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This module describes how to calculate the capacity of your system, which is different depending on if you have an Express Media Server or a Hardware Media Server.

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Resource Management and System Capacity for Systems Using the Express Media Server

The Express Media Server operates in one of two audio modes: high capacity (HC) audio mode, or high quality (HQ) audio mode. High capacity audio mode allows the maximum number of concurrent users to connect to a MeetingPlace system, all using a narrowband audio codec (G.711). High quality audio mode allows fewer concurrent users but supports wideband audio codecs (G.722, G.729), and provides noise cancellation and line echo cancellation for the G.711 codec. Automatic Gain Control (AGC) is provided in both audio modes. Video may be enabled or disabled in either audio mode.

The Express Media Server measures resource utilization using a quantity called System Resource Units (SRUs). An SRU is defined as a measurement of the system computing power used by one G.711 call. The Express Media Server calculates the total number of SRUs available on a MeetingPlace node at the time the Application Server is started. The total number of SRUs available on a MeetingPlace node is a function of the type of Cisco UCS or MCS that the Application Server resides on and the speed and number of processors on that system. MeetingPlace reserves some of the processor capacity for normal operation, and makes the remaining capacity available as a pool of SRUs to be used for audio and video conferencing.

The system consumes SRUs from the pool when callers enter the system, and when callers with video endpoints join a video-enabled meeting. The number of SRUs used depends on the voice and video attributes of the call. [Table: System Resource Units Used Per Port Type](#). For example, if a caller uses the G.729 audio codec in HQ audio mode, more resources are consumed on the system than if the caller were using a G.711 codec in HC audio mode.

Table: System Resource Units Used Per Port Type

Port Type	Number of System Resource Units (SRUs) Used
One G.711 audio port (HC mode)	1
One G.711 audio port (HQ mode)	8
One G.729 or one G.722 audio port (HQ mode)	6
One H.263 video port at up to 768 kbps	2
One H.264 AVC (level 1.1) video port at up to 384 kbps	1
One H.264 AVC (level 1.3) video port at up to 768 kbps	2
One H.264 AVC (level 3.0) video port at up to 2000 kbps	6
One H.264 AVC (level 3.1) video port at up to 2000 kbps	6

- When you configure scheduled meeting features, the system allocates the resources at runtime if they are available. If there are not enough SRUs remaining in the pool, the system will not offer the feature to the user.
- When you configure ad-hoc meeting features, the system immediately deducts resources from the remaining SRU pool to support ad-hoc voice and ad-hoc video. The system guarantees ad-hoc video conferencing up to 384 kbps. If you configure a higher rate, the system tries to deliver a higher rate, but it is not guaranteed.

Resource Management and System Capacity for Systems Using the Hardware Media Server

If you installed and configured your Cisco Unified MeetingPlace system to use a Hardware Media Server (by setting the System Media Mode parameter to hardware), the system manages resources based on the number of Audio and Video Blades installed in the Hardware Media Server and the type of codec (standard rate or high rate) selected:

- For audio ports, the number of Audio Blades and the Global audio mode parameter determine the physical capacity of the system. You set the Global audio mode parameter to either 250 ports per blade or to 166 ports per blade, depending on which audio codecs are required in your deployment. You get 250 ports with G.711. If you enable G.729 with Line Echo Cancellation, G.722, or iLBC,

the full capacity of each blade is then 166 ports, even if only G.711 is used. You can transcode the G.729, G.722, and iLBC codecs and send only G.711 calls to Cisco Unified MeetingPlace if you want to maintain the 250 port maximum capacity.

The reservation mechanism associated with meeting scheduling also affects the use for audio ports. Reservation can cause a meeting entry to be denied even if not all physical capacity is in use. Scheduling is based on configuration, not physical capacity.

- For video ports, the number of Video Blades determines the physical capacity of the system (48 ports for a single-blade system or 40 ports per blade for a multiple-blade system). If a meeting is in high-rate mode, each video connection takes two video port resources, which means the system runs out of resources more quickly. There is no reservation mechanism for video; the system services video on a first come, first served basis until the system runs out of physical resources.
- The resource cost difference between standard-rate and high-rate video is a factor of two. This means that twice as many resources are used with high-rate video.

About the Resource Management Spreadsheet

The Cisco Unified MeetingPlace Release 8.6 documentation contains a Resource Management Spreadsheet that can be found at

http://www.cisco.com/en/US/products/sw/ps5664/ps5669/prod_technical_reference_list.html.

Table 1, "Capacity for Various Video Bit Rates," is on rows 5 to 22 and lists the capacity of various video bit rates.

Table 2, "Audio and Video Port Combinations," is on rows 32 to 40 and shows various combinations of audio and video ports.

