

# Act 53 Public Access Plan:

A Report to the Vermont General Assembly on a Plan to Achieve Citizen Access to Proceedings of the Public Utility Commission from Remote Locations.

*December 15, 2017*



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The Vermont Public Utility Commission, the Vermont Agency for Digital Services, the Vermont Agency of Education, the Vermont Department of Libraries, the Vermont Judiciary, Vermont Agency of Transportation, the Vermont Access Networks, Polycom, Microsoft, Promevo, NWNIT, and I2I.

## Executive Summary

Act 53 of the 2017 General Assembly directed the Public Service Department (“Department”) to create a plan to achieve public access to proceedings of the Public Utility Commission (“PUC”) from remote locations (the “Plan”). The Act requires the plan to include interactive capability and the ability to use multiple remote locations simultaneously. The Plan may build on prior proposals. It should include an assessment of cost-effective technologies, identification of host locations, and estimated capital and operating costs.

Vermont Interactive Technologies (VIT) was established in 1988 to provide video conferencing services from studios in 13 locations across the state in support of education, government, and commercial users. The General Assembly eliminated support for the organization in 2015, and created a working group to consider its future. The group’s final report advanced a concept to continue VIT services, but the initiative was never implemented. VIT ceased operation in 2015 and its assets were dismantled and distributed by the state. This plan builds on that prior concept and addresses the Act’s criteria.

This report offers four key recommendations. First, since the goal is to achieve public access to the proceeding of the PUC, the PUC should have responsibility for, and authority over, any resulting project. If such a network is developed, the Department recommends that the PUC should coordinate meetings and offer routine support to any remote-site host organizations. Second, this report recommends that the Agency for Digital Services (“ADS”) be responsible for the design, deployment, and maintenance of the network.

Third, the Department recommends that any proposal include a simple, “off-the-shelf” design that can be supported by ADS. The Department reviewed the State’s use of video conferencing, invited vendors to provide demonstration equipment and issued a Request for Information (RFI). On the basis of this information, the Department identified three different network design topologies and developed estimates for capital and operating costs for six different network configurations, with a 5-year cost ranging from \$3,000 to \$120,000. These figures do not include equipment installation, PUC or ADS costs or support for host sites. Each configuration can be used as a starting point from which a more detailed solution can be designed.

Lastly, the Department recommends that stakeholders work collaboratively to determine the optimal network design. The Department recommends that stakeholders consider two distinct topologies for different PUC proceedings. Specifically, the system should accommodate broadcast topology for live-streaming of all PUC proceedings. For public meetings, the Department recommends that the design incorporate a “closed network” topology that utilizes two way-video conferencing capability from designated host site. If a project that calls for remote site hosts is funded, the Department recommends that ADS be directed to identify and negotiate with potential host institutions based on a total project budget, with input from the PUC.



## Introduction

Act 53 of the 2017 General Assembly (Appendix 1) directed the Department to submit “a plan to achieve citizen access to hearings and workshops of the Public Utility Commission from remote locations around the state.”<sup>1</sup> The Act requires the plan to include interactive capability and the ability to use multiple remote locations simultaneously, and may build on prior proposals. The legislation states that the report should include an assessment of cost-effective technologies, identification of host locations, and estimated capital and operating costs.

This report presents a brief background on the issue, describes the methodology employed to develop the plan, offers estimated capital and operating costs, and offers several recommendations for implementation.

## Background

Vermont Interactive Technologies (“VIT”) was a statewide videoconferencing network established in 1988 to provide Vermont business, education and government agencies with the ability to congregate across distances within the state. It consisted of a network with video conferencing studios in 13 locations across the state. The network was used to support the State’s policy of extending learning opportunities to all Vermonters regardless of geographic location. It was used for job skills preparation, public participation in government, and to facilitate other business and nonprofit development. VIT received from the General Assembly an average annual appropriation of approximately \$800,000 and capital appropriations totaling approximately \$3.6M.

In 2015 the General Assembly eliminated long-term funding for the organization and created the VIT Working Group (Group) to study and make findings and recommendations for legislative action regarding VIT and its future. In its final report the Group advanced Vermont Video Connect (“VVC”), a successor network to VIT proposed by the Department as an option for continuing service into the future. The VVC proposal included specific recommendations to reduce costs by modernizing VIT technology and developing a fixed stipend for 14 host institutions, including six with existing VIT studios. The Group recommended that the General Assembly continue to explore VVC as a possible video conferencing network that could benefit Vermonters. Some members of the Group submitted a responsive Minority Report citing deficiencies in the Group report and offering alternative recommendations.

VIT ceased doing business on December 31, 2015, and in early 2016 its assets were collected by Vermont Buildings and General Services (“BGS”). The equipment was disbursed through standard BGS surplus practice and with a large portion provided to the Vermont Judiciary. BGS reimbursed several host institutions for the costs of renovations to restore the former VIT studio facilities to their previous uses.

Act 53 states that “the plan may build on the Department’s Vermont Video Connect proposal”. Since 2015 when VVC was developed, the VIT equipment has been disbursed, and the studio spaces restored. Since 2015, technology has evolved. As a result, VVC plan is no longer directly applicable. Nevertheless, there are several aspects of the VVC concept that are still relevant, such as the use of internet based

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<sup>1</sup> The Department interprets the word “citizen,” as used in the legislation and throughout this report, to mean a member of the public.

conferencing and active speaker tracking technologies, and the use of a fixed moderate stipend for host institutions. VVC was presented as a successor to VIT to meet demand for video conferencing requirements not served by commercial services. Act 53 has a much narrower scope: it calls for a plan to achieve public access to the proceedings of the PUC.

## Methodology

After passage of the Act, Department staff interviewed various agencies of the State of Vermont to determine how video conferencing technology is presently being used. Department staff submitted a memorandum on the scope of Act 53 to the PUC on July 5, 2017. The PUC held an informal workshop on July 13. On July 24 the Department sent the PUC written follow-up comments. Both the memorandum and comments are included in Appendix 2. Department staff met with ADS staff July 24 and August 7.

In its July 5 memorandum, the Department related that the Agency of Digital Services (ADS) subscribes to services from two vendors that support video conferencing, Microsoft and Cisco. Department staff approached Polycom, maker of video conferencing and telephony appliances and requested that the vendor supply equipment for a demonstration to allow stakeholders to evaluate the equipment and the Microsoft Skype for Business service. The demonstration was conducted September 7. Department staff also requested demonstration equipment from Google, and conducted a separate evaluation of this equipment. Department staff prepared evaluation reports for these demonstrations, included in Appendix 3.

In cooperation with ADS and the Department, BGS issued a Request for Information (RFI) and received three responses. Polycom proposed equipment offered in the demonstration, adapted to operate with the Microsoft services already subscribed to by ADS. NWNIT, the ADS voice telephony services vendor, offered Cisco equipment and services deployed at the Vermont Judiciary. The company I-2-I, offered equipment and services provided by the Lifesize. The RFI and responses are included in Appendix 4.

The interviews with state agencies, the demonstration and evaluation reports, and the RFI responses were used to develop the present plan.

## Survey of state agency experience

The Department surveyed state agencies that employ video conferencing technology, including the Vermont Judiciary (Judiciary), the Vermont Agency of Commerce and Community Development (ACCD), the Vermont Agency of Transportation (VTTrans), the Vermont Department of Aging and Independent Living (DAIL), the Agency of Education (AOE), the Vermont Department of Libraries (VTLib), and the Vermont Department of Liquor Control (DLC).

### Vermont Judiciary

The Judiciary subscribes to the Cisco virtual room service provided by the state's voice telephony service contractor, NWNIT. The service is used to enable incarcerated people to interact with the court system from detention centers. The network has facilities in two courthouses and three detention centers, but has plans to expand to ten courthouses and six detention centers. Some of the Judiciary's facilities are publicly accessible. The Judiciary now has extensive experience with video conferencing and provided helpful support in the September 7 demonstration, and could be a knowledge resource if a PUC network is developed.

### Agency of Commerce and Community Development



ACCD uses Citrix GoToMeeting to provide video-enabled webinars. ACCD organizes the online meetings and invites participants who use their own equipment to join the meetings from their locations.

#### Agency of Transportation

VTrans has used the Citrix GotoMeeting service to provide webinar-type (non-video enabled) public meetings in cooperation with the Vermont Regional Planning Commissions (RPCs). VTrans conducted the meeting from the Headquarters in Montpelier. The RPCs provided public meeting space and computers equipped with speakers, monitors and, microphones. An at-home viewing/attendance was available as well, however, questions were received exclusively through a text chat feature. If the public attended the meeting at an RPC location, then questions and comments were taken in a round-robin style. Each RPC was called upon by the meeting facilitator and allowed two questions per attendee. The webinar was recorded and posted and an email account was created to take public comment for an additional two weeks. This could be a model for a potential PUC network.

#### Agency of Education

AOE received a grant to purchase and install video conference equipment in approximately 160 Vermont schools. The Vermont Legislature subsequently provided funds to update this equipment and allow AOE to acquire a video conferencing bridge. The video conference equipment and video bridge equipment are now past the manufacturer suggested end of life, which means that software updates and support are no longer available. AOE has transferred operation of the aging video bridge device to ADS, and it is likely to be retired soon. AOE is in the process of retiring all of the legacy video conference equipment in Vermont schools. When the Department developed the 2015 VVC concept, the schools were considered as possible host sites. It was determined that the available facilities in schools are not easily publicly accessible, and therefore are not ideal candidates for possible PUC network sites.

#### Department of Aging and Independent Living

The Vocational Rehabilitation division within DAIL has used video conferencing systems for many years to provide training. The equipment at approximately twelve locations and like the AOE equipment it is now past its manufacturer specified end of life and software support is no longer available. DAIL is using the video conferencing bridge that was originally purchased by the AOE. DAIL no longer actively uses the network and is contemplating future options. The equipment is not compatible with the ADS-supported bridging solutions provided by Microsoft and Cisco without expensive converter systems or services. When contemplating the 2015 VVC proposal, the Department determined that engaging the DAIL facilities in a potential VVC network would not be ideal, since the rooms are within secure portions of state office buildings and not easily publicly accessible.

#### Department of Libraries

VTLib received a grant that was used to equip 42 of the 182 public libraries in the state, and two VTLib state office facilities, with video conferencing technology. These all have notebook computers with Microsoft Windows software, and an external web camera and monitor on a rolling cart. VTLib provides a subscription to BlueJeans Networks video conferencing service. This service, at a cost of \$1,500 per year, provides two separate virtual meeting rooms that can each support up to 25 locations, and also can connect to the ADS-supported Microsoft Skype for Business video conference service.

The libraries, the existing video conferencing equipment, and the BlueJeans service, could all potentially be engaged as part of a PUC network. This is complicated by the fact that while VTLib provides some centralized services, all Vermont libraries are independent organizations. The libraries have individual policies for video conferencing use, with some having the equipment permanently installed while others have the equipment stored. The libraries all intend to reserve the equipment solely for video conferencing. The equipment is Microsoft Windows-based and could be used for other purposes, and since ADS does not support this equipment, the user experience may not be consistent. In addition, each library would have to be negotiated with separately.

#### Department of Liquor Control

The DLC uses Microsoft Skype for Business for training purposes. It has installed a Microsoft Surface Hub in its Montpelier office. This device has an 80" touch screen and active speaker tracking cameras and is tightly integrated with the Skype for Business software. Remote workers connect using their personal computers.

#### Research Parameters

Preliminary research and evaluation of the demonstration equipment led the Department to develop several initial recommendations on the types of technology that should be used.

First, the services employed for the network should be supported by ADS. The system will likely include off-network locations but will nevertheless most likely be supported by ADS, so services that ADS already supports should be adopted if possible.

Second, the equipment at remote sites should be simple. This equipment will be deployed at the facilities of remote host institutions, on public Internet networks not supported by ADS. Equipment at the remote sites that is a single-purpose device (sometimes referred to as an appliance) as opposed to a multi-purpose personal computer, is easier to maintain.

Third, active speaker tracking technology should be employed at the PUC site. The VIT studios were all equipped with motorized cameras that required an operator to manually pan, tilt, and zoom the cameras to accommodate multiple presenters, which added complexity and cost to the operation. New technology is now available that can automatically track the active speaker. This could be deployed in the PUC hearing room to allow meetings for multiple presenters without the need for constant operator intervention.

Fourth, equipment at remote sites should use fixed cameras. The remote sites will not often have multiple simultaneous speakers. Therefore, the Department determined that fixed cameras, with neither active tracking nor manual motorized cameras are sufficient for the remote sites.

## Assessment of cost-effective interactive video technologies

The statute states that the report should provide an assessment of “cost-effective” interactive technologies. Cost-effective does not mean that a technology must be inexpensive: A technology solution is “cost-effective” if the quality of the result is relative to the costs. Therefore, to assess the cost effectiveness of the solution it is necessary to define the requirements more succinctly.

There are many technologies that could be harnessed to achieve participants’ access to PUC proceedings. We find that for the purposes of this report the technologies may be grouped in three categories: Broadcast, Open, and Closed. The “topology” of a network refers to the way in which the component parts are connected. “Broadcast” refers to a topology where audio and video are transmitted from the PUC to the public over the Internet with no audio or video return channel. “Open” refers to topology where audio and video are transmitted over the Internet from the PUC and to the participants with requisite equipment. “Closed” refers to a topology where audio and video are transmitted over the Internet between the PUC and fixed sites throughout the state. The relative inclusiveness of these three types of network topologies is depicted in Chart 1 below.

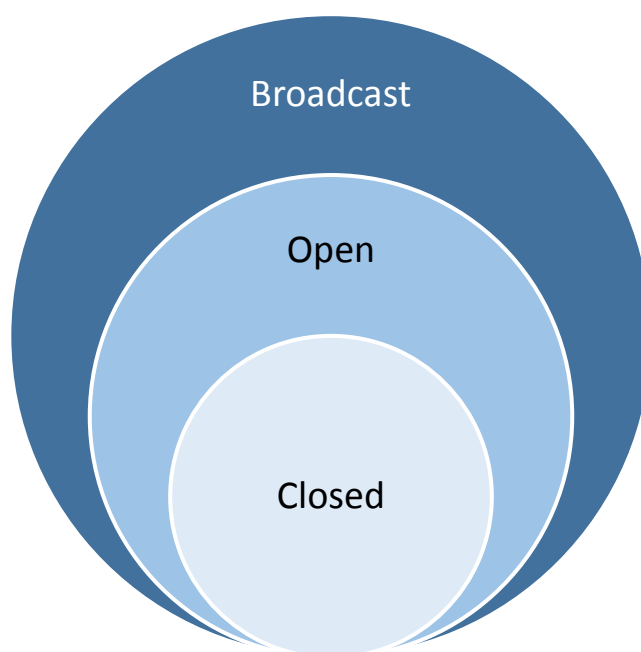


Chart 1: Topology inclusiveness

A chosen network topology balances competing requirements for accessibility and interactivity; improving accessibility comes at the expense of limiting interactivity, and vice versa. While the Broadcast topology is accessible to the most Vermonters, it offers only one-way video and thus has less interactivity than the other topologies. Closed topology requires users to travel to a host remote site, but they would not need to provide their own equipment and Internet access. The Open topology is potentially accessible to a large number of people, limited to participants with computers equipped with microphones and web cameras.

The table below describes the interactivity of these topologies:

Topology	Location	Software	Login req'd	Audio/Video
Broadcast	Residence	Web browser	No	One-way
Open	Residence	Browser Extension	No	Two-way
Closed	Host building	Dedicated Device	Yes	Two-way

Table 1: Topology Interactivity

## Broadcast Network

Live broadcast of government proceedings has been a part of Vermont public life for decades. The Vermont Access Management Organizations (AMOs) coordinate the distribution of Public, Education, and Government (PEG) content on local cable television services. PEG content is typically generated locally and is supplied from an AMO studio in broadcast television format to a cable company headend for distribution to cable customers on a fixed cable television channel. The content often includes public meetings, such as school board or city council meetings, which are in many ways similar to the proceedings of the PUC. Television technology continues to evolve but it is unlikely to be a platform for interactive connections specified in this statute.

It is possible to transmit video over the Internet. Service providers such as Netflix allow consumers to stream video content “over-the-top”, in Internet Protocol (IP) format instead of in traditional television format. It is possible to distribute PEG content, such as PUC proceedings, in a similar fashion. Like television technology, streaming video technology is typically one-way, from the content source to multiple participants. Typically, broadcast video streaming service consists of three components: a.) content creation, b.) encoding and uploading to a Content Delivery Network (CDN), and c.) distribution to consumers on a CDN.

Content, such the audio and video feeds of the proceedings of a PUC hearing, is gathered using video cameras and microphones. This content is assembled using either software on a Windows or Macintosh personal computer, or in a stand-alone video processing appliance. The key features of this function are the ability to select different cameras, or direct a motorized camera to different angles, and control audio levels. Content is typically generated in 1080p HD video format.

Video is encoded into IP format for transport over the Internet to the CDN. One leading CDN recommends transporting the data in 720p HD video format (with a resolution of 1280 x 720 pixels) using the H.264 encoding standard. The company states that the required data rate for transmission of 720p video over the Internet will vary from 1.2 Mbps to 4 Mbps, depending on the degree of motion in the content. The company also recommends that the transmission device be on an isolated (i.e. not shared) Ethernet connection, and that you should plan for double to required data bit rate to avoid glitches in transmission. Thus, a dedicated Ethernet connection with 8 Mbps of dedicated Internet throughput would be required to transmit a broadcast from the PUC hearing room.

When the meeting organizers launch transmission of a meeting broadcast through the CDN, viewers can watch the resulting video stream on a web page of the CDN. The company transmits a separate stream of IP traffic over the Internet to each viewer’s personal computer. Typically, the CDN will “transcode” the video stream into different bit rates for different types of subscribers. A subscriber with an excellent Internet connection might view the 720p stream at 1.5 Mbps. Another subscriber on a mobile phone network might view the stream at 500 Kbps, with 426x240 video.

In addition to offering one-way transmission of video from a central site to users over the Internet, most CDNs also offer opportunities for interactivity. Specifically, most CDNs offer the option for viewers to engage with the program organizers through a text chat function. The text chat feature is often embedded on the same web page on which the streaming video is featured. For instance, a viewer could use the text chat function on the web page to pose a question to the meeting moderator. On

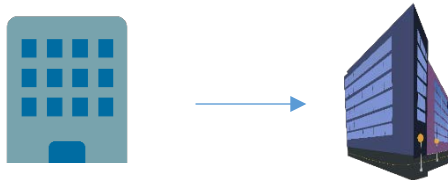
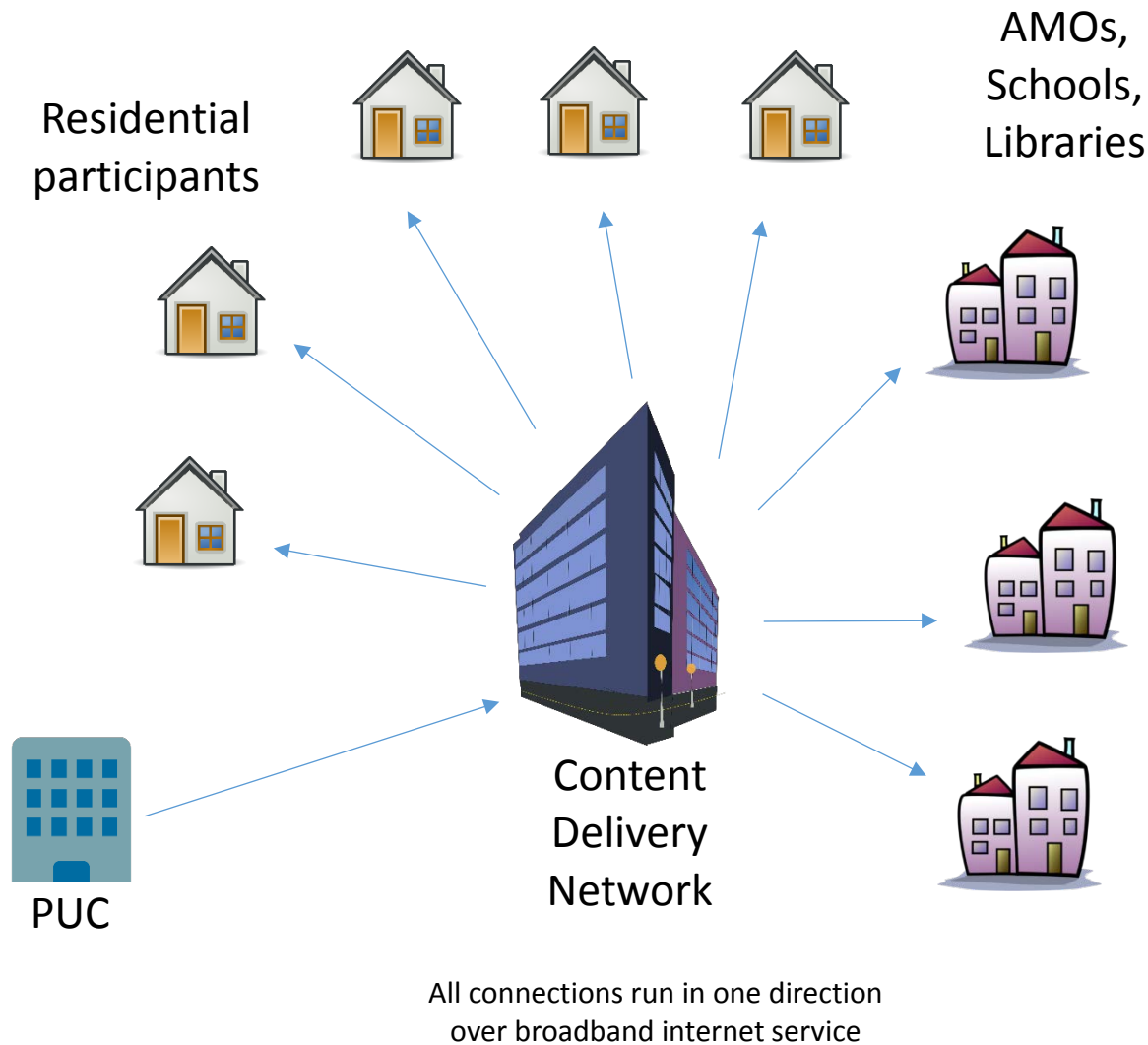
some systems a moderator could pose multiple-choice questions to viewers, who could respond on their web page, and the moderator would see an immediate vote tally.

Interactivity could also be achieved through a simultaneous telephone audio conference. It should be noted however that CDN services involve transcoding which induces a delay that typically runs about 20-30 seconds. A participant in the audio telephone conference would participate in the proceeding in real-time, while the content on the broadcast would be delayed by 20 seconds or more. This could be disconcerting for many participants, unless they disabled their receipt of the streaming broadcast while participating in the audio conference.

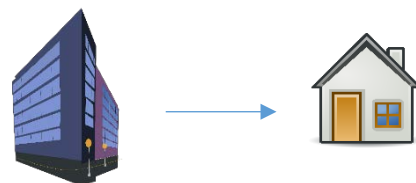
Besides the stand-alone CDN services such as Ustream, Livestream, YouTube Live or Facebook Live, it is important to note that each of the full-featured two-way video conference services subscribed to by the State also offer the ability to create one-way video transmission over the Internet.

# Broadcast

One-way service, Web Browser based



The PUC transmits audio and video to the CDN  
At up to 1-4 Mbps



The CDN broadcasts audio and video to all participants at various rates depending on network quality

Chart 2: Broadcast Network Topology

### Closed two-way video network

The network formerly deployed by Vermont Interactive Technologies (VIT) was an example of a closed two-way video network. Studios in thirteen locations were equipped with video conferencing equipment. Each location had a 348 Kbps connection to a video bridge maintained by VIT. This connection was enabled by aggregating (or bonding together) six separate 64 kbps ISDN circuits, a technology employed in the Public switched telephone network (PSTN) since the 1990s. When a conference was required, the equipment at each required remote location was connected to the video bridge for the duration of the call. All parties continuously transmitted audio and video to the bridge. The bridge provided call control logic to ensure that the audio and video of the active speaker was transmitted to all participating locations.

While ISDN is still supported, most modern video conference networks employ IP networks instead. The cost of maintaining a private video conference bridge was long a significant cost for VIT, and continues to be expensive. Thankfully there are now many service providers that offer video bridging services, so purchasing, and maintaining, an expensive and complicated video bridge independently is no longer necessary. While some video conference networks are deployed on private IP networks with IP Quality of Service (QoS) to ensure uninterrupted transmission, many video networks are also deployed using the Internet for transport. As with the VIT network, when a conference call is placed each remote location connects to a video bridge. Most video bridging services allow connections to the bridge over the Internet. One leading video conferencing equipment manufacturer, Polycom, states that 1080p video requires 2.3 Mbps, while 720p requires 1.2 Mbps. Thus, for a 720p video conference, each remote site would need a connection to the video bridge that supported 1.2 Mbps, in each direction. If the connection is provided over the Internet, as most services are now, each remote site would need an Internet connection supporting this speed. Moreover, to ensure a quality experience, the connection at each site should be on a separate (i.e. not shared) fixed Internet connection of at least twice this speed.

Video conferencing user equipment is commonly called a **codec**, because it both **codes** audio and video data for transmission to the bridge, and **decodes** this information from the bridge. There are two primary types of codecs, purpose-built hardware **appliance** codecs, and **software** codecs that run on personal computers.

Hardware codecs were long the mainstays of video conferencing since its initial deployment. These devices are optimized for the purpose and since the systems are tightly controlled by the manufacturers, they are tailored to ensure a consistent user experience. On the other hand, these devices tend to be more expensive and have a lag time in allowing adoption of new technology.

Software codecs are installed on other devices, such as computers, phones or tablets. Software codecs tend to be less expensive and are often free, but must be installed on other hardware. The software is commonly updated often, and can take advantage of technology changes more quickly. On the other hand, software codecs can be more complicated as they rely on the underlying equipment operating system, and thus at times do not offer a reliable and consistent user experience.

A network is often considered “closed” if access to the network is restricted, for instance if only certain codecs were allowed to access the network video bridge. For the purposes of this report we mean a closed network to be restricted to codecs installed at fixed locations. The Vermont Video Connect proposal submitted by the Department in 2015 envisioned codecs installed at 14 locations around the

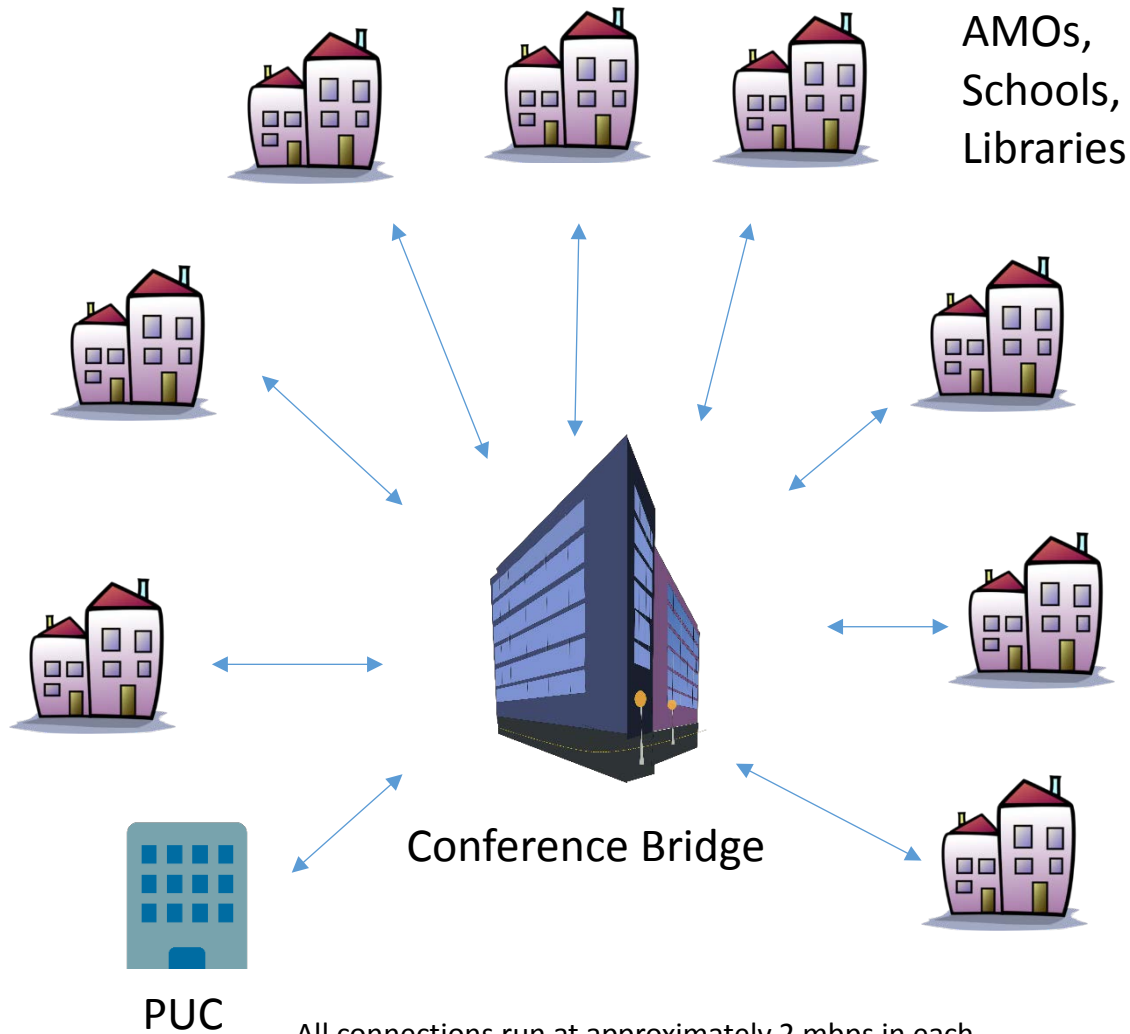


state and connected using the Internet access at these locations to an Internet based video bridge service. This too was an example of a closed two-way network. A closed network is restricted to only a set group of locations, and as a result does by definition exclude other locations.

Compared with the broadcast topology, the two-way video conferencing network poses additional challenges to PUC staff moderating the PUC proceedings. In addition to controlling the flow of the meeting in the physical hearing room, the PUC staff also have to pay attention to the individuals in the remote locations. The user experience, both of those in the hearing room, and those in remote sites, can be significantly affected by disruptive members of the public or technology issues. PUC staff are already charged with providing rigorous legal expertise, and adding technological challenges will only increase the challenge. The technology evaluation revealed that various services have varying capabilities to assist with meeting control, and these capabilities also vary in how they are implemented in different devices that ostensibly support the same service. Care should therefore be given in evaluating and selecting services and devices to ensure an accurate understanding of the call control ability provided.

