Level 1 Technical

Polycom Video Endpoints

Contents

1 – Glossary

Level 1 introduced three distinct learning paths which all converge when discussing telepresence solutions. They are Polycom terminology for features and functions, technical video terminology which is used to detail how those features and functions work, and the actual solutions themselves.

We will develop each of these three paths further through each training level, but first we will recap the key points covered so far which specifically apply to endpoints and take a look at what is coming up.

Polycom terminology

- **Lost Packet Recovery (LPR)** – a Polycom error correction technology which protects the video traffic at up to 5% packet loss with no visible difference to the end-user

Video terminology

- **H.264 High Profile** – video compression technology which enables HD from only 512kbps, allowing up to 50% bandwidth savings
- **H.323** – a protocol used in videoconferencing that defines protocols for call control and audio, video and data processing
- **SIP** – a protocol used in videoconferencing calls that is designed to work with other existing call audio, video and data processing protocols rather than defining them

Polycom Video Solutions

- **RealPresence Desktop** – all endpoints which are designed as personal solutions, for example HDX 4500 and RealPresence Desktop
- **RealPresence Immersive** – endpoint solutions which are fully integrated into a room to provide an immersive experience, for example RealPresence Immersive Studio and RealPresence OTX Studio
- **RealPresence Mobile** – all endpoints designed for mobile devices such as tablets and smartphones
- **RealPresence Room** – all endpoints which are designed as room solutions, for example HDX and RealPresence Group Series

2 - Features

There are several features which sit across the entire Polycom solution that have not yet been mentioned, which we will discuss here, along with some more detail on the different endpoint families.

Software Keys

As mentioned in Level 1, a software key is used to 'unlock' extra features should they be required by the customer. Software keys are available for the following features:

1080p resolution

- This can be added to any HDX with the exception of the HDX 4002
- With the addition of this key the HDX 6000 is capable only of receiving 1080p, but not sending 1080p
- The HDX 4500, 7000, 8000 and 9000 are capable of sending and receiving 1080p with the addition of this key
- All RealPresence Group Series endpoints are capable of sending and receiving 1080p with the addition of this key

RTV option

- This can be added to any HDX or RealPresence Group Series system
- RTV refers to a proprietary Microsoft codec, which allows the endpoint to send and receive up to 720p when in a Microsoft Lync or OCS call

TIP option

- This can be added to any HDX with the exception of the HDX 6000, or RealPresence Group Series system
- TIP refers to the Telepresence Interoperability Protocol, which was written by Cisco to allow interoperability between Cisco TelePresence systems and any vendor who incorporates this technology

Multipoint option

- This can be added to any HDX with the exception of the HDX 6000
- The HDX 4002 and HDX 7000 will provide 4-way multipoint at SD resolution (host plus 3 other connections)
- The HDX 4500, HDX 8000 and HDX 9000 can all provide 4-way multipoint at 720p resolution, providing all endpoints connect at a HD resolution
- The RealPresence Group Series 500 will provide 6-way multipoint
- The RealPresence Group Series 700 will provide 8-way multipoint

Content Sharing

Level 1 covered People+Content IP, which is sharing content using a software application. The HDX series and RealPresence Group Series 500 and 700 can also share content by the use of a content cable. This uses an open standard called H.239, but is also sometimes referred to as People+Content, which is the name Polycom gave to the legacy proprietary protocol developed to provide this functionality prior to open standards being developed.

In addition, People On Content is also available on all HDX systems with the exception of the HDX 6000 and HDX 7000. People On Content uses chromakey technology (also known as 'green screen', where a brightly colored background is used to superimpose a second image over the camera image, most commonly used to allow a weather forecaster to appear in front of the weather map). On the HDX, the content being shared becomes the 'background' and the presenter shares the content by presenting in front of a colored background in the same manner.

Endpoint Management

Management of the HDX and RealPresence Group Series ranges is undertaken either via the remote control or via a browser interface, which is reached by entering the IP address of the HDX in a browser window. If there is an admin password configured on the endpoint the browser will automatically bring up an authentication dialog box where the password can be entered. When entering authentication details a username of 'admin' should be used.

