WHITEPAPER

Real World Options for Multipoint Videoconferencing

Your next video bridge might be in the cloud!

Ira M. Weinstein

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Introduction

The business world has changed dramatically during the last ten years. Business today moves at an incredibly fast pace, and decisions must be made in real time, so no matter where your people are, they must be available. Whether they're in their primary office, on the road, in a hotel, at a branch location, or working from home, your staff members must be accessible and productive.

This need for reachability has generated increased demand for enterprise collaboration tools and specifically videoconferencing. Moreover, the need for videoconferencing has expanded far beyond the executive boardroom and now extends to desktops and portable devices. In short, high impact communications is no longer a luxury – it is a business requirement.

This expansion of video beyond the meeting room has resulted in a number of significant changes including:

Result #1 – Increased videoconferencing Usage

As more people and places become video-enabled, more people use videoconferencing. Many organizations have documented videoconferencing usage increases of 50% or more in the last year alone!

Result #2 – Increased need for multipoint video calling

As the number of videoconferencing endpoints has grown, the need for video calls including three or more participants (called multipoint calls) has also grown significantly. In the legacy videoconferencing world, a typical video meeting might have included three meeting rooms. In the "video available all the time" world, a typical meeting is likely to include a few meeting rooms and an even larger number of personal users. This trend will continue as video proliferates further into the enterprise.

Result #3 – Increased need for interoperability

The liberation of videoconferencing from the meeting room has changed the rules behind video connectivity. We can no longer assume that all participants will be using similar systems on similar networks. One user might be using connecting from his UC client (e.g. Microsoft Lync) at his desk or with a group video system from an enterprise conference room, another might be using a public videoconferencing service (e.g. Skype, Google) from a laptop or tablet, while a third might be connecting over audio only. In many cases, users won't know which systems others will be using for a given video meeting or conference call. In fact, often a user won't know which system they will use until right before the call.

This white paper provides insight into the real-world options for multipoint videoconferencing in the "have it your way" collaboration environment.

Multipoint Videoconferencing Technical Fundamentals

Centralized vs. Decentralized Video Bridging

In a centralized video bridging architecture (below right), each participating video system sends a signal to and receives a signal from a device called a video bridge (a.k.a. a multipoint control unit or MCU). This hub and spoke arrangement is the way most multipoint video calls are hosted today.

In a decentralized video bridging architecture (below left), each participating video system sends a signal to each of the other participating video systems. In a decentralized architecture, no MCU is required, but the bandwidth and processing burden on each system increases as the number of systems grows.

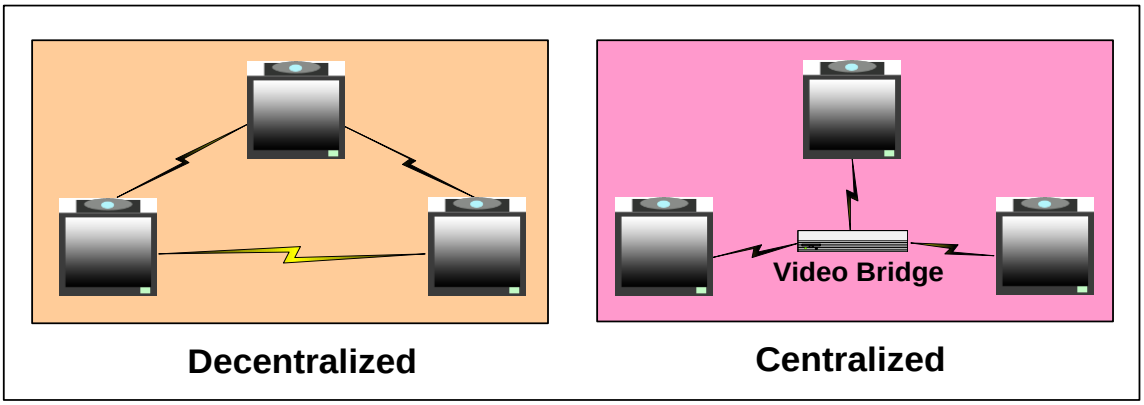

Figure 1: Video Bridging Architectures

Voice Activated Switched (VAS) vs. Transcoded Meetings

There are two kinds of multipoint video meetings; switched (or voice activated switching / VAS meetings) and transcoded meetings. In a switched meeting, the MCU switches the image of the currently speaking site to all sites. Most importantly, the MCU does not process the video signals at all.

