

# Videoconferencing and IP cameras

How to choose the perfect camera for your application  
and realise professional results



# About this guide

Videoconferencing and IP cameras come in many different forms, each suited to various applications.

This guide will help you to understand the technology and options available, so you're fully equipped to choose the perfect camera for your application. We cover videoconferencing, education, broadcast and live streaming, and personal collaboration.

The first thing to understand is how these cameras differ from the more conventional video and still cameras you may be aware of.

Start by thinking of conventional cameras such as smartphones, professional video, or still cameras. They are all intended to be controlled by a person. You pick up the camera and shoot video or take photos.

In contrast, videoconferencing and IP cameras are designed for automated or remote operation. In almost all circumstances, they are situated in a fixed position and record pre-conceived situations.



**Videoconferencing**



**Education**



**Broadcast and live streaming**



**Personal collaboration**





# Understanding the technology

The broad area of videoconferencing cameras covers many different types. Various models and their differing built-in technology and features mean you can find a camera suited to your application and budget.

This section will help you see the big picture and understand what we're talking about when we get into specifics later in this document.

## The camera

All digital cameras are a form of electronic eye and brain. Its three components are the lens, sensor and image processing. These work in harmony to produce the image output.

It starts with the lens. These come in different levels of quality, angle of view and zoom magnification. Lens quality influences sharpness, distortion, colour and contrast. Additionally, larger aperture lenses allow the lens to capture more light for better results in low-lighting conditions. And let's not forget autofocus. It should be accurate, smooth, and not 'hunt' for subject focus. The bottom line is picture quality starts with lens quality.

The lens focuses the image onto a sensor equivalent to the human eye's retina. The type and sophistication of sensor technology, its size, the number of pixels and the way it pre-processes and passes image data down the chain all influence image quality. We'll delve deeper into sensor technology in the context of individual models later on.

Next comes image processing – the brain. It's responsible for optimising the image quality and colour and reducing noise, graininess and other artefacts in the image. It also processes image data into the various formats used to transmit images over cables and networks for compatibility with various computers and devices.



## Audio

Some cameras have built-in microphones, while some rely on external mics. The inclusion or exclusion of built-in mics depends on the application. For example, most videoconferencing, education, and web cameras have built-in mics. Whereas specialised broadcast and streaming cameras will often rely on external microphones.

An external microphone should be positioned as close as possible to the person speaking to achieve the ultimate quality. That's why high-grade videoconferencing systems use microphones that can be placed on meeting tables.

In short, technology influences the audible quality of voices, significantly impacting the viewer or collaborator's experience.





## Features

In addition to providing high-quality images and sound, the different features offered by different cameras significantly impact the user and viewer experience.

### Auto Tracking

Auto tracking is an example of a feature that can positively impact viewer experience. Unlike conventional cameras, the various types of videoconferencing, streaming and web cameras are all used in a fixed position and operated remotely.

Auto tracking provides a way of keeping the main subject front and centre. Good-quality auto tracking is smooth and accurate. It may even zoom as well as pan and tilt to follow the subject.

Auto tracking technologies vary in sophistication, from basic subject tracking, to facial recognition and voice tracking.

So, it's essential to keep in mind that while auto tracking can be very beneficial, not all camera brands have technology with the same quality or sophistication. Poor performing auto tracking is distracting and counterproductive.



## Connectivity

Connectivity is vital for some camera applications to ensure compatibility with the device, camera, or network to which the camera is connected.

Webcams only require USB connectivity. However, HDMI is often necessary for videoconferencing to enable the camera to be connected to a monitor.

Multiple connectivity options are often necessary for advanced videoconferencing, education, and streaming applications. These can include:

- SDI connector - commonly used in professional video applications
- RJ45 LAN or Ethernet connectors - enables Audio Video over IP networks and network-connected remote camera control
- RS232, RS422, and RS485 are used to connect remote control panels
- Audio output can be achieved with a dedicated audio output connector or bundled with video data over HDMI or LAN connectors



## Network and streaming protocols

Network protocols determine factors such as device compatibility, network-based latency, and the level of compression, impacting video quality.

Common network protocols include:



This section contains information that's vital to know for technical people. But it's not for everyone. You may want to skip ahead.

### SRT

Secure Reliable Transport (SRT) is the latest and most sophisticated network protocol. It is secure, reliable, and open source and stands apart for its low latency levels. SRT is an increasingly popular protocol that optimises the performance of the Audio-Video stream according to network performance, which makes it the ideal choice for applications where network performance can be suboptimal or variable. Like all protocols, it requires integration with other ST+RT-compatible devices.

