UC Video Platform for Ubiquitous Video Conferencing

When videoconferencing first became available over IP networks in the late 1990's, optimism was rampant for ubiquity of the technology from the home, the office, the road, and even over the phone. The development of the H.323 standard set opened the door for video conference over a world-wide interconnect and we were all sure that video would immediately be the wave of the future. However, from the actual end user's vantage point, the promise of video conferencing does not usually measure up to the premise. The simplicity of the dial-tone metaphor makes placing a conventional voice call second nature; the video conferencing value proposition should emulate this expected simplicity in the user experience. Rapid advances in protocols, devices, interfaces and network interoperability can not only drive down costs of provisioning video conferencing, but from the user's perspective, are enabling much simpler access and usability. This paper examines the past and current roadblocks to ubiquitous videoconferencing and shows how **Encore,** our internally-developed UC video platform, is the software technology that solves those issues.

The Roadblocks

The benefits of video conferencing are self evident – instant presence, improved communication and collaboration and in return, higher productivity. Fueled by the proliferation of smart phones and tablets, end users are conditioned to expect wide spread use of the technology. With robust demand, what has inhibited usage and broad adoption until now?

Ease of Use

The primary road block to the widespread utilization of video conferencing has been ease of use, i.e. the actual user experience which particularly in a corporate setting is a far cry from the simplicity espoused in advertising and the media. There are many factors involved in this issue, but the primary customer acceptance inhibitors are listed below:

a) Access

Access to a corporate video conferencing endpoint is still limited today. In order to carry out a video call the user must first locate an operational endpoint, schedule the endpoint and/or the room in which the endpoint resides, and then make sure the same access and scheduling is carried out on the receiving end of the conference. Compare this effort to simply placing a phone call to the other party and you can get a sense of the user's frustration level and tendency to avoid the process. In many companies, access is further gated by corporate policy and human scheduling.

b) System Setup

Every video codec on the market today has a different set of cables, connectors, inputs, outputs, and to compound matters, a multitude of confusing multi-button remote controls. If the system is not placed in a controlled and managed environment, the user must first engage the Audio Visual support team to make sure the endpoint is operational. This represents another ten to thirty minutes of heartache to have a simple meeting, not exactly the productivity booster the technology promised.

c) Placing a call

Assuming that the system is actually setup and operational, the user must now place a call to another endpoint capable of receiving the call. The user must know the IP address, E.164 number, or H323 ID of the far end he wishes to reach. Each manufacturer has attempted to overcome this issue with an assortment of local address books, corporate gatekeepers, / lookup services, globally accessible address books, etc. These solutions all assume that they are properly updated and maintained by a specialist, and they do not take into account calls to new locations. Also each endpoint has its own unique method for using these lists. This "walled garden" approach drives user frustration usually ending in a visceral reaction of "Can someone just please connect us?"

d) Reliability

In spite of significant research and development over the past decade, the user's perception of service reliability has not increased. Each failed or delayed call continues to fuel that perception... Again assuming that the system is properly setup, and someone has placed a call to the correct location, many other issues continue to bubble to the surface. Interoperability between different manufacturers endpoints, selection of encoding / decoding parameters, and even making an improper call speed choice can bring a call to a screeching halt. Imagine for a moment if telephone call required knowledge of the type of phone your call recipient was using, or if the call required advance knowledge and input of the speed and bandwidth availability of the network over which the call would be made.

Even if a good connection is obtained, the user is faced with a huge array of remote control buttons moving and selecting far and near camera sources, adjusting volume levels (input and out), and finding that long lost MUTE button which may be on the remote, on the touch panel, or on the mike system. A novice user again requires the support of a specialist to make it all work.

Processor power

In early development of videoconferencing, high speed processing was not available to the average user. Video Encoding required the use of Digital Signal Processing (DSP) technology available only to specialized devices and at high cost. Typical corporate customers could only afford to place such devices within limited conference room environments therefore limiting the use of video conferences to scheduled events and selected authorized users and placing a burden on the end user to pre-arrange all meetings with a support staff.

Network

Another major road block to the widespread utilization of video conferencing is the design and use of the network, specifically:

a) Bandwidth

The minimal bandwidth for an individual VC connection to be "business" useful is about 384k. During the early years of IP video, this bandwidth was rarely available outside of the local area network within an organization, and connections to the internet or intranet were usually 1 Mbit/s or lower. Even a modest multipoint video conference had the potential to bring down a company's infrastructure and / or interfere with primary services. IT organizations actively fought to limit video access to the minimal controllable sites.

b) Quality

IP Network Quality has been a problem for real time internet traffic from the beginning development of IP based video conferencing. A jittery network naturally results in a poor quality video call with variable delays and 'lossy' images. Network quality is closely associated with bandwidth limitations. As networks become over utilized, traffic congestion coupled with low throughput network equipment results in higher network jitter and more lost packets. Attempts to resolve network quality issues were incorporated into the initial H.323 standards (and later SIP and RTSP) by using the Real-time Transport Protocol (RTP) connectionless protocol and incorporating error correction in encoding schemes to compensate for lost packets.

c) Firewalls and Routing

Due to the choice of RTP as a solution to bandwidth and network quality issues, video over IP is more difficult to configure and secure within a network. RTP requires an availability of open ports through a corporate or home firewall and those ports are dynamically selected during the placement of a call. This dynamic allocation makes configuration and maintenance of a network firewall and/or router an IT intensive procedure, or requires opening up the network which naturally reduces overall network security. Solutions to these issues have included video aware routers and firewalls as well as video border control devices. These solutions tend to overcomplicate the network and result in more configuration failures as well as increased jitter due to packet inspection and/or rebroadcast.