In a transcoded meeting, the MCU receives (or decodes) the incoming signal from each participant, mixes the signals together, and then creates (or encodes) and sends a signal back to each participant. In this type of meeting, the MCU processes the video signals, and as a result can provide a signal optimized for each participating endpoint.

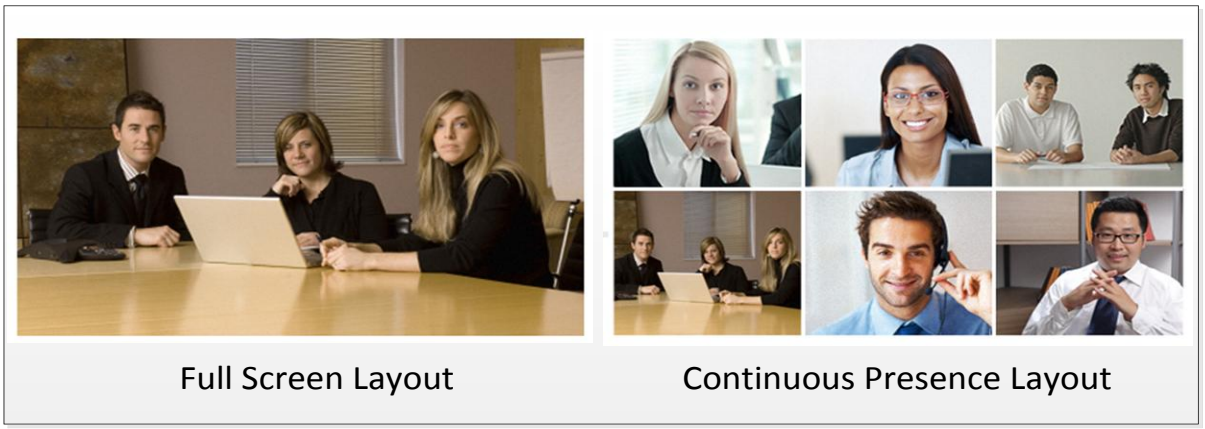

Figure 2: On-Screen Layout Options

Full Screen vs. Continuous Presence Layouts

As shown in the graphic above, a full screen layout displays a single participant at a time, while a continuous presence layout, which is sometimes referred to as CP, "Hollywood squares" or the "Brady Bunch" layout, shows multiple participating sites simultaneously.

The next section provides insight into the different ways to host multipoint video calls including buying and managing your own MCU and using the services of a hosted video bridging service provider.

Multipoint Bridging Options

For brevity's sake, we have included only the most important pros and cons of each option within this section.

On-Premise Bridging Solutions

A common way to host multipoint video meetings is to purchase, install, and manage your own video bridge. These bridges typically reside on the customer's premise and behind his network firewall.

Option 1 – Embedded Video Bridges

Video bridging capabilities are available as a software feature (often optional for an additional fee) within many group videoconferencing systems.

Key Advantages	Key Disadvantages
Cost effective Easy to use Easy to manage	Typically involves some up-front cost Limited capacity (4, 6, or max of 8 connections) Limited feature-set and performance Requires sufficient bandwidth to host all calls Not a shared resource (endpoint must be in call)

Sweet Spot – Cost-sensitive situations with only basic requirements where multipoint meetings typically include 3 - 4. Many organizations start out using embedded MCUs for their video bridging.

Option 2 – Stand-alone Hardware Video Bridge

These devices offer high capacity and strong performance, but involve a hefty up-front cost.

Key Advantages	Key Disadvantages
Available in various capacities (up to 100+ ports) Strong feature-set and performance May support calls between multiple networks	High up front cost ($2k to $10k+ per port) Quantized scalability (can't expand 1 port at a time) Requires sufficient bandwidth to host all calls Often involves a significant management burden Not always easy to use

Sweet Spot – Medium to large enterprises seeking to conduct calls with standards-based systems, having the resources / expertise to manage a bridge, and willing to pay up-front for high performance.

