CHAPTER 2

Video Infrastructure Components

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Video deployments continue to expand as enterprises focus on decreasing travel, increasing productivity, and expanding video in Unified Communications platforms. As the Unified Communications and TelePresence markets continue to grow and mature, the line between the two markets continues to blur. Both TelePresence and Unified Communications video devices employ many of the same protocols and codecs, providing full integration and the ability to utilize infrastructure devices from both solutions.

Both Cisco TelePresence and Cisco Unified Communications solutions have expanded dramatically with internal development and strategic acquisitions by Cisco.

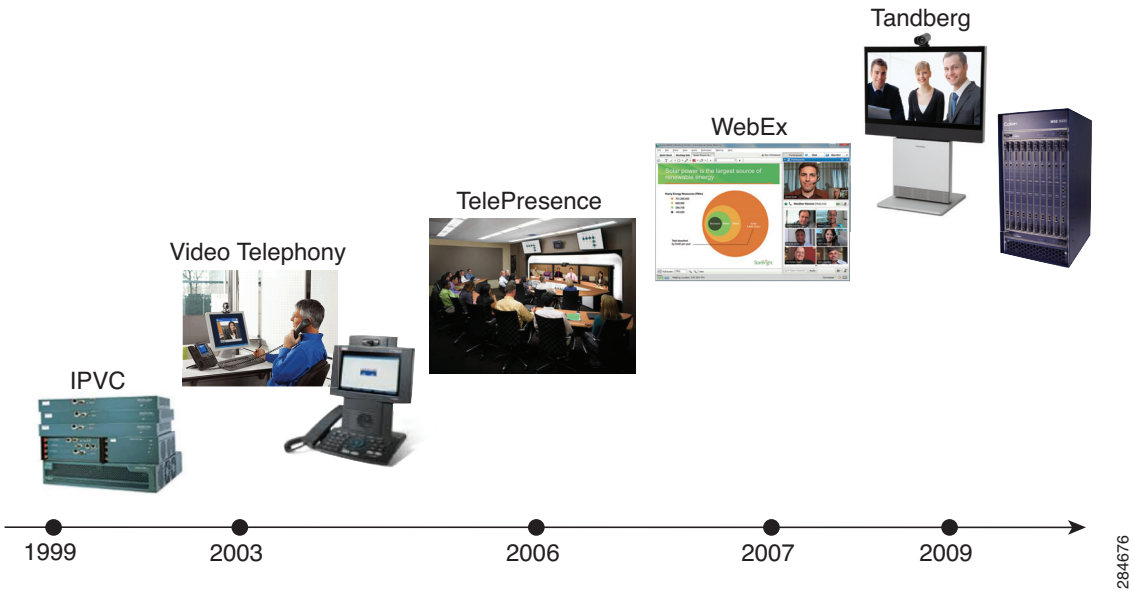
Cisco TelePresence and Unified Communications

Cisco initially entered the two-way interactive video space in late 1999 through an OEM relationship with Radvision. The Radvision relationship brought to market a number of Cisco-labeled videoconferencing infrastructure products, including the Cisco IPVC Multipoint Control Units (MCUs) and IPVC Gateways. A few years later Cisco added video support to its voice call control agent, Cisco Unified Communications Manager (Unified CM), and Cisco also added a number of video telephony products that expanded its video offering to PC-based soft clients and videophones.

In late 2006 Cisco introduced Cisco TelePresence, which added a complete portfolio of high definition (HD) conferencing products, including endpoints, a multipoint switch, TelePresence management, and a recording server. Cisco TelePresence took off and rejuvenated the videoconferencing market, making HD the norm.

With the acquisition of WebEx in 2007, Cisco added more Unified Communications products to its portfolio, including a new video soft client. Finally, in 2009 Cisco acquired Tandberg. At the time of the acquisition Tandberg was the number-one videoconferencing vendor in the market, with the most comprehensive product line in the industry. Combining Cisco TelePresence with the Tandberg portfolio instantly gave Cisco the best-of-breed TelePresence products from the desktop to the boardroom. Figure 2-1 illustrates the progression of interactive video within Cisco's product portfolio.

