SIP calls

From version 2.2, Call Bridge Groups supports the load balancing of outbound SIP calls, in addition to inbound SIP calls which was introduced in version 2.1.

To use this feature, do the following:

- [enable load balancing of outbound SIP calls from spaces](#),
- [set up outbound dial plan rules for load balancing 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.

However, you may prefer to supply the Call Bridge Group or a specific Call Bridge for the outbound SIP calls. In this situation, use the API object `/calls/<call id>/participants`, [see below](#).

For more information on load balancing SIP calls across Call Bridge Groups, see the white paper: [Load Balancing Calls Across Cisco Meeting Servers](#).

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

2.5.1 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, perform a PUT on the API object `/callBridgeGroups/<call bridge group id>` with the `loadBalanceOutgoingCalls` parameter set to true. Use POST if setting up a new Call Bridge Group.

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

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

This can be achieved in 3 ways:

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 set 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 dial plan rules for each Call Bridge in the Call Bridge group. If the scope of existing rules needs to be altered, perform a PUT on the API object `/outboundDialPlanRules/<outbound dial plan rule id>` supplying the scope request parameter as defined above. Use POST on the API object `/outboundDialPlanRules` if setting up a new outbound dial plan rule.

2.5.3 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, perform a POST on the API object `/calls/<call id>/participants` with the parameter **callBridgeGroup** and the **ID** of the Call Bridge group to use.

To make a call from a specific Call Bridge, perform a POST on the API object `/calls/<call id>/participants` with the parameter **callBridge** and the **ID** of the Call Bridge to use.

2.5.4 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 performing a POST on the API object `/calls`. 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 load balancing for empty conferences by using the parameter **activeWhenEmpty** set to **false** when performing the POST on the API object `/calls`.

2.6 Setting maximum quality levels for main video and content

This feature permits an administrator to specify a maximum resolution / frame rate pair for main video and/or for content using a callLegProfile. See the API commands in [Section 2.12.2](#)

Table 2 shows the settings available, and Table 3 explains the meanings of the settings.

Table 2: callLegProfile quality settings

Parameter	Value	Notes
qualityMain	unrestricted max1080p30 max720p30 max480p30	For main video. Restricts the maximum negotiated main video call quality for this call leg based on limiting transcoding resources. Specified using a typical resolution and frame rate. Note that call legs may operate at lower resolutions or frame rates due to endpoint limitations or overall bridge load
qualityPresentation	unrestricted max1080p30 max720p5	For content. Restricts the maximum negotiated presentation video call quality for this call leg based on limiting transcoding resources. Specified using a typical resolution and frame rate. This only affects call legs which use a separate presentation stream.

Table 3: Description of maximum quality level settings

Setting	Description
unrestricted	Default, if setting not specified. Matches the behavior of older Call Bridge versions, where no restrictions are placed on resolution or frame rate.
max1080p30	Restricts the Call Bridge to negotiating at most 1920x1080 screen size at 30 frames per second (1080p30) or equivalent, for example 1280x720 screen size at 60 frames per second (720p60). Note: 720p60 is not a separate option, use the max1080p30 setting to allow 720p60.
max720p30	Restricts the Call Bridge to negotiating at most 1280x720 screen size at 30 frames per second or equivalent transcoding resources.
max480p30	Restricts the Call Bridge to negotiating at most 868x480 screen size at 30 frames per second or equivalent transcoding resources.

2.7 Improved DTMF comma handling

Prior to version 2.2, commas included in an API-specified `dtmfSequence` did not introduce any noticeable pause. In version 2.2, a two second pause has been introduced to make the pause noticeable.

Note: `dtmfSequence` is a string of DTMF characters that the Meeting Server sends to the far end either when the call leg initially connects, or during the call.

2.8 Layout and screen changes to improve user experience

The following layout and screen changes have been made to improve the user experience during meetings:

- the borders between participant panes have been removed, the panes now touch,
- in the overlay layout, the active speaker is now full screen,
- [added the ability to remove the participant count icon on the screen,](#)
- [added the ability to use the importance level of participants to control which participants are displayed onscreen.](#)

2.8.1 Removing and showing the on-screen Participant Counter

Version 2.2 introduces a new `participantCounter` setting within `callLegProfile` objects; this allows you to control when the participant count value is shown on screen. Set `participantCounter` to one of the following values:

auto	shows the participant count value if there are off-screen participants; this is the default behavior and how the feature works in releases prior to 2.2
never	use this value to disable the participant count value so it is never included in Meeting Server video layouts
always	with this setting, the participant count value will be shown on screen permanently, even if there are no off-screen participants

For example, to disable the Participant Counter so that it is never shown, perform a PUT on the API object `/callLegProfile/<call leg profile id>` with parameter `participantCounter` set to `never`.

