

HUMANIZING ONLINE ED

Choosing a Video System & Implementing Engagement Strategies



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By George Lorenzo

Introduction

How to determine the best and most reliable options to consider when adopting a synchronous video conferencing service for teaching and learning in a fully online, blended or technology-enhanced course is not a simple task. An excursion into the world of video conferencing services and tools will take you down multiple paths with twists and turns that can get you lost and bewildered. Just getting a basic understanding of the technology and programming alone that drives synchronous video conferencing platforms requires a solid understanding of software engineering terminology and strategies. If you are not an IT person, it's easy to get confused when touring around the live video realm of educational technology.

The live online video world is at a stage of development right now that is akin to other major educational technologies that evolved over time and that we now take for granted. Synchronous video in online courses, although not a new technology, is in a rapidly developing technological developmental stage – similar to the “Internet of Things” – especially when you discuss conducting a course in which 20 or more remote students are simultaneously connecting through various browsers on a variety of operating systems with their laptops, desktops, tablets, and smartphones. Trying to obtain a high level of quality for a video event of this nature, where all in attendance can see and hear each other without packet loss, is not as simple and straight forward as it may seem upon first glance.

That's why we wrote this monograph: to educate educators about synchronous video.

The Tower of Babel Effect

The terminology related to live video conferencing and video chat in an online course has a Tower-of-Babel effect. You will see it referenced as rich media, web conferencing, social video, interactive video, synchronous technology, video discussion forums, video collaborations, Voice Over Internet Protocol, lecture capture, telepresence, multipoint video conferencing, unified communications or just plain online video. I think it should simply be called

live video discussion forums (LVDF), which is consistent with the terminology course management system's have historically used for dialogues that occur in online courses.

To make matters more confusing, when you talk to video technologists, it is hard to decipher a common language. They all have different ways to describe how this technology works and what you really need to know about it to help with your decision-making process. Trying to follow all the IT lingo related to codecs, architecture, APIs, platforms, plugins, clients, etc. is definitely a daunting task. Conversations about HTML5, WebRTC, Flash, V8, V9, H.323, H.264 SVC, SIP and more takes you more deeply into the Tower of Babel.

Nonetheless, the use of live video in online courses is an exciting educational technology. If utilized creatively and in a pedagogically sound manner, it can definitely make online teaching and learning environments much more human and less lonely. When everything is working right, students more easily feel that they are part of something that is ultra-modern and very cool just being in the environment watching and listening to each other and not necessarily actively participating. For that reason alone, it behooves educators to take a close look and figure out the best and most cost-effective solution that will work for their faculty members and online learners.

What We Cover

This monograph is a focused and unique approach to provide the most reliable and trustworthy information Real-timeOnlineEd (RTOE) could find about the service providers of synchronous video conferencing systems who have a serious interest and strategy to market and sell their products and services to higher education. In addition, it is an introduction to what you should understand about the technology that drives video conferencing systems, as well as an overview on implementation strategies when utilizing real-time video in a distance education environment. Overall, the primary goal is to really give you enough information to save you time and help you make a wise decision about what kind of video conferencing system you should adopt at your institution. For more information, also see the website that

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came out of all this work at <http://www.realtimeonlineed.com> that is in a continuous state of being updated with pertinent links to relevant and timely articles and reports on this topic.

About the Author

As an education researcher for more than 25 years, I have interviewed literally more than 2,000 educators about online education issues, trends, and strategies on numerous levels. From 2000 through 2009 I wrote and published an electronic, paid-subscription newsletter called Educational Pathways that covered numerous aspects of online higher education practices. Archives of this work are now available at no cost from <http://www.edpath.com/stories.htm>. All the writing, interviewing and research about online higher education, which I continue to do today, has given me a unique understanding of the perspectives of online instructors, administrators, course designers, students, information technologists and many of the vendors who sell their products and services to higher education.

Why Video Conferencing in Higher Education is Growing Quickly

I think it is easy to see that the time has come for widespread adoption of video technologies that allow everyone to effectively see, hear and collaborate with each other in these flexible teaching and learning environments. The cost of video has gone down tremendously through the relatively recent availability of new cloud-based video conferencing services that allow participants to see and hear each other from their desktop computers on home-based cable and DSL Internet connections. The technology has changed enough to enable remote students on different devices, computers, operating systems, and browsers to easily connect over smooth, uninterrupted video streams. Nonetheless, there are circumstances in which busy networks, old computers, computer illiteracy and users being unable to follow relatively simple directions can bring about poor video conferencing experiences. With the right preparation and attention to relatively simple details, however, such experiences can be totally eliminated.

“We are right in the middle of a boom in terms of the explosion of clients on mobile devices and phone and tablet solutions that are compatible,” says Ben Fineman, program manager, video services, Inter-

net2. “Today it is reasonable to expect that a student will have at least one device that is capable of video collaboration. Especially for schools offering more distance learning, I think it is rapidly going to become an essential attribute of any online course offering to be competitive. The addition of video to an online course delivery in real time adds so much to the experience both in terms of academic efficacy but also in terms of student satisfaction that I think within the next two to three years we are going to see an explosion of adoption of real-time video in distance learning applications.”

As noted by several industry veterans, video conferencing is becoming ubiquitous similar to how email eventually became ubiquitous in the middle to late 1990s.¹

RTOE discovered that there is enough evidence to unequivocally prove such viewpoints, so we will not belabor the point of video conferencing becoming ubiquitous in online education. However, there are a good number of requirements and limitations that you need to be aware of before you adopt a video conferencing system for your online course or program.

How This Monograph was Created and Why Some Vendors Were Profiled and Others Were Not

Finally, with regard to how this monograph was created, it is important to stipulate that the work I have done over the past two and a half decades has given me a certain amount of credibility in the higher education sector to a point where I typically can easily obtain interviews with information technologists, users, and company executives. All of the company representatives quoted here agreed to be interviewed, and some took longer to respond to interview requests than others. A good number of companies who can be considered important players in this field were not receptive to my requests to interview them. In addition, there were a small number of companies that we did not have the time to solicit for interviews. Hence, the information provided about their video conferencing systems is not as in-depth as their competitors who agreed to be interviewed, or they have not been included at all. RTOE did, however, manage to connect with more than 20 vendors to various degrees of substance. Of those contacts

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that we talked with, RTOE came up with the following list of video conferencing and web conferencing/lecture capture companies whom we consider to be viable options and education-friendly, depending on your circumstances, wants, and needs.

Video Conferencing Vendors:

Zoom, Vidyo, VSee, Polycom, LifeSize, FuzeBox, BlueJeans

Video Conferencing Vendors that Look Promising:
Acano and SeeVogh

Web Conferencing/Lecture Capture Vendors:

Adobe Connect, MediaSite, Panopto

RTOE asked most of the vendors to introduce us to some of their customers in higher education who use video conferencing, particularly in scenarios whereby students and faculty see, hear and collaborate effectively inside an online course in real time. These companies were able to connect RTOE to this kind of use base quite easily.

Some of the vendors also quite easily and quickly saw the value of being totally transparent and accommodating with helping our research by readily providing all the information requested. In effect, providing RTOE with good and reliable information gave them the opportunity to obtain substantial exposure to the educators who might consider purchasing their products and services. The logic of this is quite simple and easy to recognize. However, not every vendor we contacted managed to fulfill this request, even though some even promised to get back with us. For more information about this exercise, see the section titled “Those Who Did Not Make the Cut.” RTOE noted some of these experiences here because we think they are telling examples of a vendor’s veracity, trustworthiness, and reliability.

In various spots, I used the first person to describe my overall effort to produce this monograph. I feel strongly that writing in this manner allowed me to provide the most detailed information I could find about these vendors. Plus, this writing style enabled RTOE to provide a more personal and interesting account that is more telling and descriptive of these service providers in general. Some of the vendors in this space will not be entirely happy with how they were presented, and others will be very pleased and

should be proud of the services and products they are providing to higher education.

RTOE read everything we could find about synchronous video conferencing and cited what we thought to be the most useful and pertinent information concerning how to adopt this technology in an online higher education course. This exercise also became the basis for an in-depth articles and reports section inside the new RTOE portal, located at <http://www.realtimeonlineed.com/resources.html>.

In the end, it is RTOE’s hope that you get a fairly good idea of which companies you should consider for adopting synchronous video conferencing products and services in your online teaching and learning environments, as well as what you need to know to implement an effective and meaningful experience for both students and instructors.

Some Foundational Considerations

So, what’s first on the list of things to know? Number one, above and beyond anything else, don’t rely on what you see on vendor websites or even what they tell you when you talk with their sales reps. All the vendors in this space will sound great and work flawlessly on their website presentations. It’s not until you are in the trenches using this technology that you will come to realize that there are some major aspects of this technology that you need to consider and test out before you make any final decisions.

Envision your use-cases and be able to describe them to prospective vendors as clearly as possible. Then have vendors provide demos of how their features and functions might apply to those use cases. Also, try to have a system set up in which you can actually create your use cases before making a final decision. For example, try to create an online course in which you have a group of 20 students, all of whom are remote and using different devices and computers under different bandwidth constraints and browsers. Then hold a test video conferencing session with this group to see how everything works. This exercise alone will save you a lot of time as you discover which system works best under your specific use case(s). Later we go over some of the things you should put inside of an RFP or for a decision-making committee to consider when vetting prospective vendors.

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Understanding the New Technology

In addition to being able to clearly define a typical use case or cases, and then coming up with a way to replicate them when possible vendors demonstrate their products to you and your important constituents, you should have at least a basic understanding of the technology that is driving the development of new video conferencing systems in higher education today. This will help with increasing your ability to identify when and if a vendor overstates their capabilities, which, if you are an IT person who has attended vendor demos, is quite often common behavior.