Table 3, "Capacity Testing," is on rows 47 to 55 and can be used for you to test your numbers.

Notes about the Resource Management Spreadsheet:

- The "Total SRUs per call" field is the total of the values in the "Audio SRUs per call" and "Video SRUs per call" columns.
- To calculate the value in the 7845-I2 column, take the total number of SRUs (for 7845-I2 it is 1000) and divide it by the value in the "Total SRUs per call" column. For example, for G.711 audio + 2000 Kbps video, the value for the Total SRUs per call is 8. Therefore, the value in the 7845-I2 column is 1000 divided by 8 which is 125.
- To calculate the value in the QuadCore column, take the total number of SRUs (for QuadCore it is 1300) and divide it by the value in the "Total SRUs per call" column. For example, for G.722/G.729 audio + 1500 Kbps video, the Total SRUs per call is 10. Therefore, the value in the QuadCore column is 1300 divided by 10 which is 130.

Resource Management Spreadsheet Example

Use Table 2, titled "Audio and Video Port Combinations," in the Resource Management Spreadsheet to create different mixes (or ratios) of video and of high-complexity audio. The ratios define the maximum number of supported calls for your Cisco Unified MeetingPlace hardware.

Before You Begin

- Install the appropriate number of licenses to support your users.

Procedure

1. Analyze the use of audio and video endpoints of the users in your network. Enter a ratio (percentage) in the "Audio/Video Ratio %" cell to define the ratio of audio to video calls.
2. Press **Enter**.
3. Enter a ratio (percentage) in the "G.711 to G.722 Ratio %" cell to define the ratio of basic G.711 audio to G.722/G.729 high-complexity audio.
 - ◆ To use G.711 for all audio calls and to not offer video, enter 0 in both the "Audio/Video Ratio %" and "G.711/G.722 Ratio %" cells.
 - ◆ To have half of the calls have video and the other half use G.722/G.729 audio codecs, enter 50 into both the "Audio/Video Ratio %" and "G.711/G.722 Ratio %" cells.
 - ◆ To have all calls be video-enabled, enter 100 in the "Audio/Video Ratio %" cell.
4. Press **Enter**.
5. Read the number in the "Max number of calls supported with this combo" cell to see the number of supported calls.

Example

Assume that your Cisco Unified MeetingPlace system is installed on a Cisco MCS 7835-I3. You initially determined that you wanted to support G.711 audio and 320 kbps video.

Later, you decide to alter the mix, and you use Table 2, "Audio and Video Port Combinations," in the Resource Management Spreadsheet. For the 320 Kbps video compatibility row, you change the value in the "Audio/Video Ratio %" to 50. You also change the value in the "G711 to G722 Ratio %" cell to 50. This causes 50 percent of the calls to have video at 320 kbps and 50 percent of the calls to use G.722/G.729 audio codecs.

With this configuration, the system supports only 142 calls. In this example, half the audio calls use G.722/G.729 and the other half use G.711. The 71 video ports all use 320 kbps video bandwidth.

Calculating the Availability of System Resources on each Node in a Cisco WebEx Scheduling Deployment

If you are deploying a system with WebEx scheduling, then there is an algorithm that dynamically calculates the availability of system resources on each node in the system. Based on the results, the system decides to allow or deny scheduling of a meeting on that node.

This algorithm takes the following into consideration when calculating current resource usage:

- Average meeting size (set in the Administration Center for each site)
- Current number of active meetings
- Number of users that are currently in the system

Basically, the algorithm calculates the perceived usage as the number of active meetings, multiplied by the average meeting size, plus the number of users that are not in any meeting (but are users in the system).

By design, when the perceived usage of a node reaches 95%, the system will not allow any new meetings to be scheduled on that node. Instead, the system looks for the node that has the least perceived usage, and tries to schedule the meeting on that least-used node. If there are no more available nodes on the system, then the system won't allow the scheduling of any new meetings, until a node is available.

If you are planning to deploy a single node with WebEx Scheduling, then Cisco recommends setting the Average Meeting Size parameter to 0 (zero) for this type of deployment. If the Average Meeting Size parameter is set to 0, then the algorithm only counts users that are on the system (in meetings or at IVR sessions).

By making this change, the perceived usage reaches 95% only when 95% of audio ports are in use. By setting the Average Meeting Size parameter to 0, you effectively set the number of possible concurrent meetings to the largest value.

About Video Profile Level Negotiation and the User Experience

- [Video User Experience with the Express Media Server](#)
- [Video User Experience with the Hardware Media Server](#)

Video User Experience with the Express Media Server

When you configure the system to use the Express Media Server, and enable video conferencing, the system supports a range of endpoints from mobile users to HD users. Each endpoint has its own set of video capabilities (specified by its profile and level during signaling) that might be very different from other endpoints that join the meeting. The profile and level indicate the ability of the endpoint to decode a video stream with certain resolution and frame rate attributes. The profile and level also specify the maximum bandwidth associated with it as shown in [Table: Level and Bandwidth Mapping for Video Profiles in Software Media Mode](#).