2.8.2 Using the importance level of participants to control which participants are displayed onscreen

Version 2.2 enables you to assign an importance level to participants in a conference. Multiple participants can be assigned different importance levels, the participant with the highest importance level will be treated as if they are the loudest speaker when determining whose video is shown on the screen.

For telepresence, stacked, speakerOnly and onePlusN screen layouts, the participant with the highest importance level will be shown in the main screen, rather than the active speaker; if there are multiple participants with the same highest importance level, then one of these will be shown

in the main screen, which one being determined by who was the most recent active speaker. The Active speaker indication of a blue line below the speaker's video pane remains unaffected.

For the allEqual family of layouts, the participant with the highest importance level will be shown in one of the allEqual panes. If there are multiple important participants then up to 25 will be displayed in the allEqual panes, any remaining places will be taken by participants without importance set.

Initially, all participants have an unset importance level, any set importance level is higher than the unset state. An importance level of 1 is higher than 0, but lower than 2, and all these levels are higher than unset.

Example of using importance :

1. Remove any configured importance settings for all participants in the conference, so all participants are in the unset state.

PUT to API object `/calls/<call id>/participants/*` with request parameter `importance` unset ("")

2. Add the important person to the conference with the importance level set.

POST to API object `/calls/<call id>/participants/` with request parameter `importance` set, for example to 1.

3. To make a participant important if they are already in a conference:

PUT to API object `/participants/<participants id>/` with request parameter `importance` set, for example to 1

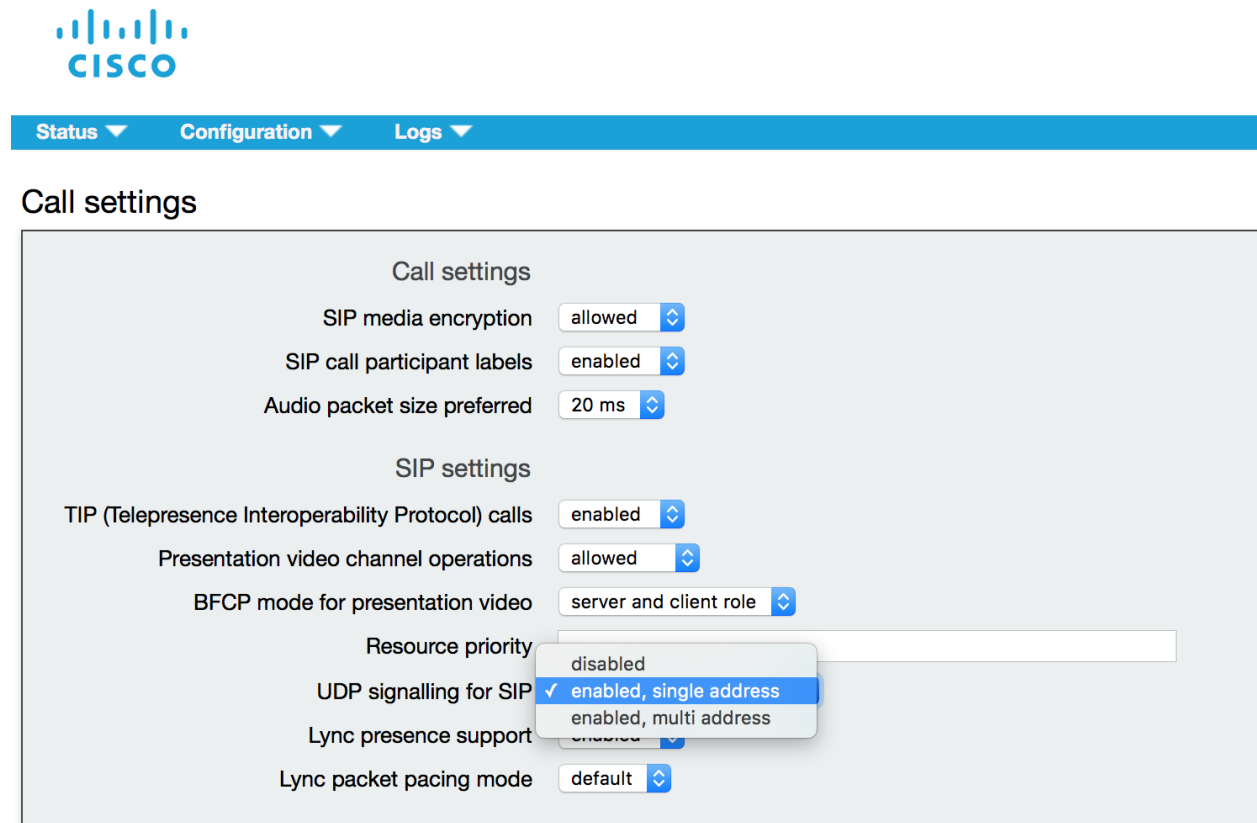
2.9 Enabling and disabling UDP signaling for SIP

