

How Cisco IT Is Deploying a Medianet Architecture to Support Pervasive Video Adoption

First medianet project enables performance monitoring, helping to meet service-level agreements.

Cisco IT Case Study / Video Infrastructure / Medianet: Cisco IT is preparing to support 32,000 video endpoints by 2012. This case study describes how Cisco IT is implementing a medianet architecture to overcome the challenges of provisioning, troubleshooting, and planning capacity for tens of thousands of video endpoints. Cisco IT has already

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implemented the Cisco IOS™ Software Performance Monitoring capabilities on the routers in teleworkers' homes, helping to meet service-level agreements (SLAs) while keeping operational costs down. The company is also in various stages of planning or implementing other Cisco® medianet technologies, including mediatrace and autconfiguration. Cisco customers can draw on Cisco IT's real-world experience to plan their own medianet architectures.

Background

Public and private sector organizations are increasing the pace of video adoption for communications, collaboration, training, and physical security. Reasons for burgeoning video traffic at Cisco include:

- **Globalization:** Video conferencing with Cisco TelePresence® and Cisco WebEx® enhances collaboration within geographically distributed teams, increasingly prevalent at Cisco. Cisco has a growing presence in emerging markets such as India and China and also works closely with global partners for its supply chain, business support, customer support, and more.
- **Proliferation of video endpoints:** After starting with campuses, Cisco IT is now introducing Cisco TelePresence systems and applications in branch offices and teleworkers' homes. The company expects to have 32,000 video endpoints by 2012.
- **More diverse video endpoints and applications:** As of 2011, the Cisco network carried video traffic from 1050 boardroom-style Cisco TelePresence rooms, another 6000 Cisco TelePresence desktop systems, more than 50 monthly IPTV sessions, 85,000 monthly video views on the Cisco Show and Share® portal, 6000 Cisco Video Surveillance IP Cameras, and hundreds of Cisco Digital Media Players (DMPs) that power digital signage. In addition, employees use 90 million Cisco WebEx minutes monthly, a growing portion of which include video. “The number and diversity of video endpoints and applications in use at Cisco pose operational challenges for Cisco IT video teams as well as network infrastructure teams,” says Ali Fatemi, project lead for Cisco's medianet deployment.
- **More participants in sessions:** Employees increasingly use Cisco TelePresence and Cisco WebEx not only for one-to-one interactions, but also for one-to-many interactions, such as training classes, and for many-to-many events, such as global sales conferences.

Challenge

To continue meeting SLAs while minimizing total cost of ownership (TCO) for thousands more video endpoints, Cisco IT needs to simplify management. Commonly cited research suggests that operations and support represent a majority of total IT spend. “Costs could quickly get out of control if Cisco IT had to individually manage tens of thousands of video endpoints,” says Plamen Nedeltchev, distinguished IT engineer and principal architect for borderless networks at Cisco.

Automation is essential for maintaining a high quality user experience. Previously, Cisco IT could not trace an individual call in progress to find the source of congestion or jitter. If someone called the Cisco Global Technical Response Center (GTRC) to report choppy video on a telepresence session traversing multiple hops (say, between a small city in India and Washington D.C.) Cisco IT could not see into the network to troubleshoot that particular segment. “There is a misperception that if you have enough bandwidth, you don’t need to worry about meeting SLAs,” says Nedeltchev. “In fact, it’s equally important to understand network behavior end to end, because every transition to a network segment with different bandwidth can cause congestion and jitter that affects the user experience.”

Another challenge for Cisco IT is efficiently provisioning tens of thousands of new video endpoints, because manual processes do not scale. For example, the Cisco physical security team plans to deploy thousands more Cisco Video Surveillance IP Cameras by the end of 2012. Traditionally, a technician in the physical security group opened a ticket with the Cisco IT network operations team, and then engineers would have to manually configure switch ports or execute a script, delaying fulfillment of the request.

Finally, the network in its current state cannot always distinguish between video traffic for different types of services, such as Cisco WebEx, Cisco TelePresence, Cisco Cius™ tablets, and Cisco Unified IP Phones 9900 Series. “The network needs the intelligence to identify different types of devices and flows so that Cisco IT can perform automated configurations with the appropriate SLAs for the user and device,” Nedeltchev says. “Manual and one-off processes will not scale.”

To address these challenges, Cisco IT decided to begin evolving the existing network into a Cisco medianet, which is a media-optimized network with the intelligence to deliver an excellent user experience while also simplifying provisioning, monitoring, and management. A medianet has the following characteristics:

- Media-aware: Can detect and optimize different media and application types (telepresence, video surveillance, desktop collaboration, and streaming media) to deliver the best experience
- Endpoint-aware: Automatically detects and configures media endpoints
- Network-aware: Can detect and respond to changes in device, connection, and service availability

Solution

Cisco IT has embarked on a phased program to enable medianet on the Cisco global WAN by upgrading the Cisco IOS software and turning on Cisco medianet technologies. Cisco IT is adopting Cisco medianet features in phases, starting with the places in the network where they will have the biggest impact.