# Closed Network

Two-way service, fixed sites



All connections run at approximately 2 mbps in each direction over broadband internet service

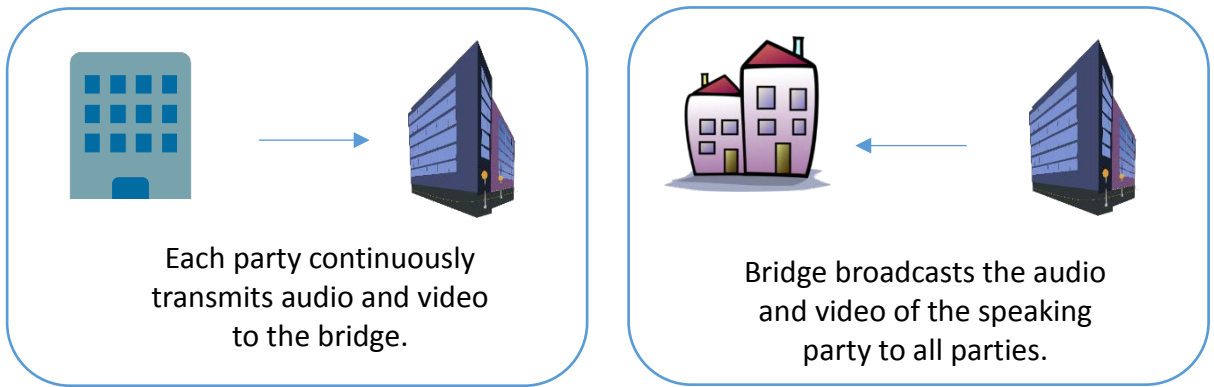


Chart 3: Closed Network Topology

### Open two-way video network

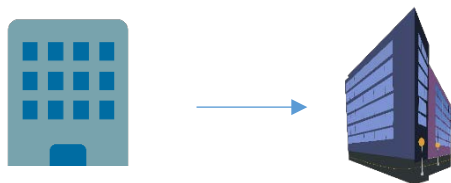
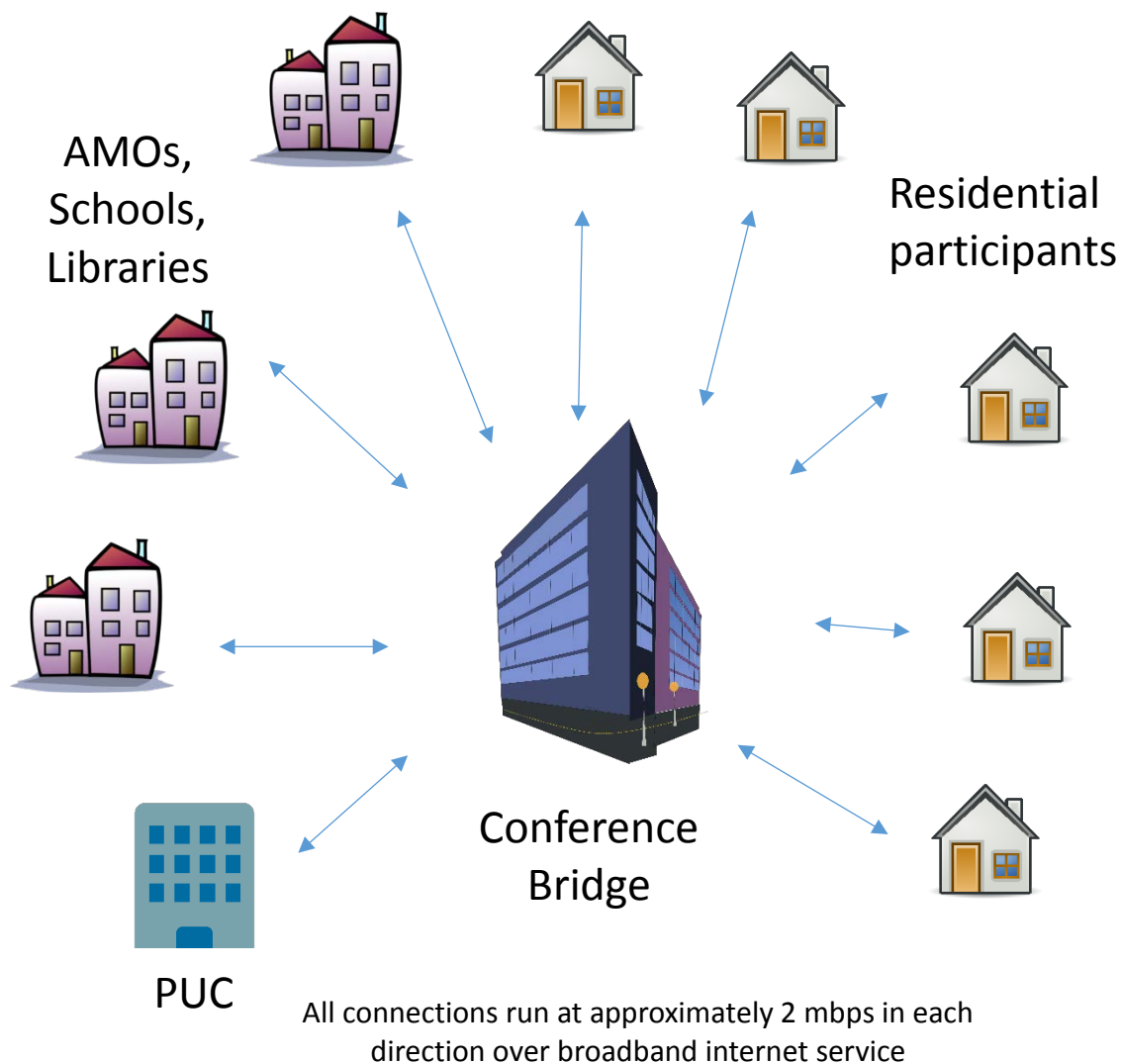
For the purposes of this report, an “open” network consists of software codecs installed on the personal computers and devices of individual participants. The same general network topology from a “closed” network still applies, in that remotely located “codecs”, including one at the PUC hearing room, connect over the Internet to an Internet-based video bridge. An example of such an open network would be Skype, Google Hangouts, Facebook, or FaceTime.

The open network environment allows the greatest participation, in that members of the public could join a meeting from the comfort of their own homes. However, an open network topology has several disadvantages as well. Members of the public would be required to join the meetings on their own, which means they would be responsible for providing the required hardware, installing the required software and regulating the performance of their equipment and internet connection. Of course, only users with adequate Internet access could participate.

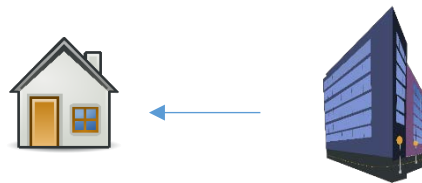
As related above, moderating a meeting on a closed network poses challenges for the PUC staff. These challenges are compounded in an open network by significant variability in hardware and network capabilities at the remote sites. In a closed network the equipment and network at remote sites would presumably have consistent operation. In an open network, in addition to moderating the meeting, PUC staff would have to content with users connecting with an array of devices. The technology evaluation revealed that remote users can join meetings using different kinds of technology. This experience also showed that the performance of a user’s device and network significantly affects call quality, and not only for that individual. Poor performance of one individual’s device or network can affect the overall group experience.

# Open Network

Two-way service, any site



Each party continuously transmits audio and video to the bridge.



Bridge broadcasts the audio and video of the speaking party to all parties.

Chart 4: Open Network Topology

## Other Considerations

In addition to the issues identified specific to the broadcast, open, and closed topologies above, the Department recognizes a few additional concerns that should be considered.

### Court Reporters

It was previously stated that the adoption of these technologies could present significant challenges to PUC staff moderating PUC proceedings. Thought should be given also to how these changes might affect the court reporters. Most PUC hearings are on the public record and are staffed by court reporters who prepare typed formal records of the proceedings. It is often challenging to follow all exchanges precisely in the PUC hearing room. The inclusion of additional remote sites would likely make this task more difficult.

### Accessibility

The proceedings of the PUC are open to the public, including those with various physical abilities, including those with auditory and visual impairments. Adopting new technology has the potential to increase accessibility since it enables participation without physically being present in Montpelier. Consideration should be given however to unintended consequences. For instance, if access is enabled over a closed network at a remote host site, would that site need to comply with state or federal rules for accessibility? And if access were enabled over an open network, would the supporting services need to comply with similar rules? These considerations are not addressed by this report, but should be considered during the design and implementation phases.

## Identification of Host Locations

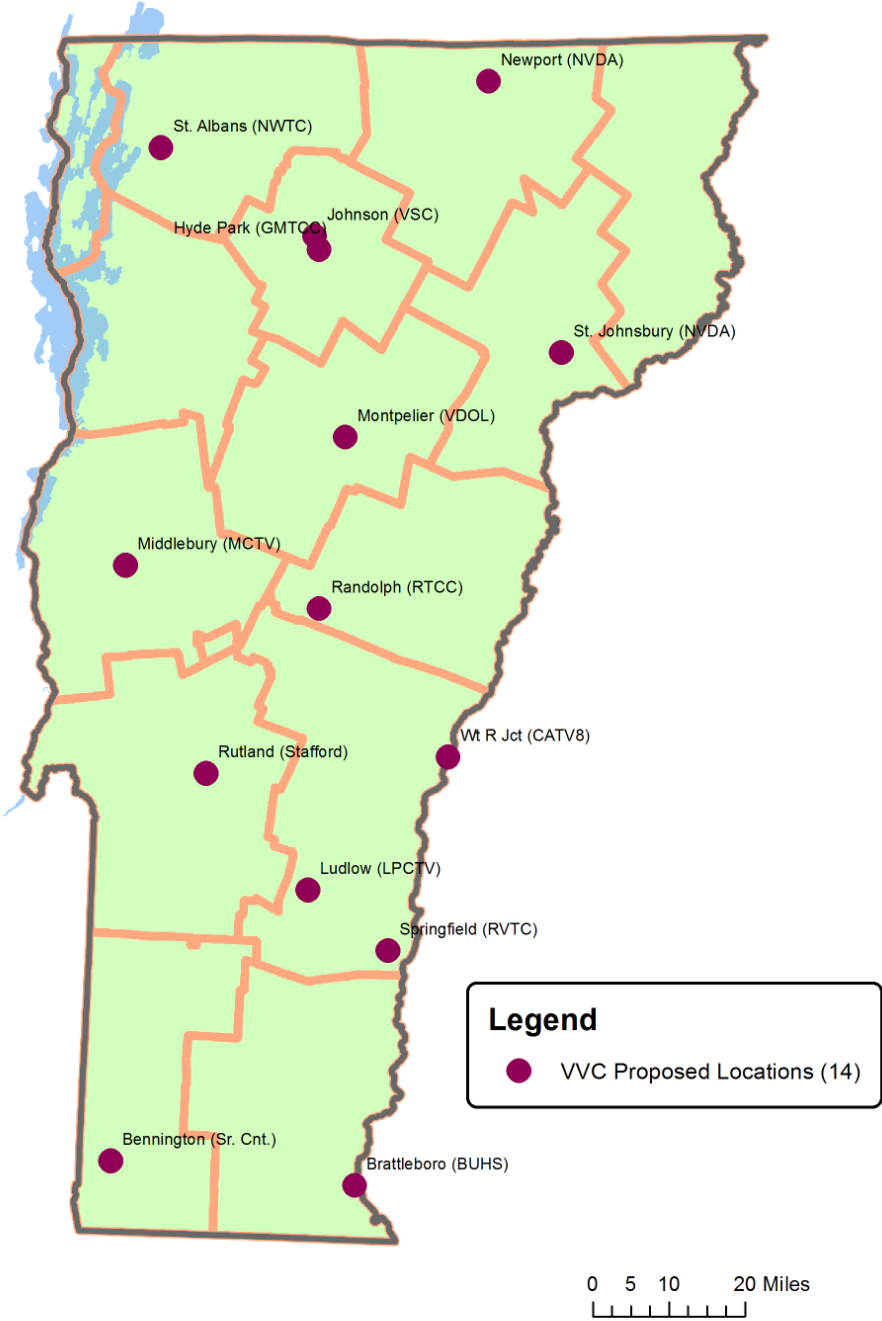
This plan recommends using a closed network model for two-way interactive video, in which host organization sponsors network satellite site. Vermont Interactive Technology (VIT) studios were installed at the facilities of many types of host institutions, including Vermont state office buildings, Vermont state colleges, career and technical centers, and high schools. There are 26 Access Management Organizations (AMOs) in the state. There are 17 career and technical centers. There are 11 regional planning commissions. Many of the facilities of these types of organizations overlap in the territories they serve, and in fact are often in the same towns. In addition there are 182 libraries in the state that could also conceivably serve as host sites.

The VVC proposal envisioned the State of Vermont providing a stipend to host institutions in the amount of \$4,000 per year (\$333 per month). In that model the State would have provided and maintained the necessary hardware and would have coordinated central scheduling. The host institution would have provided a small room for the occasional video conference meetings, and would have provided on-site support. The same or similar model could be adopted for a new program.

Negotiating with prospective host organizations takes time and resources. The Department believes that a clear plan should first be adopted before negotiations with host sites begins. The proposed VVC sites are depicted in Chart 5 below as an example of a host site plan that could be adopted.

Any proposal that includes host sites should consider the following several characteristics. First, the centrality of the host site to neighboring communities will impact the level of participation a site will typically receive. Sites should be convenient and easily accessible. Second, depending on the technological solution adopted, the proposal should consider staffing needs. As an example, AMOs may have the ability to staff evening functions with personnel knowledgeable of the equipment and PUC processes, which could ensure smooth resolutions to technical problems. Third, cost factors should be carefully considered after a budget and revenue source has been established. Ideally, any proposal would leverage synergies between the PUC and host organizations by ensuring that the mission of the host organization is consistent with the PUC's mission of expanding the public's access to its proceedings.

# Proposed VVC Network



VCGI

Prepared by the Dept. of Public Service 11/24/15

Chart 5: Vermont Video Connect Proposed Host Facilities

## Estimated Capital and Operating Costs

The Department developed estimates for Capital and Operating Costs for six different configurations with a 5-year cost ranging from \$3,000 to \$120,000. These costs include only the video conferencing hardware and services. The estimates do not include costs for installation, the costs for monitors at the PUC site, or in the case of Microsoft or Google the costs for monitors for the remote sites. This also does not include PUC or ADS costs, or support for host institutions. The prices listed for the equipment are the Manufacturer Suggested Retail Price (MSRP). In a procurement it is possible that the final contract prices could be less. The estimates do not include any support for remote hosts or for the PUC or ADS to administer the program.



## Microsoft/Polycom

ADS subscribes to Microsoft Office 365 which includes the Skype for Business communications suite. This package includes instant text messaging as well as PC-based voice and video calling and conferencing services. Microsoft has a package for room-systems that is only \$45 per year per device, and this would be appropriate for remote locations. The cost for standard service is \$312 per year and testing demonstrated that this level of service is necessary for a central location like the PUC. Note that this is the cost of the video conferencing service itself and does not include any hardware costs. The service supports up to 250 participants.

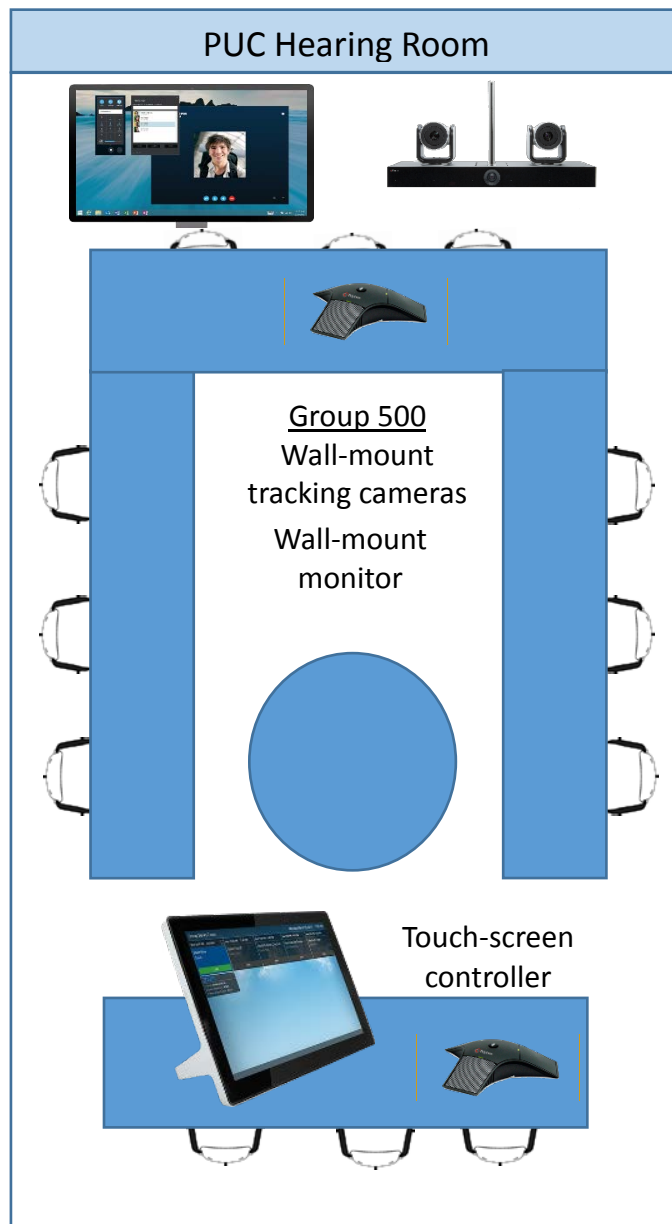
The manufacturer Polycom has integrated its video conference equipment to work with the Microsoft service. The Group 500 room system with the EagleEye Director II active speaker tracking system and desktop touchscreen controller is suitable for installation at the PUC site. It has an MSRP of \$25,746 (not including a required monitor). For remote sites, Polycom recommends the Trio 8800. This system is composed of a desktop VoIP conference telephone with an external web camera and monitor. The MSRP of the system is \$2,259 (not including a required monitor).

The advantages of this configuration are the excellent camera system, the integration with the ADS-supported Microsoft software, and the high sound quality of the Trio phone at the remote locations. The disadvantages of this configuration are the costs and incomplete integration of call control features at the PUC site, and the component nature of the remote sites, with the separate desktop conference phone for audio and the camera/monitor for video.

Closed network: For a network with 5 remote sites, the total MSRP is \$37,041, the annual service cost is \$537, and the 5-year total cost is \$39,726. For a network with 14 remote sites, the MSRP is \$57,372, the annual service cost is \$942, and the total 5-year cost is \$62,082.

Open Network: The Microsoft Skype for Business service allows residential participants to join two-way conferences on many platforms. Participants may download the Skype for Business application (for Windows, Macintosh, Android or IOS) and join conferences with an invitation and authentication. Participants may also install a web browser extension and join conferences as guests by clicking a web link URL. It is thus possible to create an open network with hardware and service subscription at only the PUC site, where all other participants join from their own devices. Such a network with the Polycom Group 500 at the PUC site and a single Skype for Business account would have an MSRP of \$25,746, an annual service cost of \$312, and a five-year total cost of \$27,306.

Broadcast: The Skype for Business platform includes an adjunct service called Skype Meeting Broadcast. This service transmits a one-way video stream from a central site. Upon scheduling the meeting the organizer receives a URL which provides direct access to the meeting. Participants can click the URL to join the meeting from any web browser, and during the meeting receive an audio and video stream of the meeting on their web browser. Meeting organizers can allow participation by enabling an online question and answer section on the same page that hosts the video feed. Such a network with the Polycom Group 500 at the PUC site and a single Skype for Business account would have an MSRP of \$25,746, an annual service cost of \$312, and a five-year total cost of \$27,306. The service supports up to 10,000 participants.



MSRP: \$25,746 (w/o monitor)  
Service: \$312/yr

	MSRP	Service	5-year
PUC	\$25,746	\$312	\$27,306
5 sites	\$37,041	\$537	\$39,726
14 sites	\$57,372	\$942	\$62,082



MSRP \$2,259 (w/o monitor)  
Service: \$45/yr

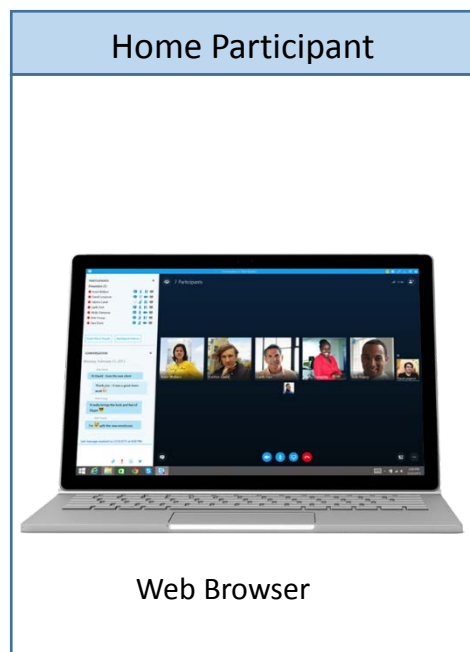


Chart 6: Microsoft/Polycom

## Microsoft/Polycom MSR

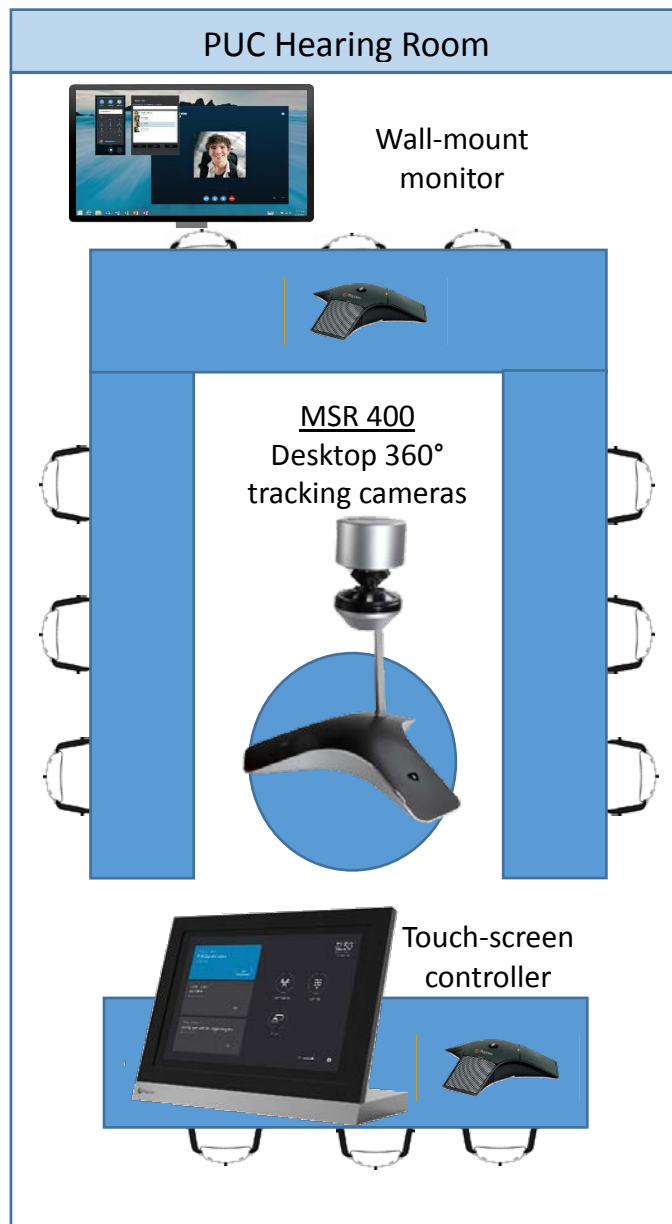
Closed Network: Polycom offers the MSR400 system that includes the Polycom CX5100 desktop 360° active speaker tracking camera and microphone system, and a Microsoft Surface Pro touch screen controller in a desktop secured docking station for permanent installation. The MSRP for this system is \$7,853 (not including a required monitor). This could be paired with the Trio 8800 at remote sites, and the Microsoft Skype for Business service.

This configuration includes a novel active speaker tracking solution, where a device with multiple cameras is installed in the middle of the room. Testing demonstrates that this camera solution works better in the PUC environment than the wall-mounted system with motorized cameras. The advantages of this configuration are the novel active speaker tracking solution, the integration with Microsoft software, and the lower price. The disadvantage is the component nature of the remote solution.

Closed Network: For a network with 5 remote sites, the total MSRP is \$19,148, the annual service cost is \$537, and the 5-year total cost is \$21,883. For a network with 14 remote sites, the MSRP is \$39,479, the annual service cost is \$942, and the total 5-year cost is \$44,189.

Open Network: Such a network with the Polycom MSR400 at the PUC site and a single Skype for Business account would have an MSRP of \$7,853, an annual service cost of \$312, and a five-year total cost of \$9,413.

Broadcast: Such a network with the Polycom MSR400 at the PUC site and a single Skype for Business account would have an MSRP of \$7,853, an annual service cost of \$312, and a five-year total cost of \$9,413.

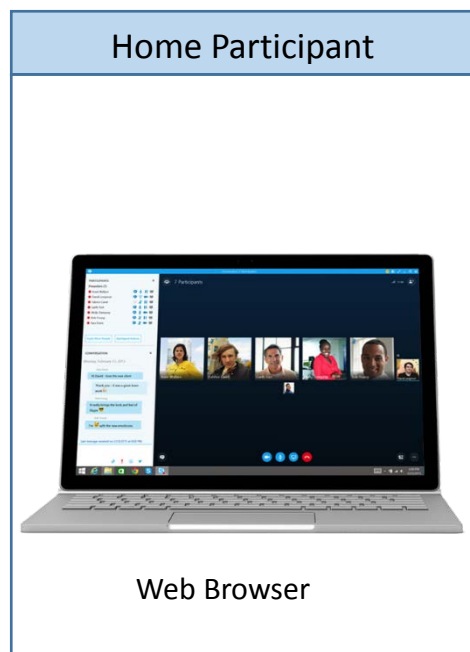


MSRP: \$7,853 (w/o monitor)  
Service: \$312/yr

	MSRP	Service	5-year
PUC	\$7,853	\$312	\$9,413
5 sites	\$19,148	\$537	\$21,883
14 sites	\$39,479	\$942	\$44,189



MSRP \$2,259 (w/o monitor)  
Service: \$45/yr



Web Browser

Chart 7: Microsoft/MSR

## Cisco Spark

The company NWNIT provides VoIP telephony service to the state of Vermont which is based on Cisco technology. The package also includes support for the Cisco “Spark” video conferencing platform. The cost for the Spark video conferencing service is \$4,680/year (\$390/month) for the central PUC site and \$540/year (\$45/month) for the remote sites. This fee includes service and remote and on-site technical support.

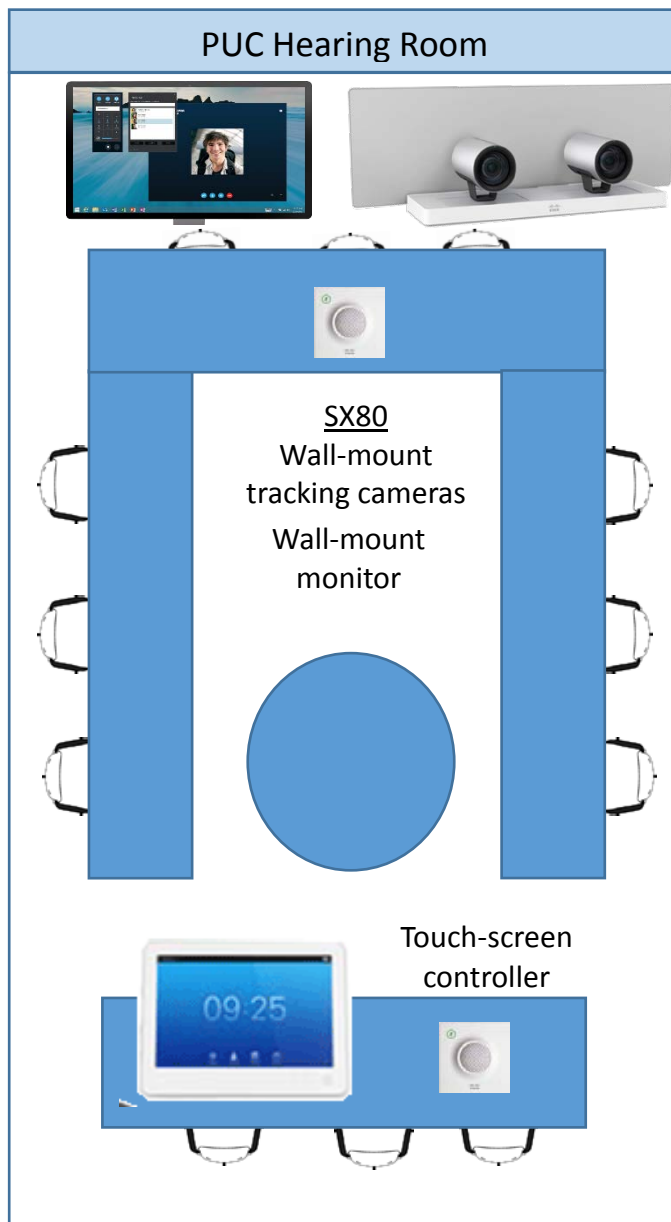
The Cisco SX-80 video conferencing system paired with the SpeakerTrack 60 active speaker tracking technology and external touch controller is suitable for the PUC site. The MSRP for this package is \$30,500 (not including a required monitor). This can be paired with the Cisco DX80 desktop system with a 23” touch screen and integrated microphone, speakers, and web camera at remote sites. The MSRP for the DX80 is \$1,819.

The advantages of this package are the active speaker tracking capabilities of the SX-80, the compact all-in-one nature of the DX80 desktop system, a simple intuitive user interface, the feature-rich Spark software package, and importantly, the fact that the service package from NWNIT includes on-site maintenance. The disadvantages of this package are the high cost, and the fact that the camera is wall-mount as opposed to central.

Closed Network: For a network with 5 remote sites, the total MSRP is \$39,595 the annual service cost is \$7380, and the 5-year total cost is \$76,495. For a network with 14 remote sites, the MSRP is \$55,966, the annual service cost is \$12,240, and the total 5-year cost is \$117,116.

Open Network: The Cisco Spark service allows residential participants to join two-way conferences on many platforms. Participants join conferences using a standard web browser, or may download a specific Spark application (for Windows, Macintosh, Android, or IOS) and join conferences with an invitation and authentication. It is thus possible to create an open network with hardware and service subscription at only the PUC site, where all other participants join from their own devices. A network with the Cisco SX-80 the PUC site and a single Cisco Spark account would have an MSRP of \$30,500, an annual service cost of \$4,680, and a five-year total cost of \$59,900.

Broadcast: There is no specific broadcast-only capability included with Spark.



MSRP: \$30,500, or LEASE: \$8,000/yr  
(w/o monitor)  
Service: \$4,680/yr

	MSRP	Service	5-year
PUC	\$30,500	\$4,680	\$59,900
5 sites	\$39,595	\$7,380	\$76,495
14 sites	\$55,966	\$12,240	117,116



MSRP \$1,819, or LEASE: \$768/yr  
Service: \$540/yr

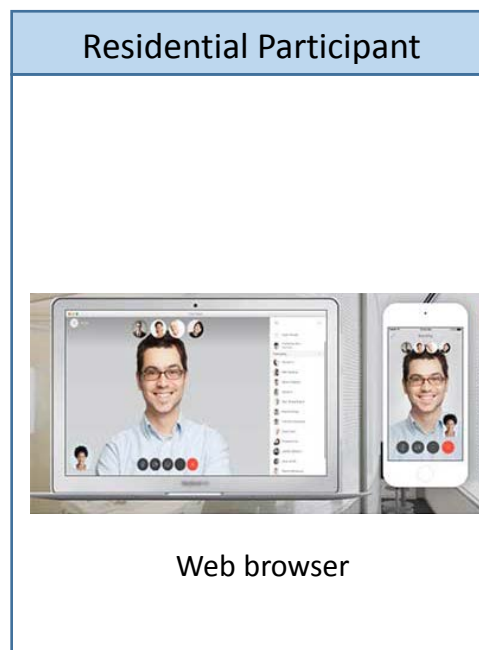


Chart 8: Cisco Spark

## Cisco VoIP

The Cisco VoIP platform provided by NWNIT for voice telephony service for state employees supports video conference service natively, without adding the Spark platform. Service for the PUC site is \$558/year, service for remote sites is \$174/year. There is an additional fee for the video bridge service and it is priced at \$1,020 per year for a virtual room that supports 5 callers, or \$3,060 for a virtual room that supports 15 callers. This fee includes service and remote and on-site technical support.

The SX-80 and DX80, described above, work with the VoIP virtual room platform, but Cisco also offers less expensive alternatives. The SX-10 is a very simple system that includes a fixed camera and codec that mounts on top of a flat screen monitor (not included) and could be used in place of the SX80. It lacks the active speaker tracking capabilities of the more expensive SX-80, but it has an MSRP of \$3,500. The 8865 is a desktop VoIP telephone in the same series as those installed by NWNIT for state employees but the 8865 supports personal video conferencing with a 5" video screen and a camera, with a MSRP of \$795.

The advantages of this package are the relatively low cost, the compact nature of the desktop VoIP telephones at the remote sites, and the fact that the service package from NWNIT includes on-site maintenance. The disadvantages are that the SX-10 lacks active speaker tracking technology and that the VoIP virtual room service has limited open-network support (it does not work with a web browser).

Closed Network: For a network with 5 remote sites, the total MSRP is \$7,474, the annual service cost is \$2,448, and the 5-year total cost is \$19,715. For a network with 14 remote sites, the MSRP is \$14,630, the annual service cost is \$6,054, and the total 5-year cost is \$44,900.

Open Network: The virtual room platform supports the Cisco Jabber client on Windows and Macintosh, but does not support web browser access. It is thus possible to create an open network with hardware and service subscription at only the PUC site, where all other participants join from their own devices. A network with the Cisco SX-10 the PUC site and service at the PUC site and a 5-seat virtual room would have an MSRP of \$3,500, an annual service cost of \$1,578, and a five-year total cost of \$11,390. It is possible to expand the virtual room as necessary for \$1,020/year for each additional 5 seats.

Broadcast: There is no specific broadcast-only capability included with the VoIP virtual room platform.