The "UDP signaling for SIP" setting allows you to completely disable SIP over UDP, or to enable "single address" or "multi address" mode. Single address mode corresponds to the SIP over UDP behavior in versions prior to 2.2 and is the default, multi address mode allows SIP over UDP on multiple interfaces.

Use multi address mode if the Call Bridge is configured to listen on more than one interface for SIP over UDP traffic. Disable "UDP signaling for SIP" if you use SIP over TCP, or require that all of your network traffic is encrypted .

The "UDP signaling for SIP" mode is set through the Web Admin interface of the Call Bridge. Log into the Web Admin interface and select **Configuration>Call settings**, see Figure 1.

Figure 1: Settings for UDP signaling for SIP



2.10 Diagnostic tools to help Cisco Support troubleshoot issues

2.10.1 Log bundle

In version 2.2, the Meeting Server can produce a log bundle containing the configuration and state of various components in the Meeting Server. This log bundle will aid Cisco Support speed up their analysis of your issue.

If you need to contact Cisco support with an issue, follow these steps to download the log bundle from the Meeting Server.

1. Connect your SFTP client to the IP address of the MMP.
2. Log in using the credentials of an MMP admin user.
3. Copy the file logbundle.tar.gz to a local folder.
4. Rename the file, changing the logbundle part of the filename to identify which server produced the file. This is important in a multi-server deployment.
5. Send the renamed file to your Cisco Support contact for analysis.

2.10.2 Ability to generate a keyframe for a specific call leg

A new `generateKeyframe` object has been added to `/callLegs/<call leg id>`. POST to `/callLegs/<call leg id>/generateKeyframe` to trigger the generation of a new keyframe in outgoing video streams for the call leg in question. This is a debug facility, and Cisco Support may ask you to use the feature when diagnosing an issue.

2.10.3 Reporting registered media modules in syslog

From version 2.2, syslog will now print a message every 15 minutes to allow people to monitor whether all media modules are alive and well.

An example from an Acano X3 server:

```
Apr 21 09:53:50 user.info cms-emea-01 host: server: INFO : media module status
111111111111
```

2.11 Summary of MMP changes

Version 2.2 has no new MMP commands.

2.12 Summary of API Additions & Changes

New API functionality for the Meeting Server 2.2 includes support for:

- [Office 365 Dual Homed Experience with OBTP Scheduling](#)
- [setting the maximum quality levels for main video and content](#)
- [an enhanced experience on dual screen endpoints](#)
- [load balancing of outbound calls to SIP endpoints](#)
- [diagnostics for recordings, streamings and Web Bridges](#)
- [enabling and disabling the on-screen participant counter](#)

there are also some other [miscellaneous additions](#).

2.12.1 Office 365 Dual Homed Experience with OBTP Scheduling

New request parameter added to `/inboundDialPlanRules` and `/inboundDialPlanRules/<inbound dial plan rule ID>:resolveToLyncSimpleJoin`

2.12.2 Setting the maximum quality levels for main video and content

New request parameters to `/callLegProfile`: `qualityMain`, `qualityPresentation`

2.12.3 Additional support for Dual Video Endpoints

New request parameter to `/compatibilityProfiles` and `/compatibilityProfiles/<compatibility profile id>:sipMultistream`

2.12.4 Support for load balancing of outbound calls to SIP endpoints

New request parameter to `/callBridgeGroups: loadBalanceOutgoingCalls`

New request parameters to `/calls/<call id>/participants: callBridgeGroup, callBridge` for POST operations only

