Accelerating Video Using Cisco Wide Area Application Services

Most enterprises understand the power of video-based information delivered directly to their employees in the workplace. They also understand that the technical quality of that video presentation, in addition to content quality, has a significant effect on the video's ability to engage the viewer and impart the message. Previous efforts to deliver high-quality video messaging, either live or recorded on video tape or DVD, have proven expensive, time consuming, difficult to control, and difficult to maintain. Network-based delivery of live video and video on demand (VoD) require significant bandwidth and dedicated content distribution networks.

Cisco® Wide Area Application Services (WAAS) provides a simple and efficient solution for delivering high-quality live video and VoD throughout the enterprise while also providing state-of-the-art WAN acceleration for other TCP-based applications.

Business Video

Most enterprises understand why video is the next-best thing to being there, and often it is even better. Video conveys much of the intimacy and immediacy of seeing someone or something in person, without the expense of travel, and it can let the viewer control the time and place. Video has proven itself as the best way for executives to communicate corporate strategies and achievements to employees, departments to deliver sales and product training, and organizations to help ensure that employees receive training required for regulatory compliance and to monitor employee participation.

Video often is not a low-cost solution, however. Large companies may make hundreds of tape or DVD copies of a program and send them by express mail to offices or departments all over the world, or they may transmit the program by satellite to regional head ends for distribution over the enterprise WAN, at a high cost in WAN bandwidth. The first technique entails sharing and tracking the video; the second, slow downloading for locations whose WAN connections run at T1 speeds or lower, especially if each employee downloads the video individually. Moreover, when DVDs or tapes with proprietary information are released to mail of packaged services, their security is no longer assured, and it is not easy to recall them if information needs to be changed.

For live video, when it is even attempted over a network, low-quality thumbnail-size head shots often have been the only alternative for mass distribution, and even these relative low-bandwidth streams can overwhelm even the largest-capacity networks as increasing numbers of users demand access.

There is an easier way: Video on demand, or VoD, can be transmitted to each location over the WAN at night or when the first user requests the program during the day, and all viewers from then on receive the program from local storage over their LAN. The program goes over the WAN once; viewers see it at LAN speeds, meaning that they can receive full-screen video rather than video in a small, unsatisfactory window. Content can be updated as often as desired, even the next day. High-quality live video can be streamed from the source to every office in the enterprise and split

to serve each requesting user. The cost is low in both distribution expense and bandwidth consumption.

Video: The Most Compelling Way of Communicating

Video, whether live or on demand, is perhaps the premier tool for educating employees about organizational priorities and getting them onboard. It is effective because it brings both intimacy and immediacy to the material being watched. Intimacy is inherent in video because the viewer sees the “whole picture”: participants’ expressions, emphases, and enthusiasms, as well as the details of any objects—for example, in a training video, what the human-machine interface of a product looks like and how to use it. The viewer thus acquires huge amounts of information. Video is versatile. It draws the viewer in, whether the program offers an individual talking, a panel discussion or Q&A session, a presentation that includes slides or demonstrations, or a walk-through of a sales visit. This intimacy makes video especially useful for:

- Executive communications about corporate goals, achievements, changes in direction, and new campaigns: Employees appreciate getting a sense of the person making the announcement, and the executive’s urgency, pride, and priorities come across naturally.
- Sales force and product training: Viewers can return to parts of the video they need to watch again, training can be delivered no matter where the employee is, and the content can be updated frequently. This feature is especially valuable for technology, pharmaceutical, financial, and other industries where products change frequently.
- Employee regulatory compliance training: Viewers can repeat certain sections to make sure they understand them, and the video can display documents along with a person talking to clarify the information. In addition, the delivery system can monitor which employees have seen the material.
- Lectures at educational institutions: Some universities are using video to make copies of lectures and other resources available at any time as an important part of what they offer students and faculty. Podcasting lectures while they are taking place of later for review is already becoming common.

The appeal of video is widely recognized, but its immediacy is not, and immediacy is a crucial part of its usefulness. The material must be delivered in a timely way so it is fresh and accurate: Yesterday’s news loses its value. Video is usually best delivered at the viewers’ convenience: when it fits into their schedules and preferably at their workspaces.

Video is also effective, however, when it is delivered to large groups at scheduled times in a conference room or other controlled environment when that is what the company needs: for example, to report earnings or changes in strategic direction to employees.

Whatever the content, video must be delivered in an affordable way. If new tapes or DVDs must be prepared every time the content changes, the material may not be timely; if this media must then be shipped in large numbers, the method will likely be too costly for video to be widely used. Sending the video natively over the WAN to everybody who should see it can consume prohibitively large amounts of bandwidth.

