



Cisco Expo
2009

Telepresence



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What is Telepresence ?

Telepresence System Components

Network Requirements

Room Requirements

Summary

Q & A



Business Video Systems



The Importance of Visual Interaction

People remember.....



20%
Hear



30%
See



70%
See *and* Hear

Importance of Visual Traffic

30% of brain's cortex devoted to vision, 8% for touch and 3% for hearing
More than 60% of communication is non-verbal

Sources: Human Productivity Lab 2006

Pearn Kandola: *The Psychology of Effective Business Communications in Geographically Dispersed Teams* 2006

Cisco Telepresence



Cisco Telepresence



Cisco TelePresence

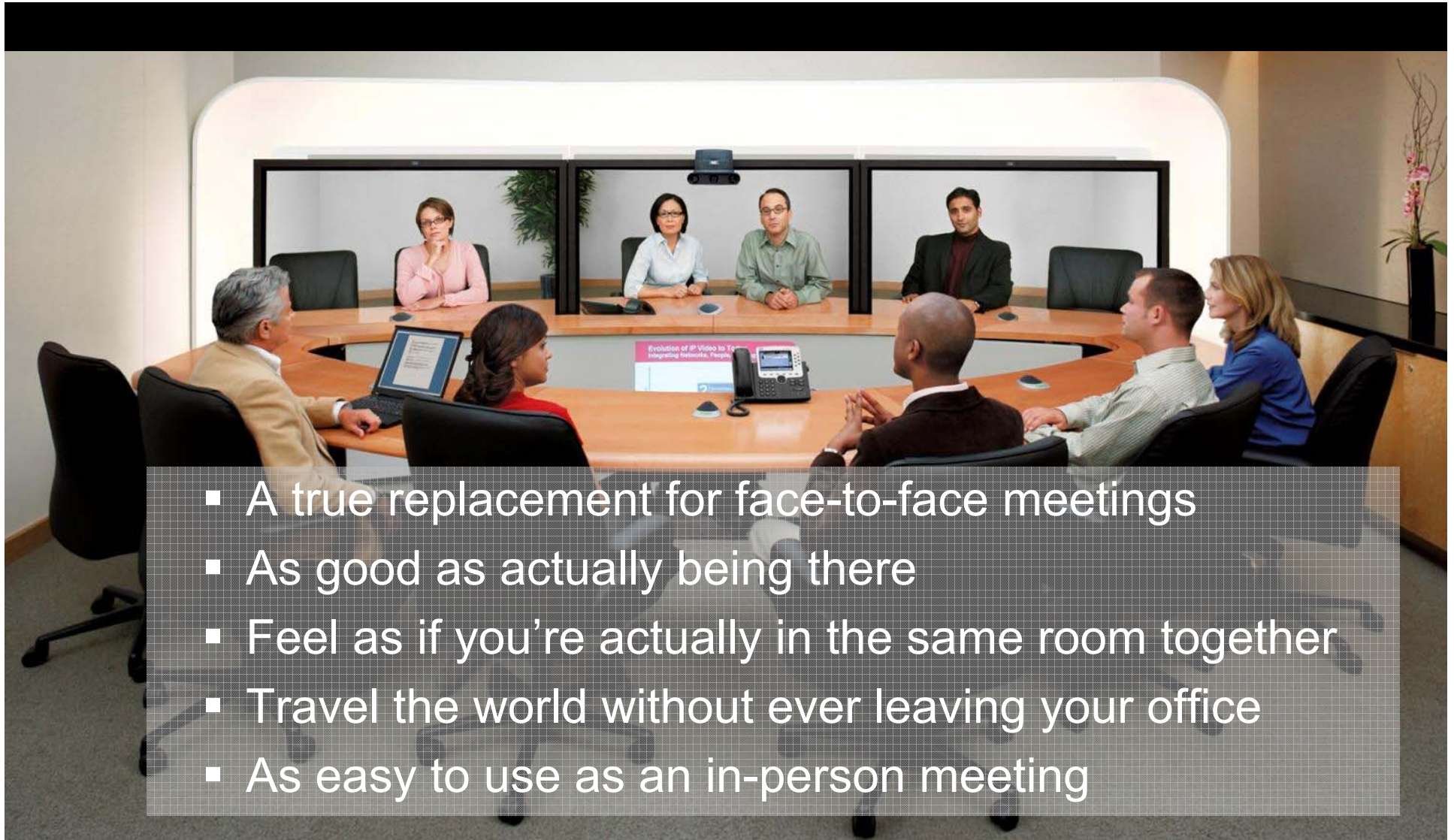
vs. Videoconferencing



- Does it really feel like you're "there" in the room?
- Can it truly replace a face-to-face meeting?
- Is each participant adequately seen and heard?
- Is it utilized heavily, or does it just sit in the corner?

Cisco TelePresence

What It Is Today—The Cisco TelePresence Meeting



- A true replacement for face-to-face meetings
- As good as actually being there
- Feel as if you're actually in the same room together
- Travel the world without ever leaving your office
- As easy to use as an in-person meeting

Cisco TelePresence

A New and Innovative Philosophy

Why TelePresence?

- More than 60% of communication is non-verbal
- Existing collaborative technologies don't adequately replace a face-to-face meeting experience

Cisco TelePresence Design Principles

- Experience the meeting, not the technology
- Life size, high-definition, eye contact, discern body language
- Natural, multi-channel, full-duplex, spatial audio

Cisco Built from the Ground Up!

- It's all about the Experience
- 25 Patents: Video, Audio, Network Integration, User Experience
- Innovative, fully integrated system – leverages Unified Communications and the Network as the Platform

Displays



Microphones



Camera



Codec

Environmentals



Furniture



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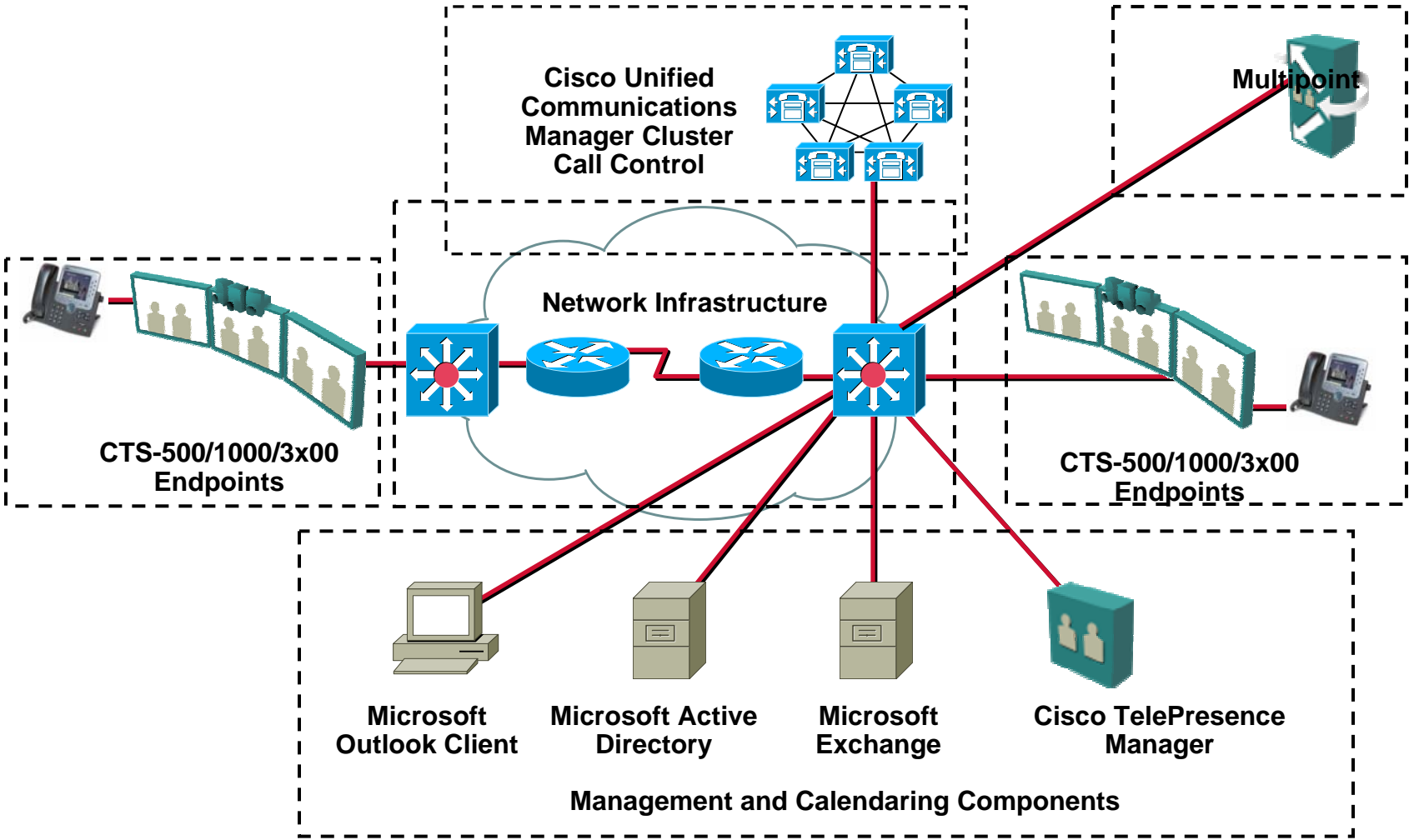
Summary