### NDI

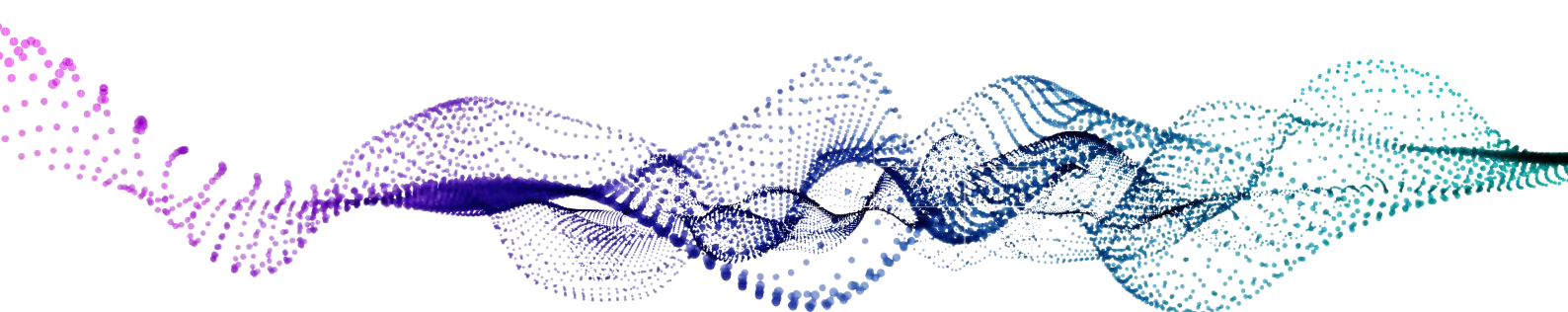
Network Device Interface (NDI) is a specification developed to enable compatible video products to communicate, deliver, and receive high-definition video over a computer network in a high-quality, low-latency method. It is frame accurate and suitable for switching in a live production environment. Therefore, NDI is ideal for applications where quality is the priority and network performance is optimised.

### RTSP

Real-Time Streaming Protocol (RTSP) is designed to control streaming media in entertainment and communications systems. The protocol combines transcoding and programming to transfer video over a network or to the Internet with an easy-to-use link.

### RTMP

Real-Time Messaging Protocol (RTMP) is a communication protocol for streaming audio, video, and data over the Internet. It is a TCP-based protocol that maintains persistent connections and allows low-latency communication.



## **ONVIF**

The Open Network Video Interface Forum (ONVIF) is a global and open industry forum that defines an international open standard for the interface of physical IP-based products. ONVIF creates a standard for how IP products within video surveillance and other physical security areas can communicate.

## **VISCA**

VISCA is a professional camera control protocol used with Pan Tilt Zoom (PTZ) cameras. It is based on RS232 Serial communications and controls cameras remotely. VISCA over IP applies the VISCA protocol over LAN.

Streaming protocols, or video compression codecs, compress and decompress digital video for transmission and storage. Codecs determine the compression level, and their sophistication determines the quality retained due to compression.

The most common streaming protocols include:

### **H.264**

H.264 is also called Advanced Video Coding (AVC) and MPEG-4. It is a block-oriented, motion-compensated codec designed to record, compress and distribute video content. It supports resolutions up to 8K.

### **H.265**

H.265 is also known as High-Efficiency Video Coding (HEVC) and MPEG-H. It is designed as a successor to H.264 and provides between 25% and 50% better data compression at the same quality. Alternatively, it provides substantially superior video quality at the same stream bit rate. H.265 enables UHD video to be streamed at higher quality, as is required by the increasing size of viewing displays, with less network load than H.264. H.265 device compatibility is advancing rapidly.



# Choosing a camera for your application

Now that you know the fundamentals of cameras and their different features, we'll explore camera requirements across various applications. You can refer back to the previous section if needed.

This section helps you to know what to look for when choosing a camera for your application, broken down into four main areas. Please skip to the section that's most relevant to you.

- Videoconferencing
- Education
- Broadcast and live streaming
- Personal collaboration.

## Videoconferencing

Videoconferencing is relevant to any application that requires participants to meet in a remote or hybrid environment. It's now an expectation that there is always an option to attend a meeting virtually.

Videoconferencing cameras are typically used in meeting rooms. The goal should be to create an engaging experience for remote participants, making them feel just like their there in person.

The correct setup depends on various factors, such as room size, number of participants and budget. A videoconferencing setup for a large boardroom that accommodates 20+ attendees will look considerably different from a small huddle space that only fits five people.