NOTE – End-users may choose to outsource MCU management (at an additional monthly cost).

Option 3 –Software Video Bridge

These systems are software-based solutions running on a vendor or customer-provided PC or server.

Key Advantages	Key Disadvantages
Lower price per port than hardware solutions Available in various capacities (up to ~ 20 ports) Solid feature-set and adequate performance	Involves up-front cost (less than hardware MCU) Low capacity (compared to hardware MCU) Requires sufficient bandwidth to host all calls Often involves a significant management burden Often involves a compromise in video/audio quality

Sweet spot – Cost-sensitive environments in which the capacity requirements are greater than available from embedded MCUs, but don't require the capacity or performance of a hardware video bridge.

Alternative Architectures

Method 1 – Media Routing

In this architecture, each system sends its signals to a centralized device (called a media router), which then switches the video signals to each of the other participating systems. Unlike a traditional voice activated switching (VAS) configuration, media routing architectures support CP layouts.

Key Advantages	Key Disadvantages
Low cost per multipoint connection May be able to operate over lossy networks May support the use of virtual servers May be available as a product or service	Requires a different encoding scheme Does not natively interoperate with standards-based video systems.

Sweet Spot – Environments in which the majority of video calling will be between other media-routing enabled systems.

Method 2 – Decentralized Architecture (a.k.a. Multi-Stream or Mesh Network)

In this architecture, each system provides a video signal to each of the other participating systems.

Key Advantages	Key Disadvantages
Eliminates the need for a centralized MCU Decreased cost and latency Allows system to optimize signals to each other	Processing power and bandwidth requirements increase as the number of participants increases Does not natively interoperate in multipoint mode with standards-based video systems.

Sweet Spot – Cost-sensitive environments with ample LAN / WAN bandwidth seeking to host multipoint video calls with a limited number of participants.

Hosted Video Bridging Services

This involves the use of bridging platforms owned, managed, and hosted by an external service provider. The use of a hosted bridging provider offers the following key advantages and disadvantages:

Key Advantages	Key Disadvantages
No up-front cost Provides access to industry-leading technology Provides strong multipoint performance Little or no management burden Decreased risk of technology obsolescence Less formidable BW requirements (vs. HW MCU) Well suited for B2B video calling Unlimited capacity (provider is responsible for ensuring that adequate ports are available)	Typically involves recurring or usage fees Involves the use of a shared bridging platform (may be a concern for some customers) Connection to service provider requires Internet bandwidth, dedicated links, or ISDN / PSTN NAT / firewall issues may need to be addressed

Type 1 – Providers Using 3rd Party Video Bridges

These providers offer services using 3rd party video bridges that they purchase, install, and manage. These offerings provide the pros and cons listed above, but also suffer from some additional limitations including:

- Majority of existing solutions today provide basic interop only (typically H.323 or SIP only)
- 100% dependency on the video bridge manufacturer to address problems, release bug fixes, etc.
- Limited ability to customize or control the solution (shared bridging hardware designed for use by a single enterprise)
- A range of issues related to the fact that the video bridges in use were designed to support a single enterprise and not a hosted service offering. Notable issues include:
    - Limited scalability (service providers require hundreds or thousands of ports)
    - Poor redundancy and load-balancing options

Sweet Spot – Enterprises seeking to conduct multipoint calls with standards-based video systems while avoiding CAPEX and the burden associated with managing video bridges.

Type 2 – Providers Leveraging their own Platforms

These companies offer hosted bridging services using their own technology / bridging platforms, which allows these providers to offer additional benefits and capabilities. Blue Jeans Network, the sponsor of this study, is an example of a hosted provider leveraging its own platform.

Solution Spotlight – Blue Jeans Network

The sponsor of this study, Blue Jeans Network, offers a hosted video bridging solution based on internally developed software running on industry-standard servers. Designed from the ground-up to support requirements of a video bridging service provider, the Blue Jeans solution offers the standard benefits of a hosted bridging service plus a range of additional benefits including:

- Enhanced Interoperability (Skype, Google+, Lync) – the ability to include Skype and Google users in meetings with standards-based room systems is a game changer. Users who previously had no choice but to dial-in on the telephone because they couldn't get to a video room or traverse their firewall can now use a free software client and "see" what they've been missing. Support for Skype and Google also enables on-the-fly, business to business (B2B) video calling.