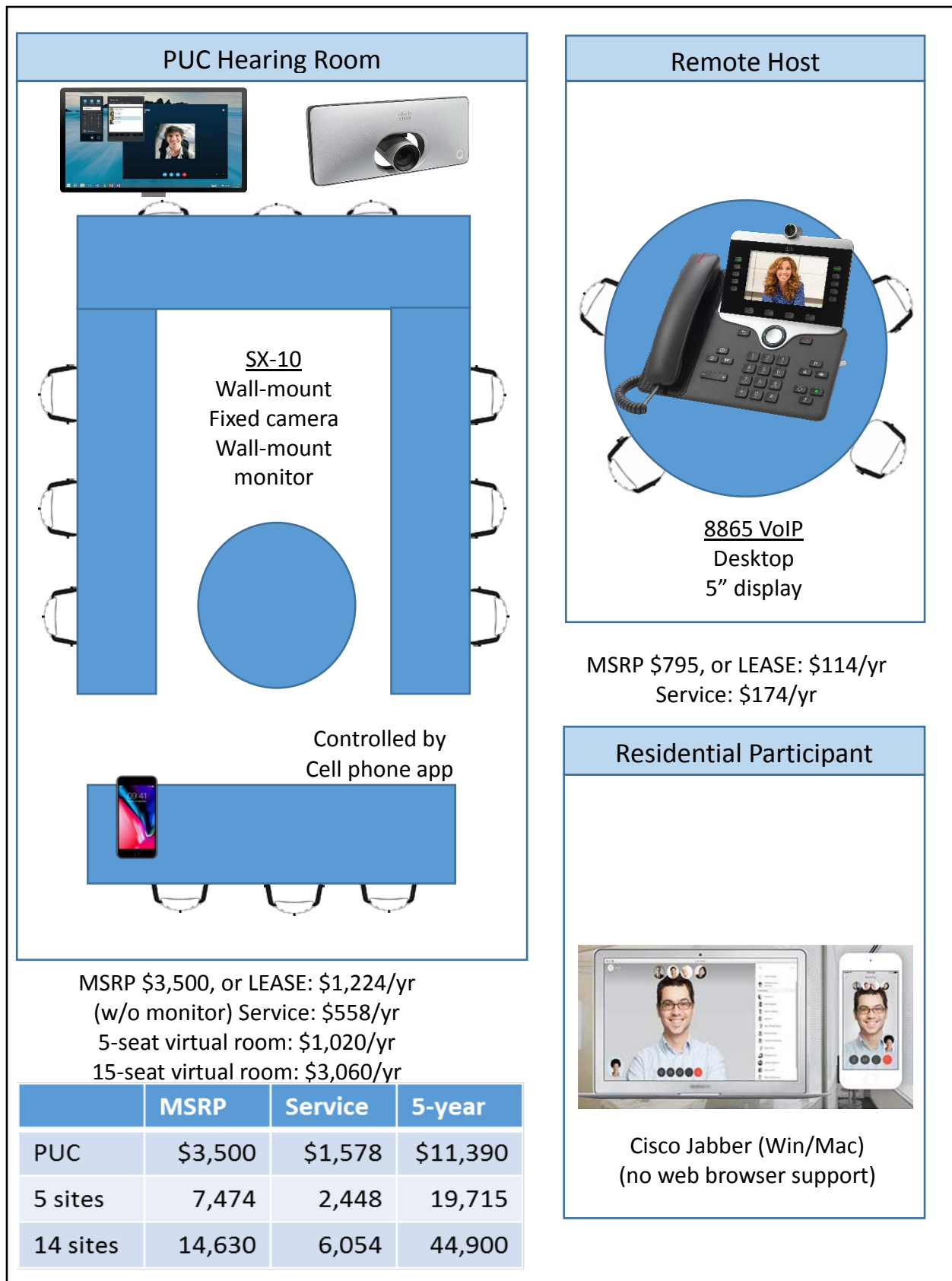


Chart 9: Cisco VoIP



## Google

Google developed and maintains the Chrome operating system used on Chromebook devices popular in schools. Google also supports the Hangouts video conferencing software platform. Google developed a hardened version of the Hangouts software and Chrome operating system specifically for video conferencing applications, which it calls Chrome for Meetings. There is no fee for the Hangouts service. Google does charge an annual \$250 fee for devices registered with the network for remote monitoring and software maintenance. It is also optimal to subscribe to the G-suite online service package (with 2 accounts) to enable scheduling, and the cost for this is \$100 per year. The service supports up to 25 locations.

The Hangouts Meet Hardware Kit (MSRP \$1,999) includes an Asus Chromebox computer, a Mimo Vue 10" desktop touch-screen controller, a Google-designed speaker/microphone and a Huddly Go 4K HD camera with 120 degree wide field of view and intelligent participant detection and auto zoom and cropping. The system could be augmented with USB accessories, including up to 4 additional speaker/microphone kits, or extra cameras, such as the Logitech PTZ Pro II motorized camera with 4 preset positions. Chromebase devices can be deployed at the remote sites. These stand-alone devices include a 23" touch screen and embedded speaker, microphone and web camera, with an MSRP of \$799.

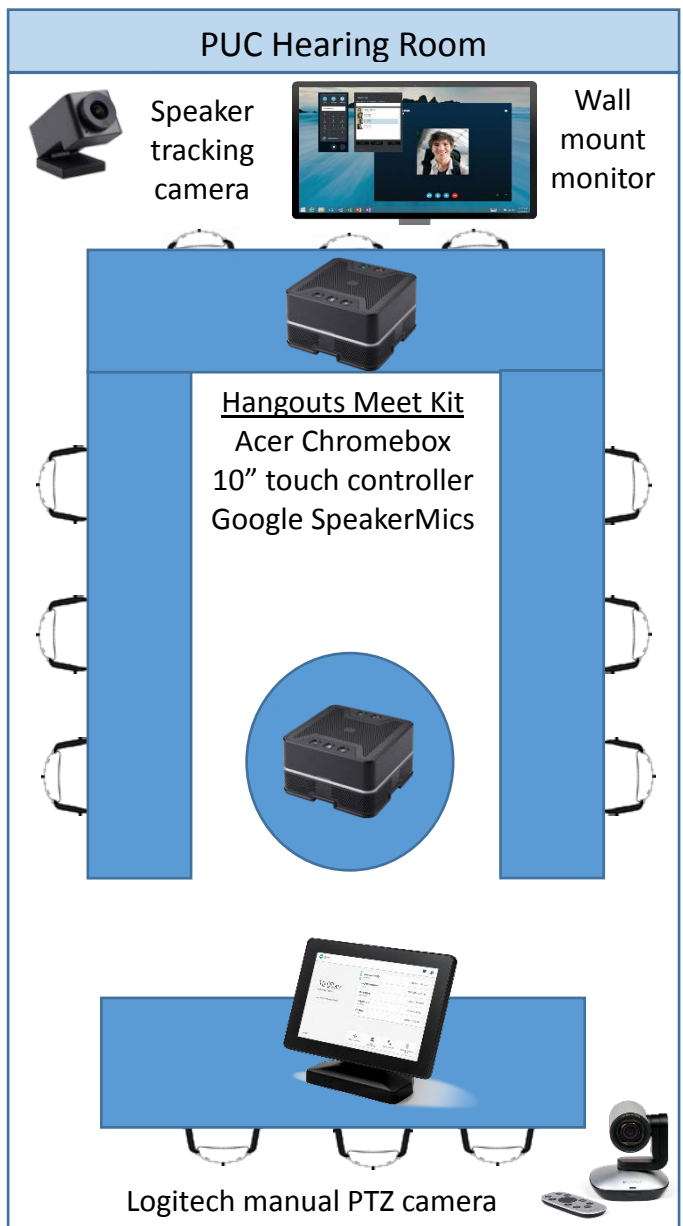
Unlike the other platforms considered, the Google Hangouts conferencing platform employs a static URL for regular conferences. With the other platforms, a URL to the meeting posted on the PUC website would need to be changed regularly, while a Google Hangouts link could be set permanently.

The advantages of this package are the price, the polish of the software - the user interface is very intuitive with limited options – and the fixed URL for conferences. The devices for the remote sites are compact and like the Cisco devices come in an all-in-one package, and annual fee includes remote software maintenance.

Closed Network: For a network with 5 remote sites, the total MSRP is \$5,994, the annual service cost is \$1,500, and the 5-year total cost is \$13,494. For a network with 14 remote sites, the MSRP is \$13,185, the annual service cost is \$3,750 and the total 5-year cost is \$31,935.

Open Network: Such a network with the Google Large Room at the PUC site would have an MSRP of \$1,999, an annual service cost of \$250, and a five-year total cost of \$3,249.

Broadcast: There is no specific broadcast-only capability included with this platform.



MSRP: \$1,999  
(w/o monitor)  
Service: \$250/yr

	MSRP	Service	5-year
PUC	\$1,999	\$250	\$3,249
5 sites	\$5,994	\$1,500	\$13,494
14 sites	\$13,185	\$3,750	\$31,935



MSRP \$799  
Service: \$250/yr

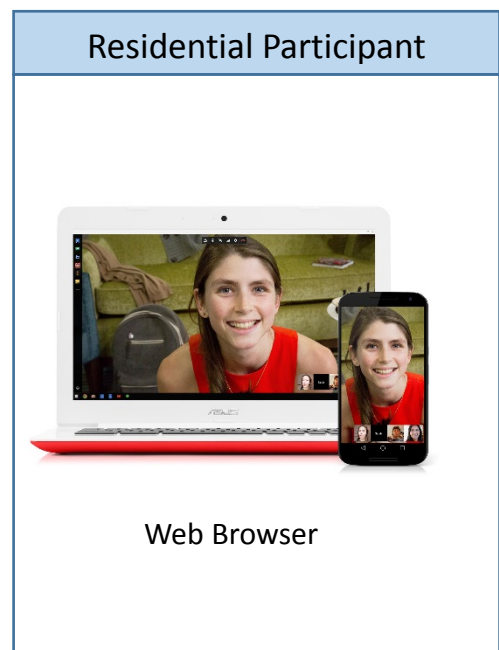


Chart 10: Google

## Google/Polycom

There is no Chrome for Meetings device that provides active speaker tracking. Although it is not a Chrome for Meetings device, the Polycom MSR400 system with the Polycom CX5100 camera and Microsoft Surface Pro can be used to join Chrome for Meetings Hangouts. This device has active speaker tracking technology with an MSRP of \$7,853 (without the required monitor). This device could be deployed at the PUC, and paired with the Chromebase devices (MSRP \$799) at the remote sites.

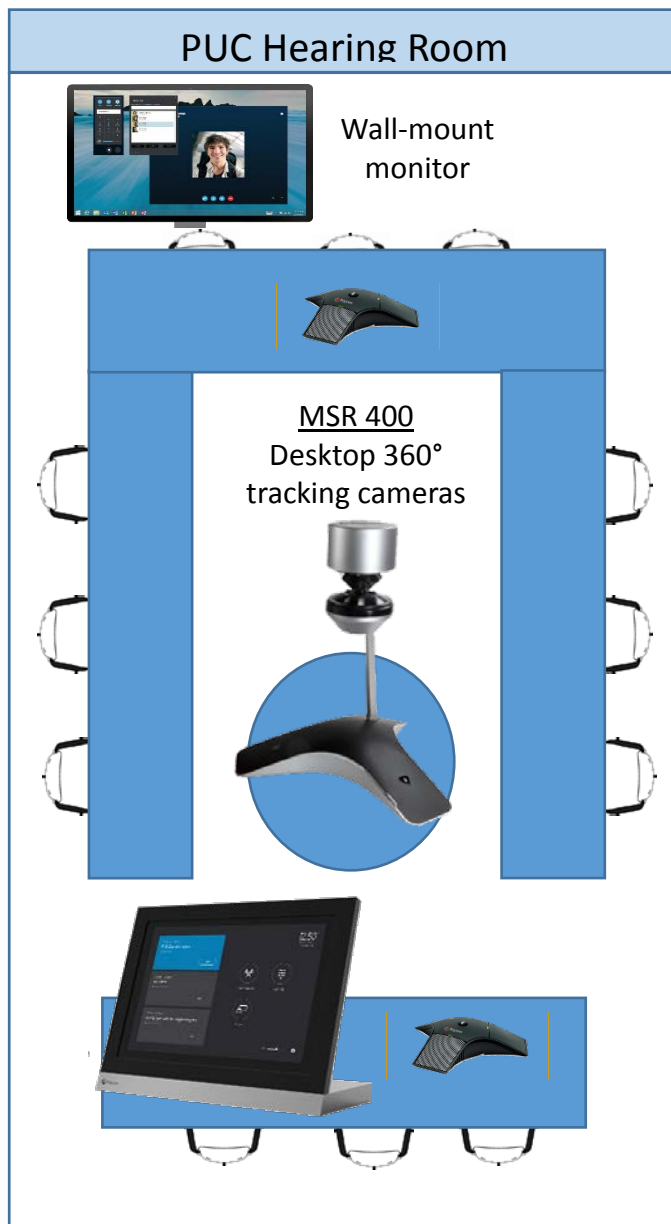
This package has the advantages of the standard Google package: price and polish. It adds the additional advantage of the active speaker tracking capabilities of the MSR400. The disadvantage of this package is that the MSR400 is not a native Chrome for Meetings device, and thus it is necessary to use access the meetings using the Chrome web browser instead of the locked-down Skype-only interface typically installed on the MSR400.

The Department has a Polycom CX5000, the prior version of the CX5100, which could be paired with a notebook computer or a Surface Pro tablet for a pilot project.

Closed Network: For a network with 5 remote sites, the total MSRP is \$5,994, the annual service cost is \$1,500, and the 5-year total cost is \$13,494. For a network with 14 remote sites, the MSRP is \$13,185, the annual service cost is \$3,750 and the total 5-year cost is \$31,935.

Open Network: Such a network with the Google Large Room at the PUC site would have an MSRP of \$1,999, an annual service cost of \$250, and a five-year total cost of \$3,249.

Broadcast: There is no specific broadcast-only capability included with this platform.



### PUC Hearing Room

MSRP: \$7,853 (w/o monitor)

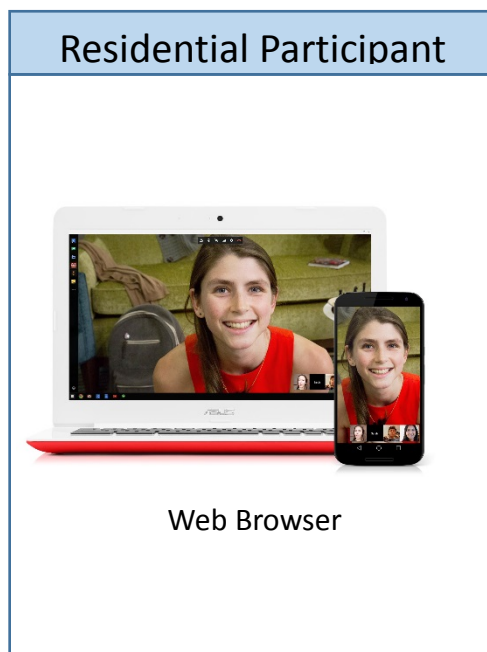
Service: \$0/yr

	MSRP	Service	5-year
PUC	\$7,853	\$0	\$7,853
5 sites	\$10,944	\$1,250	\$18,098
14 sites	\$18,185	\$3,500	\$36,539



Acer Chromebase  
Desktop  
23" touch screen

MSRP \$799  
Service: \$250/yr



Web Browser

Chart 11: Google/Polycom

## Cost Comparison

Chart 12 below depicts the 5-year cost for each of the six configurations for networks with 5 and 14 remote hosts. The “PUC Only” data relates the costs for Open Network or Broadcast topologies using the equipment at just the PUC site. Chart 13 below depicts the breakdown of the equipment and service components of the cost totals for the networks with 5 and 14 remote hosts.

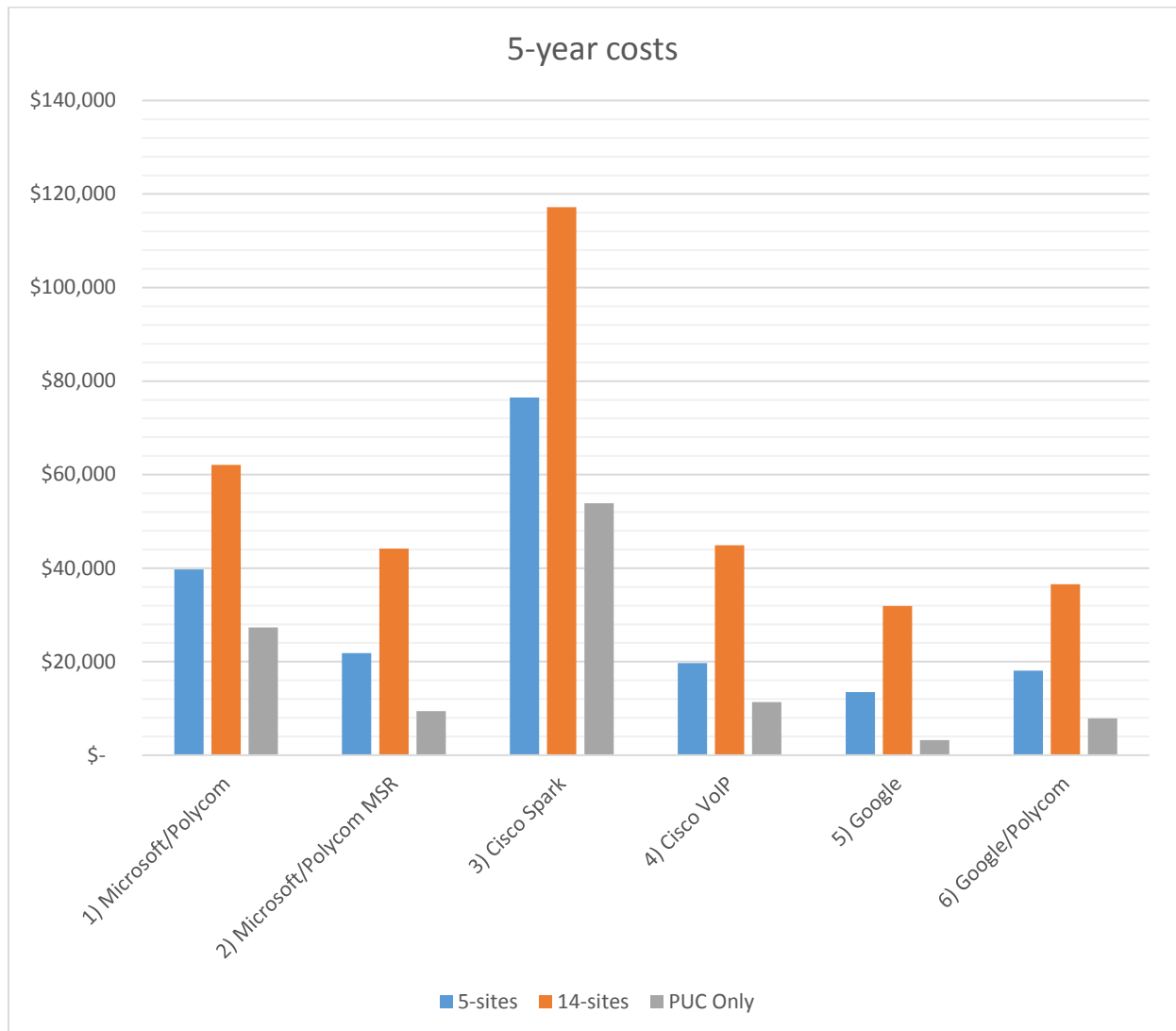


Chart 12: 5-year costs

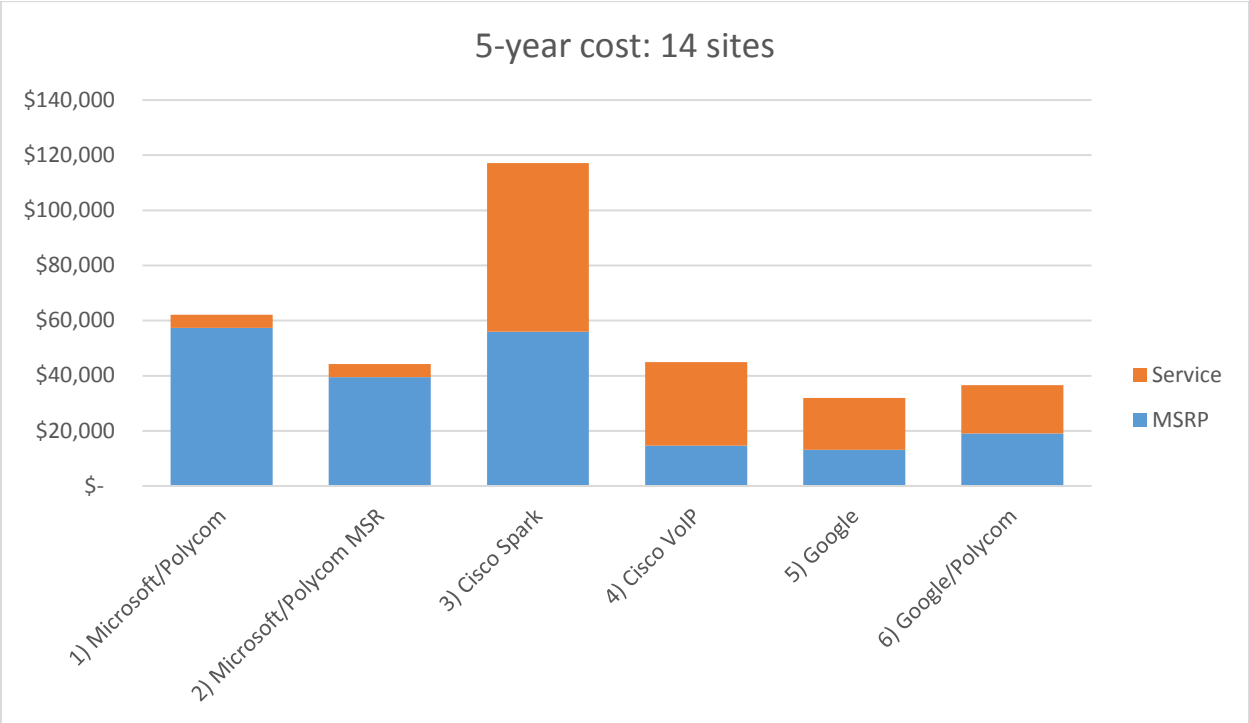
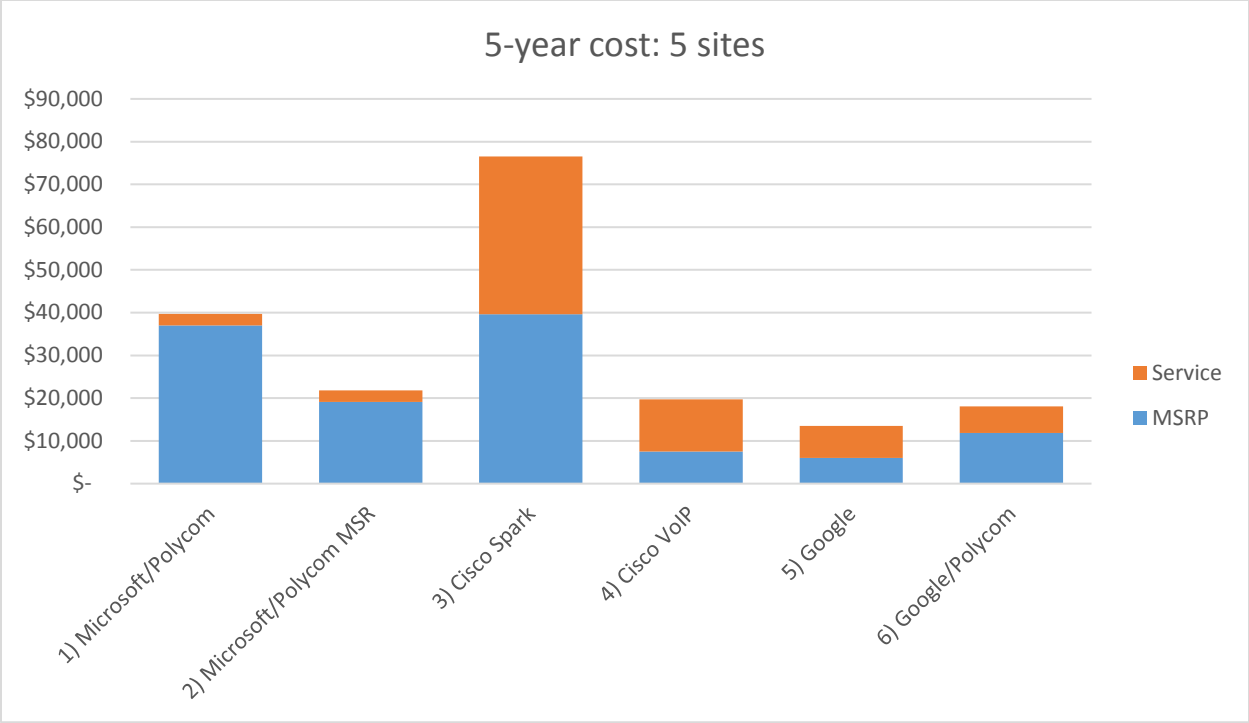


Chart 13: Cost Breakdown

## Recommendations

Active support by the PUC is essential for the success of any project to achieve greater public participation in its proceedings. The Department recommends that the PUC should have ultimate responsibility for and authority over the project.

The network should be designed holistically, with consideration given to the requirements for the three primary components: the PUC site, the remote sites, and the capabilities of the video conferencing bridging solution. When selecting a solution, consideration should be given to the call-control capabilities of the bridge service, specifically a.) the ability to employ a virtual lobby to control the start and end of the meeting, and b.) the ability to mute or remove attendees from the PUC central site.

The equipment deployed at the PUC site should have automatic active speaker tracking technology. The equipment deployed at remote locations should be a single-purpose appliance, as opposed to a computer that could be used for many purposes.

### Network topology

The Department recommends that the PUC, through stakeholder engagement determine the level of accessibility and interactivity that it believes is most appropriate, based on the broadcast, open, and closed topologies laid out in this report. The Department recommends that stakeholders consider adopting different topologies for different types of proceedings. The broadcast (streaming) topology may be appropriate for all PUC proceedings, while the closed network topology might be more appropriate for public hearings. The Department's test demonstrations showed that managing multiple video conferencing users can be difficult and therefore a closed network is recommended for two-way video conferencing, but that text chat could be a way to incorporate participants who choose not to attend from a host site.

### Responsibility and oversight

ADS should be responsible for the design, deployment, and maintenance of the network. The PUC should be responsible for scheduling meetings and coordinating with potential remote sites to confirm room availability and readiness, and provide technical support.

The Department recommends that the PUC should consider dedicating one full-time position to support the project to a.) operate the technology during PUC proceedings, and b.) to coordinate scheduling with remote sites ahead of PUC proceedings.

### Host locations

The Department recommends that stakeholders should determine whether remote locations are valuable and determine an adequate stipend. ADS should negotiate with host sites based on the available budget. ADS should design, provide, and maintain the equipment at the host sites and provide the video conference bridging service. The PUC should coordinate central scheduling. The host institution should provide meeting space for up to ten participants, electricity, broadband internet access, and on-site support. The level of staffing needed should be carefully considered prior to selection of host site vendors. Staff at host sites should have a basic understanding of PUC processes and an advanced understanding of the video conferencing network.

## Appendix 1: Statute

### Sec. 14. PLAN; CITIZENS' ACCESS TO PUC HEARINGS FROM REMOTE LOCATIONS

(a) On or before December 15, 2017, the Division for Telecommunications and Connectivity within the Department of Public Service, in consultation with relevant organizations such as the Vermont Access Network and Vermont access management organizations, shall submit to the House Committee on Energy and Technology and the Senate Committees on Finance and on Natural Resources and Energy a plan to achieve citizen access to hearings and workshops of the Public Utility Commission from remote locations across the State. The access shall include interactive capability and the ability to use multiple remote locations simultaneously. The plan may build on the Department's Vermont Video Connect proposal described in the Report to the General Assembly by the Vermont Interactive Technologies Working Group dated Dec. 9, 2015, submitted pursuant to 2015 Acts and Resolves No. 58, Sec. E.602.1.

(b) The plan shall include each of the following: (1) assessment of cost-effective interactive video technologies; (2) identification of at least five locations across Vermont that are willing and able to host the access described in subsection (a) of this section; (3) the estimated capital costs of providing such access; and (4) the estimated operating costs for hosting and connecting.



# Memorandum

## Vermont Department of Public Service

**To:** June Tierney, Commissioner, and  
Clay Purvis, Director for Telecommunications

**From:** Corey Chase, Telecommunications Infrastructure Specialist

**Subject:** SB 52 Sec 14

**Date:** July 5, 2017

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The following is an initial scoping report on Senate Bill 52 section 14, a statute that directs the Public Service Department (PSD) to develop a plan to achieve citizen access to the hearings and workshops of the Public Service Board (PSB).

The bill states that the plan shall include interactive capability, the ability to use multiple remote locations simultaneously, and may build on the Department's 2015 proposal for a replacement to Vermont Interactive Television (VIT). The plan shall also include an assessment of cost-effective video technologies, identification of at least five locations willing to host access, and estimated capital and operating costs.

The PSB in 2016 issued a report with recommendations to promote increased ease of citizen participation in PSB proceedings. This included recommendations to explore live-streaming or other internet-based systems, modernize technology in the Board hearing room to allow for streaming/distribution of hearings so the public can watch hearings live online, and/or bring back VIT. PSD staff met with PSB staff and determined that the PSB has been actively considering remodeling the hearing room. As a part of that project, it has considered fitting the room with audio and video infrastructure to facilitate live streaming over the internet. That project is on hold pending the nomination of a new PSB chair and the possible new direction that may result.

One of the primary characteristics of VIT was the ease of use it afforded participants: technicians moderated all meetings and manually panned and zoomed cameras to speaking participants. This labor-heavy activity unfortunately also created significant costs, leading to a \$809,249 annual appropriation in Fy14. VIT also charged customers for use of the facility, and its escalating rates led the Vermont state colleges, VIT's largest customer, to develop its own system instead. The PSD's 2015 Vermont Video Connect (VVC) proposal contemplated updating the then-existing VIT equipment with automated cameras and microphones designed for un-moderated meetings. This was coupled with a set annual stipend of \$4,000 per site to host sites to cover conference room use and the required Internet access; there would have been no charges for users. The VVC proposal was rejected by all parties: VIT supporters wanted only VIT-style technician-moderated meetings while VIT detractors questioned the need of the network in general. The legislature declined to provide further VIT appropriations or adopt the VVC proposal,

and so in 2016 the VIT network was dismantled, the rooms renovated (at state expense) and the equipment was sold at surplus. PSD staff believe that reinstating VIT would be the most expensive solution.

There are less expensive options. PSD staff has contacted the Agency of Digital Services (ADS) and determined that ADS now supports interactive audio/video collaboration platforms from three different vendors that could be employed to achieve citizen access: Citrix, Microsoft, and Cisco. Live streaming, with possible, limited, text-based interaction could also be implemented on either of these systems or on an independent system. There are also systems offered by Google and Lifesize that while not currently supported by ADS may also warrant evaluation.

### **Citrix**

The service provider Citrix offers Gotomeeting, web/video conferencing and Openvoice audio conferencing platforms. Gotomeeting offers web conferencing that includes computer desktop sharing with PC-based audio and video capabilities, and also integrates with Openvoice audio conferencing so audio can be provided by either the computer or a telephone. Gotomeeting is web-browser based, and is available for free on Windows and Macintosh computers. It appears that there are no stand-alone (non-pc based) devices that can connect to Gotomeeting, so all connections require a computer. In 2015 the then Secretary of Administration offered an interactive public audio/video webinar on the proposed budget using the Gotomeeting platform over the Internet. While there is no fee for participants, organizers pay a fee for using Gotomeeting. PSD staff has requested more information about ADS support for Gotomeeting going forward. ADS continues to support Citrix, Gotomeeting and Openvoice, but is encouraging users to migrate to other platforms.

### **Microsoft**

ADS has adopted Microsoft Office 365 for office suite software. This affords all state employees with access to Skype for Business. Users can conduct chats, audio, or video conferences using the Skype software installed on Windows or Mac computers or phones or tablets using the audio and video capabilities of the device. There is no charge for these services. Skype for Business also allows users to obtain a voice telephone number for an added \$48/yr fee, and that allows user to arrange telephone conference calls. Polycom, a leading manufacturer of room-based video conference equipment (such as that formerly used by VIT), produces traditional video conference room systems that integrate with Skype. These can be equipped with sophisticated camera systems that automatically identify and zoom to the active speaker. Polycom also offers stand-alone devices with built-in Skype integration. These devices do not require a computer, but are essentially desktop conference phones with a user-friendly Skype interface on a cell-phone like color touchscreen keypad. These devices can be equipped to enable video conferencing through the addition of an external monitor and web camera. These simple devices could be installed at remote locations, such as those identified in the VVC proposal. Citizens could also join the Internet based conferences using Skype software

installed on their own computers. Skype also offers a service called Skype Meeting Broadcast, which enables the live streaming of a Skype meeting over the Internet, so citizens can view the broadcast with only a browser. PSD staff has requested information from Polycom about the prices for the identified hardware, and Polycom has offered to set up demonstrations.

## **Cisco**

ADS has adopted voice service from a Cisco reseller NWNIT on a new Voice over Internet Protocol (VoIP) platform. The network infrastructure that supports VoIP telephone service is capable of supporting video conference service. In fact the Vermont Judiciary has migrated video conference service from a platform like VIT to the Cisco-based service offered by NWNIT, and now is an active user with many remote sites in operation. Like Skype, the NWNIT infrastructure is used to bridge together video calls from multiple sites, placed over the Internet, into a single multi-party video conference. Cisco offers a wide range of video conference platforms, including room systems with the modern voice activated camera systems that identify and zoom to the person in the room who is speaking. This type of system could be installed the PSB hearing room. Cisco also offers very simple desktop telephone-like systems with small, tablet-sized video screens and telephone handsets for audio. These should be suitable to enable citizens to interact individually with PSB hearings. These systems also have support for an external monitor so a large monitors could be connected at remote sites to enable multiple citizens to view and hear the hearings, and then take turns interacting with the PSB via the desktop device. Cisco offers PC and smartphone software like Skype that enables consumers to directly join conferences for a higher level of interactivity. Cisco offers the Webex service, a platform similar to Gotomeeting or the Skype Meeting Broadcast for live broadcasting, where users can view it with any Internet browser. Cisco video endpoints integrate directly with Webex. Pricing information from 2015 indicates that there is no fee for actual conferences, but there is a monthly fee for registration of each device. PSD staff has requested updated pricing information from NWNIT, and the VT Judiciary has offered to arrange a demonstration.