So what do you really need to know about video conferencing technology? This is a broad question that can have an extraordinarily long-winded answer. However, RTOE has figured out how to narrow things down to only the must-know essentials unfettered by confusion-laced technical lingo.

Cloud-based Video Conferencing

Let's start with a basic understanding of cloud-based video conferencing solutions, which are trending very fast, with new service providers consistently entering the marketplace as many education customers move away from the historical and expensive room-based video conferencing and telepresence systems.

In particular, growth of cloud-base solutions is happening because of the ubiquity of smartphones and tablets that many of your online learners will use when they access an online course. Video conferences today need to be accessed through these devices, and the traditional room-based telepresence systems, such as Polycom, Cisco WebEx (Tandberg) and LifeSize, were not initially made for the mobile world we live in today, although, to remain competitive, they have recently introduced virtualized solutions that will enable online learners on mobile device endpoints to partake in video conferences that emanate from the historical room-based systems.

The rise of mobility can't be separated from the success of the cloud. The video conferencing industry started – and still largely exists – in established rooms that are purpose-built or customized for visual communications. The explosion of mobility means that there are

more people who want to participate from a wider variety of places. The idea is to integrate the established conference rooms with the broader world of mobile devices and services – including such consumer-oriented services as Skype – and package them together.²

A cloud service, which includes Software as a Service (SaaS), means that the vendor provides all the software and controls where the software, servers (hardware) and data reside. One of the many benefits of SaaS is that their applications are hosted centrally and software updates are continually released and implemented without your users having to reinstall anything. One of the liabilities is that all of your users' data are stored on their servers and hence could be accessed by unauthorized hackers.

If sensitive data is moving through the Internet between you and your end users during video conferencing sessions, then you will want to be particularly assured that the cloud service provider has, at the very least, the appropriate SSL implementation. Secure Sockets Layer (SSL) is a protocol that controls the security of transmissions over the Internet. Make sure you ask the vendors you are vetting about the security features of their software.

Since cloud providers manage the infrastructure of their own global networks and data centers, you will also want to be guaranteed of their ability to consistently upgrade their networks and centers in order to maintain reliable, high-speed, multi-point, one-to-many and many-to-many connections, especially if they are a company that is regularly adding on new customers who basically challenge their networks' capacity as they grow.

How are performance levels of your users monitored and analyzed? Do you have to go through the provider for important analytical information? Can you see through your own dashboard, for instance, diagnostics related to the specific strengths or weaknesses of your users' networks? Can you run bandwidth tests or latency tests? Can you see where delays at various endpoints might be occurring? Can your users run such tests before they enter or while engaged in a video conference? These are all factors related to the smoothness, or lack of smoothness, of your video conference end points, and your ability to detect where problems might occur.

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What kind of software development/software engineering staff do they have? This is still a developing sector from the software and standards side of things, with the successful players being those who have a history working in this industry, with talented and skilled software developers and engineers who have plenty of hands-on experience.

In addition, pay close attention, overall, to how transparent and forthcoming with information prospective vendors are when they describe how they meet security and reliability requirements in general. Be wary of vendors who frequently say that X, Y and/or Z is slated to come out in their next release by such and such date.

Customer service and technical support are also extremely important. Some cloud providers have regular meetings with their customers to discuss what they want and need. A service provider's receptiveness to education customer concerns and their response time and response effectiveness to such concerns are things you can usually get testimonials and references about from other education users.

Finally, some video conferencing services offer plans whereby they will provide their software to your IT department to load onto your hard data center or virtualized servers of choice and manage yourself accordingly. This is an entirely different situation that is not covered in real depth here.

Last but not least, when it comes to cloud services, be very wary of all these new live "video chat" companies that are popping up that offer their services for free. The old cliché of it's too good to be true applies here. For the most part, these companies do not have any of the features and functions you will need for a sophisticated online teaching and learning environment, and their video streaming quality will cause an enormous headache when you have courses with remote students on different networks.

Room-based Video Conferencing

The industry standard for many years, starting in the 1990s, has been room or premise-based systems in which the lecture space has been constructed with sophisticated podiums, high-definition monitors,

audio systems with top-notch speakers and microphones, tired rows of seating with microphones at each seat, lighting control systems and cameras located at multiple angles.

Lighting, in particular, can be a tricky aspect of video under any circumstance. For example, if your camera is aimed at a professor at a podium in the front of the room from a medium or long distance, the image can become too dark unless supplemental lighting is applied.

In addition to these sophisticated lecture rooms of varied shapes and sizes with all kinds of wonderful video and audio equipment to make video conferencing as close to reality as possible, companies like Polycom, Vaddio and VTEL also sell portable video conferencing carts on wheels, also called media carts and or audio/video carts, that can be easily transported into classrooms in order to allow you to share your face-based class sessions with remote students online (see Ottawa University/Zoom use case, for instance).

The front end components of any room-based system includes microphones, camera, displays and control systems. The back end components include processors (codecs and bridges), network providers, storage and streaming. The front end of a room-based system will essentially remain the same as video conferencing technology advances. The back end, however, is in a state of flux as the technology of video engines continues to change. If a room-based system is the way your institution needs to go, primarily because you will be sharing your face-based classes with remote online learners, then bear in mind the following basic advice:

Distance learning, streaming, recording, distribution via web links are all readily available technologies. The engines will change and grow but the consistency of the front-end classroom will remain the single most important piece of the solution. Carefully selecting quality front-end products will allow organizations to cost effectively reap the benefits of video communications for many years without the need to constantly change all aspects of technology as engines change.³

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IT Lingo Explained

As noted earlier, the IT lingo for video conferencing can be somewhat convoluted and not consistent among all the different vendors. In many ways I feel that it should be left to the IT professionals alone. During the many conversations I have had with vendors and users, I often felt confused and subsequently spent a good many hours reviewing definitions and reading the many points of views concerning the implementation of video conferencing. The question really becomes how much of the lingo should non-technical faculty, staff and administrator be aware of when these vendors and/or your professional IT staff communicate with you during the vetting process? The answer is “not much,” unless you are interested in becoming a video technologist.

Following is a short list of important definitions that should be helpful but not necessarily mandatory to know.

WebRTC (web-based real-time communications) is an open Application Programming Interface (an API specifies how software works together with other software) that enables browser-accessible, live video chat. It supports the Chrome, Firefox and Opera browsers and does not support the Internet Explorer (Microsoft) and Safari (Apple) browsers. It is currently in a limbo state with regard to becoming an open industry standard.

One term that you will hear frequently is **codec**, which is short for compression/decompression. Codecs (and there are many) basically make what are customarily large video files smaller and easier and much faster to transport over the Internet.

MCU is the acronym for multipoint control unit, which is the bridge for transporting video over the Internet that emanates from all the different attendees and presenters in a given meeting. MCUs have historically been expensive and relatively complex hardware-based infrastructures comprised of controllers and processors. Today there are cloud-based MCUs that are less expensive and may also be available as software that you can run on virtualized servers if you want to take that route.

MP3 is an audio compression format that is often confused with **MP4**, which is a media container format. MP3 pertains to audio only, while MP4 pertains to storing audio and video, including an audio file that may have been compressed into MP3.

H.323 is a protocol for ensuring real-time interoperability, compatibility and transfer of audio, video and data transmissions over the Internet. It became a standard in 1996.

H.264 is a codec that often has the acronym **SVC** alongside it, meaning scalable video coding. **H.264 SVC** enables multipoint video communications to scale or adapt to the endpoints during a meeting. So, for example, if an endpoint has low bandwidth, this particular codec will translate accordingly and reduce the frame rate or resolution of the video image so that the user at that particular endpoint gets the best experience possible.

SIP is the acronym for session initiation protocol. It deals primarily with how signals and calls are set up, processed and terminated.

VP7, VP8 and VP9 are video compression formats created by On2Technologies, which was acquired by Google in August 2009. VP9 is the latest iteration of what’s called Next Gen Open Video. It is a royalty free standard that addresses the efficiency and quality of video compression.

The use of the word **telepresence** typically means video conferencing conducted at the highest quality to give meeting participants the closest feeling possible of a virtual meeting being real, to a level where you feel like you could touch the person that you are actually communicating with on a screen.

Profiles and Use Cases in Reverse Alphabetical Order

What follows are profiles of vendors whom RTOE has vetted through extensive research and interviews with company executives. These vendors, except for those listed under the section titled “Those Who Did Not Make the Cut,” are, in RTOE’s opinion, serious contenders that you might want to consider purchasing.

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In addition to these profiles, there are use cases based on interviews with the actual users of these vendor products and services. Use cases are what the major players are accumulating as quickly as they can to show the higher education marketplace how they can fulfill multiple types of teaching and learning scenarios. These use cases are simply provided to give you a sense for which vendors have online higher education customers using their products and services. I added some personal comments as well. In the section, titled “Implementation Concerns,” RTOE provides advice about the best way to prepare and present video in your fully online, blended and technology-enhanced teaching and learning environments.

Zoom

Zoom is a young and growing cloud-service provider. Their tag line is “The Cloud Meeting Company.” The education sector is one of Zoom’s primary verticals, and they have been consistently building up their number of use cases in higher education since they launched in 2011.

Zoom is led by CEO Eric Yuan, formerly corporate vice president responsible for collaboration software development at Cisco. He also worked for WebEx before it was acquired by Cisco. “I personally worked on the first generation of WebEx software,” Yuan says, adding that the development of Zoom has been a very determined effort to build a new product from scratch with a team of experienced engineers that he recruited through his connections in the field. “Everyone on our team of engineers has at least 10 years’ experience,” he explains. “We support all browsers. We know that WebRTC is not a reliable technology because its video quality is not great. Plus, if it has a bug, you can’t fix it because you must wait until Google updates it. In addition, we are in a mobile era and our team is building our own video engine. We understand H.264, H.265, WebRTC, VP8, VP9, etc, and we leverage all the best parts of all those video engines and put them together into the Zoom video engine.”