New request parameter to `/outboundDialPlanRules` and `/outboundDialPlanRules/<outbound dial plan rule id>: callBridgeGroup`

Added value to `scope` parameter for `/outboundDialPlanRules: callBridgeGroup`

New request parameter to `/calls: activeWhenEmpty`

2.12.5 Assigning an Importance level to participants to control the screen layout

New request parameter to `/calls/<call id>/participants/: importance` (POST only)

New request parameter to `/participants/<participant id>: importance` (PUT only)

New API object: `/calls/<call id>/participants/*` with request parameter: `importance` (PUT only)

2.12.6 Retrieving diagnostics on a Recorder/Streamer/Web Bridge

New node added to `/recorders/<recorder id>: activeRecordings`

New node added to `/streamers/<streamer id>: activeStreams`

New node added to `/recorders/<recorder id>, /streamers/<streamer id>, /webBridges/<web bridge id>: status`

The table below shows the status settings for the components.

Status	Component	Recorder	Streamer	Web Bridge
unused	component is unused	✓	✓	✓
success	connected to the queried Call Bridge	✓	✓	✓
connectionFailure	could not connect to the queried Call Bridge	✓	✓	✓
invalidAddress	the configured URL is invalid	✓	✓	
dnsFailure	the configured URL cannot be resolved by the DNS server	✓	✓	

Status	Component	Recorder	Streamer	Web Bridge
remoteFailure	a connection was established with the component but the Call Bridge received a failure response	✓	✓	
unknownFailure	an unknown failure occurred	✓	✓	
lowDiskSpace	has limited disk space available	✓		

2.12.7 Support to disable and re-enable the on-screen participant counter

New request parameter added to `/callLegProfiles:participantCounter`

2.12.8 Miscellaneous additions

- New request parameter added to `/coSpaces` and `/coSpaces/<coSpace ID>:meetingScheduler`
- New read-only field added to `/calls/<call ID>:ownerName`
- New request parameter added to `/system/status:cdrCorrelatorIndex`. This support external tools to the Meeting Server determining whether they have received all CDR records that have been sent.
- New operation to `/calls/<call id>/participants/*` with attributes `layout` or `(rx|tx)(Audio|Video)Mute`
- New request parameter added to `/compatibilityProfiles` and `/compatibilityProfiles/<compatibilityProfile ID>:sipMediaPayloadTypeMode`
- New object `/callLegs/<call leg id>/generateKeyframe`. POST to `/callLegs/<call leg id>/generateKeyframe` to trigger the generation of a new keyframe in outgoing video streams for the call leg in question. This is a debug facility, and Cisco Support may ask you to use the feature when diagnosing an issue.

2.13 Summary of CDR Additions & Changes

Version 2.2 introduces the following changes to the Call Detail Records of the Meeting Server:

- `ownerName` field added to `callStart` records

The `ownerName` field is populated from one of the following (in priority order):

- `meetingScheduler` set through the API
- `name` field in `/user` corresponding to owner
- `Jid` field in `/user` corresponding to owner
- Not filled in if none of the above exist.

3 Notes on Upgrading Cisco Meeting Server software to version 2.2

This section assumes that you are upgrading from Cisco Meeting Server software version 2.1. If you are upgrading from an earlier version, then Cisco recommends that you upgrade to 2.1 first following the instructions in the 2.1.x release notes, before following any instructions in these Cisco Meeting Server 2.2 Release Notes.

Note: Cisco has not tested upgrading from a software release earlier than 2.1.

To check which version of Cisco Meeting Server software is installed on a Cisco Meeting Server 2000, Cisco Meeting Server 1000, or previously configured VM deployment, use the MMP command `version`.

If you are configuring a VM for the first time then follow the instructions in the Cisco Meeting Server Installation Guide for Virtualized Deployments.

3.1 Upgrading to Release 2.2

The instructions in this section apply to Meeting Server deployments which are not clustered. For deployments with clustered databases read the instructions in this [FAQ](#), before upgrading clustered servers.

CAUTION: Before upgrading to release 2.2.6 you must take a configuration backup using the `backup snapshot <filename>` command and save the backup safely on a different device. See the MMP Command Reference document for full details. Do NOT use the automatic backup file that is created during the upgrade process.

Upgrading the firmware is a two-stage process: first, upload the upgraded firmware image; then issue the upgrade command. This restarts the server: the restart process interrupts all active calls running on the server; therefore, this stage should be done at a suitable time so as not to impact users – or users should be warned in advance.