Mobility

In the voice communication world, user can make or receive calls from anywhere in the world, regardless of equipment choice or location. In order for video to be broadly accepted and used, it must meet this high standard of simplicity and ubiquity. Unfortunately the cost prohibitive nature of the equipment, as well as the reliability of the network, requires the user to be at a known "supported" location in order to participate in a video conference. This degree of pre-planning and location restriction has traditionally made video conferencing an unattractive choice reserved mostly for highly structured communications.

Mesh Architectures

In the consumer and desktop market, meshed architectures using variable rate codecs have become a predominant solution. Meshed architectures allow for the media streams to travel directly from client to client without routing back to a centralized controller. This style of implementation reduces bandwidth requirements to the central location and limits the media path to the clients. In multipoint environments, however, a meshed architecture requires that each client send and receive streams from every other client participating in the call.

Overall network bandwidth requirements grow exponentially, quickly becoming unmanageable. The network bandwidth requirement to each participant also increases with each new participant eliminating the participation of low bandwidth users. In addition, a meshed architecture also requires that the user not only must open up firewall paths to a central location, but they must also ensure that each firewall path to every other connection must be open.

The Solutions

So far, we have explored in detail many of the inhibitors to widespread and routine adoption of video conferencing. Fortunately, these challenges are not only addressable but can be solved without complex integration services or 'forklifting' of existing investments.

Over the last decade, AGT has developed **Encore**, a platform that not only solves the technology challenges but also addresses the inherent soft factors including corporate security, mobility and device support that have impaired video conferencing usability and adoption. **Encore** not only eliminates many of the historical issues with legacy video conferencing technology but also helps organizations take advantage of new technologies and devices that can open up video conferencing to a much wider group of users.

Developed as a platform that can be co-located with your existing video infrastructure, Encore provides a path from legacy MCU ports to a scalable, on-prem software platform, and then eventually to the virtual cloud in the future.

So, let's review the challenges once again, and specifically show how **Encore** ensures that the user experience is both simple and productive.

Ease of Use

Encore addresses ease of use in various ways. However, the most important aspect of the **Encore™** solution is providing a single user interface and common user experience regardless of the end users equipment, location, or network environment.

a) Access

By providing interoperability of the various endpoints - desktop, smartphone, video, and telepresence, **Encore** allows the end user to select the equipment that is most convenient to use at any location. Support of all current Microsoft Windows Operating Systems as well as all current Apple Operating Systems gives the user the choice of technology for the desktop. In addition, interoperability with all manufacturers (Sony, Polycom, Cisco, Lifesize) of classic video endpoints provides a legacy and/or conference room user the ability to interact with any other user in a conference. With the recent incorporation of iOS devices (iPad, iPhone, iPod) in the PerfectMeetings Mobile App, the user now has access to the conference from anywhere in the world.

b) System Setup

Although **Encore** technology cannot improve on the difficulty of setup with individual classic video conferencing endpoints, the desktop Java client provides for operational video conferencing on any PC or Mac with a video camera and microphone. Auto detection of http proxy settings and open network ports provide for connectivity with no user setup. **Encore** does, however, provide optional user settings to adjust the environment if desired.

c) Placing a call

In order to eliminate user confusion when attempting to join or start a video meeting, **Encore** provides Meet-Me functionality that only requires knowledge of a single Domain Name System (DNS) address for access from a desktop and / or mobile client and provides a single IP Address or E.164 number for access from classic video conferencing systems. There is no necessity for address book maintenance or even H.323 gatekeeper lookup functionality when **Encore** is used as the meeting place.

d) Reliability

Reliability is perhaps the key to adoption of video conferencing. By interconnecting the **Encore** services with the open internet and providing connectivity as a basic cloud service, users will gain confidence that they can connect from any location at any time. **Encore's** Mobile Pathway Protocol encapsulates the broader RTP media protocol into a single, tunneled TCP connection using standard "open" ports. This ensures that classic network roadblocks such as firewalls and routers enable the communication to pass through. The

user can be confident that any network which allows outside connection to the web will also provide connectivity to the meeting, without compromising Enterprise security.

