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WAINHOUSE
Research

A Next-Gen Approach to Group Video

Leveraging BYO Devices in New Collaboration Spaces

Challenges of Traditional Video Conferencing

The way meetings are conducted in the typical organization has changed significantly in recent years.

Back in the day, a business meeting was usually a formal, structured event. In most cases, the meeting was scheduled well in advance, included a carefully thought out list of invitees, and followed a pre-defined and documented agenda.

In almost all cases, the meeting was conducted in a traditional meeting room with traditional meeting room furniture (table, chairs, and a large screen display the front of the room).

Most of the time, each meeting also had a pre-defined host or leader – either the highest profile person in the room (e.g. the CEO or VP), the person delivering the formal presentation (e.g. the quarterly financials, details of pending merger, etc.), or the person chairing the session and ensuring that the rules of order were followed.

During every meeting, the host or lead would always sit at the head of the meeting room table. And whenever content was being presented, that content was shown at the front of the room and directly across from the meeting host.

Over time, organizations became more global. As a result, the ability to include remote participants (colleagues, partners, clients, prospects, etc.) in these meetings became very important. Video conferencing was ideally suited to address this need as it allowed remote participants to (1) hear the meeting, (2) see the meeting, and (3) be seen and heard by others.

As video conferencing was added to the meeting room, the obvious place to position the camera was at the front of the room because it …

- Ensured that the meeting host was captured perfectly on camera

- Delivered strong eye contact to remote participants due to the fact that when people looked at the shared display / projected image (either to see shared content or view remote participants), they were also looking directly at the camera

But that was then and this is now. Today, meetings are more collaborative … more egalitarian in nature. So instead of having a single meeting host or lead who is the center of attention for most of the session, meetings often have multiple contributors.

Unfortunately, capturing multiple participants in different parts of the room during the meeting using a single, front-of-the-room camera is no easy task – especially in informal or open work spaces.

Today's work environment is less structured than in the past. And meetings / teaming sessions happen not just from inside meeting rooms, but on-the-fly from non-video-ready places like the cafeteria, the lounge, someone's office, or even on the lawn. Traditional video conferencing methods do not work well in these unequipped, non-traditional work spaces.

This study, sponsored by Huddle Room Technology (HRT), provides insight into new ways of conducting video meetings – both inside and outside the meeting room.

Limitations of Traditional Meeting Room Video Conferencing

Front Wall Cameras

The majority of group video conferencing today is conducted in meeting rooms. And most video-enabled enterprise meeting rooms use a single camera installed at the front of the room either below, above, or between the shared display(s). In such spaces, two types of cameras are commonly used:

Pan / Tilt / Zoom (PTZ) Cameras
These motorized cameras can be adjusted to capture different parts of the room with either a close-up or wide-angle view. While not inexpensive, the flexibility offered by motorized PTZ cameras has made them the de facto standard in most video conferencing rooms. However, there are some significant drawbacks associated with PTZ cameras.

First of all, it is often necessary to zoom the camera all the way out to capture everyone in the room. As a result, people look very small on screen.

And while these cameras are designed to be moved left/right/up/down to capture tight shots of specific people, this requires a person to actively control the camera (using an IR remote) or the installation of an automatic camera tracking system. The former can be distracting, and the latter adds cost.

In addition, when these cameras are zoomed in to capture specific people, others in the room are off camera – a concept we call tele-absence (instead of tele-presence).

Fixed Cameras
Some meeting rooms, especially smaller spaces and those with tight budgets, use fixed cameras (e.g. webcams or panoramic cameras) instead of PTZ cameras. This offers one key benefit – reduced cost.

Some fixed cameras offer digital pan / tilt / zoom. However, again this means someone must control the camera. And digital zoom may reduce image quality (depends on resolution, zoom level, etc.).

And some fixed cameras also sport the ability to detect people within the image and automatically digitally "zoom-in" on active speakers. In this situation, these cameras are acting like PTZ cameras, and bring the pros and cons of that approach to the table.

But most of the time, these cameras are what we call, "set it and forget it" cameras that capture a fixed view of the room. The result is a camera image that often includes unpopulated areas of the room. In other cases, depending on the camera and design of the space, some participants are off camera.

Summary / Implications

The takeaway is that front wall cameras require the meeting participants to be seated within the field of view / capture area of the camera. This impacts many things including:

- The room design by forcing designers to use a somewhat traditional room layout

- Where people can sit in the room as they must be within the camera's field of view

- How people in the room act during the meeting as they must face the front wall instead of each other in order to provide the remote participants with a good experience

Center of Table / Room Camera Systems

Over the years, Wainhouse Research (WR) has seen, tested, and used a number of center-of-table or center-of-room camera solutions. These solutions typically digitally "stitch" together the video images from multiple image sensors or cameras to provide a 360-degree view of the meeting space.

