



# hai 1000

**Multi-Stream HD/SD H.264  
Telepresence Codec**

## Product Overview



Distributore per l'Italia

# hai 1000 Product Overview

- Product
- Features & Benefits
- Market Applications
- Configuration – SD & HD
- Networking & Management
- INVITATION™ and Interop



# hai 1000



- Multi-stream codec for telepresence style collaboration
- H.264 / MPEG-4 AVC for efficient bandwidth utilization
- Full bandwidth HD and SD for crystal clear DVD quality video
- Telecom grade quality for always on operation
- Flexible configuration to suite your exact system requirements
- Easy to configure and manage for quick & solid commissioning
- Standards based interoperability with traditional videoconferencing



# hai 1000 Features & Benefits

Feature	Benefit
<p><i>Full SD Video or HD resolution</i>  <i>Up to 1080p / 30</i></p>	<p><i>Crystal clear video</i>  <i>Not “best effort”, just best!!</i></p>
<p><i>Consistent frame rate by design</i>  <i>Fixed 24, 25, 30, 50, or 60 fps</i></p>	<p><i>Fluid motion free of artifacts</i>  <i>Traditional VTC (conferencing) jumpy/unstable</i></p>
<p><i>Super wideband audio</i>  <i>From 20Hz to 20KHz at 384kbps</i></p>	<p><i>No listener fatigue during long sessions</i>  <i>Traditional VTC has limited audio quality</i></p>
<p><i>Perfect audio video synchronization</i>  <i>Less than 20 ms A/V drift</i></p>	<p><i>No distraction to better focus</i>  <i>Traditional VTC has variable synchronization</i></p>
<p><i>Lowest, fixed compression latency</i>  <i>Less than 120 ms end to end</i></p>	<p><i>Allows natural, spontaneous communication</i>  <i>Traditional VTC has 300+ ms latency</i></p>
<p><i>Always on reliability</i>  <i>Telecom grade hardware design</i></p>	<p><i>Never reboot, never loose sessions</i>  <i>Traditional VTC requires constant care</i></p>



# hai 1000 Features & Benefits

Feature	Benefit
<p><i>INVITATION</i> Using SIP for Interoperability</p>	<p><i>Bridge in traditional VTC through MCU</i> <i>High performance need not be isolated</i></p>
<p><i>Industry standard compression</i> <i>H.264 / MPEG-4 AVC &amp; AAC</i></p>	<p><i>Saves 60% of bandwidth vs. MPEG-2</i> <i>Interoperable with standard systems &amp; STBs</i> <i>for low cost mass distribution</i></p>
<p><i>Full bandwidth video</i> <i>Up to 5 Mbps SD and 10 Mbps HD</i></p>	<p><i>Video quality to match available bandwidth</i> <i>Achieve the quality that you plan for</i></p>
<p><i>Logical Multicast</i> <i>Multiple multicast and/or unicast streams</i></p>	<p><i>Hit multiple points over unicast networks</i> <i>Multicast is available but not a necessity</i></p>
<p><i>Configurable Input/Output</i> <i>Analog or digital</i></p>	<p><i>Achieve the highest installation</i> <i>Suits your cameras and displays</i></p>
<p><i>Dual Stream HD / XGA</i> <i>Second HD input supports RGBHV</i></p>	<p><i>Transmit XGA data screens simultaneously</i> <i>Real time collaboration</i></p>



# hai 1000 Markets & Applications

Telepresence  
Extreme Conferencing



Medical  
Mission Critical Video



IPTV / Broadcast  
MPEG-4 AVC / H.264  
Everywhere



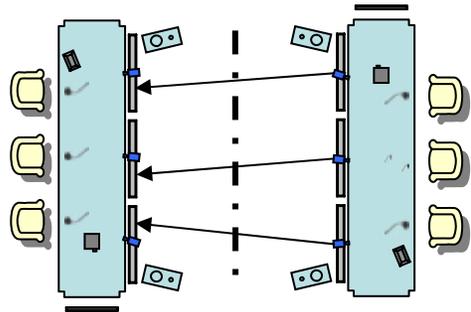
Education  
Continuous Presence



# hai 1000 Markets & Applications

## Telepresence / Boardrooms

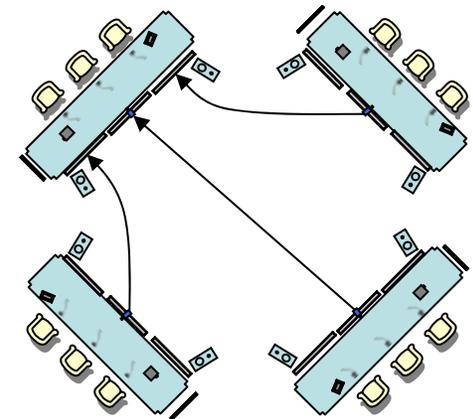
Requiring the replication of a TRUE-TO-LIFE environment, where corporate leaders can interact remotely without the distraction of technology



