

What is a Medianet?

Executive Summary

Enterprises are adopting video as a part of their business practices to increase worker productivity, improve collaboration, reduce costs, and streamline and optimize business operations. This trend is increasingly accelerated by the move toward green IT, which encourages the reduction of their carbon footprint through adoption of collaboration technologies, including video. The growing use of video requires a change in how networks are built and operated -- and how they function. The network must be aware of and respond to the needs of a range of media and network applications. As applications require ever-more-demanding use of network resources, the best-effort delivery model becomes feasible only insofar as the enterprise can upgrade infrastructure -- keeping one step ahead of the demand. Network applications need to become more aware of (and use) the services the network offers, not only to simplify application management, but also to provide context-realizable experiences that are more social, visual, and personal.

A medianet is a network optimized for rich media -- not only voice and video, but the mixing together of videos and documents, webpages, text, and many other forms of media. The applications must be able to query the network for services and information in order to offer users a better experience. The network can provide an individualized service to video applications, such that network resources are allocated in line with what is important to the business.

Benefits of a medianet include the following:

- **Experience:** Effective media content needs to allow for personalization, it must be easy to use, and it must offer the best possible quality of experience (QoE).
- **Efficiency:** Plentiful device and network resources can suddenly become scarce when faced with many multimedia sessions; management of these resources needs to provide for their efficient use.
- **Expandability and velocity:** As networks grow increasingly complicated as they add new services, devices and applications also become increasingly time-consuming and difficult. Simplicity, management tools, automatic deployment, and self-serve mechanisms all reduce the operations workload and lead to faster turnaround times.

Developments in the three focus areas always enhance a converged media-optimized network -- the basic form of a medianet that exists today. A medianet network by Cisco is an integrated, end-to-end validated design that has been tested and documented to support reliable and predictable deployments.

Defining 'Medianet'

As mentioned previously, a medianet is an intelligent network optimized for rich media, especially video. A medianet does not stop at the boundary of a home or a business, but can comprise service provider, enterprise, and home networks.

The coordination and synchronization of multiple types of video, audio, and written documents into a single experience is a critical aspect of a medianet. A medianet is not a replacement of existing IP Next-Generation Network (NGN) or AVVID network architectures; rather, it is an evolutionary extension in the multimedia space of these existing network architectures.

New capabilities at all levels of the network infrastructure and end devices enable a medianet system to send, deliver, and optimize rich media. These capabilities are enhanced over time as the technology matures and is implemented in products, including:

- Providing an improved and individualized QoE
- Simplifying deployment and management
- Optimizing available resources

In the spirit of interoperability, a medianet tries as much as possible to use the existing body of standards in the implementation of these new capabilities. A medianet is certainly not exclusive to a single vendor, and may include devices from many vendors.

Network Challenges

The deployment and integration of voice in the network was relatively simple compared to the multifaceted video applications that are emerging. This section describes the challenges that a successful medianet implementation must overcome. As with Voice over IP (VoIP), video over IP allows the reuse and convergence of the communications infrastructure. Where different types of delivery mechanisms (satellite, DVDs, taps, and coaxial) were needed for the various types of video, a single system can now be used. With VoIP, there was concern regarding some aspects of network characteristics, such as delay and jitter. If the video application is interactive, then delay and jitter are important because they have the potential to critically affect the user experience. Similarly, in some types of video applications, the amount of raw bandwidth required to deliver high-quality video can also be a critical factor, especially if the available bandwidth at remote or branch-office locations is insufficient -- again affecting the user experience. Unlike voice, minute network degradations can lead to easily noticeable impairments in a video stream.

The movement of video across a network presents several challenges for the network, including predictability, performance, quality, and security.

Predictability

As stated earlier, video can consume a great deal of bandwidth. With the High Definition (HD) video becoming more common, this usage amount will multiply quickly. Streaming a single hour of HD video (8 Mbps) with a modern video codec can easily consume more than 3.5 gigabytes of bandwidth on the network. Using earlier codecs, the value is twice as high. If the session needs to be recorded (for example, if it was an interactive meeting or an employee-directed broadcast), then more than 3.5 gigabytes of storage needs to be found to save the content. Given the large numbers involved for a successful video experience, predictability of success must be assured.