Microsoft Outlook Integration

There have been several versions of Outlook integration, however the part the endpoint plays is the same regardless of the infrastructure and version of Outlook used. It is achieved by authenticating the endpoint to an Active Directory account used by the room the endpoint is located in. Although there is more to the solution than only this, this is how the endpoint part works. The endpoint calendar is then used to bring up reminders prior to the meeting, and can also allow direct connection to the meeting where possible.

Polycom Touch Control

The Touch Control is an alternative method of controlling most endpoints. It features a gesture-based touch interface which allows most of the remote control functions to be achieved in a user-friendly, innovative manner.

As opposed to a direct connection to an HDX, it is connected directly to the LAN. Connected by a process known as 'pairing', the IP address of the endpoint is entered into the Touch Control, as well as any password if required by the endpoint. Once this is complete, the menu from the home screen will disappear, and the Touch Control is ready to go. It also has an inbuilt infrared transmitter, which can still control the endpoint like a normal remote control in the event of a network failure.

In addition, the Touch Control has two USB ports; the first can be used to plug into a PC to show content via cable using People+Content IP, and the second can accommodate a memory stick directly; this enables content to be shown without the need for a PC. If showing content in this manner, the presentation appears on the Touch Control screen, and annotation function also becomes available.

SoundStation Integration

All HDX and RealPresence Group Series models are able to integrate with a SoundStation IP 7000 conference phone, which enables use of the IP 7000 as the HDX microphone. Additionally to this, the IP 7000 is also able to register to a SIP PABX for audio conferencing at the same time.

Benefits of this are only needing one microphone on the table, and also being able to integrate an audio participant into a video call. The IP 7000 also has limited capability to control the endpoint by making and ending video and audio calls, and altering the volume.

StereoSurround

Polycom's heritage as an audio company is often visible through the features built into the audio product range, and StereoSurround is a great example of this.

When in a call, the far end will hear the location of the participants, meaning that if participant A is on the left hand side of the room, participant A will be heard from the left hand speaker at the far end. Should participant B walks from one side of the room to the other while speaking, the far end will hear participant B move across the speakers from one side to the other while watching them do so. The microphone is even clever enough to know if the microphone is rotated or moved, and correct the audio stream accordingly.

This feature is of tremendous importance when showing the capability of Polycom to provide a life-like, immersive conferencing experience.

3 – Polycom Video Endpoints

RealPresence Desktop

These are personal solutions suitable for desktop or small huddle room usage, and break down into the following product groups:

HDX 4000 Series

These solutions consist of the HDX 4002 and HDX 4500. Primary features are:

- People on Content capability
- Optional ISDN connectivity
- 21” or 24” widescreen display options (HDX 4002 and HDX 4500 respectively) that can be used to extend the computer monitor

HDX 4500 also supports:

- An additional monitor output
- Collaboration via Polycom VisualBoard technology
- Polycom Touch Control

RealPresence Desktop

This is a software solution found on the Polycom Support site and downloaded at no cost for both Windows and Mac platforms. Primary features are:

- SIP and H.323 SVC-capable video collaboration client with chat capability, content sharing and LPR
- Supports up to 720p 30fps send and receive depending upon hardware*
- Can be used in conjunction with Video Resource Management solutions for authentication and provisioning onto an existing video network and enable further functionality such as encryption, firewall traversal and global address book
- Supports usage of headphones (wired and Bluetooth®) for privacy and clarity of communication

*release notes or datasheet should be checked to confirm availability and capability for specific devices

RealPresence Immersive

The RealPresence Immersive solutions consist of RealPresence Immersive Studio and RealPresence OTX Studio as briefly covered in Level 1. What we will do here is decipher the different model names and explain the additional extras available with each.

RealPresence Immersive Studio

RealPresence Immersive Studio is the newest solution in the RealPresence Immersive family. It is a ‘room within a room’ solution and is available in two different finishes (walnut or ash) and also in two different sizes, accommodating 9 or 21 participants. The solution includes the table and media wall with 84” displays. Chairs are not included and can be supplied, or the customer can supply their own.

There are also several options to customize the RealPresence Immersive Studio solution, including a back wall, lights, ceiling cloud and chairs. Where the 21 seat option is selected, an extra row of seats is added and stools are available to elevate the back row of participants.

RealPresence OTX Studio

The OTX Studio solution is also a complete 'out of box' solution, including the table, displays, camera housing, content screens and rear mount wall. Chairs are not included and can be supplied, or the customer can supply their own.