Video as an Application on the WAN

Cisco WAAS is a comprehensive WAN optimization solution that accelerates applications over the WAN, delivers video to the branch office, and provides local hosting of branch-office IT services. These features enable IT departments to centralize applications and storage in the data center while maintaining LAN-like application performance and rapidly deliver local branch-office IT services while reducing the branch-office device footprint.

Cisco WAAS Software Version 4.1 makes WAN optimization easy to deploy while preserving existing network services; it adds application-specific acceleration, developed and validated in partnership with application vendors; enables efficient delivery of video to the branch office with little effect on bandwidth; and supports local hosting of branch-office IT services on a single virtualized hardware platform.

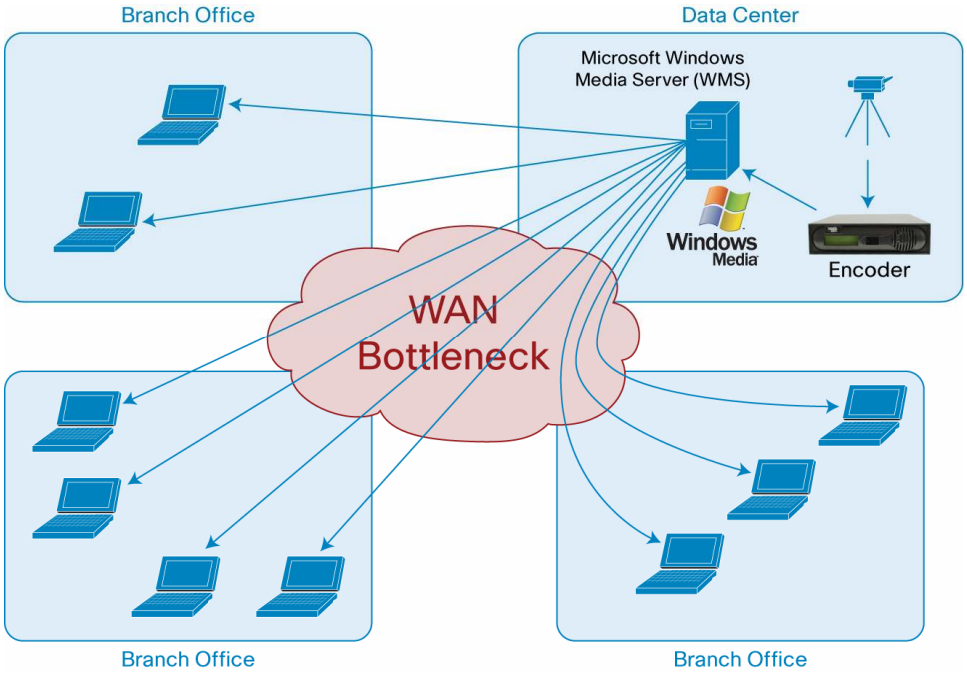
In addition to accelerating and prepositioning VoD to the branch office, Cisco WAAS 4.1 now enables wide-scale delivery of high-quality live video to the branch office by offering automated edge video stream splitting that helps ensure that only one video stream is transferred over the WAN regardless of the number of users in the branch office watching that stream. This feature usually eliminates the need for WAN upgrades to deliver live streaming video to a branch office. The automation feature also eliminates the complex configuration that is required in traditional video delivery systems. In addition, the solution offers server offload capability that can provide a 10X reduction in the number of data center video servers.

Live Video

Delivering high-quality live video events over the WAN is one of the most challenging networking tasks. Such live events typically involve high-ranking executives and expensive production studios and crews, and relay vital business information. There is no “second chance” in such situations. Organizations that do not have multicast-enabled networks, or have a mix of unicast and multicast networks, face significant difficulties in providing high-quality video while accommodating all other active WAN traffic.

Unicast networks in particular pose a serious challenge as congestion on the link from multiple clients attempting to view the live event may result in unacceptable video quality and a disruption of other business-critical applications (Figure 1).