Phase 1: Enabling Performance Monitor in Home Routers

The first project is simplifying monitoring and troubleshooting of routers used in teleworkers’ homes. Cisco encourages telework because telecommuting reduces greenhouse gas emissions, tends to increase productivity, and enables the company to keep operating if offices are closed due to inclement weather or disaster. “To be as productive as they would be at the office, teleworkers need a good experience,” says Jawahar Sivasankaran, senior manager in the Cisco IT Customer Strategy and Success group. “But limited bandwidth in homes and IT staff’s inability to physically touch devices make it essential to have good monitoring and troubleshooting capabilities.”

To address these challenges, Cisco IT has enabled Performance Monitor, a medianet technology in the Cisco IOS Software, in approximately 9000 Cisco Virtual Office routers. Cisco IT network administrators use Performance Monitor to analyze the performance of video traffic across the network. “If a Cisco teleworker calls Cisco IT to report a problem with video quality, the engineer can now log in to the Cisco Virtual Office router to see the latency, jitter, and packet loss of every video and voice call, per session and per flow,” says Nedeltchev. Cisco IT personnel do not need privileged access to the router IOS for troubleshooting, because the performance monitoring is available in IOS user mode. Alternatively, they can use a monitoring tool that graphically represents performance.

Cisco IT will gradually begin implementing Performance Monitor and other Cisco medianet technologies in more places in the network, including campuses and branches. Cisco Services has been engaged to deliver a Medianet Readiness Assessment, and Cisco IT will introduce new features in a given location as the equipment is upgraded during Cisco’s regularly scheduled Fleet Upgrade program. Cisco IT will also use Performance Monitor, along with mediatrace, IPv6, and TrustSec, in upcoming Borderless Networks deployments for campus buildings and branches.

Phase 2: Adding Mediatrace for Performance Monitoring

In the next phase of the medianet project, Cisco IT will enable mediatrace, which monitors a flow from point to point, across all hops. “Mediatrace is the equivalent of trace for RTP traffic, and reveals more than sniffers for identifying the specific hop, router, switch, line card, or interface that’s causing congestion, packet loss, or jitter,” says Nedeltchev.

The first mediatrace implementation will occur in selected buildings in San Jose, California and Bangalore, India. “Eventually the whole Cisco network will support mediatrace, but it’s not necessary to wait to upgrade the entire network before experiencing the benefits,” Nedeltchev says. “Every hop that’s mediatrace-capable will report its status, helping engineers to identify the source of issues affecting the user experience.” Even though the last mile for teleworkers might not be visible through mediatrace, for example, statistics on all other hops will be visible, helping Cisco engineers narrow down the source of problems.

Later Phases: Auto Configuration and Media Services Interface

Future plans under consideration include using the auto configuration capability for video endpoints, and the Media Services Interface (MSI) to collect information from individual video applications and endpoints. More detail about these plans appears in the Next Steps section of this case study.

Results

Transforming the network architecture into a medianet is helping Cisco IT continue to meet SLAs for the user experience as the number of video endpoints multiplies, and without huge staffing increases and unnecessary bandwidth upgrades. “For the first time, we can trace every video flow from end to end,” says Nedeltchev. “The medianet helps us provide a better SLA for employees through real-time monitoring of video performance, improved fault isolation, and proactive rather than reactive troubleshooting.”

Following are use cases illustrating benefits of Cisco’s first medianet projects.

Troubleshooting Video Calls in Progress to Help Meet SLAs

Situation: A user calls to report poor video quality while a video session is in progress. One participant is in a Tier 3 city in India using a Cisco TelePresence system, and the other is in a Tier 2 city in France using a Cisco Unified IP Phone 9900 Series with a high-definition video display.

Before: Previously, Cisco IT used Cisco IOS IP SLA, sniffers, or third-party tools to understand real-time issues with endpoints or video, such as high pixilation. “Troubleshooting was a manual process with inconsistent results,” says Nedeltchev. “We usually could not find the source of the problem during the call, especially over multiple network hops.” The previous tools also could not stress the network to reveal problems that might occur during peak usage times.

With Medianet: Now Cisco IT uses Performance Monitor to monitor the call in progress in real-time, separately assessing the voice, video, and data flows for the session. “Performance Monitor helps us meet SLAs because we can see the call in progress between two parties,” says Nedeltchev. “The feature provides very high value in employees’ homes, which often have limited bandwidth. Also, Cisco IT can’t physically access those devices if they have problems, making visibility even more important.”

Performance Monitor also alerts the IT admin when congestion or jitter exceeds a defined threshold, helping Cisco IT identify problems before they affect more people. Later, Cisco IT plans to use mediatrace in conjunction with Performance Monitor to collect diagnostics hop by hop while the problem is present. Diagnosing and isolating issues associated with a particular hub or blade will help Cisco IT address issues even before users experience them. “In this sense, mediatrace enables proactive troubleshooting,” says Nedeltchev.

Automated Provisioning of Video Endpoints Will Save 2000+ Hours over 1.5 Years

Situation: Cisco’s Physical Safety and Security team needs to add Cisco Video Surveillance IP Cameras, or Cisco Workplace Resources wants to add Cisco Digital Media Player (DMPs) to connect digital signage.