Center of Table Solutions

Center of table solutions involve the placement of a multi-camera / multi-sensor device in the middle of the table in a standard meeting room.

On the positive side, these solutions can usually capture everyone seated at the table on camera (assuming people are not blocked by other people or devices such as a user's notebook). And this experience gives remote participants the feeling that they are in the middle (literally – in the middle) of the meeting because they can see everyone at the table.

However, the captured images often include parts of the room that are not important like empty areas of the table. And in most cases, the wide captured image makes each participant seem small. [1]

Also this approach can cause eye contact problems because when people are looking at the front screen to see content or remote participants, it typically means they are looking away from the camera device at the center of the table.

Furthermore, this methodology serves to "flatten" the room to the remote participants. Two people sitting right next to each other in person might be at opposite sides of the captured image. As a result, it is difficult to tell which way local people are looking, or if they are looking at others in the room. For some, this loss of spatial context can be disorienting.

Center of Room Solutions
Center of room solutions involve the placement of a multi-camera / multi-sensor system, typically with multiple flat-screen displays, at the center of the room. Such solutions offer a highly interactive experience, and typically provide strong eye contact.

However, center of room solutions usually require an atypical meeting room design without a meeting room table. In addition, the need for multiple cameras and displays make these solutions more expensive than standard room systems (in most cases).

As a result of these items, such solutions tend to be deployed in relatively low quantities to address specific use cases and applications.

Summary / Implications
Center of table and center of room solutions provide very different experiences than front-wall camera solutions. While highly differentiated, these solutions also involve sacrifices in terms of experience, cost, and/or room design flexibility.

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[1] Some solutions have the ability to extract close-up views of individual people from the stitched image. However, solutions that automatically identify and extract people tend to be expensive. Alternatively, manual solutions usually require people to sit in very specific locations and also capture empty seats.

A Direct BYOD Approach

One way to ensure that each meeting participant is always on-camera is to have each person use his personal "BYO" device (notebook, tablet, smartphone) to connect to the meeting separately.

One important benefit of this approach is that it allows group video meetings to happen anywhere – not just in a video-enabled meeting room. Shared displays and shared cameras are no longer necessary.
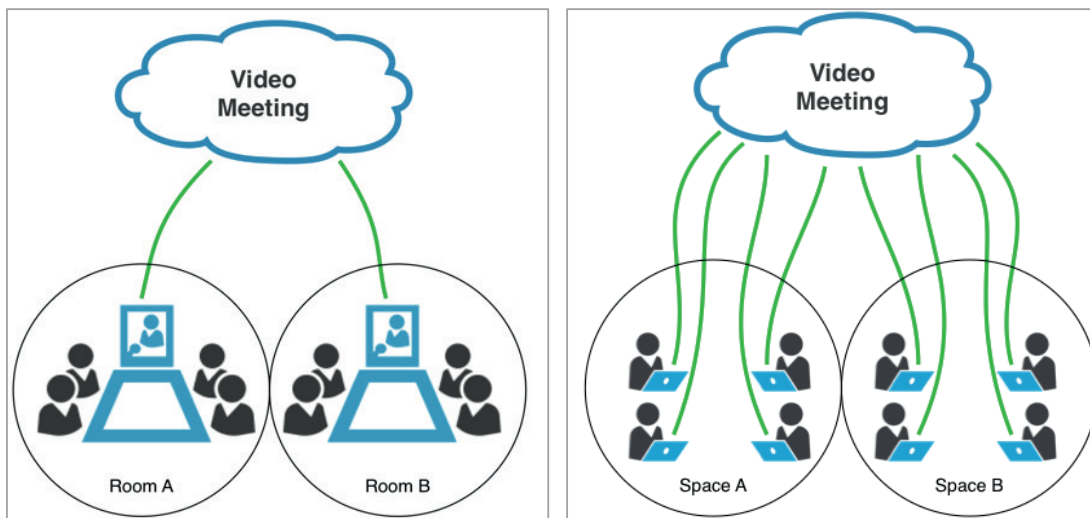

Figure 1: Traditional (L) vs. the BYOD Approach (R) to Group Video Conferencing

The graphic above on the left shows a traditional video meeting involving eight participants within two video-enabled meeting rooms. The graphic on the right shows those same participants with each participant connected directly, using his BYO device, to the video meeting.