Figure 2-1 Progression of Cisco Two-Way Interactive Video Products



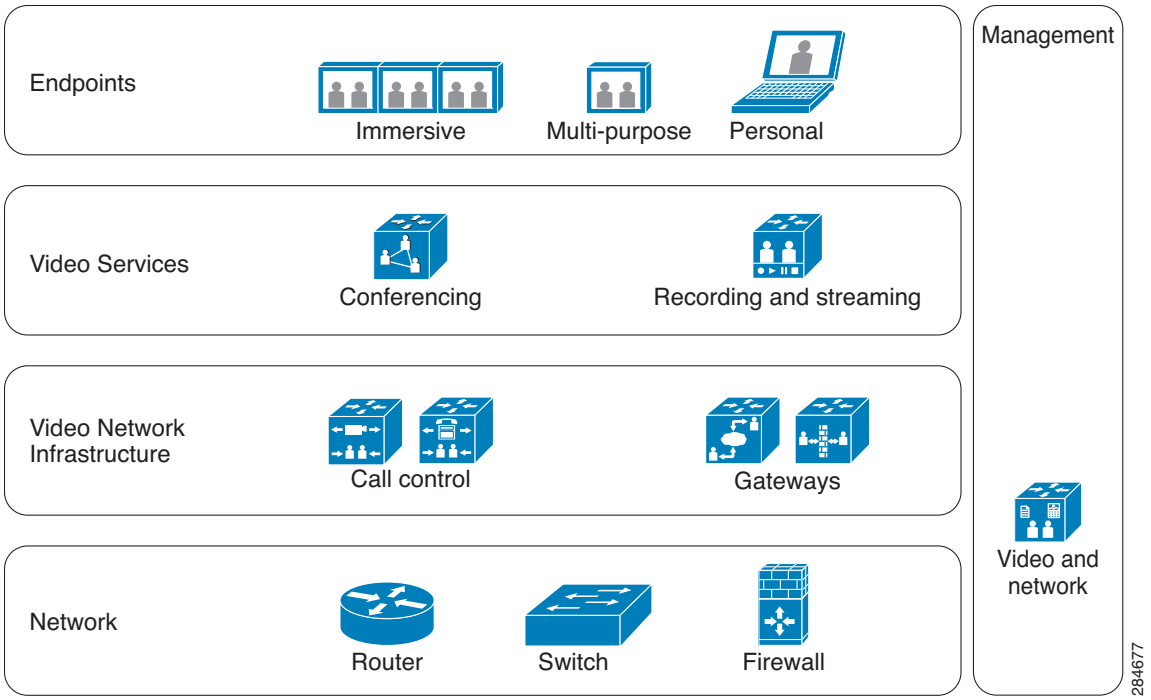
Video Architecture

All interactive video architectures consist of five categories, as shown in Figure 2-2:

- Endpoints, page 2-3
- Video Services, page 2-4
- Video Network Services, page 2-6
- Management, page 2-8
- Network, page 2-9

Each category contains devices that provide a specific function for the video deployment, but devices from all categories are not required or present in all video deployments.