Q & A



Cisco TelePresence

System Components



CTS

Cisco TelePresence
System



Cisco TelePresence

Codec

- **Linux Based Platform**
- **Network Protocols**
 - CDP and 802.1Q for VLAN assignment
 - 802.1p and DSCP for QoS
 - HTTP Configuration/Firmware Downloads
 - SSH and HTTPs for Administration
 - SIP Signaling
- **Media Capability**
 - Video: H.264 @ 1080p/720p, CIF
 - Audio: AAC-LD and G.711
- **Auto Collaboration for data sharing**
- **Audio Add-In for audio only participants**



Cisco TelePresence

Authentication and Encryption

- **Based on Cisco Unified Communications**

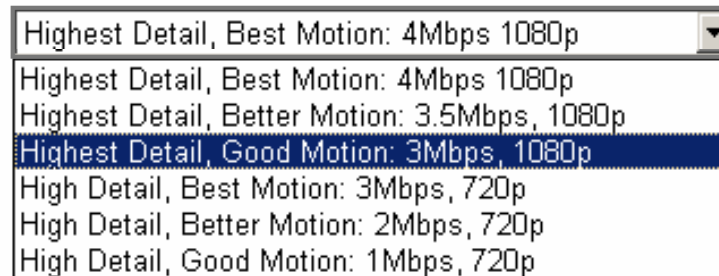
- ✓ X.509v3 Digital Certificates (MIC / LSC)
- ✓ Certificate Trust List (CTL)
- ✓ Signed Firmware Loads
- ✓ Signed / Encrypted Configuration Files
- ✓ SIP over TLS
- ✓ S-Description key exchange in Session Description Protocol (SDP)
- ✓ DTLS key exchange
- ✓ Secure Real-Time Transport Protocol (sRTP)

The only unique thing about Cisco TelePresence's implementation is the addition of DTLS (TLS over UDP) as key exchange .

Cisco TelePresence System

Resolution and Motion Handling

Quality (per Display)*



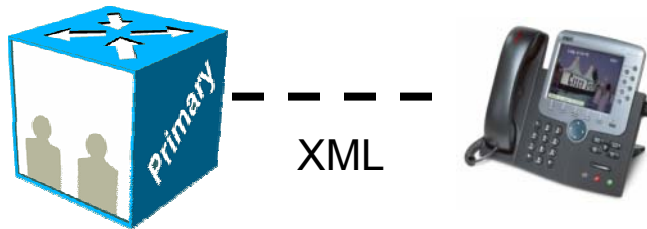
Part of CUCM
Administration
for each CTS

- CTS codec supports 1080p and 720p
- Three motion handling settings within each resolution
- Flexibility for deploying systems in sites with bandwidth constraints
- In case of excessive Jitter or loss a codec will lower its motion handling within the set resolution

Cisco TelePresence System

User Interface

- Cisco Unified IP Phone 7975 provided as part of system
- Provides the user interface to the CTS – touch screen



- Features:

- Ad hoc (manual) calls
- System speed dials
- “One Button to Push” dialing for scheduled meetings
- Conference/Join used to add audio participants to a TelePresence meeting



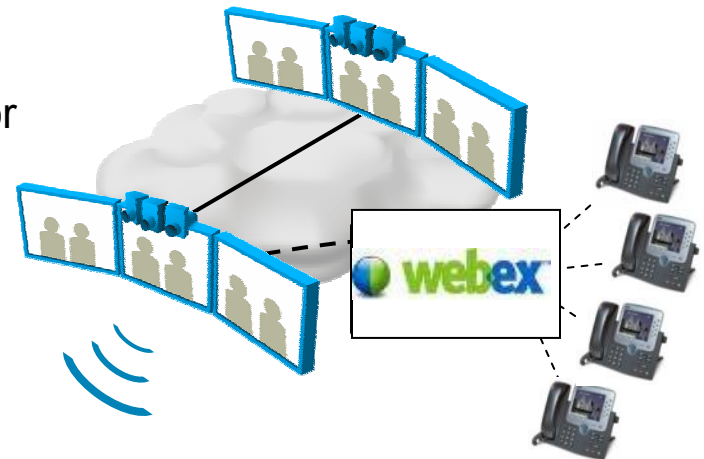
Cisco TelePresence System

Audio Add-in

- Audio add-in allows any CTS system to add any audio only (IP or PSTN) participant or audio bridge into a TelePresence meeting
- Call initiated from the XML interface on 7975
- Uses 4th (auxiliary) audio channel using G.711 codec



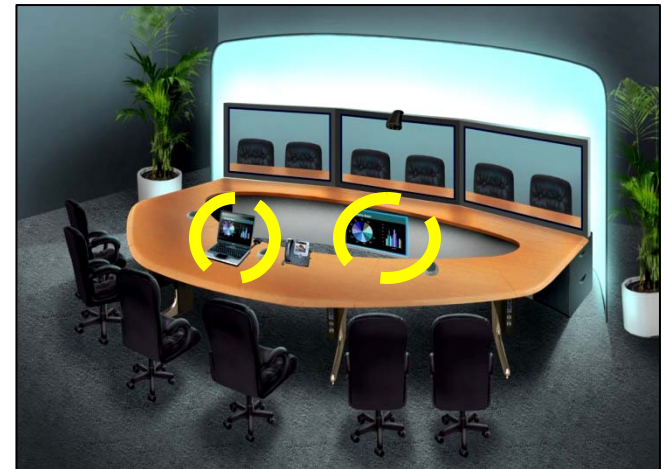
or



Cisco TelePresence

Auto Collaborate

- Automatic Content Sharing
 - From laptop (VGA connector)
 - Via documentation camera (HDMI connector)
 - Simultaneously displayed to all participants in the meeting
- Plug and Play
 - Controlled by last activated source
- Dedicated Aux Video/Audio Channel
 - H.264 video codec
 - Input resolution 1024x768 @ 60Hz
 - Sampled @ 5 frames per second
 - AAC-LD audio