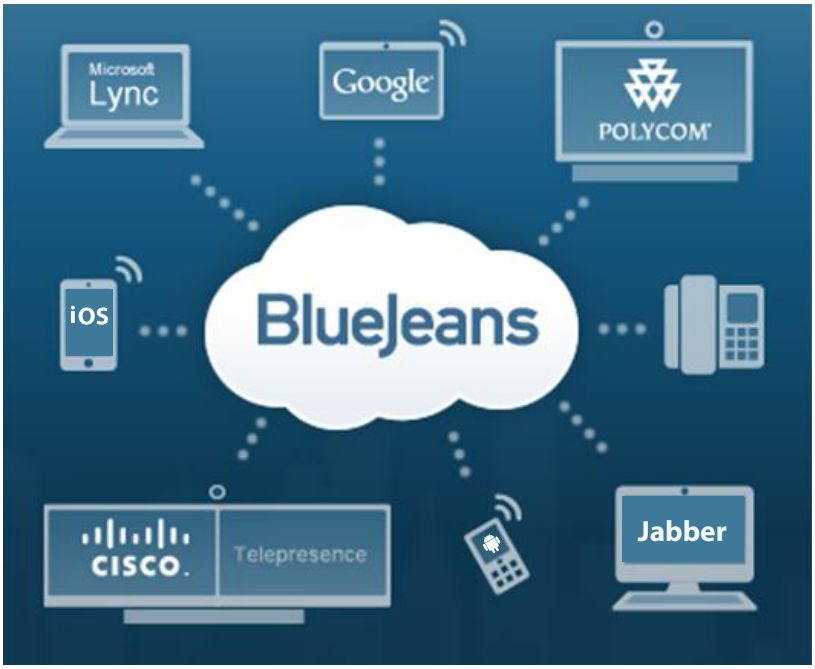

Figure 3: Blue Jeans Network - Interoperability Diagram

- Ease of Use and Access – Blue Jeans simplifies the "join a meeting" process by providing email invites including detailed instructions specific to each type of the connection. For example, in the email invite below, a Skype user can join the meeting by clicking on a URL.

- Faster Technology Advancement – unlike most bridging service providers who are dependent on 3rd parties for feature releases and bug fixes, Blue Jeans is both the platform developer and the service provider. As the platform developer, Blue Jeans can add new features in real time. As the service provider, Blue Jeans has a firsthand view of issues and problems and can deploy software enhancements and patches immediately. This provides end-users with faster access to new features and fixes.

