White Paper

Combining Interactive and Streaming Video to Extend the Reach of Multipoint Videoconferencing

VCON

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Multipoint Conferencing Needs for Video

The market need for multipoint videoconferencing is not much unlike that of the audio conferencing market. A variety of needs exist depending on the situation at hand. The examples below provide a small sampling of this variety.

Personal versus Group Needs

The multipoint videoconferencing needs of a user at their normal workspace is typically very different than that of a group assembled in a conference room or classroom. Personal conferencing tends to be ad hoc (needed on a spur of the moment). A comparison in the audio arena can be found in the conference button on most phones. During a person-to-person conversation, a third participant can easily be added by simply pressing the conference button on the phone. This is ad hoc conferencing. Group conferencing, on the other hand, tends to be scheduled. Just like the conference room in which the group of participants will meet, so are the multipoint videoconference requirements scheduled in advance.

Small versus Large versus Very Large Conferences

There can be dramatic differences in the needs and meeting dynamics based on the size of the conference and the number of sites participating. A small multipoint videoconference of three to four sites is typically very interactive and can be assembled almost "on the fly" if necessary (ad hoc conference). A larger conference of six to eight sites tends to be scheduled in advance and will usually have less overall interaction between the sites. In fact, two or three of the sites will probably dominate most of the interaction while the other sites remain mostly passive. A very large conference of twenty sites or more will certainly be scheduled and will almost always involve one site as the central presentation point, with the other sites only participating in periodic questioning during or following the presentation.

Without specific available research, it is commonly accepted that 85-90% of all multipoint videoconferences involve four or fewer sites. Extending this further, it is likely that 98% of multipoint videoconferences involve ten or fewer sites. But much of the reason for this is due to manageability and network bandwidth issues with large conferences rather than the needs of the user community. Solutions to address this will be covered later in this paper.

Simple versus Complex Conference Requirements

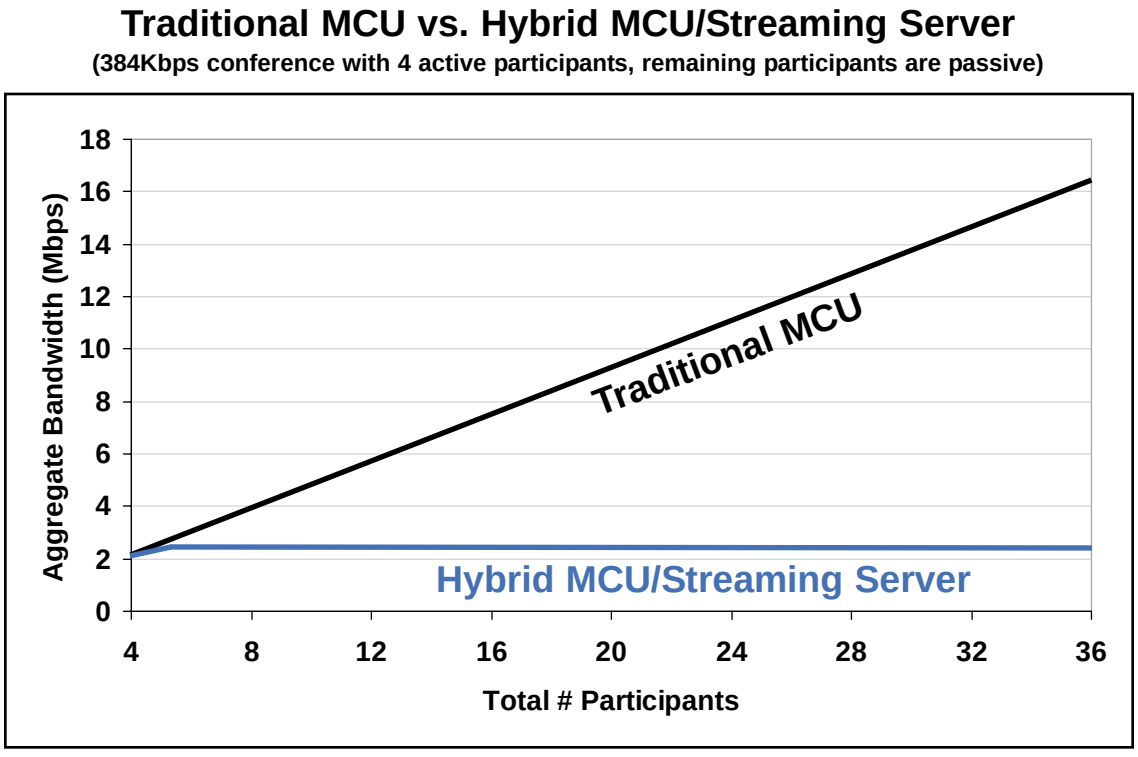
The tools and features that are needed during a multipoint conference have less to do with the size of the conference and more to do with the type of meeting or presentation being conducted. A simple conference might entail "meet me here" dialing whereby each participant dials a pre-assigned number to a known conference session that is "always on". Another simple conference example from a technical perspective is one in which all participants are connected at the same data rate and with the same audio algorithm. Contrast this with more complex conferencing features such as scheduled dial-out to all of the participants from the Multipoint Conferencing Unit (MCU), cascading (networking) multiple smaller conferences into a single large conference, or audio transcoding for times when participants need to connect using disparate audio algorithms. Again, the issue of needing a simple versus a complex conference session is dictated by the particular needs of each and every conference.