To install the latest firmware on the server follow these steps:

1. Obtain the appropriate upgrade file from the support section of the Cisco website. There will be five files:

[Cisco_Meeting_Server_2_2_6_CMS2000.zip](#)

This file requires unzipping to a single upgrade.img file. Use this file to upgrade Cisco Meeting Server 2000 servers, follow the instructions below. Note: this file may be released a few days after the other upgrade files.

[Cisco_Meeting_Server_2_2_6_vm-upgrade.zip](#)

This file requires unzipping to a single `upgrade.img` file. Use this file to upgrade vm deployments, follow the instructions below.

[Cisco_Meeting_Server_2_2_6.vhd](#)

Use this file to upgrade Microsoft Hyper-V deployments

[Cisco_Meeting_Server_2_2_6_x-series.zip](#)

This file requires unzipping to a single `upgrade.img` file. Use this file to upgrade Acano X-series servers, follow the instructions below.

[Cisco_Meeting_Server_2_2_6.ova](#)

Use this file for new vm deployments, follow the steps in the *Installation Guide for Virtualized Deployments*.

Note: If you are using WinSCP for the file transfer, ensure that the Transfer Settings option is 'binary' not 'text'. Using the incorrect setting results in the transferred file being slightly smaller than the original – and this prevents successful upgrade.

2. Validate the download; the checksums for the 2.2.6 release are shown in a pop up box that appears when you hover over the description for the download.
3. Using an SFTP client, log into the MMP using its IP address. The login credentials will be the ones set for the MMP admin account. If you are using Windows, we recommend using the WinSCP tool.

Note:

- a) You can find the IP address of the MMP's interface with the `iface a MMP` command.
 - b) The SFTP server runs on the standard port, 22.
 - c) After copying the `upgrade.img` file, you will not be able to see it listed as being in the file system; this is normal.
-

4. Copy the software to the Server/ virtualized server.
5. To apply the upgrade, issue the upgrade command.
 - a. Establish a SSH connection to the MMP and log in.
 - b. Initiate the upgrade by executing the upgrade command.
upgrade

The Server/ virtualized server restarts automatically: allow 10 minutes for the process to complete.

6. Verify that the Meeting Server is running the upgraded image by re-establishing the SSH connection to the MMP and typing:
`version`
7. Check the **Configuration > Outbound Calls** rules updating the Local Contact Domain field and completing the new Local From Domain field if necessary.
8. Update the customization archive file when available.
9. If you are deploying a scaled or resilient deployment read the Scalability & Resilience Deployment Guide and plan the rest of your deployment order and configuration.
10. If you have deployed a database cluster, be sure to run the `database cluster upgrade_schema` command after upgrading. For instructions on upgrading the database schema refer to the Scalability & Resilience Deployment Guide.
11. You have completed the upgrade.

3.2 Downgrading

If anything unexpected occurs during the upgrade process you can return to the previous version of the server software.

Use the regular upgrade procedure to “upgrade” the Meeting Server to the appropriate version. Then restore the configuration backup for the older version, using the MMP command `backup rollback <name>` command. Do not rely on the backup generated automatically during upgrade. For deployments with clustered databases read the instructions in this [FAQ](#), before “upgrading” clustered servers.

Note: The `backup rollback <name>` command overwrites the existing configuration as well as the license.dat file and all certificates and private keys on the system, and reboots the Meeting Server. Therefore it should be used with caution. Make sure you copy your existing `cms.lic` file and certificates beforehand because they will be overwritten during the backup rollback process. The .JSON file will not be overwritten and does not need to be re-uploaded.

3.3 Cisco Meeting Server 2.2 Deployments

To simplify explaining how to deploy the Meeting Server, deployments are described in terms of three models: the single combined Meeting Server, the single split Meeting Server and the deployment for scalability and resilience. All three different models may well be used in different parts of a production network.

3.3.1 Deployments using a single host server

If you are deploying the Meeting Server as a single host server (a “combined” deployment), we recommend that you read and follow the documentation in the following order:

1. Appropriate Installation Guide for your Cisco Meeting Server (Cisco Meeting Server 2000, Cisco Meeting Server 1000 and virtualized deployments, or the installation guide for Acano X-Series Server).
2. The Single Combined Meeting Server Deployment Guide enabling all the solution components on the single host. This guide refers to the Certificate Guidelines for Single Combined Server Deployments for details on obtaining and installing certificates for this deployment.