Theoretically, this approach solves many of the previously described issues.

Camera Field of View - Each person would use the embedded camera on his personal device, and thus would be on camera at all times. And the close proximity of the user to his device means that the outgoing image would be up close and personal, without much wasted space.

Eye Contact - Since each user's device includes both the camera and display showing the remote participants and/or shared content, this approach would provide relatively strong eye contact.

Audio In / Out – This approach means that each participant will use the mics and speakers on his personal device. This avoids the issue of having to share mics between users. And it allows users to sit close to the microphone (or use a headset), which improves outgoing audio quality.

Incoming Video and Shared Content – Each participant will view the remote participants and any shared content on his personal device. In some cases (e.g. a user with his notebook in a large room or a room with small shared displays), this will provide the participant with a better (larger, more detailed) view of the remote participants and shared content.

Space Flexibility – This approach eliminates the need for a shared display and a front-of-room camera. As a result, each participant can sit wherever he wants, and meetings can be conducted almost anywhere (assuming network is available).

Limitations of the Direct BYOD Approach

Unfortunately, the above approach doesn't work in the real world.

Bandwidth Required - This methodology will significantly increase the amount of bandwidth required for the video meeting. In the example below, assuming all connections are at the same speed, the above approach will use 4x more bandwidth. Furthermore, in most cases the individual users would connect over Wi-Fi, and Wi-Fi capacity is usually at a premium in the enterprise.

Audio Issues - First of all, having multiple active microphones and speakers that aren't ganged-together in the same room or proximity will cause numerous audio problems including echo and feedback.

In theory, some of the audio issues (echo, feedback) could be resolved by muting the mics and speakers of all but one person in the same location. But this would lose the ability to detect the active speaker. Alternatively, each participant could use headphones, but this would impact user comfort and probably not eliminate all audio echo and feedback.

Lost Location Information – With this approach, the video platform (on-premises or cloud) has no idea who is local and who is remote. Thus each user would receive the incoming video and audio from all users – including those in the same room. This is inefficient and disconcerting as the local user would see and hear some the other local folks live and then delayed slightly within the incoming video stream.

The takeaway here is the "direct" BYOD approach is not viable, which is why it is rarely (if ever) used in the real world.

Solution Spotlight

The sponsor of this study, Huddle Room Technology (HRT), offers an innovative and unique solution that enables a new meeting paradigm.

Essentially, the HRT Huddle Hub One (the "Hub") device (see image at right) allows participants to use their personal devices (a la the Direct BYO approach above) without facing the issues described above.


With this approach …

- Each participant (up to 6) connects to and sends a video stream to the Hub over Wi-Fi (see the light green lines going from each participant to the device on the credenza in the image below) either over the production LAN or using a dedicated Wi-Fi network hosted by the Hub.

- The Hub combines those streams into a single stream (see the dark green line going from the same device to the user labeled "VC Host"). The VC Host can choose from a variety of screen layouts including equal and active speaker layouts (see images below).

- The Hub also has the ability to detect which participant is the active speaker, and then to show that person in a larger window in the outgoing image (see images below).


HRT's "Equal" Layouts
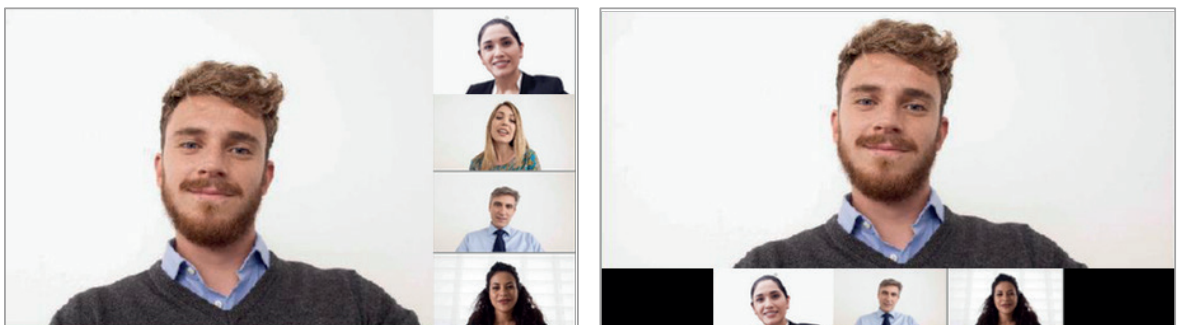
HRT's "Active Speaker" Layouts

- The VC Host's device then sends that composited video stream / image to the remote site, video bridge, or cloud service (see long dark green line below).