Optional Presentation Codec for 30fps video

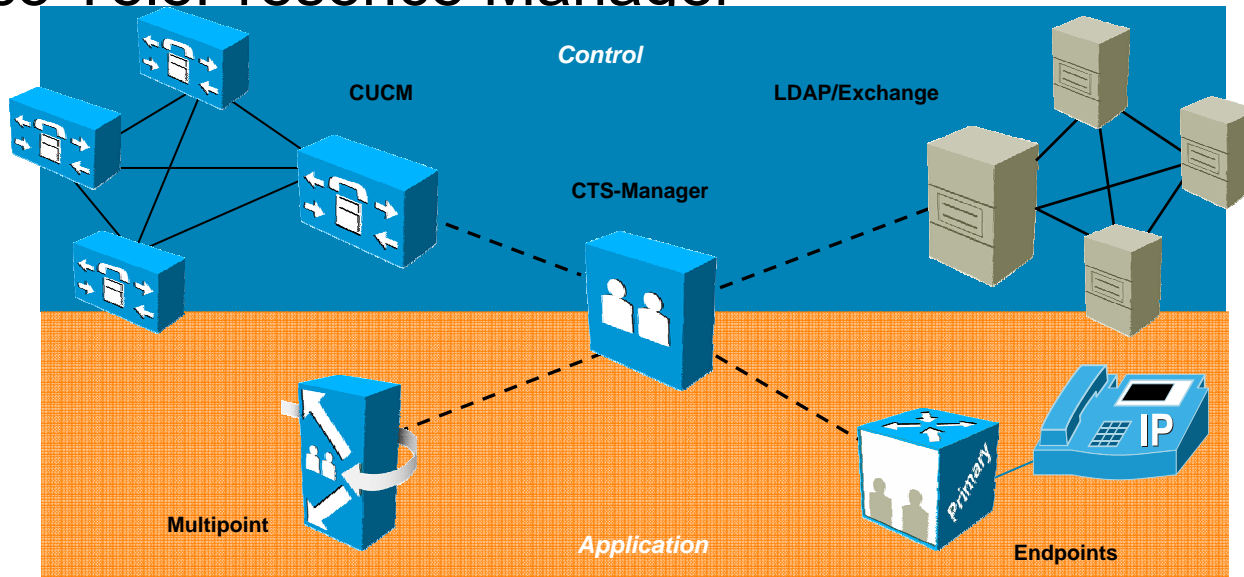
CTS-Man

Cisco TelePresence Manager



Cisco TelePresence

Cisco TelePresence Manager



- Calendaring integration and management
- Middleware “glue” between Cisco TelePresence Systems, Cisco Unified Communications and corporate calendaring systems
- Provides One Button to Push (OBTP) access to scheduled meetings
- Resource and location management for multipoint services
- Helpdesk and concierge services

End Points

CTS End Points



Cisco TelePresence

Cisco TelePresence Systems

Cisco TelePresence System 3200

- 18 seats
- Purpose-built room
- 1080p–720p full high definition
- 3–65” plasma displays
- Spatial wideband audio
- Imperceptible latency



Cisco TelePresence System 3000

- Six seats
- Purpose-built room
- 1080p–720p full high definition
- 3–65” plasma displays
- Spatial wideband audio
- Imperceptible latency



Cisco TelePresence

Cisco TelePresence Systems

Cisco TelePresence System 1000

- Two seats
- General purpose room
- 1080p–720p high definition
- 65” Plasma display
- Wideband audio
- Imperceptible latency



Cisco TelePresence System 500

- One seat
- Purpose-built room
- 1080p–720p high definition
- 37” Multipurpose plasma display
- Wideband audio
- Imperceptible latency



CTMS

Cisco TelePresence
Multipoint Switch



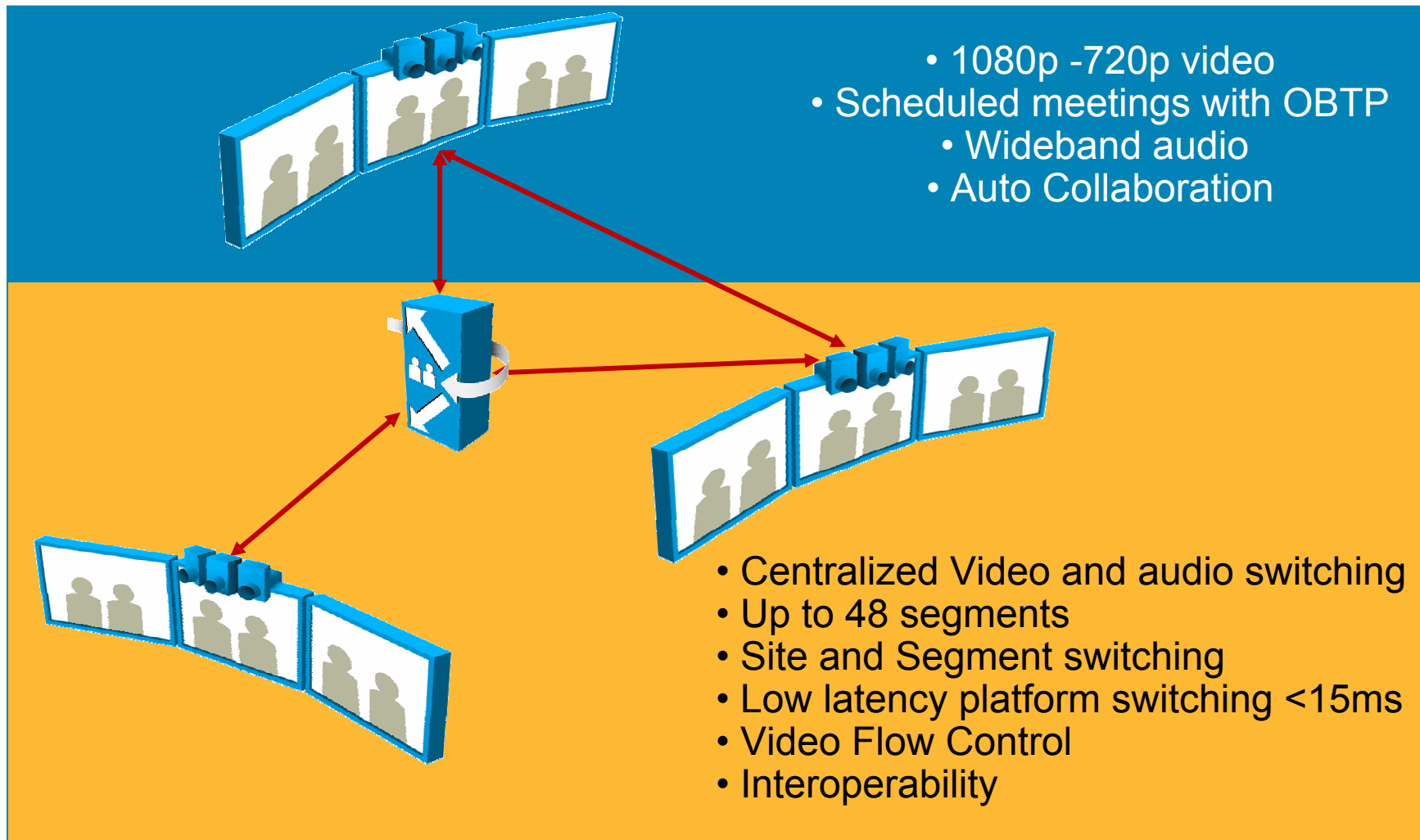
Cisco TelePresence Multipoint Switch

Overview

- Supports TelePresence Meetings for more than 2 endpoints
- Supports up to 48 segments
- No restrictions on number of conferences (up to 48 segments)
- Software based low latency switching <15ms
- Non-TelePresence Interoperability
- Scheduled multipoint meetings with One Button to Push

Cisco TelePresence

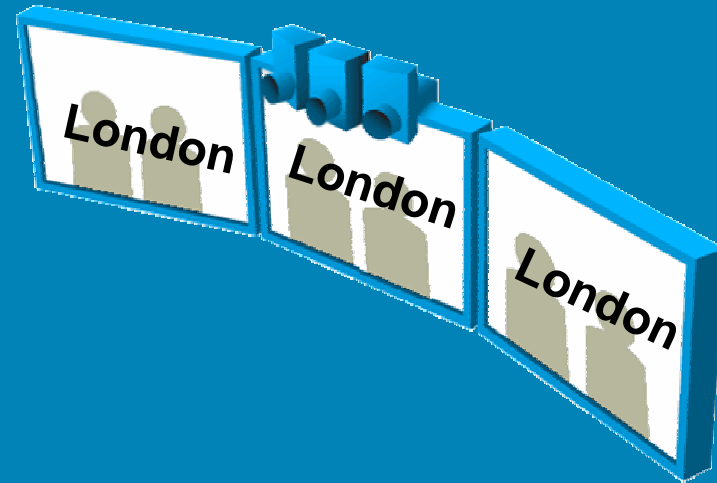
Cisco TelePresence Multipoint System (CTMS)