Note: The Cisco Meeting Server 2000 only has the Call Bridge, Web Bridge, XMPP server and database components. It can be deployed as a single server on an internal network, but if a deployment requires firewall traversal support for external Cisco Meeting App clients, then TURN server and Load Balancer edge components need to be deployed on a separate Cisco Meeting Server 1000 or specification-based VM server – see the “single split” deployment below.

3.3.2 Deployments using a single split server hosted on a Core server and an Edge server

If you are deploying the Meeting Server in a split server model, we recommend that you deploy the XMPP server on the Core server, and deploy the Load Balancer on the Edge server.

Read and follow the documentation in the following order:

1. Appropriate Installation Guide for your Cisco Meeting Server
2. The Single Split Meeting Server Deployment Guide. This guide refers to the Certificate Guidelines for Single Split Server Deployments for details on obtaining and installing certificates for this deployment.

3.3.3 Deployments for scalability and resilience

If you are installing the Meeting Server for scalability and resilience using multiple host servers, we recommend that you deploy the XMPP server on Core servers, and deploy Load Balancers on the Edge server.

Read and follow the documentation in the following order:

1. Appropriate Installation Guide for your Cisco Meeting Server
2. The Scalability and Resilience Deployment Guide. This guide refers to the Certificate Guidelines for Scalable and Resilient Server Deployments for details on obtaining and installing certificates for this deployment.

4 Bug search tool and resolved and open issues

You can now use the Cisco Bug Search Tool to find information on open and resolved issues for the Cisco Meeting Server, including descriptions of the problems and available workarounds. The identifiers listed in these release notes will take you directly to a description of each issue.

1. Using a web browser, go to the [Bug Search Tool](#).
2. Sign in with a cisco.com registered username and password.

To look for information about a specific problem mentioned in this document:

1. Enter the bug identifier in the **Search** field and click **Search**.

To look for information when you do not know the identifier:

1. Type the product name in the **Search** field and click **Search**

or,

in the **Product** field select **Series/Model** and start typing **Cisco Meeting Server**, then in the **Releases** field select **Fixed in these Releases** and type the releases to search for example **2.2.0**.

2. From the list of bugs that appears, filter the list using the *Modified Date*, *Status*, *Severity*, *Rating* drop down lists.

The Bug Search Tool help pages have further information on using the Bug Search Tool.

4.1 Resolved issues

Issues seen in previous versions that are fixed in 2.2.6

Cisco identifier	Summary
CSCvf65214	When a Cisco Meeting App user dials a space which has multiple access methods, the Meeting Server will always present a prompt indicating they must enter a passcode, even if one is not required. An alternative prompt has been added "enter passcode (if required)".
CSCvf51295	Some error messages in WebRTC calls may be incorrectly displayed in English when using the Japanese language pack.
CSCvf42693	Attempting to resolve a blank call ID for a Lync conference could cause the Meeting Server to restart.
CSCvf36654	In some call flows through a Cisco Unified Communications Manager, calls placed on hold to a Meeting Server may be disconnected after a period of time.

Cisco identifier	Summary
CSCvf36154	During some database to Call Bridge syncs, an unnecessarily large number of records may be updated, possibly reducing performance on heavily loaded systems or preventing some data from being updated.
CSCvf30053	In a clustered Meeting Server deployment, it is possible that TMS scheduled meetings will start late or have incorrect information, for example meeting names.
CSCve08594	After a period of time, an H.323 GW can stop accepting new calls. A restart of the H.323 GW fixes this problem. This problem could occur if the TCP channel for the H.245 connection for a particular H.323 call had closed.

Issues seen in previous versions that are fixed in 2.2.5

Cisco identifier	Summary
CSCvf31964	In some scenarios, some SIP endpoints may not be visible to any of the other participants in a conference.
CSCve86049	Presentation sharing may not be possible when multiple H.323 endpoints connect to a Meeting Server through the built-in H.323 Gateway.
CSCve35060	H.323 Gateway calls through an IVR will be disconnected if the Meeting Server setting for encryption is "Allowed", but encryption is "Required" for the space.
CSCvf31494	In AVMCU meetings, SIP endpoints could have an avatar displayed rather than their own video, if media is encrypted between the AVMCU and the Meeting Server and the spotlight is locked on any participant for 15 minutes or longer. On unlocking, the SIP endpoint could be displayed as an avatar.