Collaboration Suite



Pearson Publishing – Telepresence Boardroom  
Integrated by: Teliris



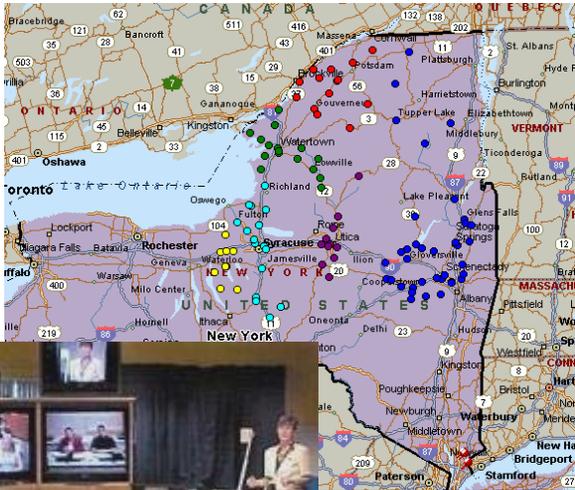
Multi-Point Conference



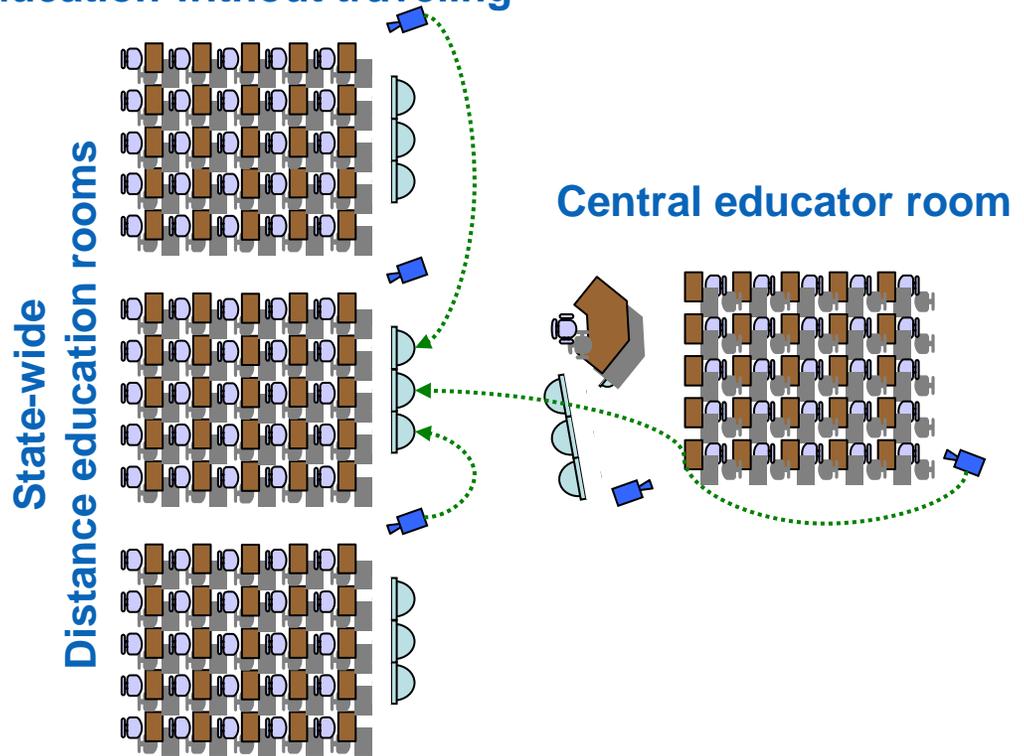
# hai 1000 Markets & Applications

## Distance Education / Continuous Presence

Requiring dedicated connectivity between remote classroom to allow students the highest quality education without traveling



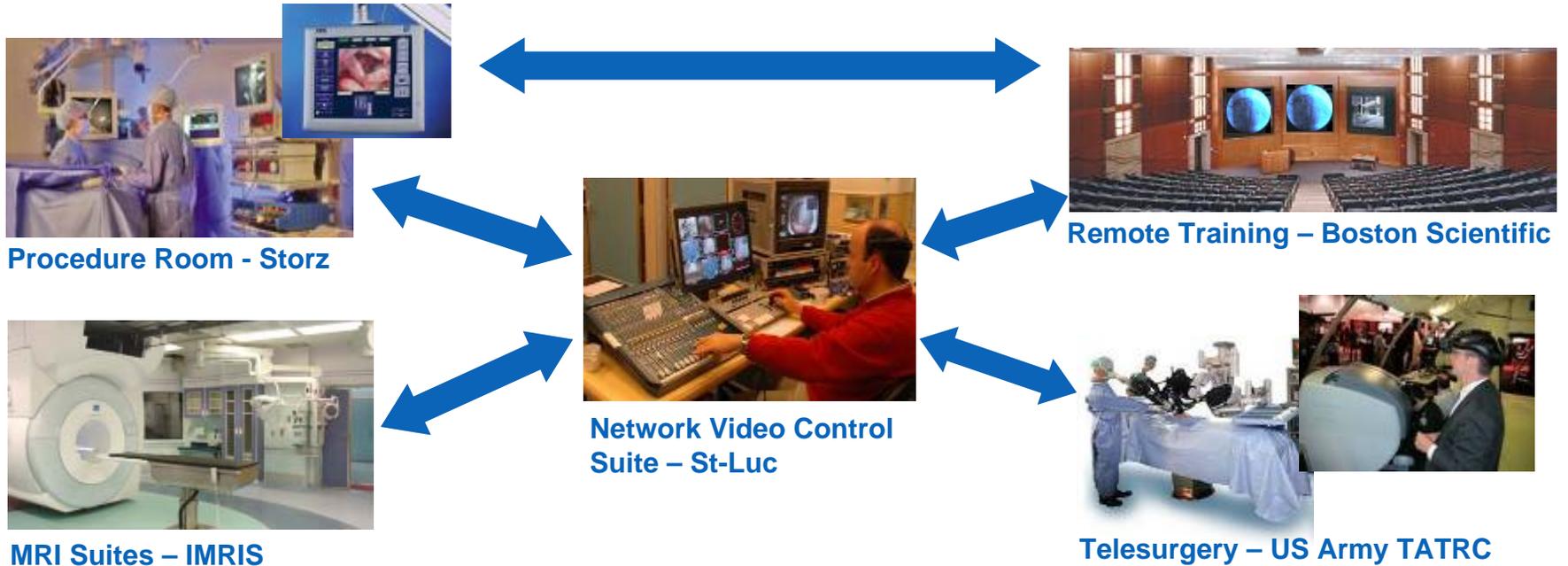
New York State - Verizon



# hai 1000 Markets & Applications

## Medical Systems

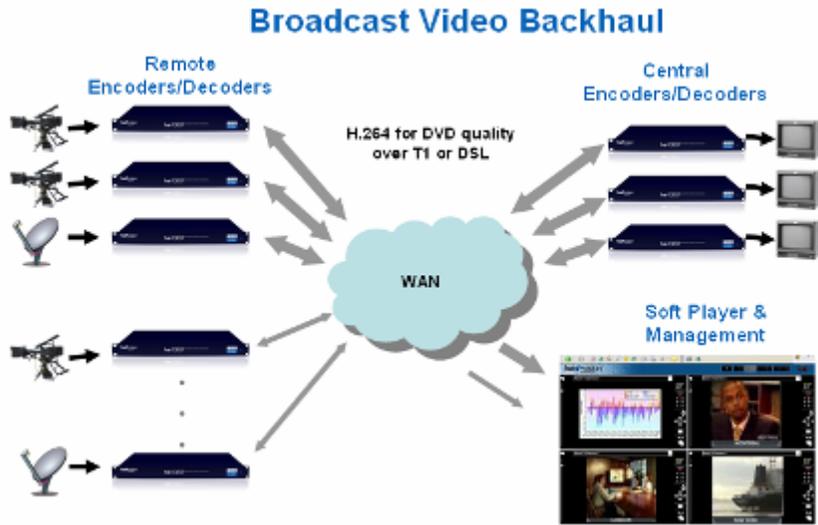
Bringing procedures to critical audiences where reliability, quality and precision is a necessity



# hai 1000 Markets & Applications

## Interactive Broadcast

Connecting facilities, affiliates, and event locations to enable flexible video distribution and interactive real-time commentary without the costs and inherent delay of satellite



- Interactive News
- Multiple stream production feeds
- Monitoring
- Terrestrial and satellite application