There are also several options to customize the OTX Studio solution, including:

- Optional table finishes
- Complete Experience Kit including acoustic wall with aesthetic finish and lighting
- Freestanding rear wall kit for where the OTX Studio rear wall will not be affixed to the wall of the room

The OTX was previously available in 1 or 3 camera versions, known as OTX 100 (Compact or Standard) or OTX 300 respectively.

RealPresence Mobile

- Can be found in the Android and Apple app stores and downloaded at no cost for Apple® iOS and Android™ platforms
- SIP and H.323 SVC-capable video collaboration client with content sharing and LPR*
- SmartPairing™ allows the mobile device to be used as a remote control for HDX and RealPresence Group Series endpoints and also to transfer calls received on RealPresence Mobile to an HDX or RealPresence Group Series endpoint*
- Can be used in conjunction with Video Resource Management solutions for authentication and provisioning onto an existing video network and enable further functionality such as encryption, firewall traversal and global address book
- Supports usage of headphones (wired and Bluetooth®) for privacy and clarity of communication

*release notes or datasheet should be checked to confirm availability and capability for specific devices

RealPresence Room

These are all the solutions used to provide video collaboration in meeting rooms. They consist of two families – the HDX series and RealPresence Group series of endpoints. There is a great deal of information available for both these families online, but here are the specifications of both:

	Polycom HDX 9000	Polycom HDX 8000	Polycom HDX 7000	Polycom HDX 6000
UltimateHD features				
Polycom HD Voice with 22 kHz of Audio	•	•	•	•
HD Content Sharing	•	•	•	•
HD Video (720p 30fps) from 512Kbps	•	•	•	•
HD Video (720p 60fps) from 832Kbps	•	•	•	receive only

HD Video (1080p) from 1 Mbps	•	•	•	receive only
SD (4CIF30) Video from 128 Kbps	•	•	•	•
SD (4CIF60) from 512 Kbps	•	•	•	
Connectivity				
H.323 and SIP max line rates Mbps	6	6	4	2
Optional BRI, PRI or V.35 module	•	•	•	
Audio only line (POTS analog)	•	•		
Video I/O				
Max video outputs	3	3	2	1
Max video inputs	4	4	3	2
General information				
Integrated 20.1-inch LCD, HD display				
All-in-one 24-inch codec and HD display				
Internal multipoint (HDCP, SDCP) OPTIONAL	HDCP	HDCP	SDCP	
Max # HDX Microphone Arrays	4	3	3	1
Content sharing				
Polycom People+Content/H.239 for Data Sharing	•	•	•	•
Polycom People+Content IP	•	•	•	•
Polycom People On Content	•	•		
Adjustable content 10, 50, 90% BW	•	•	•	•
Other key differentiators				
Polycom SoundStation IP 7000 Speakerphone Integration	•	•	•	•
Dual monitor emulation	•	•	•	•
Polycom SoundStructure Integration	•	•	•	•
Polycom Lost Packet Recovery (LPR)	•	•	•	•
APIs supported	•	•	•	•
Standard encryption (except where prohibited by law)	•	•	•	•
Polycom Touch Control	•	•	•	•
Polycom EagleEye Director	•	•	•	•
Polycom UC Board	•	•	•	
Polycom VisualBoard technology	•	•	•	•

	RealPresence Group 700	RealPresence Group 500	RealPresence Group 300
Video and audio performance*			
1080p 60fps video from 1.7 Mbps	•	•	•
1080p 30fps video from 1 Mbps	•	•	•
720p 60fps video from 832 Kbps	•	•	•
720p 30fps video from 512 Kbps	•	•	•
4CIF 60fps video from 512 Kbps	•	•	•
4CIF 30fps video from 128 Kbps	•	•	•
Polycom HD Voice audio to 22 kHz	•	•	•
Video inputs			
HDCI (Camera)	2	1	1
HDMI	3 (HDMI 1.4)	1 (HDMI 1.3)	
VGA	1	1	
Component (YPbPr)	1		
Video outputs			
HDMI	3 (HDMI 1.3)	2 (HDMI 1.3)	1 (HDMI 1.3)**
VGA	3		
Simultaneous video output signals	3	2	1**
Audio inputs			
HDCI (Camera)	2	1	1
HDMI	3	1	
ConferenceLink2 input ports	2	1	1
ConferenceLink2 devices supported	3	2	2
RCA line-in	2		
3.5mm stereo line-in		1	
Audio outputs			
HDMI	1	1	1
RCA pair stereo line-out	1		