Figure 2-2 Video Architecture



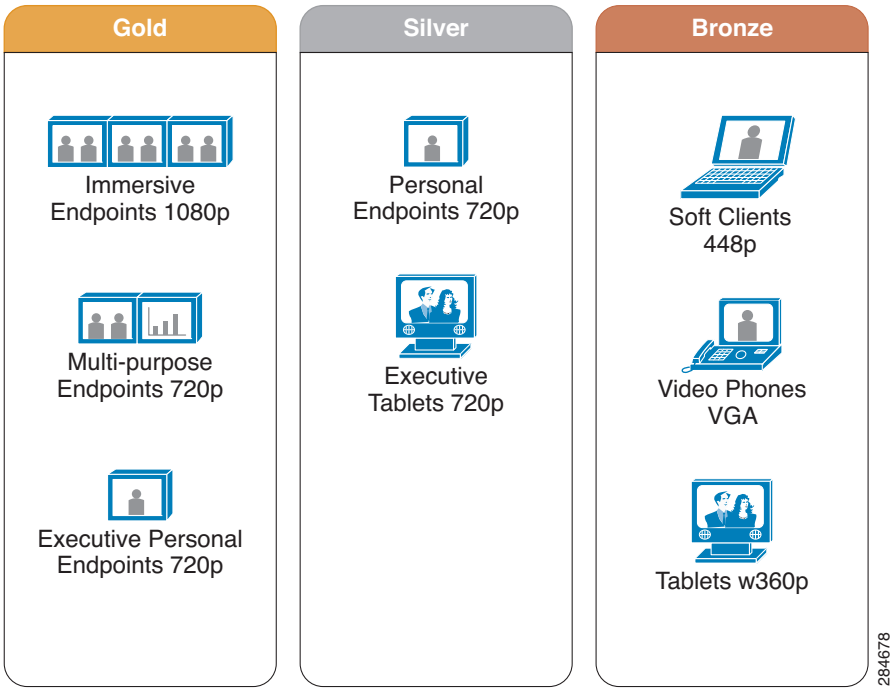
Endpoints

An endpoint consists of a screen, microphone, speakers, and one or more video and audio processing devices called codecs. These components are usually combined into a single unit that can range from a phone with a screen (at the basic end), to a large TV-like device, to an immersive multi-screen system with integrated tables and seating. Cisco provides a large number of video endpoints ranging from video-enabled tablets to multi-screen immersive endpoints.

Different types of video endpoints provide different user experiences and in many cases different feature sets. Each video endpoint supports multiple resolutions, but not all video endpoints support the same set of resolutions. For example, a multi-screen immersive endpoint might support high definition resolutions up to 1080p at 30 frames per second (fps) while a video-enabled tablet might support high definition resolutions up to only 720p at 30 fps. All video endpoints have a core set of features that usually consist of the ability to send and receive live audio and video, and send and receive shared content. Depending on the endpoint type, advanced features such as integrated conferencing or the ability to support additional video and audio sources may be available.

It is important to remember that higher resolutions consumes more network bandwidth. In most deployments, customers choose to limit the higher resolutions based on the endpoint type or user type. Video deployments always start with the type of video endpoints being deployed and the resolutions being supported. It is not uncommon to see customers create multiple classes of video that directly correlate with the supported resolution or user type. Classes are often based on a minimum level of service provided to each endpoint type or user type, and the classes may contain different maximum resolutions for the same type of endpoint depending on the user. Figure 2-3 shows an example of possible video classes deployed in an enterprise.

Figure 2-3 Example of Possible Video Classes



Video Services

Video services consist of two subcategories:

- Conferencing, page 2-4
- Streaming and Recording, page 2-5

Video services are not required but are an important part of any video deployment. Almost all video deployments use one or more of these services.

Conferencing

Conferencing devices allow three or more video devices to participate in a meeting at the same time. Some conferencing devices can also provide management of conferencing resources, thus allowing conferencing ports to be used more efficiently. Cisco provides conferencing devices that support switching and transcoding.

Switching forwards incoming audio and video without manipulating the video media itself. Switching platforms essentially switch video from one endpoint to another and require all video endpoints in a meeting to send and receive the same resolution. Switching devices offer a cost-effective and scalable solution for video deployments supporting video endpoints with the same resolution sets and not requiring advanced video features such as continuous or active presence.

Transcoding is the encoding and decoding of video media streams between endpoints. Transcoding devices offer support for video endpoints participating in the same meeting with different resolutions, continuous or active presence, and other advanced conferencing features. They allow for maximum conferencing flexibility and feature sets.

Cisco provides multiple video conferencing platforms that support both switching and transcoding. Table 2-1 shows which devices support switching or transcoding.

Table 2-1 Conferencing Platforms for Switching and Transcoding

Conferencing Platform	Switching	Transcoding
Cisco TelePresence Multipoint Switch	Yes	No
Cisco TelePresence Server	No	Yes
Cisco TelePresence MCU 4000 Series and MSE 8000 Series	No	Yes
Cisco Integrated Services Router (ISR) G2	No	Yes

Cisco TelePresence Conductor is a new type of conferencing device that has the capability to manage conferencing ports intelligently. Cisco TelePresence Conductor serves as the front end for all conferencing devices and manages the distribution of conferencing requests. Cisco TelePresence Conductor enables large pools of distributed conferencing resources to be allocated dynamically instead of being limited to conferencing devices with static configurations.