# hai 1000



**hai1060**

6 slot chassis, up to 10 channels



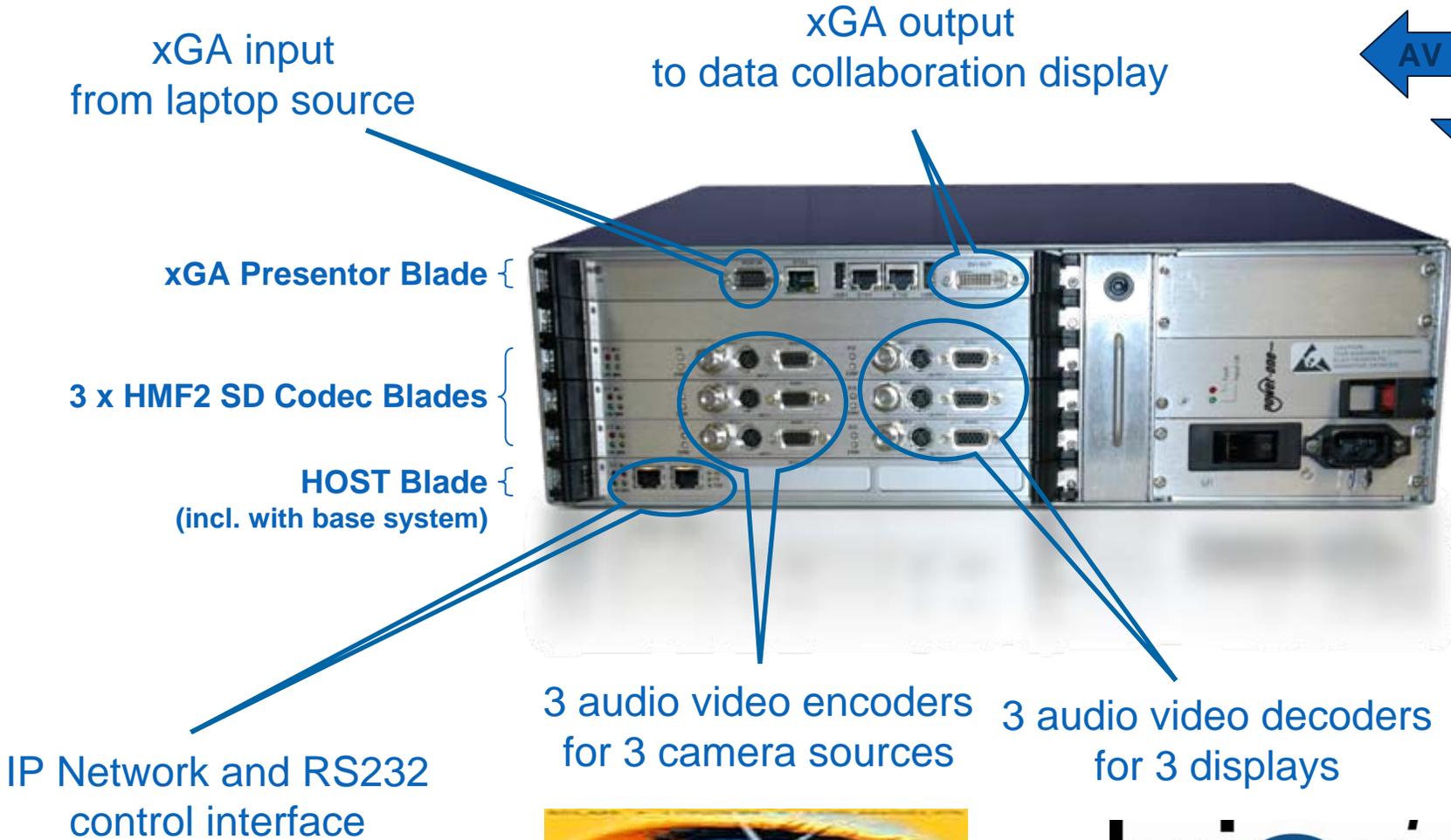
**hai1020**

2 slot chassis, up to 2 channels

- Multi-Stream – up to 10 channels
- Multi-Format – H.264 and MPEG-2
- Up to 10 Mbps MPEG-4 AVC
- High performance – lower than 120 ms latency
- Perfect audio/video synchronization
- Configurable I/O – digital or analog
- HD, SD, YPbPr, RGBHV/DVI, SDI, S-Video, Composite
- HDMI upscaled SD output available
- 4 channel audio – digital or analog
- Interoperable with videoconferencing
- Extremely reliable – Telco grade HW and OS
- Manage through web, CLI, SNMP, or haiVIEW



# hai 1060 SD 3x3 w/ xGA example



# hai1000 HMF2 Codec Blade



**Fixed Encoder / Decoder Blade Format Shown**

**Analog Video (S-Video & Composite) and Audio (4 Channel – Unbalanced RCA or Balanced XLR))**

## HMF2 Features:

- Compatible with
  - hai1060 (6 slot, up to 5 codec blades)
  - hai1020 (2 slot for encode/decode only)
- Blade configuration
  - Encoder/Decoder, Encoder or Decoder only
- Multiple compression
  - MPEG-4 AVC (H.264) from 128 kbps to 5 Mbps with AAC audio
  - MPEG-2 (optional) as supported on hai500 E2 (400 kbps – 15 Mbps)
- Video resolution
  - 720x480 (SD 480i)
  - 352x480 (HHR)
  - 352x240 (SIF)
- Extremely low latency
  - From 190 to 260ms end to end
- Variety of input / output formats
  - Video (SDI / Composite / S-Video)
  - Audio (Analog / AES), 4 audio channels (16 bits)



# hai 1000 HMF2 Codec Blade



Carrier Blade Format Shown – Configuration Below

	Encoder PIC (Personality Interface Card)	Decoder PIC (Personality Interface Card)
Standard Configuration	S-Video, Composite, YPbPr Component (SD), Quad Analog Audio	S-Video, Composite, YPbPr Component (SD), Quad Analog Audio <b>(shown)</b>
Optional	SDI, Composite, SDI Embedded AES Audio, Quad Analog Audio <b>(shown)</b>	SDI, Composite, SDI Embedded AES Audio, Quad Analog Audio
Optional		HDMI Upscaled to HD, Embedded Digital Audio, Quad Analog Audio



# hai 1000 HMF2 Codec Blade

## PICs – Personality Interface Cards

<p>SCI – Analog Input PIC SCO – Analog Output PIC</p>	<p>S-Video, Composite, YPbPr Component (SD), Quad Analog Audio</p> <ul style="list-style-type: none"> <li>•DB25 to Analog Video Input or Output Breakout Cable</li> <li>•DB25 to Analog Audio Input or Output Cable (RCA or Balanced XLR)</li> </ul>	
<p>SDI – Digital Input PIC SDO – Digital Output PIC</p>	<p>SDI, Composite, SDI Embedded AES Digital Audio, Quad Analog Audio</p> <ul style="list-style-type: none"> <li>•DB25 to Analog Audio Input or Output Cable (RCA or Balanced XLR)</li> </ul>	
<p>HDO – HDMI Output PIC</p>	<p>HDMI SD Upscaled to 720p HD, Embedded Digital Audio, Quad Analog Audio</p> <ul style="list-style-type: none"> <li>•DB25 to Analog Audio Input or Output Cable (RCA or Balanced XLR)</li> </ul>	



# hai 1060 HD 4x4 example



## MAKO-HD



4 x MAKO-HD Codec Blades

HOST Blade  
(incl. with base system)