Zoom requires that you download the Zoom client to your desktop. It is very easy and intuitive and has simple features and functions for holding conferences. With Zoom, you can hold a video conference with up to 100 participants, and 25 of those partici-

pants can be displayed inside a Brady Bunch gallery view in which they can see and hear each other via video chat simultaneously. Zoom utilizes voice activated switching (VAS) as opposed to continuous presence. So, if everyone has their microphones turned on and a function called “active speaker” is running in the background, whomever talks the loudest becomes spotlighted as the main speaker. If you run “spotlight speaker” in the background, the program puts up one speaker, i.e. the instructor, as the primary active speaker. All students will see and hear the instructor as the active speaker. All students are also muted at that time. Zoom has high quality desktop and mobile screen sharing and whiteboarding, as well as the capability to record conferences for viewing asynchronously. For security, it has SSL encryption.

Its pricing is very reasonable (see <http://zoom.us/pricing>). With a Zoom account, you can host a video conference, and those you invite into your conference do not need to also have an account, but the Zoom client will automatically be downloaded.

Zoom supports Windows, Mac, IOS and Android operating systems and browsers.

The capability to form breakout rooms where students can self-aggregate or be aggregated by the instructor into small private groups while the conference is live on the same screen is a function that was under development at press time. So far, at the time of this writing, no provider had this type of group-forming functionality, but we expect that to be a common feature in the future.

As noted by CrunchBase, Zoom has accumulated \$15.5 million in funding.⁴ Yuan says that he and his team have worked for two solid years “around the clock” to build the foundation of Zoom. “We are still not done yet because we are still working on the functionalities, but the foundation is solid” he adds.

Ottawa University

Zoom was more than happy to introduce RTOE to educators who are using their product on a regular basis. On their customer testimonial web page, brief quotes from users are provided by Florida State University, Nova Southeastern University, Ottawa University, Stanford Continuing Studies, and University

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of Northern Iowa. We talked with Director of IT Ken Corser from Ottawa University, among several other institutions that are using Zoom for a variety of courses. Everyone we talked with had very positive comments about Zoom.

Ottawa University is a relatively small private, non-profit, faith-based liberal arts college founded in 1865 and located in Ottawa, Kansas, with additional campuses in Arizona, Indiana and Wisconsin. It offers fully online undergraduate and graduate degree programs. Online courses are offered in 8-week sessions.

About 18 months ago, Ottawa University began an investigation to find a replacement solution for their relatively old Polycom carts that were limited to conferencing between two Polycom network sites as opposed to being capable of allowing remote students to take part in a conference from multiple network sites.

Corser felt that the solutions offered by Polycom and Cisco that he and others at Ottawa reviewed during a vetting process to find a new video conferencing system were “super expensive and out of the ball park in terms of cost.” His research concluded that there were three strong video conferencing companies to consider: BlueJeans, Vidyo, and Zoom. “I vetted all of them very systematically and strategically,” he says, adding that faculty and staff held pilot classes “to see how the student experience was. We collected surveys; we took our time; we did it appropriately because we did not want to make a rash decision.”

After deploying Zoom as a pilot over a two-week period, “the overwhelming response was this is what we wanted,” Corser says. “It really came down to ease of use and scalability – the fact that I could have it in the hands of one hundred people with a few clicks. Very few of the video systems we looked at, even the thousands-of-dollar systems, could keep up with Zoom.”

Ottawa’s distance education model entails having their traditional face-to-face classrooms shared with remote learners enrolled in their fully online programs, so they needed a portable room-based system similar to the Polycom carts they were using in the past. Zoom partners with VTEL Products Corpora-

tion for this kind of video conferencing, room-based hardware. Ottawa purchased several VTEL IPanels, which are units comprised of two 55 inch HDTVs, a portal stand with wheels, a pan-tilt camera so you can capture the entire room or the instructor alone, and an on-screen interface. Each class, in addition to the students physically in attendance, has no more than 15 remote students in attendance. The remote students see and hear the class in action and vice versa.

All online learning video conference sessions are streamed over a Video VLAN that Ottawa carved out for uninterrupted bandwidth operation. “It is optimized strictly for video. So if someone downloads a 300 meg Netflix video, for instance, it will not affect Zoom meetings because that will go over our data VLAN and not our Video VLAN,” Corser says. At any given time there are about six to eight courses on video conference going on concurrently with remote students. “We average about 32,000 minutes every 30 days aggregated across all meetings.” He adds that multiple video conferences running simultaneously have not caused any issues whatsoever. “It has been an unbelievable transformation for us over the past year and a half.”

Vidyo

Vidyo is six years older than Zoom, founded in 2005. It also has almost ten times as much money, with funding in the \$132 million range, and almost twice as many employees at 80. They are headquartered in Hackensack, NJ. ⁵ Vidyo is well known for its high definition video conferencing with H.264 Scalable Video Coding (SVC) technology along with the fact that they provide the WebRTC-oriented software that powers Google Hangouts and Google+.

Vidyo claims to provide telepresence-quality video conferencing services. Deployment options for Vidyo include any combination of on-premise, private cloud, and public cloud components.

In April 2013, Vidyo announced its entry into a partnership with Internet2 NET+. When a vendor enters into an agreement to offer its services to Internet2 members at a discounted rate, they are placed into an evaluation category called “service validation.” This process entails “working with university representatives in collaboration with the service provider to

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structure a common legal agreement, to understand the security and accessibility attributes of the service, to architect how the cloud service will connect to the Internet2 network, and to integrate with the federated identity services that our community uses,” explains Ben Fineman, program manager, video services, Internet2. “That process takes anywhere from three to six months generally – it is pretty in-depth. After they finish the service validation, they move into the early adopter phase. Early adopter is like being in beta. The service is now available for a university to buy, but it is understood that during this phase we are still going to be working out the bugs in terms of service delivery, in terms of the architecture and any issues that might come up.”

As of January 29, approximately nine months after announcing their service validation status, Vidyo was not yet listed on Internet2 NET + as an early adopter. Two other Vidyo competitors that are profiled in this monograph – BlueJeans and FuzeBox – have reached early adopter status with Internet2 under the category of Cloud Services & Applications. SeeVogh, also profiled here, is listed under service validation.⁶

A unique feature of Vidyo is that students connecting with smartphones and tablets can use native pinch-to-zoom and panning features to show both people and content in fine detail. Another useful and practical feature of Vidyo is that it adapts to end point networks that may have low bandwidth constraints by directing an optimized video stream to each conference attendee. In technical parlance, Vidyo utilizes the earlier-noted H.264 SVC standard packet-routing-oriented technology as opposed to transcoding. This feature definitely comes in handy when holding conferences with remote students who are often on relatively low-bandwidth connections and/or poor and noisy networks, which is one of the biggest challenges you will have to deal with when holding distance education courses with multiple students connecting from all over the world.

Using Vidyo requires an appliance, called VidyoRouter™, that can be a physical piece of hardware or installed as VMware. VidyoRouter™ is the main component of the system. There are additional components that come with deploying Vidyo (please see

<http://www.vidyo.com/products/deploy/> for more detailed information).

As noted on the Internet2 website, Vidyo delivers a smooth experience between all the major conference room types, as well as for participants joining from their laptop, desktop and mobile devices. Vidyo conferences can accommodate 150+ participants concurrently. The number of concurrent users able to participate in a live video chat in a gallery view varies depending on the endpoint device. In a lecture hall with remote students attending, Vidyo has a panorama view that provides up to six screens with eight people on each screen for a total of 48. Their audio is provided in the typically-preferred continuous presence modality. Vidyo supports encoding resolutions up to 1080p, and decoding up to 2880 x 1800 pixels, which is excellent. This provides ample screen real estate to show the expressions and body language of multiple participants at the same time, enabling rich and natural-feeling interaction.

Carnegie Mellon University and Northwestern University

The folks at Vidyo were also more than happy to introduce RTOE to some of their higher education users. We spoke with Northwestern University (NU) and Carnegie Mellon University (CMU). Associate Professor of Business Technologies and Director of CMU’s Tepper School of Business FlexMBA program, Robert Monroe, explains that students in the FlexMBA program, who are from all over the world, meet online once a week during the semester for a synchronous 75-minute class discussion using Vidyo. Each session is comprised of approximately 20 students who can all concurrently see and hear each other.

“Vidyo has been extremely robust,” Monroe claims. “We found the video quality to be excellent. You give up some of the fancy features (such as the many features and functions that a product like Adobe Connect has, for instance) to have that quality. The screen sharing is very good. The instructor can direct what appears in the shared screen space and pick whatever is on their computer to display, be it a PowerPoint, Excel spreadsheet, or whatever.”

Students in this program are provided with a more-than-adequate laptop as part of their tuition costs that

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is loaded with all the software they need. They are also advised to have a minimum of cable-modem-quality broadband Internet service. In addition, the students in this program are all information and computer literate, making many of the issues that some institutions must deal with, because of students being incapable from a broadband and computer-savvy perspective, non-existent.

Low Usage and Why

The picture is a little different at NU. Michael Curtis, manager of Academic & Research Technologies for the Northwestern University Information Technology department, says that although NU has a campus-wide license with Vidyo that includes an excellent section on the NU website that has all the information and guidance any faculty member or student needs (see <http://www.it.northwestern.edu/desktop-videoconference/index.html>) to get started, “there is a very small amount of desktop conferencing or online video conferencing happening where you have remote students connecting with faculty,” Curtis says.