Opportunity and Benefits of Simultaneous Streaming

The concept of interactive versus passive participation was introduced in the previous section. In most cases today, both types of participants are treated equally when it comes to multipoint videoconferencing. They all simply represent remote sites connected to the MCU for the videoconference. The only difference is that some sites have the microphone muted until questions need to be asked while other sites are very interactive. The question to ask is why do all of these sites need be treated equally from the technical perspective of the MCU? Perhaps a combination of interactive multipoint conferencing and one-way streaming video could be used instead.

When using an MCU for a videoconference, there is a very linear relationship between the number of sites connected and the amount of network bandwidth required. As more sites are added, the bandwidth demands increase accordingly. This is due to the fact that each site has bi-directional audio traveling to and from the MCU (typically between 16-64Kbps per stream), each site is receiving video from the MCU (typically between 128-1536Kbps per stream), and one or more participants are sending video to the MCU (depending on whether the conference is configured for voice-activated switching or continuous presence). As an example, an eight-site multipoint conference in voice-activated switching mode at 384K would demand an aggregate 3.6Mbps without any assumption for IP overhead. Over the LAN this is likely not an issue. But over the WAN it can be an extremely costly effort to support.

If the eight-site conference mentioned previously truly only required four sites to be interactive and the remaining four sites passive, then the bandwidth demand on the network could roughly be cut in half. This could be accomplished by streaming the conference to the four passive sites via IP multicast, which is extremely bandwidth efficient (only a single stream on the network for all connected participants). Imagine the scalability benefit of such a conference. In reality, it wouldn't matter if there were four passive sites connected or four hundred. The aggregate bandwidth consumed on the network would be the same - due to the bandwidth efficiency of IP multicast. The graph below depicts the difference in bandwidth demands for a traditional MCU versus a hybrid MCU/streaming server. A solution designed with such hybrid functionality will be covered later in this paper.



The "passive" participants described in the previous example do not need to be completely passive. If the level of interaction they need during the conference is limited to simply asking questions or providing feedback, it is relatively easy to include a text chat (i.e. - instant messaging) capability as part of the conference. With this, an appropriate level of interaction can be given to hundreds or thousands of participants while still gaining the benefits of the limited number of fully interactive sites and significant network bandwidth savings.