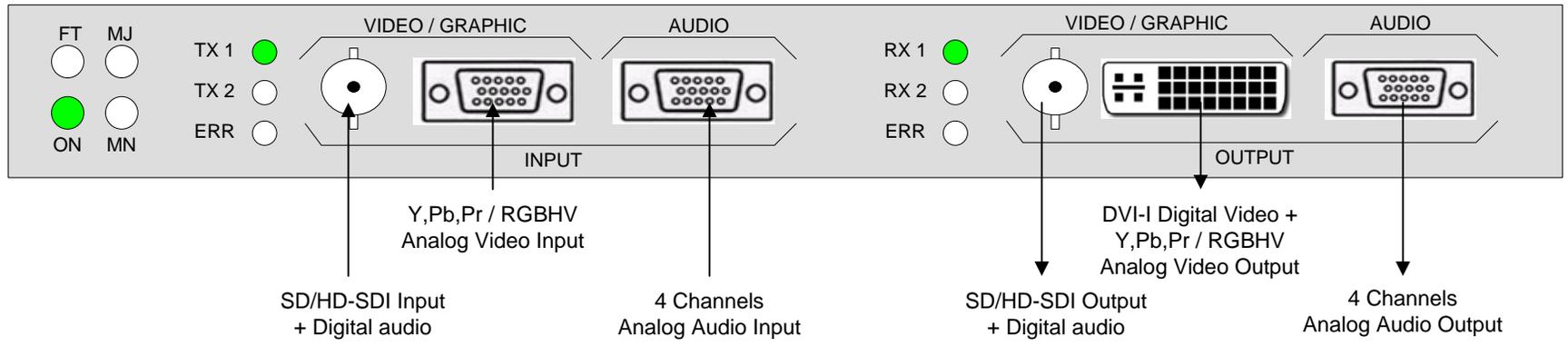
4 audio video decoders  
for 4 HD displays

4 audio video encoders  
for 4 HD or SD camera sources  
and 4 RGBVH sources

IP Network and RS232  
control interface



# hai 1000 MAKO-HD Codec Blade



# hai1000 MAKO-HD Codec Blade



Encoder / Decoder Blade Format Available

## MAKO-HD Features:

- Compatible with
  - hai1060 (6 slot, up to 5 codec blades)
  - hai1020 (2 slot for encode/decode only)
- Blade configuration
  - Encoder/Decoder only
- Compression
  - MPEG-4 AVC (H.264) from 128 kbps to 10 Mbps with AAC audio
- Media Sharing
  - Dual Channel Encoding per Blade for RGBHV simultaneously with HD video
- Video resolution
  - 1080p
  - 1080i
  - 720p
  - 480p
- Extremely low latency
  - Less than 120ms end to end
- Variety of input / output formats
  - Video (Digital/Analog/RGBHV)
  - Audio (Analog / AES), 4 audio channels (16 bits)



# MAKO-HD Digital Video Interface (SDI)



•HD & SD SDI



Format	Standard	Resolution	Frame Rate (fps)	Bit Rate
SD	SMPTE-259M	720x480/576i	25, 30	270 Mbps
HD	SMPTE-296M	1280x720p	24, 25, 30, 50, 60	Up to 1.485 Gbps
	SMPTE-274M	1920x1080i	25, 30	1.485 Gbps
	SMPTE-274M	1920x1080p	25, 30	1.485 Gbps



# Component Analog (Y,Pb,Pr) Video Interface

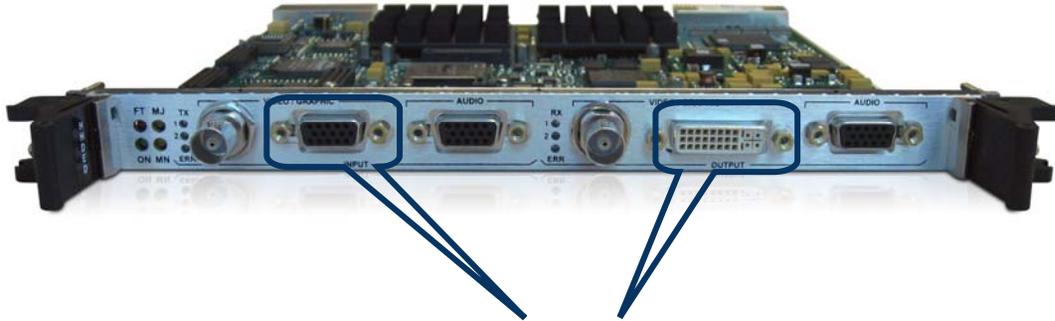


•PPbPr breakout cable on DB25 or on DVI connector

Format	Standard	Resolution	Frame Rate (fps)	Bit Rate (in the digital domain)
SD	CEA_770.2-C	720x480/576p	25, 30, 50, 60	270 Mbps
	CEA_770.2-C	720x480/576i	25, 30	270 Mbps
HD	CEA_770.3-C	1280x720p	24, 25, 30, 50, 60	Up to 1.485 Gbps
	CEA_770.3-C	1920x1080i	25, 30	1.485 Gbps



# Computer Graphic (DVI / RGBHV) Video Interface



•RGBHV breakout cable on DB25 and DVI or RGBHV on DVI connector

Name	Resolution	Refresh Rate
VGA	640x480	Up to 85 Hz
SVGA	800x600	Up to 85 Hz
XGA	1024x768	Up to 85 Hz
WXGA	1280x768	Up to 60 Hz



# MAKO-HD Codec Blade Key Features



## Lowest Latency Available

- Less than 120 ms end-to-end latency

## Optimized for HD 720p 60 fps at 4 Mbps

- Supports from 256 kbps up to 10 Mbps in HD mode
- Supports from 64 kbps up to 6 Mbps in SD mode

## Dual stream per encoder (analog/digital)

- Unique capability of decimating frame rate to insert Computer Graphic content (ex. 720p @ 56 fps + 1024x768 @ 4 fps)
- Output is always standard compliant at 30/60 fps
- Can support HD 720p 30 and YPbPr 720p 30 simultaneously!!!



# MAKO-HD Codec Blade Key Features



## Video

- State-of-the-art H.264 MPEG-4 AVC video compression
- Baseline support ensuring lowest latency
  - Main Profile support allowing lower bit rate at same quality with some latency trade-offs
- H.264 Level 4.1 support (HD 1080p @ 30 fps)
- Full control on video/audio settings ensuring perfect tweaking for the network and the application

## Audio

- Up to 4 channels of analog and/or digital audio
- Super wideband audio up to 22 kHz frequency range
- Audio / video drift (lip-sync) below 20ms
- Balanced and un-balanced audio
- MPEG-4 AAC-LC audio compression from 32 kbps up to 256 kbps per audio pair



# MAKO-HD Codec Blade Key Features



## Additional Special Features

- Users' created logo and text insertion at both encoder and decoder levels
- Supports Close Caption (SD/HD)
- Background Noise filtering (Random Noise) and Mosquito Noise reduction
- Special effects on video signals when session is starting
  - Zoom out / Fade out / etc.