He believes that part of the reason for low video conferencing adoption rates is due to the fact that, regardless of the ease of use to conduct a video conference, many instructors want video conferencing to be similar in its simplicity to communicating over a teleconference in which all you have to do is pick up the phone, dial a number and enter a passcode to be connected to remote students. He adds that the current and future generation of students are growing up with technology that just works. “They do not have to figure out how it works. And if something does not work (with one click, for example), they will not bother with it.”

“In a one-to-one environment, it’s easy,” Curtis continues. “But any time you get a group, when they want to have four or five sites in a video conference, it becomes an event, and you have to coordinate with all the technical staff and all the different sites. It is no longer just a video conference. It is a production event. Yes, you can absolutely send out links. You could easily have people join into a video conference without them having an account, but most of our faculty members will not do it.”

Curtis further explains that getting faculty members to adopt video conferencing requires building their confidence, which also requires them to invest time into understanding how everything works. However, “if there is a three-minute delay, they are not happy,” he says. “It has to be perfect every time. It must be part of their morning ritual, so to speak. It has to be that ingrained in what they are doing. Young faculty are willing to experiment with it, and we advise them to have backup, alternative options in place (such as a phone conferencing option) in case they run into any technical issues.”

Overall “it is frustrating because we know it works just fine,” Curtis says. “We use it almost every day (internally). In the four and a half years that we have had Vidyo on campus, we probably have had less than 40 calls for problems, and those are usually something to do with their accounts, such as ‘I can’t login’ or something dealing with their ID.”

VSee and the Ease-of-Use Factor

Video conferencing ease of use is an obvious and important factor to take under consideration when trying to figure out which system to adopt at your institution. This is where a company called VSee wins hands-down, in my opinion. This tool, unfortunately, is not for large remote groups. However, if you have eight or less remote students all in different locations in a meeting, then you might want to consider using VSee for its ease-of-use as well as for all its progressive and highly useful features and functions. Plus, if you and all your students have .edu email extensions, you get to use it for free.

The affable, passionate, intelligent, and altruistic VSee CEO Milton Chen has an impressive work ethic and authentic aura and vibe that, in my opinion, other CEOs should emulate. His blog, for instance, is loaded with valuable information and honest opinions.⁷ His website includes links to many of his competitors, and he is quick to tell you to try them out before making a decision as to whether or not to adopt VSee. In September 2012, VSee was the official People’s Choice winner of the ATA Telemedicine Video Contest, out of 79 video submissions.

When we interviewed Chen, he was getting ready for a trip to a Syrian refugee camp where, from a small, make-shift cabin, he and a small medical out-

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reach team set up a telemedicine station and operating table with a microscope to perform ear, nose, and throat surgeries while also conducting telemedicine eye exams to a long line of refugee patients.⁸

The healthcare industry is VSee's primary business vertical. Because of that, VSee has a very secure architecture in order to comply with HIPAA rules and regulations, for instance. Chen touts VSee's end-to-end encryption as the top-of-the-line insurance for having private, confidential and off-the-record video conferences as opposed to many video conferencing vendors who typically have full access to your video streams on their servers.

VSee's primary backers are salesforce.com and the National Science Foundation. The company is about three years old, based in Sunnyvale, Ca. with 30 employees, many of whom are telecommuters who work from home. Chen says that one quarter of the staff previously worked in refugee camps in Africa and the Middle East. "These are programmers and designers who are technically strong while at the same time they will go on an airplane to Africa," he says. "We want to build a product that can touch many peoples' lives."

Chen earned his PhD at Stanford University on the human factors and design of video collaboration, so he is passionate about ease-of-use issues, and it shows in his product. The many one-click and drag functions for sharing and annotating information and presentations, for instance, are very impressive and unique in the industry. Chen's Ph.D. dissertation, published in 2003, was titled "Conveying Conversational Cues through Video."⁹

Florida Institute of Technology

Chen connected us to Joshua Pritchard, assistant professor, School of Behavior Analysis, Florida Institute of Technology. Pritchard had been using VSee for one-to-one advising services for graduate students who were preparing for their certification exams after they have earned a master's degree in Applied Behavior Analysis. His department was getting ready to increase their usage of VSee to include live video communications with interning students who are out working in the field at various medical centers or at the homes of their young patients. These students were being set up with Looxcie wearable

cameras that connect to their iPhones. The Looxcie camera is an unobtrusive Bluetooth-like device that you wear on your ear. As the interns work with young patients, they are able to have a professor see and hear everything they are doing and provide live, on-the-spot advice through their VSee connections.

Pritchard said that what initially attracted him to VSee was the capability of their technology to work well under low bandwidth conditions. "I started using it in my private practice, where I have people that I work with who are located in South Africa," he says. "Skype would not work under their bandwidth conditions." VSee, on the other hand, has very high quality video under the same circumstances. "I was impressed with that," he says. He also commented on the ease of use and that VSee has what he calls "a low-intrusion graphical interface that made me feel more like I was actually with the person I was communicating with" as opposed to seeing a screen with company branding information and other clunky video-calling graphics. Finally, "I also liked that it was free. I never felt – when I interacted with them (VSee support staff) – that this was a big for-profit game. It felt more like 'hey, how can we help the world connect better.' I think that is much different than any of the others I have used."

Polycom

Polycom is one of two video conferencing infrastructure and equipment providers profiled in this monograph that sells room- and cart-based systems to the education sector. The other one is LifeSize. I did not include the other large provider customarily listed in this category, Cisco's WebEx, which acquired Tandberg in 2010, because I was unable to connect with them after numerous attempts. In my personal opinion, this is negative signal and frankly forces me to place WebEx into an undesirable category. I also talked with several high-level, former Cisco/Tandberg employees who are now either working for other video conferencing companies or have started new video conferencing businesses themselves, such as Pexip and Acano, who have been coined as being part of an "ex-Tandberg gang" by Wainhouse Research.¹⁰

Polycom is in a different league than all of the others profiled here. It was founded in 1990 and has 3,800 employees. For its 2013 fourth quarter alone it had \$348 million in revenue.¹¹

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When I filled out an online form to get a demo of their cloud services, in particular, I got a call from a monotonal representative who point-blank asked me if I was in the market to buy. I explained that I was writing this monograph for educators and wanted to get a demo of their cloud-based services. He said he would get back with me, but he never did. I could have gone through Polycom's PR representative and gotten a demo, but I wanted to see what would happen if I requested it on my own through their website. It amazes me how large companies, in particular, whom you would think have a fairly good sense about these kinds of things, could be so clueless.

Several IT people told me that Polycom's prices are too high. The impression I have been getting repeatedly is that the newer cloud-based services that have entered the marketplace in the past five years are much more financially feasible for educators to consider, as already noted by Ottawa University. But, of course, if you are sharing a traditional on-ground class with remote online learners, you are more than likely going to want to have a top-notch cart or room-based system to look your very best, and a Polycom system could be your answer. However, if you are only concerned about having your remote students be able to see and hear each other and you on their desktops, and the students sitting in your classroom don't need to see and hear the remote students, then all you really need is an Internet connection and a decent web-cam and microphone on your computer.

One of the enormously important benefits of going with Polycom is its audio quality. I also asked Polycom what the maximum number of users is that you can see and hear simultaneously? Their response was "you could have thousands or potentially millions of folks on a call if you have the network to support it. If you had that many folks on one call, you'd just have to manage the video layout."

Highest Quality Audio at the Manhattan School of Music

Christianne Orto, dean for distance learning and recording arts at the Manhattan School of Music, has had a long relationship with Polycom dating back to the mid 1990s. "It is our bread and butter, and the reason why we use Polycom solutions is primar-

ily for its high quality audio," she says. "We are a music school – a performance school – and sound is of paramount concern."

Orto was referring to Polycom's partnership with the Manhattan School to co-develop an audio codec called "Music Mode," which supports the ultimate in quality sound in support of music performances and instruction over high-speed Internet connections.

"Music Mode basically optimizes their audio codec for live music and acoustic sound," notes Orto, adding that she believes the Manhattan School is the first conservatory in the U.S. to use synchronous video teaching and learning methods in their blended-learning courses. It started in 1996 with one of their many world-recognized faculty members, violinist Pinchus Zukerman, who, because of his demanding touring and concert schedule, wanted to incorporate high quality synchronous video into the courses he taught so he could clearly hear and instruct his students over video conferencing while on the road. After piloting and proving how well it worked for Zukerman, Music Mode video conferencing has been incorporated throughout the Manhattan School's many different courses and programs.

"We also export content and programs to schools and colleges around the country and around the world," Orto explains. "We deliver about 2,000 programs a year. We bring in remote (guest) educators as well as faculty and students from our campus (over a Polycom video conference), and we reach out to people around the world through these programs."

For a technical perspective, Polycom published an informative whitepaper in 2011, titled "Music Performance and Instruction over High-Speed Networks," that explains how "key acoustic technologies, including Automatic Gain Control, Automatic Noise Suppression, Noise Fill, and Acoustic Echo Cancellation," help to guarantee true music reproduction in a video conference.¹²

Polycom's Cloudiness

Polycom has a large number of products and services that made it difficult for me to figure out what educator's should really know about them. In addition, you must go through one of their partners in order to purchase any of their products and services.

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In early 2012, Polycom launched its cloud offering, called RealPresence. However, the more I read about their cloud offering, the more I became confused. For instance, a trusted consultant explained to me that for Polycom's cloud services to talk with a Skype user, for instance, you would need to have Polycom hardware or load specific software onto virtualized servers, which is basically a physical piece of hardware that has been divided up into multiple isolated virtual environments. This is different than the SaaS cloud-based services discussed earlier. To try to clear this up in my mostly non-technical mind, I asked Polycom via email the following question: "Is there some hardware/boxes/MCUs that need to be incorporated into your purchase in order to make interoperability feasible?" Their response (verbatim) was: "No specific hardware needed. The hardware isn't the piece that provides interoperability. It's the way we've architected our software solution that provides interoperability with UC applications, standards and protocols (we can ship our sw out on standard x86 servers.) We provide native integration so IT users and end users don't even have to think about what protocol they're using, what protocol their devices support – it just works."