  Note that the VC Host's device is the only one actually connected to the video meeting. All others devices / users are connected to the Hub only via the HRT software application.
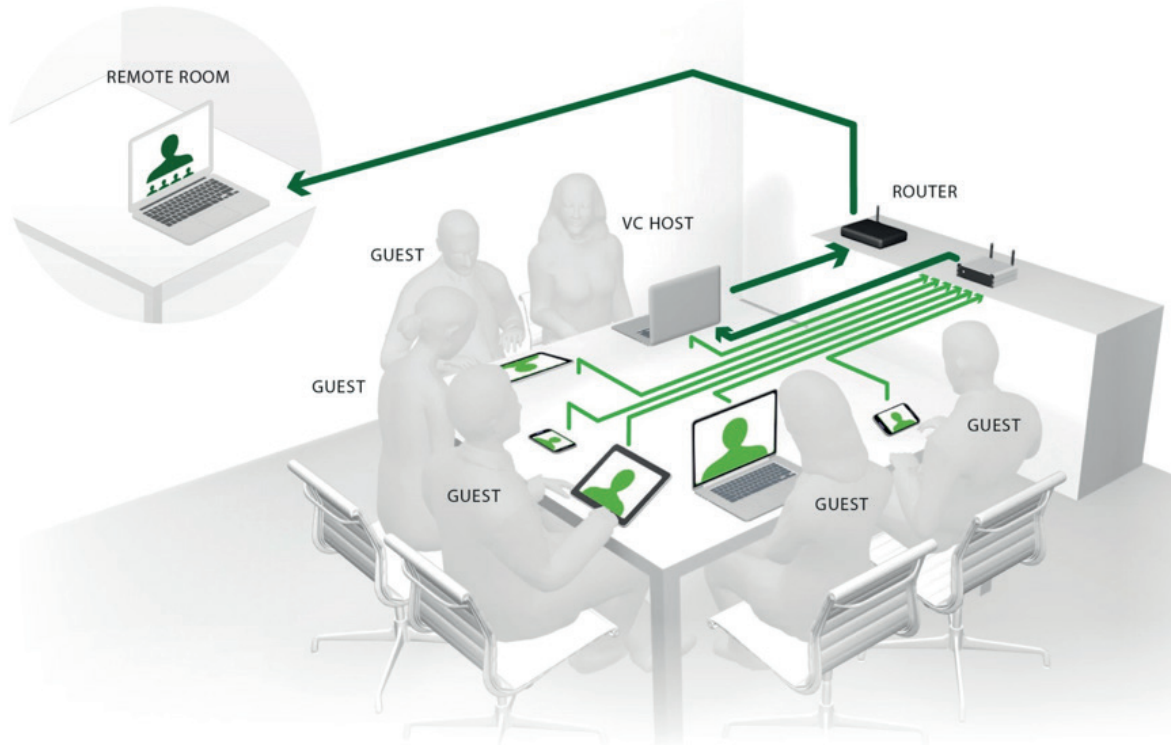

The incoming video and audio signals are handled as follows:

- The VC Host's device receives the incoming video stream from the remote room, video bridge, or cloud service, and sends that stream to the Hub (see dark blue lines in the graphic below).

- The Hub mirrors and sends the host's screen (which contains images of the remote participants) to other participants' devices (see light blue lines below).

In addition, the solution allows each participant to share his content with the other local and remote meeting participants.