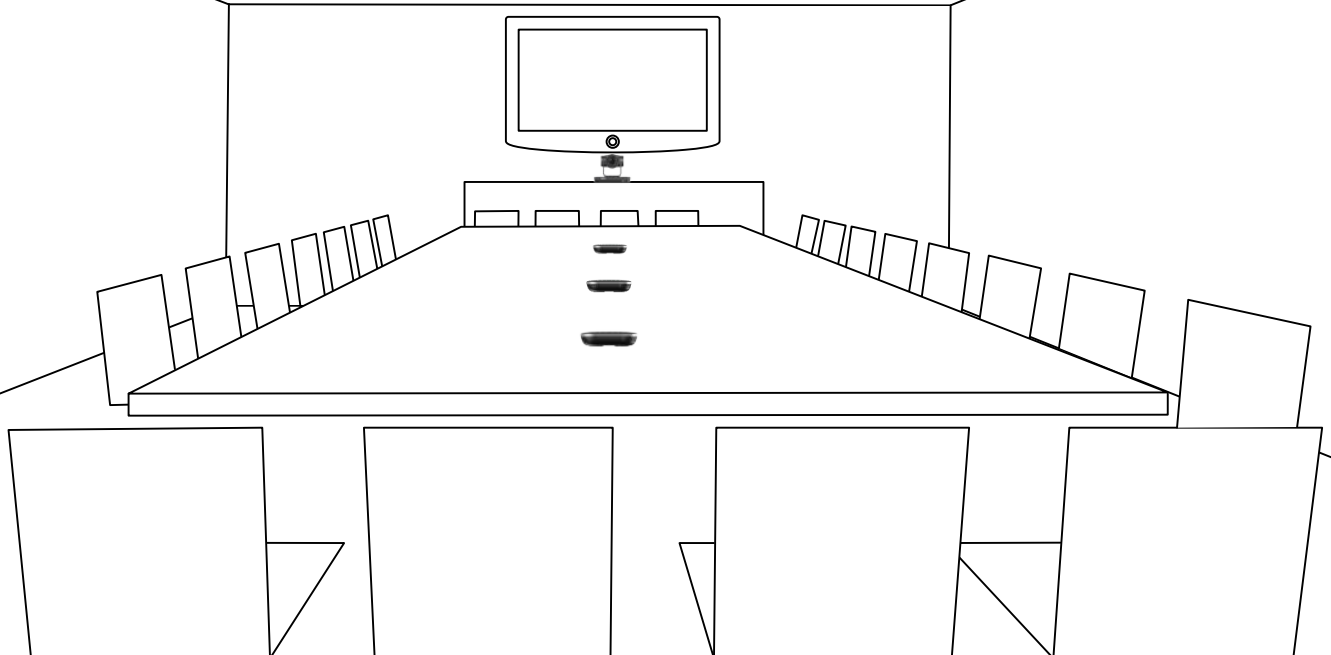
Ultimately, your videoconferencing solution should provide a smooth meeting experience for both remote and in-person attendees. Video and sound quality should make it easy for all meeting participants to collaborate effortlessly.

Now let's look at the most critical features to consider when looking for a robust videoconferencing solution.