Requirements for Management and Administration

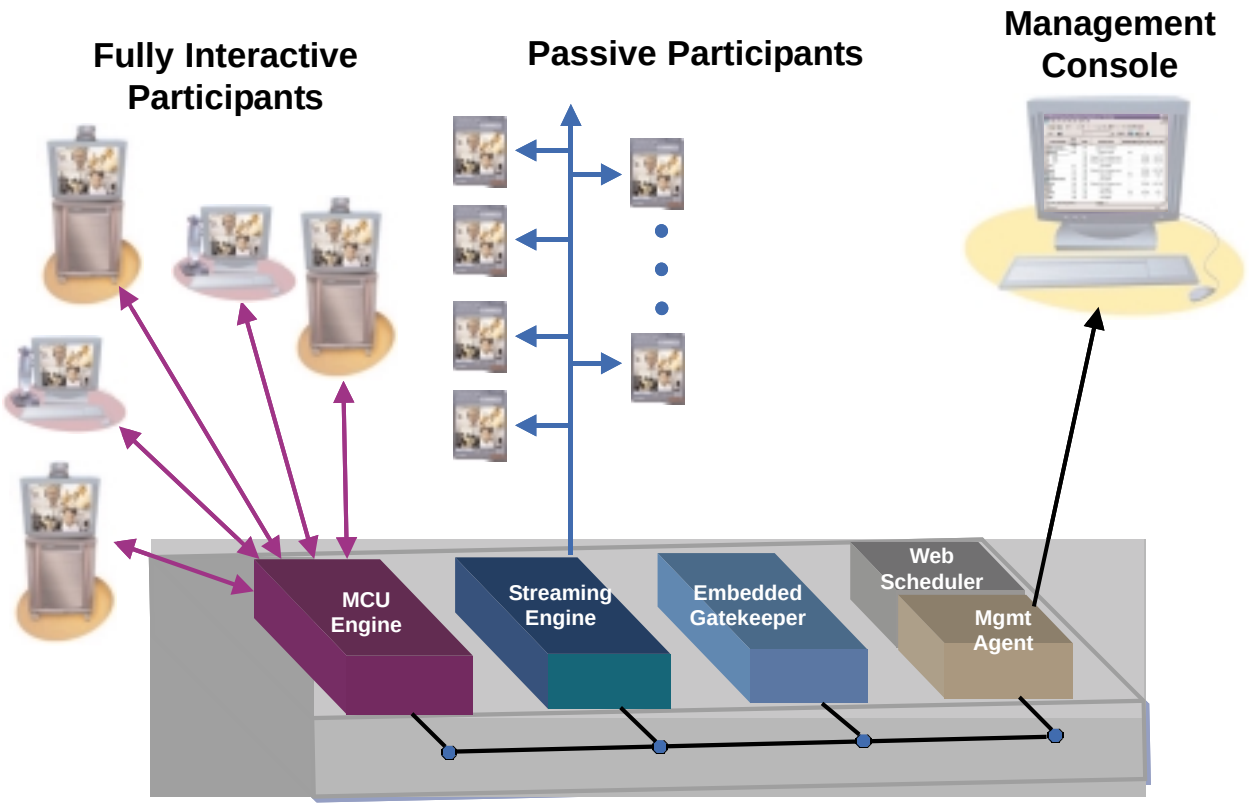
Like any network infrastructure device, centralized management by the network administration staff is critical. For an IP-based MCU device, management can be broken into three areas: session management, bandwidth management and user management.

- **Session Management** - As mentioned previously, there are numerous ways MCU sessions can be configured. Typically an MCU will have multiple sessions configured on the same physical device. While some of the configured sessions might remain unchanged, there are usually times when unique conference requirements dictate a custom configuration only for the duration of the conference. It is important that the network administrator is able to make such custom changes quickly and easily.

- **Bandwidth Management** - Due to the bandwidth demands associated with multipoint conferences, having embedded bandwidth management capabilities in the MCU device is especially valuable. There are two key types of bandwidth management: per user and per network zone. Both are commonly included as part of a standards-based logical entity called the H.323 Gatekeeper. Bandwidth limits that are set on a per user basis can be considered class-of-service policies. It might be that some users are allowed to conference at high data rates like 2Mbps while others are only allowed to conference at 128Kbps. Bandwidth limits set within the zone or between zones are to protect the LAN and/or WAN bandwidth consumption. Having an embedded gatekeeper as part of the MCU device can provide significant advantages, only some of which are related to bandwidth management.

- **User Management** - The needs and permissions of each video-enabled user on the network can easily be different. For example, it might not be desirable to allow all users to utilize the dial-in "meet me here" conferences configured on the MCU. Having a permission group for such services can be highly beneficial. Most user management functions are based on policy decisions that relate to business requirements. The implementation of such policies as it relates to use of the MCU should be easy to administer.

VCON VCB



The VCON Conference Bridge (VCB)

VCON's answer to multipoint conferencing is the VCON Conference Bridge (VCB). The VCB comes in two models, the VCB 2500 (a turnkey hardware solution) and a software-only VCB that can be purchased in conjunction with the VCON MXM, giving customers the flexibility to choose from a hardware or software solution. Both the hardware and software versions of the VCB offer the same rich feature set and same robust functionality.