Unfortunately that answer made me even more confused.

In addition, it is hard to figure out what Polycom's pricing models are. When I asked about pricing, they responded with: "We do not have specifics on pricing because the pricing varies depending on Polycom's partner who sold it, products and services the customer bought and the size of the deployment."

Between Polycom and LifeSize, profiled next, I came away more confused than anything else. This does not mean that both are not viable vendors to consider. Both are definitely important players and companies that educators should strongly consider for building out their video conferencing systems, as are the others profiled here.

One thing that Polycom has done that I think is very useful, for instance, is publish a helpful and interesting "Guide to Collaborating Across Borders" that features tips for video conferencing with Australians, Europeans from many different countries, the Chinese, Indians, Russians and Singaporeans.¹³

LifeSize

LifeSize started in 2003 under a different name (KMV Technologies) until 2005 and became a division of Logitech in 2009. Its main office is in Austin, Texas, with regional offices in Germany and Singapore. LifeSize has raised \$42.5 million in funding and has more than 500 employees.¹⁴ LifeSize sells high definition endpoints and accessories, NAT\ firewall traversal, audio phones, ISDN gateways, Multipoint Control Units and management systems, mobile video conferencing software, and a cloud-based solution called LifeSize Connections through its more than 1,500 partners.

We interviewed Simon Dudley, the company's official "Video Evangelist." We did not ask to be connected with any higher education use cases, like we did with most of the other vendors we profiled. Dudley made it clear that LifeSize is not a service provider but instead provides equipment to video conferencing service providers or the technology for video conferencing systems that a college or university might want to implement themselves. "I would argue that any professional-grade video conferencing system will allow you to do good quality video," Dudley says.

LifeSize supports up to 49 attendees in a video conferencing live chat simultaneously. For schools that have the Blackboard Learn course management system, LifeSize offers integration through a plug-in.

FuzeBox

FuzeBox is another relatively young and successful cloud-based service. FuzeBox was founded in 2009 and is headquartered in San Francisco. Its CrunchBase profile shows that it has \$46 million in funding.¹⁵ Inc. Magazine recognized FuzeBox at #125 on the 2013 Inc. 5000 list of the fastest growing private companies in the United States and #12 in the San Francisco Bay Area.¹⁶ In addition, they were the first video conferencing vendor to achieve Internet2 NET+ Early Adopter status.¹⁷

FuzeBox provides an audio bridge and a video gateway for interoperability with Polycom, LifeSize and Cisco. You can have up to 125 participants in FuzeBox but only 12 simultaneous video feeds in a gallery display where everyone can see and hear each other in a live video chat, as opposed to 25 that

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you can have with BlueJeans and Zoom, 49 with LifeSize and Vidyo and unlimited with Polycom.

Like all the other major players, FuzeBox utilizes the H.264 SVC codec for managing the way video transmits across all the various endpoints in a meeting. The FuzeBox client adapts to its users. “We can monitor what is happening on a call,” says Kevin Young, FuzeBox’s senior director of communications. “We can see if you are receiving packet loss and automatically adjust some of the different levels to give you a better experience, whether it is lowering the frame rate or lowering the resolution. We try to give you the best experience based on the actual network conditions you have at the time. We are able to balance both the video and audio data capabilities.”

Saint Louis University

Saint Louis University (SLU) has a campus-wide license with FuzeBox. There is a very professional and creative promotional video about their adoption posted on the FuzeBox blog at <http://blog.fuzebox.com/saint-louis-university-sharing-knowledge-and-the-university-through-fuze/>. For an overview of how SLU has been introducing and supporting FuzeBox usage across campus, see <http://www.slu.edu/x70841.xml>.

We talked to Kyle Collins, director of Academic Technologies, regarding how SLU came to adopt FuzeBox about a year and a half ago and how things have been working out overall. Through FuzeBox, for instance, SLU’s on-ground Doctor of Philosophy in Nursing program now accepts new students at a distance every semester. So, courses in this particular program are now successfully being held in a room-based video conference environment with both remote and on-ground students in attendance, all seeing and hearing each other in high definition.

Collins explains how an advisory committee was formed to examine what was needed in a video conferencing system as well as which vendors they would invite to campus to provide demonstrations to faculty, deans and other college administrators and staff. “We went to every vendor we could find,” he says. “At the time there were probably 15, and we got good responses from only a couple of them.” The entire committee meeting process entailed

coming up with a strong list of every required and optional product and service feature and functionality that the committee could jointly come up with. A fit gap analysis was then drawn up that was essentially a spread sheet of all the features each vendor had or was missing. From that, four finalists came to the forefront.

Collins notes that during this process it was determined that having a video conferencing system that would integrate with their Blackboard course management system was not as critical of a feature as they had initially thought.

“When Fuze came on campus, they just blew everybody away,” Collins claims. “Their mobile platform was unbelievable. It was better than most that were non-existent at the time. They smoked everybody on the mobile platform hands down.”

Since adopting FuzeBox 18 months ago, SLU has gone from a pilot with 100 licenses to more than 1,000 students, faculty and staff signing up for accounts. In addition, FuzeBox has given the school the ability to now offer a degree in art history at its Madrid, Spain campus, with a few courses conducted online the are held from the SLU main U.S. campus by a local faculty member. These were courses needed to round out the program and be able to offer it in Madrid. In addition, SLU’s School of Public Health has an emergency management program that now brings in guest speakers from national emergency-related organizations over FuzeBox video conferencing. “It’s all very exciting,” Collins says. “We have lots of use cases that tend to be very creative.”

Of course, with any adoption of video conferencing, the best way to conduct a successful meeting is to be prepared prior to logging on. The SLU Academic Technologies department has that covered on their website by offering training, testing, and preparation for a variety of users’ needs. As noted below, this is a good example of what kind of training and support services any institution should have ready to go when introducing video conferencing to its faculty, staff and students:

- **Quick Start Guides:** For prospective users who want to host a meeting in a hurry.

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- **On-Demand Tutorials:** For prospective users to view at their own pace, 20-minute tutorials for PC, Mac, tablet, and mobile device users.
- **Live Meetings:** Fuze Trainers are available on a regular daily basis.
- **Recorded Training Session:** Recorded demonstrations from the SLU Fuze Training team.

Collins also explains that FuzeBox has always been very receptive to making adjustments and adding on any new features and functions to its products and services through regular meetings with the SLU staff, currently being held on a bi-weekly basis. For example, recent communications with FuzeBox executives has resulted in the company actively working on enhancements to its administrative dashboard that would allow people like Collins and his staff to have more user-data analytics at their fingertips as opposed to having to go through FuzeBox for such information. For information about the cost of having FuzeBox on your campus, which is based on FTE counts, see the Internet2 Net+ website, where pricing for both members and non-members is listed at <http://www.internet2.edu/products-services/cloud-services-applications/fuze/fuze-fees/>.

BlueJeans

BlueJeans was founded in 2009 and is headquartered in Mountain View, CA. Its CrunchBase profile shows that it has 200 employees and \$98.5 million in funding, with \$50 million of Series D funding raised in September 2013.¹⁸ Wainhouse Research's September 25, 2013 bulletin noted that the recent investment in BlueJeans was an indicator of how it is "subtly morphing from a video bridging service with top notch interoperability to a full collaboration service with voice, video, chat and data conferencing." In addition, it was noted that BlueJeans had quickly grown to 2,000 paying business customers with 3 million meeting participants.¹⁹ Plus, similar to FuzeBox, BlueJeans gained Internet Net+ early adopter status.

Interoperability Factors

BlueJeans is basically a cloud-based bridging service, or what some people call an "MCU in the Sky." Its hosted software and hardware enable interoperability between multiple and different kinds of endpoints, which simply means that it allows everyone to join in a conference from a room, a tablet, a smartphone, a desktop computer, a laptop – pretty much anywhere there is an Internet connection. As noted on the BlueJeans website, under the heading "Multi-Vendor, Multi-Device Interoperability":

All parties can easily connect to the same BlueJeans meeting using their platform of choice. So whether you use Cisco, Polycom, LifeSize, Microsoft Lync, or Google Video Chat—to name a few—you can easily collaborate with co-workers, customers and partners. You can even connect through your browser or mobile device.²⁰

To further elaborate this point, Alagu Periyannan, BlueJeans co-founder and chief technology officer, wrote the following in a March 28, 2012 blog post titled "The Mechanics of the MCU Alternative":

We could never have achieved the kind of widespread interoperability with Cisco, Polycom, LifeSize, Sony, Microsoft Lync, and GoogleTalk without the flexibility of our platform. We find an interop issue, we debug, fix it and can roll into production in hours or days. We run our R&D team more like a web company than a traditional equipment maker. We can introduce features into production in a matter of weeks and not years. We can experiment with beta features similar to web companies like Google and Facebook and instantly get feedback and improve.²¹

In an interview with several company representatives, it was explained to RTOE that BlueJeans supports up to 25 endpoints simultaneously. I think it is important to note here that any video conference that has more than 20-something participants in a video gallery view will look cluttered and be relatively difficult to manage on a typical-sized desktop screen. Even 20-something might be a bit too much for

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some instructors, but it should be within a web- and computer-savvy person's capabilities to hold a dynamic, interactive course without any serious issues with today's video conferencing technology.

"We really want people to be able to join a meeting face-to-face and simultaneously interact," says Education Account Manager Kirsten Gleaves. "We do not want it to be just streaming; we want you to be able to raise your hand and say something and have that real-time interaction and communication."

