Cisco Medianet Readiness Assessment (MRA) Service

Executive Summary

The last decade has witnessed a rapid development of data and voice convergence over a common IP infrastructure. Now video is converging with data and voice traffic over a common IP network. Converging video with data and voice is more complex than converging data and voice: it demands more considerations, and it imposes stricter requirements on the underlying IP network.

Enterprises understand the need and significant benefit of adopting these various media-rich applications because they dramatically improve productivity, increase collaboration, and reduce cost. They also can help enterprises meet the challenge of globalization while simplifying and optimizing business processes and operations. Several different media-rich applications that can positively affect business are available for enterprises to take advantage of:

- High-definition room-based interactive video such as Cisco TelePresence™
- Standard-definition desktop collaboration applications such as Cisco® Unified Video Conferencing

Various streaming and broadcast types of video applications such as digital signage, video on demand (VoD), and video surveillance.

Enterprises can face several challenges as they prepare their networks for video adoption. Unlike voice, video is more bursty and bandwidth-intensive, and it is more sensitive to delay, jitter, and packet loss. As the benefits of video are realized, the adoption rate of video applications and convergence will accelerate in the coming years, putting more pressure on enterprises to get ready for video.

Some fundamental questions that need to be addressed are:

- How do I help ensure the successful deployment of media-rich applications and achieve the video quality experience expected?
- How do I help ensure the addition of enterprise media-rich applications will not affect the existing mission-critical voice and data applications?

- Is my network ready to support these new applications? If not, what does it need to be media ready?
- How do I scale my network for multiple video applications?

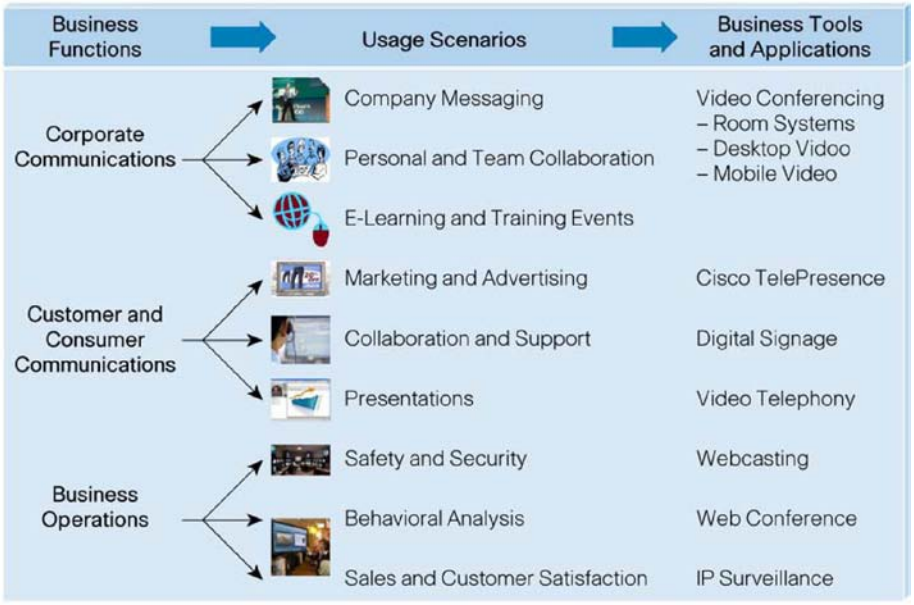
This document reviews the high-level requirements of a media-ready network and presents a high-level framework and systematic methodology to perform Medianet Readiness Assessment (MRA) on your enterprise network. It goes into detail on the methodology and process it takes to perform the assessment.

Overview of Video Applications and Challenges

Explosion of Video Traffic

Video is exploding on corporate networks for reasons such as collaboration through globalization of the workforce, forming extended relationships with customers and partners, scaling learning, and social networking phenomena that are crossing over into the workplace. In addition, there are other corporate measures such as enhancing physical security and the desire to go green. See Figure 1 for an example of enterprise video business alignment.