Video is considered an “inelastic” traffic type as opposed to other traffic types such as TCP, which adjusts its sending rate based on the amount of available bandwidth to avoid congestion. Additionally, TCP can recover from loss by retransmitting the lost data. Many forms of video (for example, real-time applications) cannot adjust their bandwidth dynamically and cannot really be aware of the bandwidth limitations along a path.

Because of the large bandwidth differences the network and endpoints must contend with, some semblance of protection and predictability needs to be in place. The endpoint and the network may not have the capacity to deliver an hour of HD video to all consumers. Portions of the network may not have enough bandwidth to support both the high-quality video and regular business transactions. These contentions need to be controllable as well as predictable. Given business policies, a disruption of either the video or business transactions may actually be acceptable -- but the outcome when both applications try to access the network must be predictable. Because of the nature of video, two video applications contending for the same limited bandwidth can only result in deteriorating the video experience in both sessions. A media-aware network -- medianet -- needs to ensure that when contention occurs the user experience for the higher-priority stream is prioritized and that the lower-priority stream is either dropped or forced to accept a lower-bandwidth service. Similarly, there are examples within the same application session. A two-person video conference call may be fine with only two parties, but when the call becomes a three- or four-person session the network may not be able to sustain the required traffic. In a medianet, applications negotiate to reserve network resources end to end such as bandwidth and access to low-latency queues and paths that are more stable before they start the media stream.

Performance

Video applications can be very sensitive to aspects of network performance. Some of the performance characteristics of a network path include delay, loss, and jitter.

Delays arise from physical limits (speed of light) as well as queuing mechanisms in routers and gateways that the packets traverse along the way. When delay increases above 400 milliseconds (camera to display), people become aware of it and the delay starts to impede interactive communications.

Jitter is the variability of delay. Buffers can be used to smooth out variations in delay. In order to ensure proper playback, the network must have accurate timing information. Too much buffering in the network prevents effective interactive video. A medianet relies on precise clock synchronization and end-to-end measurement of network delays to use the least amount of buffering necessary.

Multiple network paths may also be available for a media stream to traverse to its destination. Some of these paths may be better suited for the video application than others. A performance-aware medianet can match the application performance requirements to the best available network path. Again, this process optimizes the QoE by minimizing jitter, loss, and delay.

Quality

Higher quality in video is obtained by using higher resolutions, more colors (increased bits per pixel), spatial audio (multiple audio channels and higher sampling rates), and multiple displays. All of these parameters increase demand for bandwidth -- in turn increasing the sensitivity to degraded network conditions.

With video, when the impairments become apparent, the experience of the session deteriorates very quickly. With audio, users are somewhat more forgiving with regard to quality, and the relatively lightweight bandwidth burden is generally easier to control and manage. Video, however, certainly does not exhibit this characteristic. Users are easily disturbed by poor video quality -- and the bandwidth burden of video means that even slight deterioration of services within the network can significantly affect the video experience. Similarly, with video, the accompanying audio experience must be satisfactory and synchronization with the video must be consistent -- an even more stringent requirement.

We are increasingly engaging in multistream interactions (multiple audio and video streams combined to form a single immersive experience). For example, Cisco TelePresence™ meetings consist of multiple HD video and audio streams combined to deliver the illusion of a shared space. Cisco WebEx™ conferencing also can include multiple participants on webcams and telephones. These multistream interactions place additional demands on the network, because all streams now must be handled as one to ensure a consistent experience (they need to stay perfectly synchronized -- not only between audio and video, but also between the multiple video streams and multiple audio streams). All streams must take the same path through the network and must be given the same priority in order to avoid problems such as lip-synchronization errors (when audio is out of phase with video). It is no longer possible to prioritize network traffic solely by media type (video first, audio second, and then text applications); all streams of the same interaction must be handled with the same quality-of-service (QoS) guarantees. The increasing ubiquity and greater integration between multimedia applications suggests that maintaining quality in the face of greater network demands will be a significant challenge that must be met with consistent medianet architectures. The cost of not considering a media-enabled network will be poor quality for not just some but all of the increasing number of applications.

Medianet extends beyond the enterprise boundary, and service providers play a particularly large role in the assurance of video quality. They can offer premium IP services to businesses and consumers that ensure video traffic is allocated sufficient bandwidth, with the right service levels in order to preserve the QoE from end to end.