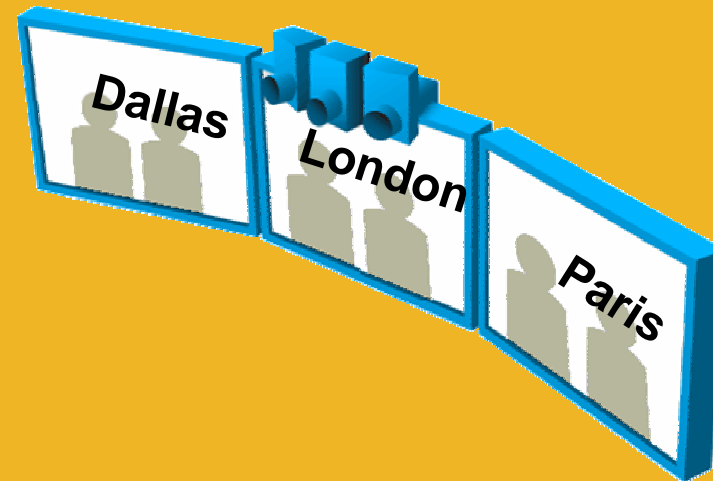
Cisco TelePresence Multipoint Switch

Site and Segment Switching

Site Switching
Entire site switches

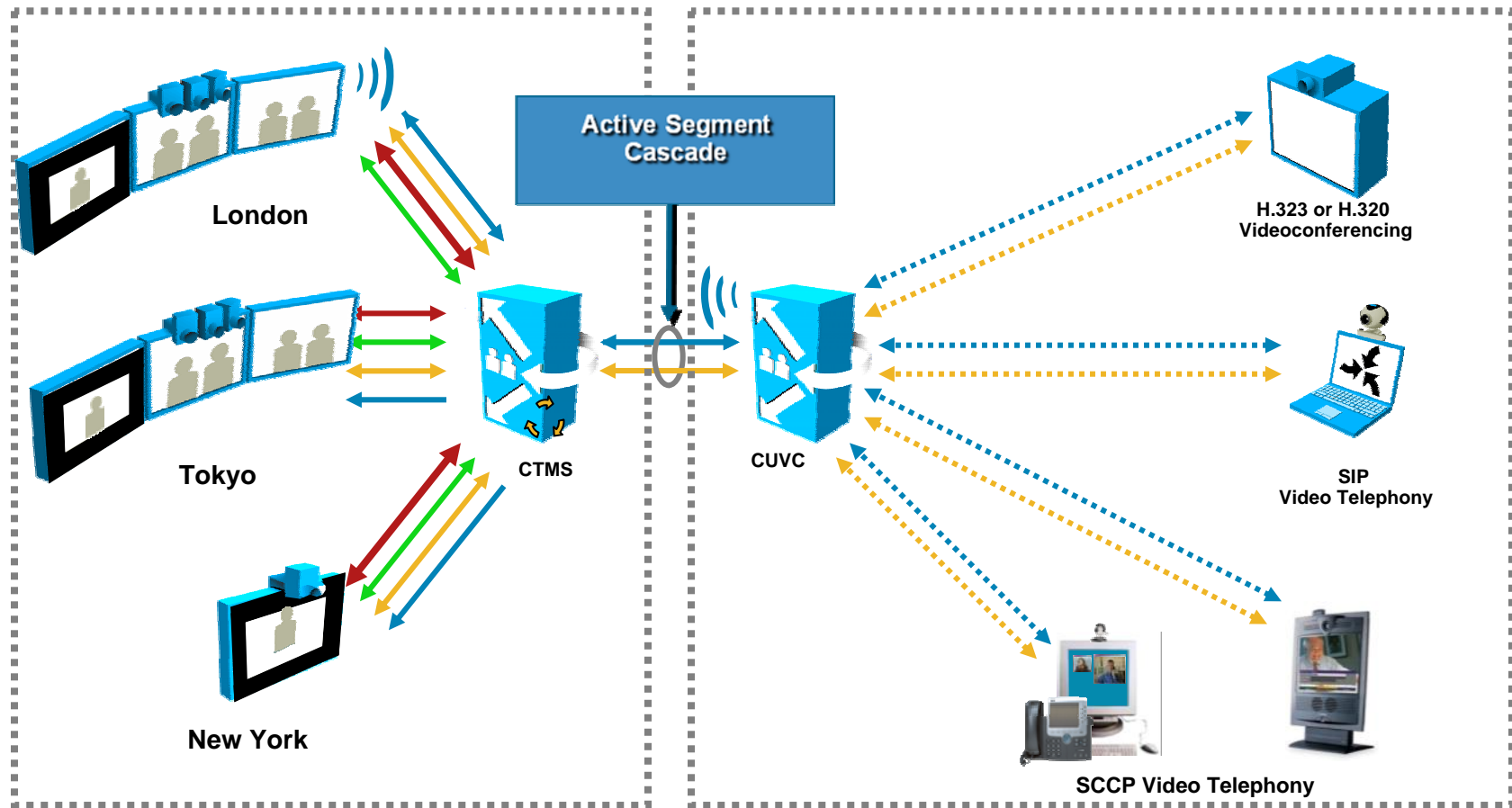


Segment Switching
Each segment switches independently



Cisco TelePresence Multipoint Switch

Interoperability – Media Plane



- H.264 1080p
- H.264 CIF
- AAC-LD
- G.711
- Any video format CUVC supports
- Any audio format CUVC supports

- Today, TelePresence and Videoconferencing are fundamentally different experiences and are generally maintained as separate environments
- CTMS provides multipoint *switching* for Cisco TelePresence
- CUVC provides multipoint *mixing* for Videoconferencing
- Solution is to bridge the two environments by cascading the CTMS and CUVC together

Cisco TelePresence Multipoint Switch

Interoperability – User Experience





What is Telepresence ?

Telepresence System Components

Network Requirements

Room Requirements

Summary

Q & A



Cisco TelePresence Network Requirements

Why is TelePresence So Sensitive?

Cisco TelePresence Codecs use 1080p @30fps Resolution

1920 lines of Vertical Resolution (Widescreen Aspect Ratio is 16:9)

1080 lines of Horizontal Resolution



1080 x 1920 lines =
2,073,600 pixels per frame
x 3 colors per pixel
x 1 Byte (8 bits) per color
x 30 frames per second
= 1,492,992,000 bps
or **1.4 Gbps Uncompressed**

Cisco TelePresence Codecs transmit 3-5 Mbps per 1080p screen,
which represents *over 99% compression*.
Therefore packet loss is proportionally magnified in overall video quality.

