



**AT&T Connect<sup>®</sup>**

## **Video conferencing functional and architectural overview**

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# 1. Introduction

AT&T Connect incorporates powerful multi-point video conferencing capabilities that can help employees, customers, and partners, collaborate more effectively and closely from virtually wherever they're located.

## Solution highlights

- Fully integrated multipoint voice, data, and video conferencing solution.
- H.264 video codec for superior image quality.
- Existing AT&T Connect customers can activate video capabilities quickly and easily.
- Delivers professional interactive video collaboration experience from a desktop, laptop, tablet, or handset in the office, at home, on the way, or in a conference room.
- Simple and intuitive control of video transmission and image layouts.
- Supports up to six video streams based on the “latest speaker” algorithm.
- Provides customer settings to control the permitted bandwidth for video in AT&T Connect conferences.
- No special firewall configurations required: uses standard outbound port (:80 or :443), the same as a regular web browser.
- Robust distributed server architecture routes real-time communication streams in a highly scalable, fault-tolerant, bandwidth-efficient manner with low video delay.
- Special techniques and algorithms for optimizing bandwidth usage and avoiding network congestion.
- Last-mile bandwidth control algorithm that lets participants stay in the conference and view video according to their network condition.
- Provided as part of the AT&T Connect service offering with no need for on-premises components.



## Video capabilities

### How do you enable video during a conference?

Video conferencing is integrated with AT&T Connect. No special scheduling or IT preparations are required to activate video during web conferences, as long as the system administrator has enabled video for the participant.

If video is not available during a conference, the host or active presenter can select **Conference Settings** in the **Conference** menu and check **Allow the use of video** to enable video transmission. Once enabled, the video icon and menu options will appear in the Participant Application interface for participants with supported cameras connected to their workstation.

The screenshot shows a 'Conference Settings' dialog box with the following sections and options:

- Whiteboard**
  - Allow all participants to draw on the whiteboard
  - Allow only participants in the broadcast group to draw on the whiteboard
- Video, Audio, Recording**
  - Allow participants to record locally
  - Allow the use of video (highlighted with a red circle)
  - Allow voice over computer (VoIP)
- Policy**
  - Allow notes among participants
  - Allow participants to send notes to presenters
  - Allow the use of emoticons
  - Allow participants to insert materials (relevant for PC users only)
  - Allow participants to view the Materials list (relevant for PC 9.5 users only)
  - Allow participants to view the Participants list
  - Play entry/exit tones

At the bottom, there is a note: '\*Some settings may not be configurable due to company policy.' and buttons for 'OK' and 'Cancel'.

**Note:** This is a per-conference setting and at the conclusion of the conference it will reset to the default value.

If the option to permit the use of video is not available (the feature may be restricted as a company policy), participants should contact AT&T Support to see if video can be enabled for their account. If allowed, the feature will be activated.

### Who can transmit video during the conference?

During a web conference, if video is allowed, all the connected participants who have a video camera can start transmitting their video. Since the number of allowed video streams in a conference may be less than the number of participants who want to share their video, AT&T



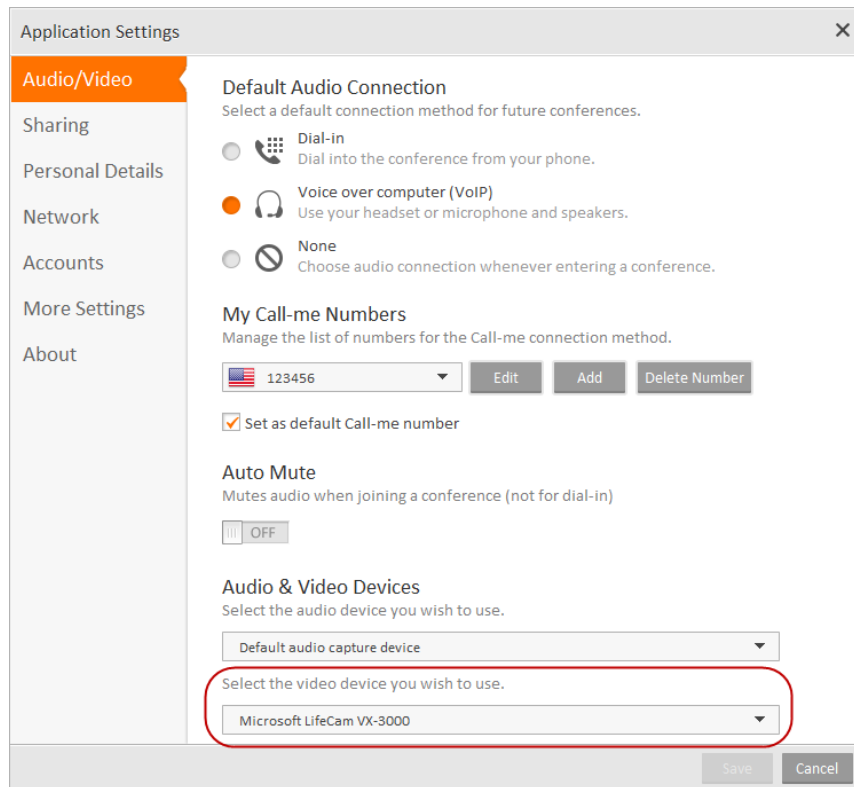
Connect uses a “latest speaker” algorithm to prioritize participant videos according to the last time they spoke during the conference.