Figure 1. Enterprise Video: Business Alignment



Many enterprises are realizing the value of video and are looking to provide streaming rich media for many aspects of their operations, including corporate communications, customer and consumer communications, and business operations. Some enterprises are beginning to use video assets within their business process. Many enterprises are using a variety of video tools to address critical business issues such as enhancing collaboration while reducing operational expenditure, effective partner and customer communications, improved physical security, and greatly enhanced corporate communications through video

conferencing, Cisco TelePresence, digital signage, video telephony, webcasts, web conferencing, and IP surveillance.

Enhancing Collaboration and Globalization

Large numbers of the enterprise workforce are increasingly located outside of headquarters. Enterprises can take advantage of virtual presence video communications to provide effective communications across distances and cultures. They can use video to gain competitive advantage by decreasing time to deliver strategic messages and simplify educational and training practices.

Customer Communications

Sales teams can improve customer relationships with virtual presence enabled by technologies such as Cisco TelePresence while also reducing travel expenses and the carbon footprint of the enterprise.

Corporate Communications and Advertising

Technologies such as digital signage allow enterprises to control communications from a central point while relying on the network for scale. In addition, the content can be customized for the location or scheduled to coincide with corporate events. Additionally, digital signage can be used as a great advertising tool. For example, retailers focus on in-store experience; they want to deliver relevant messages at a point where consumers are naturally receptive.

Business Operations

New security risks have prompted the demand for improved and more scalable video surveillance systems. Enterprises are embracing IP video surveillance systems to provide better safety and security. Cisco's IP video surveillance cameras provide high-definition streams to effectively monitor remote locations.

The IP video surveillance system is more than just a loss-prevention system: it can become an asset by allowing businesses to gain an understanding of their business operations. Video surveillance can be used by enterprises to gather real-time data to conduct their business operations. For example, retailers use IP video surveillance systems to improve on merchandise sales by performing customer traffic flow analysis and workforce management.

Challenges

Video is a powerful business tool, but new challenges need to be addressed in order to meet user expectations for a flawless experience. As mentioned previously, converging video onto an IP network is much more complex than converging voice over IP (VoIP) because video:

- Is bandwidth intensive.
- Is bursty.
- Has several different types of video applications, such as live and on-demand high-definition streaming video, high-definition digital signage, high-definition video surveillance, desktop video conferencing, and high-definition virtual-

presence interactive video. Each type of video application has unique requirements and characteristics and requires a network wide strategy to help ensure a high-quality user experience.

The remainder of this section summarizes the video-ready network requirements; the list is not exhaustive. Refer to the “Media-Ready Network Architecture” white paper for more details.

Quality of Service

Like voice, video applications have strict requirements and generally are much more sensitive to packet loss because each packet could represent a tremendously compressed amount of visual information, and even small packet losses can result in visible degradation of video quality. In contrast, VoIP codecs can conceal small packet losses (up to 1 percent) effectively.

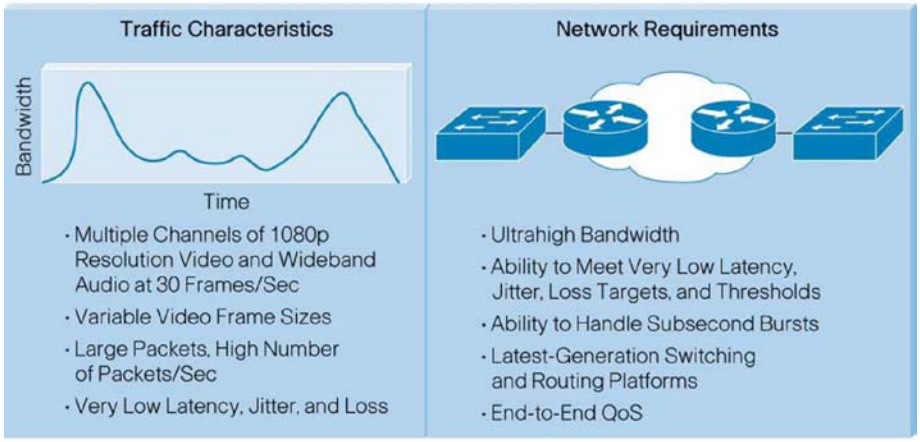
Video traffic has stringent quality-of-service (QoS) requirements for bandwidth, packet loss, jitter, and delay. These are even more stringent for video applications that are real time or interactive and require high-definition resolution. Video traffic is very bursty and bandwidth intensive; a high-definition (HD) stream could require more than 20-Mbps bandwidth for delivery over the network. And unlike the constant-rate nature of voice packet transmission, video packets are variable in rate and size. The high compression ratio of video traffic makes it even more sensitive to packet loss compared to that of VoIP. Normally, video has a more than 99 percent compression ratio, so even a small amount of packet loss or jitter can cause noticeable disruptions in the user experience, and latency must be kept to a minimum so large buffers in the network or at the receiving endpoints are not needed to compensate for high jitter. Table 1 lists typical packet loss, jitter, and latency requirements for a few video applications (live streaming video). Table 1 shows that different applications have different requirements. The intent of the numbers in the table is to show the upper ends of the limit that are tolerable for the various applications (that is, the worst case scenarios). In all cases, the network should be engineered for the best latency, jitter, and packet loss numbers possible (that is, below the high-level tolerance numbers indicated in Table 1).