Figure 1. Live Video Unicast WAN Bottleneck



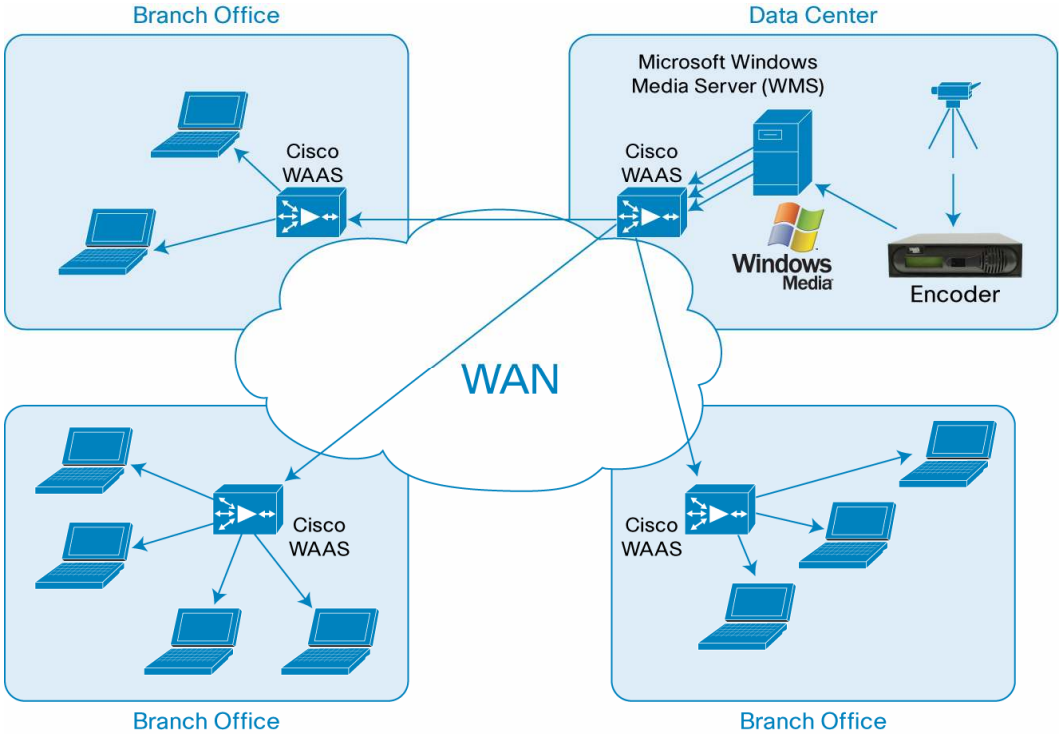
Cisco WAAS 4.1 offers special protocol-level optimizations for Windows Media Technologies (WMT) over Real-Time Streaming Protocol (RTSP) according to specifications licensed from Microsoft. This special optimization is offered in addition to the generic Layer 4 optimization (transport flow optimization [TFO], data redundancy elimination [DRE], and Lempel-Ziv [LZ] compression) currently offered for other video formats and protocols, including VoD applications. This generic optimization covers video over HTTP, Adobe Flash, QuickTime, RealVideo, and any other video protocol delivered over TCP.

The video optimizations provided by the Cisco WAAS 4.1 Video Application Optimizer use automatic stream classification at Layer 7 and do not require any management or coordination prior to or during the video event. This approach helps reduce management overhead, simplifies the production of live video events, and enables each IT and video production group in the organization to concentrate on the task at hand. A client request to join a live Windows Media streaming event is initiated using a TCP connection. This TCP connection request is redirected to the Cisco Wide Area Application Engine (WAE) Appliances using Cisco WAAS, and the Cisco WAAS video policy is applied. Typically, Windows Media Player (WMP) will initially request a User Datagram Protocol (UDP) connection to the video server in the data center. When the Cisco WAAS video application optimizer identifies this request as a request to join a Windows Media live event, it will deny this request for a UDP connection. WMP, as part of its default behavior, will resend the request, this time asking for a TCP connection. This default behavior by WMP is called protocol rollover.

When the live event starts, as soon as the first client connects through Cisco WAAS, the video application optimizer automatically identifies the event as live; communicates the user authentication, authorization, and control commands to the video server at the data center; and, if authorized, delivers the video stream to the client. Any additional clients from that site that request the same live stream will, after authorization, be served locally without incurring additional streams on the wire. The user credentials and access control will always be delegated all the way to the video server, which is the authoritative entity. Each new client request will reuse the existing

incoming stream coming from the WAN for the same stream's URL, creating a splitting effect for the outbound streams (Figure 2). For the incoming accelerated stream, DRE and LZ compression are disabled, reducing resource overhead on the Cisco WAAS WAE devices for the optimized connections.

Figure 2. Live Video Unicast with WAAS 4.1 Video Application Optimizer Live Stream Splitting