Embedded inside each VCB is a multipoint conference engine, a streaming engine, an H.323 gatekeeper, a web-based scheduler, and a remote management and administration interface. Such an architecture allows complete flexibility in servicing multipoint conferencing needs of all types. From simple to complex, small to very large, fully interactive to a mixture of interactive and passive, the architecture of the VCB is ideally suited for virtually all conference types. And the remote management interface gives the administrators complete control no matter where they are.

The streaming engine inside the VCB allows any active conference to be simultaneously streamed using the IP multicast standard, which is extremely bandwidth efficient. The active conference being streamed can be configured for voice-activated switching or continuous presence. Users that wish to passively join live streamed conferences from the VCB can use a simple broadcast viewer that supports the IP multicast standard. And remember that via IP multicast, hundreds or thousands of users can simultaneously join into the session with no incremental impact on network bandwidth. VCON offers such a broadcast viewer at no charge (downloadable from the VCON website). The VCON Broadcast Viewer has an embedded content manager, which automatically detects active broadcasts and presents them to the user in a list that includes the name of the conference.

The H.323 gatekeeper embedded inside the VCB 2500 is based on VCON's award-winning Media Xchange Manager (MXM) technology. Combined with the remote management interface, administrators have access to a full suite of tools for conference session configuration, bandwidth management, policy services, dial plan administration, call status monitoring, and reporting/billing. Software VCB purchases must also include the VCON MXM.

The VCB 2500 includes the VCON Conference Moderator (this is an option with the software VCB), which combines web-based scheduling and multipoint session moderation for videoconferencing networks of any size. With easy scheduling in the hands of the user community, similar to the way other conferences and meeting rooms are scheduled, videoconferencing can be more easily integrated into the work schedule when calls start promptly and are pre-configured, including size, type and quality. When the conference time arrives, the VCON Conference Moderator will automatically connect participants across the network, whether it is a point-to-point or multipoint conference call.

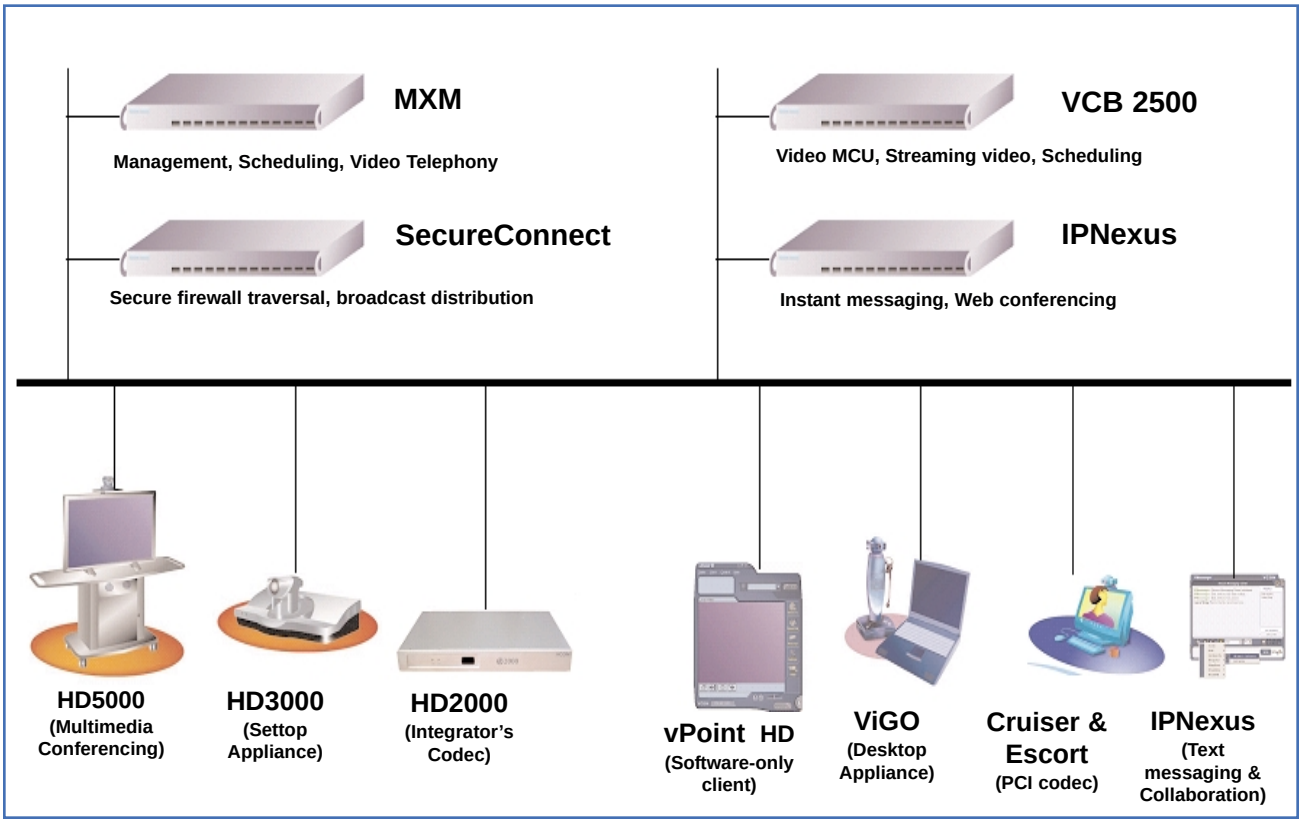
The web-based moderation feature of the VCON Conference Moderator enables the conference host to easily monitor and manage a multipoint conference session. The host can see a list of participants who have joined the conference and can add or remove participants during a conference. Through the Conference Moderator, the host of the call can configure the number of participants in the call, the audio algorithm, the conference data rate, whether the conference will be voice-switched or continuous presence, and the host can start and stop streaming of a VCB conference at any time.