Clients that support transmitting and receiving video:

- PC
- Mac® clients
- iOS® (iPad® & iPhone®)
- Android™ handsets & tablets

#### Notes:

- The PC clients v9.5 (or older) show a "busy" message once there is no room for additional videos. The new clients (Mac, iOS, Android) allow all the participants to register to transmit video, and then transmit the video when they are one of the latest speakers.
- If your device supports more than one video device, you can choose your preferred video device. In the **Conference** menu select **Application Settings** and then open the **Audio/Video** tab. Under Audio & Video Devices, choose the video device you want to use.

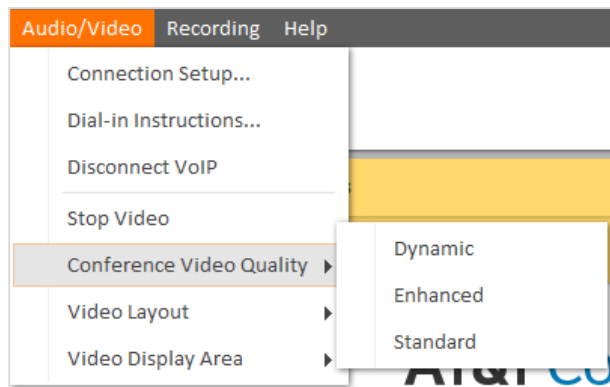




## Control the video quality

The conference host or presenter can control the quality of each video stream (from the PC only). The video quality setting controls the bit rate of the video image for each participant. By default, Dynamic quality is selected so that the system chooses the best bit rate based on the “latest speaker” algorithm and the number of current videos in the conference. The host can force Enhanced quality to improve the quality of each image, or Standard quality to compromise the video quality in order to display additional video panes.

- **Dynamic** (default)—each video window requires 80-400 Kbps, depending on the speaker order. The latest speakers transmit at a higher bit rate.
- **Enhanced**—each video window requires ~250 Kbps and all participants transmit high-quality video.
- **Standard**—each video window requires ~80 Kbps. All participants transmit lower-quality video and six videos are allowed in a conference, without requiring an increase in the AT&T Connect customer’s bandwidth.



**Note:** We recommend using VoIP for audio when you take part in a video conference for a better video and audio lip sync experience.



## Permitted video bandwidth

Each AT&T Connect customer can define the permitted video bandwidth in the organization. The permitted bandwidth is the total number of Kilobits per Second (Kbps) that the server sends to each participant. The table below contains the bit rate of each video window that is being transmitted. Higher video bit rate allows AT&T Connect to transmit higher-resolution and frames-per-second video.

The media engine constantly adjusts the resolution and number of frames per second according to the conference settings and actual network conditions.

### How to read the table

Focus on the permitted bandwidth setting in your organization, according to the video quality selected by the conference host. You can see the bit rate for each video stream according to the speaker order and the number of video streams (1-6).

#### Dynamic Video Quality (Default) in Kbps

	Permitted Video BW (Kbps)			
	Up to 1.5	Up to 1	Up to 750	Up to 500
1	500	500	500	500
2	500 500	500 500	450 300	300 200
3	500 500 500	500 300 200	350 250 150	250 150 100
4	500 500 300 200	400 250 200 150	300 200 150 100	200 140 80 80
5	500 350 250 200 200	350 250 200 100 100	250 150 150 100 100	160 100 80 80 80
6	400 250 250 200 200 200	350 200 150 100 100 100	200 150 100 100 100 100	100 80 80 80 80 80

#### Standard Video Quality in Kbps

	Permitted Video BW (Kbps)			
	Up to 1.5	Up to 1	Up to 750	Up to 500
1	80	80	80	80
2	80 80	80 80	80 80	80 80
3	80 80 80	80 80 80	80 80 80	80 80 80
4	80 80 80 80	80 80 80 80	80 80 80 80	80 80 80 80
5	80 80 80 80 80	80 80 80 80 80	80 80 80 80 80	80 80 80 80 80
6	80 80 80 80 80 80	80 80 80 80 80 80	80 80 80 80 80 80	80 80 80 80 80 80





