Video conferencing room primer
General guidelines for room design and best practice

There is no one video system that is right for all organizations. It is important to select video components that are the best fit for your goals and needs. This will in turn determine the equipment required and the optimal room solution for your use.

However, the premises of your organization may dictate a less than optimal room solution. In order to minimize the effects of the trade-offs needed, some know-how is required—and that is where this little guide may come in handy.
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Video conferencing is **Green**

One of the most effective ways to reduce CO₂ (carbon dioxide) emissions is to reduce unnecessary travel. On average, our customers find that video conferencing reduce the need to travel by up to 30%, while improving their bottom line.

**Ten tips to advance business goals and reduce environmental impacts with video conferencing**

**Telecommuting.** Enable people to work from home while still being fully engaged in the workplace with a face-to-face connection. Save on real estate and operational costs, while increasing productivity and morale of employees who don’t spend hours in traffic.

**Access to remote experts.** Connecting customers and employees to experts and advisors over video no matter where they are located saves time, money and carbon emissions, and increases customer satisfaction and loyalty.

**Global meetings.** Whether meeting with the board or your global team, there’s no need for a flight. Just a short walk down the hall or a quick call from the desk and everyone can meet face-to-face.

**Customer briefing centers.** Video unites purchasers, clients, sales staff and engineers in real time without travel to facilitate instant decision making and collaboration.

**Work-life balance.** Employees who are always on the road often report more stress, less productivity and reduced job satisfaction. Video removes the need to travel, increasing morale, productivity, and collaboration.

**Distance learning.** Schools and training facilities get an added lesson in conservation when they connect via video to remote institutions to enhance learning opportunities and save on costs.

**R&D.** Designers and researchers around the globe can hold video discussions about product design, carry out component modifications, and advance development timelines, without increasing their carbon footprint.

**Team building.** Multiple offices don’t have to mean isolated teams. Video allows remote team mates to see each other as often as if they were in the same office, building camaraderie without associated travel.

**HR recruiting.** Video-based screenings of out-of-town candidates cut costs and carbon emissions by eliminating travel, while allowing hiring managers to read candidates’ facial expressions.

**Real-time collaboration.** Organizations can deal with large amounts of rich data and collaborate in real-time from multiple locations with the visual and multi-media capabilities of video conferencing, instead of losing productivity from rigorous travel out into the field.
One solution doesn’t fit all

There is no one video system that is right for all organizations. It is important to select video components that are the best fit for your goals and needs. This will in turn determine the equipment required and the optimal room solution for your use.

However, the premises of your organization may dictate a less than optimal room solution. In order to minimize the effects of the trade-offs needed, some know-how is required—and that is where this little guide may come in handy.

Matching solutions to your goals

How you answer the following questions will help you decide how the premises to be used for the video system should be designed.

- How do you envision your company using video conferencing?
- What kind of information do you exchange—product details, spreadsheets, multimedia, high security information?
- How many people would participate in each type of meeting, in each location?
- Would meeting room systems be installed in dedicated video rooms or would they be installed in rooms also used for other purposes?
Elements of a video conferencing solution

The five essential components in a telepresence video conferencing system are:

- **Camera** and **microphone** capture the image and sound at one location.
- A **codec** converts the video and audio into a digital signal and compresses it before sending it out over the network.
- At the other end, a codec decompresses the signal and feeds the picture to a **monitor** and the sound to a **loudspeaker**.

A video call can incorporate two units or many, with considerable options for functionality.

Depending on your application requirements and budget, you will have numerous options for the video solution you choose. There is a system for every workspace—from boardrooms to desktops and from field locations to manufacturing floors.

A total solution

An end-to-end telepresence video conferencing solution incorporates a full suite of video systems, infrastructure for multiple environments and centralized management tools. You can expand it even further by integrating with external devices and productivity tools.

Your end-to-end solution may include some or all of the following products:

- **Immersive** creates the most realistic in-person meeting experience and provides an ideal platform for communication and interaction. Meeting participants feel as though they are having a conversation with colleagues right across the table—even though they may be miles or continents apart. The telepresence category can include immersive, room-based telepresence environments and personal telepresence systems for executive desktops.

- **Group Video Conferencing Systems** (also called Multi-purpose or Room systems) These high-quality systems are designed to be used in meeting rooms, boardrooms, auditoriums and other shared environments. High Definition video conferencing solutions can offer the same clarity of picture and sound as the immersive systems.