Table 1. Network Requirements (by Video Type)

Metric	Video Collaboration	Digital Signage	Cisco TelePresence	Video Surveillance
Latency (seconds)	150	200	150	300
Jitter (milliseconds)	30	10	10	10
Packet loss	1%	0.05%	0.05%	0.05%

Cisco TelePresence provides a good representation of the challenges that the wide array of video applications need to address. Figure 2 shows the correlation between Cisco TelePresence traffic characteristics and its general network requirements.

Figure 2. Cisco TelePresence Network Requirements



High Availability

Video applications require millisecond-level network service recovery because video traffic cannot accept unpredictable or large network recovery timeouts. Thus convergence targets will be higher, and packet loss due to network outage must be minimal.

Enterprises also need a survival strategy to use localized services in case of link failure; remote branch offices need to be able to function alone.

Security

Numerous security threats affect media-rich communications. A comprehensively designed media-ready network design can provide visibility into threats such as:

- Eavesdropping: Unauthorized listening to and recording of video conversations presents the risks of privacy loss, reputation loss, and regulatory noncompliance.
- Denial of service: The loss of media-rich services can lead to lost productivity and business.
- Compromised video clients: Hacker control of video clients, such as cameras, displays, and conferencing units, can result in fraud, data theft, and damaged reputations.
- Compromised system integrity: Hacker control of video application servers or the video control infrastructure presents risks similar to those of compromised clients, but on a significantly greater scale, and with the potential to cause major productivity and business loss.

Bandwidth

Media-rich applications contribute to the use of large amounts of bandwidth. Burstiness is another critical bandwidth-related concern. When provisioning bandwidth, enterprises must also consider burst requirements.

Some video applications have a traffic model with a single or a few video sources transmitting to many simultaneous viewers. Deploying bandwidth-optimization techniques to minimize bandwidth requirements is highly advantageous. IP multicast and stream splitting can provide efficient distribution across the network.

Network Intelligence to Distinguish Applications

Enterprises need an intelligent network platform to continuously differentiate between business-critical and recreational video applications to support and protect business goals and objectives. Differentiation might require deep packet inspection technologies to achieve the granularity needed to distinguish between different types of video streams.

Most media-rich applications have voice, video, and data components. There are advantages of being able to perform application subcomponent separation, such that the data component of a multimedia application receives one level of service, whereas the voice and video components of the same application receive a different level of service.

Visibility and Monitoring

Successful video delivery requires IT organizations to continuously make sure that performance of their video applications is acceptable by constantly measuring the performance and evaluating the network capacity to verify that service-level agreements (SLAs) on service quality are being met.