## **Live Streaming**

The ADS Enterprise Architecture group, which is responsible for infrastructure strategy, is presently gathering together materials about streaming public hearings. Generally live streaming enables transmission of audio and video content over the Internet. Specifically, the audio and video are connected to a PC with special software installed, and this PC transmits the stream over the Internet to the service provider. The service provider in turn transmits the stream over the Internet to the individual users. Typically users can view the content using only a standard web browser, without other specific software to install. The services also typically enable viewers to interact with the meeting organizer either via text/chat on the web page, or via separate telephone conference call. Skype Meeting Broadcast, Webex, or Gotomeeting could be used for live streaming. Initial reports from ADS suggest that the 2015 budget webinar may have been presented using the services of a company called Livestream, and not Gotomeeting.

## Initial analysis

The PSB hearing room could be equipped with video equipment that automatically identifies the speaker to automate transmission of the hearings, and this is available for any of the identified platforms. The Polycom equipment that integrates with the Skype service appears user friendly, and there is no charge for registration of this equipment or conferences. The Cisco desktop video phones are very compact, intuitive and user friendly, but it appears that there is a monthly registration charge for each device. Live streaming could be implemented as a stand-alone solution, or it could be integrated with either of the other offerings. PSD staff has contacted several vendors to request equipment and will arrange demonstrations later this summer. The table below provides a comparison of the three systems.

Attribute	Citrix - GoToMeeting	Microsoft - Skype	Cisco - VoIP
Cost	No Monthly Fee	No Monthly Fee	Monthly fee for all devices
Supported by ADS	Phasing out	Yes	Yes
Equipment Requirements for PSB	PC Browser based, requires admin to set up initial meeting link	Dual camera system	Dual camera system
Ease of PSB Set Up	Medium	Medium	Easy
Equipment Requirements for VVC locations	PC Browser based or any smart device	Skype compatible VoIP or phone with video camera	VoIP phone with external monitor
Availability of remote access for public	Join on any device via browser and invite link	Join on any device with Skype software/app	Join on any device with Jabber/Spark software/app
Ease of Public Use	Medium/Difficult	Easy/Medium	Medium



## WVC: Vermont Video Connect

An overview of ADS supported video collaboration solutions  
prepared by the PSD pursuant to Senate Bill 52

# Citrix: GotoMeeting and OpenVoice

PC browser-based audio and video conference



Optional  
PSTN OpenVoice  
Audio conference



PSB Hearing room



PC browser-based interaction  
or participation via telephone



WVC locations



Join on any device via browser  
and invitation  
Online  
Participant

Watch on any web browser

Gotowebinar

All connections to the conference service over the Internet

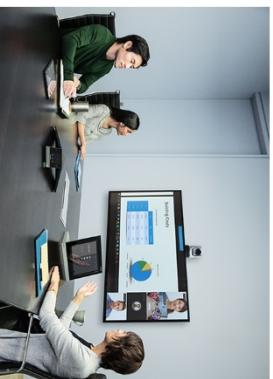
# Microsoft: Skype for Business



Dual-camera system that detects and tracks active speakers

Optional audio via telephone

## PSB Hearing room



Skype compatible VoIP video room conference phone with video camera and monitor

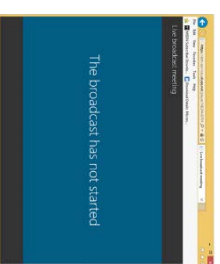


## WVC locations



Join and interact on personal device with Skype software and invitation

## Skype Participant



Watch on any web browser, interact via text chat

## Skype Meeting Broadcast

All connections to the conference service over the Internet



# Cisco: VoIP phones, Jabber, and Webex



Dual-camera system that detects and tracks active speakers

Optional audio via telephone

## PSB Hearing room



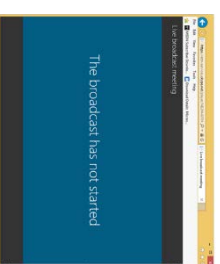
VoIP telephone with external monitor support

## WVC locations



Join and interact on personal device with Jabber software and invitation

## Cisco Jabber



Watch on any web browser, interact via text chat

## Webex

All connections to the conference service over the Internet



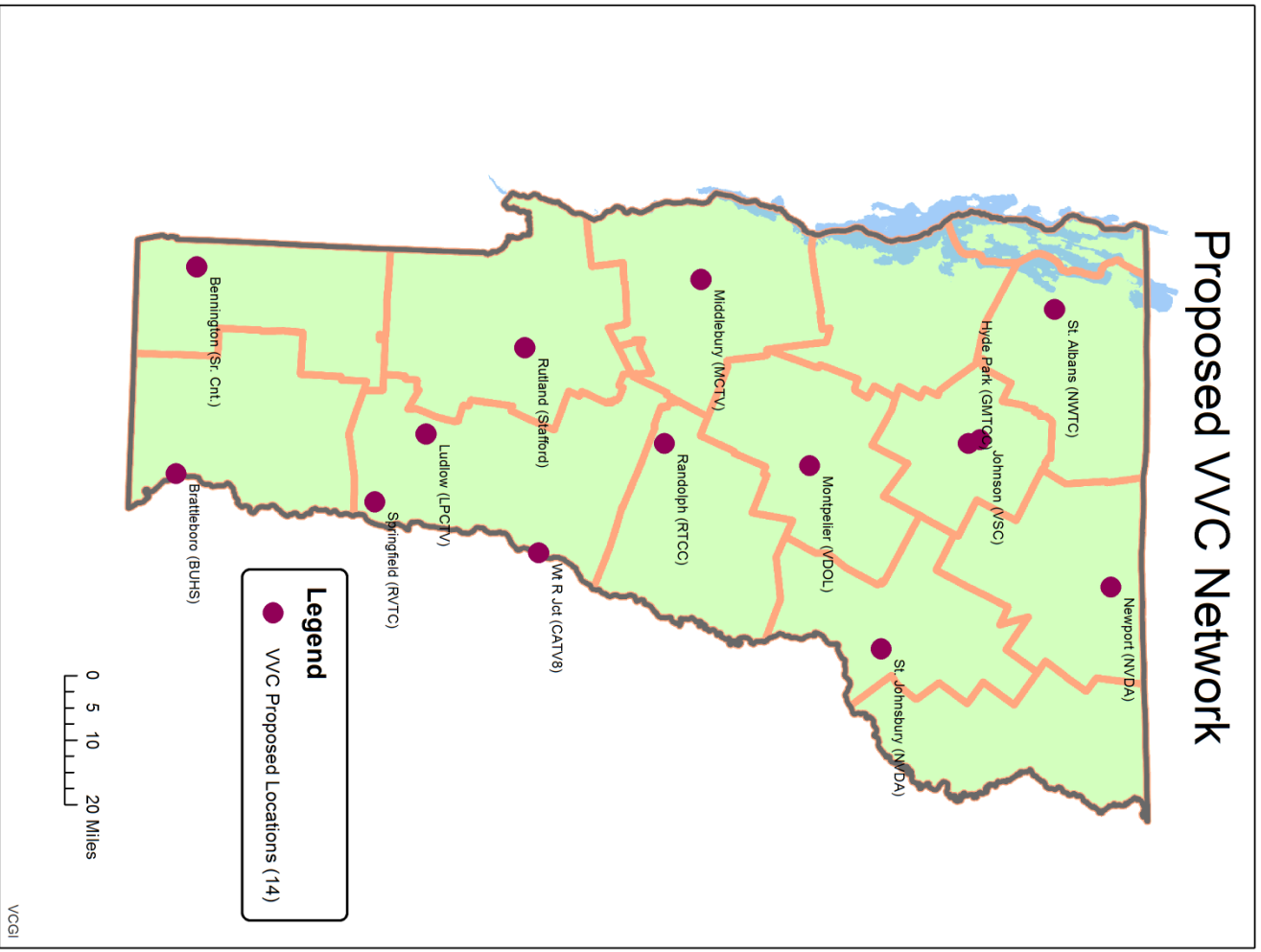
# Comparison

Attribute	Citrix - GoToMeeting	Microsoft - Skype	Cisco - VoIP
Cost	No Monthly Fee	No Monthly Fee	Monthly fee for all devices
Supported by ADS	Phasing out	Yes	Yes
Equipment Requirements for PSB	PC Browser based, requires admin to set up initial meeting link	Dual camera system	Dual camera system
Ease of PSB Set Up	Medium	Medium	Easy
Equipment Requirements for VVC locations	PC Browser based or any smart device	Skype compatible VoIP or phone with video camera	VoIP phone with external monitor
Availability of remote access for public	Join on any device via browser and invite link	Join on any device with Skype software/app	Join on any device with Jabber/Spark software/app
Ease of Public Use	Medium/Difficult	Easy/Medium	Medium

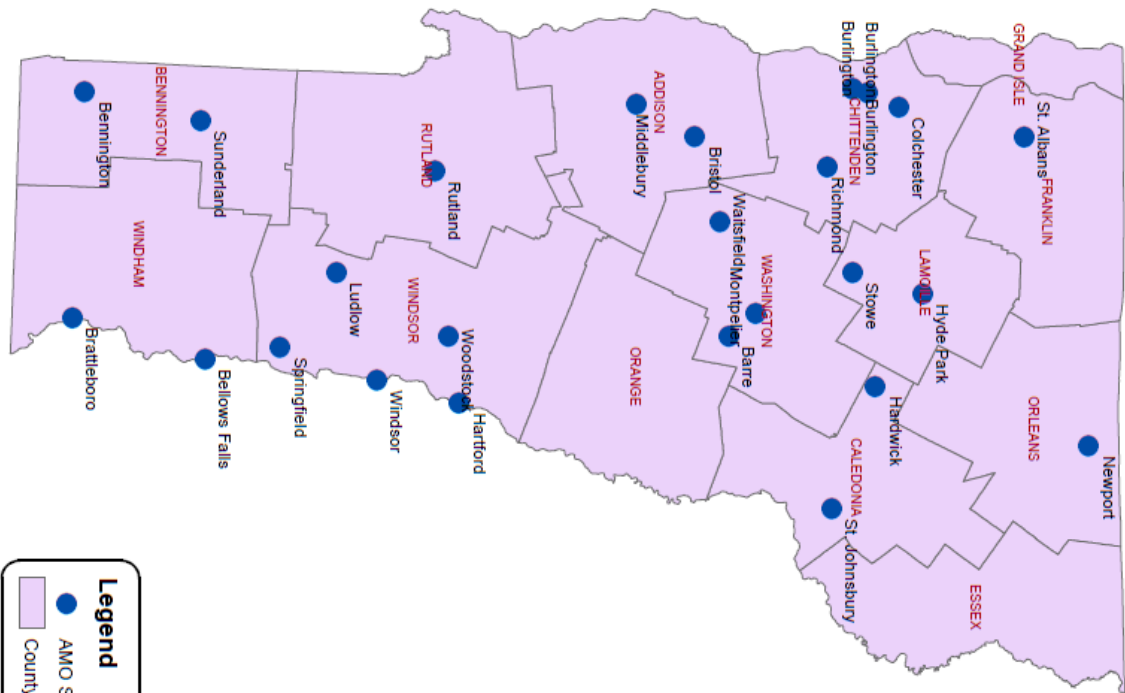
VIT Locations				Possible Vermont Video Connect Locations			
Town	Host	Location	Town	Host	Location <sup>1</sup>	Type	VIT Site
Bennington	Senior Cnt	Bennington (Senior Cnt)	Bennington	Senior Center	Bennington (Sr. Cnt.)	State	Y
Brattleboro	BUHS	Brattleboro (BUHS)	Brattleboro	BUHS	Brattleboro (BUHS)	HS	Y
Johnson	VSC	Johnson State College	Johnson	VSC	Johnson State College	VSC	Y
			Hyde Park	GMTCC	Hyde Park (GMTCC)	CTE	
Lyndonville	VSC	Lyndon State College	St. Johnsbury	NVDA	St. Johnsbury (NVDA)	RPC	
Middlebury	Hannaford	Middlebury (Hannaford)	Middlebury	MCTV	Middlebury (MCTV)	AMO	
Montpelier	VDOL	Montpelier (VDOL)	Montpelier	VDOL	Montpelier (VDOL)	State	Y
Newport	North Country	Newport (North Country)	Newport	NVDA	Newport (NVDA)	RPC	
Randolph	VT Tech	Randolph (VT Tech)	Randolph	RTCC	Randolph (RTCC)	CTE	
Rutland	Stafford	Rutland (Stafford)	Rutland	Stafford	Rutland (Stafford)	CTE	Y
Springfield	RVTC	Springfield (River Valley)	Springfield	RVTC	Springfield (RVTC)	CTE	Y
St. Albans	BFAHS	St. Albans (BFAHS)	St. Albans	Northwest CTE	St. Albans (NWVTC)	CTE	
Williston	VT Tech	Williston (VT Tech)					
Wt. R. Jct.	CCV	Wt. R. Jct. (CCV)	Wt R Jct	CATV8	Wt R Jct (CATV8)	AMO	
			Ludlow	LPCTV	Ludlow (LPCTV)	AMO	

Either Hyde Park or Johnson would be swapped for a site in Chittenden County

# Proposed VVC Network



# Vermont Cable AMO studios



Prepared by the PSD 6/23/2017

# Equipment Reference

- ▶ GoToConference package (Citrix)  
[https://support.citrixonline.com/en\\_US/Meeting/help\\_files/G2M090132](https://support.citrixonline.com/en_US/Meeting/help_files/G2M090132)
- ▶ Logitech Group (Citrix or Microsoft)  
<https://www.logitech.com/en-us/product/conferencecam-group>
- ▶ Logitech Connect (Citrix or Microsoft)  
<https://www.logitech.com/en-us/product/conferencecam-connect>
- ▶ Polycom RealPresence Medialign Dual 70 (Microsoft)  
<http://www.polycom.com/hd-video-conferencing/telepresence-room-systems/realpresence-medialign.html>
- ▶ Polycom Trio (Microsoft)  
<http://www.polycom.com/voice-conferencing-solutions/conference-phones/realpresence-trio.html>
- ▶ MX 700 (Cisco)  
<http://www.cisco.com/c/en/us/support/collaboration-endpoints/telepresence-mx700/model.html>
- ▶ DX650 (Cisco)  
<http://www.cisco.com/c/en/us/products/collaboration-endpoints/desktop-collaboration-experience-dx650/index.html>
- ▶ 8845 (Cisco)  
<http://www.cisco.com/c/en/us/products/collaboration-endpoints/ip-phone-8845/index.html>
- ▶ \*\*\* Other services not presently supported by ADS \*\*\*
- ▶ Lifesize  
<https://www.lifesize.com/en/video-conferencing-phone>
- ▶ Google Chromebox for Meetings  
<https://enterprise.google.com/chrome/devices/#meetings>

July 27, 2017

Sarah Hoffman, Commissioner  
Vermont Public Utility Commission  
112 State Street, Floor 4  
Montpelier, Vermont 05062

Re: Susan M. Hudson Hearing Room Renovations

Dear Commissioner Hoffman:

On July 13, 2017, staff from the Department of Public Service (“Department”) attended a meeting at the Public Utility Commission (“Commission”) to discuss potential audio and video upgrades to the Susan M. Hudson Hearing Room. At the conclusion of that meeting, you requested comments from the attendees on the matter by July 27. Department staff appreciated the opportunity to hear from other stakeholders and the Commission on this important subject. The Department submits the following comments for your consideration.

The Department agrees with the Commission that the hearing room needs to be renovated. The department further concurs with the Agency of Digital Services (“ADS”) that at this phase of the process, it is important to identify the needs and goals of the stakeholders before proceeding with a solution. The Department believes that there are two threshold questions the Commission should consider: first, what is the target audience? and second, what is the appropriate level of interactivity necessary to achieve the goals of citizen access to the Commission’s proceedings? It is the Department’s position that the target audience is the public and that there should be an interactive component to whatever technology the Commission decides to adopt.

As you are aware, Act 53, which was enacted earlier this year, directs the Department to write a report outlining a plan for achieving citizen access to the public hearings and workshops of the Commission. The language and history of the legislation make clear that the report was to focus on technology that performs the same basic functions as the Vermont Interactive Technologies system (“VIT”). VIT was a multi-party, interactive video conferencing system. Participants could visit one of a handful of sites around the state and interact with the Commission using the interactive video function. The network was managed by full time and part time staff, and VIT staff were present at each available site when the system was in use. The Commission frequently used VIT for public hearings. VIT no longer exists and it is unlikely to return in the near future.

Nevertheless, there are products and services available that can provide participants with a similar level of connectivity. The Department is arranging demonstrations of video conferencing equipment on platforms already supported by ADS. This effort should assist stakeholders in

developing a needs assessment tailored to the Commission. Specifically, the Department has engaged Polycom, Cisco, and Google.

Polycom is a manufacturer of video conference equipment. Its equipment is designed to work with Skype for Business, Microsoft software provided to state employees with the Office 365 subscription through ADS. The company is prepared to provide two devices, one suitable for the hearing room, and another suitable for remote locations. This solution would be relatively inexpensive to implement and would allow the Commission to broadcast to remote sites and participants watching at home.

Cisco manufactures video conference equipment that is designed to work with the service provided by the NWNIT, the vendor that supplies VoIP service to ADS. The Vermont Judiciary subscribes to video conference services through NWNIT using Cisco equipment and would be willing to demonstrate the equipment. The Department has reached out to NWNIT to determine price information.

Google has developed a special version of its Chrome devices specifically designed for video conferencing. The Department has engaged the leading “Chromebox for Meetings” vendor and has arranged for an evaluation device to be provided later this summer.

These three options can provide interactive connectivity to the hearing room like what members of the public used at VIT. The Department is exploring these three options through vendor demonstrations and testing. The Department would be willing to coordinate vendor demonstrations with the Commission. Input from the Commission and other stakeholders would allow the Department to properly evaluate whether any of these products could meet the needs of the Commission, the public and the intent of Act 53.

Sincerely,

Clay Purvis  
Director for Telecommunications and Connectivity

## Appendix 3: Evaluation report



# Polycom-Skype Evaluation Report

## Introduction

On September 7, 2017 at 2:00pm the Public Service Department (PSD) conducted a demonstration of Polycom video conferencing equipment using the Skype for Business (S4B) service included with the Microsoft Office 365 (O365) subscription provided by the Agency of Digital Services (ADS) to Vermont state employees. The demonstration was conducted in the PSD Giga and Mega conference rooms.

The PSD has been directed by statute to prepare a plan to achieve citizen access to the proceedings of the Vermont Public Utilities Commission (PUC), and this demonstration was conducted to gather information for that plan. The primary purposes were to demonstrate the capabilities of current technologies, identify the kinds of network topologies that are supported, and identify important features. The secondary purpose was to examine the particular devices offered by Polycom and the service provided by Microsoft.

The demonstration showed that the overall conference experience is affected by the number of participants, the quality of the equipment at conference endpoints, and network connecting them. **Consideration should be given to balancing maximum public access with producing a quality meeting experience when selecting network topology.** The demonstration showed that the ability to implement call control capabilities is important to manage meetings. **Call control capabilities should be carefully considered when selecting equipment and developing procedures.** The demonstration also showed that camera systems with automatic speaker tracking capabilities are available and can be used in public meeting environments. **Systems with automatic speaker tracking cameras should be considered at the PUC site.**

## Participants

- Clay Purvis, PSD
- Corey Chase, PSD
- Steph Magnan, PSD
- John Gerhard, PUC
- Brenda Chamberlin, PUC
- Rob Chapman, ORCA
- Karen Canas, ADS
- Rhonda Boudreault, ADS
- Joe Kezar, ADS
- Morgan Ecklund, AoE
- Jason Boyd, AoT
- Sommer Bucossi, AoT
- Scott Carbee, VT Judiciary
- Jon Davies, Polycom
- Ken Smaldone, Polycom
- Angel Aviles, Microsoft

## Equipment

Polycom Trio 8800 (**Trio**) with Visual+ extension device and Logitech C390e Webcam, and power over Ethernet AC/DC power supply Manufacturer Suggested Retail Price (MSRP): \$2,259. This system was installed in the PSD Mega conference room, connected to a PSD-provided HP 23" monitor.

Polycom Group 500 (**Group**) (MSRP \$10,999) with Skype interoperability license (MSRP \$999) RealPresence Touch keypad (MSRP \$1,749) and EagleEye Director II automatic speaker tracking dual-camera system (MSRP \$11,999) for a combined MSRP as tested: \$25,746. This system was installed in

the PSD Giga conference room, connected to a PSD-provided wall-mounted 60" monitor utilizing the attached Bose speakers

Both systems were configured by ADS as "Outlook Resources" with S4B Plan 2 credentials within O365, as [psd.polycom500@vermont.gov](mailto:psd.polycom500@vermont.gov) and [psd.polycom8800@vermont.gov](mailto:psd.polycom8800@vermont.gov). The cost for each credential is \$3.80 per month. An O365 E3 credential, typically issued to state employees, costs \$26 per month. ADS also offers the O365 E1 credential type, which only supports online access to O365, and this is \$9 per month.

## Evaluation Procedure

The demonstration followed the outline of the previously prepared Evaluation Plan, attached below at the end of the document.

### Initial Device Test

Before the evaluation started, the addresses of the Group and Trio were entered into the Favorites of the opposite device as required by the systems, and test calls were successfully placed from one to the other.

### Skype for Business Meeting Test

Corey created a meeting invitation using the Microsoft O365 Outlook Windows application and listed all participants and the two Polycom room system as attendees. The Outlook meeting included the Skype Meeting option. The Skype Meeting Options (restricted access/Virtual Lobby, or Presenter) under the Meeting Options tab in the Outlook invitation were not enabled. Meeting invitees included:

- Corey Chase, PSD (in person, also Windows S4B)
- Karen Canas, ADS (by cell phone S4B app)
- Rhonda Boudreault, ADS (at 133 State St, by Windows S4B)
- Joe Kezar, ADS (in Barre, by Windows S4B)
- Morgan Ecklund, AoE (in Barre, by Windows S4B)
- Angel Aviles, Microsoft (by Windows S4B)
- Ken Smaldone, Polycom (in person, also by cell phone S4B app)
- Polycom Group 500 in PSD Giga conference room: [psd.polycom500@vermont.gov](mailto:psd.polycom500@vermont.gov)
- Polycom Trio 8800 in PSD Mega conference room: [psd.polycom8800@vermont.gov](mailto:psd.polycom8800@vermont.gov)

The Evaluation Procedure called for tests of three different types of network topologies:

- Two-way video, fixed network, credentialed users
- Two-way video, open network, non-credentialed users
- On-way video, open network, broadcast

While it is possible to create multi-party ad-hoc meetings using the Polycom devices, the recommended approach that used in the demonstration, specifically, creating a meeting invitation ahead of time in the Windows Outlook application. In the test, all invitees received the Outlook invitation and joined the Skype meeting from various devices. PSD staff used the controls on the Group and Trio to browse the on-device calendar, identify, and join the meeting. This demonstrated the capability for the Polycom devices to join a S4B meeting with credentialed users of various device types.

Scott Carbee joined the meeting to demonstrate non-credentialed users. His Windows PC device, specifically without Microsoft Office installed, was connected to the SOV-Public Wifi network in the Giga conference room. The Microsoft Outlook invitation was forwarded to his personal email account. He clicked on the “Try Skype Web app” link (as opposed to the standard “Join Skype Meeting” link) in the Outlook invitation and used the Microsoft Internet Explorer web browser to open the URL. He installed the “S4B Meetings” browser extension, and was able to join the meeting as a “guest”. He configured the browser extension to identify the webcam and microphone on his computer. He was able to participate in the meeting as a normal attendee, with both audio and video. This demonstrated the capability for members of the public to join a two-way meeting without credentials using their own equipment and a web browser extension. All participants then all exited from the meeting.

### Skype Meeting Broadcast Test

Corey created a Skype Meeting Broadcast (SMB) using the Microsoft SMB portal and included Steph as a team member. Steph received the Outlook invitation on her desktop computer and initiated the SMB using the S4B client. When the call was active she invited the Group and the Trio to join the meeting; these calls were accepted using the controls on each device. On her PC, from within the S4B client she selected the video to make live, and then launched the broadcast. The web address of the SMB was emailed to the personal email of Scott Carbee, who browsed to the web address using the Safari browser on his iPad, also connected to the SOV-Public WiFi network. Steph was able to switch the source video between the Group and the Trio, and this was seen with a 20-40 second delay on the iPad Safari browser. This demonstrated the ability to transmit one-way broadcast service to members of the public using just a web browser with no credentials.

### Evaluation Notes

The meeting demonstrated that a video conference meeting experience can be affected by the quality of the equipment and network capabilities of the various endpoints. The attendees used a range of equipment and network types. Three state employees (Rhonda, Joe, and Morgan) connected using Windows S4B clients, over ADS-managed networks. Morgan used a high-quality Logitech web camera with motorized pan/tilt/zoom, and this produced a noticeably better video image. Karen and Ken connected using the S4B cell phone app over cell networks. Karen complained of being dropped from the call even though she had a good cell data connection. Of all devices on the call, the Polycom Trio and Group demonstrated the best video capture quality. Attendees were particularly impressed by the audio quality of the Trio. The Group relied on the internal speakers of a large display in Giga conference room. Angel Aviles of Microsoft, who connected from a Windows S4B client from his home office using a residential broadband connection, said he had an older web cam with a Windows driver problem, demonstrated the noticeably worst performance with a noticeable video delay and freezing.

The EagleEye Director II auto-tracking camera system included with the Polycom Group worked quite well and could identify and zoom to a speaker (after a sustained monolog) even in a busy room. During a back-and-forth conversation with opposing speakers, the camera drew back to a wide-angle room view instead of switching between speakers. The image quality produced by the Group was noticeably superior to any other image quality.

The demonstration showed that the overall conference experience is affected by the quality of the equipment at all endpoints and network connecting them. Specifically, subpar performance of the

network or equipment of a single participant can affect the overall meeting experience because this signal is transmitted to all participants. This performance issue does not affect Skype Meeting Broadcast, because only one device is originating audio and video. In addition, the effect of not employing call control features was demonstrated. Callers could join and depart the call at will, and there was no ability to mute attendees. Without these features it is hard to maintain meeting order. Therefore consideration should be given to balancing maximum public access with producing a quality meeting experience when selecting a network topology.

Following the demonstration, PSD and ADS attendees met on September 11, 2017 to discuss the event. The notes from the discussion are presented below:

Agenda Item/Topic	Discussion Points
<p><b>Testing debrief/discussion</b></p> <ul style="list-style-type: none"> <li>• Wins: What worked</li> <li>• Losses: What did not work</li> <li>• Biggest challenges</li> </ul>	<p>Wide range of folks involved in testing - variety of devices over different networks (including new Polycom)</p> <ul style="list-style-type: none"> <li>• Scott - we don't have clear picture of what use case will be but did proof of concept that got us through all levels - will need more time to make decisions in regard to how to proceed.</li> <li>• Angela - concerned about support, is there a need for the citizens to be able to use video for the PUC to see the callers or do we only need the PUC to be broadcast?</li> <li>• John - tricky to be the one running the call - concerned that hearing officer will need to both run the call and facilitate the hearing concern re ease of use</li> <li>• Corey - thought it was helpful to see the wide range of varying inputs, there was some chaos when Microsoft was participating - Karen's connection via cell phone and Rhonda connecting via laptop and 2 newer Polycom units. Agreed with John that it was challenging to control the environment.</li> <li>• Karen – <ul style="list-style-type: none"> <li>• We were testing Polycom I thought did not realize we were presenting all options.</li> <li>• Cisco run by another Branch of Government, we could not assist in anyway.</li> <li>• Issues with Polycom Directory</li> <li>• I called in from my Iphone and had great cell service, call kept dropping.</li> <li>• Should have had Networking involved. Network is huge here (Express Route needed)?</li> <li>• Broadcast did not work.</li> <li>• Dropbox was set up the day before.</li> </ul> </li> </ul> <p>Discussion in regard to the specific devices, new versus older, camera capability, phones, laptops, how much control is needed and how much access should be provided - what mix will be appropriate? Suggestion that the better equipment be available for the hearing room as we cannot control those calling in (public) as far as the equipment goes. Skype broadcast was not working for the initial meeting - there is a ticket open with PSD. A workaround was used and the meeting was broadcast before</p>

	the end of the testing time. Skype meeting broadcast provides URL for folks to watch the stream.
<b>Skype Broadcast</b>	Is there an ability to run both simultaneously? The URL broadcast along with Skype to allow individuals to testify as part of the hearing process - short answer is yes. The Skype server determines who is talking. When in broadcast mode the facilitator selects the video stream. Training would help facilitator(s) to understand how they would need to broadcast and run the meeting.
<b>Blocking video</b>	Blocking Video from participants - Discussed ability to block video, when do we need to see the public citizen that is commenting? Corey suggested additional testing, Angela to share link to meeting options. And provide intro to liquor who has recently purchased
<b>Ability to join once meeting initiated</b>	test successful - Can meeting link be joined later - once meeting has been initiated. That tested successfully - Scott was able to join via ipad using link.

### Skype Meeting Broadcast notes

Corey experienced difficulty launching a SMB to demonstrate the one-way service, and was initially not successful until a work-around was identified. The meeting was created in the SMB online portal, but when attempts were made to initiate the meeting in S4B, the meeting would not launch and the app reported that an error was experienced. Eventually Steph was listed as an Event Team Member in the SMB meeting configuration, and she was finally able to successfully launch the SMB using the S4B on her PC. The following day tests showed that the SMB service again would not work for Corey, the work around of adding Steph as a team member did not work, and Steph too could not launch an SMB she created. The next Monday the SMB service was back to normal and worked as expected and both Corey and Steph were able to successfully launch SMB meetings. It was noted during the call that whereas with a multi-party S4B meeting, the service automatically selected the video to transmit to users, with the SMB meeting the organizer is required to select the video to transmit to the broadcast. During the subsequent SMB test calls, the Question and Answer (Q&A) feature was enabled. To moderate the Q&A, the meeting organizer must use a web browser to click a link on the SMB portal website. This opens a new page where it is possible to moderate the questions posed by SMB viewers on their individual web pages. It was noted that a moderator would have to monitor the SMB using the S4B app in one window on their PC, and also monitor the Q&A feature on a separate window or PC.

### Post demonstration testing

Microsoft S4B meeting options, Polycom implementation of these features, and participant knowledge and training for these features influenced the Polycom/Skype demonstration. The online meetings were originated with Microsoft Outlook invitations without the use of S4B online meeting control features, namely the **Virtual Lobby** and the use of **Presenters**. Additional testing to investigate these features was conducted after the demonstration.

## Microsoft S4B Meeting Options

When creating a S4B online meeting in Microsoft Outlook, a **Meeting Organizer** may adjust settings in the Meeting Options tab to:

- a.) restrict access to a meeting by requiring attendees to wait in a virtual lobby
- b.) allow some attendees (e.g. invitees) to bypass the virtual lobby and join directly
- c.) disable the chat window, mute all attendees, or block attendees from sending video or
- d.) designate which attendees (besides the organizer) will be Presenters (specific attendees, or all attendees)

The table is from the Microsoft S4B help page and relates the four options for restricting the meeting, by identifying who gets into a meeting directly and who is required to wait in the virtual lobby.

Who gets in directly?	What happens	Recommended when...
Only me, the meeting organizer	You are the only one who gets into the meeting directly. Everyone else has to wait until admitted.	You have a high security meeting and confidential information.
People I invite from my company	Only people who were invited can join the meeting directly. Everyone else has to wait until admitted.	You're discussing confidential information, and want to only allow specific people to join.
Anyone from my organization	Anyone from your company can get in to the meeting directly, even if not invited.	You don't have external participants and you are not discussing confidential information.
Anyone (no restrictions)	Anyone who has access to the meeting link gets in to the meeting directly.	You're inviting outside participants and you're not discussing confidential information.

Once an online meeting is underway, a **Presenter** may:

- a.) present information (e.g. their desktop) to meeting attendees
- b.) admit attendees from the virtual lobby
- c.) remove attendees from the meeting
- d.) designate any attendee as a Presenter
- e.) mute all attendees
- f.) block all attendee video
- g.) mute or unmute individual attendees, or
- h.) lock the video onto a particular attendee (video spotlight)

The Virtual Lobby feature allows a meeting organizer to control whether and when to admit attendees to a meeting. The feature can be used to admit all attendees simultaneously for a more uniform meeting experience. A Presenter can remove attendees from a meeting after they have been admitted. If the Virtual Lobby is not enabled, these attendees could rejoin the meeting again without being re-admitted. The call control capabilities of a Presenter, e.g. the ability to mute or remove attendees, are helpful for managing a large meeting with the potential for disruption posed by multiple parties.

### Polycom implementation of S4B options

These features are all available from within the Windows S4B client, but are not uniformly implemented by Polycom in the devices provided for the demonstration. ADS issued Microsoft Office S4B Plan 2 “resource/room system” credentials for each device for the demonstration. These credentials further limit the ability to implement these features, so in addition, operation of each device using a standard Office 365 E3 credential was also evaluated. The table below shows the capability of each device (with each credential type) for four separate features:

- a.) Join a meeting (bypass the Virtual Lobby)
- b.) Admit all, or individual attendees
- c.) Mute and unmute all, or individual attendees
- d.) Remove all, or individual attendees.