- **Desk or personal video conferencing systems**. These systems are designed for personal or single-person use and include video VoIP phones, executive systems and PC-based systems optimized for use in the office workstation, home office or even the coffee shop.

- **Centralized management and scheduling tools**. The Cisco TelePresence Management System (TMS) enables you to control an increasingly complex communications environment without decreasing the level of service—or significantly increasing associated support costs. With a management system, you can perform remote diagnostics and system upgrades, control associated resources and link to third-party communication tools, generate usage reports and calculate your return on investment.

- **Multipoint Control Unit** (MCU). With MCUs, you can join multiple video and voice participants into a single conference. You can find MCUs that offer High Definition continuous presence to ensure the quality of your High Definition units across the whole network, and ones that are highly scalable media services engines that grow with your business demands.

- **Video infrastructure**. As video adoption in your organization grows to include multiple sites and advanced functionality, you will require network infrastructure to support your solution.

- Video infrastructure ensures:
  - That users on different networks can connect through the same video solution.
  - That bandwidth can be regulated.
  - That calls across different networks and user domains can connect securely with NAT-firewall traversal*.

An intelligent infrastructure component such as Cisco’s Telepresence Video Communication Server (VCS) can make your network more reliable by ensuring that all calls are routed properly, convert IP addresses into directories for one-click dialing, and allow your video units to interoperate with phones and other devices.

* NAT (Network Address Translation) is a technique that hides addresses of a private network behind a single IP address on the Internet. NAT Firewall Traversal is a general term for techniques that establish and maintain connections traversing (NAT) gateways.
FindMe. Now you can call the person, not the device. With applications such as FindMe, a part of the VCS, callers can find you regardless of where you are. Individual video users can log on to a Web-based interface and control where and how they are contacted. If a user will be away from the desk, for example, he or she can have inbound calls to a video unit automatically forwarded to a cell phone.

Content Server. By adding a content server, you can record and stream video meetings—such as company-wide announcements or trainings—to be shown to a wide audience at a time most convenient for viewers.

Peripherals and Accessories. There is a wide range of peripheral equipment that can enhance your visual communication environment. High Definition and wide angle cameras, as well as upgraded speakers and microphones, enhance the visual and audio experience. With document cameras, you can transmit drawings and other documents via video. You can connect your video systems to DVDs, VCRs, whiteboards and document and multimedia applications via your PC.

General room design guidelines

Once you’ve chosen your video solution and prepared your infrastructure, it will be time to deploy. That means setting up the best possible experience for your users.

You can use video in many workspaces—boardroom, manufacturing floor, work station or home office.

A few simple adjustments (and a few things to keep in mind) will ensure that your meetings have the best possible image and audio quality.

Interior design considerations

When considering the interior design of the video conferencing workspace, the primary goals should be to make the room as comfortable as possible, putting less emphasis on the technology. Specific colors are recommended for backgrounds and walls to enable better recognition of the participants without straining the capabilities of the video cameras. Recommended colors are soft, textured wall coverings, but smooth painted walls will work if colors are muted earth tones and the lighting is adjusted to suit. When considering furniture and walls be aware of color and physical characteristics that may make your video or audio input have to work harder.

Immersive telepresence rooms provide a total control of the lighting, furniture, walls and floor and one will then have more freedom to opt for other solutions regarding choice of materials and colors, cf. the use of blue glass panes in the immersive room shown above.
Background considerations

- Remember that the camera also shows what is behind you. A calming background with a neutral color, medium contrast and soft texture will be the best to have. We recommend walls without patterns.
- Avoid moving backgrounds such as curtains in a draft or people walking behind you. This may reduce image quality and distract the attention of those on the far end.
- Do not place the camera facing a doorway.
- Choose a table that is light but not reflective. A light natural wood is a good choice.
- Avoid unnecessary furniture or clutter in the room.