Gleaves adds that the education space is one of the company's largest verticals. "We have hundreds of universities using BlueJeans, all the way from Princeton to Iowa Community College. The spectrum is broad."

How to Deal with Bandwidth Issues

BlueJeans also utilizes the technologies necessary to adapt calls based on the bandwidth of any given endpoint in a meeting. If, for example, you are connecting wirelessly from Starbucks via low bandwidth, BlueJeans will drop you to audio only. You will still be able to see everyone else's video, but your interactions with others in attendance will be by audio only.

It's hard to determine precisely what level of bandwidth is really needed for multipoint video conferences. According to Skype, for example, the recommended connection speeds for a group meeting with seven or more people in attendance is 8 Mbps download and 512 kbps upload, with the minimum suggested as 4Mbps download and 128kbps upload.²²

Western Carolina University and MIT

BlueJeans offered to connect us to several use cases, and we decided to talk with Zach Phillips, video support technician at Western Carolina University (WCU), and Wesley Esser, director, IT Consulting and Support, at the MIT Sloan School of Management.

Both WCU and MIT bought into BlueJeans in order to extend their current room-based system capabilities. Phillips explains that faculty were coming to him seeking ways in which to invite guest lecturers to present to their class at a distance from their home-based or office-based work stations. "It hap-

pened enough to a point where I tried the BlueJeans product and said this solves that problem, and it is easy to do. I do not have to hook up any special hardware. I can use their hardware. They solved that problem for me, which is why I advocated for it and why we eventually purchased it."

MIT's Esser says that "the whole reason why we started with BlueJeans is because we have all these expensive room systems and everybody said this is great but how do I connect with Skype, and our first answer was, well, you don't. That is how we got BlueJeans, and then we saw that their web interface was more reliable than Skype's."

MIT's executive MBA program has been using BlueJeans for those instances where busy, professional students in their EMBA program would like the option of enrolling in an elective business course that is only offered in the traditional classroom setting. MIT has a good number of small, tiered amphitheater classrooms with cameras, microphones and monitors to accommodate this kind of request.

For the back and forth interactions between the students sitting in the live class and the remote students attending from different endpoints, a technician was needed to switch the camera angle from the instructor to a general view of the students in the classroom during a question and answer session, for example. Esser says that they are now looking into the possibility of having a teaching assistant manage this function in the future instead of an IT department technician. "We are at the point of figuring out what the real lessons are out of this and what modifications we need to make to the rooms to make this something that a TA could process with a great deal of confidence," Esser says. In the meantime, "BlueJeans has been great at taking feedback and making changes. There are things we can do now that we could not do previously."

Phillips has similar things to say about the BlueJeans service. "It has been a big hit here," he says. "We bought into it year one, and the second year, when it came up for renewal, we upgraded our package. We are getting a lot of use out of it, and it is saving me a lot of stress."

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BlueJeans pricing is not posted on their website nor on the Internet2 website. It does show, however, that “pricing through Internet2 is based solely on the number of faculty and staff at the university; all students, regardless of school size, get access for free. This means everyone within the university will be able to host unlimited meetings, use unlimited minutes, and join using any video-enabled endpoint; all for one flat fee for up to 3 years.” According to a BlueJeans representative, Internet2 members are charged 10 percent less than non-members.

Web Conferencing Service Providers

There is a fine distinction between web conferencing and video conferencing. We only profiled three companies under the web conferencing category – Adobe Connect, Mediasite and Panopto. There are others, including the well-known Tegrity and Echo360 and many others. From closely monitoring the online education space, these are the companies that repeatedly come to the forefront during my research.

Web conferencing and video conferencing are often defined as one and the same thing when in fact they are distinctly different from each other. The primary difference is that web conferencing does not have conference attendees on video. In a web conference, the remote participants typically view a single presentation by a person or group that could be a real-time or asynchronous video with a whiteboard, PowerPoint or other shared content. The conference usually includes an audio bridge, often accomplished through a dial-in phone call that has a conference ID and passcode, but can also be accommodated through a VOIP real-time, two-way audio communication through your computer’s speakers and microphone. However, interaction between the presenter and attendees of a web conference is done via text chat as opposed to video chat.

In a video conference, the presenter and the remote attendees all have webcams and microphones for creating the closest replication possible of a true-face-to-face meeting in a virtual environment. Because of this factor alone, video conferences are much more bandwidth intensive than web conferences and require more preparation prior to holding an “event.” (See Implementation Concerns.)

Under the banner of web conferencing is “lecture capture,” a technology that has grown in popularity in recent years. EDUCAUSE defines lecture capture as

an umbrella term describing any technology that allows instructors to record what happens in their classrooms and make it available digitally Lecture capture systems offer three important benefits: an alternative when students miss class; an opportunity for content review, particularly when abstruse topics are introduced or detailed procedures are performed; and content for online course development.²³

As noted in a Wainhouse Research whitepaper that was sponsored by lecture capture company, Tegrity:

Lecture capture is the first new technology since the notebook and pencil and textbook to allow a learner to be able to review what he or she has been taught. And learners are responding in droves. In a Fall 2010 Tegrity Student Survey of 6,883 college age and adult higher education students, a total of 85% stated that having access to recorded lectures made study somewhat or much more effective than normal. About a third indicated that lecture capture significantly increased their success in the course, and almost 46% indicated that it increased somewhat their success in the course. Finally, almost three quarters (73%) indicated that lecture capture significantly or somewhat improved their grade in the course.²⁴

Adobe Connect

Adobe Connect is an amazing web conferencing tool with a host of features and functions unlike any other. In 2011, PC Magazine named them the best web conferencing solution. They do, however, seem to have some growing pains and some strange business practices when it comes to showcasing their products and services to education IT professionals.

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Two IT professionals at major universities told RTOE that the demo Adobe Connect provided to them during a vetting process was pretty bad. One called it a “nightmare” and another emphatically said it was “the most horrific thing you would ever see.” Also, we heard from two other higher education Adobe Connect users, informally, that their audio and video quality is shaky at times.

However, when talking with an Adobe Connect long-standing customer – Jason Shaeffer, director of synchronous services, Academy of Art University in San Francisco – RTOE was presented with an extraordinarily positive testimonial. Plus, when you look at all the competitive vendor websites in this space, Adobe Connect really shines with the way they present all of the product’s special features in a very comprehensive way for educators to understand. In short, their “Adobe Connect for eLearning” section is impressive (see <http://www.adobe.com/products/adobeconnect/elearning.html> and click on the “Features” link).

Because of all these factors, I came away from my investigation into Adobe Connect with an ambiguous thumbs-up and thumbs-down conclusion. Plus, due to the fact that Adobe is obviously entirely Flash based, also has ambiguous connotations for me, especially after reading “Thoughts on Flash,” by the late Steve Jobs.²⁵

I have also come to believe that Adobe Connect’s multipoint live video conferencing capabilities – not their web conferencing, lecture capture and webinar capabilities, which are top notch – are not as robust as the video conferencing companies profiled here. Their video streams come in at 480p, which refers to the number of lines in a video resolution. The p means “progressive.” The number 480 is relatively low, meaning that the resolution is not as sharp as a 720p or 1080p, for example. The others profiled here all have high definition resolutions, which are generally at least 720p.

Academy of Art University

The Academy of Art University’s use of Adobe Connect is most certainly a terrific modern day example of how synchronous video can be utilized effectively and creatively to engage students. Shaeffer says that Connect is being utilized successfully at the

Academy in numerous ways. For live video conferencing, which is our obvious focus here, Connect is being used in the Academy’s bachelor’s and master’s online architecture program. Students have the opportunity to learn from architects, artists, engineers, and material specialists through both synchronous and asynchronous online class videos via Adobe Connect.

Shaeffer says that while the program is “devotedly asynchronous,” there are parts of the program that are conducted synchronously, such as when remote students collaborate with on-campus students on a group project. For example, Adobe Connect was utilized effectively for a recent problem-based exercise in which students had to architecturally redesign a section of the San Francisco Embarcadero historic district. “We pushed out a video of what the site looks like through a tour via Adobe Connect,” Shaeffer explains. “The students collaborated back and forth, and then we hosted sessions with the department directors. We also broke the students out into groups of five and gave them their own Adobe Connect rooms where they can all see each other on their web cams and post materials. The web cam adds so much value because of the humanity it brings to the course. A student might be located on a farm in Minnesota; another student is in South Korea; another is in New Jersey. We have all these students collaborating with each other, seeing each other, talking to each other and sharing documents and posting comments.”

Shaeffer adds that an Academy staff member was allocated to this project in order to provide technical support and answer any questions students might have related to connecting. “As far as the video and audio, they have made huge improvements on all the codecs,” he says. “All the audio is great, and the video has gotten a lot better. We always want more features, and they continue to add them.”

MediaSite

Sean Brown, vice president at MediaSite from Sonic Foundry is a passionate professional and highly knowledgeable guy when it comes to all things video in higher education. He has more than two decades of experience in the field and some strong opinions and interesting insights about the use of live video in

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higher education. “We are an incredibly successful company without two-way video,” he says, adding that the company is, however, poised to adopt live, multipoint video conferencing when the education market is more ready for it.

As for the present, he sees more of an interest for on-demand video, meaning video-based lectures that are recorded, archived and searchable in libraries on a server that students can access whenever they want, “on-demand.”

“The MediaSite system is one that is best described as a classroom-based system designed to be easy to use,” Brown says. “It may sacrifice interactive (live multipoint video) features in the name of that simple concept.”

Before being acquired by Sonic Foundry, MediaSite originally was a spin-off company that was created by the Carnegie Mellon Center for Technology Transfer and Enterprise Creation in 1997.