## Large meeting rooms

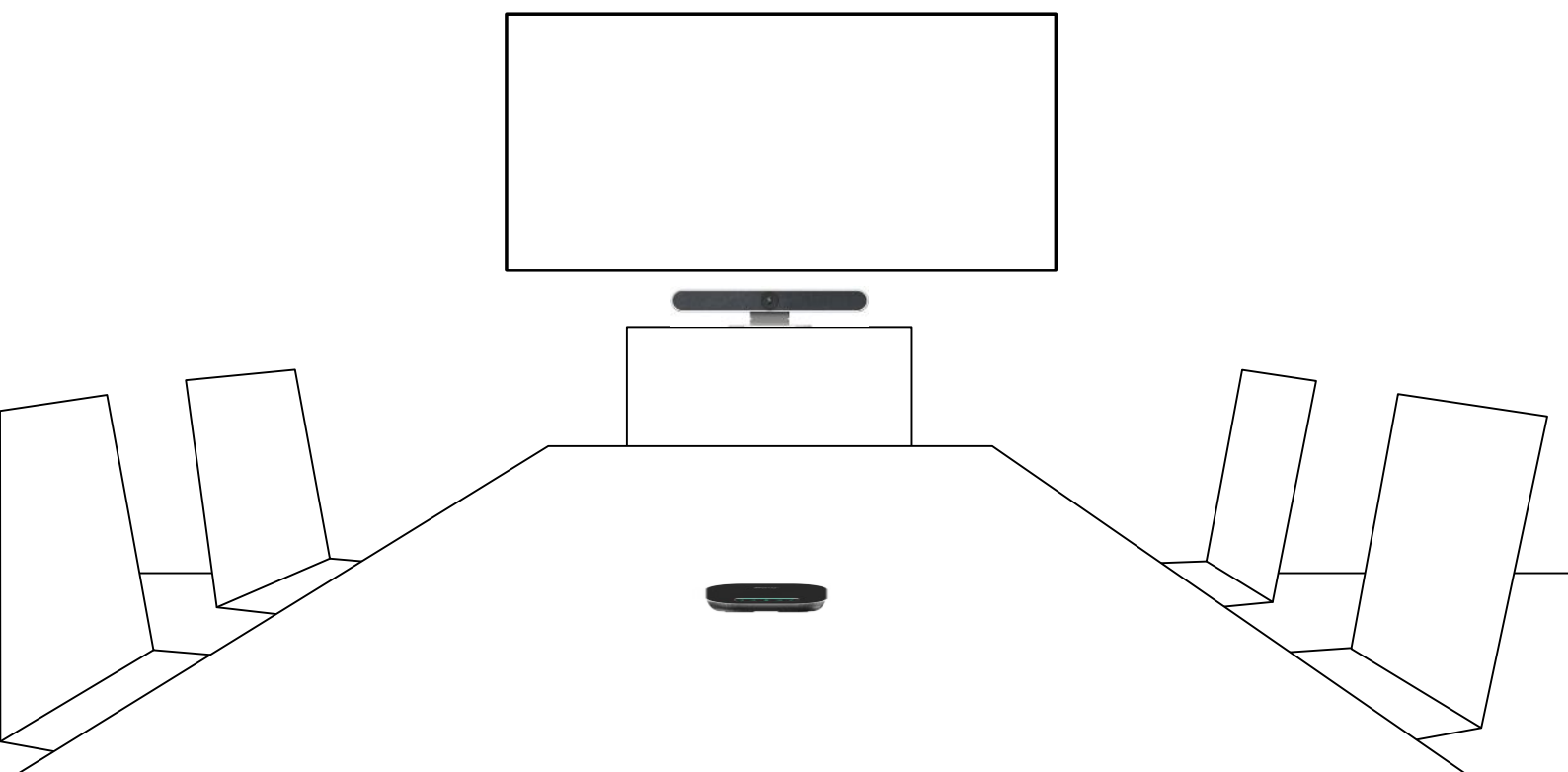
- The lens should have a zoom range that's wide enough to capture all meeting room participants, while being able to zoom in to feature a single person
- Framing presets is a feature that makes it easy to pan, tilt and zoom in to specific views to feature individual participants. This dramatically improves the experience of remote participants. Once set up correctly, presets are simply selected via remote control
- Some Video Bar style videoconferencing cameras use microphone arrays to identify the location of the person speaking, enabling the camera to automatically zoom in to the main subject
- Large rooms are often set up with one or more speakerphones - integrated microphone and speaker units that are placed on the meeting room table. This arrangement ensures that incoming and outgoing sound can be clearly heard by all participants
- Picture quality is determined by the quality of the lens, autofocus performance, sensor resolution and quality, and image processing. Advanced image processing with 2D and 3D digital noise reduction will ensure image clarity and natural colour under a wide range of lighting conditions
- 4K/Ultra HD or 1080P/Full HD video capture and will deliver crystal clear, colourful and natural images. Ultra HD provides sharper images on larger screen sizes
- You should choose a camera with connectivity options that are compatible with your existing IT and AV infrastructure
- Network protocols should be chosen and configured to achieve the best balance between image quality and latency (the delay experienced by remote participants).





## Small to medium-sized meeting rooms

- Video bar-type videoconferencing cameras combine a camera, microphones and speakers. They're a great choice for small to medium-sized rooms
- Some Video Bar type videoconferencing cameras use microphone arrays to identify the location of the person speaking, enabling the camera to automatically zoom in on the main subject
- As meetings rooms get larger, it's best to add one or more speakerphones - integrated microphone and speaker units that are placed on the meeting room table. This arrangement ensures that everyone in the room can be clearly heard by remote participants, and that incoming sound is clear to all meeting room participants
- The lens should have a zoom range that's wide enough to capture all meeting room participants
- Framing presets is a feature that makes it easy to pan, tilt and zoom in to specific views to feature individual participants. This dramatically improves the experience of remote participants. Once set up correctly, presets are simply selected via remote control
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## APT AV Videoconferencing products

### UHD430 Ultra HD 4K Pan Tilt Zoom (PTZ) Camera Series

Based on a high-performance Ultra HD 4K camera system, The UHD430 series combines exceptional resolution, image quality and performance within a robust and stylish camera unit.