Assuring quality extends beyond the provisioning of bandwidth to provide the necessary intelligent network services. A medianet must also be able to monitor itself and report on problems within the network, as well as on the endpoints. By understanding the media stream and its requirements, a medianet can create tolerance thresholds for the QoE such that beyond the threshold, the application and network can decide to reroute around the failure (if there is a network failure), suspend the session, or lower the quality expectations of users. Monitoring is essential to maximize the efficiency of the finite network resources, enabling the network to dynamically adapt to prevailing conditions without the need to wastefully overprovision -- a common inefficiency in many video deployments.

An example of how an intelligent medianet can maximize the efficiency of network services is where there are many consumers of the same video stream. In this case the opportunity arises to differentiate the video stream for each user such that each user is presented with as high a video stream as can be sustained based on available resources within both the network and the capabilities of the video-consuming client. The quality of the video stream may be limited by not only the amount of bandwidth available along the path to the device, but also the capabilities of the device itself. A medianet may transform HD video to standard-definition (SD) quality video (which may differ not only in resolution, but also in screen aspect ratios) if users cannot appreciate the HD video through their SD-only device. A medianet, with its end-to-end visibility, can adapt to conditions -- allowing a maximized QoE and efficiency of resource use.

Security

One of the concerns of a converged communications system is with the mechanisms to secure communications. The most common concern is the threat of a loss of confidentiality. Encrypting the sensitive traffic can address this concern, but doing so often has the side effect of obscuring the content of traffic from the network, rendering it unable to differentiate traffic and to apply additional and differentiated services. If no information is available in the clear (that is, not encrypted) regarding the type of application and its requirements, then delay-tolerant FTP traffic may be

treated in the same way as delay- and jitter-sensitive interactive video. When all traffic is treated the same, efficient use of the available resources is impossible.

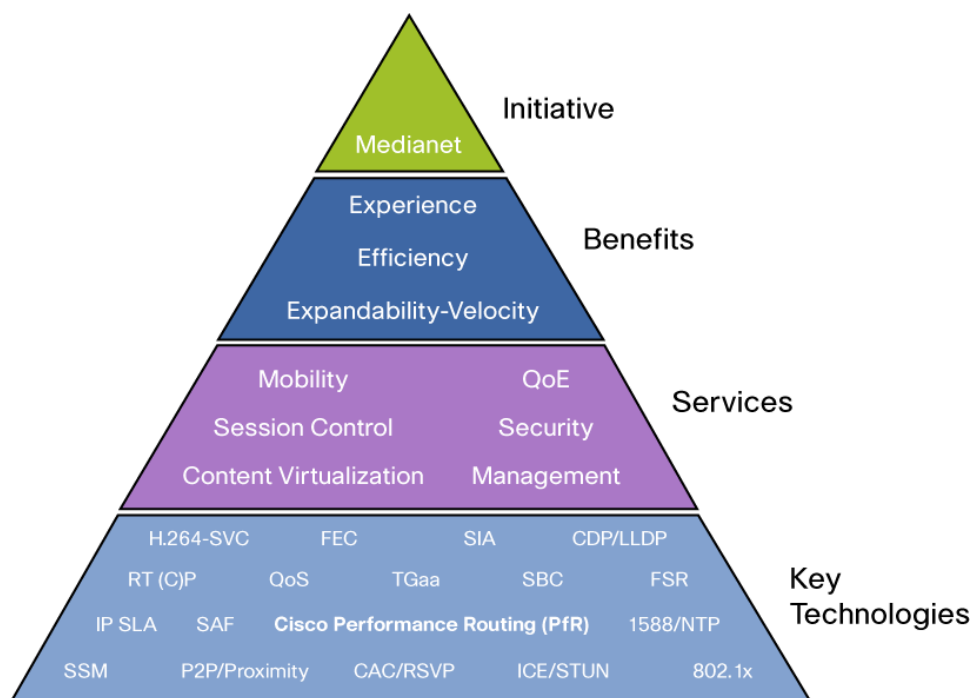
A medianet can differentiate encrypted traffic based on other information, which may be in the form of the IP header differentiated-services-code-point (DSCP) field that represents the general QoS treatment expected for that packet. However, networks are moving to a state where the DSCP field is not providing enough granularity of information for the actions the network needs to take. For example, the same DSCP value is used among many different video applications, but some video applications still need to be prioritized and differentiated from others. This situation results in a high-value TelePresence session being treated the same as a low-value, noncritical, desktop video session.