Cisco TelePresence Network Requirements

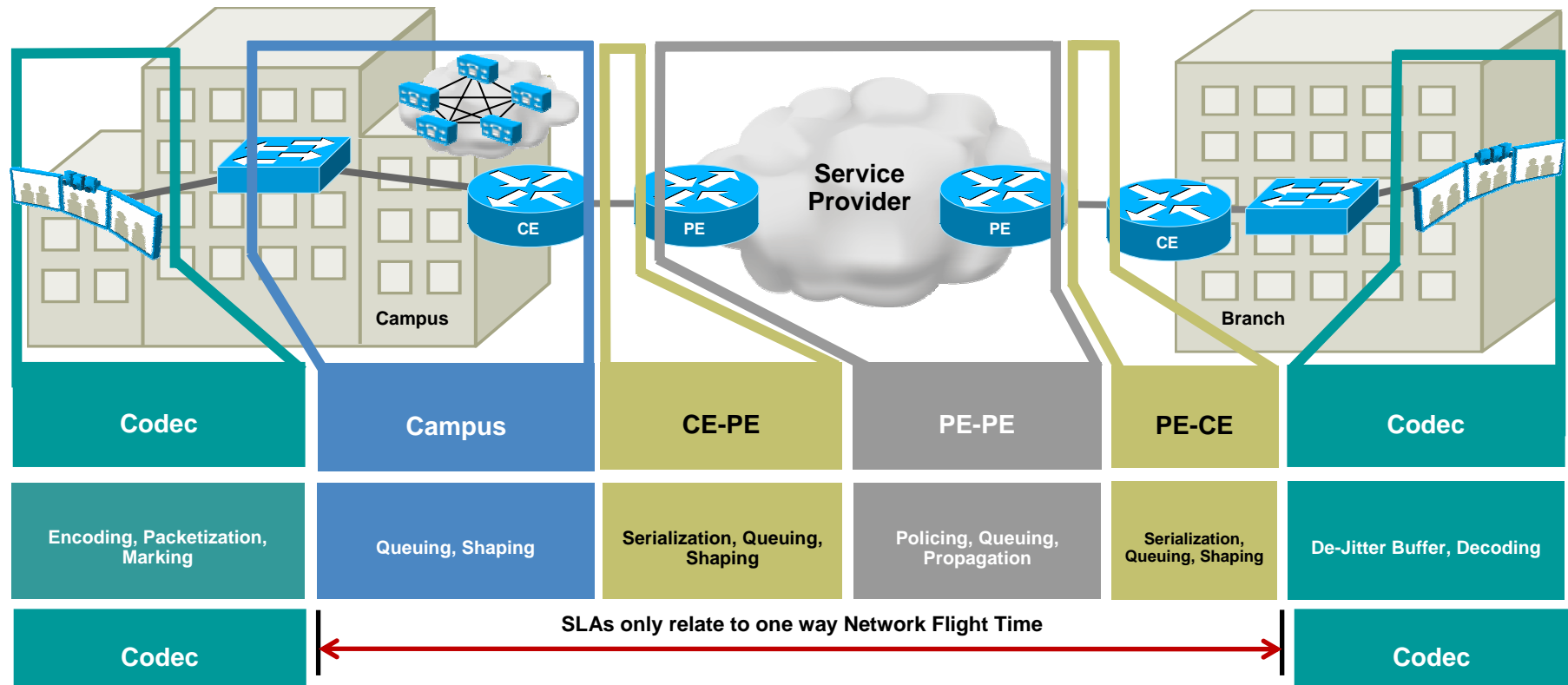
Bandwidth Requirements

Network must be provisioned for the below, but average bandwidth utilization is 30-40% of these numbers						
Resolution	1080p	1080p	1080p	720p	720p	720p
Motion Handling	Best	Better	Good	Best	Better	Good
Video per Screen (kbps)	4000	3500	3000	3000	2000	1000
Audio per Microphone (kbps)	64	64	64	64	64	64
Auto Collaborate Video channel (i.e. data projector) (kbps)	500	500	500	500	500	500
Auto Collaborate Audio channel (i.e. audio add-in) (kbps)	64	64	64	64	64	64
CTS-1000 Total Audio and Video (kbps)	4,628 TX 4,756 RX	4,128 TX 4,256 RX	3,628 TX 3,756 RX	3,628 TX 3,756 RX	2,628 TX 2,756 RX	1,628 TX 1,756 RX
CTS-3200\3000 Total Audio and Video (kbps)	12,756	11,256	9,756	9,756	6,756	3,756
+ 20% for Layer 2-4 overhead						
CTS-1000 total bandwidth (Mbps) <i>includes Layer 2- 4 overhead</i>	5.5 Mbps TX 5.7 Mbps RX	4.9 Mbps TX 5.1 Mbps RX	4.3 Mbps TX 4.5 Mbps RX	4.3 Mbps TX 4.5 Mbps RX	3.1 Mbps TX 3.3 Mbps RX	2.0 Mbps TX 2.1 Mbps RX
CTS-3200\3000 total bandwidth (Mbps) <i>includes Layer 2- 4 overhead</i>	15.3 Mbps	13.5 Mbps	11.7 Mbps	11.7 Mbps	8.1 Mbps	4.5 Mbps

Optional	Additional Bandwidth
Auto Collab. 30fps	~4Mbps
Interoperability	~1Mbps

Cisco TelePresence Network Requirements

Latency, Jitter and Loss SLA



Metric	Target	Threshold 1 (Warning)	Threshold 2 (Call Drop)	Enterprise Component	Service Provider Component
Latency	150 ms	200 ms	400 ms*	20%	80%
Jitter	10 ms	20 ms	40 ms	50%	50%
Loss	0.05%	0.10%	0.20%	50%	50%

Cisco TelePresence Network Requirements

Provisioning for Bursts On The LAN

- All Ethernet switches / line cards in the path must have enough per-port memory buffers to handle the sub-second byte/packet rates
 - Any Ethernet switch port carrying one CTS call must have ≥ 400 KB of transmit memory per port
 - Any Ethernet switch port carrying multiple CTS calls (e.g. a port servicing a CTMS) must have ≥ 1 MB of transmit memory per port
- All Ethernet switch ports in the path must provide Priority Queuing
- All Ethernet switch ports in the path should be ≥ 1 Gbps

Detailed platform-specific test results and configuration guidance is available in the TelePresence Design Guide at <http://www.cisco.com/go/srnd>

▪ Catalyst 6500

- ✓ WS-X6816-GBIC
- ✓ WS-X6748-SFP *
- ✓ WS-X6748-GE-TX *
- ✓ WS-X6724-SFP *
- ✓ WS-X6708-10G-3CXL *
- ✓ WS-X6708-10G-3C *
- ✓ WS-X6704-10GE *
- ✓ WS-X6516A-GBIC
- ✓ WS-X6516A-GBIC
- ✓ WS-X6516-GBIC
- ✓ WS-X6516-GE-TX
- ✓ WS-X6502-10GE *
- ✓ WS-X6501-10GEX4 *
- ✓ WS-X6416-GE-MT
- ✓ WS-X6416-GBIC
- ✓ WS-X6408A-GBIC
- ✓ WS-X6316-GE-TX
- ✓ WS-X6148A-GE-45F *
- ✓ WS-X6148A-GE-TX *

▪ Catalyst 4500

- ✓ WS-X4548-GB-RJ45V
- ✓ WS-X4548-GB-RJ45
- ✓ WS-X4448-GB-RJ45V
- ✓ WS-X4448-GB-RJ45

▪ Catalyst 4948

- ✓ WS-C4948 *
- ✓ WS-C4948-10GE *

▪ Catalyst 3750 / 3750-E

- ✓ WS-C3750G
- ✓ WS-C3750-E
- ✓ Stacked configurations

▪ Catalyst 3560 / 3560-E

- ✓ WS-C3560G
- ✓ WS-C3560G-E

* Recommended for ports carrying multiple CTS calls and/or multipoint calls (e.g. ports in/out of a CTMS)