All test calls were created using Outlook invitations with the Virtual Lobby enabled (anyone from the organization does not have to wait in the Virtual Lobby). Using the S4B Plan 2 credentials, the devices were designated as Presenters in two ways: a.) by designating “anyone in the organization” a Presenter in the Outlook invitation, or b.) by using the S4B Windows client of the meeting organizer after the start of the meeting.

Credential Type	Trio 8800				Group 500			
	Join	Admit	Mute	Remove	Join	Admit	Mute	Remove
S4B Plan 2	N*	Y**	Y**	Y**	N*	N	Y	N
Office 365 E3	Y	Y	Y	Y	Y	N	Y	Y

\* Must be admitted by different Presenter \*\* Only after being admitted by S4B client

It appears that some Presenter capabilities are not implemented by Polycom on either device. This includes the ability to block attendee video and the ability to lock the video on an individual attendee (the S4B spotlight video feature).

### Windows Skype Client considerations

These Virtual Lobby and Presenter call control features can only be fully employed if a meeting organizer creates the call through Outlook and then joins the online meeting from a Windows Skype client and participates in the call to some degree, except with the Trio using the full O365 E3 credentials.

If the Virtual Lobby and Presenter features are enabled, the call control capability of the Group 500 is limited and the Windows S4B client is required for several features. With the S4B Plan 2 credentials, a Windows S4B client is required to admit attendees (including the Group) from the Virtual Lobby, and to

remove attendees from the meeting; once admitted the Group can mute and unmute attendees. While using the O365 E3 credentials, the Group can join meetings and it can remove attendees, but a Windows S4B client is still required to admit attendees from the Virtual Lobby. With a Group, the use of a Windows S4B client is necessary to use the Virtual Lobby feature with either the S4B room or O365 E3 license types. The S4B client is also necessary to use Presenter privileges to mute and remove attendees even if the Virtual Lobby is not used if using the S4B Plan 2 credentials. **A Windows S4B client is essential to use the S4B call control features when using the Group.**

The Group was initially tested in “Skype mode”, which appears to disable the standard Polycom remote control and thus requires the RealPresence Touchpad for call controls. Further testing was done in Normal mode, i.e. without Skype mode enabled. In this mode, the Group used a different color scheme on the display but still showed calendar entries. It was possible to use the standard remote control to browse the directory and select calendar entries to join Skype meetings from the calendar and place Skype calls to Favorites. The S4B call control feature implementation using the Touch is similar in both modes. The Group can be operated with S4B using the normal mode with the standard remote. The Touch adds limited additional value over the standard remote, specifically the ability list and have limited control over participants (see table above). However, if the S4B call control features are employed this necessitates a separate Windows S4B client in the meeting room, and the Touch can then be distraction. **The RealPresence Touchpad and Skype mode adds limited value to the Group if the S4B call controls are employed.**

The Trio has greater call control capability than the Group. A Windows S4B client is required to admit the Trio with S4B plan 2 credentials from the Virtual Lobby; after this the Trio can admit or remove other attendees. With the O365 E3 credentials, the Trio has the same functionality as a Windows S4B client. **A Windows S4B client is required to employ the S4B call controls with the Trio using the S4B Plan 2 credentials.**

### [Polycom device notes](#)

The Polycom devices have incomplete implementation of access to the Microsoft O365 directory. The Group can access the directory and identify users by name, but displays “unknown” status and cannot place calls to them or add them to Favorites. It is nevertheless possible to place direct calls to entries in the device Favorites. Adding entries to the Favorites is complicated, as it requires entering the device credentials using the S4B client, and identifying entries, and adding them to the favorites in the client. These then appear as favorites on the Group using the same credentials. The Trio has a different behavior. Unlike the Group, the Trio cannot search the O365 directory. It is possible though to enter an address directly on the Trio. If the address is entered completely and accurately the Trio can identify it in the O365 directory and call it directly and place it in the device Favorites. Both of these issues are identified as known bugs by Polycom and are in the pipeline to be addressed.

In order to evaluate S4B meeting options, standard O365 credentials were used on the Polycom devices. Vermont ADS has instituted mandatory two-factor authentication for Vermont employees using O365. Thus in order to enter standard E3 credentials into the Polycom devices, it is necessary to browse to the Account Settings section of O365 Online and create a special, unique “App Password” for each device. This was not a problem with the S4B Plan 2 credentials.



Both the Polycom Group and the Trio require two Ethernet ports; in the case of the Group, one for the codec device and a second for the touch pad, and in the case of the Trio, one for the Trio and a second for the Visual+ video device. These two devices must be paired before the device can work. This pairing relies on the IP address of the device; if the IP address changes the pairing process needs to be completed again. Thus it is advisable to employ fixed IP addresses instead of DHCP.

Both the Polycom Group and the Trio can be configured through the touch pad or through a web portal; it is convenient to use the web portal of the Trio, but many items for the Group can only be configured through the web portal. ADS has instituted Virtual Local Area Network (VLAN) segmentation to support Voice over Internet Protocol (VoIP) and general data on the same Ethernet network. By default the Link Layer Discovery Protocol (LLDP) and Cisco Discovery Protocol (CDP) options are enabled on the Trio, which can result in the Trio being identified as a VoIP device and placed in the VoIP VLAN. This results in the Trio web portal being unreachable to a Windows device on the same Ethernet physical network. This can be resolved if the LLDP and CDP options are disabled on the Trio. The Visual+ device can also be identified as a VoIP device, so disabling these features on the Trio could make the Visual+ unreachable. It is advisable to use Internet Explorer 11 with https to access the Polycom device web portal.

The S4B credentials are entered for the Group from the web portal in two separate places: Admin>Network>IP Network>SIP and Admin>Servers>Calendaring. When entering or changing credentials it is advisable to enter the credentials in the SIP location first and wait for the device to register before changing them under Calendaring.

The Visual+ extension device paired with the Trio connects to the Logitech C390e Webcam using a standard USB interface. Staff attempted to connect other USB cameras to the Visual+ device but it would not recognize any others tried.

Experiments were also conducted using PSTN conferencing with the Polycom devices. Specifically a Skype meeting was organized in Outlook by an O365 user that has the PSTN Conferencing option. The Group and Trio were invited. The call was joined by the organizer, the Trio and the Group. The call was then joined by a user who dialed in on the telephone using the provided instructions. The caller showed up separately on the Trio, identified by caller-ID, and the Trio had Presenter call control capabilities.

# Skype-Polycom Evaluation Procedure

## Two-way video: fixed, credentialed users

Set up two Polycom devices in neighboring rooms, Public Utilities Commission (PUC) hearing room and Public Service Department (PSD) Giga conference room, at 112 State St. 3<sup>rd</sup> fl. The Polycom Group 500 will be in the PUC room and the Polycom Trio 8800 will be in Giga. Set up a third device, a notebook with webcam, for a moderator in an adjoining room. Additional state employees should join from their desks using notebook computers with web cameras. This includes a PSD employee at 112 State St. and Agency of Digital Services (ADS) employee at 133 State St. (There will thus be 5 connections on the call)

Ensure Microsoft recognizes Skype for Business (SfB) stand-alone (plan 2) credentials on both devices.

The moderator should schedule a SfB call via Outlook, and invite the rooms as well as other PSD and ADS users. Then the two Polycom devices in the PUC room and Giga room should join the call. The users should configure the system so that the remote sites can join the call without intervention at that location.

Users at the PUC site should test the motorized camera system. They should create preset fixed locations and have the moderator switch between the locations. They should also enable and evaluate the voice activated camera pointing system.

Users should evaluate the quality of the audio from the PUC room, and consider the range and suitability of the camera system in the PUC room.

Moderator at PUC room site should determine how to call on or mute individual sites.

## Two-way video: open, non-credentialed users

When tests with the credentialed users are complete, the moderator should send a link to the conference to other PSD and ADS employees. These should join using a browser on a PC without SfB installed, so that they can join without credentials using only the browser and SfB extension.

The moderator should determine how to call on or mute non-credentialed users.

## One-way video: broadcast

When tests of two-way video are complete the moderator should create a Skype Meeting Broadcast (SMB) session. The moderator should engage the chat feature before activating the meeting. The moderator needs to open a separate browser window to view the chat.

Other PSD and ADS employees should view the SMB by opening the link in a browser. The users should provide feedback using chat feature, and the moderator should respond.

The moderator evaluate the potential for a single person to control the SfB conference while simultaneously monitoring the SMB meeting and the chat window. This will require the moderator to monitor three separate windows on their computer.

# Chrome for Meetings Evaluation Report

## Introduction

On September 8, 2017 the Public Service Department (PSD) conducted an evaluation of Google Chrome for Meetings (C4M) technology. The demonstration was conducted in the PSD office at 112 State Street in Montpelier.

The PSD has been directed by statute to prepare a plan to achieve citizen access to the proceedings of the Vermont Public Utilities Commission (PUC), and this demonstration was conducted to gather information for that plan. The primary purposes were to demonstrate the capabilities of current technologies, identify the kinds of network topologies that are supported, and identify important features. The secondary purpose was to examine the particular C4M devices and Google Hangouts service.

The devices and service provided an attractive, easy to use and stable platform, with one significant drawback for the proposed environment: there is no active speaker tracking camera available for C4M devices. It is possible to join a C4M hangout with an active speaker tracking camera by using the Chrome browser on a Microsoft Windows device.

## Participants

- Corey Chase, PSD
- Sunni Eriksen, PSD
- Steph Magnan, PSD

## Equipment

The Google-partner Promevo provided an ASUS C4M device for evaluation, (MSRP \$999), consisting of:

- Asus Chromebox computer with Core i7 processor and 4 GB of RAM
- Wireless Remote control with integrated keyboard
- Logitech USB Web camera
- Jabra Speak 410 USB speaker/microphone
- Google C4M software

The device connects to the Google Hangouts video conferencing service, and while there is no fee for the service, there is an annual Management and Support fee for C4M devices, of \$250 per device per year (first year included in sale price). This service allows for remote software maintenance. The device was connected to a PSD-provided 23" HP monitor with an HDMI connector.

## Device Configuration

The Asus device arrived preconfigured from Promevo, and it boots up directly into a locked-down version of Google Hangouts. Prior to shipment the device was registered to the domain "chromebooktrial.promevo.com". The company provided a Google G-suite username such as [a.b@chromebooktrial.promevo.com](mailto:a.b@chromebooktrial.promevo.com) and associated password to access the administration website (admin.google.com/chromebooktrial.promevo.com). At this page an administrator can associate a Google calendar with the device. The same calendar can be assigned to multiple devices. For this demonstration we used the Google calendar associated with the Google account provided.

In order to use this platform, it would be necessary to employ a specific domain, such as puc.vermont.gov. Support would be necessary from the Agency for Digital Services (ADS) to verify ownership of this domain.<sup>1</sup> In order to use the calendar functions it is necessary to subscribe to the Google G-suite platform, at a cost of \$50 per year per account. Promevo recommends at subscribing with at least two accounts, one with administrative privileges, and a second for day-to-day operations.

### Evaluation Test Procedure

The Evaluation Test Procedure (included below) called for tests of three different types of network topologies:

- Closed: Two-way video, fixed network, credentialed users
- Open: Two-way video, open network, non-credentialed users
- Broadcast: On-way video, open network

The original evaluation procedure is not strictly applicable because the device operation is different than expected. Unlike other web-based video conferencing services, you do not place a call from one C4M device to another. Instead, you create a Hangout meeting (which is accessed at a static Internet URL), and then you and the other party join the same Hangout meeting.

One way to initiate a meeting is to create a Hangout from the C4M device. From the home page you select "Create Hangout" and then assign the Hangout a name and the device joins the meeting. From within the meeting you select the Add Person icon and in the pop-up window enter the email address and select "Invite". Instead of ringing the invited party (as with a telephone) this process will send an email to the attendee with a URL to join the Hangout.

Another method to initiate a meeting is to create a meeting invitation from the associated Google calendar. In the calendar invitation page you set the time and invite guests, and see an associated Video call (Hangout) name. From this calendar page you can change the name of the Hangout, and you can also control the Guests and have the ability to a.) modify the event, b.) invite others, and c.) see the guest list. When you create the calendar event, the Hangout shows up on the invited C4M home page as a scheduled event. The user then selects the event to join the Hangout at the appropriate time. Google has created an extension for Microsoft Outlook. PSD staff installed the extension and configured it to connect to the provided Google calendar, and confirmed that it allows you to create a Hangout invitation from within Microsoft Outlook. Using the calendar to set up the meeting provides more administrative options and control so it is the preferred method of initiating a meeting.

By default, Hangouts for C4M are restricted to those accounts associated with the domain, in this case chromebooktrial.promevo.com. If you attempt to invite a user with an address outside the domain, the service will warn you and require that you change a setting to allow the Hangout to be accessed by outside parties. With this change you can then send an invitation to outside parties, either from the C4M device or from the Google calendar. You can also access the Hangout directly from a static URL. When the Hangout is created, it is accessible via a fixed URL at hangouts.Google.com, for instance, the Hangout "hello" is accessed at the URL below:

<sup>1</sup> [https://support.google.com/chromedevicesformetings/answer/6094478?hl=en&ref\\_topic=6094395](https://support.google.com/chromedevicesformetings/answer/6094478?hl=en&ref_topic=6094395)

**[https://hangouts.Google.com/hangouts/\\_/chromebooktrial.promevo.com/hello](https://hangouts.Google.com/hangouts/_/chromebooktrial.promevo.com/hello)**

You can then email this URL to recipients manually, instead of creating a calendar invitation, or you can post the URL publicly. Even with the meeting set to public, when an outside participant attempts to join the Hangout, the Hangout owner will be prompted to allow the participant to join the call.

**Closed: Two-way video: fixed, credentialed users**

On his Windows PC using the Chrome browser, Corey logged into the Promevo-provided Google account, associated with the chromebooktrail.promevo.com domain. He navigated to the calendar and created a meeting. From the calendar main page, he selected the event and then selected Join Event, which launched a new web Hangouts web page. The Hangout appeared on the C4M device as a scheduled event, and he selected Join to enter the Hangout. This meeting was restricted to only users within the domain, and as such demonstrated two-way video to fixed credentialed users.

**Open: Two-way video: open, non-credentialed users**

While still in the scheduled Hangout, Corey selected the Add Attendee icon, which brought up a pop-up dialog box. Originally the call was restricted to Promevo, but he selected the setting to change the Hangout accessibility to “Anyone with the link”. He then copied the URL and emailed it to Sunni and Steph. They received the email, clicked the link to open the URL in Internet Explorer. They then joined the call as “Guest”. The C4M device prompted approval for each to join. The meeting was thus open to the public and no credentials were required, and as such this demonstrated an open two-way network for non-credentialed users. The conference organizer can mute other attendees, but the attendees can unmute themselves. The conference organizer can also eject attendees, and they must be approved to rejoin the meeting.

**Broadcast: One-way video**

Youtube Live is a free, web-based streaming service. Users with a Google account browse to the Youtube Creator Studio website. On this page users can create a new Live Streaming Event. When this is initiated, it launches a new web page with a special version of Hangouts called Hangouts on Air. From within this page the user launches the web stream. This live stream can be accessed by anyone using the URL of the Live Streaming Event without a username or password. Unfortunately C4M is not compatible with Hangouts on Air. Because the C4M devices run a restricted version of Chrome software, they cannot access the specialized version of Hangouts on Air. You also cannot invite a C4M device to join a Hangouts on Air meeting. thus the C4M device cannot be used as a source for the video origination. Nevertheless, the Two-way video Open network tested above does provide significant public access, but C4M meetings are restricted to 25 participants.

**C4M devices**

There are two additional C4M devices on the market: the Acer Chromebase for Meetings and the Asus Chromebox for Meetings: Large Rooms. The Chromebase model is a self-contained device with a 24” touch screen with a built-in camera, speaker, and microphone, MSRP \$799. Because this device has a touch screen, no external keyboard or remote control is necessary. And since the camera, speaker, and microphone are integrated, it allows for a clean installation, with only two wires: a power cable and an Ethernet network cable. The Large Rooms model is like the one tested but has two desktop

speaker/microphones and a Logitech PTZ Pro motorized camera that allows for Pan, Tilt, and Zoom, MSRP \$1,999. In both cases the price includes the first \$250 annual maintenance fee.

The wireless remote control provided with the Chromebox devices presents some concerns. It is small and could be misplaced. In addition, it requires a 2032 watch battery, and the unit provided for the demonstration arrived with a dead battery. It was determined that a standard USB keyboard could be used instead of the remote control provided.

### **Active Speaker Tracking Cameras**

The camera provided with the Large Room system can be programmed with four preset positions and can be directed to these positions with a separate wireless remote control. This requires an operator to direct the camera to new positions based on who is speaking. It appears that there are no active speaker tracking cameras available for Chrome devices. The PSD has a Polycom CX5000, a conferencing device with active speaker tracking technology. The device is designed to present audio and video feeds on a single USB interface to a Windows computer. This device was connected to the ASUS Chromebox, which identified the speaker and microphone for full audio capability. The ASUS device also identified the web camera in the Polycom device but experienced a driver problem and could not generate a video feed.

An alternative test was conducted. The Polycom device was connected to a Windows notebook, and the device was identified by Windows for audio and video service. Using the Chrome internet browser, the “hello” Hangout at the URL described above was entered, and then from within the Hangout web page the Polycom device was selected for audio and video. Then the “hello” hangout was also engaged from the ASUS C4M device. The active speaker tracking technology in the Polycom worked correctly. Thus it was demonstrated that it is possible to join the C4M hangout using the Polycom active speaker device, but only by using a chrome web browser on a Windows PC. This solution introduces a Microsoft Windows device into a network of single-purpose C4M devices that emulate appliances, and this potentially complicates usability, maintenance and support. Also for optimum performance it is necessary to determine the appropriate specifications for the Microsoft Windows device.

## Chrome for Meetings Evaluation Test Procedure

### Two-way video: fixed, credentialed users

Set up two devices in neighboring rooms in the Public Service Department (PSD) Giga and Mega conference rooms, at 112 State St. 3<sup>rd</sup> fl. The Chromebox for Meetings (CfM) will be in Giga, and a notebook PC with a web camera will be in Mega.

Promevo will issue Google G-Suite credentials for the CfM device. Ensure Google credentials are accepted and that the device is activated. Ensure that the other device has the Google Chrome internet browser and that it is up to date, and place individual test calls using Google Hangouts to confirm operation of webcam and microphone before proceeding. The moderator should schedule a CfM call via Microsoft Outlook using the Hangouts plugin. Users should evaluate the quality of the audio from the Giga room, and consider the range and suitability of the camera system in the PUC room. Moderator should determine how to call on or mute individual sites.

### Two-way video: open, non-credentialed users

When tests with the credentialed users are complete, the moderator should send a link to the conference to other PSD employees. These employees should be able to join the conference from a different web browser without downloading any browser extension or needing any credentials. The moderator should determine how to call on or mute non-credentialed users.

### One-way video: broadcast

When tests of two-way video are complete the moderator should create a Youtube Live Streaming session. The moderator should engage Hangouts on Air, and invite the CfM device to join the Hangouts, and then begin the Broadcast, and then circulate the URL to the other participants. Other PSD and ADS employees should view the Youtube live stream by opening the link in a browser. The users should provide feedback using chat feature, and the moderator should respond. The moderator should evaluate the potential for a single person to control the conference while simultaneously monitoring the meeting and the chat window.

## Appendix 4: RFI and responses



## SEALED BID REQUEST FOR INFORMATION

### Public Utility Commission Hearings & Workshops - Public Access

**ISSUE DATE:** August 18, 2017

**QUESTIONS DUE BY:** August 24, 2017 4:30PM EST

**RFI DUE DATE:** September 7, 2017 3:00PM

**RFI MUST BE RECEIVED AT:** 109 State Street, Montpelier

**SECURITY PROCEDURES:** Please be advised extra time will be needed when visiting and/or delivery information to 109 State Street. All individuals must present a valid government issued photo ID when entering the facility.

All bidders are hereby notified that sealed bids must be received and time stamped by the Office of Purchasing & Contracting located at **109 State Street - Montpelier, VT 05609-3001** - by the time of the bid opening. Bids not in possession of the Office of Purchasing & Contracting at the time of the bid opening will be returned to the vendor, and will not be considered. **Any delay deemed caused by Security Procedures will be at the bidder's own risk.**

**RFI OPENING AND LOCATION:** September 7, 2017 3:00PM, 109 State Street, Montpelier

**PLEASE BE ADVISED THAT ALL NOTIFICATIONS, RELEASES, AND AMENDMENTS ASSOCIATED WITH THIS RFI WILL BE POSTED AT:**

<http://bgs.vermont.gov/purchasing/bids>

**THE STATE WILL MAKE NO ATTEMPT TO CONTACT VENDORS WITH UPDATED INFORMATION. IT IS THE RESPONSIBILITY OF EACH VENDOR TO PERIODICALLY CHECK**

<http://bgs.vermont.gov/purchasing/bids> **FOR ANY AND ALL NOTIFICATIONS, RELEASES AND AMENDMENTS ASSOCIATED WITH THE RFI.**

**PURCHASING AGENT:**

**Stephen Fazekas**

**TELEPHONE:**

**(802) 828-2210**

**E-MAIL:**

**Stephen.Fazekas@vermont.gov**

**FAX:**

**(802) 828-2222**

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# 1 PURPOSE

This Request for Information (RFI) is issued for the Public Service Department (PSD) to gather input and obtain information and cost estimates in proceeding with proposals to employ cost-effective interactive video technologies to achieve citizen access to hearings and workshops of the Public Utility Commission (PUC) from remote locations across the State.

The PSD intends to evaluate the submissions by respondents to explore how they would meet their needs and understand the cost associated with proposed solutions. The PSD shall not be held liable for any costs incurred by the vendors in the preparation of their submission, or for any work performed prior to contract issuance.

## 1.1 LIABILITY

**THIS IS A REQUEST FOR INFORMATION (RFI) ONLY.** This RFI is issued solely for information and planning purposes – it does not constitute a Request for Proposal (RFP) or a promise to issue an RFP in the future. This request for information does not commit the State to contract for any materials or service whatsoever. Further, the State is not at this time seeking proposals and will not accept unsolicited proposals. Respondents are advised that the State will not pay for any information or administrative costs incurred in response to this RFI; all costs associated with responding to this RFI will be solely at the interested party's expense. Not responding to this RFI does not preclude participation in any future RFP, if any is issued. If an RFP is released, it will be posted on the BGS bid opportunities web site: <http://www.bgs.state.vt.us/pca/bids/bids.php>. It is the responsibility of the potential offerors to monitor this site for additional information.

## 1.2 CONFIDENTIALITY

The PSD retains the right to promote transparency and to place this RFI into the public domain, and to make a copy of the RFI available as a provision of the Vermont access to public records laws. Please do not include any information in your RFI response that is confidential or proprietary, as the PSD assumes no responsibility for excluding information in response to records requests. Any request for information made by a third party will be examined in light of the exemptions provided in the Vermont access to public records laws.

**The solicitation of this RFI does not commit the PSD or the State of Vermont to award a contract. This RFI is for information gathering purposes only and no vendor will be selected, pre-qualified, or exempted based upon their RFI participation.**

# 2 BACKGROUND INFORMATION

For more information see Act 53 (section 14) from the 2017 Vermont legislature, and a report pursuant to Act 174 from the 2016 Vermont legislature, available at the links below:

Act 53:

<http://legislature.vermont.gov/assets/Documents/2018/Docs/ACTS/ACT053/ACT053%20As%20Enacted.pdf>

Act 174 report:

[http://puc.vermont.gov/sites/psbnew/files/doc\\_library/recommendations-citizen-participation-report.pdf](http://puc.vermont.gov/sites/psbnew/files/doc_library/recommendations-citizen-participation-report.pdf)

# 3 RFI DESCRIPTION

**The State is seeking information to** employ cost-effective interactive video technologies to achieve citizen access to hearings and workshops of the PUC from remote locations across the State. The access shall include interactive capability and the ability to use multiple remote locations simultaneously. The access shall include at least five (5) locations across Vermont.

**The RFI has these key objectives:**

- Provide prospective respondents with information regarding the business need, and,
- Solicit respondent information to assist the State in determining if identified requirements can be met in a cost-effective manner.
- Solicit respondent information to assist the State in determining if identified requirements can be met by available software/hardware COTS (Commercial off the Shelf) alternatives.

The State is seeking feedback on the information in this RFI and will consider any information, including partial responses, received in response to this RFI. If the State moves forward in the development of an RFP, the RFP process will be open to all respondents regardless of their decision to participate in this RFI.

**The State envisions that the solution will support the following high-level goals:**

- Promote increased ease of citizen participation in PUC proceedings
- Expand opportunities parties to participate in PUC proceedings by telephone or other electronic means
- Create opportunities for interactive public hearings around Vermont so the public can participate simultaneously in widespread locations
- Modernize technology in the PUC's hearing room to allow for streaming/distribution of hearings, etc. so the public can watch hearings and workshops live online

## **4 CURRENT STATE**

Presently the PUC allows parties to participate in some proceedings via telephone conference call, and has a new business quality audio speakerphone. In the past the PUC conducted several meetings each year using the now-defunct Vermont Interactive Technologies network. The hearing room has an aging audio public address system with microphones but it is not used regularly.

## **5 STATEMENT OF WORK**

### ***5.1 ANTICIPATED REQUIREMENTS***

The purpose of this RFI is to determine if there are solutions capable of meeting the State's anticipated requirements and to determine alternatives for meeting those requirements that are consistent with the overall vision for the PSD and the State.

The State's discovery efforts to date have resulted in a desire to obtain access to solutions with the following attributes:

#### **5.1.1 Business Requirements**

Act 53 from the Vermont 2017 legislative session directs the PSD to submit "a plan to achieve citizen access to hearings and workshops of the Public Utility Commission from remote locations across the State." This RFI is part of the process to develop the required plan. Upon reviewing the plan in the 2018 legislative session, the Vermont legislature may choose to adopt and fund the plan. It is anticipated that a state agency, to be determined, will acquire the equipment and services and make these available to the PUC and the public. It is anticipated that the services will be provided without charge to the public. Proposals with alternative business models will be considered.

#### **5.1.2 Functional Requirements**

The PSD has identified three types of services it would like to consider to meet the high-level goals:

- a) Fixed-site two-way video: Video conferencing network consisting of the PUC hearing room and from 5 to 25 other publicly-accessible locations around the state. The remote locations have not been identified, but could be libraries, state office buildings, schools, etc.

- b) Open-network two-way video: Video conferencing network consisting of the PUC hearing room and citizens accessing the network from their homes and/or businesses using software installed on their own devices. The bidder shall specify whether citizens are required to have pre-obtained login credentials to join the meetings.
- c) One-way broadcast video: Broadcast video service, consisting of camera(s) and equipment in the PUC hearing room, and accessed by citizens from their homes and/or businesses anonymously using only a web browser or browser extension. Citizens should not need to obtain an account or install special software, and the service should be available on many devices: PCs (Windows/Mac/Linux) and portable devices like smartphones and tablets.

### **5.1.3 On-Going Maintenance /Service Level Requirements**

The bidder should describe maintenance and service level requirements it can offer.

### **5.1.4 Technical Requirements**

All connections shall be provisioned over the public Internet. The PUC hearing room is served by the State of Vermont IT service, the Agency of Digital Services (ADS). The other fixed locations for network type (a) (not yet identified) will not likely be on the State IT network, but will all have wired public Internet access of at least 25/3 Mbps.

The bidder shall specify the IP data throughput requirements for all sites for each different option proposed.

The Vermont PUC hearing room measures 22 feet by 32 feet. It is anticipated that the bidder will recommend technology for this location with motorized cameras capable of fixed preset pan/tilt/zoom locations. It would also be helpful to review bids for systems with camera systems that automatically detect and zoom to the active speaker.

The other rooms have not been identified but will likely be small offices, with an anticipated audience of 1-5 people. In many locations the equipment will be stored and deployed only in advance of a meeting.

It is anticipated that the service provider will offer Internet based video conference bridging or video broadcast services.

### **5.1.5 Documentation Requirements**

None.

## **6 REQUESTED INFORMATION**

Each submission prepared in response to this RFI must include the elements listed below, in the order indicated. The vendor, when presenting the response, must use the following outline:

- Cover Page
- Vendor Information
- Cost Estimates
- Business and Technical Requirements

### **6.1 COVER PAGE**

The first page of the vendor's RFI Response must be a cover page displaying at least the following:

- Response of RFI Title
- Vendor's Name
- Contact Person
- Telephone Number
- Address
- Fax Number
- Email Address

All subsequent pages of the RFI Response must be numbered.

## ***6.2 VENDOR QUESTIONNAIRE***

Please provide your answers to the stated questions related to the project. Additional information may supplement your answers and must be attached to the RFI response.

## ***6.3 CONTACT INFORMATION***

All communications concerning this Request for Information (RFI) are to be addressed in writing to the attention of: Stephen Fazekas, State of Vermont, Office of Purchasing & Contracting, **109 State Street - Montpelier, VT 05609-3001**. Stephen Fazekas is the sole contact for this RFI Response. Attempts by RFI Responders to contact any other party could result in the rejection of their RFI Response.

## ***6.4 RFI RESPONSE SUBMISSION***

**CLOSING DATE:** The closing date for the receipt of RFI Responses is 3:00 PM September 7, 2017. **Responses** must be delivered to: Stephen Fazekas, State of Vermont, Office of Purchasing & Contracting, **109 State Street - Montpelier, VT 05609-3001** prior to that time. RFI Responses or unsolicited amendments submitted after that time will not be accepted and will be returned to the vendor.

The responses will be received by purchasing at **109 State Street - Montpelier, VT 05609-3001** and will be passed on to PSD for review.

**RFI responses must include one (1) electronic copy on Compact Disc (CD) and Three (3) Paper (hard copy) responses must also be submitted. Paper copies must be bound with a staple, binder or other appropriate means such that pages are not submitted loosely. Three (3) copies of the RFI must be delivered to the Purchase Agent.**

**The electronic response made to the narrative portion of this RFI must be in Microsoft Word compatible format. At least one copy of the Cost Table and Business and Technical Requirements must be made in Microsoft Excel.**

## ***6.5 EXPLANATION OF EVENTS***

### **1. Issuance of RFI**

This RFI is being issued by the Office of Purchasing & Contracting, Department of Buildings and General Services Department. Additional copies of the RFI can be obtained from the State Purchasing Division web site <http://bgs.vermont.gov/purchasing> or directly from the State Purchasing Agent.

### **2. Deadline for Written Questions**

Potential respondents may submit questions regarding this RFI. Questions must be submitted in writing, by e-mail, to the Purchasing Agent Stephen Fazekas at [Stephen.Fazekas@vermont.gov](mailto:Stephen.Fazekas@vermont.gov) and must be received by 4:30 PM Eastern Time on August 18, 2017.

### **3. Response to Written Questions**

Any vendor requiring clarification of any section of this proposal or wishing to comment or take exception to any requirements or other portion of the RFP must submit specific questions in writing no later than August 18, 2017, at 4:30PM. Questions may be e-mailed to [stephen.fazekas@vermont.gov](mailto:stephen.fazekas@vermont.gov). Any objection to the RFP or to any provision of the RFP, that is not raised in writing on or before the last day of the question period is waived. At the close of the question period a copy of all questions or comments and the State's responses will be posted on the State's web site <http://bgs.vermont.gov/purchasing/bids>. Every effort will be made to have these available as soon after the question period ends, contingent on the number and complexity of the questions.

### **4. Submission of Responses**

Three (3) paper copies of the RFI response and one (1) electronic copy on CD should be delivered to the Purchasing Agent no later than 3:00 PM Eastern Time on September 4, 2017 Responses received after the due date and time may

not be considered.

Responses should be labeled, " Public Utility Commission Hearings & Workshops - Public Access"

## 5. Review and Evaluation of Responses

The review and evaluation of responses to the RFI will be performed by PSD and their designees. The evaluation process will take place the week following the response due date. During this time, the RFI Manager or other PSD representatives may, at their option, initiate discussion with respondents for the purpose of clarifying aspects of their responses.

## 6. Vendor Demonstration of Their Product

Vendors chosen from the review process may be called on to demonstrate their products and/or service offering. These select vendors will make arrangements with PSD to demonstrate their products and/or service offering. The PSD shall not be liable for any costs incurred by the vendor in preparation of its demonstration. All costs occurred are the vendor's sole responsibility. All demonstrations are for planning purposes only and do not constitute a legal bid.

## 7. Vendor Product Test Trial

Certain Vendor products and/or service offering may be selected after review process to be trialed by PSD, if this is an option allowable by the vendor. The test trial can last up to 90 days. Up to 2 vendors products selected will be involved with the test trial. The PSD staff will provide feedback to the RFI Manager. **The selection of vendor products for a test trial does not commit the PSD or the State of Vermont to award a contract. This test trial is for information gathering purposes only and no vendor will be selected, pre-qualified, or exempted based upon their RFI / test trial participation. All costs occurred are the vendor's sole responsibility. All product test trials are for planning purposes only and do not constitute a legal bid.**

# 7 VENDOR QUESTIONNAIRE

We are asking for a total cost estimate (low and high estimates) comprised of software, hardware, and necessary implementation services. We understand that the cost figures provided are for planning purposes only and will not be binding in any way.

