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## Cost Efficient H.320 Video Conferencing over ISDN including Multipoint Access

### Overview:

The purpose of this paper is to explain in greater detail how to implement cost savings into H.320 compliant ISDN based Video Conferences, including conferences with multiple participants. It describes the components and their functions that are needed to establish an H.320 Video Conference as well as how to implement cost efficient alternatives.

It is assumed that the reader has a general knowledge of Video Conferencing systems and the standards involved. However, the following technical papers are available to provide more information on these topics:

- *How do I choose a Video Conferencing system?*
- *Video Conferencing Standards and Terminology.*
- *H.323 Terminals, Gatekeepers, Gateways & MCUs.*
- *Global Dialling Scheme (GDS) for Schools Video Conferencing.*
- *H.323 Dial Plan and Service Codes used by Gatekeepers etc.*
- *IP Ports and Protocols used by H.323 Devices.*
- *H.221 Framing used in ISDN Conferences.*

### Which standard do you need, H.320 or H.323?

The first question that starts the process of identifying your Video Conferencing system is concerned with who and where are the people that you want to conference with. It is a networking issue that determines how the participating endpoints are going to be connected and hence which is the applicable standard that you should consider following. As indicated above, there are effectively two standards used in Video Conferencing, H.320 or H.323. After you have decided which standard you want to adhere too, you can start looking at the platform, performance and price equation.

#### ***Do you want to conference just within your organisation, or with suppliers or the world?***

H.320 is the ITU's umbrella standard for Video Conferencing between endpoints connected over ISDN, whilst H.323 is the ITU's umbrella standard for Video Conferencing between endpoints connected over an IP network. Whilst the long term prediction is for the world to use IP, if you currently do not have an existing LAN or WAN to connect the participants, then it is likely that the easiest and most cost efficient means of connecting all the endpoints is via ISDN, especially if they are in different countries. Hence you need H.320 compliant endpoints, or better still, dual H.323 and H.320 compliant endpoints that will allow you to migrate from ISDN to IP as and when the network infrastructure is available.

### H.320 Endpoints:

Historically, H.320 endpoints were large and expensive room based systems that had to be booked in advance. Operating in this way is restrictive, causes time delays and loses the spontaneity and momentum of using Video Conferencing to solve problems. However, we now have **H.320** compliant Desktop systems, Group systems and ISDN VideoPhones that make Video Conferencing generally more available to everybody in an organisation.

### Integrated Services Digital Network, (ISDN):

An ISDN connection has two possible interfaces; a BRI (Basic Rate Interface) or a PRI (Primary Rate Interface). The BRI consists of two circuit-switched B-channels, each of 64kbps that are used for data and one D-channel of 16kbps that is used for network control. The BRI physically consists of two pairs of twisted wire (transmit & receive) that are terminated by an NTU (Network Termination Unit) in the form of an RJ-45 connector. The PRI is similar to the BRI, but with more channels and extra control bandwidth. In Europe, the PRI consists of up to thirty 64kbps B-channels, that are used for data transmission up to 1920kbps and one 64kbps D-channel for network control. The PRI is usually terminated by an NTU in the form of two BNC connectors; although some use an RJ-45. In North America, the PRI consists of 23 B-channels of 64kbps for data, one D-channel of 64kbps for network control and an extra 8kbps for Framing.

With H.320 Video Conferencing systems, each 64kbps B-channel can either have its own ISDN number; share the same number as its paired BRI channel or be set so that all BRI channels share the same ISDN number. Usually, a BRI has the same ISDN number assigned to both of its B-channels; this is controlled by the providing **Telco**. With a 384kbps Video Conferencing system, the ability to operate in 6B mode or inverse multiplex the six channels together and operate in a 384 BONDED mode is a function of the equipment. Either way, it will have six ISDN numbers that may or may not be the same.

In 6B mode, the 384kbps channel can be regarded as consisting of six individual B-channels. When initiating a conference call to a system that is to operate in 6B mode, the six ISDN numbers must all be entered and dialled in the exact sequence that the ISDN lines are connected to the equipment.

In 384 BONDED mode, the 384kbps channel can be regarded as consisting of six 64kbps TimeSlots, with the first TimeSlot, being structured exactly like that for a B-channel. When initiating a conference call to a system that is to operate in 384 BONDED mode, only the first ISDN number is entered and dialled. The receiving system acknowledges the call on the first channel and replies with its remaining five numbers in the correct sequence. It is therefore crucial that a system is setup to reflect all its ISDN numbers in the correct sequence as this is the only way in which a calling system can determine what to dial. The correct numbers are the **local numbers** without area code. Only when all six ISDN numbers are known can the dialling system initiate a 384 BONDED call.

There are advantages and disadvantages to operating in a 384 BONDED versus 6B channel mode; with the obvious advantage being that it can carry an extra 8kbps of Video. The conference is also initiated quicker as all six channels are dialled together. With 6B, the channels are dialled sequentially, hence with a long distance call, there is a possibility that the first channel will time-out before the conference is established. The main disadvantage is that all channels must be available for 384 BONDED to work. There is no recovery mechanism. If, for whatever reason, a line is dropped during a conference, then the call is terminated.

An important consideration is the effect and use of Gateways and Multipoint Control Units. Most of these only support BONDED calls at 384kbps and do not work in 6B mode. In these situations, you have no option but to use 384 BONDED calls.