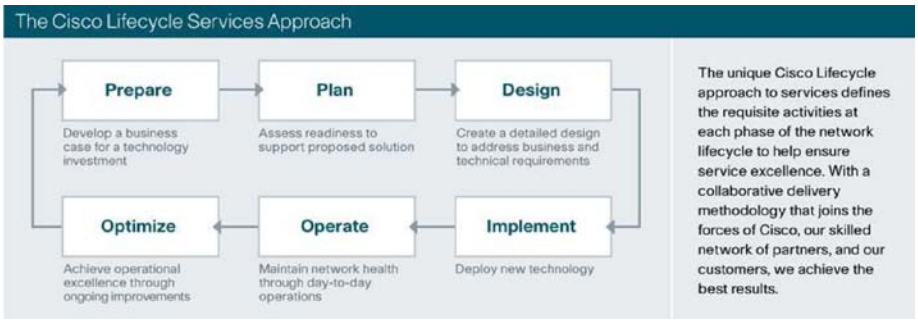
What Is Medianet Readiness Assessment (MRA)?

The obvious question that arises is how do enterprises go about helping make sure the challenges described earlier are being addressed and the network is ready to support various video applications? The answer is to perform an MRA service on the existing enterprise network infrastructure and use the findings and recommendations to help prepare the network to be media ready.

MRA is a service that should be performed when planning to deploy video (or media-rich) applications over an existing IP network. (For the sake of brevity and simplicity, in this paper the words video and media-rich will be used interchangeably.) MRA covers the evaluation of the entire network infrastructure and the media-rich applications that need to be deployed.

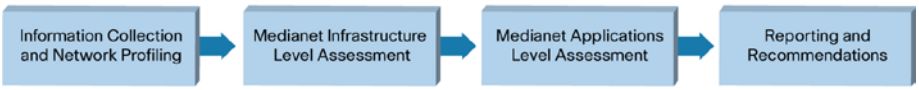
Figure 3 describes the Cisco phased approach for the entire lifecycle of any service. It has six distinct phases: Prepare, Plan, Design, Implement, Operate and Optimize (PPDIOO). The PPDIOO methodology provides a systematic way to not only successfully deploy media-rich applications into the enterprise environment but also help ensure smooth operations postdeployment. Each phase involves individual tasks and processes. MRA encompasses the Prepare and Plan phase before the Design and Implementation phases. MRA helps ensure a smooth and successful deployment.

Figure 3. Lifecycle Services Approach



MRA is a simplified process, consisting of the various phases shown in Figure 4.

Figure 4. Phases of MRA



General information is gathered from primary individuals. After that is done, tools are used to perform a network audit. The collected raw data is used for analysis and organized into different categories. After the analysis is done, an MRA detail and summary report is compiled with assessment results and actionable recommendations.

Information Collection and Network Profiling

This phase involves interviewing various enterprise contacts and gathering the information. This information helps evaluate the current and planned network implementation, including hardware, software, network design, network links, and applications, and help to bring all the business requirements together and understand them as well. Each of these areas is evaluated against Cisco best practices and requirements for a video-ready network.

Infrastructure-Level Assessment and Application-Level Assessment

MRA can be divided into two separate assessment packages: Medianet Infrastructure-Level Assessment and Medianet Application-Level Assessment.

The infrastructure-level assessment covers the network infrastructure layer and makes sure the network is video ready at the infrastructure level. The application-level assessment looks at the application-specific aspects to make sure your network is ready to support this video application.

Enterprises that are still trying to figure out what set of video applications to deploy can request just an infrastructure-level assessment. Enterprises that already know what they want deployed into their network or already have one or more video applications deployed and want to enable other types of video applications would need a service that includes both the infrastructure-level assessment and the appropriate application-specific assessments.

Reporting and Recommendation

The data obtained for various hardware/software features/parameters is tabulated, and an evaluation is made of features that are missing from either the hardware or the software, in order for the network to be a media-ready network. In this case, the analysis takes into consideration the specific requirements and what expectations the enterprise has of its media-ready network (that is, what multimedia applications need to be deployed and what is the required scale).

The captured statistics would help assess if the hardware needs to be upgraded.