Issues seen in previous versions that are fixed in 2.2.4

Cisco identifier	Summary
CSCvf21142	Presentation video does not work between Meeting Server 2.2 and Polycom HDX endpoints.
CSCvf21169	If a tenant participant limit is specified, participants may not be admitted to a distributed call even if the limit has not been reached.
CSCvf14323	If a customized background image is in use, the background image is repeatedly loaded when lots of participants in a space need to be activated or deactivated en masse (for instance because a host joins a space with lots of guest users). If this background image file is fairly large, it causes an extra load on the system, which can eventually lead to a restart of the Meeting Server.

Cisco identifier	Summary
CSCvf09283	Under certain circumstances, connections from Lync to a clustered Meeting Server commence with a NEGOTIATE message with a To: URI of the following form: To: sip:<DN of pool>;ms-fe=<FQDN of CMS>. Currently, the Meeting Server uses the NEGOTIATE To: URI (minus any parameters) as its contact domain when responding to subsequent requests on that connection. Where present, the value of the ms-fe parameter would be a better choice, as it resolves to the individual Call Bridge rather than each / any of the Call Bridges in the pool.
CSCvf02256	callLeg API reports empty /alarms node with no further information as to what the alarms are.
CSCve84209	Reconnecting a WebRTC host participant doesn't activate a SIP guest user.
CSCve49642	If a new distributed peer link is established 'after' a permanent messageText has been sent for a particular call, participants over the distributed link are not shown this message.
CSCvf21193	If custom branding resources (call branding or IVR branding) should be used for a call leg and the web server hosting these resources is unavailable, then the Meeting Server will wait for up to two minutes for a TCP response on every call leg in the conference before giving up and joining the endpoint to the conference. After this bug fix, the Meeting Server will delay the first call that needs custom branding resources for a short time before determining that they are not available, and proceeding without them. Subsequent calls will not be delayed.

Issues seen in previous versions that are fixed in 2.2.3

Cisco identifier	Summary
CSCve99788	The Call Bridge could crash in some circumstances while processing a request from a Lync client to add a SIP endpoint or Cisco Meeting App user to an AVMCU.
CSCve98059	Setting the date on a Cisco Meeting Server 2000 via the MMP only persists until reboot. The MMP should not offer the option to set the date. Set the date and time correctly in UCS Manager.
CSCve98053	The default hostname of a Cisco Meeting Server 2000 is "acano", when it should be CMS2000.
CSCve87518	Participant name labels are missing in layouts with PIPs, for example stacked layout.
CSCve83819	When Lync proxy connections are used in a clustered deployment of Meeting Servers, content sharing in a dual-homed call to a Lync or S4B client shows a black screen.
CSCve72610	Chat messages do not appear in the chat window for a non-member user connected to a space. This occurs when the /callProfile has parameter "messageBoardEnabled" initially set to false, but is subsequently changed to true.

Cisco identifier	Summary
CSCve68664	H.323 Gateway restarts unexpectedly with h323 process: signalled:9 after canceling a call that is in the process of being connected from the client. This causes active H.323 calls to drop.
CSCve62662	A resource leak could lead to the H.323 Gateway component crashing. This leak was caused by a race condition between a media stream being setup and the call being torn down. In some situations, this prevents the resource being released when the call is torn down, and over time all resources are consumed.
CSCve49637	TX9000/IX5000 does not receive video after Hold/Resume if a Session Border Controller (SBC) is within the call path.
CSCve35856	If a logged in user calls into a space that they aren't a member of using the WebRTC app, the log in box displays "Type passcode", even if the passcode is optional.
CSCve18588	The H.323 Gateway could crash if a call was torn down while a new media stream for that call was being set up.
CSCve17230	In-call chat doesn't work in distributed calls between two Cisco Meeting App users when allocated to two different Call Bridges.
CSCve08092	When making an outgoing call to a Lync client with videoMode set to disabled, the call rings on the Lync client but then drops shortly afterwards.