Lighting considerations

- Avoid direct light on people, presentation materials or the camera lens. Direct light tend to create harsh contrasts and shadows.
- While there are several concepts popular with designers, one key design parameter appears throughout most recommendations. To eliminate shadows, a combined lighting arrangement ratio of 60/40 for ceiling and wall lighting is often recommended. Wall lighting should be indirect and such lamp arrangements are readily available from a wide range of suppliers. The key here is to equalize the available light on the participants and eliminate shadows, dark backgrounds, and bright spots in the center of the conference table.
- “Daylight” type lamps are most effective. You should avoid colored lighting that might tint your image.
- Special attention should be given to eliminating as much natural light as possible from entering through windows. The sunlight is very different in nature from artificial light in terms of color temperature, and creates sharp contrasts in the room, which in turn may confuse the automatic adjustment mechanisms of most cameras for video conferencing systems. Effort should be put into establishing uniform lighting in the room, and using curtains or opaque blinds to cover the windows will help.
- Take care when placing whiteboards directly behind people or where lighting may reflect and cause glare. Highly reflective whiteboards should be avoided. If they are not required, remove them altogether.

Heating, ventilation and air conditioning considerations

The equipment installed in your video conferencing room may generate a considerable amount of heat. This will depend on your choice of equipment, but keep in mind such things as the fact that larger monitors generate more heat than small monitors do, more people in a room will generate more heat than few people will, and so on. This may force you to consider modifications of the heating, ventilation and air conditioning (HVAC) system.

Acoustical considerations

Any current conference room can be adapted for use as a video conferencing room by making adjustments based on the needs of video and audio equipment to capture signals.

Although the term video conferencing emphasizes video, the acoustics should by no means be forgotten. Audio communications should be as clear and uninterrupted as possible, otherwise the purpose of video conferencing will be defeated because people will not experience natural communication.

If the audio is good, minor glitches in the video can also be tolerated without concern. The acoustics of the room should offer fair sound absorption and sound insulation.

Sound absorption and diffusion is needed to reduce the influence of flat reflective surfaces like polished floors, windows, ceiling, flat walls, etc. This is done by introducing sound absorbing materials such as a wall-to-wall carpet, absorption panels on the walls and/or the ceiling, and medium to heavy weight curtains in front of windows. The latter may also help to keep natural light out.

Sound diffusion is improved by making surfaces less flat. Large decorative objects irregular in shape will help. Furniture, in particular of the soft upholstered kind, will also help.

The improvement of sound absorption in the room contributes to the reduction of reverberation effects which tend to make sounds very lively and confusing.

In general terms a 10% or more coverage of the total surface of the walls and ceiling with quality sound absorption panels can greatly improve the sound quality.
If you are in the position to choose, keep in mind that irregularly shaped rooms are acoustically better than the commonly encountered shoe-box shape. Opposing parallel surfaces may cause flutter echoes stemming from the sound bouncing back from the parallel surfaces over and over again. A very practical test to check for this is to stand in various positions in the room and clap your hands loudly once in every position.

If the clap sound is crisp, clear and distinguishable then the acoustics of the room are good enough for video conferencing.

On the other hand, if you hear diffusions as though more people are clapping their hands at the same time, there is flutter echo present and this will affect the sonic quality of the room. This will call for absorption on the parallel surfaces. Although not always attainable, sound absorbing materials work better if they are mounted at a distance from the wall—typically 0.2 m (8’’). This may interfere with the architectural ideas behind the look of the room.

**Sound insulation** refers to the elimination of outside environmental noise or other sounds, that could be surprisingly distracting during a video conference.

The problem often is that while you might be accustomed to the sound of traffic just outside your office all day, your remote colleagues might find this to be an unpleasant surprise during a video conference.

Such problems are much more disturbing in a video conference, since participants automatically sharpen their sensory perception to overcome the lack of physical contact.

Sound insulation works both ways, in addition to reducing the amount of outside noise, it also enhances the privacy of your video meetings. For business critical meetings this may be of great importance.

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**Cisco recommends**

- Reverberation time (RT) should be within 0.3–0.6 [s] in the octave bands 125–4000 [Hz].
- The acoustic absorption should to the extent possible be distributed on the walls in addition to the ceiling to avoid flutter-echo effects from parallel walls.
- If you are not going to put absorption on all walls, put the absorption on non-opposing walls to minimize flutter echo effects in all directions.
- Distribute the absorption elements about the walls, avoid absorption clusters.
- The ceiling is recommended to have an absorption factor ≥ 0.9 in the octave bands 125–4000 [Hz]. This will normally require a mineral wool ceiling of good quality.
- The walls should preferably have sound absorbing fields at the side, front and back walls. If perforated or slotted panels are used, the opening area of the panel must be at least 20 % of the panel area.
- Sound absorption on walls could also be made with mineral wool wall panels, curtains or other absorptive materials.
- Carpet on the floor is strongly recommended.
- All walls around the room should have a sound insulation of R’w ≥ 48dB (≥ STC 50).
- The door should have a sound insulation of Rw ≥ 38dB (≥ STC 40).
- Background noise level should ideally be ≤ 30dB(A). However, a background noise level ≤ 35dB(A) will be acceptable. This includes both noise from technical installations (air-conditioning, in particular) and outdoor traffic noise etc.
Room layout guidelines