## 8 APPENDIX A: COST ESTIMATE WORKSHEET

### 8.1: COST ESTIMATE TABLE

Item	General Requirements Description	Cost
1	XXX	
2	XXX	
3	XXX	
4	XXX	
5	XXX	

### 8.2 ADDITIONAL MATERIALS

Please provide any other materials, suggestions, cost, and discussion you deem appropriate.

September 5, 2017

**Stephen Fazekas**

Purchasing Agent  
State of Vermont  
109 State Street  
Montpelier, VT 05609-3001

**Cover Page**

- Response of RFI Title: REQUEST FOR INFORMATION Public Utility Commission Hearings & Workshops – Public Access
- Vendor's Name: I-2-I Technologies
- Contact Person: Jennifer Hicks
- Telephone Number: 512-406-1802
- Address: 801 E Plano Pkwy #240, Plano, TX 75074
- Fax Number: 800-615-0390
- Email Address: [jhicks@i2itech.com](mailto:jhicks@i2itech.com)

Submitted to:

Stephen Fazekas  
State of Vermont  
Office of Purchasing & Contracting  
109 State Street - Montpelier, VT 05609-3001



## Vendor Information



I-2-I Technologies appreciates the opportunity to submit to you an RFI response. As a fully certified reseller of video conferencing products including Lifesize, I-2-I Technologies provides complete turnkey systems for any video conferencing need for our clients including state agencies, local governments, independent school districts, and institutions of higher education. As a systems integrator of related and supporting technologies, our company has the expertise to fully integrate, develop, and evolve these solutions to maximize their effectiveness to the State of Vermont over the lifetime of the products.

We are tremendously dedicated to our large number of customers and we are proud to have very satisfied and happy customers with the quality of our work. With almost two centuries of combined expertise in the video solutions industry, our sales staff at I-2-I provides a complete and customized solution to each and every customer by using a consultative sales approach as we partner with our customers. I-2-I is in its 14th year of business and has grown into a multimillion-dollar business that has been profitable since its second year. That success is a result of the company emphasis on providing the best possible customer experience by offering turnkey solutions that are fully supported and maintained by the highly trained I-2-I staff.

### Company highlights include:

- Multiple staff serve as President and Board Members of the United States Distance Learning Association
- Multiple staff serve as Board Members for T.W.I.C.E. – Two Way Interactive Connections in Education
- Active Platinum Sponsor of the Texas Distance Learning Association with representation on the Executive Partnership Council
- Awarded the TxDLA Corporate Partner of the Year in two of the last 10 years
- Multiple employees have served in leadership roles in the Texas Distance Learning Association
- State of Texas Department of Information Resources (DIR) ICT Contract vendor with multiple awards since 2008 and inter agency agreements with additional state contracts
- Consistent TOP 5 reseller for Lifesize

### Services we offer:

- Video conferencing equipment including high definition codecs
- Audio conferencing equipment including VoIP solutions
- Streaming video equipment including encoders, VOD servers, and portal servers
- Installation and maintenance services
- Help desk support
- Video conferencing services
- Network services
- Educational and training services
- Consulting and engineering services
- Audio/video integration services
- Professional services that provide complete onboarding and implementation support

*Solution recommended for this RFI:*

This RFI response includes the Lifesize product portfolio as it provides all of the solutions that meet the requirements of this RFI including:

- On premise (Fixed site two-way video) videoconferencing systems
- Mobile and desktop applications (Open-network two-way video)
- Cloud based interactive videoconferencing services
- One-way broadcast video capabilities
- Installation free videoconferencing applications
- Administrative console for centralized management of all services
- Virtual Meeting Rooms for hosting public information events
- Simple user interface for easy public access

We appreciate the opportunity to work with you in the near future. Please feel free to contact me with any questions regarding our RFI response.

Sincerely,

Jennifer Hicks  
Partnerships Executive  
i2i Technologies  
512-406-1802  
jhicks@i2itech.com

## **Cost Estimates**

(SEE EXCEL SPREADSHEET)

### **5.1.2 Functional Requirements**

The PSD has identified three types of services it would like to consider to meet the high-level goals:

- a) Fixed-site two-way video: Video conferencing network consisting of the PUC hearing room and from 5 to 25 other publicly-accessible locations around the state. The remote locations have not been identified, but could be libraries, state office buildings, schools, etc.
- b) Open-network two-way video: Video conferencing network consisting of the PUC hearing room and citizens accessing the network from their homes and/or businesses using software installed on their own devices. The bidder shall specify whether citizens are required to have pre-obtained login credentials to join the meetings.
- c) One-way broadcast video: Broadcast video service, consisting of camera(s) and equipment in the PUC hearing room, and accessed by citizens from their homes and/or businesses anonymously using only a web browser or browser extension. Citizens should not need to obtain an account or install special software, and the service should be available on many devices: PCs (Windows/Mac/Linux) and portable devices like smartphones and tablets.

### **5.1.3 On-Going Maintenance /Service Level Requirements**

The bidder should describe maintenance and service level requirements it can offer.

#### **Maintenance:**

I-2-I Technologies provides audio, video, remote, and on site maintenance levels to address: Configuration, Training, Preparation/Delivery/Follow-up, Technical Assistance & Troubleshooting.

## Service Level Requirements:

I-2-I offers a unique approach to Service Levels:



## Implementation & Support Plans: Modules

i2i Technologies team members have an average of 17 years in the video conferencing industry; working with K-12 schools, higher education institutions, state and governmental entities, telemedicine providers, and corporate groups across the United States. The i2i Technologies team has both the technical and instructional skills to assist organizations in meeting their goals and objectives while increasing the adoption of their chosen video solutions. We can work with your team to aid them in becoming not only competent, but comfortable with the technology, enabling them to seamlessly insert it into their daily lives to increase efficiency and save time. We believe anyone can learn to effectively communicate and collaborate with a supportive environment. Our instructional programs are developed with the following beliefs in mind.

**Target the outcome. Deconstruct the skill. Learn enough to self-correct. Remove barriers. Use it.**

We lay the groundwork during the implementation and support process and highly encourage groups to immediately use what they learned. Our most successful implementations have focused on structured follow-up activities to encourage usage. After about 20 hours of use, people are quite comfortable and competent, transforming into “video” people. Use the menu below to determine the modules needed to support and implement your solution. It’s a simple process that assists in making sure all elements for success are in place with your internal team alone or in conjunction with communication & collaboration veterans, like the i2i Technologies team. Select the choices in each menu section to begin the process of customizing your plan and preparing for launch.\*

## Appetizers (Select one.)

*Goal: Development of Knowledge and Skills of Solution Administrators and Support Personnel*

Module	Basic Readiness & Verification – Part #8500-APP-001	Advanced Readiness & Verification – Part #8500-APP-002
Description	Fully test and confirm all equipment/services prior to end user exposure based on the intended uses of the solution.	Fully test and confirm all equipment/services prior to end user exposure based on the intended uses of the solution. Additional time and support is needed with larger implementations.
Objectives	<ul style="list-style-type: none"> <li>• Deployment Verification</li> <li>• Video Readiness</li> <li>• Basic Admin Onboarding</li> </ul>	<ul style="list-style-type: none"> <li>• Deployment Verification</li> <li>• Video Readiness</li> <li>• Advanced Admin Onboarding</li> <li>• Firewall/Proxy Config Guidance</li> <li>• Review of Support Process</li> <li>• Dedicated Support Team</li> <li>• Planning &amp; Communication Support</li> </ul>
Audience Up to 10 Staff Members	Administrators and technical staff supporting a solution that is minimal to mainly a refresh with the organization's personnel working in conjunction with our team.	Administrators and technical staff supporting a solution that involves a new infrastructure rebuild/refresh (cloud or onsite) or an organization new to video communications working in conjunction with our team.
Mode (Preferred)	Remote**	Remote**
	**On-site for additional time, travel, & lodging.	
Pricing <i>NOTE:</i> ***Remaining hours will be rolled over to an i2i Technologies Retainer Plan (no expiration).	Contact us for more information at <a href="mailto:sales@i2itech.com">sales@i2itech.com</a> or 800.424.9887. ***Up to 20 hours	Contact us for more information at <a href="mailto:sales@i2itech.com">sales@i2itech.com</a> or 800.424.9887. ***Up to 50 hours

*\*Please Note: Up to 45-60 days may be needed to properly prepare to successfully serve your "meal" once your menu selections have been made and communicated.*

## Entrees (Select as many as you need.)

*Goal: Development of End User Knowledge and Skills*

Module	Communication & Collaboration (Basic) – Part #8500-ENT-001	Strategies & Applications (Advanced) – Part #8500-ENT-002	Bootcamp (Premium)**** – Part #8500-ENT-003 ****Discussion with i2i Technologies team required prior to selection.
Description	Focused session on basic instruction for learning the equipment, increasing productivity, and administrative uses of the solution.	Focused session designed to prepare staff to create effective and interactive lessons, modules, and training sessions in live and on-demand formats.	Full day immersion session with hands-on simulations. Participants will transition from interacting face-to-face to over distance through hands-on

			experiences involving deep learning of equipment, etiquette, and program design.
Objectives	<ul style="list-style-type: none"> <li>• Introduction to equipment solution</li> <li>• Application of uses within the organization</li> <li>• Best practices and etiquette</li> <li>• Conducting effective meetings and presentations</li> <li>• Hands-on practice</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction and hands-on with equipment</li> <li>• Analysis and design of activities and interactions</li> <li>• Ground rules, etiquette</li> <li>• Supportive technologies and collaboration skills</li> <li>• Creating collaborations and partnerships</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction and hands-on with equipment</li> <li>• Interactive applications and technologies</li> <li>• Face-to-face versus virtual engagement</li> <li>• Supportive technologies</li> <li>• Norms of behaviors, checklists, and community building</li> <li>• Collaborative skills</li> </ul>
Audience Up to 10 Staff Members	All organizations needing to develop a basic awareness of applications, including meetings and administrative uses.	Organizations with additional goals based on teaching courses, onboarding, talent development, or specific initiatives.	Organizations needing a longer, more immersive experience and wanting to teach courses/classes facilitate training sessions, or specific initiatives.
Mode (Preferred)	Remote**	Remote**	Face-to-face**
	**On-site for additional time, travel, & lodging.		
Pricing	Contact us for more information at <a href="mailto:sales@i2itech.com">sales@i2itech.com</a> or 800.424.9887. 3 hours	Contact us for more information at <a href="mailto:sales@i2itech.com">sales@i2itech.com</a> or 800.424.9887. 3 hours	Contact us for more information at <a href="mailto:sales@i2itech.com">sales@i2itech.com</a> or 800.424.9887. 6 hours

## Desserts (Select as many as you need.)

*Goal: Application and Continued Development of Knowledge and Skills of End Users*

Module	Revisiting the Toolbox – Part #8500-DES-001	Further Developing the Toolbox – Part #8500-DES-002
Objectives	<ul style="list-style-type: none"> <li>• Check for understanding of equipment knowledge and skills from basic, advanced, and/or premium Entree module.</li> <li>• Review applications of solution and increase comfort level.</li> <li>• Further develop competency of end users in their transformation to becoming “video” people.</li> </ul>	<ul style="list-style-type: none"> <li>• Build community among departments within the organization to bridge gaps and increase collaboration.</li> <li>• Develop organizational knowledge &amp; support to promote usage.</li> <li>• Identify processes and procedures for improving adoption throughout the organization.</li> <li>• Increase end user engagement.</li> </ul>
Description	Follow up session to survey end user understanding and increase comfortability while reinforcing equipment usage and competency.	Follow up sessions to lay the groundwork for developing a user network to share information building strategies, processes, and procedures.
Audience	Up to 10 Staff Members	Up to 10 Staff Members
	<i>Note: Prerequisite: Basic, Advanced, or Premium Entree Module.</i>	
	Remote**	Remote**

Mode (Preferred)	**On-site for additional time, travel, & lodging.	
Pricing	Contact us for more information at <a href="mailto:sales@i2itech.com">sales@i2itech.com</a> or 800.424.9887. 2 hours	Contact us for more information at <a href="mailto:sales@i2itech.com">sales@i2itech.com</a> or 800.424.9887. Four 2 hour sessions over one year

## Business and Technical Requirements

**See Excel Spreadsheet**

<b>Cost Table (three types of services)</b>		
	a) Fixed-site two-way video: Video conferencing network consisting of the PUC hearing room and from 5 to 25 other publicly-accessible locations around the state. The remote locations have not been identified, but could be libraries, state office	
<b>Item</b>	<b>General Requirements Description</b>	<b>Range of Cost Per Location - one time charge</b>
1	Lifesize Icon450	\$4700 - \$5500
2	55" display and mobile cart	\$2400 - \$3400
3	Installation	\$1500-\$2200
		<b>Range of Cost - annual recurring cost</b>
4	Lifesize Icon450 Assurance Maintenance	\$475-\$550 yearly
	b) Open-network two-way video: Video conferencing network consisting of the PUC hearing room and citizens accessing the network from their homes and/or businesses using software installed on their own devices. The bidder shall specify whether citizens are required	
<b>Item</b>	<b>General Requirements Description</b>	<b>Range of Cost - annual recurring cost</b>
5	Lifesize Cloud	\$12,000 - \$15,000 yearly
	c) One-way broadcast video: Broadcast video service, consisting of camera(s) and equipment in the PUC hearing room, and accessed by citizens from their homes and/or businesses anonymously using only a web browser or browser extension. Citizens should not need to obtain an account or install special software, and the service should be available on many devices: PCs	
<b>Item</b>	<b>General Requirements Description</b>	<b>Range of Cost - annual recurring cost</b>
6	Lifesize LiveStream	\$2,500 - \$10,000 yearly
	<b>Additional Services:</b>	
<b>Item</b>	<b>General Requirements Description</b>	<b>Range of Cost - one time charge</b>
7	i2i Technologies Implementation & Support	\$15,000 - \$20,000



## Business and Technical Requirements

### 5.1.4

## Lifesize Product and Services Bandwidth Requirements

The bandwidth for the mobile clients (Lifesize Cloud) is between 128-768Kbps.

The bandwidth for the desktop applications (Lifesize Cloud) is 600-800Kbps.

The bandwidth for Lifesize video conferencing endpoints (Lifesize Icon 450) is 600-1000Kbps.

## Lifesize Cloud Technical Requirements

Security concerns are a big reason companies dismiss using cloud-based services for any application. Video conferencing is no exception. At Lifesize, we understand the importance of security, and we built Lifesize Cloud to provide customers with a secure experience from the meeting room to the office and on the go.

### Data storage

We store the following basic information:

#### ACCOUNT MANAGER

- Email address (which is also your username)
- Password
- First name
- Last name
- Telephone
- Address
- Company

#### USERS

- Display name
- Email address (which is also your username)
- Password

#### BILLINGS

We leverage a third-party PCI-compliant partner for direct sales and our Lifesize Partners for channel sales; therefore, no user billing information is stored in our systems.

#### OTHER DATA

We never record, capture or store any unencrypted video/media stream or chat conversations.

### Security

#### ACCOUNT SECURITY

- We send an authentication email before activating an account.
- Each account (admin and users) is secured with a password.
- We never send passwords via email. If you forget your password, you will be able to reset it.
- Passwords are not shown in the licensing database.

#### MEETING SECURITY

- Passcode—You can add a passcode to secure your meetings.
- Remove participant—During a meeting, any participant can be easily removed from the call.

### Authentication

The connection between the Lifesize Cloud apps and Lifesize® Icon™ and the Lifesize Cloud service is authenticated through https at provisioning. Registrations are secured via TLS.

### Encryption

Lifesize Cloud lets you connect instantly with anyone, anywhere on any device. This means that some of your calls will be conducted over the public Internet. Rest assured that we support state-of-the-art encryption:

- 128-bit AES (Advanced Encryption Standard) encryption for media
- TLS (Transport Layer Security) encryption for signaling

NOTE: PSTN/audio-only calls, by their nature, are not encrypted.

### Firewall/NAT traversal

You don't have to place devices outside your firewall to enable communications through Lifesize Cloud. Our architecture lets you keep your apps and meeting room video systems behind your firewall and manages the traversal through our authenticated servers.

#### FIREWALL CONFIGURATIONS

Lifesize Cloud uses the following TCP/UDP ports against lifesecloud.com to enable the service.

### Service availability

Lifesize Cloud is operated in secure Tier 1 data centers in North America, Europe and Asia, ensuring redundancy and failover. In case of disruption, your calls will be routed to another available server. Our systems are backed up, ensuring that your configurations are protected and up to date.

### Questions?

## Lifesize Cloud apps and Lifesize Icon:

PROTOCOL	DESTINATION PORT	DESCRIPTION
TCP	80	HTTP: Lifesize Cloud app download (NOTE: will redirect to web console download page)
TCP	443	HTTPS: Lifesize Cloud app provisioning
TCP	35060/35061	Lifesize Cloud app signaling (SIP/TLS)
UDP	10000-16000	RTP media

## For any SIP video endpoints:

PROTOCOL	DESTINATION PORT	DESCRIPTION
TCP/UDP	5060/5061	SIP/TLS

## For any H.323 video endpoints:

PROTOCOL	DESTINATION PORT	DESCRIPTION
TCP	1720	H.225: call signaling
UDP	1719	H.225: RAS
TCP	10000-16000	H.245: Control channel

# Technical Requirements for PC, MAC, Mobile devices using Lifesize Cloud:

## DIAL PLANS

Support for both direct-dial and "meet-me" dialing plans

- Direct dial any user, video system or meeting room for instant collaboration
- Create and schedule meet-me meetings using:
  - Chrome™ Extension for Google Calendar™
  - Add-in for Microsoft® Outlook® 2010, 2013, 2016
  - Any ICS compatible calendar
- Email-based dialing support

Support for legacy dial plans

- Dial out to any IP address or URI
- Every user and meeting room is reachable by IP address, URI or telephone number

## MEETING ROOMS

Every user can create meeting rooms

- Full-screen presenter mode
- Ability to mute participants
- Optional security passcode
- Configurable layout options
- Each room supports up to 50<sup>1</sup> participants joining on an H.323/SIP video system, Lifesize app, guest client or telephone

## CALL ESCALATION

Create a group call by simply adding another person to your call—no need to hang up and dial a bridge or meeting room (Feature available on the Lifesize app, Lifesize® Icon™ and Lifesize® 220™ video systems)

## UNLIMITED GUEST CALLING

Anyone can join your call from a web browser (Chrome and Internet Explorer® 11), a Mac® or PC, or a video system.

## TELEPHONE SUPPORT

Local telephone numbers in 60+ countries—provides dial-in support to all users and meetings

- Prepopulated search-based directory with presence support<sup>2</sup>
- Meetings directory
- Chat in and out of calls with one person or a group of people
- Audio plus screen sharing (Web Conferencing Mode)
- Favorites list
- Automatic software updates

## LIFESIZE LIVE STREAM<sup>4</sup>

- Live stream meetings to up to 10,000 viewers
- Enable any of your Lifesize virtual meeting rooms for simultaneous live stream events
- Set viewing permissions for secure live streaming
- Easy set up and reporting via the Admin Console
- Real-time Q&A<sup>3</sup>
- Watch from a variety of browsers and mobile devices
  - Android 6+
  - iOS 9+
  - OSX 10.10+
  - Windows 7+

## LIFESIZE RECORD & SHARE<sup>4</sup>

- HD-recorded content automatically organized into channels
- Configurable permissions, including automatic access for meeting participants
- My Feed, My Videos, Watch List
- AES-128 encryption data-in-flight and AES-256 data-at-rest
- Downloadable MP4
- Record from any Lifesize app-enabled device
- Playback on any device
  - Android 6+
  - iOS 9+
  - OSX 10.10+
  - Windows 7+

## LIFESIZE ICON AND 220 VIDEO SYSTEMS

Supports connection and automatic configuration to your

- Avaya®
- Cisco®
- Polycom®
- Radvision®

## MANAGEMENT AND REPORTING

- Centralized management of Lifesize account and video systems
- Usage reports and notifications
- Multiple account manager support

## SECURITY AND FIREWALL TRAVERSAL

- Encrypted signaling and media, AES 128-bit
- Automatic firewall traversal, no public IP required (Lifesize app and Lifesize Icon only)
- Web proxy support

## VIDEO AND AUDIO QUALITY

- HD video up to 60 fps
- Wideband HD audio with built-in echo cancellation

## SYSTEM SUPPORT

- Mac OS X® 10.9, 10.10, 10.11 and 10.12
- Windows® 7, 8, 8.1 and 10
- Intel Core™ i5 1.6 GHz or faster, 4 GB RAM

## BRING YOUR OWN DEVICE SUPPORT

Lifesize supports the latest iOS and Android devices, making your video conferencing available on a broad range of tablets and smartphones

### Android (v7.0 or later)

- HTC: One M8, One, One X, One S
- Samsung: Galaxy S®7 Edge, Galaxy S®7, Galaxy S®6 Edge, Galaxy S®6, Galaxy Grand Prime™, Galaxy S®5, Galaxy S®4, Galaxy S® III, Galaxy S® II, Galaxy Note® 5, Galaxy Note® 4, Galaxy Note® 3, Galaxy Note® II, Galaxy Note®, Galaxy Tab® Pro 12.2, Galaxy Tab® Pro 10.1, Galaxy Tab® Pro 8.4, Galaxy Tab® 3 8"
- Google: Nexus 10™, Nexus 9™, Nexus 7™, Nexus 6P™, Nexus 6™, Nexus 5™, Nexus 5X™



## USER AND MEETING DIRECTORIES

Lifeseize simplifies dialing your contacts. You no longer need to dial long IP addresses because every Lifeseize app and Lifeseize Icon video system comes with a prepopulated search-based directory—simply select the entry you wish to call.

Add existing video systems to the shared directory

## PRESENCE

Presence indicators let you see at a glance whether the person you want to reach is available<sup>2</sup>.

## LIFESIZE APPS

Lifeseize for Macs, PCs, iOS and Android™ mobile devices and browser-based Lifeseize Web App in Chrome and Internet Explorer 11 offer native Cloud integration:

Lifeseize account and automatic software updates

Available options include touchscreen phone, dual display support and 10x PTZ camera

Lifeseize Icon Health Monitoring: Real-time alerts can be sent to a dedicated inbox

LIFESIZE ICON ONLY: View and launch Microsoft® Office 365®, Google Apps for Work or Microsoft® Exchange Server 2013 or 2016 calendar for scheduled meetings on paired Lifeseize Icons<sup>1</sup>

## INTEROPERABLE AND STANDARDS-BASED

Lifeseize is an interoperable service that works with video systems and infrastructure<sup>3</sup> from the following manufacturers:

- Skype for Business
- Microsoft® Lync® 2013, Lync® Online

NEKUS 6™, NEKUS 5™, NEKUS 4™

- Motorola: Droid Turbo 2, Moto X™ (2013 edition), Moto G™ (version 2)
- LG: LG G5, LG Stylus 2, G Stylo™, G4, G3

This list includes only recently certified devices; other Android devices might work with the Lifeseize app.

## iOS (v10.0 or later)

- iPhone® 7, iPhone® 7 Plus, iPhone® 6S, iPhone® 6S Plus, iPhone® 6, iPhone® 6 Plus, iPhone® 5s, iPhone® 5c, iPhone® 5, iPhone® 4S, iPad Pro™, iPad® Air 2, iPad® Air, iPad® 3, iPad® 2, iPad® Mini 4, iPad® Mini 3, iPad® Mini 2, iPad® Mini, iPod touch® 5G

## Windows (v8.0 or later)

- Microsoft: Surface™ Pro
- All Intel®-based tablets running v8.0 or later

<sup>1</sup>Enterprise subscription plan customers only. <sup>2</sup>Presence availability varies by account size and video system. <sup>3</sup>Not supported on mobile devices. <sup>4</sup>Requires Lifeseize Enterprise or Premium Subscription Plan. <sup>5</sup>Public IP address required.

# Technical Requirements for Lifeseize Icon450:

## SYSTEM COMPONENTS

- Lifeseize Icon 450 with integrated PTZ camera
- Lifeseize Phone HD
- Power supply/cables
- Lifeseize Remote Control

## COMMUNICATIONS

- SIP, H.323, 128 Kbps–6.0 Mbps
- 1 x RJ-45 Network LAN 10/100
- 1 x Lifeseize Link for Lifeseize Phone HD

## SUPPORT FOR SINGLE DISPLAY

- Any display with HDMI input supporting 720p or 1080p video modes

## 1080P30 ZOOM CAMERA

- Wide-angle zoom lens with 80-degree horizontal field of view
- 5x optical zoom
- Auto focus/automatic gain control
- 10 camera presets (near or far end)

## VIDEO SPECIFICATIONS

- Maximum resolution 1920x1080, 16:9 aspect ratio
- All resolutions progressive scanning
- Over 200 resolutions supported
- Example bitrates and resolutions (H.264 High Profile, AAC-LD):
  - –600 Kbps (720p30)
  - –820 Kbps (720p60)
  - –1.2 Mbps (1080p30)

## SMART-FRAMING SENSOR

- 120-degree horizontal sensor range
- Auto PTZ and centering of room participants in video frame

## VIDEO STANDARDS

- H.264 High Profile, H.264 Baseline Profile

## VIDEO INPUTS (1 INPUT)

- 1 x HD Video In (up to 1080p30) HDMI enabled

## VIDEO OUTPUTS (1 OUTPUT)

- 1 x HD Video Out (up to 1080p30) HDMI enabled

## FULLY INTEGRATED LIFESIZE PHONE HD

- 90 Hz to 22 kHz
- Audio pickup range up to 4.57 m (15 ft)
- 48kHz audio sampling
- Powered by Icon 450 directly through Lifeseize Link cable
- Support for one Lifeseize Phone HD accessory
- Ships with 9 m Lifeseize Link cable
- Optional 15 m Lifeseize Link cable available

## AUDIO FEATURES

- WebRTC NetEQ packet loss concealment
- Full duplex for natural conversations
- Advanced acoustic echo cancellation
- Automatic gain control
- Automatic noise reduction

## AUDIO STANDARDS

- G.711, G.722, G.722.1 and G.722.1C licensed from Polycom®, MPEG-4 AAC-LC, MPEG-4 AAC-LD

## AUDIO INPUTS (2 INPUTS)

- 1 x Lifeseize Link (Lifeseize Phone HD)
- 1 x HD Video In

## AUDIO OUTPUTS (2 OUTPUTS)

- 1 x Lifeseize Link (Lifeseize Phone HD)
- 1 x HD Video Out

## OTHER SUPPORTED STANDARDS

- H.221, H.224, H.225, H.231, H.239/BFCP, H.241, H.242, H.245, H.281, RFC 3261, RFC 3264, RFC 2190, RFC 3407, RFC 2833

## USER INTERFACE & FEATURES

- Simplified user interface
- Heads up remote control
- Seamless call escalation to a multiparty call
- Graphical user interface administration console
- Multiple languages supported
- Do Not Disturb mode
- Video and audio mute
- Picture-in-picture

## LIFESIZE CLOUD\*

- Seamless call escalation for video and voice participants
- Calendar, meeting directory, favorites, unified searchable directory
- Automatic provisioning
- Guest calling
- Single button recording and sharing\*\*
- Mobile calling
- Video network management
- Secure firewall traversal, plus NAT
- Automatic software updates

## SECURITY

- Ability to disable HTTP, SSH services
- H.235 (AES) encryption support including strict compliance
- TLS/SRTP support
- Kensington Security Slot

## INTELLIGENT NETWORKING FEATURES

- Adaptive motion control (AMC) including forward error correction (FEC) for superior video quality in all network conditions
- NAT/firewall traversal (H.460/SIP)
- Auto bandwidth detection

## DIRECTORY AND ADDRESS BOOK

- Up to 100,000 directory entries
- Global search tool
- LDAP support/H.350 compliant
- Meeting directory support
- H.323 URI dialing support (Annex O)

## SYSTEM MANAGEMENT

- Web interface
- Auto configuration
- SNMP
- Backup and restore capability
- 1x USB 2.0 (for support of serial control interfaces)

## POWER

- System power 19VDC, 2.31A (max, with Phone HD) supplied by AC-DC power supply (included). AC specification: 100-240VAC, 50/60 Hz

## ENVIRONMENTAL DATA

- Operating temperature: 0°C (32°F) to 40°C (104°F)
- Operating humidity: 15% to 85%, noncondensing
- Storage temperature: –20°C (–4°F) to 60°C (140°F)
- Storage humidity: 10% to 90%, noncondensing

## VIDEO DEVICE DIMENSIONS

- Width: 216.5 mm (8.52")
- Depth: 119.1 mm (4.70")
- Height: 135.5 mm (4.94")
- Weight: 1.19 Kg (2.62 lbs)

## MOUNTING OPTIONS

- Mounting holes: 2 x M5 screw holes 150 mm (6 in) apart
- Mounting screws\*\*\*: 2 x M5 screws (Max insertion depth: 3.8 mm)

## REGULATORY NUMBER

- Lifeseize Icon 450 = LFZ-033

\*Requires a Lifeseize Cloud subscription.

\*\*Through Lifeseize Cloud Amplify, sold separately.

\*\*\*Mounting screws are not included.



## Response to RFI

# Public Utility Commission Hearings & Workshops – Public Access



### Prepared for:

Stephen Fazekas  
Dept. of Buildings & General Services,  
Office of Purchasing & Contracting  
109 State Street  
Montpelier, VT 05609-3001

### Due Date:

September 7, 2017  
by 3pm

### Prepared by:

NWN Corporation  
271 Waverley Oaks Road  
Waltham, MA 02452  
(781) 472-3400

### Contact:

Ted Shea, Senior Account  
Executive  
(781) 472-3453  
TShea@nwnit.com



September 6, 2017

Stephen Fazekas  
Department of Buildings and General Services  
BGS Financial Operations  
Office of Purchasing & Contracting  
109 State Street  
Montpelier VT 05609-3001

**RE: RFI – Public Utility Commission Hearings & Workshops – Public Access**

Dear Stephen,

NWN Corporation (NWN) is pleased to submit a response to the State of Vermont's Request for Information (RFI) for the Public Service Department to gather input and obtain information and cost estimates in proceeding with proposals to employ cost-effective interactive video technologies to achieve citizen access to hearings and workshops of the Public Utility Commission from remote locations across the State.

NWN has over 30 years of experience providing sophisticated IT products and consulting solutions to clients across the country. Because of our responsiveness and proven reputation for meeting cost, schedule, and quality commitments, our partners regularly engage us as prime contractor in a broad variety of large-scale service delivery projects. NWN is delighted to pursue this opportunity and brings considerable experience in meeting the needs of our clients.

Our company information includes:

<b>Legal Name of Organization:</b>	NWN Corporation
<b>Corporate Address:</b>	271 Waverley Oaks Road, Waltham, MA 02452
<b>Point of Contact:</b>	Ted Shea, Senior Account Executive (781) 472.3453, <a href="mailto:tshea@nwnit.com">tshea@nwnit.com</a>

Please feel free to contact me with any questions you may have regarding this response or if you would like further information. Thank you for this opportunity to serve you.

Sincerely,

**NWN Corporation**

**Ted Shea**  
Senior Account Executive  
Phone: (781) 472 .3453  
Email: [tshea@nwnit.com](mailto:tshea@nwnit.com)



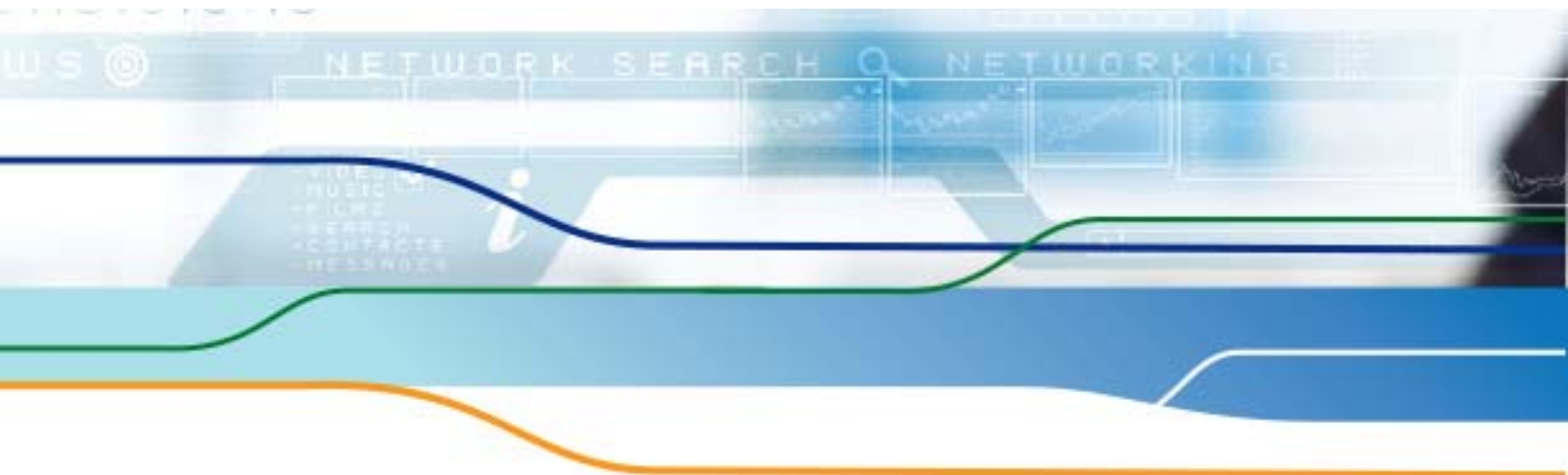
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# Section 1. Introduction & Executive Summary

Response to RFI | State of Vermont, Dept. of Buildings & General Services |  
Public Utility Commission Hearings & Workshops – Public Access



# Executive Summary

NWN is pleased to respond to the Public Utility Commission Hearings & Workshops – Public Access RFI. We understand the importance of this use case to the State of Vermont and its ability to service their constituents and customers. This platform will enhance the State's ability to reach its customers with more frequency and efficiency and allow for a more collaborative exchange via video conferencing. The solution will feature a combination of video equipment installed within the existing State network footprint along with several video endpoints installed in strategic publically-accessible locations. Regardless of location, the end devices and the overall service will be administered by the engineers within the NWN NOC 24x7. This will ensure system availability without the burden on the State resources.