This approach allows any audio system that can connect to the VC Hosts device to be used. This includes wired and wireless (Bluetooth) mic/speaker units from vendors like Jabra, Logitech, Revolabs, Sennheiser, Shure, and others.
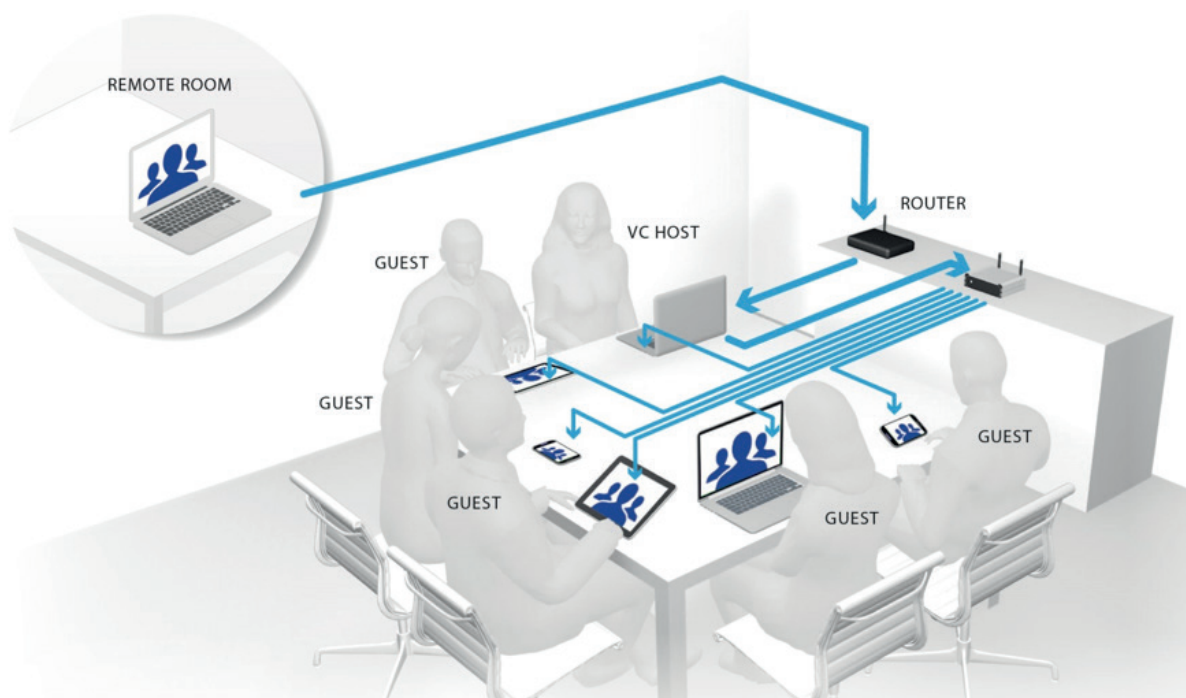
Solution Benefits

The HRT Huddle Hub One device / approach offers a number of benefits including:

- The ability for each participant to use his own personal (BYO) device's camera and display which means:

    o Meetings can be conducted anywhere – not just in the meeting room

    o People can sit anywhere in proximity to each other (no need to face a shared camera or look at a shared display)

    o Remote participants will receive strong eye contact

- Decreased WAN bandwidth utilization as only the VC Host's device is connected to the meeting.

- Compatibility with any conferencing, collaboration, or UC software package including Skype, Skype for Business, WebEx, Zoom, and others.

Conclusion

Meetings today are far more collaborative than in the past, including not just one but often many different presenters and value contributors. In some cases, such as during teaming sessions, all of the meeting participants play an equal role in the discussion.

On the positive side, the egalitarian meeting approach has helped many companies increase productivity and throughput. However, this means that many (or even all) meeting participants need to be captured on camera during video meetings – ideally without resorting to the dreaded wide-angle shot in which each person becomes very small on screen.

There are various solutions on the market today that address this need – to some degree – including panoramic and fixed cameras, motorized PTZ cameras, and center of table and center of room solutions. Each of these solutions brings with it some advantages, as well as some disadvantages. Notably, each of these solutions require the meeting to happen in a traditional meeting room with a shared display.

The sponsor of this study, Huddle Room Technology (HRT), has developed a product that provides many of the benefits of the above approaches and more, while avoiding the common challenges (cost, complexity, loss of flexibility, etc.) that these solutions typically bring.

HRT's approach allows people to conduct group video meetings from anywhere using their personal devices. This is both millennial-friendly and real-estate efficient as any space can now become a video conferencing space.

Organizations today are working hard to support the expectations and different work methods of their next-gen workers. HRT's Huddle Room One offers a unique solution that allows organizations to support a new meeting paradigm by leveraging users' personal devices, without the hassle and expense of having to upgrade (or even depend on) their existing meeting rooms.

About the Authors

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About Wainhouse Research

Wainhouse Research, www.wainhouse.com, is an independent analyst firm that focuses on critical issues in the Unified Communications and Collaboration (UC&C). The company conducts multi-client and custom research studies, consults with end users on key implementation issues, publishes white papers and market statistics, and delivers public and private seminars as well as speaker presentations at industry group meetings.

About Huddle Room Technology (HRT)

(copy provided by HRT)

HRT (www.hrt.website) is a European company based in US, Italy and Slovenia, founded by people with solid experience in video conferencing systems. HRT's mission is to deliver technological solutions that create the most comfortable and effective experience for video communication in huddle rooms and impromptu meeting spaces.