# hai 1000 System Features



- Frame and blade design hai1060 – up to 10 channels
- hai1020 – single encode/decode
- INVITATION Videoconference Interop
- Latency less than 120 milliseconds
- Logical multicast / multiple unicast
- Telecom grade reliability
- Robust frame & blade design
- Web, CLI, and SNMP interfaces
- AMX and Crestron compatible



**hai**  **vision**  
network video

# hai 1000 Management



- 10/100 Ethernet – Network video and in-bank remote management
- RJ54 RS-232 Serial Management Port (adapter cable required) local management and control

## Controlling the hai1000 systems and networks

- HTTP – Internal Web Server
- Command Line Interface (CLI) over Management Port or Ethernet
- SNMP over Ethernet
- Session Initiation Protocol (SIP) with the optional INVITATION feature
- haiVIEW
  - haiVIEW application
  - haiVIEW SDK (HTML developer platform)
  - haiVIEW JAVA API (programming interface)



# hai 1000 Management



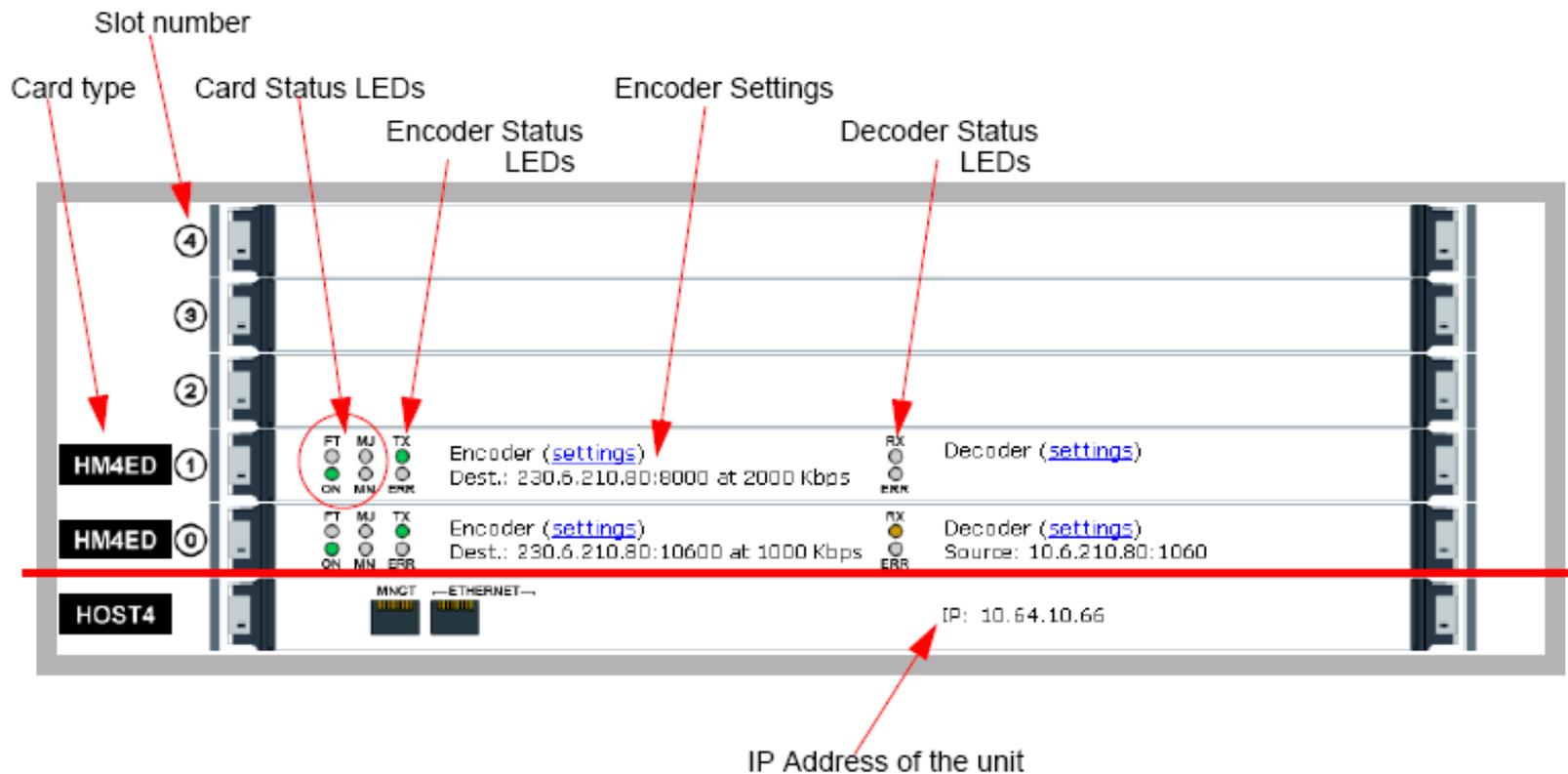
## HTTP – Internal Web Server

- Provides high level access to many system features
- Some advanced features (filter adjustments, buffers, etc.) only available through the CLI interface. These are typically adjusted on system installation only.
- Web interface has pictorial of functioning system with all lights, card inventory accurate.
- Sessions/streams may be defined, adjusted (bite rates, GOP sizes, etc)
- Stream adjustment is “on the fly” and almost instantaneous while encoding (no system or card reboots)
- Diagnostic and upgrade features available through the web interface.



# hai 1000 Management

Settings are elegantly displayed as you drag your mouse over the interface



# hai 1000 Management



## Management Systems

- hai1000 networks can be managed using haiVIEW, a light session manager enabling multiple stream topologies to be launched easily
- Complex scheduling systems typically used in distance education such as RENOVO and ProSphere support the hai1000
- Creston and AMX style controllers can easily interface with the hai1000 either through the serial management port, over IP, or by communicating with a haiVIEW Session Server
- Custom systems may be developed to control the hai1000 through any of the listed management methods.

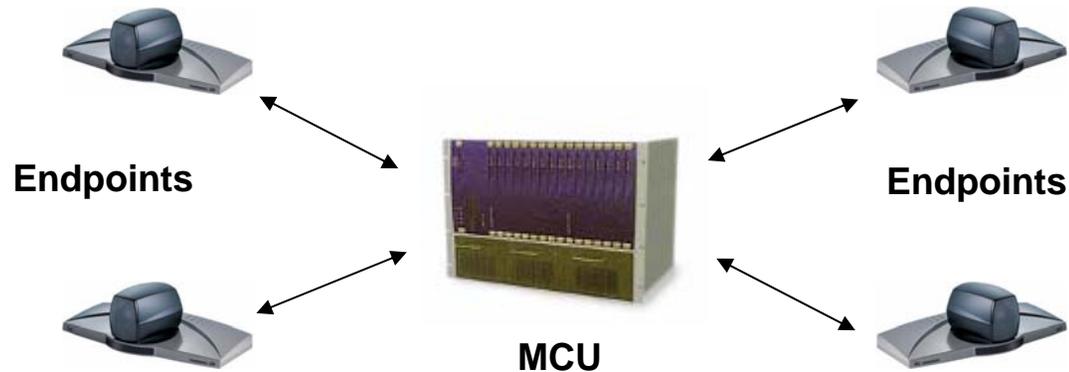


# hai 1000 Networking



## Traditional Videoconferencing

- Multipoint conferencing (and even many point to point calls) are handled through an MCU
- The MCU moderates amongst the various technologies, performs features such as quad-split and loudest speaker