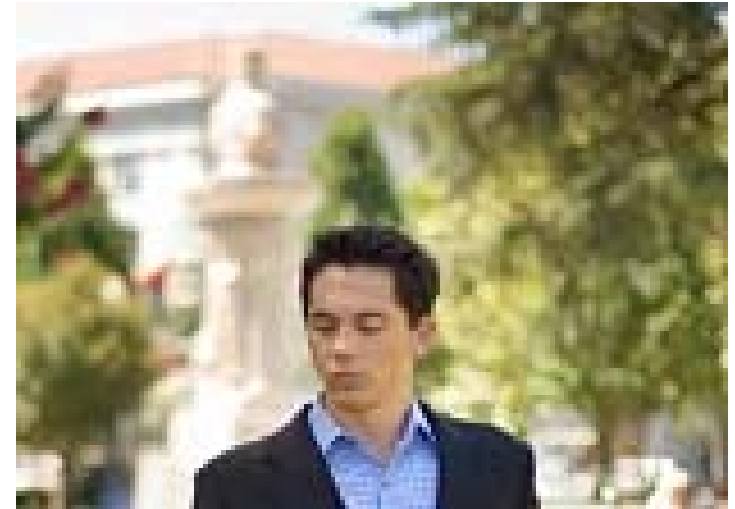
Cisco TelePresence 1.5

CTS Satellite Support

- Extends network latency threshold
 - Latency threshold is increased from 250ms to 2 seconds when in satellite mode
 - Jitter and Loss thresholds are the same



Standard CTS endpoints will change to satellite network thresholds when they detect that they are connected to a satellite CTS



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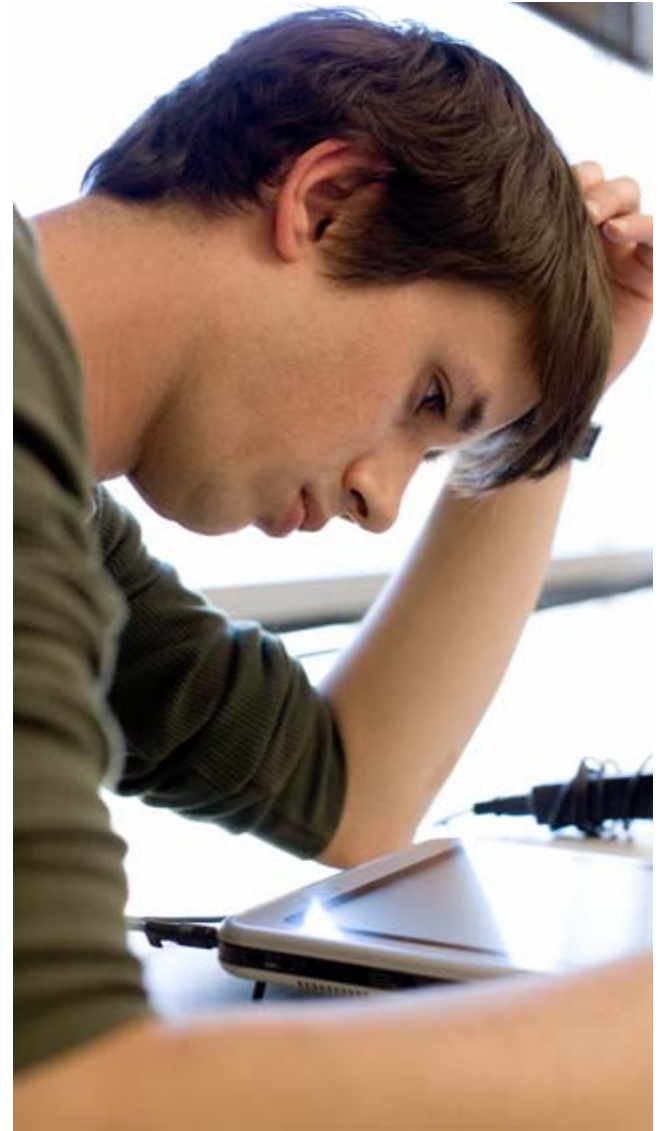
Q & A



Cisco TelePresence Room Requirements

Creating the Environment

- The Experience is more than the video
- The Environment
 - Room dimensions
 - Lighting
 - Acoustics
 - Power
 - HVAC
- The Goal is to create consistency



Cisco TelePresence Room Requirements

Room Dimensions: CTS-3000 (Metric)

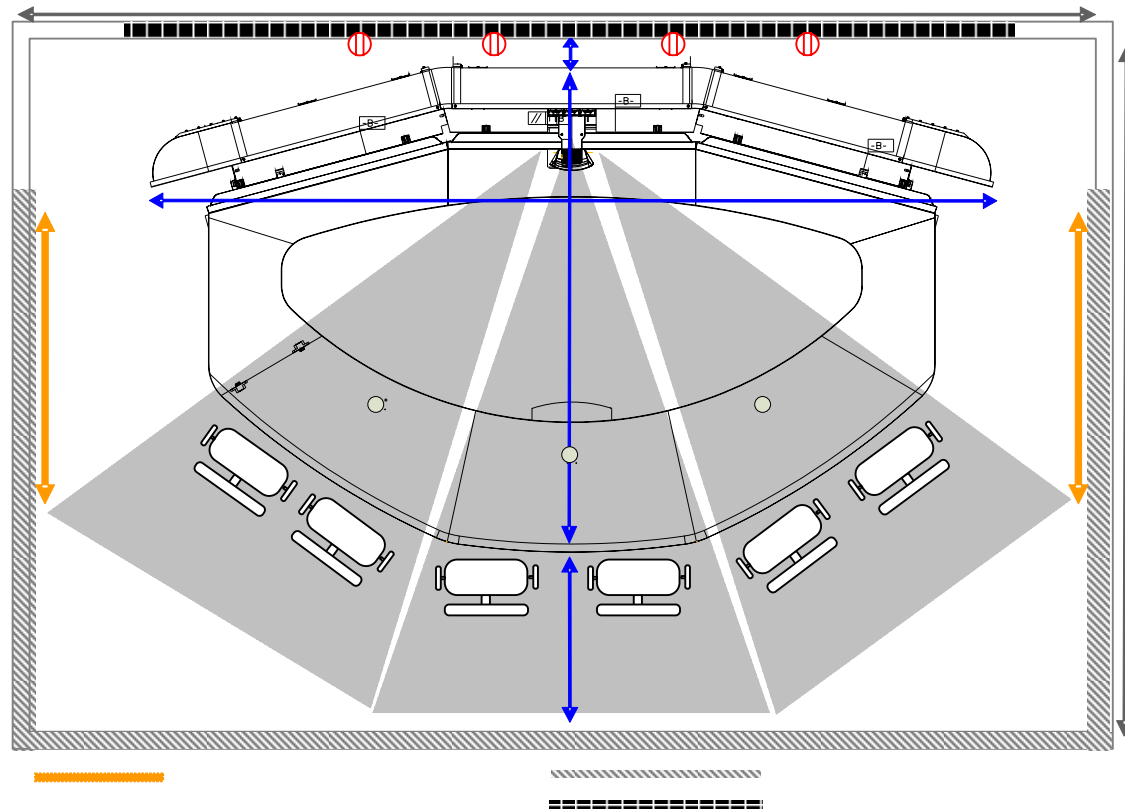
- **Room Dimensions:**

Minimum:
4.57m x 6.1m x 2.44m

Recommended:
5.8m x 6.7m x 3.05m

Maximum:
7.01m x 9.45m x 3.66m

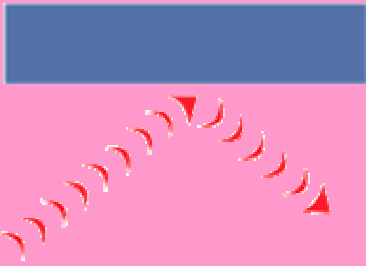
- Table provided as integrated part of system
- Chairs provided by customer