**Enhanced Video Quality (Enhanced) in Kbps**

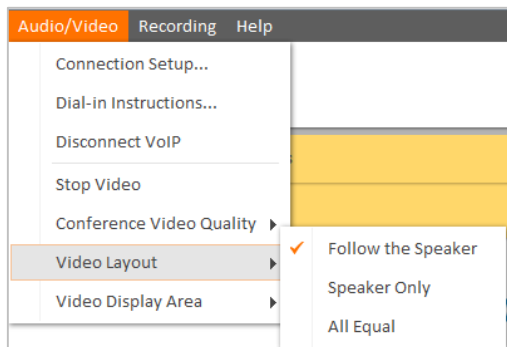
Permitted Video BW (Kbps)				
	Up to 1.5	Up to 1	Up to 750	Up to 500
1	250	250	250	250
2	250 250	250 250	250 250	250 250
3	250 250 250	250 250 250	250 250 250	NA
4	250 250 250 250	250 250 250 250	NA	NA
5	250 250 250 250 250	NA	NA	NA
6	250 250 250 250 250 250	NA	NA	NA

**Notes for PC Client v9.5 (and below):**

- PC client v9.5 (and below) supports up to four large or six small video windows.
- Since you cannot change the bit rate during a conference, the system should transmit at the lowest value shown in the table. Mac, iOS and Android will align to the values shown in the table.

## Video layout

Participants can set the video layout in their particular AT&T Connect client applications. AT&T Connect allows up to six simultaneous, standard-definition video streams based on the permitted bandwidth and video quality.



Different AT&T Connect clients have different video layouts:

- **Speaker only**—displays only the latest speaker.
- **All equal**—displays all the video streams in the same size.
- **Follow the speaker**—displays the current speaker in a larger frame than the other streamed participants.

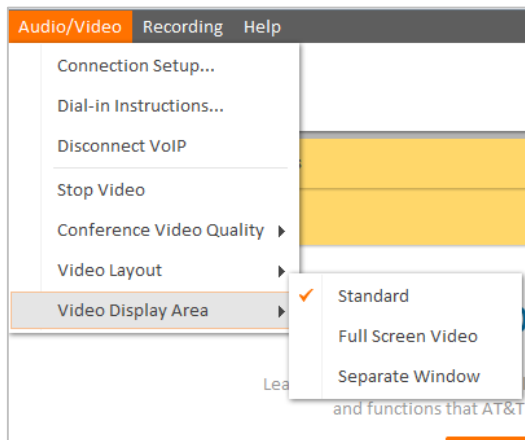


Client	Layouts
PC v9.5 and below	<ul style="list-style-type: none"> <li>All equal</li> </ul>
PC v 10.0 and above	<ul style="list-style-type: none"> <li>Speaker only</li> <li>All equal</li> <li>Follow the speaker</li> </ul>
Mac, IOS, Android	<ul style="list-style-type: none"> <li>All equal</li> <li>Speaker only</li> <li>Follow the speaker</li> </ul>

## Video display

Participants using desktop applications (PC, Mac) can set how they want to display their video. The display options are:

- **Standard**—displays the Video panel above the Participants list.
- **Full Screen Video**—displays the Video panel in full-screen mode.
- **Separate Window**—detaches the Video panel and displays it in an adjustable, movable window.



## Control management

This table summarizes the different levels of control available to hosts and participants.



User	Control
<b>Host</b>	<ul style="list-style-type: none"><li>• Enables/Disables video usage during a conference</li><li>• Sets video quality:<ul style="list-style-type: none"><li>• Dynamic</li><li>• Enhanced</li><li>• Standard</li></ul></li></ul>
<b>Participants</b>	<ul style="list-style-type: none"><li>• If multiple webcams are available, can choose video device</li><li>• Start/stop transmitting own video</li><li>• Set video layout:<ul style="list-style-type: none"><li>• Speaker only</li><li>• All equal</li><li>• Follow the speaker</li></ul></li><li>• Set video display (PC + Mac):<ul style="list-style-type: none"><li>• Standard</li><li>• Full Screen Video</li><li>• Separate Window</li></ul></li></ul>



## 2. Usage scenarios

AT&T Connect Video Conferencing can typically be used in any of the scenarios described below.

### One-on-One mentoring, interviewing, consultation

Video-based job interviews or professional mentoring sessions are personal exchanges with a powerful emotional element. Interviews may benefit from live video's ability to transmit body language and emotional reactions. We recommend using the Enhanced mode, to help yield a more natural interaction and intuitive, effective communication.