Before: The department contacted Cisco IT to provision the switch port. Network administrators had to interrupt their current activity to manually configure the switch port with the appropriate quality of service (QoS) settings, Call Admission Control, and so on. “Manual configuration took an estimated 45 minutes for a video surveillance camera and 25 minutes for a DMP,” says Fatemi.

With Medianet: Cisco IT is working with the Cisco Physical Safety and Security department to autoprovision IP cameras. The plan is for the department’s technicians to simply connect the device to the appropriate switch port. Then, the Auto Smartports feature on Cisco Catalyst® switches will detect the device type and configure the port and device interface accordingly. Video will start flowing in about five minutes.

“Auto Smartports reduce the time to deploy a new video endpoint from 25-45 minutes to just 5 minutes, and the installer needs less training,” says Fatemi. Cisco IT expects to deploy a few thousand video endpoints in the next several quarters, and the Auto Provisioning feature will save 2000-4000 hours of Cisco IT time during that period.

Next Steps

Cisco IT is enabling the Performance Monitor feature in more places in the network, giving priority to places with the least bandwidth. The next step will be adding mediatrace. Other plans under consideration include:

- **Monitoring the user experience end-to-end and gaining better control of endpoints, with MSI.** Today’s networks have difficulty differentiating the traffic flows (voice, video, data, and signaling) sent by different devices, appliances, and applications. This lack of differentiation complicates bandwidth management and makes it more difficult to monitor the user experience. To overcome this challenge, Cisco IT is considering using endpoints with MSI, a Software Developer Kit (SDK) that enables applications to signal information that a media-aware network can use to make intelligent traffic management decisions. For example, MSI can dynamically classify each flow, enabling more granular QoS policies for different types of traffic. MSI will also allow Cisco IT to monitor and troubleshoot traffic all the way to the endpoints, enabling an IT engineer to start a mediatrace from a Cisco WebEx client, for instance, to isolate problems to the endpoint or network. “MSI is a game-changer, extending the network all the way to applications and endpoints,” says Nedeltchev.
- **Collecting session detail records (SDRs) about the user experience:** Using endpoints with MSI, Cisco IT will also be able to collect session detail records, useful for continuing to deliver a consistent user experience as the number of endpoints and applications grows. “Keeping the focus on the user experience is a new trend in networking, and medianet technology helps make it possible,” says Nedeltchev.
- **Video usage modeling and more accurate capacity planning using IPSLA Video Operations (VO):** Before deploying new video endpoints, Cisco IT assesses the impact on a particular network segment to

determine if additional bandwidth is necessary. “Bandwidth is a big chunk of the overall IT budget, and the risk of over-allocating bandwidth will increase as we deploy tens of thousands more video endpoints,” says Sivasankaran. Cisco IT is considering using IPSLA VO to simulate and measure the impact of use scenarios such as an entire office watching streaming video of the global sales event. “While traditional IP SLA tools inject synthetic traffic, IPSLA VO gives a more accurate picture of bandwidth requirement, because it mimics real video traffic,” says Nedeltchev.

- **Usage-based billing:** As part of the journey to delivering IT as a Service (ITaaS), Cisco IT needs an easy-to-use, reliable way to bill internal customers based on usage. Currently, most companies bill for services based on the number of endpoints, regardless of how much traffic those endpoints generate. “We’d like to bill our internal customers based on utilization, and the medianet will give us the visibility we need,” says Fatemi.
- **Unified management, with Cisco Prime Collaboration Manager:** Also on the roadmap is using Cisco Prime Collaboration Manager, which presents real-time, unified views of all Cisco TelePresence sessions in progress. The tool will also give Cisco IT end-to-end visibility into the media paths for each telepresence session. The initial deployment is planned for the San Jose and Bangalore campuses.

Lessons Learned

Cisco IT shares the following lessons with other organizations that want to evolve their network into a medianet that can support many video endpoints and high video traffic volume:

- **Realize you do not have to wait to upgrade the entire network to begin using medianet technologies.** Cisco is adopting medianet technologies during regularly scheduled fleet upgrades. “We’re beginning with the places in the network where we can turn on medianet immediately,” says Nedeltchev. “Real-time monitoring helps us meet SLAs and create a quality user experience that increases video adoption.”
- **Begin implementing Cisco medianet technologies in the places in the network that currently are the most difficult to manage.** Cisco IT began with home offices and branch offices, by enabling Performance Monitor on the Cisco ISR included with Cisco Virtual Office.
- **Develop a consistent management strategy.** Include policies for provisioning, configuration management, connectivity, and change management.
- **Keep in mind that the medianet is just one component of a comprehensive IT strategy.** “Make sure you take an architectural approach to building a borderless network, complementing video performance monitoring with application performance technologies, energy management, and security,” says Sivasankaran.

For More Information

To read additional Cisco IT case studies on a variety of business solutions, visit Cisco on Cisco: Inside Cisco IT www.cisco.com/go/ciscoit.

To learn more about Cisco medianet technologies, visit www.cisco.com/go/medianet.

Note

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