This proposed solution will integrate with the existing NWN-provided VoIP platform. This will enable the State to leverage familiar provisioning, deployment, billing and support processes and procedures that have already been established during the significant deployment of VoIP to thousands of State employees. The proposed Cisco-based video platform will be completely managed and operated by the same NWN teams that are supporting the organization today thus streamlining the process of system turn up from an operational perspective. The spirit of the NWN cloud-based offerings is to provide all levels of service from hardware procurement and design details, to implementation and support for the solution on an everyday basis.

Each one of our clients is unique and has their own objectives, drivers, culture and approach. NWN Corporation, and each of our 550 + employees, strives to understand every one of our customer's situations intimately so that we can provide solutions *that fit you or your organization's needs!* We offer a full range of services across the entire technology stack and differentiate ourselves in the industry by providing our customers with multiple consumption models including on-premise, hybrid and hosted options. Our flexibility in delivering our solutions combined with our experience and scalability continues to drive technology adoption within all of our higher education customers. In turn, our technology partnership has allowed our customers to deliver a solid, robust platform that provides for an exceptional learning environment.





# Vendor Information

## NWN at a Glance

Firm Name:	NWN Corporation
Corporate Address:	271 Waverley Oaks Rd. Waltham, MA 02452 (781) 472-3400
Contact Name:	Ted Shea, Enterprise Account Executive
Contact Address:	271 Waverley Oaks Rd. Waltham, MA 02452 (781) 472-3453
Date established:	June 2000
Ownership:	C-Corporation, 13 offices
State of Incorporation:	Delaware
Corporate Officers:	Skip Tappen, President & CEO; Ben Turner, CFO
Current Management:	Since 2017

## NWN Corporate Profile

NWN is a U.S. IT solutions company that provides sophisticated IT products and consulting solutions to clients across the country. NWN serves a broad range of industries, including healthcare, manufacturing, media, entertainment, financial services, professional services, education and state and local government. NWN offers a full range of professional services including consulting, design and project management, as well as hardware and software for storage, data center, network operations, desktop computing and unified communications. NWN also offers a full menu of customizable cloud-based solutions, managed services (nCare™) with remote 24/7 command center support, and IT staffing services. NWN has nearly 550 employees in the U.S. serving more than 7,000 customers.

NWN holds the highest corporate certifications with Cisco, HP and Microsoft, as well as premier relationships with Intel, McAfee, VCE and other best-of-breed partners. The company has more than 300 engineers, project managers, consultants and technicians, many of whom have achieved the top level of vendor certifications necessary for NWN to maintain its elite status with its principal vendor group.

NWN develops and maintains the deep knowledge and experience required to provide effective IT solutions for the industry's most common computing environments. NWN is one of only a handful of IT service companies to hold elite/ national partner status with leading IT vendors that include Cisco, Hewlett Packard (HP), Microsoft, VMware and EMC, and distribution channel partners such as Synnex, Ingram Micro and Arrow. Each of these industry leaders has chosen NWN as one of a small number of "go-to" partners.



## Section 2. Business & Technical Requirements (including Cost Estimate)

Response to RFI | State of Vermont, Dept. of Buildings & General Services |  
Public Utility Commission Hearings & Workshops – Public Access





Helping Customers Solve Business Problems through Technology

# Video Conferencing & Streaming

Proposal and Statement of Work (SOW)



Prepared for:

State of Vermont

Department of Public Service

Prepared by:

▶ Dave Tuell, Senior Solution Architect

▶ Ted Shea, Senior Account Executive

▶ September 5, 2017



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## Statement of Confidentiality

The contents of this document have been developed by NWN Corporation (NWN). NWN considers the contents of this document to be proprietary and business confidential information. This information is to be used only in the performance of its intended use. This document may not be released to another vendor, business partner or contractor without prior written consent from NWN. Additionally, no portion of this document may be communicated, reproduced, copied or distributed without the prior consent of both the Customer and NWN.

## NWN Corporation Summary

NWN is a U.S. based IT Solutions Company that provides sophisticated IT products and consulting solutions to Customers across the country. NWN serves a broad range of industries, including healthcare, manufacturing, media, entertainment, financial services, professional services, education, state and local government. NWN offers a full range of professional services including consulting, design and project management, application development, as well as hardware and software for storage, data center and network operations, and desktop computing. NWN also offers a full menu of customizable managed services with remote 24/7 command center support.

NWN develops and maintains the deep knowledge and experience required to provide effective IT solutions for the industry's most common computing environments. NWN is one of only a handful of IT service companies to hold elite/ national partner status with leading IT vendors that include Cisco, Hewlett Packard (HP), Microsoft, VMware, EMC, NetApp and distribution channel partners such as Synnex, Ingram Micro and Arrow. Each of these industry leaders has chosen NWN as one of a small number of "go-to" partners.

NWN holds the highest corporate certifications with Cisco, HP and Microsoft, as well as premier relationships with Intel, Intel Security, VMware, EMC and other best-of-breed partners. Our technical staff of engineers, project managers, consultants and technicians has achieved the top level of vendor certifications necessary for NWN to maintain its elite status with its principal vendor group.

## NWN Solution Practices

NWN's goal is to deliver a full suite of the most desirable enterprise-class solutions to Customers ranging from Fortune 500 industry leaders to midmarket customers nationally. NWN's suite of solutions includes network infrastructure, data center and virtualization, unified communications and collaboration, end-user computing, IT security, application development, workforce agility and managed services.

NWN Solutions are divided into the following Technologies:

- Data Center and Networking
- Collaboration
- End-User Computing and Mobility
- Applications and Data Services
- Security
- Cloud

NWN Services are divided into the following areas:

- NCare - Managed Services
- NForce – Staffing Services
- NCloud – Cloud Services
- NPro – Professional Services
- NSolve – Applications and Data Services
- Infrastructure Assessments

NWN Delivery Models include:

- Cloud (Hosted) IT Services
- On-Premise Solutions
- Hybrid Solutions

## NWN Corporate Philosophy

NWN helps customers solve business problems through technology. We work with private sector businesses across many industries as well as state, local and educational organizations in the public sector. Our professionals help Customers choose the solutions that make the most sense for them, then implement these expertly.

NWN offers a broad range of innovative and cost-effective software and technology solutions and services, from business intelligence and custom application development to technology infrastructure, monitoring and support services. We work with Customers to articulate business objectives, put the right process and technology elements in place and make sure these solutions never blink. Each solution is custom-tailored to fit the Customer's needs.

With so many technology products and services available in the marketplace today, organizations need a trusted advisor to help them identify, develop, implement, and integrate the ones that will make the largest and most measurable impact on business results. NWN is focused on:

**Effectiveness.** We help our customers streamline operations, drive down costs, and increase speed to value. Our data center and virtualization solutions routinely pay back in months, not years. Financial services, healthcare and education customers who implement and use our business intelligence solutions begin to see operational performance improvements almost immediately. We help Customers manage computing assets throughout the lifecycle for total cost of ownership effectiveness.

**Dependability.** Always-on, ubiquitous communication is no longer optional for successful organizations. And information must get to the right hands at the right time under the most stringent attention to security. NWN's networking and data center solutions, coupled with our security expertise and our 24x7 managed service, give our customers the dependable, resilient capability they need. For our customers, our people are always on as well.

**Flexibility.** Organizations with new markets to tackle and those with peaks-and-valleys demand need flexibility. NWN provides scalable and on-demand solutions for collaboration, IT infrastructure, and important applications. Our IT staffing service can also provide just-in-time talent for critical projects and temporary needs.

**Reach.** Organizational silos are a thing of the past. With NWN workflow and data management solutions, our Customers get the seamless operations that their customers value. NWN's business intelligence solutions help them tap newly coordinated data, and our robust infrastructure solutions manage the IT traffic expertly behind the scenes. And with front end capabilities such as NWN's video, mobility, and Web portal solutions, the ability to reach citizens, patients, students, sales prospects, partners and colleagues is virtually unlimited.

**Innovation.** NWN solutions offer insights as well as operational excellence. Our consultants and engineers work shoulder-to-shoulder with Customers to solve knotty problems, big and small. When our Customers need the newest thing to wow their customers, we join them in the blue sky to find innovative solutions that work.

## What Makes NWN Different?

**Customer Focus and Accountability.** At NWN, we're focused on the customer. Our team takes on the customer's business problem as if it were our own. That means we are accountable for solutions that are sensible, practical, and effective. They are the solutions we would choose for ourselves, and they work.

Our in-depth technology expertise and thorough understanding of customer business processes enable us to deliver world class solutions quickly and cost-effectively. But we don't stop there – NWN can take on the day-to-day accountability for managing and maintaining the solutions we engineer and implement or we can focus on a complete knowledge transfer to ensure our Customers' self-reliance. Either way, we take an owner's perspective in everything we do to ensure our customers get the results they were hoping for.

**Responsive, Local Service and Global Reach.** NWN's "down the street" availability means we can drop by when you call. At the same time, we are large enough to resolve a broad range of enterprise issues and agile enough to handle these quickly. Our "follow the sun" approach to software development blends teams of software engineers across NWN office locations in the U.S. and China. This approach lets us transcend the boundaries of the typical eight-hour workday to deliver more results to Customers in less time without sacrificing quality or budget.

**Team Values and Integrity.** Our projects are managed and staffed with seasoned business and technology experts. We are recognized for the quality, commitment and capabilities of our teams. Our employees collaborate so closely with our customers and partners that we become one operating team.

**Excellence.** NWN relentlessly pursues excellence in the technologies that matter to our customers. You trust us to be the experts, and we take that responsibility to heart. There is no substitute for real-world experience.

**Commitment.** NWN won't stop until the job is done—the whole job. The results we produce for our customers make us proud of who we are and what we do.



## Our Office Locations

With 14 offices across the U.S. and in Beijing, China, NWN is able to provide customers with the responsiveness and agility of a local consultant, backed by the strength and resources of a global IT solution integrator. NWN has offices in:

- Birmingham, AL
- Charlotte, NC
- Farmington, CT
- Fresno, CA
- Gold River, CA
- Greensboro, NC
- Greenville, SC
- Houston, TX
- Mt. Laurel, NJ
- Raleigh, NC
- Sacramento, CA
- Waltham, MA
- Beijing, China

# Proposal

## Project Overview

The State of Vermont Department of Public Service has engaged NWN Corporation for the implementation of a hosted Cisco Meeting Server solution as defined in this document. As part of this project NWN will implement the new components, which include:

- Cisco Expressway
- Cisco Meeting Server
- Cisco MX and DX series video collaboration endpoints
- VBRICK Rev

As part of this project NWN will integrate the Cisco Meeting Server with the State of Vermont's NWNComm hosted platform and will also implement a Cisco Collaboration Edge solution using Cisco Expressway to provide registration of the existing video endpoints and for Business to Business video calling capabilities. The VBrick Rev platform will provide live webcasting capabilities.

Implementing Cisco Meeting Server will allow the State of Vermont Department of Public Service to take advantage of the latest productivity enhancements and collaboration tools included with the new releases of the Cisco Meeting Server.

## Project objectives

The following points are captured as the customer's measures as indicators of a successful project:

- Installation and configuration of redundant Cisco Meeting Servers in the NWN datacenter to support the State of Vermont Department of Public Service video conferencing requirements
- NWNComm/Cisco Unified Communications Manager Integration with Cisco Meeting Server
- Installation and configuration of Expressway-C/E to support video conferencing with external participants
- Integration with VBRICK Rev for live webcasting / video streaming
- Installation and configuration of (1) new MX800 endpoint with SpeakerTrack and PresenterTrack located in the Department of Public Service Hearing Room
- Installation and configuration of up to (25) DX80 endpoints located in remote Department of Public Service sites

# Statement of Work (SOW)

## Scope Summary

As part of this project NWN will implement Cisco Meeting Server and VBrick Rev Services. These components are listed in the **Proposed Location Configuration** section below and will include:

- (2) Cisco Meeting Servers
- (1) Cisco Expressway-C/E pair
- VBRICK Rev
- (26) New Cisco video endpoints, including the following models:
  - (1) Cisco MX800 video endpoints
  - (25) Cisco DX80 video endpoints

The components of Cisco Meeting Server are as follows:

- (2) Cisco Meeting Server 1000
  - Each Cisco Meeting Server 1000 supports up to 96 HD connections and 3000 Audio connections
  - Cisco Meeting Servers are scalable and can cascade calls between each server
  - Integrated Cisco Meeting Server Edge provides firewall traversal for the WebRTC and thick clients
  - Cisco Unified Communications Manager integration provides full audio and PSTN connectivity
  - Cisco Meeting Server Auto-attendant provides on demand meeting capabilities
  - Cisco Meeting Server Web Scheduling interface and invitation customization provide easy customer usability
- (1) Shared Multi-Party Licenses (Supports 1 concurrent call between the two servers)
  - Additional concurrent meetings require additional meeting licenses

During this project NWN will:

- Develop detailed design specifications and implementation plan.
- Licensing planning.
- Customize meeting message invitation template
- Test and validate all existing system functionality.
- Perform technical handoff and administration knowledge transfer.
- Update existing system documentation.

At the conclusion of the project NWN will document the installation for The State of Vermont Department of Public Service and complete the technical handoff, which will entail the review of the system documentation and administrative knowledge transfer on the ongoing operation and management of the new system.

## ***Proposed Location Configuration***

Based on the requirements outlined in the RFI, NWN is proposing the installation of the following equipment at the designated locations:

### **NWN Datacenter**

- (2) Cisco Meeting Servers
- (1) Cisco Expressway-C/E pair
- VBRICK Rev integration

### **Public Hearing Room**

- (1) Cisco MX800 with dual 70" displays (wall mount or floor mount)
  - Dual cameras for SpeakerTrack functionality
  - Ceiling mounted / desktop microphones
  - Third camera for PresenterTrack functionality
  - Registered directly to the State of Vermont's NWNComm Communications Manager via the internal network

### **Remote Sites**

- (25) Cisco DX80 with 23" display (free standing desktop device)
  - Registered indirectly to the State of Vermont's NWNComm Communications Manager via the Mobile and Remote Access feature provided by the Expressway-C/E pair.

## **Project Success Measures**

The following points are captured as the customer's measures as indicators of a successful project:

- Successful implementation of Cisco Meeting Server / VBrick Rev, providing the audio and video conferencing features/functionality defined in the RFI while providing a solution that can scale to support future conferencing requirements.

## **Project Management Methodology**

An NWN Project Manager will be assigned to this project, utilizing the NWN Project Methodology (*see Attachment 1*), to ensure the successful delivery of this initiative as defined in this scope. The following outlines the roles and responsibilities of the NWN Project Manager:

- Act as a single point-of-contact between NWN and Customer
- Ensure thorough project communication with project stakeholders and team members
- Develop & maintain detailed project plan, task plan, schedule & communications plan
- Prepare, distribute & communicate regular status, action item & related project reports
- Manage project scope and respond to change requests
- Define and manage the escalation process
- Conduct project kickoff, status, milestone and review/closure meetings

- Review all Project Documentation and Deliverables
- Oversee knowledge transfer

## 1 - Initiate Phase

The initiate phase of the project is critical to establishing a firm foundation for the launch and delivery of the project. Activities in this phase of the project include:

- Internal kickoff meeting – this meeting involves the NWN Sales Team and the NWN Implementation Team. At this meeting, the entire NWN team is made aware of the Customer's expectations that were set during the Sales process to ensure all communication is translated to the Implementation Team for the on-site work effort.
- External kickoff meeting – this meeting involves the NWN Team and the Customer's Team and usually takes place at the Customer's site. During this meeting, all aspects of the project will be reviewed and established. This includes, but is not limited to: logistics management, roles and responsibilities of all project team members, draft schedule, task plan and work breakdown structure (WBS), communications plan and design and implementation approaches.
- Scheduling for Design Meeting – Initial timeline will be set for overall project. NWN and Customer will work together to identify resources for project and coordinate schedules to complete the Design Phase.
- Create project plan package – the NWN Project Manager will work with the overall team to create a project plan package, schedule, communications plan, project documents and protocols.

### ***Deliverables:***

- Kick off meetings and follow up communications
- Project plan package
- Project work schedule and related meetings (design, discovery, status)

## 2 – Assess, Plan and Design Phase

Activities in this phase of the project include:

- Video Conferencing System Design Meeting - After the kick-off meeting, NWN and the Customer's team will hold a design meeting to discuss the technical aspects of the video conferencing system configurations. NWN expects the Client will come prepared with documentation and resources necessary to cover all topics. These topics will include:
  - Unified Communications best practices
  - Implementation strategies
  - Discussion of downtime and risks

A project time frame (including specific dates) will be created at the end of the Design meeting.

- Develop Detailed Design Document - At the end of this Design meeting, NWN has gathered enough information to create a design document for the installation of the equipment. The design document will include configuration parameters specific to the implementation and any key technical decision made

during design. The design will conform to Cisco and NWN guidelines and recommendations and the completed design document will be submitted for customer approval prior to proceeding with the install.

- Functionality testing procedures – NWN and the customer will prepare a testing document that is the basis for verifying the in scope functionality of this solution. This will be used during the Execute Phase of the project.
- GATE REVIEW: Design Acceptance – NWN will conduct a design review and acceptance session with the customer to review the design details prior to initiating any production implementation or changes. The customer's acceptance of the design is the approval to move forward in the project.

***Deliverables:***

- Design development meetings
- Test and acceptance procedures
- Detailed design documents
- Design acceptance meeting

### 3 - Prepare Phase

Activities in this phase of the project include:

- Licensing Planning and Registration – NWN will review the required licensing and assist the customer with obtaining the necessary licensing and registering it prior to the completion of the migration.
- Pre-production integration – NWN will configure, test and integrate the in scope solution to the point of production impacting cutover or placement into service. NWN will demonstrate to the customer the functionality of the system to the point possible prior to integrating the solution into the customer's production systems.

***Deliverables:***

- Registration and Installation of all licensing
- Pre-production integration demonstrated

### 4 - Execute Phase

Activities in this phase of the project include:

- Application Configuration – NWN will configure Cisco Meeting Server to support the following services
  - Video conferencing services to support the new (26) Communications Manager registered video endpoints
    - Current maximum of (1) licensed concurrent video conference with up to (48) Full HD calls (1080p30) or 96 HD calls (720p30) or 192 SD calls (448p30) or 3,000 audio calls or a combination of video types and/or audio calls within the capacity of the system per server. Additional concurrent conferences are supported by the purchase of additional meeting licenses. Servers can be configured to allow more participants to join

meetings by incrementally changing the quality of existing participants. In larger deployments with groups of servers, conferences can be load balanced across multiple servers first and then set to allow more participants to join by incrementally changing the quality of existing deployments.

- Integration between Cisco Meeting Server and the VBrick Rev platform to provide live streaming / webcasting capabilities.
- Expressway - NWN will deploy Cisco Expressway Collaboration Gateway services to provide registration of the existing remote site endpoints and for Business to Business video calling functionality. During this phase NWN will complete the following tasks:
  - Deploy Expressway-C and Expressway-E Virtual Appliances.
  - Work with the State of Vermont's IT team to complete the network configuration required for the configuration of the Collaboration Gateway services. This includes:
    - Network connectivity
    - Firewall rules
    - DNS entries
    - Certificates
  - Integrate NWNComm/CUCM cluster with the Expressway-C System
  - Test and validate all functionality required
- Video Conference System Implementation - After obtaining all necessary licensing and during an agreed upon maintenance window NWN will complete the implementation of the Cisco Meeting Server platform:
  - Provisioning of (26) Cisco video endpoints in Communications Manager, consisting of the following models:
    - (1) Cisco MX800 video endpoints
    - (25) Cisco DX80 video endpoints

**Note:** The upgrade, implementation and/or configuration of any of the third-party applications currently used in the customer's environment are outside of the scope of this upgrade and as such NWN expect the customer to engage the appropriate vendors in the troubleshooting and reconfiguration of these components in order to guarantee interoperability with the new Cisco Meeting Server.

- GATE REVIEW: Production readiness acceptance – NWN will review the production cutover and implementation with the customer to verify that the solution is functioning in their environment as presented in this scope and the detailed design from the earlier Gate Review.

***Deliverables:***

- Implementation of the Cisco Meeting Server / VBrick Rev services based on parameters referenced in the approved Design Document:
  - Configuration/provisioning of the following Cisco Collaboration Applications:
    - Cisco Meeting Server
    - VBrick Rev
    - Cisco Expressway
- Video collaboration endpoint deployment
- System acceptance testing
- Production implementation of the solution (cutover date or Phased implementation)
- Gate Review- production implementation acceptance by customer

## 5 - Transition Phase

Activities in this phase of the project include:

- Day 2 Support – NWN will remain on site for help address and diagnose any problems that arise due to the migration to the new equipment. NWN will be able to troubleshoot any Cisco Meeting Server system issues and the Customer needs to provide a resource with troubleshooting knowledge for the Customer's software applications and end user devices. Once the new Cisco Meeting Server system is agreed to be stable by NWN and the Customer IT Staff, NWN will start to finalize the documentation for the project.
- Knowledge Transfer – NWN's technical team on the project will conduct a solution orientation session and knowledge transfer with the customer's designated staff. This does not replace manufacturer specific technical training on the specific equipment, but provides a solid overview of how NWN has integrated the solution into the customer's environment. Details of this session are:
  - (8) two hour sessions with up to five (5) customer technical staff members at the customer's site.
    - Meeting Scheduling
    - Meeting Controls

**Technical Hand-Off is NOT intended to replace formalized training.**

- Project closure meeting – NWN will conduct a project review, acceptance and closure meeting to close out the project. This will include a review of the scope for completion, BOM deliverables, final documents and customer acceptance and survey documents.

***Deliverables:***

- Knowledge transfer sessions
- Project closure meeting



## Out of Scope

*Any area not specifically presented in the Scope section of this proposal is considered outside the scope of this project. Changes to the scope as detailed in this proposal require an estimate review and must be approved by mutual agreement. Additional (or lower) charges may apply to incorporate the requested changes. Changes will not become effective until agreed upon in writing by both the Customer and NWN.*

# Assumptions and Requirements

## General Assumptions

1. This Proposal is only valid for 45 days. At the end of the 45-day period, NWN will need to refresh the pricing in this proposal before the Customer decides to execute this contract.
2. NWN is not responsible for configuration changes on any equipment not specifically stated in the above Statement of Work. Customer is responsible for any surrounding infrastructure configuration in order to support services being set up in this scope of work.
3. Project is delivered with a combination of remote and on-site engineering resources. The State of Vermont Department of Public Service will provide remote connectivity to all necessary network segments in order for NWN to carry out work on this project.
4. Customer assumes all responsibility for providing the appropriate power for all installed equipment in this proposal. NWN can provide the plug type and desired power connection for each piece of equipment in the proposal.
5. Customer is responsible for all rack or cabinet hardware (including rack mounting hardware) that is needed to install the new equipment.
6. Customer assumes all responsibility for ensuring enough contiguous rack space for the new equipment to be installed during this project.
7. Customer needs to provide all Fiber Patch Cables between the new network equipment and the fiber patch panels in each network closet. NWN can provide the appropriate connector type for each patch cable if desired by the Customer.
8. Customer needs to provide all Copper Patch Cables between the new network equipment and the copper patch panels in each network closet. NWN assumes RJ45 connectivity for all copper patch cables needed.
9. Customer is responsible for providing all Cable Management (Vertical and Horizontal) in order to correctly route each patch cable from the newly installed network equipment to the appropriate patch panel.
10. Customer is responsible for all environmental concerns in each network closet that NWN will install new equipment.
11. Customer must provide free and clear access to the network equipment racks in each network closet.
12. Customer must provide a work area large enough for receipt of all new equipment for this project.
13. Customer must provide outside phone and Internet access for all NWN staff when onsite.
14. Customer must provide a dedicated point of contact for the entirety of this project. This Contact must be available during major steps in the installation process.
15. Customer and NWN will mutually agree upon downtime prior to any installation and ensure this downtime is scheduled in advance so the Customer can make appropriate preparations at the facility.
16. Customer's responsible for removal of shipping packaging once all the equipment is received at the Customer site.

17. Customer is responsible for shipping replaced gear back to Cisco.
18. Customer must have ACTIVE manufacturer support contracts on any existing equipment that NWN will be upgrading or updating during this work effort.
19. Adjacent equipment, including equipment that is connected to elements being worked on by NWN, has manufacturer support as well as customer-assigned support personnel to address any issues that arise during the work under this engagement.
20. Services will be restored to pre-upgrade/pre-migration status/condition. Resolution of any pre-existing issues is not within the scope of this engagement.
21. Customer will provide existing “as built” information, including diagrams and other documentation including equipment OS configuration.
22. Customer is responsible for all aspects of incident management related to E911/police/fire/EMT including timelines and reporting.
23. No new features will be deployed or configured during the project.

## Collaboration Assumptions

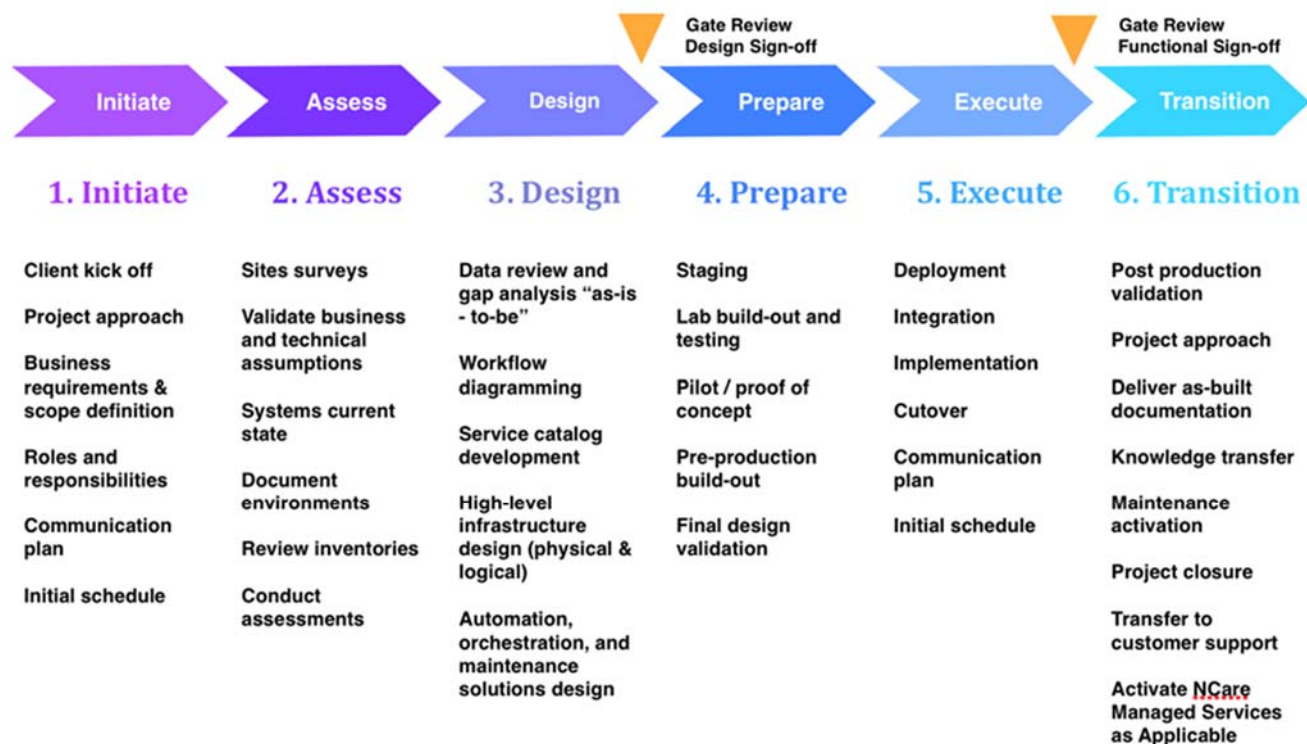
1. Customer is responsible for providing provisioning information needed to complete Cisco Meeting Server and VBrick Rev service.
2. Customer is responsible for all switch, firewall and router configuration work effort to establish proper connectivity in this scope of work.
3. Customer is responsible for integration and support of 3<sup>rd</sup> party applications in this project.
4. NWN is not responsible for any unknown hardware or software that may not be compatible with the Cisco Meeting Server / VBrick Rev platform.
5. Customer is responsible for all hardware, software, licensing, maintenance or other required resources not explicitly listed on the Bill of Materials and subsequent Purchase Order.
6. Customer will ensure LAN Infrastructure is in place and configured to support Cisco video collaboration. In the event NWN is asked to assist the Customer with LAN configurations, a Change Order will be issued for additional services
7. Any software, hardware or licensing not explicitly provided and listed in the Quote required for the project will be supplied by the customer.
8. All user provisioning, synchronization and authentication will be provided by integration with the Customer’s Microsoft Active Directory. It will be extremely important that the information in the Active Directory is current and accurate.
9. NWN will work with the Customer to provide the certificates required for the configuration of Expressway and for the completion of the network configuration required including network connectivity, firewall rules, name resolution (DNS), etc.

## Solution Pricing

<b><i>General Description</i></b>	<b><i>Enablement Fee One time cost</i></b>	<b><i>Monthly Cost</i></b>
<ul style="list-style-type: none"> <li>▪ Implementation of the Cisco Meeting Server / VBrick Rev services based on parameters referenced in the approved Design Document: <ul style="list-style-type: none"> <li>○ Configuration/provisioning of the following Cisco Collaboration Applications: <ul style="list-style-type: none"> <li>▪ Cisco Meeting Server</li> <li>▪ VBrick Rev</li> <li>▪ Cisco Expressway</li> </ul> </li> </ul> </li> <li>▪ Video collaboration endpoint deployment- MX800 (1), DX 80 (25)</li> <li>▪ All related ongoing support through the NCare organization</li> </ul>	\$62,250.00	\$10,103.53
<b><i>60 Month Term</i></b>		

## Attachment 1. Project Delivery Methodology

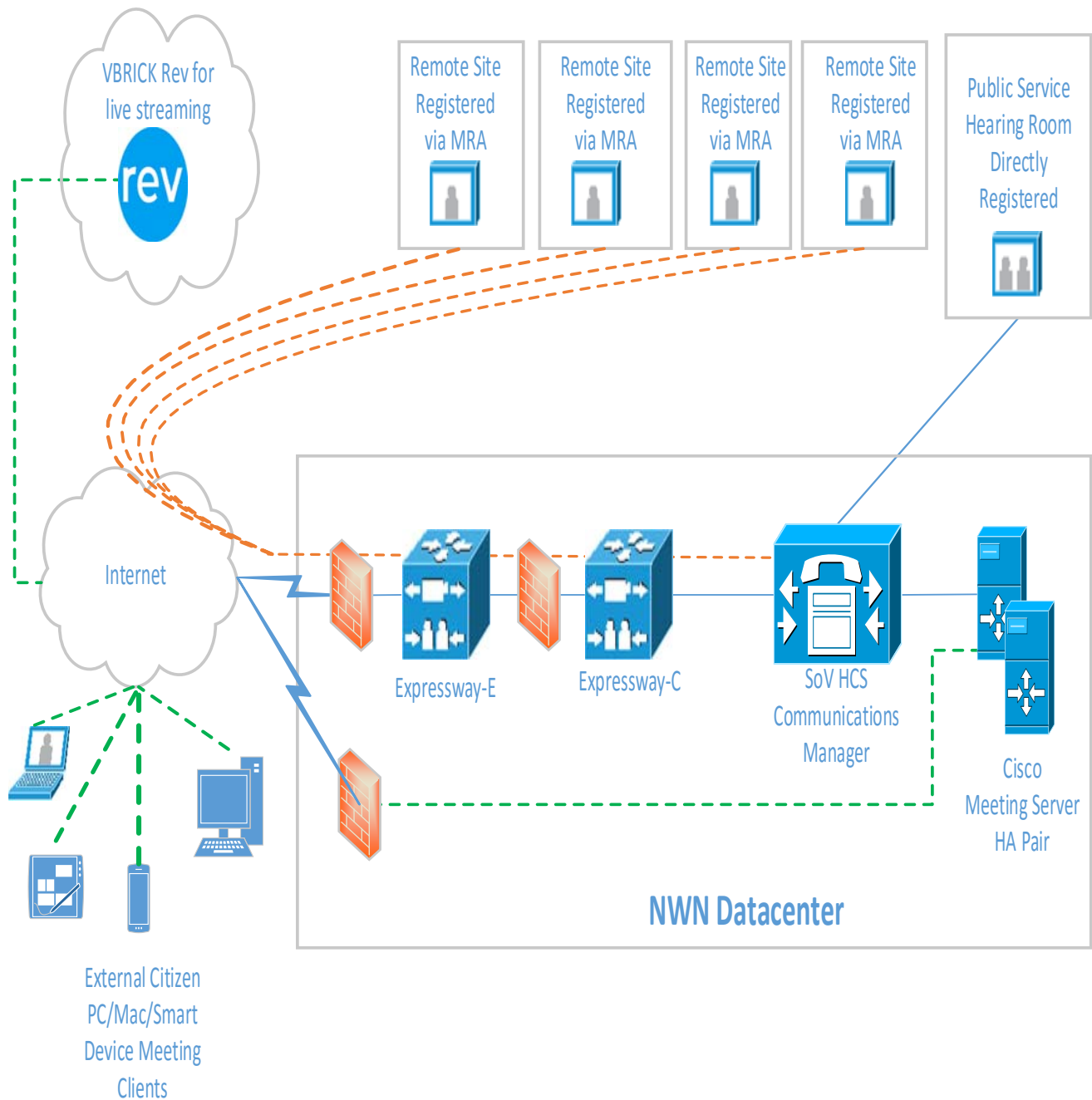
NWN approaches our customer engagements using a unique integrated methodology. Our solutions matrix allows us to provide engagements and delivered technologies. This approach engages the customer at the point of need for the particular project: at points along the solution lifecycle from business requirements analysis and identification, project concept and definition, assessments, designs, development, implementation and integration to on-going support.