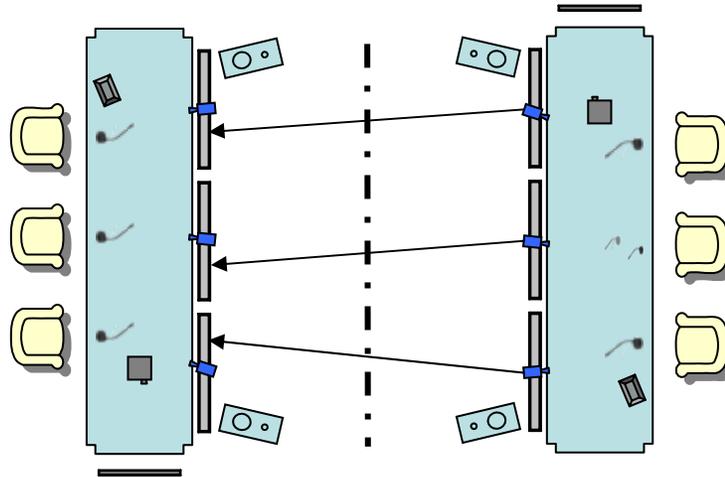


# hai 1000 Networking



## Performance Communications

- A direct “stream” is created between each camera and each display
- All participants are given full screen real estate – no quad splits
- All audio is distributed to each room and moderated through high quality audio systems (echo cancellers)

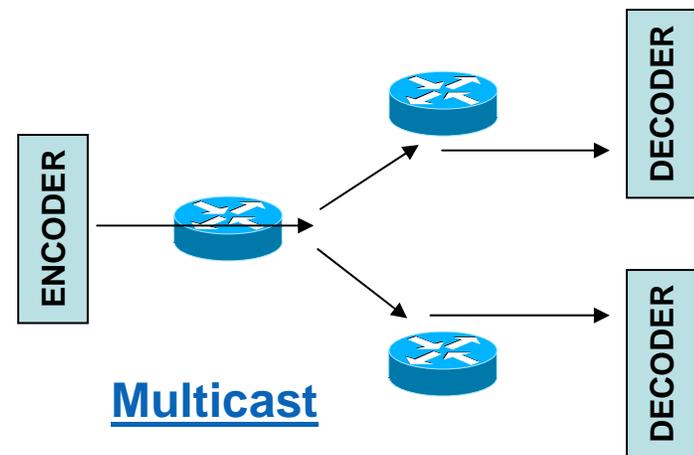
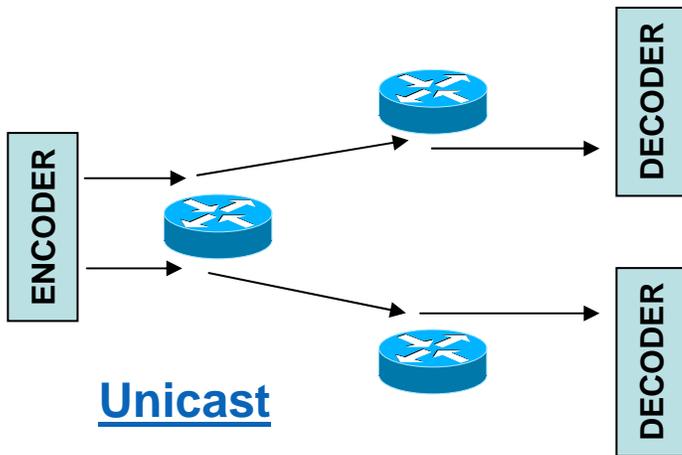


# hai 1000 Networking



## Multicast vs. Unicast

- **Unicast** – separate streams must be generated for each remote participant
- **Multicast** – a single stream is generated and replicated for multiple participants within the network routers

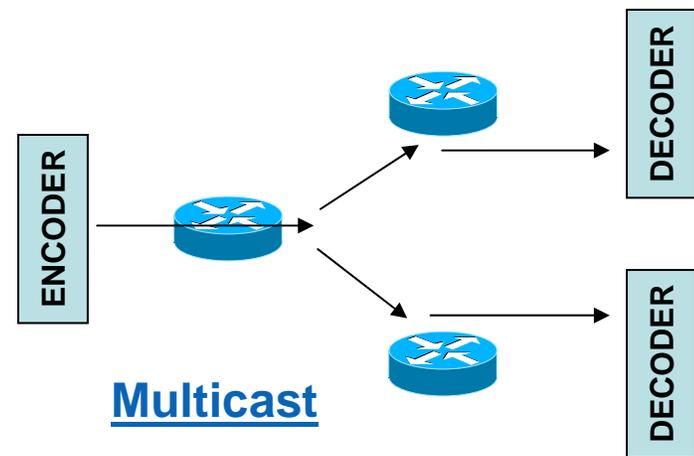
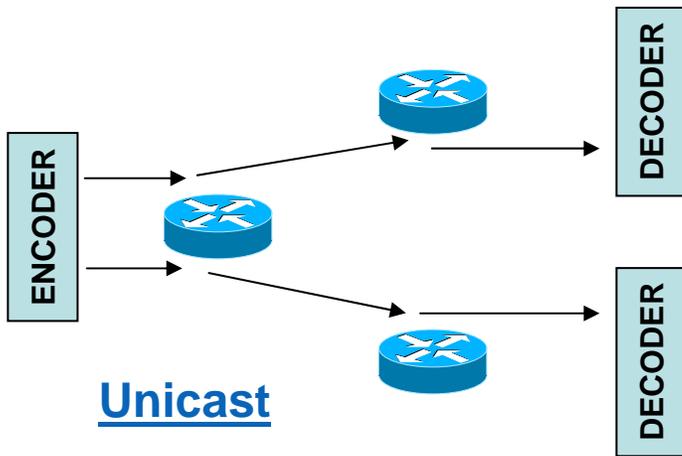


# hai 1000 Networking



## Multicast vs. Unicast

- Unicast – typically not supported over the WAN, so unique unicast to each destination is used
- Multicast – typically available on the LAN, specifically useful in IPTV style deployments broadcasting to many decoders or set top boxes



# hai 1000 Networking



## Logical Multicast

- Each hai1000 encoder can emit multiple streams, and they can be a mix of multicast and unicast
- Up to 3 streams per encoder is available on the web user interface, and up to 10 streams per encoder via the CLI – each stream has the same video parameters (ie resolution & video bitrate)
- Each hai1060 can have 5 encoders, so one system is capable of emitting up to 50 separate video streams
- This is very useful for complex deployments. A telepresence system may like to send 3 streams from each camera to 3 separate destinations and have an additional multicast stream available for internal campus broadcast.