Cisco TelePresence Room Requirements

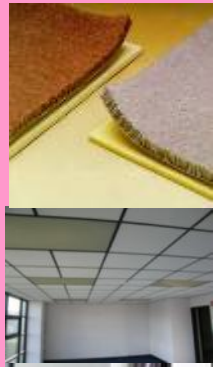
Room Components to Consider

Sound reflection

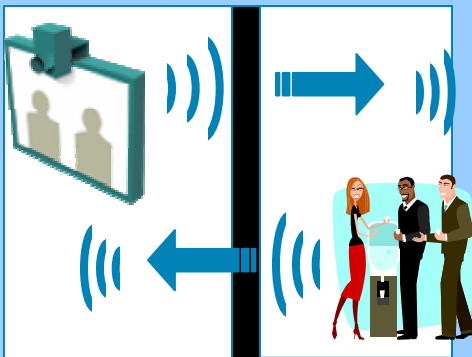


- Evaluate existing flat surfaces in room

- Walls
- Ceiling Tiles
- Flooring
- Window glass



Sound transmission

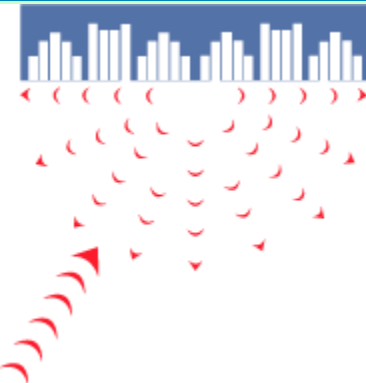


- Block outside noise permeating room

- Doorway seal
- Build wall beyond ceiling line



Sound diffusion



- Diffuse reverberation by introducing decorative elements

- Furniture
- Wall Hangings
- Décor Accents



Cisco TelePresence Room Requirements

Lighting & Acoustic

- Windows in a room allow transmission of extraneous noise, light, and temperature
- Windows also create exaggerated sound reverberation within a room
- Address windows to prevent external factors from permeating into the TelePresence environment and to control sound reflection inside the room



Interior Window

Exterior Window

Cisco TelePresence Room Requirements

Lighting Requirement

- **Proper lighting is critical to the experience!**
 - 300-400 lux of well dispersed, **horizontal**, ambient light throughout the room. 4100k fluorescent bulbs with indirect fixtures; Provide 4100k color temperature light source
 - Minimum illumination of **250** lux is acceptable if the room is not too deep and light cove helps to light up the face;
 - The lighting in the room should be well controlled. It means block natural sun light or other type of office light through glass or thin blinds
 - Lighting source shouldn't create any Temporal Flickering



Cisco TelePresence Room Requirements

Acoustics—Room Isolation

- Rooms should be isolated from other environments and not allow more than **20-30dB** of sound transmit through walls. **40-60 STC and IIC** recommended

- Walls

 - Sound Transmission Class (STC)**

 - Drywall, Cinderblock, Brick, Glass, other?

 - Do walls extend to structural deck?

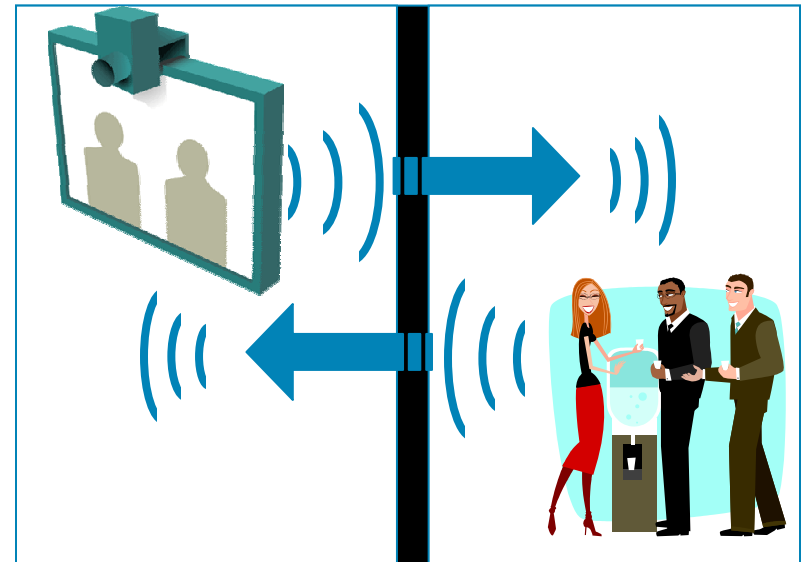
 - Insulation between rooms?

- Floor and Ceiling

 - Impact Insulation Class (IIC)**

 - Multi-floor construction?

 - Raised or Plenum floors?

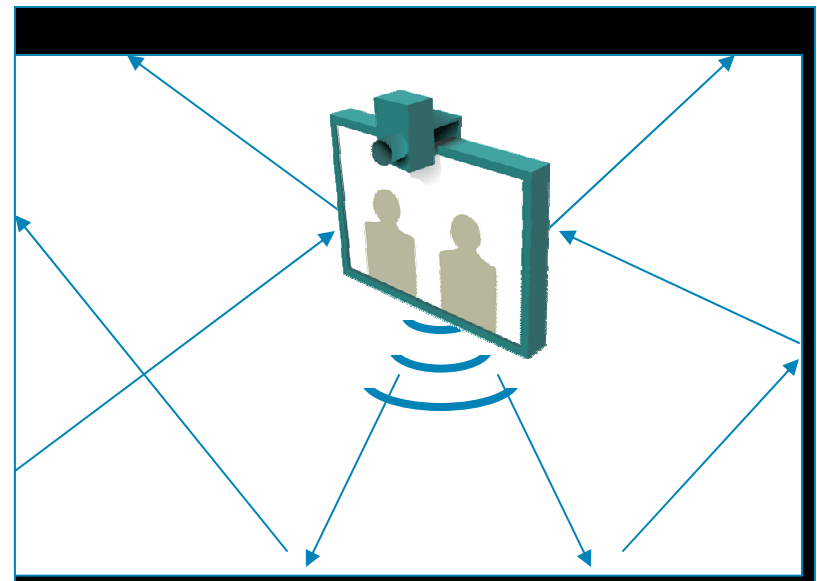


HVAC noise should not be greater than 42dB at diffuser. 36dB and lower recommended

Cisco TelePresence Room Requirements

Acoustics—Reverberation = Echo

- **Noise Reduction Coefficient (NRC)** Absorption of sound
- Reverberation should not exceed 500 milliseconds and is ideal at 150—300ms across all frequencies (125Hz-4kHz)
- **Walls**
Painted Drywall and Fabric Panels recommended. Wood, brick, block or similar may required remediation
- **Floors**
Carpet is highly recommended
Marble, wood, and tile are highly sound reflective
- **Ceiling**
Acoustic tiles with high sound absorption rating highly recommended



Cisco TelePresence Room Requirements

Wall Finishes

- Wall treatment choices introduce varying levels of sophistication and help improve room acoustics
- Furniture and Plants provide depth to the room while improving room acoustics

Paint



Wall Covering



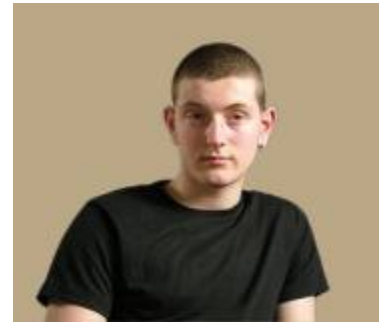
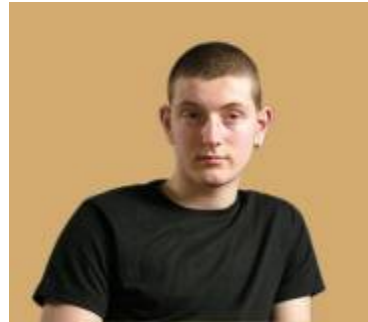
Fabric



Cisco TelePresence Room Requirements

Background Color

- Warm background colors livens participants



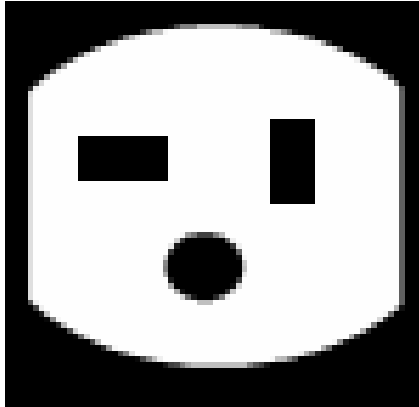
unpainted background



Impact of color background

Cisco TelePresence Room Requirements

Power and cooling Requirements



Power Requirements	Maximum	Typical	Idle
CTS-1000	1160 Watts	1079 Watts	123 Watts
CTS-3000	5292 Watts	4410 Watts	342 Watts