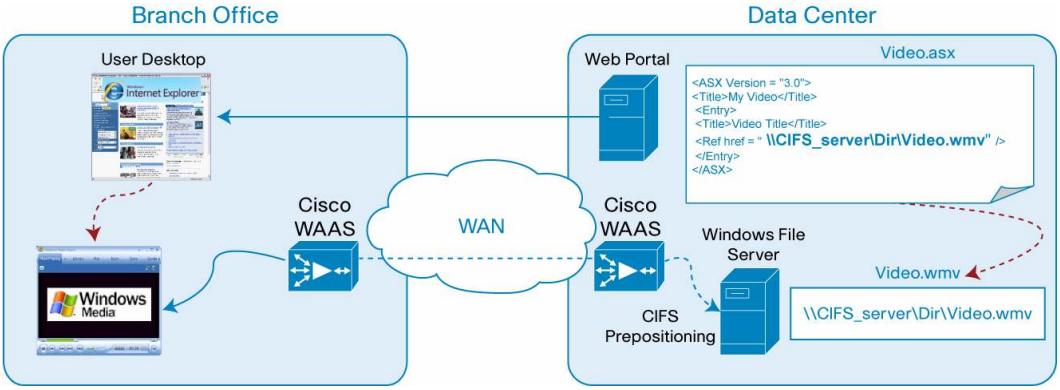


Video on Demand

VoD can also help unify an organization as each viewer in the organization receives the same message whether it is delivered today or next year. VoD can uniformly educate employees about corporate goals and priorities, new products and procedures, regulatory compliance mandates, or any other information that needs to be communicated, providing a sense of intimacy and immediacy between the speaker and viewer that is difficult to achieve in any other medium other than a live interaction.

VoD is typically offered to users by means of a web-based portal at which users can search for and select appropriate content for viewing. Access to and management of the content can be provided in numerous ways, but often the easiest way is to host the usually large, high-quality, high-bit-rate video files on a standard file server. Figure 3 shows how a web portal can be set up to offer VoD access using file-based control of the VoD. In this case, the VoD URL is specified as a Microsoft Common Internet File System (CIFS) file access coded inside a standard Microsoft redirector file (Video.asx) embedded in the web portal. The VoD file itself, physically located on a standard Windows file server, can be prepositioned to the Cisco WAAS WAE devices located at the edge of the network using standard Cisco WAAS CIFS prepositioning directives and using off-peak bandwidth. When the user selects the VoD file for playback, the browser launches Windows Media Player, and the player requests the VoD file. After the Windows file server authenticates and authorizes the user, the VoD file is served from the local Cisco WAAS WAE device using the CIFS file access protocol.

Figure 3. VoD Prepositioning and Access



Although this example illustrates the prepositioning and access of a Windows Media VoD file, the techniques are applicable across all media types that can be viewed using file-based access: Adobe Flash, QuickTime, RealVideo, and any other video protocol.

In addition to the benefits of prepositioning large video files using off-peak bandwidth and the associated network cost savings, CIFS-based access to VoD assets can also provide an easy way for content creators to manage and distribute content using standard file and file share tools with which they are familiar. Access control is also maintained with standard server access methods, such as Microsoft Active Directory, without having to implement special security in the web portal.

Video Optimization Benefits

Cisco WAAS 4.1 provides the capability to optimize video distribution in much the same way it optimizes the delivery of any TCP-based application. However, Cisco WAAS goes beyond optimization of an existing application by providing the capability to deliver an entirely new and potentially valuable service that would not be possible without it: scalable, live, high-quality Windows Media video streaming. As more users request to join the live broadcast and additional splitting of the single incoming live stream occurs, the acceleration benefit becomes a multiple of the number of users without using additional WAN bandwidth.

Additionally, by removing the need to serve and manage a streaming connection to each requesting user, Cisco WAAS reduces the burden on the origin video server by intelligently multiplexing remote user requests over a single connection per location. Thus, video servers see fewer connections and are required to serve less data, thereby enabling video server scalability.

Cisco WAAS also enables the prepositioning of VoD media using its new CIFS application optimizer, making recorded video easily and conveniently accessible to the branch-office user without having to disrupt normal WAN traffic with large file downloads during prime business hours. VoD caching used in conjunction with prepositioning by the Cisco WAAS CIFS application optimizer provides a powerful VoD-delivery architecture for enterprise e-learning, training, and video message archival and playback.

The Cisco WAAS video optimization policy also provides data reduction and optimization for video other than Windows Media video, both live and VoD. This feature enables WAN optimization using DRE and LZ compression and bandwidth reduction with TFO for other video formats: video over HTTP, Adobe Flash, QuickTime, RealVideo, and any other video protocol that uses TCP as a transport mechanism.

Conclusion

Cisco WAAS 4.1 provides a simple and scalable WAN acceleration architecture to provide distribution of and access to both live and on-demand video streams and recordings. For Windows Media live streams, Cisco WAAS provides one-to-many stream splitting capability, allowing existing networks to deliver high-quality video to the edges of the enterprise WAN. For VoD, Cisco WAAS provides CIFS prepositioning services to reduce bandwidth consumption during peak business hours.

The benefits from the live Windows Media optimizations in Cisco WAAS 4.1 include reduced WAN bandwidth requirements for delivery of high-quality video, the option to avoid complex multicast network configurations, lower operating costs through zero-touch operation and autodetection, and reduced capital expenditures by offloading the video servers at the data center.

For More Information

For more information, please visit http://www.cisco.com/go/waas.

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV
Amsterdam, The Netherlands

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Printed in USA C11-499855-00 10/08