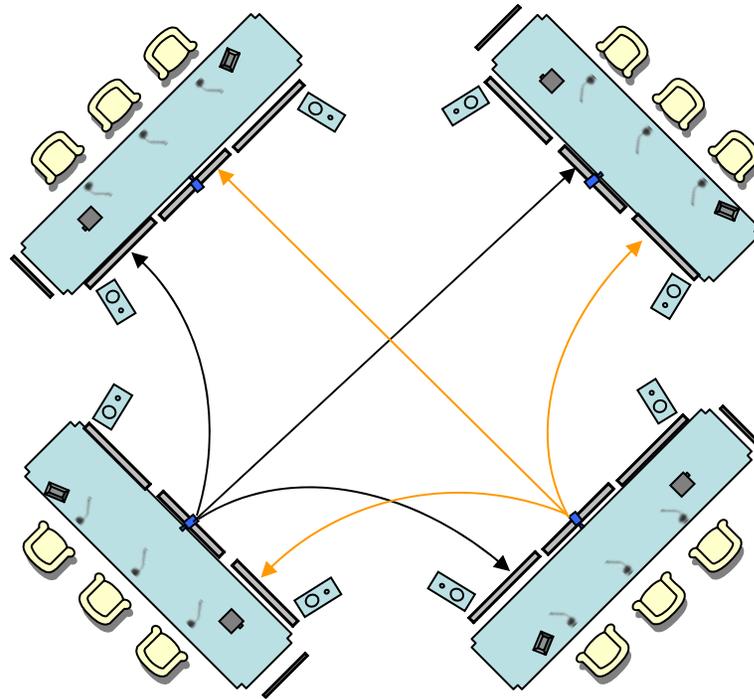


# hai 1000 Networking



## Logical Multicast

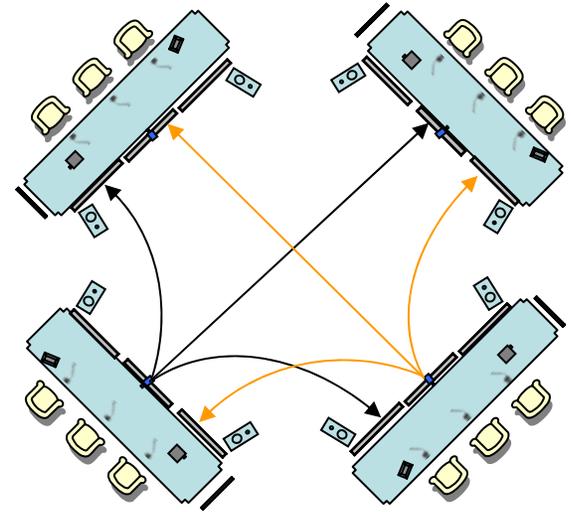
- Each camera sends 3 duplicate streams, one for each destination



# hai 1000 Networking

## Bandwidth

- The bandwidth required for each room is the maximum of the inbound or outbound streams, as bandwidth today is typically bi-directional (full duplex).
- A one camera three display site communicating with three other sites will need 3 inbound streams and 3 unicast outbound streams
- Typically we recommend adding approximately 50% to the raw video bitrate to get the overall bandwidth requirement – so a 2 Mbps video stream would need a 3 Mbps connection.



# hai1000 Compatibilities

## The hai1000 is compatible with:

- HaiVision's TASMAN encoder/decoder products
- HaiVision's hai500 multi-stream codec systems (MPEG-2 mode)
- HaiVision's haiVIEW multi-window multi-standard soft player
- Industry standard H.264 and MPEG-2 encoders and decoders
- Set top boxes (very low cost decoder endpoints), specifically the Amino 124, 125, 130, and 131
- Industry standard soft players, specifically the free and widely used VLC player by VideoLAN
- Traditional video conferencing endpoints though INVITATION (optional). Specifically supported is the CODIAN MCU 4500.



# hai 1000 Compatibilities

## H.264 / MPEG-4 AVC Systems

		DECODERS						
		hai1000	Tasman	Oscar	haiPLAY	Amino STB (Model 124)	Apple QT	VLC
ENCODERS	hai1000	Yes (1), (2), (3)	Yes (1), (2), (3)	No	Yes (1), (2), (3), (5)	Yes (1)	Yes (5)	Yes (1), (2), (3), (5)
	Tasman	Yes (1), (2), (3)	Yes (1), (2), (3)	No	Yes (1), (2), (3), (5)	Yes (1)	Yes (5)	Yes (1), (2), (3), (5)
	Oscar	No	No	Yes (4)	Yes (4), (5)	No	Yes (4), (5)	Yes (4), (5)

Formats:

- (1) Transport Stream over UDP
- (2) Transport Stream over RTP
- (3) Direct RTP
- (4) RTSP with Direct RTP
- (5) File format - only if stream is recorded with haiPLAY



# INVITATION

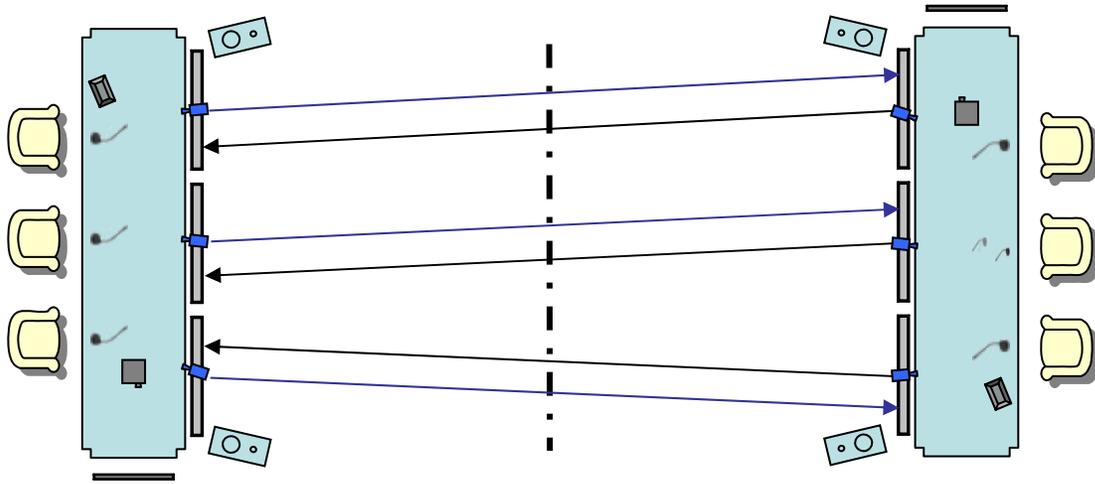


## INVITATION™ – Call initiation with traditional VTC devices for hai1000 series

- Each hai1000 encoder/decoder blade can be treated as a separate conferencing device
- SIP based connectivity with Codian 4200 MCU
- MCU trans-signals to H.323 as required
- MCU performs necessary call format conversions
- Call is adjusted to maximum capability of either endpoint with regard to resolution and bitrate
- Call can be initiated via the hai1000 interface, the MCU, or the videoconference endpoint