When sharing an application or using the whiteboard, we recommend you use the Standard video window. This will leave adequate whiteboard space to allow participants to view the application or the whiteboard content being shared.

### Team/business meeting

Most meetings fall into these categories and can include:

- Project kickoffs, steering committees, and updates
- Ad-hoc brainstorming and troubleshooting
- Business meetings with customers, partners, or vendors

These meetings can bring together a handful of coworkers, or involve tens of participants from related teams. Because these meetings involve the active participation of several users, widespread video coverage is crucial and using the **Follow the Speaker** layout helps you achieve the best meeting experience.

### Training sessions and web seminars

These are classroom training and instructional meetings where there is one primary speaker and limited interaction from other participants. Presenters can also demonstrate physical equipment and processes in real-time, addressing questions as they arise.

Such conferences can be held using AT&T Connect with the **Broadcast Mode** feature. When using this feature, the presenter and the other speakers who are part of the "Broadcast Group" can broadcast video streams to all other endpoints in the conference. If additional participants are added to the Broadcast Group, they will be able to share their video as well (based on the standard behavior, and up to the number of allowed streams per conference).



## Dual monitors

The AT&T Connect Participant Application lets participants extract the video pane from the Participant Application located on one monitor and move the video panel to another. In this way, the video panel does not take away space from either the Participants list or the whiteboard. Participants can enlarge the video panel in the second screen to enjoy a panoramic view of the conference (as shown below).





## 3. Architecture

Each AT&T Connect client application connects to an AT&T Connect real-time conferencing server, which is part of a globally distributed network of interconnected communications servers hosted by AT&T. The AT&T Connect client application transmits a participant's video from an attached webcam. The client application encodes and transmits a single outbound H.264 video stream to its connected server. The client application receives multiple H.264 streams from that server, decodes them, and displays them on the client screen, along with any whiteboard data or shared applications presented during the web conference.

The AT&T Connect communications server distributes incoming H.264 video streams to other servers and other connected clients in the conference. If network congestion causes the video stream for the outgoing video for a specific participant(s) to overflow its sending-queue, the server automatically thins or suppresses the outgoing video stream for this participant(s) until the congestion clears, or more bandwidth becomes available.

The AT&T Connect communication servers only distribute video streams to other servers and to other connected clients in the conference. The services do not process or transcode the video streams. This architecture is intended to minimize delay for the media transmission between all participants.



## 4. Deployment as hosted service offering

AT&T Connect video conferencing is deployed as a purely “hosted” service in which the participants’ client applications connect to the AT&T Connect conferencing servers over public Internet connections (all conferencing traffic is encrypted end-to-end for secure transmission).

Customers don’t need to deploy any special hardware on their premises, other than standard USB desktop webcams. Enabling AT&T Connect on a hosted basis requires no additional networking infrastructure on the customer premises.

However, the customer’s site LAN must provide sufficient bandwidth to support the required video conferencing traffic. The customer must also have sufficient internet WAN access available from those premises (users who are working remotely from home must have a sufficiently capable broadband connection through their residential ISP). The default permitted video bandwidth per client is 500 Kbps. The bandwidth limitation can be increased up to 1.5 Mbps per customer based on request.

By default, the hosted service doesn’t utilize any QoS measures; video streams are delivered on a “best-effort” basis. Suitable internet WAN bandwidth generally provides acceptable image quality, however, there is no SLA and video quality varies with internet traffic congestion and other factors beyond the control of AT&T. If a given participant’s network connection has insufficient bandwidth, the AT&T Connect software will automatically attempt to reduce that participant’s video transmission bit rate (yielding a lower-quality video image). If available bandwidth is still insufficient, the system will automatically suspend video transmission from the participant. This should not disturb video transmission from of participants equipped with better network connections.

Customers with hybrid deployments of communication servers on premises may experience less WAN traffic for video and improved video quality (especially delay) between on-site participants.



## 5. Security

Real-time conferencing streams are protected with 128-bit end-to-end SSL encryption. Specifically, all streams (audio, video, whiteboard data, application sharing, screen images, and so on) pass from the AT&T client software (on the participant's desktop), through the AT&T Connect conferencing servers, and on to the other participant PC client applications. The streams are not decrypted during this transit.

The real-time data streams passing between AT&T Connect servers, and between servers and connected clients, are compressed and encoded for bandwidth efficiency and added security before encryption is applied.

The architecture of the AT&T Connect solution allows participants who are located behind different firewalls to share their live video with no need for a dedicated internet connection. The AT&T Connect client application requires only a single outbound port (usually port 80 or port 443) to be opened on the corporate firewall. This is the same requirement typically required for web navigation using a conventional web browser.





## 6. System requirements

For the system requirements and supported devices, see the *AT&T Connect System Requirements* document.