The series is designed to meet the most exacting professional demands. The ability to choose zoom lens magnifications, connectivity and network protocol options enable precise matching of specifications to project and system demands. Value for money is a stand-out strength, making the range suitable for a range of budgets where professional-quality video capture is required.

**Best for:** Medium-large meeting spaces, webinars, virtual conferences, onboarding and training



### HD570 Full HD Pan Tilt Zoom (PTZ) Camera Series

The HD570 series is a professional standard HD camera system that combines exceptional image quality and near-silent pan-tilt-zoom (PTZ) functionality within a robust and stylish camera unit.

The series is designed to be a high-quality Full HD camera that is compatible with virtually all industry connectivity and network standards. The combination of high picture quality, choice of zoom lens magnifications and connectivity options makes it a highly versatile camera that will provide reliable performance in any videoconferencing application.

**Best for:** Medium-large meeting spaces, webinars, virtual conferences, onboarding and training.





## HD515 Series Full HD PTZ Camera

The price leader of the APT AV range combines high-performance video with impressive capabilities and configuration options. A choice of 3X wide and 10X zooms lenses makes it suitable for a wide range of room sizes. Video output connectivity is via USB and support is provided for H.265 and H.264 video codecs.

**Best for:** Small-large meeting spaces, webinars, virtual conferences, onboarding and training, company town halls.



## VB460 Intelligent 4K All-in-one Video Bar

An all-in-one videoconferencing solution with a built-in camera, speakers and a 6-speaker microphone array. With powerful functions like face recognition, voice localisation and voice tracking, the VB460 automatically adjusts the image framing according to the number of meeting participants and can zoom in to focus on the main subject.

**Best for:** Small-large meeting spaces, webinars, onboarding and training.



## WC201 Auto Framing 4K ePTZ Camera

Featuring Ultra HD 4K resolution and two built-in omnidirectional microphones, this plug-and-play ePTZ camera is durable, reliable and easy to install. The WC201's flawless auto-framing capabilities ensure that the key subject stays front and centre in every meeting.

**Best for:** Small-medium meeting spaces, webinars, virtual conferences, onboarding and training.



**UVC700 Omnidirectional Speakerphone**

Professional standard omnidirectional microphone kit featuring advanced voice processing technology for clean and clear audio. The UVC700's 4-channel high-definition microphone array provides clear sound and intelligent noise reduction.

**Best for:** Large meeting spaces, webinars, virtual conferences, onboarding and training, company town halls.





## Education

The need for cameras in educational settings has evolved significantly in recent years. It's now common practice for lessons, lectures and events to be live-streamed and recorded. This is particularly relevant to higher education, where lectures, inaugurations, graduations and other events are live-streamed and recorded for those unable to attend in person.

The student/viewer experience is central to selecting the right solution for video in educational settings. An education camera that delivers poor image and sound quality or continuously 'hunts' for subject focus will provide a substandard remote learning experience.

Ease of use and reliability are essential to developing a seamless student experience. Your education camera solution needs to be easy to operate by faculty members, allowing them to focus on the lesson, lecture, or event at hand rather than worrying about disruptions or dropouts.