Streaming and Recording

Streaming and recording devices provide the ability to record, replay, and stream important meetings, messages, or updates. Meetings can also be streamed to allow a large number of users to participate in a meeting as view-only participants. Cisco offers one recording and streaming server for TelePresence and Unified Communications video endpoints, and one recording-only server for TelePresence endpoints only, as follows:

- Cisco TelePresence Content Server (TCS)

  The Cisco TCS is available as an appliance or a blade for the Cisco TelePresence Media Services Engine (MSE) chassis. Cisco TCS provides live recording, streaming, and playback of video meetings with content from any TelePresence or Unified Communications video endpoint. Live streams and recordings can be viewed with standard QuickTime, RealPlayer, and Windows Media Players.

- Cisco TelePresence Recording Server (CTRS)

  The CTRS is a server-based platform that provides studio mode and event recording and playback for Cisco TelePresence System 3*x*10, 1300, 1100, and 500 endpoints. Recordings can be viewed in native 1080p or 720p resolution from any Cisco TelePresence System 3*x*10, 1300, 1100, and 500 endpoints. or with QuickTime, RealPlayer or Windows Media Player in CIF format.

Video Network Services

Video network services also consist of two subcategories:

- Call Control, page 2-6
- Gateways, page 2-7

Video network services offer essential services such as call routing and access to external video networks.

Call Control

The main functions of a call control device are endpoint registration, call routing, monitoring, and maintaining connections. Call control platforms also form the base for network dial plans and options for call admission control. Cisco offers two main call control platforms for interactive video: Cisco Unified Communications Manager (Unified CM) and Cisco TelePresence Video Communication Server (VCS). Unified CM has been used for call control and provisioning for some of the largest IP voice deployments in the world. Unified CM is also the call control and provisioning platform for the original Cisco TelePresence and Cisco Unified Communications devices.

Cisco VCS was designed to provide call control for H.323 and Session Initiation Protocol (SIP) video environments with advanced video features to support large-scale deployments. VCS can be deployed in either of the following ways:

- VCS Control — Provides call control for an enterprise video deployment.
- VCS Expressway— Supports Network Address Translation (NAT) and firewall traversal, extending video outside the enterprise for business-to-business communication or internet-based remote workers.

Each call control platform can be deployed independently or as an integrated solution for existing and new customers. Unified CM supports direct registration for all Unified Communications video endpoints and most TelePresence endpoints, while VCS supports most TelePresence endpoints but does not support Unified Communications endpoints. Table 2-2 lists the call control support for each video endpoint type or series.

Table 2-2 Call Control Support Per Video Endpoint

Endpoint	Unified CM	VCS
TX9000 Series	Yes	No
CTS 3000 Series	Yes	No
CTS T Series	No	Yes
TX1300 Series	Yes	No
CTS MX Series	Yes	Yes
CTS Profile MXP Series	Yes	Yes
CTS Profile Series	Yes	Yes
CTS EX Series	Yes	Yes
CTS MXP Series	No	Yes
CTS 1100	Yes	No
CTS 500	Yes	No

Table 2-2 Call Control Support Per Video Endpoint (continued)

Endpoint	Unified CM	VCS
Cisco Jabber Video for TelePresence (Movi)	No	Yes
CTS E20	Yes	Yes
9900 Series	Yes	No
Cisco Unified Personal Communicator	Yes	No
Cisco Jabber	Yes	No
Cius	Yes	No

Gateways

Video gateways provide access from one network to another. Cisco provides the following video gateways:

- ISDN gateways

  ISDN gateways provide TelePresence and Unified Communications video endpoints with connectivity to legacy H.320 video endpoints. ISDN gateways are often referred to as H.320 gateways.

- Advanced media gateways

  Advanced media gateways provide communication between Microsoft Office Communications Server 2007 R2 or Microsoft Lync Server users and standards-based TelePresence and video conferencing devices.

- IP-to-IP gateways

  Cisco offers the following IP-to-IP gateways that provide business-to-business (B2B) connectivity as well as support for Internet connectivity for video endpoints:

  - Cisco VCS Expressway

    VCS Expressway is an appliance that works in conjunction with the VCS Control to provide firewall traversal using H.460.18, Assent, or SIP protocols. It supports Traversal Using Relay NAT (TURN) servers. VCS Expressway also provides endpoint registration and signal and media interworking for SIP and H.323 video devices across the public Internet.