MediaSite, like Adobe Connect and Panopto, gives you the tools to index everything – making entire video libraries searchable. It too has a lot of other features and functions for enhancing, editing and distributing your video lectures, as well as for text-based communications during a live lecture. As Brown suggests, web conferencing is not as labor intensive as live video conferencing. It requires less set up, less training, less reliance on the public Internet, and overall less possible failure points.

MediaSite connected us to a good number of use cases, but since the focus of this report is really on synchronous video conferencing, we decided to keep the write up of this section more condensed. Watch our RTOE eNewsletter for timely and relevant feature articles about web conferencing services and use cases in the future.

Panopto

Panopto is another Carnegie Mellon company, founded in 2007, based in Pittsburg, Pa, with \$2.6 million in funding according to CrunchBase.²⁶ They too provided us with use cases that we decided on not using here in this monograph. We talked with their Director of Business Development Rebecca Lessem.

Panopto is very much like MediaSite and Adobe Connect. They do, however, seem to have a stronger focus on building out more synchronous technologies to their platform. Lessem told us that Panopto is a “distant cousin” of Acatar, another interesting and relatively new CMU company that offers a total online education platform solution. Panopto is younger than MediaSite and Adobe Connect and looks to me to be just as innovative and perhaps even more innovative in the area of synchronous video. Stay tuned to RTOE in the future for more about Panopto when we expand our coverage to include more information about web conferencing service providers.

Finally, for more information, I suggest that you read an article published in Campus Technology that has some informative insights, with use cases from different vendors:

A decade ago, the technology offered little more than a stodgy record of the sage on the stage – a viewing necessity only for students unwilling, or unable, to get out of bed in time for class. Today, lecture capture has progressed from unloved backup to an integral part of how many instructors teach their courses. Whether in flipped classrooms or blended courses, new lecture capture features are helping make face-to-face class time more appealing – and out-of-class learning more productive.²⁷

How to Write Up a Video Conferencing Provider RFP

Regardless of whether or not you decide to use a video conferencing or web conferencing service provider, or both, you will more than likely want to have some straight-forward parameters for making a choice through a committee advisory meeting or request for proposal process. RTOE was able to obtain some solid and worthwhile information from our interviewees concerning what to put inside a vetting process.

As a side note, we communicated with two IT professionals who explained to us that some vendors in this space are not cooperative with providing a live, in-person demo and instead prefer to give their presentations over a video conference, especially since that is their business. Oftentimes, however,

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education IT professionals would prefer to conduct live, face-to-face, demo meetings with prospective vendors along with having their prospective users in attendance to ask questions on the fly and see and hear the results on the ground, in person, instead of over an Internet connection. At the same time, it is understandable that a company would not want to incur travel expenses for a demo when it could be effectively convened online via live video conference where everybody could see and hear each other, but not shake hands.

FuzeBox, in particular, was very helpful in supplying RTOE with specific information on an RFP for a video conferencing system that could be utilized inside a distance education environment:

Objective:

To develop a reliable, cost-effective video conferencing and distance learning solution for fixed and mobile devices (laptops, smart phones, iPads, etc) which leverages web conferencing capabilities,

RFP Requirements:

- Provide the highest level video and audio quality
- Allow both point-to-point and multipoint connections
- Be available on both desktop and mobile devices (for hosts and participants)
- Integrate with existing video conferencing systems
- Provide application and desktop sharing in addition to camera-based video and audio
- Provide industry standard encryption
- Provide access to recorded meeting content for downloading and archiving
- Require minimal technical support for basic connections (user friendly)
- Allow “ad hoc” participants inside and outside organization

Use Cases:

- Executive level - Chancellor and Senior Management meetings that include 1-2 attendees per site.
- Board Room Level - Chancellor and Senior Management meetings that include up to 25 attendees per site.
- Administrative Level - Mid-Level Management meetings that include up to 25 attendees per site.
- Seminar Level - Academic and administrative meetings that include up to 50 attendees per site.
- Classroom Level - Academic classes that include up to 100 attendees per site.
- Pilot process will not require hardware purchases (cloud based)
- Pilot process will allow for two full and consecutive academic semesters
- All campuses and the senior mgmt. to participate in pilot project

Vendor criteria:

As the team reviews the vendor responses during the demonstration phase, vendors will be rated as noted below:

- Ability to meet time requirements
- Total Cost of Ownership
- Key personnel
- Past performance (experience)
- References
- Understanding of work to be performed (technical merit)

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Some additional criteria that can be added to the aforementioned, include:

- Do you have 24/7 technical support and customer service?
- How frequently can meetings be held with the appropriate vendor staff members to discuss product enhancements that may be desired?
- Do you have a higher ed users group that we can communicate with?
- What kind of system do you have in place for rolling out any new versions of your software when they become available?
- What kind of training and support materials do you have that we can utilize when rolling out to our constituents?
- What's the maximum number of meeting participants that can all see and hear each other simultaneously via video chat in a gallery view?
- What's the maximum number of meeting participants you can have for any given video conference?
- How can you assure me that there will not be any glitches when I have to hold multiple conferences in a wide variety of courses concurrently?
- What kind of analytics can I acquire on my own? What kind of analytics can I acquire from the vendor?

Consulting Services

There are also a good number of companies that provide video conferencing consulting services and are partners with the major equipment vendors. We talked with Michael Werch, president of Video Guidance, founded in 1999 and based out of Bloomington, Minnesota. Video Guidance partners with such video conferencing companies as Polycom, Cisco, LifeSize, Acano and Pexip. "Education has been a cornerstone of our success since the beginning,"

Werch says. "It is a vertical that we focus on, and we have representatives who do nothing but call on the education marketplace."

For example, Video Guidance recently helped Central Lakes College install MX300 Cisco Telepresence systems at three community colleges for a \$13 million Department of Labor TAACCCT grant that offers flexible training alternatives to manufacturing workers in video-conferencing-enhanced courses that are becoming available this spring through a Regional Advanced Manufacturing Re-Training program.

Some other consulting companies I have run across in this research, but have not talked with, are AVI Systems, IVC Communications and Vision Point. There are many more across the country.

Although I do not have any direct experience with any of these companies, other than the interview I had with Werch, they all look like viable alternatives to consider, especially for those higher education institutions that may not have a strong or capable enough IT staff to conduct an effective vetting process that may include making decisions about the building out of state-of-the-art room-based systems.

Video Guidance, for instance, has 15 years of experience advising, installing and supporting room-based video conferencing systems. In a Wainhouse Research whitepaper that Video Guidance sponsored, the primary services offered by reputable video conferencing consulting companies are listed under the following six categories:

Needs Assessment Consulting: Addresses collaboration needs, evaluation of your existing network, security, infrastructure, team resources, room design issues and business strategies.

Equipment Supply and Support: Is the reseller certified by equipment manufacturers? Are the consultants knowledgeable about what hardware and software you will need?

Systems and Application Integration: This can be simple or complex. How does your system integrate with audio subsystems, speakers and lighting control systems?

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Adoption and Training Services: Often overlooked but obviously important – you need to make sure that your users know how to use the equipment and are comfortable with scheduling, launching and joining meetings as well as the proper etiquette when on camera.

Managed Services: Two important elements come into play here: Have a savvy help desk as well as a remote monitoring and management service for video endpoints and infrastructure.

Hosted Services: If you are looking for a hosted solution, such as a cloud-based service, you'll want to be fully aware of what you are getting into. ²⁸

Those Who Did Not Make the Cut

I tried to include the Blackboard Collaborate product here, which is Wimba and Eluminate combined, both well-established and reliable products. After at least four attempts to reach them without a timely response, I had to drop them from being included even though they did eventually respond but it was too late for my deadline.

As noted earlier, I was unable to connect with Cisco WebEx for this project. I sent out emails and made several calls to no avail. I could not figure out who to contact for press inquiries. I called company headquarters and got nowhere. I left messages on voice mails explaining the details of my intentions and production deadlines but did not get any responses.

There were others I tried to connect with but could not, or their public relations and marketing representatives were too slow in responding. Over the years, I have learned that, ironically, dealing with public relations and marketing company representatives often hinders or prolongs the interviewing process to a point where it becomes necessary to drop prospective interviewees out of the project due to their lack of follow-through and lack of understanding. On the other hand, there are times when a knowledgeable PR/marketing representative makes the interview and research process very easy, setting things up quickly and efficiently without any hassles or delays. The vendors that either did not respond or were too slow in responding were Avaya, Infinite, Microsoft Lync, Nefsis (a brother company) and Pexip. I also talked with a representative from MegaMeeting, but

they did not follow up with a use case, and my overall impression was that they were more consumer- and business-oriented than education-oriented.

Also, to repeat what I noted earlier, I would advise educators to stay away from the video chat companies, including Google Hangouts and Skype. They were not built with distance education in mind, have limitations regarding presentation functions, and overall are better for one-to-one or one-to-few personal communications. Google Hangouts, for instance, did not follow up with any education use cases as they said they would when I talked with them. Google Hangouts and Skype are fine for one-to-one communications. I have used both, but would not consider using them in a course with multiple remote students.

As I was writing this in early February, Google Hangouts came out with a new video conferencing product for up to 15 people simultaneously that includes the purchase of a \$999 “Meeting Room-In-A Box” comprised of a Chromebox computer, a camera, a speaker-microphone combo, a remote and software. There is a \$250-per-device annual fee for management and support, with the first year included in the \$999 price. I don't see the benefits in this solution. For more information, see a recent article in TechCrunch. ²⁹

Those to Watch

There were two other vendors who were very good at responding, but after taking a closer look into their operations, products and services, RTOE came to the conclusion that it would be a better idea to monitor their future development and consider them as serious contenders at a later date instead of at the time of writing and publishing this monograph. They are Acano and SeeVogh.

Acano is very new to the market, founded in February 2012 and announcing general availability of their products and services in August 2013. RTOE contacted them late in the research and interview process for writing this monograph. They did have a week's time to supply RTOE with at least one higher education use case, and they explained that they had several universities paying for their products and services. However, they did not come through with a use case connection that we could interview.