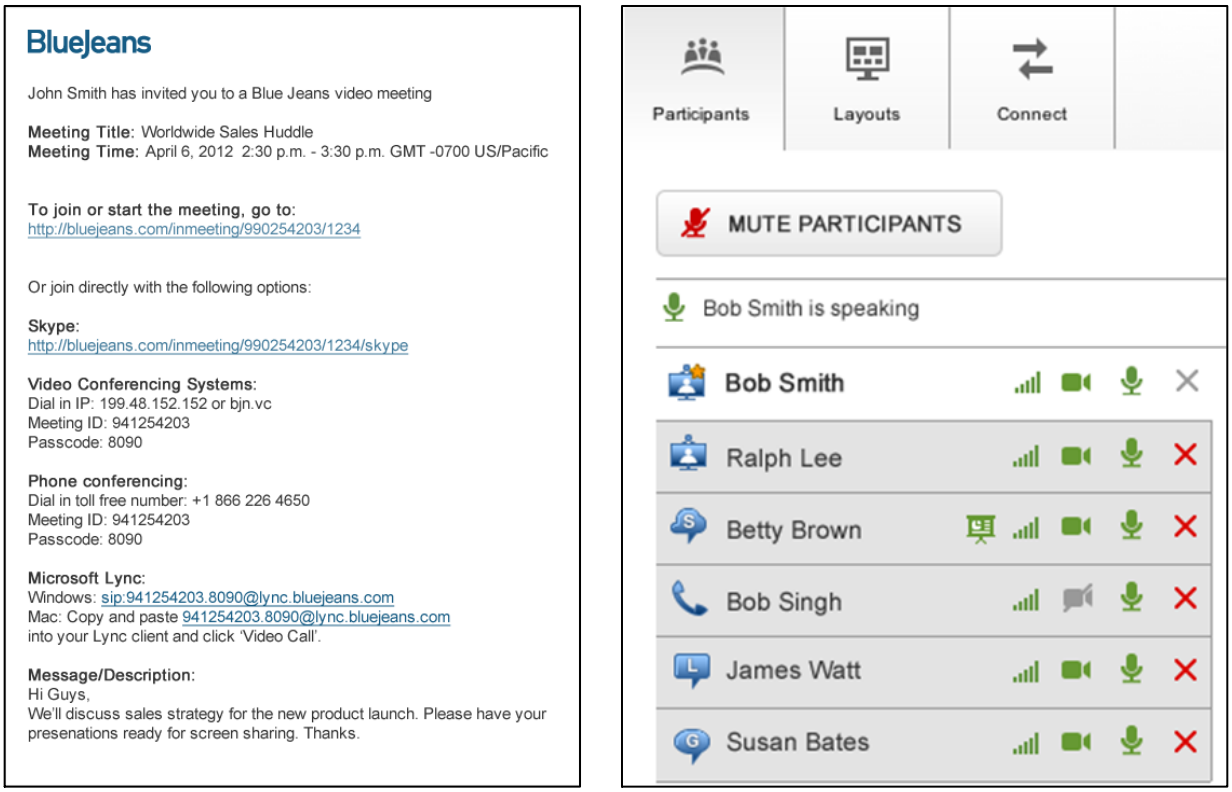

Figure 4: Blue Jeans Network - Email Invite (L) and Moderator Controls (R)

- **Expanded User Controls** –Blue Jeans's platform allows users to customize and control their video bridging experience. Meeting hosts can set their preferred language for the user interface, invite attendees, set meeting passwords, enable or disable entry tones, see a list of session participants, lock meetings, start and stop video, change layouts, and more via the web-based user interface (see screenshot above). Many of these features are also available to meeting participants. This is another element of "have it your way" video calling.

- **Low Cost** – The Blue Jeans platform was developed internally using standard software development tools and runs on standard PC hardware. This allows Blue Jeans to host its application in almost any co-location facility and avoid the costs associated with 3rd party hardware (MCUs, custom DSPs, specialized programmers, etc.). The example below compares the financials associated with the purchase of a hardware video bridge with the cost of utilizing the Blue Jeans service.

  Hardware MCU – Cost Calculation

  As shown, the monthly cost of ownership for a 24-port, HD-capable hardware MCU is approximately US $4,800. This calculation is based on an estimated cost per port of US $5,000[1], a 36 month depreciation period, and annual maintenance of 15%.

[1] Depending upon MCU vendor, model, configuration, and discounts, the end-user "street" price per HD720p port from leading vendors ranges from $4k to $10k or more.

IMPORTANT – The hardware MCU cost estimate used in this section specifically does NOT consider the cost of financing the initial investment, system installation and configuration, rack space and power / cooling, additional network bandwidth, administrator training, and support staff to manage the MCU. It also assumes that the 24-port capacity is sufficient to handle all of the end-user's multipoint calls, even during peak periods.

Total Number of Ports	24
Cost Per Port (US $)	5,000
Purchase Price	120,000
Product Lifespan (months)	36
Monthly Cost - Hardware (US $)	3,333
Maintenance	15%
Monthly Cost - Maintenance (US $)	1,500
Monthly Cost - Total (US $)	4,833

Figure 5: Monthly Cost Calculation - Hardware MCU

Blue Jeans Network – Cost Calculation

The table below highlights the monthly cost associated with using the Blue Jeans Network service. The monthly cost is based on the number of meeting rooms required, and each meeting room can support up to 25 participants. The cost figures assume that each video system / participant is able to reach the BJN service via the Internet without bandwidth upgrades.