  - Cisco Unified Border Element

    Cisco Unified Border Element is available on a number of Cisco router platforms and provides a network-to-network demarcation point for signaling interworking, media interworking, address and port translations, billing, security, quality of service (QoS), and bandwidth management. Service provider TelePresence Exchanges often implement Cisco Unified Border Element as an IP-to-IP gateway because it provides a demarcation point and adds security between customer networks.

  - Cisco Intercompany Media Engine (IME)

    The Cisco IME is a server-based platform that provides business-to-business connectivity when used in conjunction with the Cisco ASA 5500 Series Adaptive Security Appliances and Cisco Unified CM 8.*x* or later releases.

Management

Video management platforms perform multiple functions such as scheduling, video endpoint and infrastructure monitoring, and in some cases provisioning or tracing of media flows across the network. Cisco provides three main management platforms for TelePresence and Unified Communications video:

- Cisco TelePresence Management Suite, page 2-8
- Cisco TelePresence Manager, page 2-8
- Cisco Prime Collaboration Manager, page 2-8

Cisco TelePresence Management Suite

The Cisco TelePresence Management Suite (TMS) is delivered as a management appliance or software that can be loaded on a server. Cisco TMS provides one-button-to-push (OBTP) call launching, scheduling, monitoring, and provisioning for TelePresence endpoints registered with the VCS. The TMS also provides OBTP, scheduling, and statistics for TelePresence endpoints registered to Unified CM. TMS also extends scheduling and some monitoring features to third-party telepresence and video endpoints such as Polycom and LifeSize.

The TMS can be integrated with enterprise calendaring systems such as Microsoft Exchange for scheduling with tools such as Microsoft Outlook. TMS also has a built-in web scheduling interface that enables users to schedule meetings directly through TMS.

Cisco TelePresence Manager

Cisco TelePresence Manager is a server-based platform that was originally developed to provide OBTP call launching, scheduling, and management for Cisco TelePresence endpoints. Cisco TelePresence Manager also performs scheduling for telepresence endpoints, including third-party endpoints that are not registered to Unified CM.

Cisco TelePresence Manager can be integrated with enterprise calendaring systems such as Microsoft Exchange for scheduling with tools such as Microsoft Outlook. Unlike TMS, Cisco TelePresence Manager does not have built-in web-based scheduling.

Cisco Prime Collaboration Manager

Cisco Prime Collaboration Manager is a server-based network management platform that allows real-time monitoring and analysis of medial flows from Cisco Medianet-enabled devices. Cisco Medianet devices are routers and switches that support Cisco Mediatrace, which maps the path media takes through the network and which can be used only with endpoints that contain the Cisco Media Services Interface (MSI). The MSI is a software component that is embedded in video endpoints and collaboration applications, and it provides advanced features such as auto-configuration of network ports and initiation of Mediatrace. Cisco Prime Collaboration Manager also supplies historical reporting and a view of utilization and problem trends as well as critical outages.

Network

A properly designed network is a key component of any video design. Using existing network protocols, features, and tools simplifies video deployments and helps ensure a successful deployment. Interactive video devices are sensitive to loss, so it is imperative to keep loss to a minimum. Identifying video traffic on the network and ensuring end-to-end Quality of Service (QoS) provides the most predictable video experience.

With the use of protocols such as Cisco Discovery Protocol (CDP), which is a Cisco proprietary Data Link Layer protocol used to share information between network devices, video endpoints can be identified automatically, thus allowing their QoS markings to be trusted, traffic to be placed in the appropriate Virtual Local Area Network (VLAN), and packets to be queued appropriately. Additionally, VLANs can be used to insulate video traffic from other network traffic and to provide additional security.

Video-aware networks allow for real-time traffic analysis for troubleshooting network issues in real time. Tracking video flows through the network and identifying the exact point in the network where loss is occurring is essential in today's networks where video flows between two endpoints can take different paths across the network, depending on network conditions. Using Cisco Medianet-enabled devices not only allows for real-time traffic analysis but also provides utilization data that helps avoid network oversubscription.