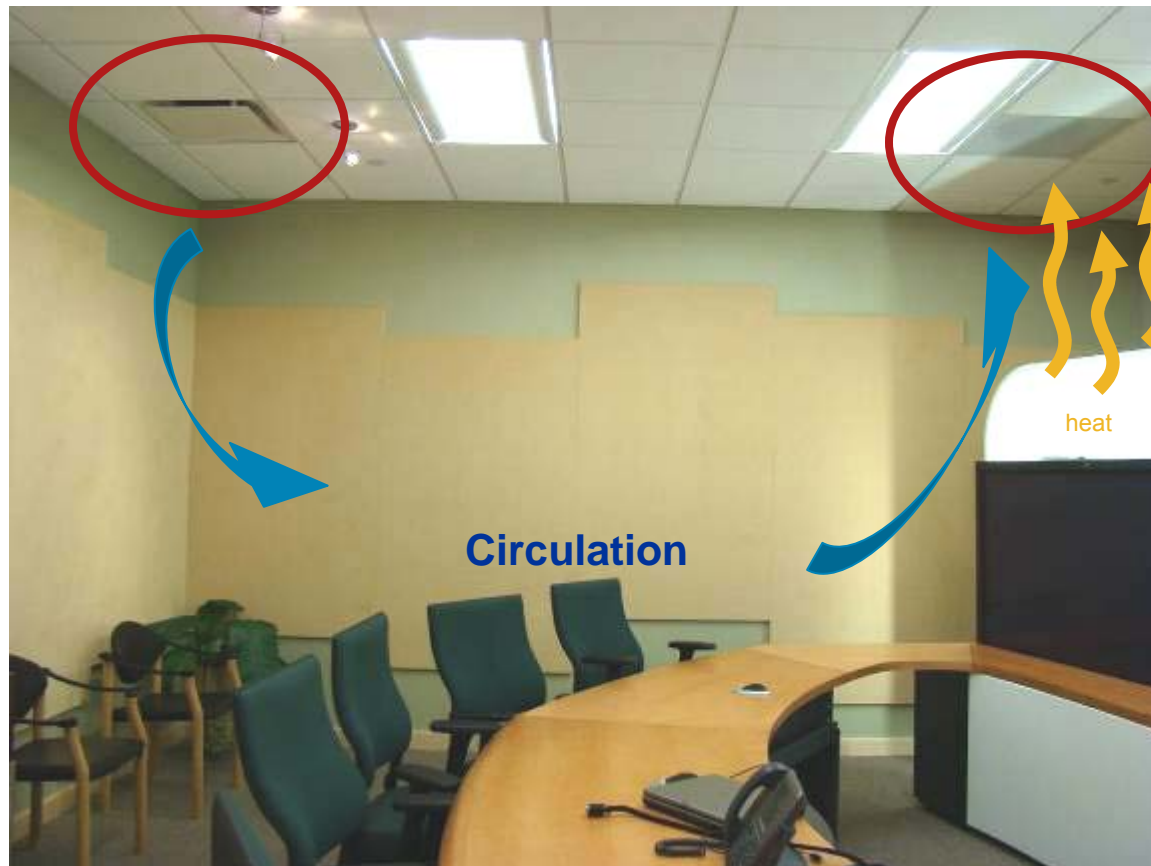
Power Requirements	Maximum	Typical	Idle
CTS-1000	4859 BTU\hr	4582 BTU\hr	419 BTU\hr
CTS-3000	20762 BTU\hr	17750 BTU\hr	1167 BTU\hr

Cisco TelePresence Room Requirements

Tuning the Environment for HVAC

- Dedicated HVAC control for TelePresence room
- Placement of HVAC should be configured to provide proper displacement of heat, room ventilation and proper circulation of air flow

Supply registers
placed behind participants help cool the room and provide new air



Return registers
placed above the monitors effectively displace hot air from the room and CTS unit



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Key Takeaways

- Cisco TelePresence provides an “in-person” experience
- Cisco TelePresence is a native component of Cisco Unified Communications
- Cisco TelePresence is a new application with unique network requirements
- Cisco TelePresence has defined room environments to ensure the user experience





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Breakout Session Evaluation Form

Your session feedback is valuable

Please take the time to complete the breakout evaluation form and hand it to the member of staff by the door on your way out

Thank you!



Appendix Room Examples



Executive Design

Van Ness

- **Employee Grade:** Executive
- **Room Size:** 24'-10" x 21'-7"
- **Wall Finish:** Fabric
- Cherry wood baseboard and upper paneling
- **Acoustics:** Acoustic paneling in room along TelePresence microphone level
- **Lighting:** Soffit with indirect fluorescent lighting (primary source of illumination)
- Hanging pendant lights (aesthetic finish, not a primary source)
- Wall wash, spot lights along perimeter to help create perception of depth
- **Concept:** higher-end environment
- Ceiling plan customized to reflect more sophisticated style
- Aesthetics, acoustics and lighting all upgraded in parallel
- Address larger room depth by adding seating and decor



Professional Design

Pacific

- **Employee Grade:** Manager, Director, Executive
- **Room Size:** 17'-0" x 22'-0"
- **Wall Finish:** Fabric
- Painted drywall
- **Acoustics:** Acoustic paneling wrapped in fabric, staggered
- **Lighting:** 100% indirect, recessed fixture with wide distribution of light
- Spot lights to create a wall wash and promote the perception of depth
- **Concept:** added acoustic property without full wall treatments
- Panel color is predominant on camera so background paint can be more non-TelePresence color



Professional Design

Haight



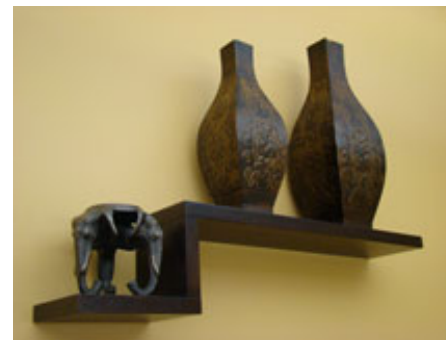
- **Employee Grade:** Manager, Director, Executive
- **Room Size:** 15'-6" x 25'-0"
- **Wall Finish:** Wallpaper
- **Acoustics:** Wall art in credenza alcove to diffuse sound reflections
- **Lighting:** Traditional commercial fixtures with added diffusers for a more even diffusion of light.
- **Concept:** wall texture helps create depth on camera
- Wall art carries continuity across three screens



Classic Design

Ashbury

- **Employee Grade:** Staff Member
- **Room Size:** 16'-5" x 25'-0"
- **Wall Finish:** Paint
- **Acoustics:** None
- **Lighting:** Linear Pendant fixture, 100% indirect illumination for even illumination
- **Concept:** standard room deployment with the addition of decor
- Wall art carries continuity across three screens
- Balance decor for in-room experience as well as on-camera experience



Executive Design

Marina

- **Employee Grade:** Executive
- **Room Size:** 12'-5" x 16'-4"
- **Wall Finish:** Wallpaper
- **Acoustics:** none
- **Lighting:** Linear Pendant fixture for primary illumination
- Wall sconce for added fill light Wall wash fixtures to promote depth and add interest to the background
- **Concept:** multi-purpose meeting room
- Metallic tones of lighting and wallpaper give the room a more polished feel
- Miniatures of buildings in background help build depth on camera



Classic Design

Sloat

- **Employee Grade:** Staff Member
- **Room Size:** 13'-4" x 10'-10"
- **Wall Treatment:** Paint
- **Acoustics:** none
- **Lighting:** 100% indirect, recessed fixture with wide distribution of light
- **Concept:** standard small conference room
- Multi-purpose for meetings other than TelePresence
- Decorative touches help lessen sterile feel of flat paint