### Features and performance for education

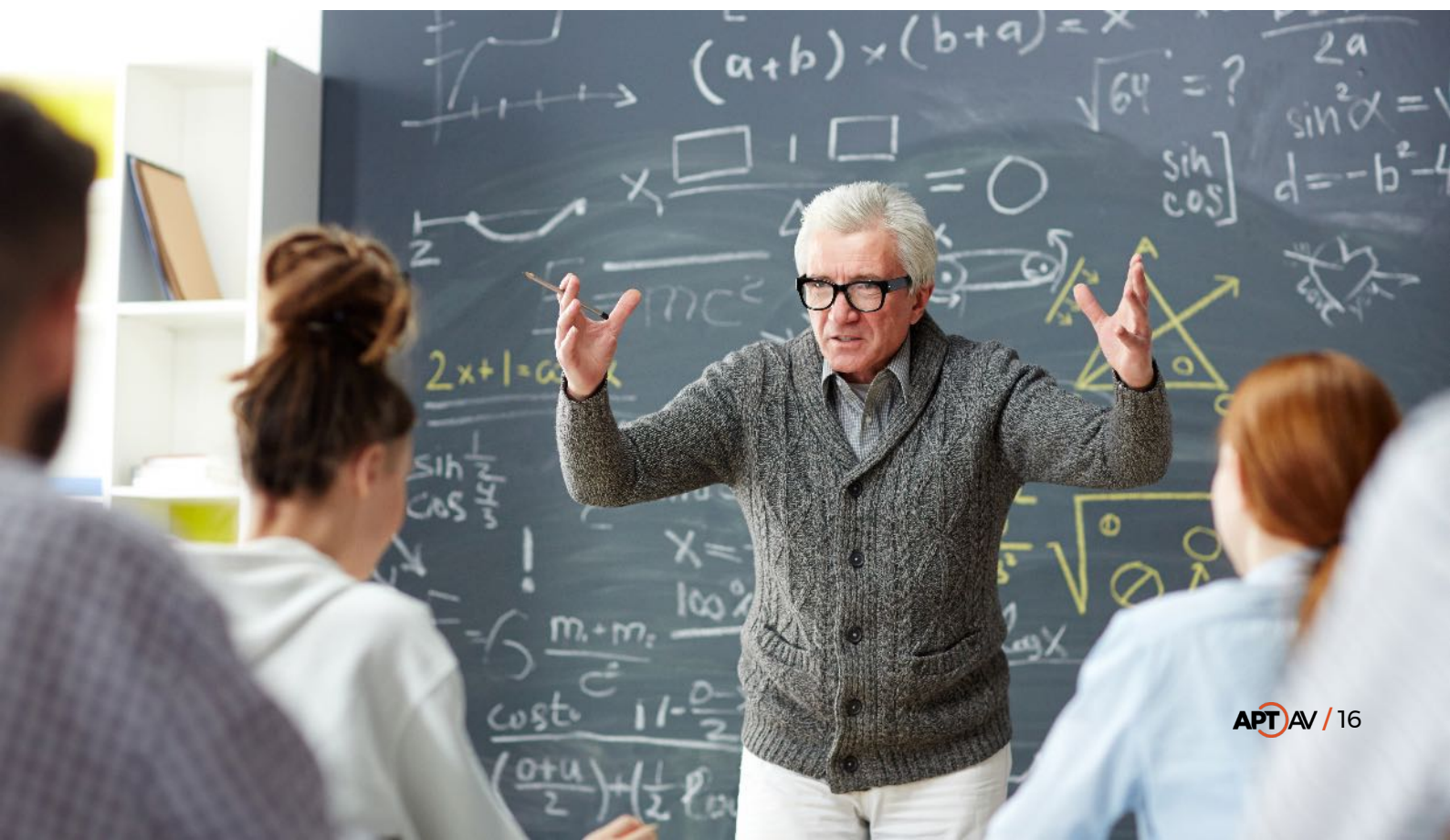
So, what features are most useful for education cameras? Here are a few essentials:

- High-performance subject auto tracking is a must-have feature. Auto tracking uses subject and facial recognition technology to identify and lock onto the main subject. The camera then automatically pans, tilts and zooms to follow the subject as they move around the room. Auto tracking makes the viewing experience much more engaging than viewing a static wide shot of a lecture hall or classroom.



- Not all auto tracking technology performs as it should, so it pays to choose wisely as auto tracking that does not follow the subject smoothly and consistently creates a disruptive viewer experience.eras feature tracking exclusion zones. This feature ensures ensures that the camera does not chase a new subject - someone entering a room for example.
- Picture quality is determined by the quality of the lens, autofocus performance, sensor resolution and quality, and image processing. Advanced image processing with 2D and 3D digital noise reduction will ensure image clarity and natural colour under a wide range of lighting conditions.
- 4K/Ultra HD or 1080P/Full HD video capture and will deliver crystal clear, colourful and natural images. Ultra HD provides sharper images on larger screen sizes
- The cameras zoom lens range should be chosen according to the room size and shape. It needs to be wide enough to cover the widest desired framing and provide sufficient zoom magnification to provide a close-up of the main subject.
- You should choose a camera with connectivity options that are compatible with your existing IT and AV infrastructure
- Network protocols should be chosen and configured to achieve the best balance between image quality and latency (the delay experienced by remote participants).
- Most educational cameras require external microphones. Options to consider include:
  - Lavalier or lapel mic for the lecture and other presenters.
  - Lectern mic
  - Radio mics or microphones that focus on particular zones can be used to capture ambient sounds or contributions from around the room.

## APT AV Education products





## HD100T Education Intelligent Auto Tracking Camera

A fully featured, high-performance pan tilt zoom (PTZ) camera designed for educational settings. Featuring advanced auto-tracking pan tilt zoom (PTZ), an integrated ultra-wide panoramic camera and Full HD output resolution, the HD100T is built to capture hybrid and online learning content.

A choice of zoom lens magnifications, and HDMI, NDI, and LAN connectivity make the HD100T suitable for all configurations.

**Best for:** Live streaming and recording, lecture capture, school event streaming, hybrid classrooms, distance education.