3.5mm Stereo line-out		1	1
Connectivity			
Ethernet (10/100/1G)	2	1	1
USB	3	2	2
RS-232	DB9	Mini-DIN 8-Pin	Mini-DIN 8-Pin
Multipoint (via optional license key)			
Max. SD connections	8	6	
Max. HD connections	4	4	
Content sharing*			
Polycom People+Content / H.239 via HDMI/VGA content inputs	•	•	
H.239 via Polycom People+Content IP	•	•	•
1080p60fps content transmit	•	•	
1080p60fps content receive	•	•	•
Simultaneous 1080p video/content (one 30fps, one 60fps)	•	•	Receive Only
Simultaneous 1080p60 video and content	•		
Additional features			
Polycom EagleEye Director Camera	•	•	•
Polycom Touch Control	•	•	•
Polycom UC Board / VisualBoard Technology	•	•	•
Polycom SoundStation IP 7000 Integration	•	•	•
Polycom SoundStructure Integration	•	•	•
API support	•	•	•
Optional RTV, TIP integration	•	•	•

RealPresence Packaged Solutions

Room solutions can also be supplied as bundles that include endpoints, stands or wall mounts, monitors and all required cables. Some have been designed for specialist usage such as education, justice or applications where the endpoint is required to be mobile, such as manufacturing or health environments. These are known collectively as Packaged Solutions.

Packaged Solutions are available with both HDX and RealPresence Group Series endpoints.





4 - Architecture

Endpoint Chassis

All the room endpoints which encompass the HDX range are built using the same chassis and have the same form factor, with the exception of the HDX 4500. All run on a Linux platform, which is very secure and not susceptible to network threats or attacks. The HDX 4000, 7000 and 8000 include a two port switch to allow a computer or other device to share the same network port. The HDX 8000 and 9000 additionally have a serial port to allow connectivity into external control options such as products by AMX® and Crestron®. All the endpoints which encompass the RealPresence Group Series range are built using similar chassis which have a very small form factor, and also all run on a Linux platform. The RealPresence Group 700 also includes a two port switch to allow a computer or other device to share the same network port.

Many of the internal components are the same, and each series of endpoints uses the same software to provide an identical look and feel across all models. Indeed, with the addition of the Polycom Touch Control, all telepresence solutions, including the Immersive Telepresence rooms, can have the same experience for unparalleled ease of use.

When positioning a specific endpoint model for a customer it is very important to understand the capabilities of each, both to be very clear when discussing the customer's requirements, and also to be sure of encompassing them in the final solution.

Microphone Array

The microphone products contain not just one microphone but an array of three microphones in each. This provides not only excellent coverage across a room, but is also a key part of the StereoSurround technology discussed earlier.

Microphones are available in a desktop microphone format which provides coverage of approximately 10ft / 3m in diameter, and a ceiling microphone format which provides coverage of approximately 30ft / 10m in diameter and is available in black or white. Microphones can also be 'daisy-chained' for additional coverage where necessary, though capacity to do so differs depending on the endpoint in use.

Group Series model	Maximum mic arrays
Group 300	2
Group 500	2
Group 700	3

HDX model	Maximum mic arrays
HDX 4002	3
HDX 4500	-
HDX 6000	1
HDX 7000	2
HDX 8000	3
HDX 9000	4

Please note that when using a SoundStation IP 7000 as a microphone these figures may change; the admin guides have detailed information about microphone arrangements for each.

EagleEye Cameras

There are two camera options with the HDX series. The first is the EagleEye III camera, model number MPTZ-9 (pictured to the right), which is capable of sending 1080p at up to 60fps. It provides 12x optical zoom (meaning that the camera itself provides the zoom capability through the camera optics, as opposed to digital zoom where the zoom is achieved by changing the picture digitally).

Historically there have been several versions of this camera which may cause confusion (especially as they look very similar), so this will be covered here.

The first version, released with the original HDX 9000, is known as the EagleEye HD or EagleEye 720. It is capable of up to 720p, as the name suggests, and looks identical to the picture above. It can be identified by the model number on the base, which is MPTZ-6.