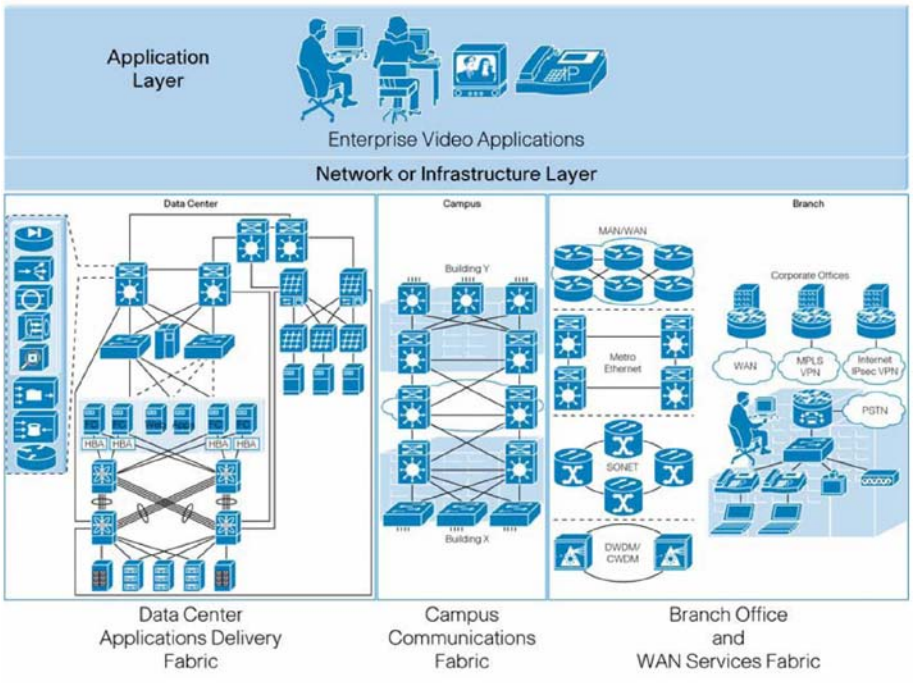
The enterprise bandwidth requirement and current bandwidth utilization analysis would help determine if the enterprise network needs to upgrade the network/link bandwidth.

In addition to the above requirements, network high-availability requirements and gaps are taken into consideration to determine what the upgrade recommendations should be.

MRA Methodology and Modules

The previous section provided a general description on the concept of MRA, the general flow of performing an MRA, and tasks involved in it. MRA is done in a systematic way. In this section we introduce the framework, the associated methodology, and the modules. The enterprise network is logically divided into two different layers: application layer and network infrastructure layer. The network infrastructure level tests compliance to Cisco leading practices for video in the following areas: hardware and software, QoS, network and device performance, medianet infrastructure level design, and SLA. The application layer consists of different video applications such as desktop collaboration, Cisco TelePresence collaboration, video surveillance, and digital signage. Figure 5 depicts the enterprise network view in this layered approach.

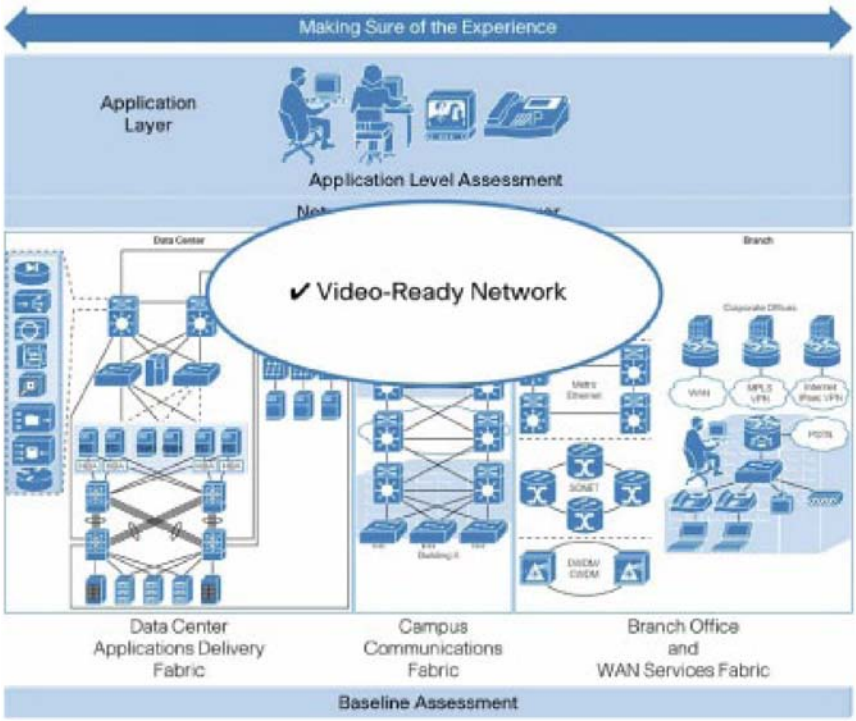
Figure 5. MRA to Support a Video-Ready Network