Issues seen in previous versions that are fixed in 2.2.2

Cisco identifier	Summary
CSCve70685	Occasionally, the Cisco Meeting Server restarts when a participant is put on hold and then activated.
CSCve70201	Audio quality significantly degrades during very high load. This may happen during peak hours when hundreds/thousands of audio and video calls as well as hundreds of distributed links are being hosted on a Meeting Server.
CSCve65931	Multiple Call Bridges configured as a group may cause the Cisco Meeting Server to restart during PIN entry.
CSCve39382	With a Call Bridge group setup, the caller ID displayed on the calling endpoint can be inconsistent depending upon whether a call has been replaced or not.
CSCve31915	In dual homed meetings involving a cluster of Call Bridges, if a Lync participant locks the spotlight on itself, participants on a remote Call Bridge will only see participants on that Call Bridge, rather than the Lync participant as expected.
CSCve28532	In dual-homed S4B/Lync meetings hosted on clustered Meeting Servers, participants using XMPP clients, i.e. web clients or the Cisco Meeting App, will not see the presentation if the client is connected to a different core server in the clustered deployment to the one that has the call to the AVMCU conference.

Cisco identifier	Summary
CSCve22901	If a member is logged into the Cisco Meeting App and observing their space when a participant calls into the space, sometimes the member sees the name of the new participant appear in green under the space name, but not always.
CSCve21895	Frozen video from S4B clients in a dual-homed conference is sent to SIP endpoints. This occurs from S4B client version 16.0.7766.5299.
CSCve18884	In some rare circumstances, dropped video frames and throttling occurs in video sent from a Meeting Server, even when the unit is not heavily loaded.
CSCve18504	When a Lync conversation is escalated to a Lync meeting, any subsequent SIP endpoints (added to this meeting via an SFB client), will incorrectly see the first SIP endpoint's address in the FROM field of the incoming SIP INVITE (instead of the SFB client). This is only an issue if the SIP endpoint is specifically looking at the incoming caller ID; once connected to the Lync meeting, all participants' names are correctly shown on their respective video stream.

Issues seen in previous versions that are fixed in 2.2.1

Cisco identifier	Summary
CSCve35795	Office 365 Dual Home Experience with OBTP Scheduling (also known as Lync simplejoin) doesn't work with newer server releases of Office 365 and fails with the message "lync simplejoin resolution: resolution failed (conference not found)" even though the O365 meeting does exist.
CSCve22765	Inconsistent voice prompts played to users when Call Bridge group is used.
CSCve18410	French translations for Web Bridge guest join options require improvement.

Issues seen in previous versions that are fixed in 2.2.0

Cisco identifier	Summary
CSCve95813	A rare thread synchronization error can result in a media process crash. Users might experience a brief interruption in media while objects are moved to another media framework.
CSCve26277	Cisco Meeting Server doesn't respond to BFCPHello from HDX when BFCP mode is "server and client".
CSCvf02105	Improvements have been made to 3 screen TIP endpoints dialling into a Meeting Server over a SIP trunk configured to use Early Offer. If you continue to see problems with the call dropping to a single screen call, then you are advised to set the SIP trunk from CUCM to the Cisco Meeting Server to use Delayed Offer.
CSCve26267	Directory search does not search on 'first name' field
CSCve08053	Choppy mpeg4-generic encrypted audio from TelePresence Server.

4.2 Open issues

The following are known issues in this release. If you require more details enter the Cisco identifier into the Search field of the [Bug Search Tool](#).

Cisco identifier	Summary
CSCve26287	TIP endpoint doesn't display video when quality is below 720p.

Cisco Legal Information

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.

THE SOFTWARE LICENSE AND LIMITED WARRANTY FOR THE ACCOMPANYING PRODUCT ARE SET FORTH IN THE INFORMATION PACKET THAT SHIPPED WITH THE PRODUCT AND ARE INCORPORATED HEREIN BY THIS REFERENCE. IF YOU ARE UNABLE TO LOCATE THE SOFTWARE LICENSE OR LIMITED WARRANTY, CONTACT YOUR CISCO REPRESENTATIVE FOR A COPY.

The Cisco implementation of TCP header compression is an adaptation of a program developed by the University of California, Berkeley (UCB) as part of UCB's public domain version of the UNIX operating system. All rights reserved. Copyright © 1981, Regents of the University of California.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE OF THESE SUPPLIERS ARE PROVIDED "AS IS" WITH ALL FAULTS. CISCO AND THE ABOVE-NAMED SUPPLIERS DISCLAIM ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

All printed copies and duplicate soft copies are considered un-Controlled copies and the original on-line version should be referred to for latest version.

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco website at www.cisco.com/go/offices.

© 2017 Cisco Systems, Inc. All rights reserved.

Cisco Trademark

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this url:

www.cisco.com/go/trademarks. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)