### Project Management Methodology

An NWN Project Manager will be assigned to this project and, utilizing the NWN project methodology, is responsible for ensuring the successful delivery of this initiative as defined in this scope. The NWN Project Manager will provide timely communications, status updates, project timelines and tasks, team activity coordination and issues management and escalation to the project sponsor. The NWN Project Manager will use the appropriate tools necessary to complete the project successfully based on the scope of work for the project.

## ATTACHMENT 2. Proposed Video Environment Overview Diagram



RFI Response:  
Public Utility Commission Hearings & Workshops –  
Public Access

Polycom, Inc.  
Jon Davies  
617-895-6800  
Andover, MA  
Jon.davies@polycom.com

Polycom helps organizations unleash the power of human collaboration. More than 400,000 companies and institutions worldwide defy distance with secure video, voice and content solutions from Polycom to increase productivity, speed time to market, provide better customer service, expand education and save lives. Polycom and its global partner ecosystem provide flexible collaboration solutions for any environment that deliver the best user experience, the broadest multi-vendor interoperability and unmatched investment protection.

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Polycom recommends the State of Vermont's Public Service Department leverage its existing Microsoft Skype For Business 0365 platform to host interactive citizen access to hearings and workshops from remote locations across the State. Additionally, the State of VT can continue to use its current VOIP platform which, at this time, is better left as a separate application to reduce confusion and adoption for users and more importantly avoid an expensive, new video platform added to the existing VOIP platform. The State of VT can migrate to either platform at a later date if they believe the consolidation to one platform will increase efficiencies, value and cost savings.

The Skype for Business 0365 platform allows for both internal and external Skype for Business users to click to call video, audio and data sharing in multiparty meetings from smart devices, computers and videoconferencing team appliances in conference rooms, as well as extend conferences to external parties who do not have Skype for Business (via Skype for Business Web App). (Please note, although Polycom is a strategic partner of Microsoft and build collaboration solutions for them, Polycom does not sell the Microsoft Skype for Business 0365 platform. If the State of Vermont has questions or needs more information regarding the 0365 Skype for Business platform and licensing, it is best to contact your Microsoft team directly).

Polycom's response below assumes leveraging your existing Skype For Business 0365 platform. In fact, we are actively assisting your IT team with a proof of concept project of the actual solution outlined in this response.

#### Functional Requirements

The PSD has identified three types of services it would like to consider to meet the high-level goals:

- a) Fixed-site two-way video: Video conferencing network consisting of the PUC hearing room and from 5 to 25 other publicly-accessible locations around the state. The remote locations have not been identified, but could be libraries, state office buildings, schools, etc.

For the PUC hearing room, Polycom recommends its Group 500 videoconferencing solution with Microsoft Skype for Business Native SW license and our automatic speaker location technology Eagle Eye Director II. This solution has cameras and microphones that are capable of covering larger conference rooms with larger groups and offers automated camera positioning so videoconferences



come to life where the far end participants can see up close who is speaking or engaged in a back and forth dialogue.

For the 5-25 smaller huddle rooms at publicly-accessible locations around the state, Polycom recommends our affordable and high performance Trio with Visual Plus Solution for Microsoft Skype for Business. Trio Visual Plus is a state of the art speakerphone with color touch screen, wireless data sharing capability and videoconferencing in one elegant package. It natively integrates to Skype for Business.

- b) Open-network two-way video: Video conferencing network consisting of the PUC hearing room and citizens accessing the network from their homes and/or businesses using software installed on their own devices. The bidder shall specify whether citizens are required to have pre-obtained login credentials to join the meetings.

Polycom recommends a discussion with your Microsoft team to learn about their Skype for Business Web Client that allows external participants to join Skype for Business conferences that only requires that they have a Smart Device or computer with a web cam.

- c) One-way broadcast video: Broadcast video service, consisting of camera(s) and equipment in the PUC hearing room, and accessed by citizens from their homes and/or businesses anonymously using only a web browser or browser extension. Citizens should not need to obtain an account or install special software, and the service should be available on many devices: PCs (Windows/Mac/Linux) and portable devices like smartphones and tablets.

Polycom recommends a discussion with your Microsoft team to learn about their Skype for Business streaming solution that can be part of 0365 Skype for Business.

#### 5.1.3 On-Going Maintenance /Service Level Requirements

The bidder should describe maintenance and service level requirements it can offer. Please see MSRP pricing of the Group 500 solution and Trio Visual Plus with service costs at the bottom of this response.

#### 5.1.4 Technical Requirements

All connections shall be provisioned over the public Internet. The PUC hearing room is served by the State of Vermont IT service, the Agency of Digital Services (ADS). The other fixed locations for network type (a) (not yet identified) will not likely be on the State IT network, but will all have wired public Internet access of at least 25/3 Mbps.

The bidder shall specify the IP data throughput requirements for all sites for each different option proposed.

Polycom solutions for Microsoft Skype for Business require an estimate of one synchronous megabit per device.

## 8 APPENDIX A: COST ESTIMATE WORKSHEET

### 8.1: COST ESTIMATE (MSRP)

For PUC hearing Conference Room:

RealPresence Group 500-720p: Group 500 HD codec, EagleEyeIV-12x camera, mic array, univ. remote, NTSC/PAL. Cables: 2 HDMI 1.8m, 1 CAT 5E LAN 3.6m, 1 HDCI digital 3m, Power: AMER-Type B, NEMA 5-15. Maintenance Contract Required.	\$10,999	7200-64250-001
Onsite installation, RealPresence Group 500-720p: Group 500 HD codec, EagleEyeIV-12x camera	\$1,300	4870-64250-002
Premier, One Year, RealPresence Group 500-720p: Group 500 HD codec, EagleEyeIV-12x camera	\$1,320	4870-64250-112
Ceiling Microphone array-White "Primary". Includes 2ft/60cm drop cable, electronics Interface, wall plate with 10ft/3m and 50ft/15m plenum cable, RJ45(F)/Walta(M). For RealPresence Group, HDX and SoundStructure. See Extension for additional arrays.	\$1,239	2200-23809-002
Ceiling Microphone Array - White "Extension" Kit: Includes 2ft/60cm drop cable, electronics interface, 25ft/7.6m plenum cable. For use with Ceiling Microphone Array 2200-23809-002. Platform dictates maximum # supported.	\$1,239	2200-23810-002
Group Series Microsoft Interop License. Enables Skype for Business, Lync 2013, and AV MCU interop on qualified RP Group series software. Valid for all RP Group Series products.	\$999	5150-65083-001
EagleEye Director II with 1-EagleEye IV-12x camera, power supply & NA power cord. Requires HDCI input on codec, RP Group series systems with software v6.1 or later and 1 additional EagleEye IV-12x camera. Maintenance Contract Required	\$11,999	7230-69421-001
Premier, One Year, RealPresence Touch with silver trim	\$205	4870-84910-112
Premier, One Year, EagleEye Director II.	\$1,200	4870-69424-112
Polycom RealPresence Touch with silver trim for use with Group Series models. Requires PoE network connection or optional external power supply (2200-42740-XXX). One year Premier Maintenance Included in CALA.	\$1,749	8200-84190-001

For smaller huddle rooms:

Skype for Business/O365/Lync Edition RP Trio 8800 Collab. Kit, Polycom UCS SfB Lic., 802.3af/at PoE. Incl. Trio 8800, Trio Visual+, Logitech C930e, network cables, USB and HDMI cable (1.8m), VESA mount and 1 yr (China: 3yrs) Partner Premier. NO PWR KIT	\$2,259	7200-23450-019
Premier, One Year, RealPresence Trio 8800 Collaboration Kit	\$60	4870-23450-112

## ***8.2 ADDITIONAL MATERIALS***

Please provide any other materials, suggestions, cost, and discussion you deem appropriate.

<b>Price Quotation</b>	
<b>Quote Number:</b>	PLCM-471158
<b>Opportunity Name:</b>	State of VT - Public Utility Commission RFI
<b>Date:</b>	9/6/2017
<b>Currency:</b>	USD
<b>Price Book:</b>	NA



Quoted for:  
**State of Vermont**  
**Public Utility Commission Hearings & Workshops - Public Access**  
**RFI**

Polycom, Inc.  
 6001 America Center Drive  
 P.O. Box 641390  
 San Jose, CA 95002

Prepared By:  
 Jon Davies  
 Sales Manager  
[jon.davies@polycom.com](mailto:jon.davies@polycom.com)

Quantity	Part Number	Description	MSRP	Category
<b>For PUC Hearing Conference Room:</b>				
1	7200-64250-001	RealPresence Group 500-720p: Group 500 HD codec, EagleEyeIV-12x camera, mic array, univ. remote, NTSC/PAL. Cables: 2 HDMI 1.8m, 1 CAT 5E LAN 3.6m, 1 HDCl digital 3m, Power: AMER-Type B, NEMA 5-15. Maintenance Contract Required.	\$10,999.00	Hardware
1	4870-64250-002	Onsite installation, RealPresence Group 500-720p: Group 500 HD codec, EagleEyeIV-12x camera	\$1,300.00	Service
1	4870-64250-112	Premier, One Year, RealPresence Group 500-720p: Group 500 HD codec, EagleEyeIV-12x camera	\$1,320.00	Service
1	2200-23809-002	Ceiling Microphone array-White "Primary". Includes 2ft/60cm drop cable, electronics Interface, wall plate with 10ft/3m and 50ft/15m plenum cable, RJ45(F)/Walta(M). For RealPresence Group, HDX and SoundStructure. See Extension for additional arrays.	\$1,239.00	Hardware
1	2200-23810-002	Ceiling Microphone Array - White "Extension" Kit: Includes 2ft/60cm drop cable, electronics interface, 25ft/7.6m plenum cable. For use with Ceiling Microphone Array 2200-23809-002. Platform dictates maximum # supported.	\$1,239.00	Hardware
1	5150-65083-001	Group Series Microsoft Interop License. Enables Skype for Business, Lync 2013, and AV MCU interop on qualified RP Group series software. Valid for all RP Group Series products.	\$999.00	Software

		EagleEye Director II with 1-EagleEye IV-12x camera,pwr supply,NA pwr cord,Interworking with RP Group series systems requires: HDCI input on codec,RP Group series systems sw v6.1 or later.Work as a USB camera system need SW 1.1 or later.Mnt Cnt Req'd.		
1	7230-69421-001	Premier, One Year, EagleEye Director II. Polycom RealPresence Touch with silver trim for use with Group Series models. Requires PoE network connection or optional external power supply (2200-42740-XXX). One year Premier Maintenance Included in CALA. Premier, One Year, RealPresence Touch with silver trim	\$11,999.00	Hardware
1	4870-69424-112		\$1,200.00	Service
1	8200-84190-001		\$1,749.00	Hardware
1	4870-84910-112		\$205.00	Service
		<b>Total:</b>	<b>\$32,249.00</b>	
<b>For Smaller Huddle Rooms:</b>				
		Skype for Business/O365/Lync Edition RP Trio 8800 Collab. Kit, Polycom UCS StB Lic., 802.3a/at PoE. Incl. Trio 8800, Trio Visual+, Logitech C930e, network cables, USB and HDMI cable (1.8m), VESA mount and 1 yr (China: 3yrs) Partner Premier. NO PWR KIT		
1	7200-23450-019	Premier, One Year, RealPresence Trio 8800 Collaboration Kit	\$2,259.00	Hardware
1	4870-23450-112		\$60.00	Service
			<b>Total:</b>	<b>\$2,319.00</b>

This quote was created using the Polycom Quotes On Demand system

To our knowledge, the information contained in this Price Quotation is accurate as of the creation date and will expire thirty (30) days after the creation date or as governed by the partner contract whichever is longer. We, however, reserve the right to correct any typographical product or discount errors, at any time, without liability of any kind. This Price Quotation and any contractual relationship related to the purchase of the products set forth herein is subject to the then-current terms and conditions between the parties and any inconsistent or additional terms in a purchase order shall have no force and effect. Please note that all purchase orders are subject to acceptance by us and shall be of no effect absent such acceptance.

Polycom Authorized Partner is responsible for obtaining appropriate regulatory certification prior to shipment of products into any country for which Polycom has not obtained such certification. For up-to-date information on which countries Polycom has obtained certification, please refer to the Polycom Access Center on the PolycomConnect for Partners website. From PolycomConnect's home page, navigate to the "Order Center" tab, choose "Product and Price Info" then select "Search and Browse" to lookup a product ID. For further information on product homologation and certification please contact [ypeapproval@polycom.com](mailto:ypeapproval@polycom.com).

This quote may represent an Unused Care adjustment based on the date of the quote. This adjustment may be reduced if customer delays the implementation beyond the dates utilized for the adjustment.

THE PRICES INCLUDED IN THIS QUOTATION ARE EXCLUSIVE OF ANY VAT, GST, SALES & USE TAXES, OTHER TRANSACTION TAXES, FEES AND DUTIES. FOR THIS REASON THE FINAL INVOICE MAY DIFFER SIGNIFICANTLY IF THE ABOVE ITEMS ARE REQUIRED TO BE INCLUDED.

## DATA SHEET

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# Polycom® EagleEye™ Director II

Get ready for your close-up with the only smart camera that makes every video conference a true face-to-face experience

Meeting across sites is as natural as being in the same room now that presenters are seen up close without fumbling with technology. Polycom® EagleEye™ Director II camera automatically zooms in on an active speaker without the use of a remote control or camera presets. EagleEye Director II takes video conferencing to the next level so meeting participants no longer have to worry whether they're in camera view or stop the conversation to grab the remote control. Now, 100% of your time in meetings is focusing on the bigger issue—solving critical business problems.

### Automatic people-tracking

By zooming in and framing active speakers, everyone will be able to clearly see vital facial expressions and any subtle body language which allows for deeper engagement and more effective meetings. Utilizing the latest in speaker tracking and facial recognition technologies, EagleEye Director II continually scans the room and commands the cameras to appropriately frame everyone in the room. When someone in the room starts to speak, the system seamlessly transitions to an up-close view of that speaker, similar to a TV-production experience.

### Intimate and inclusive experience

Maintaining engagement with everyone in the room, not just the active speaker, is critical for every meeting. EagleEye Director II does this seamlessly, keeping everyone connected by highlighting the active speaker up close at the same time as providing a smaller view of the whole group in one video stream.

### Smart data analytics

The power of EagleEye Director II extends beyond the conference room by providing powerful data analytics to measure the return on investment of video collaboration, when used in conjunction with Polycom® RealPresence® Group Series and Polycom® RealPresence Clariti™\*. Data reports include the number of participants at the beginning, middle, and end of each meeting, which can be used to ensure each video room investment is utilized to its fullest potential. Additionally, IT professionals can monitor room usage to ensure that automated conferences are being attended and not running in empty rooms.



### Benefits

- More engaging and less stressful meeting experience with automatic camera technology that zooms in on an active speaker without anyone using a remote control
- See nonverbal cues up close & maintain context of the room with single stream video of both the active speaker and everyone in the room
- Measure return on investment with powerful data analytics for IT administrators\*
- Extend into larger rooms up to 10 m such as boardrooms, classrooms and assembly meeting spaces
- Easy to upgrade existing video systems for immersive-like meeting experience



Front view



Rear view



Side view

## Product specifications

### Package includes:

- EagleEye Director II base, power supply and necessary cables
- EagleEye Director II base, power supply, necessary cables and one EagleEye IV camera
- EagleEye Director II base, power supply, necessary cables and two EagleEye IV cameras

### Compatible cameras

- 2x EagleEye™ IV 12X camera

### Compatible Polycom video systems

- Polycom RealPresence Group 300, 310, 500, 550 and 700\*\*

### Compatible Skype for Business video systems

- Polycom MSR and other certified Skype Room System v2 docks
- Microsoft Surface Hub (55" and 84")
- Skype for Business 2015 and Lync 2013 client running on Microsoft Windows 7, 8, 8.1 or 10

## Recommended room size

- Participants should be within 33 feet (10 m) of EagleEye Director II
- Performance may vary in different room configurations

### Modes

- Frame speaker
- Frame group

### Connections

- 1 x mini-HDCI out to video system
- 2 x USB 2.0
- 1 x 3.5 mm stereo line-in
- 1 x HDMI in
- 1 x HDMI out

## Environmental Specifications:

- Operating temperature: 0° — 40° C ambient
- Operating humidity: 10—90%
- Storage temperature: -40° — 70° C.
- Non-operating humidity : 5% — 95%, non-condensing
- Altitude: 5,000 meters operational, 10,668 meters non-operational (transportable)
- Will operate in florescent lighting environments worldwide

## Physical characteristics

- Base box with vertical array 11.14" x 21.57" x 5.5" (H x W x D)
- 283 mm x 548 mm x 140.5 mm (H x W x D)
- Weight: 4.7kg with two EagleEye IV cameras

## Electrical

- Auto sensing power supply
- Typical operating voltage/power - 100-240VAC, 50/60Hz Output 12V@5A

## For more information

Please visit your local Executive Experience Center to see a demo.  
[Schedule your free demo.](#)

\* Data analytics require Polycom RealPresence Group Series and RealPresence Resource Manager 10.1 or higher

\*\*RealPresence Group Series 6.1 or higher

## About Polycom

Polycom helps organizations unleash the power of human collaboration. More than 400,000 companies and institutions worldwide defy distance with video, voice and content solutions from Polycom. Polycom and its global partner ecosystem provide flexible collaboration solutions for any environment that deliver the best user experience and unmatched investment protection.

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[www.polycom.co.uk](http://www.polycom.co.uk)





## DATA SHEET

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# Polycom® RealPresence Trio™ 8800

## The conference phone reimagined for Skype for Business and Microsoft Office 365 Cloud PBX

Polycom® RealPresence Trio™ is the conference phone reimagined. Marrying our legendary voice quality with the additional capabilities of personal content sharing and business-class videoconferencing, RealPresence Trio can be flexibly deployed anywhere, from huddle rooms to boardrooms.

### Legendary voice quality

Polycom RealPresence Trio is a revolutionary conference phone offering the industry's most advanced sound quality.

With a 20-foot pickup range and advanced audio technology such as enhanced Polycom® HD Voice™ and the patented Polycom® NoiseBlock™, conversation flows naturally and you hear every word clearly.

RealPresence Trio is sleek and sophisticated. A 5-inch color touch screen and intuitive navigation make it simpler than ever—resulting in fewer mistakes, quick starts for every meeting and minimal training requirements.

RealPresence Trio can also be used as a speakerphone and provides wired and wireless pairing with your personal devices using Bluetooth or USB. It even includes convenient, illuminated mute buttons on each leg so everyone in the room can manage the meeting. RealPresence Trio is the ideal solution for any meeting space that needs the best audio experience.

### Easily add content sharing and video conferencing\*

The way people work is changing. With the growing trend of open workspaces and the rising costs of real estate, fewer individual offices exist. To give people a private place to work, a growing number of small conference rooms or huddle rooms has emerged, but they are not often outfitted with the business tools needed to drive the productivity you want.

RealPresence Trio award-winning design, the first of its kind, allows you to easily add the RealPresence Trio™ Visual+ accessory and a USB compression camera to enjoy content sharing and real-time video for complete visual collaboration. The flexibility and performance of RealPresence Trio make it the perfect choice for team collaboration environments and it is priced right for mass deployment.

\*Requires RealPresence Trio Visual+ accessory



### Benefits

- World's clearest and richest audio experience in a conference phone
- Easily share content and business-grade video conferencing\*
- Faster adoption and user preference with wired or wireless pairing of your portable devices (BYOD)
- Simple touch interface minimizes mistakes and speeds connection with "one touch join"
- Conveniently manage and provision using Polycom® RealPresence® Resource Manager
- Affordably priced for mass adoption across every meeting space

## Deployment and Manageability

RealPresence Trio is the first, and only, conference phone certified for Microsoft Skype for Business and Microsoft Office 365 Cloud PBX powered by Skype for Business online.

Deploying, provisioning and managing RealPresence Trio is effortless. The extensive capabilities of RealPresence Resource Manager enable administrators to quickly customize settings and tailor the user interface to meet specific deployment needs.

### Product specifications

#### User interface features

- Gesture-based, multitouch-capable capacitive touch screen
- 5-inch color LCD (720 x 1280 pixel), 9:16 aspect ratio
- On-screen virtual keyboard
- 1 USB 2.0 Type A-compliant port USB battery charging BC1.2 compliant (requires full Class 4 power input on LAN IN for operation)
- Integrated Bluetooth 4.0 and NFC
- 3 multicolored capacitive-touch mute indicators
- Unicode UTF-8-character support
- User interface localized in Arabic, Chinese, Danish, Dutch, English (Canada/US/UK), French, German, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Russian, Slovenian, Spanish and Swedish

#### Audio Features

- 3 cardioid microphones
- Loudspeaker
  - Frequency: 100-22,000 Hz
  - Volume: 92 dB at 0.5m peak volume
- 6m/20-foot microphone pickup range
- Supported codecs:
  - G.711 (A-law and  $\mu$ -law)
- Polycom® Siren™ 7 (16kbps)
- Polycom® Acoustic Clarity™ technology provides full-duplex conversations, acoustic echo cancellation and background noise suppression - Type 1 compliant (IEEE 1329 full duplex)
- Polycom® NoiseBlock™
- Voice activity detection
- Comfort noise generation
- DTMF tone generation (RFC 2833 and in-band)
- Low-delay audio packet transmission
- Adaptive jitter buffers
- Packet loss concealment
- Bluetooth device pairing for wideband speech and multimedia streaming (HFP/AD2P)
- Call handling features

- 1 line (registration)
- Shared call/bridged line appearance
- Distinctive incoming call treatment/call waiting
- Call timer and call waiting
- Call transfer, hold, divert (forward), pickup
- Called, calling, connected-party information
- One-touch speed dial
- Do-not-disturb function
- Local configurable digit map/dial plan
- Corporate directory access using LDAP
- Visual conference management

#### Network and provisioning

- Open SIP and Skype for Business/Microsoft Office 365/Lync 2013
- SDP
- IETF SIP (RFC 3261 and companion RFCs)
- Two-port gigabit Ethernet switch
  - 10/100/1000Base-TX across LAN and 2nd port
  - 2nd port supports IEEE 802.3af PSE
- Wi-Fi network connectivity
  - 2.4 - 2.4835 GHz (802.11b, 802.11g)
  - 5.15 - 5.825 GHz (802.11a may vary by country)
  - 2.4 and 5 GHz (802.11n)
- Manual or dynamic host configuration protocol (DHCP) network setup
- Time and date synchronization using SNTP
- FTP/TFTP/HTTP/HTTPS server-based central provisioning
- RealPresence Resource Manager (v. 10.1 or above)
- Polycom Zero Touch Provisioning
- Provisioning and call server redundancy supported
- QoS Support
  - IEEE 802.1p/Q tagging (VLAN), layer 3 TOS, and DSCP
  - WMM (Wi-Fi multimedia)
- VLAN – CDP, DHCP VLAN discovery
- LLDP-MED for VLAN discovery

#### Security

- 802.1X authentication and EAPOL
- Media encryption via SRTP

- Transport layer security (TLS)
- Encrypted configuration files
- Digest authentication
- Password login
- Support for URL syntax with password for boot server address
- HTTPS secure provisioning
- Support for signed software executables
- Wi-Fi encryption: WEP, WPA-Personal, WPA2-Personal, WPA2-Enterprise with 802.1X (EAP-TLS, PEAP-MSCHAPv2)

#### Power

- LAN IN: Built-in auto-sensing IEEE 802.3at. PoE Device (Class 4) (requires full Class 4 power input on LAN IN for operation). Backward compatibility with IEEE 802.3af.
- LAN OUT: Built-in auto-sensing IEEE 802.3af power sourcing equipment (requires full Class 4 power input on LAN IN for operation)

#### Approvals

- Japan MIC/VCCI Class B
- FCC Part 15 (CFR 47) Class B
- ICES-003 Class B
- EN55022 Class B
- CISPR22 Class B
- VCCI Class B
- EN55024
- EN61000-3-2; EN61000-3-3
- NZ Telepermit
- Australia A&C Tick
- ROHS compliant
- 19471-0715

#### Radio

- US
  - FCC Part 15.247
  - FCC Part 15.407
  - FCC Part 15.225
- Canada
  - RSS 247 Issue 1
- EU
  - ETSI EN 300 328 v1.9.1
  - ETSI EN 301 893 v1.7.1
  - ETSI EN 300 330

- ETSI EN 301 489-3
- ETSI EN 301 489-17
- Japan
  - Japan Item (19)
  - Japan Item (19)-3
  - Japan Item (19)-3-2

- Australia
  - AS/NZ4268

#### Safety

- UL 60950-1
- CE Mark
- CAN/CSA-C22.2 No. 60950-1-03
- EN 60950-1
- IEC 60950-1
- AS/NZS 60950-1

#### Environmental conditions

- Operating temperature:  
0 to 40°C (+32 to 104°F)
- Relative humidity: 5% to 95%  
(non-condensing)
- Storage temperature:  
-20 to +70°C (-4 to +160°F)

#### RealPresence Trio 8800 ships with:

- Phone console
- 7.6m/25-foot network cable CAT 5e
- 2m/6.5-foot USB 2.0 cable
- Cable wrap
- Tactile overlay for improved accessibility
- Setup sheet

#### Accessories (optional)

- RealPresence Trio Expansion Microphones (2200-65790-001)
- Power kit incl. ext. single-port gigabit midspan, 802.3at Type 2 compliant, local power cord and network cable (7200-23490-xxx)
- RealPresence Trio Visual+ for enabling content presentation and video (2200-13339-xxx)

#### Warranty

- 1 year

#### Country of origin

- Thailand

#### Phone dimensions (L x W x H)

- 38.3 x 7.5 x 33.2 cm (15.1 x 2.9 x 13.1 in)
- Unit weight: 0.95Kg (2.1 lbs)

#### Box dimensions (L x W x H)

- 48.3 x 11.5 x 39.4 cm (19 x 4.5 x 15.5 in)
- Box weight: 1.97 Kg (4.35 lbs)

#### Part numbers

- 2200-66070-018 Trio 8800, PoE
- 2200-66070-018 Trio 8800, PoE Skype for Business/Microsoft Office 365 Cloud PBX

## About Polycom

Polycom helps organizations unleash the power of human collaboration. More than 400,000 companies and institutions worldwide defy distance with video, voice and content solutions from Polycom. Polycom and its global partner ecosystem provide flexible collaboration solutions for any environment that deliver the best user experience and unmatched investment protection.

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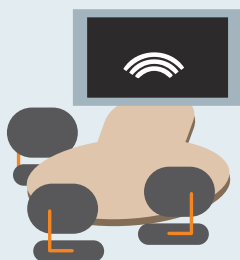
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## How to make **huddle room** meetings more productive

Huddle rooms, or small meeting spaces, are common workspaces for collaboration. But the way people work has evolved, and many huddle rooms are audio-visually challenged. See how you can turn your huddle room into a collaboration hub of productivity.



**50 MILLION**  
Estimated huddle rooms  
around the world <sup>(1)</sup>

**400%**

Increase in group video  
conferencing usage by 2019 <sup>(2)</sup>

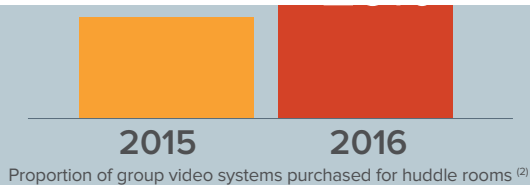
Growing trend in video enabling huddle rooms

10%

20%



**33%**



of employees work remotely and need to collaborate effectively across distances <sup>(3)</sup>

## DOES YOUR HUDDLE ROOM LOOK LIKE THIS?

Typical huddle room meeting experience today.  
What's wrong with this picture?

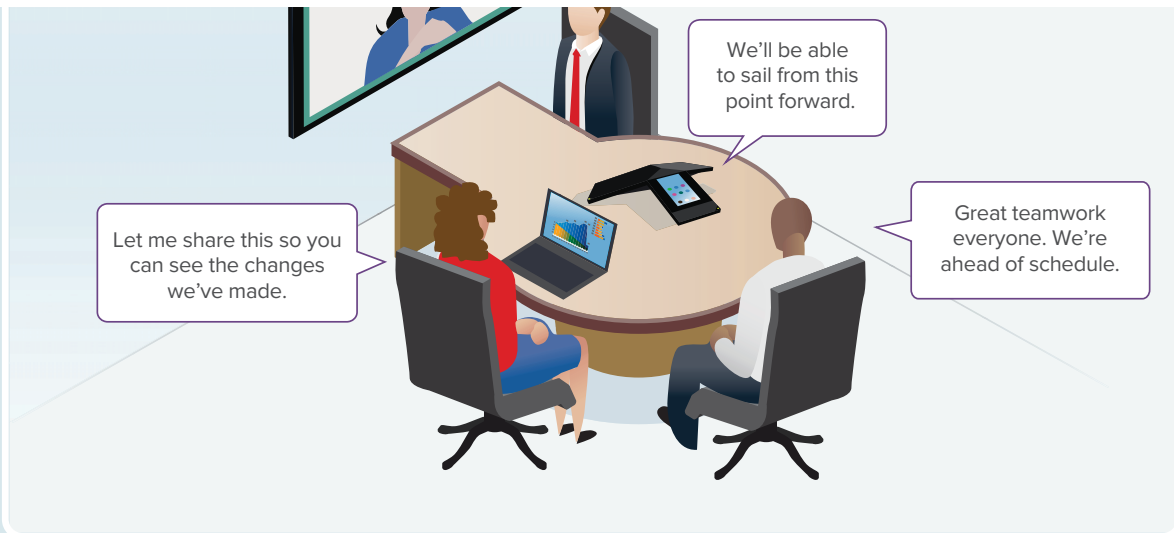


## POLYCOM-ENABLED HUDDLE ROOM

As organizations adapt to support the new ways people work, huddle rooms need to change to improve collaboration with internal and external meeting participants.

I can see you're pleased with the results.





## POLYCOM HUDDLE ROOM PORTFOLIO

### Polycom® RealPresence Trio™



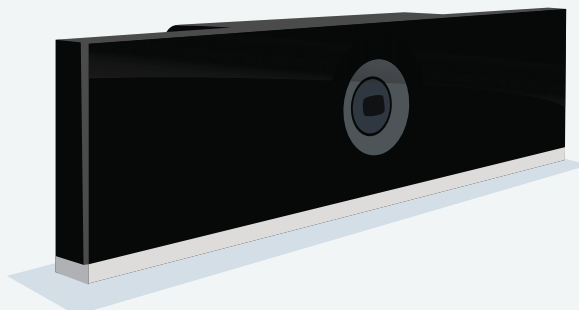
If premium **audio** is important to you, RealPresence Trio offers:

- Exceptional audio conferencing solution
- Expandable to enable rich content sharing and high definition video
- Flexible, powerful, and cost-effective

### Polycom® RealPresence Debut™

If simplest **set up** is important to you, RealPresence Debut offers:

- Easy, clutter-free video solution
- Set up in less than 90 seconds
- Minimal IT support needed



## Polycom® RealPresence® Group Convene™



If best overall **performance** is important to you, RealPresence Group Convene offers:

- Everything you need in a compact package, including the monitor
- Powerful video and content collaboration
- Flexible, intuitive user interface options

All Polycom huddle room solutions offer advanced audio technology including HD Voice™, our patented NoiseBlock™ or Acoustic Fence™ for distraction free meetings, a broad range of platform compatibility and BYOD support.

To learn more about which Polycom Huddle Room solution is right for you, explore our workspaces tool.

**[www.polycom.com/go/huddle](http://www.polycom.com/go/huddle)**

### SOURCES

1. Wainhouse Research, "Understanding the Huddle Room Opportunity," December 2014
2. Gartner, "The Rise of the Video-enabled Huddle Room in the Digital Workplace," December 2015
3. Frost and Sullivan, "Huddle Spaces: Bridging the Gap Between Desktops and Large Conference Rooms," 2014