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Werch at Video Guidance claims that Acano is a “game changer,” but, of course, that remains to be seen at this time.

Acano is based in the UK. Its CEO OJ Winge, was previously senior vice president at Cisco. He joined Cisco when they acquired Tandberg, where Winge was executive vice president of products. Acano has three different types of deployment options, says Larry Satterfield, global vice president of sales: the first option is through the purchase of an “optimized” Acano server; the second option is through software that you could purchase and run in a virtualized environment on standard servers; the third option is a cloud-based solution that you can adopt through their partners for a monthly fee. As noted on the Acano website, “coSpaces are the heart of the Acano solution.” A coSpace is a meeting room. “You can set up as many coSpaces as you like,” Satterfield says. “Educators like to set up a different one for each of their classes, and they have the ability to go into it on a real-time or non-real-time basis.”

At the time of this writing, recording capabilities were said to become available in the Fall. In addition, the downloadable literature on their website notes that the ability to work over Android devices is “coming in 2014.” Overall, it is my opinion that Acano is too new to consider as a viable option at this time. RTOE will continue to follow them and try to keep people informed about their progress.

SeeVogh has a strong academic background, having been developed by computer scientists from the California Institute of Technology (CalTech) as they were working with the global scientific research community associated with the Large Hadron collider in Geneva, Switzerland. Their work in the field looks to be based primarily on collaborating via live video with global research networks, such as NSF and other research organizations from Europe, Australia, Japan, Korea and Slovakia.

SeeVogh also entered into the service validation evaluation phase for Internet2 Net+ Cloud Services & Applications back in April 2012, meaning that it has not yet reached the early adopter category in almost two years. Plus, SeeVogh was unable to connect us to any higher education use cases in which it is being utilized inside a course. For those reasons, I put them in the “Those to Watch” category.

Implementation Concerns

Many online educators would rather not get involved with the prospect of adding synchronous methods of teaching to their courses. It is RTOE’s belief, however, that the most effective online courses have a combination of both synchronous and asynchronous methods. To support this opinion, we refer to a very good article published in the EDUCAUSE Quarterly in 2008. Stefan Hrastinski, from Sweden, offers common-sense advice about when, why and how to use synchronous versus asynchronous methods in a fully online, blended or technology-enhanced course.

When to Go Asynchronous or Synchronous

Go asynchronous when you want your students to reflect on and respond to complex course materials so they have enough time to reflect on the subject matter. Go synchronous for the not-too-complex stuff like having your students get acquainted and/or to plan tasks, or for a quick discussion about a topic that does not require any deep research, for example. Use e-mail, discussion boards, blogs, and other social media such as Facebook for asynchronous materials. In addition to video conferencing, utilize instant messaging and live chat for real-time communications. Hrastinski goes on to say that “asynchronous and synchronous e-learning complement each other . . . The combination of these two types of e-learning supports several ways for learners and teachers to exchange information, collaborate on work, and get to know each other.”³⁰

Group Work or Not

Although video conferencing is ideal for group work, I believe that group work in an online course is not something that students particularly enjoy. When I wrote “The Complete Idiot’s Guide to Getting Your MBA Online,” I interviewed more than 25 online MBA students from different institutions, and virtually every one of them told me that they would prefer not to be given assignments that required them to be put into small teams. This is especially true of adult learners, who prefer working on their own and are more self-directed than younger students. The common refrain I heard about group work is that there is always someone in a virtual team that does not pull his or her weight and then unfairly takes part in the accolades and credit that goes to the whole team. Since nobody wants to expose that kind of behavior, it often gets unnoticed to the quiet

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chagrin of the students who worked hard and did the required work or went beyond the required work.

Yes, You Can Do It

Probably the greatest thing about live video is that it makes everyone feel more like they are part of something, regardless of being put into teams or regardless of the amount of participation that happens. It brings a human element to an online teaching and learning environment that would not exist otherwise. In general, there are all kinds of learners with all kinds of preferences, so you will never please every student. Nonetheless, I have not seen any evidence of students not enjoying a well-thought-out, trouble-free, live video conference. If an instructor puts in the required time to learn about this technology and formulate good pedagogy and sound strategies, the use of multi-point video conferencing in distance education will absolutely prove to be a truly engaging and enjoyable experience.

Rules of the Road

Irrespective of when, why and how you decide to use video, there are definitely some rules of the road that you should consider. One very important thing I learned about being on a webcam occurred to me when I reviewed a recording of a video conference I took part in while writing this monograph. I never realized that I made such obvious facial expressions that exposed my feelings. My frowns, my rolling of the eyes, my expressions of confusion and discontent were quite obvious. While this would be a good thing for the teacher to see as a means to identify whether or not her students are “getting it,” I don’t think it would be ideal for an instructor to have such obvious facial expressions. So, examine how you look on a webcam in a meeting with someone prior to holding your video conference just to see how you look, and then make the necessary adjustments for when the real event takes place.

Here are some additional rules of the road, many of which are common sense:

- Don’t get too close to the camera. I have been in video conferences where some faces were so close-up that they made me feel uncomfortable to look at them.
- After you have made exactly sure how you are going to include a video conference in your course from an instructional design perspective, do a test run with some volunteers or the actual students, record it, and then review very closely to see how everything came together and whether or not you will need to make some adjustments.
- Make sure everyone knows how to mute and un-mute their microphones.
- All those in attendance should really have high-speed broadband connections whenever possible. Wi-fi is usually okay, but it is preferable to have your computer be connected directly by an Ethernet cable to a high-speed wired network.
- Wearing a headset with a microphone is best for audio quality. Sometimes the sound coming from a computer’s speakers, for instance, will cause an echo effect that is very annoying.
- Prepare a simple sheet of instructions to send to your students related to where to click to join a conference, what they may have to download to their computers, how to make sure that their webcam and microphone settings are right, and basically what to expect during a video conference and how they can use whatever tools you may be planning to utilize, such as polling, testing, when and how to talk, when and how to text chat, and how to view your presentation materials.
- Have a back-up plan for those who may experience a poor stream or packet loss. Make sure they have an option to move to audio only over a typical telephone conferencing bridge, for instance. Also, try to have someone on board that they can call on the phone for technical support.
- Look professional. Don’t come to class wearing a tee-shirt or a wrinkled blouse. Solid, dark colors typically show best on camera as opposed to white, stripes or plaids. No shiny jewelry either.

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- Have an icebreaker activity for the first time you host a video conference, such as having each student say their name and something about their background and why they are enrolled in the course. Ask them to keep it short and to the point. This is also an excellent way for you to see each student's ability to fully comply with instructions and use this technology.
- Get to know each student by first name and be ready to call on them and/or engage in a personal one-to-one over video. This is a great way to make your students feel welcome and respected, just like in a traditional classroom setting.
- Make certain that your video interactions are structured and moderate them accordingly. Have specific questions for students to respond to, for instance, and make sure they are prepared in advance to respond in order to avoid the possibility of embarrassing someone.
- Have a good set of etiquette rules in place, especially with regard to keeping everyone on task and on topic in a professional fashion with no opportunities for anyone to use foul language or be overly critical. Keep it all positive and engaging with exercises that reinforce community and respect for each other.
- Make sure you are in a quiet space where there is no background noise. The same holds true for the students in attendance.
- Try not to talk over or interrupt anyone who is speaking.
- Don't move around too much. Keep your hand movements to a minimum.
- If you are in a room with students in attendance on video, you might want to arrange the seating in a triangle formation.
- Another important thing to take under consideration in a room is to make sure that windows have blinds to minimize lighting problems.

- Test out camera angles prior to holding a room-based conference. Also make sure there are enough microphones, usually at least one for two people.

Several years back, I worked on a project related to recording teachers in a classroom in which I co-wrote and published "A Basic Guide and Support for Video Recording Teachers in the Classroom" with John Ittelson. There's some good information in that 8-pager related to recording guidelines, video shot lingo, lighting, audio and microphones, and more, for when you are in a room-based video conferencing. It can be downloaded from <http://www.myteachingvideo.org/my-teaching-video-resources/>

In Conclusion

I'd like to wrap this up by saying that this project took a solid four months of research, interviewing, transcribing and writing and re-writing to put together something that can be easily digested by a non-technical educator who is thinking about adding live video to his/her course. Zoom, Vidyo, VSee, Polycom, LifeSize, FuzeBox and BlueJeans are the companies that surfaced to the top as being the most viable and trustworthy vendors for higher education to consider for adopting synchronous video in their fully online, blended or technology-enhanced courses. Of those, VSee should be considered for only small courses with eight or less remote students attending. The others can accommodate larger multi-point video conferences. RTOE looked at more than 20 vendors total, some of which we did not even mention in this monograph, but these seven, definitely, in my opinion, lead the pack. It is my strong desire that by doing all this research and profiling these vendors as the best solutions, you will have saved enough time to make the purchase of this monograph worth every penny.

I'd like to conclude by saying that I truly believe that live video over the Internet will be increasingly adopted by higher education, but it still very much remains to be seen when it will become widespread and second nature for faculty to use in their fully online, blended and technology-enhanced teaching and learning environments. The technology is there, and it is not over priced. It is simply a matter of adopters taking the time to learn how to use it effectively.

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The use cases profiled here are fine examples of the humanization of online education. They have taken the time out to learn this technology, and, furthermore, they have discovered that it is not a difficult endeavor. To copy a worn out phrase: Just Do It!

Please feel free to contact me if you have any comments regarding this monograph at george@realtimeonlineed.com. In the meantime, please continue to visit realtimeonlineed.com and please subscribe to our eNewsletter, as we continue to cover this space while it grows in importance for the entire world of online education.

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