## HD220 Lecturer Auto Tracking Electronic Pan Tilt Zoom (ePTZ) Camera

Driven by world-leading technology and high-quality components, this easy-to-configure and affordable lecture camera delivers accurate and natural auto-tracking. The HD220 incorporates an ultra-wide lens and advanced 4K CMOS image sensor to deliver Full HD video output. 3x digital zoom magnification is available while retaining excellent image sharpness. SDI, USB 3.0 and LAN connectivity makes the HD220 suitable for a wide range of applications and can be counted on to deliver exceptional image quality and robust reliability.

**Best for:** Lecture capture, school event streaming, hybrid classrooms, distance education.



## Broadcast and live streaming

Broadcast and live streaming is the process of capturing and distributing video via online digital platforms, either in real time or as a recording. It's a powerful medium and very effective way to command attention and update your target audience instantly.

The ability to broadcast to a broad audience has never been so accessible, with high-quality digital cameras replacing the need for traditional broadcast solutions. Large video production crews and satellite vans are no longer required to create polished, professional video capture.

Applications for broadcast and live streaming camera solutions vary and can include:

- Courts – evidence presentation, video record keeping, overflow and press rooms, external live streaming, video conferencing support, remote depositions
- Conference venues – live streaming and recording events, broadcasting internally from one area to another (overflow area), remote speakers
- Medical/Telemedicine – live streaming and recording surgical procedures for educational purposes, remote medical appointments
- TV production – sports, news, worship, reality TV.



While the applications for live video production are endless, there are common requirements.

- The need for reliability is paramount. Cameras are most often installed for repeated and regular production of live streams or recording. Live video production is amazingly efficient, but making sure that everything always works is a must. So cameras need to be robust and reliable to perform consistently over time
- Choosing the required connectivity and network protocol options are often an early consideration that help to narrow down the list of cameras you can choose from. Will you use LAN with PoE, SDI, HDMI or USB connectivity? Network and streaming protocols impact image quality and latency. Will you use NDI, SRT or another protocol?
- Image quality has a real impact on the viewer experience. Picture quality is determined by the quality of the lens, autofocus performance, sensor resolution and quality, and image processing. Advanced image processing with 2D and 3D digital noise reduction will ensure image clarity and natural colour under a wide range of lighting conditions.
- 4K/Ultra HD or 1080P/Full HD video capture and will both deliver crystal clear, colourful and natural images. Ultra HD provides sharper images on larger screen sizes. Furthermore, screen sizes and industry resolutions continue to increase, so a 4K camera is more future-proof.
- The angle of view and magnification of the zoom lens should be matched to the room and production requirements. The lens should have a zoom range that's wide enough to capture all meeting room participants, while being able to zoom in to feature a single person





- Framing presets is a feature that makes it easy to pan, tilt and zoom in to specific views to feature individual participants. This dramatically improves the experience of remote participants. Once set up correctly, presets can be selected via a control panel or infrared remote control
- Do you have a need to track moving subjects? If so, will you use an operator-controlled panel or auto tracking?
- Auto tracking uses subject and facial recognition technology to identify and lock onto the main subject. The camera then automatically pans, tilts and zooms to follow the subject as they move around the room. Not all auto tracking performs as it should however, so it pays to choose wisely as auto tracking that does not follow the subject smoothly and consistently creates a disruptive view experience.
- Some cameras feature auto-tracking exclusion zones. This feature ensures ensures that the camera does not chase a new subject - someone entering a room for example.
- Audio is also a key consideration. For optimal audio, most broadcast and live stream cameras require external microphones, and microphones are often matched with a particular camera. So you can choose to route audio via the camera to combine it with the image feed to simplify switching.



## APT AV broadcast and live streaming products

### UHD430 Ultra HD 4K Pan Tilt Zoom (PTZ) Camera Series

Based on a high-performance Ultra HD 4K camera system, The UHD430 series combines exceptional resolution, image quality and performance within a robust and stylish camera unit.

The series is designed to meet the most exacting professional demands. The ability to choose zoom lens magnifications, connectivity and network protocol options enable precise matching of specifications to project and system demands. Value for money is a stand-out strength, making the UHD430 series suitable to a range of budgets where professional-quality video capture is required.

**Best for:** Legal proceedings, TV production, tele-health, virtual or hybrid conferences, event production, arts and entertainment.



### HD570 Full HD Pan Tilt Zoom (PTZ) Camera Series

The HD570 series is a professional standard HD camera system that combines exceptional image quality and near-silent pan-tilt-zoom (PTZ) functionality within a robust and stylish camera unit.

The series is designed to be a high-quality Full HD camera that is compatible with virtually all industry connectivity and network standards. The combination of high picture quality, choice of zoom lens magnifications and connectivity options makes it a highly versatile camera that will provide reliable performance in any application.