Processor power

Today's commercially available processors have the power and speed necessary to encode full motion video at 30 to 60 frames per second to the H.263 and H.264 standards, as well as newer available codec standards such as VP8. Even new mobile devices such as the iPad 2 and the iPhone 4 have enough power to support quality video encoding. This growth in processing power readily available to the end-user has resolved the issue of cost and device selection. **Encore** features compact client applications which take advantage of the client processor without bogging down the user's desktop.

Network

AGT has invested significantly in unburdening IT departments from end user network configuration requests needed for video meetings. **Encore** has eliminated the need for configuration of specific firewall settings or installation of unique network devices in order to allow the user to join video meetings, all of which are frustrating to end users. As consumers, many have already adopted video technology (Skype, FaceTime, etc.) on the open internet and do not understand why this simple availability of video conferencing services does not exist within their organization, or when visiting other organizations. **Encore's** exclusive Mobile Pathway Protocol makes media traffic appear to the network as any other web traffic by tunneling through one of a choice of TCP connections allowing the user to connect through Firewalls as well as HTTP Proxy devices.

a) Bandwidth

The good news about bandwidth availability is that it continues to grow as demand grows. In today's corporate environment it is common place for a single location to have 10 Mbits or greater connectivity available to the internet. This trend will continue to grow as costs continue to fall and demand grows. This growth has allowed the **Encore** Service to take advantage of the TCP protocol and its inherent reliability. Even today, mobile wireless bandwidth availability is becoming widespread. The adoption of 4G technology in the wireless space can only help the spread of video communication.

b) Quality

IP Network Quality is improving just as bandwidth availability is becoming widespread. In the early days of the Internet, packet loss of 5% and jitter of 50-100 ms were not uncommon. In today's Internet these numbers are considered unacceptable from the provider. Large packet loss and jitter are only seen in congested networks and their existence will continue to be reduced as available bandwidth and processing throughput of network equipment rises. Media streams no longer have to rely on RTP and lost packet recovery within encoders to assure accurate and timely delivery of the media to the far end. **Encore** has taken advantage of this leap of network capabilities by incorporating TCP and Secure Socket Layer (SSL) into its CET technology.

c) Firewalls and Routing

In the corporate environment, any system that requires reconfiguration, setup, or additional equipment in the embedded IT infrastructure will always be met with end user resistance. In addition, at a remote location, the user does not even have access to the IT department to help make those changes possible. **Encore's** exclusive Mobile Pathway protocol allows the end user to get connected "through" the corporate infrastructure without requiring IT support. In the home / small office and "on-the-road" environment, the user is no longer required to have a "smart" or RTP aware network interface, or configure personal internet connections. Use of CET also means that in the mobile world, the wireless service provider does not matter as long as the device has an IP connection.

Mobility

Encore's Mobile Pathway technology ensures that the user can tunnel through any corporate and public WAN network without having to worry about firewalls and router setups. **Encore** makes video conferencing available from the home, the hotel, the coffee shop wireless hotspot, as well as connected to a "visitor" protected wireless LAN within another corporate office. With the implementation of CET and VCAP on mobile devices, the user can now carry his videoconferencing equipment in his pocket from location to location.

Once your employees are videoconferencing-enabled even when they take their iPad or iPhone to another company's building or wi-fi location, they will be able to "virtually" add anybody back at the home office, as needed, in full interactive video. Sales, service, and learning departments are discovering ways to enhance their effectiveness using true video mobility.

Mesh Architectures

Although **Encore** easily supports two party video conferences, the technology is optimized for multipoint conferences. Since **Encore** does not use load intensive mesh architectures, each conference participant only requires connectivity back to a central location, which also means that each participant only requires the network bandwidth for a single set of media streams. The star architecture of **Encore** makes it possible for the service provider or corporate IT department to manage the bandwidth required for all connections. **Encore's** speed matching and transcoding capabilities ensure that participants may connect at their own media rate and uses the optimum codec for their equipment and bandwidth availability allowing interoperability between differing vendors and media standards.

In Summary

With the latest release of the **Encore** UC Video Platform**, Applied Global Technologies** has addressed the current roadblocks to ubiquitous video conferencing and meeting, and in the process has dramatically improved the user experience:

- The release of Mobile Pathway Protocol enables video users to confidently connect from anywhere at any time.
- The PIN-based architecture provides a simple and consistent entry point that users are familiar with from classic voice based telephone conferencing. It also eliminates the requirement for scheduled facilitated calling.
- The consistent user interface from desktops to mobile devices provides end users with a consistent connection experience.
- The star architecture of **Encore** makes high capacity multipoint video conferencing manageable and allows users with differing equipment, bandwidth, and capabilities to come together in a single meeting.
- The interoperability of devices from high end telepresence systems, legacy video systems, multiple types of desktop systems, and multiple mobile systems frees the user to choose device and location rather than being forced into a structured conference room.

At AGT, we believe that Encore allows video conferencing to follow the simplicity and accessibility of audio conferencing, user constraints. By combining existing legacy videoconferencing investments with broad availability of consumer-device endpoints and widespread mobile network availability, we anticipate dramatic increases in productive Enterprise usage and penetration of video conferencing.