New video conferencing rooms that are fortunate enough to be conceptualized in design from the start—and are dedicated specifically to the application—are easy to implement. Unfortunately this may not always be the case.

A video conference is directionally oriented by the visual focus capabilities of the camera. This should therefore be taken into consideration when working with room layouts. Allowances must be made for furniture, additional wallboards, etc.

The size of the attending group is not only depending on the actual room size itself. The room layout will also determine how many participants may attend. The actual seating arrangement is then defined to allow the participants to see and be seen through the conference.

There is a minimum distance required for the camera to capture all of the attending participants. This should be taken into consideration when doing the layout. Also keep in mind that if the room is also to be used for other purposes than video conferencing, steps should be taken to avoid any layout conflicts.

Furniture manufacturers have developed conference tables specifically designed to allow meeting attendees to see and be seen by the video equipment. There are several sources available for specialized video equipment including custom conferencing tables and matching cabinets.

**Small meeting rooms.** The best capture angle for the video camera is a “down the table view” with the end seat closest to the camera empty.

![Small meeting rooms](image)

Small meeting rooms normally work best with a “down the table view” arrangement. A slightly slanted table (right) may work better in some cases.

This avoids having an attendee in that seat, who can neither see the monitor nor be seen by the camera, and permits the assembled group to view the remote part of the meeting. The arrangement also creates a clear walkway into and around the table.

**Larger meeting rooms** designed for 10–30 people will normally work better if the seating is arranged in a U form.

![Larger meeting room](image)

A larger meeting room often works better with the seating arranged in a U shape. This can also be achieved by letting the wide side of the table face the camera.

**Distance learning applications** with larger audiences (typically 30 people and above) may require a more traditional auditorium or classroom layout. To enhance the experience, several monitors may be used. The below example shows a configuration with remote and local speaker, a separate presentation monitor and two extra monitors to provide a better view for those seated in the rear.

![Distance learning application](image)

Distance learning applications often work better with auditorium or classroom layouts.

One thing to keep in mind here is that the remote lecturer should be able to talk to the students. A camera collocated with the monitor showing the remote presenter will enable the students to communicate with the lecturer as they are looking at the monitor and thus provide natural communication.
Microphone guidelines

For small groups of people a single microphone will normally suffice. Systems supplied with more than one microphone have been designed to use all the microphones supplied. These microphones should be placed as far apart as possible from each other to minimize the interference. Note that there are Cisco microphones designed for ceiling mounting available.

Make sure that no speaking participant experience obstacles blocking the view to the microphone at all times.

Microphone should be placed away from noise sources like computer and projector fans placed on the table. The noise from such sources is often perceived as surprisingly loud by the remote participants.

For distance learning applications and other classroom and auditorium layouts (see the previous page for more on this), make sure there are microphones located so that the lecturer (the remote speaker) can hear the audience whenever needed.

Monitor and camera guidelines

Viewing distance depends on the size of the monitor you will be using and the number of people gathered around the table, as indicated in the below fig. Note the way viewing distance is defined here. See sidebar for recommended viewing distances.

Our multi-purpose system cameras have a horizontal angle of view of around 70°. Minor variations exist between the different models.

You may need to take the angle of view into account when deciding where to put your camera. Keep in mind that if the camera position differs significantly from the monitor location you will obscure the feeling of natural communication.

For systems with the camera attached to the monitor, this may call for care when deciding the room layout and the number of seats.

Cisco recommends

Assuming the use of a 1080p monitor with an aspect ratio of 16:9, we recommend that you start out with the following viewing distances:

- 42” monitor: 1.5m / 4’11”
- 52” monitor: 2.0m / 6’6”
- 65” monitor: 2.5m / 8’2”

Note that these figures should be regarded as guidelines only. We do recommend that you try things out on-site before fixing any mounting position.