In doing the MRA, a modular approach is recommended, thereby dividing the assessment into different logical modules, with each module covering specific checks. When taking a modular approach, MRA can be divided into two separate assessment packages: Medianet Infrastructure-Level Assessment and Medianet Application-Level Assessment, as depicted in Figure 6.

As discussed earlier, the Infrastructure-Level Assessment covers the network infrastructure layer and helps ensure the network is video ready at the infrastructure level. The Application-Level Assessment looks at the application-specific aspects to make sure your network is ready to support this video application. This approach enables a more focused approach on assessing specific areas of the network and be more systematic, while being more scalable.

Figure 6. Modularized Approach to Delivering a Video-Ready Network



Medianet Infrastructure-Level Assessment

Infrastructure details are collected and analyzed for compliance with Cisco leading practices for video in the following areas:

- Hardware and software
- Quality of service (QoS)
- Performance
- Medianet infrastructure-level design
- Service-level agreements (SLAs)

Hardware and Software Compliance

In this compliance module, we will examine the hardware platforms, device line cards and buffers, and software releases for consistency and compliance with the required level to support video applications.

The following areas are assessed for video standards compliance:

- Campus infrastructure
- Data center infrastructure
- Branch infrastructure
- WAN infrastructure
- Software release level

Campus Infrastructure Assessment

Hierarchy and Modularity

This assessment looks at the hierarchy and modularity of the enterprise network.

Network hierarchy is perhaps the single most important aspect of network design resiliency. A hierarchical network is easier to understand and easier to support because consistent, expected data flows for all applications occur on the network over similar access, distribution, and core layers. This setup reduces overall management requirements of the network and increases understanding and supportability of the network, often resulting in decreased traffic flow problems and troubleshooting time and improved IP routing convergence. Network hierarchy also improves network scalability by allowing it to grow without major network changes to all layers of the network.

Network modularity can be defined as a consistent building block for each hierarchical layer of the network. Using a consistent “model” for each layer of the network can improve supportability because it becomes much easier to properly test modules, create troubleshooting procedures, document network components, train support staff, and quickly replace broken components.

Campus LAN and VLAN Design

This section assesses the campus LAN and VLAN design.

A solid Layer 2 LAN design promotes overall availability, scalability, and manageability of the LAN network. The Cisco goal is to create a common Layer 2 LAN design that optimizes each of these factors in a converged network environment. This design is currently referred to as “common infrastructure” and is used here to compare potential LAN designs. This design currently offers the most scalable design while providing optimal convergence and overall manageability. The design includes core, distribution, and access layers using Cisco Catalyst® 6500 Series Switches with Layer 3 capabilities at the distribution and core layers. It also uses Hot Standby Router Protocol (HSRP) on redundant distribution chassis for high availability.

IP Addressing and IP Routing

Baseline assessment also verifies the current IP addressing and routing at the enterprise.

The IP routing design is always critical in larger network environments, primary concerns being how quickly the routing protocol will converge following network failures and how scalable the routing protocols are in the particular network environment.

Hardware Platform, Line Cards, Software, and Security

Next we assess other major areas, such as hardware platform and line cards, software release and strategy, and security based on best practices and guidelines for a video-ready network.

In the following branch-office WAN and data center module assessments, similar areas are examined based on specific guidelines and best practices for that Place In Network (PIN).