# Telepresence – Point to Point

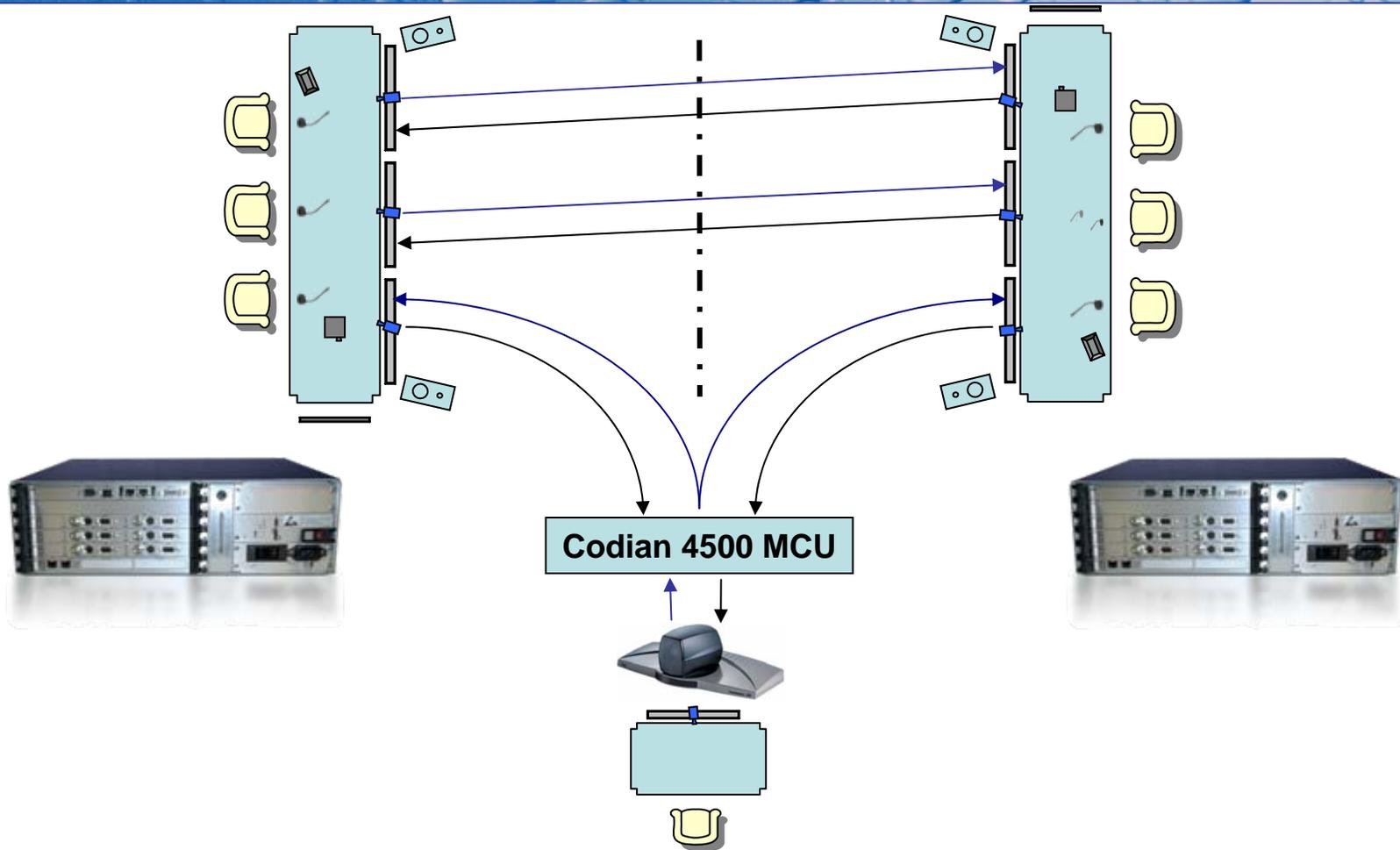


TRUE  
MPEG-4 AVC  
H.264

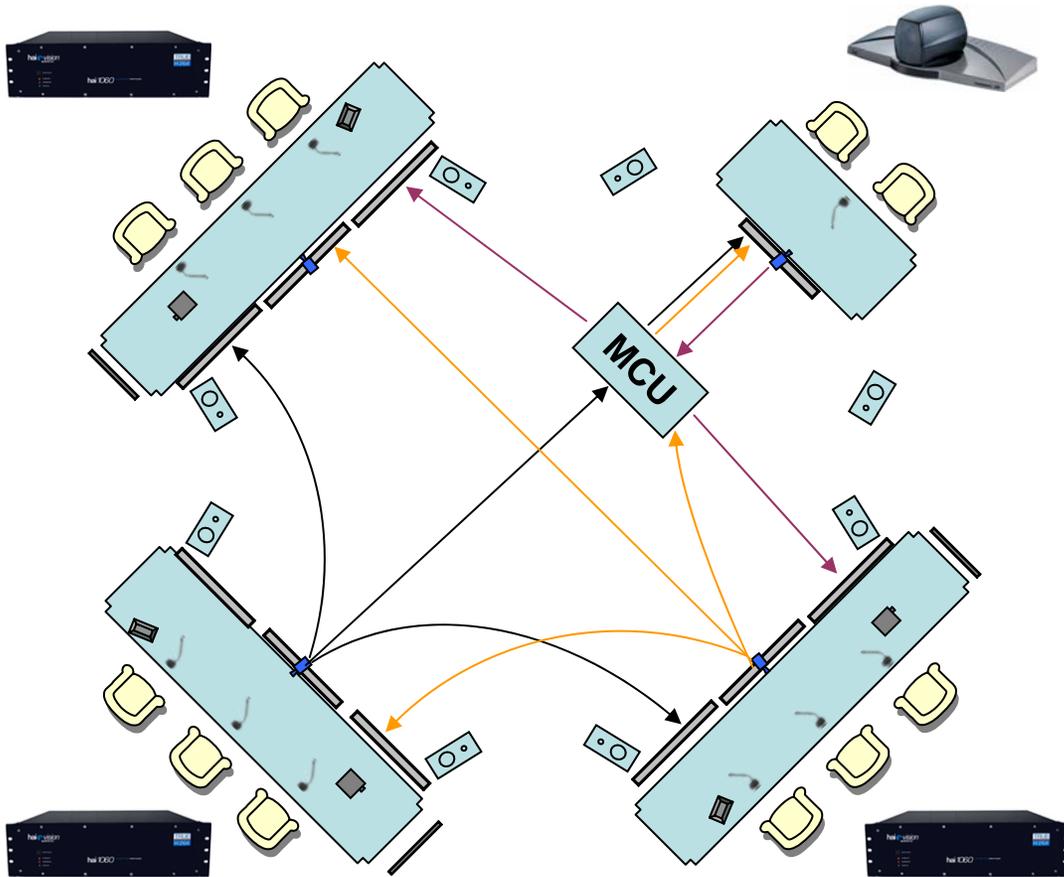


hai vision  
network video

# Telepresence – INVITATION



# Multi-Point with INVITATION



## 2x3 4 Site Example

- High quality telepresence maintained at optimal level between primary sites
- Primary sites delivered to VTC device through MCU quad split
- VTC delivered to primary sites as full screen at best available quality

# Each 2x3 INVITATION System

## 2 x 3 w/INVITATION

- 1 encoder, 2 decoders for primary communication {
- Codec for MCU communication {
- HOST blade – single IP port {



## INVITATION

- Based on Session Initiation Protocol (SIP) allows full interoperability
- SIP for signaling, H.264 for video compression, and AAC for audio compression is the complete standards package assuring long term investments in video communications infrastructure



# hai 1000

## The hai1000 is:

- A true multi-stream codec – up to 10 channels per chassis
- A solid performer with telecom grade reliability
- Fast, and with the MAKO-HD, the fastest available today at 120 ms latency
- Accurate in the consistent delivery of synchronized audio and video
- Flexible, with input and output options to suit your needs
- Capable to serve hybrid environments with SD and HD video and data
- Easy to manage with the necessary controls for complex integration
- Compatible with both traditional conferencing and standard streaming appliances