**Best for:** Legal proceedings, TV production, tele-health, virtual or hybrid conferences, event production, arts and entertainment.



## HD515 Series Full HD Pan Tilt Zoom (PTZ) Camera

The price leader of the APT AV range combines high-performance video with impressive capabilities and configuration options. A choice of 3X wide and 10X zooms lenses makes it suitable for a wide range of room sizes. Video output connectivity is via USB and support is provided for H.265 and H.264 video codecs.

**Best for:** Legal proceedings, TV production, tele-health, virtual or hybrid conferences, event production, arts and entertainment.



## HD-20 1201C1 Box Camera

Featuring a 20x optical zoom and multiple interfaces, such as HDMI, 3GOSDI and LAN, the HD20's advanced image processing algorithm delivers high-resolution, accurate depth and vivid colours. The HD-20 supports H.264/H.265 video codecs, providing seamless motion images under low bandwidth conditions. Its impressive autofocus technology makes this camera an excellent choice for any application.

**Best for:** Live streaming, telehealth, webcasting.



## CC030 PTZ Camera Controller

A professional-standard controller for smooth remote operation of multiple PTZ cameras. Featuring flawless functionality and a broad range of connectivity options, this beautifully engineered controller helps you stay one step ahead of your live or recorded broadcasts and live streams.

**Best for:** Multi-camera productions and live events of all types.





## CC2000 Budget PTZ Camera Controller

A lower-cost option, this IP-based PTZ camera controller features variable speed control and camera switching and is fully compatible with most PTZ cameras.

**Best for:** Multi-camera productions and live events of all types.



## CD200 4K USB 3.0 Capture Card

Converts HDMI input to USB 3.0 at up to 4K - 2160 30P or 1440 60P. Enables HDMI devices to be used for PC-based applications such as Zoom or Microsoft Teams. HDMI pass-through at up to 216 60P. Lightweight, compact and reliable.



## Personal collaboration webcams

Webcams are devices for personal collaboration to use with apps such as Zoom or Microsoft Teams. If you regularly attend or host virtual meetings, creating a camera setup that works well for you and those you communicate with is essential.

A relatively new category of webcam is the personal video bar that include a microphone and speaker. Most webcams are easy to connect and use. They connect via USB and most feature plug-and-play setup.

While portable devices have a built-in camera, a dedicated webcam or personal video bar will provide a better image and will show you at your best.

Here are some of the features and performance specs that you should consider:

- As with all cameras, the best quality images are produced by a combination of a high performance lens, sensor and image processing. For example, not all cameras of the same resolution will provide the same level of image sharpness, colour accuracy and low noise in low lighting conditions
- Full HD resolution is sufficient for most webcam applications
- Ultra High Definition (UHD) or 4K resolution will provide a better image on very large screen sizes if you are using videoconferencing software that supports UHD.
- Webcams typically use a fixed wide angle lens. Some provide a digital zoom so you can adjust your framing manually. Webcams and mini video bars with 4K resolution will maintain better image quality when using a higher digital zoom magnification.
- The most advanced webcams feature Electronic Pan, Tilt and Zoom (ePTZ) that automatically adjusts the framing for the subject. This makes optimum framing super-easy and is very beneficial if you need to move around while participating in an online meeting
- Your camera should feature a built-in high-quality microphone that allows you to be heard clearly by others
- Personal video bars have an in-built speaker that's optimised for voice. Some also feature an in-built video light that provides even and flattering lighting of your face
- You should make sure that you choose a camera that is compatible with your computer's operating system and the software application you will use for video collaboration.



## APT AV webcam and personal video bar products

### VC300 All-in-one mini video bar

A lightweight, all-in-one personal desktop video bar featuring an integrated 1080P HD camera, speaker, microphone and foldable fill light. This plug-and-play personal video bar can be easily installed onto your LCD or PC monitor, or alternatively, be placed on your desk or tripod.

**Best for:** Video meetings and webinars



### WC201 4K EPTZ Auto Framing Camera

Advanced ISP processing algorithms deliver vivid hi-res images for an excellent virtual meeting experience. Featuring 4K resolution and two built-in omnidirectional microphones, this plug-and-play personal ePTZ camera is durable, reliable and easy to install.

**Best for:** Video meetings , webinars and multi-participant videoconferences



### WC104 Full HD Webcam

With flawless functionality and superior performance, this plug-and-play webcam features a high-quality CMOS sensor for clear and vivid video capture. Its wide-angle lens and built-in audio system make it an ideal choice for personal collaboration.

**Best for:** Video meetings and webinars

[Visit our website](#) to view the complete range of APT AV camera solutions.







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