Branch-Office WAN Network Assessment

This assessment checks the following aspects at a branch office:

- Hardware
- Software
- Security
- IP routing

Data Center Network Assessment

This assessment checks the following aspects at a data center:

- Hardware
- Software
- Security
- IP routing

QoS Compliance

Quality of service is crucial to the success of deployment of video application into an enterprise network. The enterprise should have an overall QoS strategy to support not only the advanced applications such as voice and video, but also the business-critical data applications on a converged network. Implementation of a comprehensive QoS strategy requires the ability to identify the business-critical applications and set a QoS service policy to mark and prioritize their traffic. After traffic has been classified and marked, then queuing policies must be implemented on every node where the possibility of congestion could occur. QoS includes defining the trust on ports to prohibit unauthorized use of QoS for preferential treatment at the access level and generally requires the following QoS policies:

- Appropriate (endpoint-dependent) trust policies
- Classification and marking policies
- Policing and markdown policies
- Queuing policies

Another critical aspect of the overall QoS strategy is the SLA contracted with the service provider for the WAN connectivity. In general, for video applications, an SLA needs to specify the lowest practical latency (such as less than 60 milliseconds [ms] one-way service provider edge-to-edge latency), low jitter (such as less than 5 ms peak-to-peak jitter within the service provider network), and lowest practical packet loss (0 to 0.05 percent). Service provider burst allowances and capabilities are also factors to consider.

In this compliance module, we will look at QoS from an end-to-end perspective. First we need to understand the enterprise overall QoS strategy for video, voice, and all other business applications, and then we will check on the marking/classification and queuing implementation end to end for compliance and consistency.

Performance Compliance

A medianet-ready network must be able to support the increasing demand as more video applications are deployed. To maintain optimal performance, the network should easily accommodate higher bandwidths, scaling to support Gigabit Ethernet to the desktop and 10 Gigabit Ethernet for uplinks into the core. The network should allow video forwarding without introducing significant latency. The aggregation network layers must support 10 Gigabit Ethernet to handle high bandwidth.

In this module, we will check on the network resource utilization, such as CPU, memory, and bandwidth, to assess for any gaps and make sure the network is ready and has enough resource for video application deployment. This module will provide the baseline network infrastructure-level resource state for the enterprise. Along with application-level assessment, we will be able to further determine the compliance status of the enterprise network in terms of network resources and whether there will be a need to remediate to support the specific requirements for video deployment.

Infrastructure-Level Design Compliance

In this module, we will examine the design aspect of the network infrastructure for its readiness to support video applications using Cisco leading practices. The areas we examine are:

- Hierarchy and modularity
- High availability
- IP routing design
- Overall security strategy for video
- Security (endpoint security, 802.1x, media security, and server infrastructure security)
- Video delivery and optimization

SLA Compliance

SLA compliance assessment provides a baseline of SLA parameters of the existing enterprise network. It utilizes a video SLA assessment toolset and simulates real video traffic of various types using video profiles ranging from Cisco TelePresence® conferencing to Standard Definition (SD) video. Ideally this would be done to the enterprise network to assess its readiness in terms of the required SLA level for video applications, but if there are known gaps such as the desired QoS implementation is not in place, then the SLA assessment could serve as a reference point for the current state of the network to support desired video applications. After the known gaps are remediated, similar assessment tests can be run again to validate the network.

Medianet Application-Level Assessment

The application-specific assessment covers each video application, making sure that the enterprise network is media ready. It consists of the following modules:

- Desktop video collaboration
- Cisco TelePresence collaboration
- DMS and digital signage
- Video surveillance and physical security
- Interoperability and third-party devices

Each module performs application-specific checks. The various assessment tasks within the modules are based on the specific requirements for that particular application. For example, the Cisco TelePresence collaboration module has a specific check based on the scheduling requirement. Given the dependency of the groupware in the enterprise environment, the readiness of the groupware infrastructure and environment to support the Cisco TelePresence application must be assessed. Similar checks are required for call-control infrastructure in the enterprise environment as well. Another example is storage consideration for video surveillance, where the bandwidth and storage requirements for the enterprise network are based on the resolution and frame-rate needs.

Conclusions

In order to realize the business benefits of media-rich applications, enterprises must prepare and plan with an MRA service on their network. This assessment allows enterprises to understand what gaps they need to bridge in order to have the best user experience not only with their new media-rich applications but also with their existing mission critical applications.

Cisco Advanced Services is the industry leader in providing end-to-end media-ready network architectures with highly trained professionals and a deep understanding of the different media-ready network requirements.

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