Table: Level and Bandwidth Mapping for Video Profiles in Software Media Mode

AVC Modes	Typical Resolution	Level Advertised ¹	Minimum Bit Rate	Maximum Bit Rate
H.263	CIF	Level N/A	192 kbps	768 kbps
Mobile (H.264 AVC)	QCIF	1.1	64 kbps	384 kbps

Calculating the Availability of System Resources on each Node in a Cisco WebEx Scheduling Deployment

Compatibility (H.264 AVC)	CIF	1.3	192 kbps	768 kbps
High Quality (H.264 AVC)	VGA or 4CIF	3.0	768 kbps	2000 kbps
HD (H.264 AVC)	720p	3.1	1200 kbps	2000 kbps

1. Cisco Unified MeetingPlace supports [RFC 3984](#), which governs the negotiation of H.264 through levels and not specific resolutions or frame rates. Each level supports multiple resolutions depending on the bit and frame rates.

As shown in [Table: Level and Bandwidth Mapping for Video Profiles in Software Media Mode](#), only one video mode per video format is offered when the system is in software media mode, and the system does not provide interoperability between these different profile levels. This means that when a meeting is scheduled, only endpoints that can support the advertised video profile level or higher can join the meeting with video. If the endpoint offers a higher profile level than advertised, the system negotiates to a lower level. Consequently, the higher-level video endpoint can join the lower-level meeting, but a lower-level endpoint, which cannot support the higher advertised level, can join as audio only.

- If Mobile (Level 1.1) is advertised, all higher-level video endpoints can join, but the video quality is reduced to Level 1.1.
- If Compatibility (Level 1.3) is advertised, only Levels 1.3, 3.0, and 3.1 video endpoints can join with video, but the video quality is reduced to Level 1.3. Level 1.1 video endpoints can join but will be audio-only endpoints in the conference.
- If High Quality (Level 3.0) is advertised, only Levels 3.0 and 3.1 video endpoints can join with video. All other lower-level video endpoints can join but will be audio-only endpoints in the conference.
- If HD (Level 3.1) is advertised, only Level 3.1 video endpoints can join.
- If a Level 3.0 endpoint enters an HD Level 3.1 conference, or if a CIF endpoint enters a high-quality conference, the system negotiates the endpoints down to an audio-only experience because of the level incompatibility.

Video User Experience with the Hardware Media Server

When you install the Media Server and configure the system for hardware media mode, the system supports the modes, profiles, and levels shown in [Table: Level, Resolution, and Bandwidth Mapping for Video Profiles in Hardware Media Mode](#) for scheduled and reservationless meetings.

Table: Level, Resolution, and Bandwidth Mapping for Video Profiles in Hardware Media Mode

AVC Modes	Level Advertised	AVC Resolution	Minimum Bit Rate	Maximum Bit Rate
Standard Rate	1.2	176 × 144 (QCIF)	64 kbps	384 kbps

Table: Level and Bandwidth Mapping for Video Profiles in Software Media Mode

(H.263 and H.264 AVC)		352 × 288 (CIF)		
High Rate		176 × 144 (QCIF)		
(H.261, H.263, and H.264 AVC)	2.0	352 × 288 (CIF)	64 kbps	2000 kbps
		704 × 576 (4CIF)		

As shown in [Table: Level, Resolution, and Bandwidth Mapping for Video Profiles in Hardware Media Mode](#), there are multiple video modes per video format. This means that for a meeting in hardware mode, if the user profile for the meeting owner uses high rate, users with video endpoints that use H.261, H.263, and H.264 AVC can join with video supported. This is possible because the Hardware Media Server supports transcoding between video codecs.

The Hardware Media Server also performs transrating, which means a user with an ISDN connection can join a meeting with user using a 2 Mb connection without affecting the interaction between participants using the High Rate AVC mode.

You configure the video type through the User Profile page. When the user schedules the meeting, the system uses this mode as the video type. The system applies the mode setting on a per-meeting basis.

How to Calculate Values for the Media Resource Configuration Page in the Administration Center

- [The Media Resource Configuration Page](#)

The Media Resource Configuration Page

You can set values for the meetings held on your system by going to the Media Resource Configuration page in the Administration Center. For descriptions of the fields on that page, and guidelines for setting these values, see the online help in the administrator interface and the *Configuration Guide for Cisco Unified MeetingPlace Release 8.6* at

http://www.cisco.com/en/US/products/sw/ps5664/ps5669/products_installation_and_configuration_guides_list.html.