### Dedicated Multipoint Control Units, (MCU):

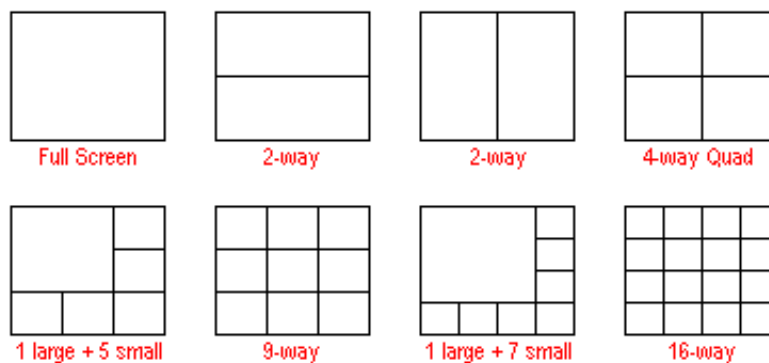
In the past, most H.320 conferences would have been between just two participants as ISDN is essentially a point-to-point connection. However, multipoint technology now makes it possible for groups of people to participate in a conference and share information. To hold a multipoint conference over ISDN, participants must use either a dedicated Multipoint Control Unit (**MCU**) that connects and manages all the ISDN lines, or an endpoint with an embedded H.320 multipoint capability such as the Polycom **HDX 8004XLP** or Emblaze-VCON **xPoint**.



The basic function of any H.320 MCU is to maintain the communications between all the participants in the conference. H.320 MCU's are hardware based as they need to connect to all of the ISDN lines from each participant. For example, to manage a conference between four H.320 systems, each at 384kbps (3xBRI), a dedicated H.320 MCU needs to connect the twelve BRI's. This is typically done as 24 x 64kbps

channels within a Primary Rate Interface, (PRI).

MCU's are capable of operating in either Continuous Presence or Voice-Activated Switching mode. Continuous Presence allows participants to see more than just who is speaking. The actual number of participants viewable in a Continuous Presence conference is a function of the MCU used and maybe subject to network constraints.



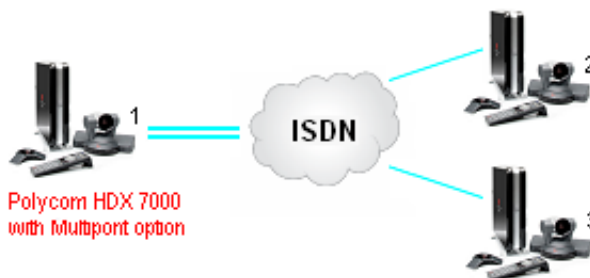
### Typical Continuous Presence Screen Layouts

In Voice-Activated Switching mode everybody sees the participant who is speaking. When somebody else speaks, the MCU switches the video and audio to the new speaker... and so on throughout the duration of the conference.

In general, dedicated MCU's support simultaneous sessions, more participants, higher bitrates, more screen layout options and more features than embedded MCU's found in some endpoints.

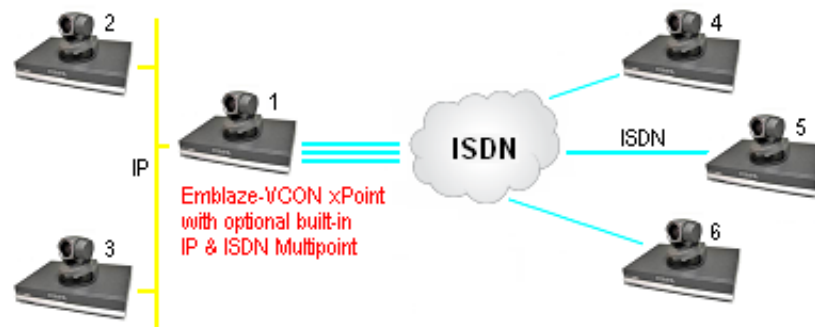
### Endpoint with Embedded H.320 Multipoint:

An alternative to using a dedicated MCU for small conferences involving 3 or 6 participants is to equip one of the endpoints with an embedded multipoint capability. Both the Polycom **HDX 7002XLP** and Emblaze-VCON **xPoint** have an embedded multipoint options that support themselves and the other sites in either a Voice-Activated or Continuous Presence session.



### ISDN Connections using Built-in Multipoint

Furthermore, both of these systems have IP connectivity as standard, so when their ISDN connectivity option is used in conjunction with their multipoint capability, they allow mixed-mode operation between both ISDN and IP networks.



### IP <=> ISDN mixed connections using built-in Multipoint

In a simplistic manner, they act like a Gateway bridging between the other ISDN and IP endpoints.

### Using an MCU Bureau Service:

A dedicated hardware H.320 MCU can represent a large capital investment that maybe difficult to justify when initially starting to use H.320 Video Conferencing. How many times a month are you going to conduct a 3 or more way Video Conference? This could be difficult to quantify until you actually start conferencing, so how can you justify the high capital investment when you don't really know how often it will be used? The answer is you can't, so use a Bureau Service instead.

By initially using a Bureau Service to provide and manage whenever you need to conduct a 3 or more way Video Conference, you can quantify how often you exactly require this functionality. Over a period of time, you will receive usage and cost reports, so you will be able to determine with a reasonable amount of certainty if you can actually justify the capital investment required to have you own MCU. And if you can't, then you can continue to use the Bureau Service.

21st Century Video offers a Bureau Service, for more information, please email: **Bureau Services**.

### Cheaper ISDN Call Charges:

The ISDN Call charges can represent a significant amount of the ongoing costs associated with using H.320 Video Conferencing, especially if the endpoints are overseas. A National 64kbps ISDN call costs a similar amount to that of a standard telephone call, so a 384kbps ISDN call is at least 6 times that of a telephone call to the same destination. However, overseas ISDN calls have a higher tariff. An alternative is to use Least Cost Call Routing, (LCCR) that offers substantial savings over British Telecommunication's standard rate for both UK and International ISDN calls.

21st Century Video can enable LCCR, for more information, please email: **Least Cost Call Routing**.