One thing that may modify the validity of the above guidelines is the number of people along the table. Persons sitting at—or near—the end of the table may feel that the distance to the monitor is too far for them, in particular during presentations. In such cases a larger monitor is recommended.

Also note that if you sit too close to the monitor, the camera will “look down” on you. This may partly disturb the feeling of natural communication for the remote participants.
Presentation tool guidelines

You may enhance the telepresence experience by adding presentation sources, such as a document camera, PC based presentations or external video sources—for example by playing back a DVD.

Observe that a video conferencing room also may be used as a local meeting room. The monitor may then serve as presentation monitor for the local meeting.

Document camera

If you need to present objects or paper based documents, a document camera may be used.

The camera is normally mounted above the meeting table, but may, if local conditions dictate, be mounted above any table in the room.

The document camera is accessed by selecting Presentation with the remote control and then specify input source (what you would like to watch).

PC presentations

Presentations residing on a PC, on a computer network, or anywhere else accessible from the PC, may also be shown on during a video conference.

Most Cisco TelePresence systems and all codecs allow computers to connect to the video system.

PC presentations enable all participants, local and remote, to share a presentation. The presenting computer is then the only computer needed.

Whiteboard

If you want to include a whiteboard in the video conferencing room, we recommend that you consider investing in a second camera rather than relying on the idea that the whiteboard can be viewed from the main camera.

To ensure a good view from the main camera, the whiteboard must normally be placed so that it opposes the main camera. The glare of a shiny whiteboard may be very disturbing to the remote participants.

Many Cisco TelePresence systems support more than one camera and you may easily switch between the two cameras with the remote control.
Best practices

A successful video conference provides a face-to-face meeting, even if the participants are miles or continents apart. Keep in mind that it still is a meeting—normal etiquette and dress code apply even here.

General
- Set the unit to Automatic Answer, but mute the microphone for privacy reasons.
- Let the participants rehearse “the noble art of operating a video system” to the extent needed.

For desktop video conferencing units
- The video system should be located close to your PC, along with your other everyday tools. This way you can easily share presentations without having to move. You may even be able to use your system as a PC screen.
- Use a headset for privacy in an open office environment.

For meeting rooms
- Place the microphone at the front of the table to ensure that all speech will be detected. The best position is at least 2 m (6.5’) in front of the system, on a flat surface with at least 0.3 m (1’) of table in front.
- If possible, keep the document camera close to the leader of the meeting, alternatively, close to a designated controller. Remember to arrange all the peripherals so that one participant can reach each of them to point, change the display, record or perform other functions during the conference.
- To help ensure the most natural meeting environment, position the camera on the top center of the receiving monitor. The camera should point directly at the meeting participants to guarantee eye contact with those at the far end. Check this out by means of the self-view feature of your video system. The self-view settings shows what the remote party can see from you (the outgoing video).

- If you are going to do presentations you are normally going to make use of duo video. That means the use of two video streams, one showing the presentation and the other showing the presenter—or the group of presenters. Small systems may force you to choose between showing the presentation or the presenter.
  For duo video some attention is needed. Duo video is often shown side by side with half the screen showing the presentation and the other half showing the presenter. Provide the impression that you seem to look towards the presentation instead of the impression that you sit with your back towards it, when all is viewed on the remote monitor. Alternatively, look straight into the camera to avoid this phenomenon.

Use camera presets
- Cisco TelePresence systems let you create predefined zoom and camera pointing directions (pan). Use these to zoom into the person speaking, if appropriate. Do not forget to zoom out again afterwards.

Loudspeaker volume
- The audio system will use the loudspeakers built into the monitor or the Cisco Digital Natural Audio Module.
- For some systems you can set the default volume level by adjusting the volume on the monitor with the monitor remote.

Brightness control
- To adjust brightness, colors or other settings of the monitor, use the monitor’s own remote control. Adjust the monitor to suit the conditions of the conference room. The monitors supplied by Cisco have on-screen menus that are very easy to use. For more information on configuring the monitor, see the corresponding user manuals.

Ease of Use
- To help meeting participants dial, add presentations and use other functionality during a call, consider stationing a poster, table tent or other quick-reference guide in the room.
On our web site you will find an overview of the worldwide Cisco contacts.
Go to: http://www.cisco.com/web/siteassets/contacts/index.html

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