Total # of Meeting Rooms	1	2	3	4	6	8
Max. # of Participants / Meeting Room	25	25	25	25	25	25
Total # of Ports	25	50	75	100	150	200
Monthly Cost (US $)	599	898	999	1,330	1,999	2,666
Break-Even - Hardware MCU vs. BJN (years)	Infinite	Infinite	Infinite	Infinite	20.0	8.6
Cumulative $ to BJN (over 3 years)	21,564	32,328	35,964	47,880	71,964	95,976
Cumulative $ for HW MCU (over 3 years)	174,000	174,000	174,000	174,000	174,000	174,000

Figure 6: Monthly Cost Calculation - Blue Jeans Network

Basic Cost / Break-Even Analysis

The monthly cost of the BJN service including four (4) meeting rooms is less than the maintenance cost of the MCU. In other words, the break-even period is infinite. Even with eight (8) BJN meeting rooms (offering a total of 200 ports vs. the hardware MCU's 24 ports), the break-even point is more than 8 years.

Organizations may enjoy significant savings by utilizing the Blue Jeans Network hosted bridging service instead of buying and managing a hardware video bridge / MCU.

The net is that organizations may enjoy significant savings by using BJN instead of buying a hardware video bridge.

Note that Blue Jeans Network also offers metered pricing (pay per minute of usage) and fixed pricing per port for unlimited usage.

Summary

The availability of videoconferencing in meeting rooms and on user's PCs, desk phones, tablets, and smartphones means that users can be video-capable no matter where they are. This has increased both the need for multipoint video calling, but also the required capabilities of video bridges.

Enterprises seeking to host high quality multipoint video calls have a choice to make – buy a video bridge, or use the services of an external hosted bridging service.

- The purchase option involves an up-front cost, either performance compromises (embedded bridges) or a significant management burden (dedicated video bridges), and the risk of technology obsolescence.
- The hosted bridging service option avoids the up-front cost, but involves recurring fees.

The desire to avoid capital investments has driven many organizations to use hosted bridging services. Traditional video bridging service providers use 3rd party video bridges as the foundation of their offerings. Unfortunately, these video bridges were not designed to power multi-customer, service offerings. As a result, these offerings suffer from cost and feature-related issues.

The sponsor of this white paper, Blue Jeans Network, offers a hosted video bridging service based on internally developed software running on industry-standard hardware. Since Blue Jeans Network is both the solution developer and the service provider offering the solution, the company can respond to issues quickly, add new features at any time, roll new versions quickly, and offer services at a lower cost than providers leveraging 3rd party hardware. This is similar to the model used by Google for its hosted applications, and it works very well.

There are some situations in which the use of an external bridging service may not be possible (e.g. classified Government communications). In general, however, enterprises seeking low-stress, cost-effective, and high performance video bridging should consider the use of a hosted video bridging service provider such as Blue Jeans.

About Wainhouse Research

Wainhouse Research, www.wainhouse.com, is an independent market research firm that focuses on critical issues in the Unified Communications and rich media conferencing fields, including applications like distance education and e-Learning. The company conducts multi-client and custom research studies, consults with end users on key implementation issues, publishes white papers and market statistics, and delivers public and private seminars as well as speaker presentations at industry group meetings. Wainhouse Research publishes a variety of reports that cover all aspects of rich media conferencing, and the free newsletter, *The Wainhouse Research Bulletin*.

About Blue Jeans Network

(copy provided by Blue Jeans Network)

At Blue Jeans Network, our mission is to make video communications as easy and pervasive as audio communications, enabling more effective collaboration at work, at home, and on the road. Our cloud-based conferencing service makes this possible by enabling customers to connect with each other seamlessly anytime, anywhere, and from practically any device. The Blue Jeans Network extends high quality video communications beyond the traditional boundaries of specialized conference rooms and into the mainstream, allowing individuals and employees throughout an enterprise to interact more effectively with each other, and with their customers, partners, suppliers, family, and friends. Blue Jeans Network is a private company headquartered in Mountain View, California. For more information, go to: http://bluejeans.com.