The features of the VCB and VCB 2500 can be divided into “basic” and “advanced” features. Basic features are features that can be found on most MCUs, including MCUs embedded in endpoints, and advanced features are usually only found in stand-alone MCUs and usually come with an additional price tag. The VCB products include all of the features below t no extra charge.

Basic	**Advanced**
Voice-activated switching	Simultaneous streaming
Continuous presence	Sessions up to 64 participants
Narrow-band G.711 audio	Wide-band G.722 and G.722.1 audio
Dial-in or dial-out	G.723, G.728 audio
Up to 4Mbps data rate	Audio transcoding
Audio add-in	Mixed H.323 & SIP support
H.261, H.263 video support	Cascading
Embedded gatekeeper	Ad hoc conferencing (invite)
Remote management interface	Integrated QoS
Annex Q (FECC)	Firewall port range config
H.235 encryption	H.263+, H.263++, H.264 video support
H.239 video+data streams	Symmetric bandwidth for CP calls
	Speed matching
	Mode switching
	Web-based scheduling

The VCB offers investment protection in two key areas. First is scalability. Any VCB can be configured with as few as 8 ports, and can easily be expanded in 8-port increments up to a maximum of 64 ports without adding or replacing hardware/software modules. Individual conference sessions can be configured in any size up to all 64 ports. Additionally, the VCB comes with a one-year software subscription, which entitles the user to no-charge software upgrades for a one year period. That is true investment protection.

VCON's Solution Portfolio for Rich Media Conferencing



VCON's rich media conferencing solution is delivered via a client/server architecture, which dramatically decreases the total cost of ownership and allows unprecedented scalability and manageability. The desktop client applications are increasingly software-only. Such "thin" clients are easy to distribute, install, upgrade and maintain. The clients VCON offers are as follows:

- HD5000 — PC-based videoconferencing rollabout (conf room)
- HD3000/HD3000 LT — Settop videoconferencing appliance (conf room)
- vPoint HD — Software-based videoconferencing system
- ViGO™ — USB desktop videoconferencing appliance
- Broadcast Viewer — Multicast streaming viewer
- IPNexus — Instant messaging and collaboration client

Centralized on the server (or multiple networked servers) are VCON's management tools and advanced rich media applications. The management tools allow the administrator to centrally monitor and control all aspects of the rich media deployment. The applications are individually licensed based on the specific needs of the customer. This architecture allows smaller initial rollouts to a limited user base and a limited application set, while allowing very easy upgrades for more users and more applications. The server-based applications VCON offers are as follows:

- Media Xchange Manager™ — Management, Video PBX
- VCON Conference Bridge — Multipoint Videoconferencing, Streaming, Scheduling
- SecureConnect Family — Firewall/NAT Traversal and Encryption
- IPNexus Server — Instant Messaging, Collaboration

VCON is aggressively driving the market's shift from legacy videoconferencing to integrated rich media conferencing. Since our founding in 1994, VCON has been a regular innovator of new technologies. Doing this repeatedly requires far-reaching vision and a close touch with user needs and market shifts.

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