The next version, with model number MPTZ-7, is the EagleEye 1080 (pictured left). It was the first camera Polycom supplied with the HDX series which was able to achieve higher than 720p, but was limited to 1080i.

Polycom then released the EagleEye II, which has the familiar EagleEye form factor and is also restricted to 1080i. The model number is MPTZ-8.

Should the model number be obscured or unavailable due to the camera being fixed down, accessing the HDX via the browser interface and looking at the camera page will show which camera is connected if need be.

It is also worth mentioning for completeness that there is also an SD version of the EagleEye camera, but this is not supplied with any HDX system.

The other camera option is the EagleEye View (pictured to the right). It is capable of sending 720p at up to 30fps, and provides 4x digital zoom. It has integrated microphones which have coverage of approximately 6ft / 2m and can be mounted upside-down

The Group Series endpoints are compatible with the cameras listed above, but will only provide the resolution the camera is capable of delivering; if the 1080p key is present but a 720p camera is in use, the picture transmitted will be restricted to 720p.

There are three camera options specifically designed for the Group Series.

The EagleEye IV supports up to 1080p 60fps, and has a fully digital interface to the codec, which renders it incompatible with the HDX series. It is available in two versions, one with a 4x zoom (MPTZ-11) with a black chassis, and one with 12x zoom (MPTZ-10) with a silver chassis. MPTZ-10 features a 10x optical zoom with a digital zoom to 12x. An extender is available for EagleEye IV allowing a cable run of up to 100m (330ft).

In addition, the Group Series may also be used with the EagleEye Acoustic camera, seen here. The EagleEye Acoustic is a monitor-mount camera which includes a microphone, so is ideal for desktop and personal video collaboration. It can support up to 1080p at 30fps or 720p at 60fps, and also includes pan, tilt and zoom. Like the other EagleEye cameras power for the camera is supplied by the primary camera input.

EagleEye Director

The EagleEye camera is also able to integrate into the EagleEye Director camera tracking solution, which uses two cameras to provide a seamless experience when in a call. By using one camera to provide a fixed view of the entire room, and one camera to zoom in on a speaker, then EagleEye Director will cross-fade from one camera to the other. When the speaker changes, there will be a cross-fade back to the room view and so on.

The EagleEye Director unit contains microphones used for finding sound, and uses the moving camera with facial recognition to locate the face of the person speaking, so only a person who is speaking is able to get the camera to zoom in, eliminating distractions caused by maybe a door slamming, papers on the microphone, or similar.

Please note that only EagleEye II (MPTZ-8) or EagleEye III (MPTZ-9) cameras are compatible with EagleEye Director, so it is important when talking to a customer with existing endpoints systems to be sure any whether existing equipment may be used.

Other Capabilities

Here is a final table detailing some other capabilities:

HDX model	PSTN	ISDN*	SVC	EagleEye Cameras	EagleEye Director	Video Inputs
HDX 4000	Y	Y	-	-	-	1
HDX 4500	-	-	-	-	-	2
HDX 6000	-	-	-	1	Y	1
HDX 7000	-	Y	-	1	Y	2
HDX 8000	Y	Y	-	2	Y	3
HDX 9000	Y	Y	-	2	Y	3
Group 300	-	-	Y	1	Y	1
Group 500	-	-	Y	1	Y	2
Group 700	-	-	Y	2	Y	3

*ISDN is provided via an optional module which can be purchased separately

5 - Conclusion

This guide has provided an introduction to Polycom Video Endpoints. Your next step following the qualifying assessment will be Level 2 Instructor-Led Training, where you will learn more about how to set up, configure and manage Polycom Video Endpoints.

Available Resources

In addition to the information contained in this document, please also take a moment to familiarize yourself with the following resources available:

Solution brochures - http://www.polycom.com/products/telepresence_video/telepresence_solutions/index.html

White papers - http://www.polycom.com/products-services/resources.html

Customer success stories - http://www.polycom.com/global/en/customer-stories.html

Product documentation – www.polycom.com/videodocumentation

- HDX Administrator's Guide and Integrator Reference Manual
- RealPresence Desktop Help
- RealPresence Group Series Administrator's Guide and Integrator's Reference Manual
- RealPresence Mobile Help

Polycom Endpoint matrix (registration to Polycom Connect required)

- From them homepage **Resources > Sales Tools > Product Reference Matrices**
- Select NA (North America) or ROW (Rest of the World)