A medianet can differentiate traffic based on metadata, which is additional contextual information that is sent alongside the actual media stream. Based on this metadata, which is encoded by the medianet application, the network can treat different applications according to their specific needs, as well as offer additional services when the metadata is understood. The metadata can be of a sensitive nature itself (though not as sensitive as the referenced media stream) and may be encrypted in such a way that still allows an authorized network to process it. Explicit signaling of the application requirements removes the guessing that network and security devices are left to apply on traffic that all looks very similar.

Security plays a special role in the fostering of rich-media communications between companies. The creation of secure, application-aware communication points between sets of companies is an essential part of a medianet. In such a network, the progression of the media from the internal networks of one company to the external reaches -- beyond the firewalls and security gateways -- is security-validated, as well as the ensured quality. Intelligent network security services lay the bedrock for secure video applications that do not compromise the integrity of organizations while providing a scalable and consistent means to enable businesses to harness the power of video.

Benefits of a Medianet

As shown in Figure 1, the benefits of a medianet are in three distinct areas: experience, efficiency, and expandability and velocity.

Figure 1. The composition of Medianet**Experience**

The purpose of media (and communications in general) is the movement, distribution, and conveyance of ideas. The meaning and value of “media” is not limited to just bits and bytes being moved from one point to another point, but also includes the successfulness of the idea’s catching attention, being understood, and consumed by the recipients. In fact, the successfulness of “idea” movement and projection is related to the extent that technology is transparent and easy to use, while providing the highest quality and universal availability.

The higher the depth and realism of video, the higher the level of engagement, participation, and thus communication. To bring this higher degree of realism to participants, more aggressive use of the network is required. These additional requirements for the network are in terms of not only bandwidth, but also the quality of this bandwidth. To convey a very high-quality one-way video requires a certain amount of bandwidth -- anything lower, and the time investment required for a transfer is a barrier. But, to have interactive high-quality video, a specific kind of network bandwidth is required: access to low-latency paths and queues.

Also consider the individual variation of connectivity and device capability among the participants. For example, the participants in a one-way session may be connected over a low-speed cellular network while others may be well-connected through a multimegabit connection. In addition, the well-connected users may have a multitude of device capabilities such as surround-sound vs. mono-sound, display size, display aspect ratios, and display resolution. The organizers and participants of the session would want all viewers to participate -- but participate in a manner that scales with their individual situation and provides the best possible quality and experience for each user.

A medianet is about not only enabling more effective interactive real-time sessions but also enabling other types of media by increasing the availability, depth, and quality of the sensory experience. The experience is also not limited to the media (or the session) itself but to the ease and joy of using, configuring, and sharing media with many audiences.

Efficiency

A medianet tries to make the most efficient use of endpoint and network resources. With the steady stream of video-enabled applications, the expectation is that the rate of increase in usage of high-quality bandwidth will quickly surpass the available bandwidth. A simple upgrade of bandwidth will only lead to the quick expanded use of that bandwidth. More than building the network to the worst-case scenario, a medianet controls access to the network, so that network usage is aligned with time-specific business needs, while simultaneously managing the available resources.

On the endpoint, network capacity awareness in relation to other applications and an understanding of the place of each application in the overall business priority allow the application to scale. For example, if at the present time low-latency high-capacity bandwidth is not available because of a competing (but more important) application, the application in contention can lower the quality expectation to the end user and use a lower bit-rate video stream. This scenario allows both applications to function and remain aligned with the business priorities. However, the business must agree on the proper network bandwidth provisioning (which has cost implications) and the lowest acceptable QoE.

Efficient use of network resources includes proper use of existing network transmission technologies such as multicast, content distribution networks (CDNs), and WAN optimization. These technologies can help efficiently deliver the same content across the network topology by eliminating duplication of transmission. Other transmission efficiency techniques include the opportunistic use of backup links and primary links simultaneously to spread the network load and maximize resource usage. The desire for efficiency can be extended to environmental benefits as well. A medianet can enable high-quality remote conferencing that can reduce the need for costly, time-consuming, and environmentally degrading travel. Through maximization of available network resources, a medianet can be the guardian of good user experience for new video applications without the need for costly overprovisioning.

Expandability and Velocity

As networks evolve to handle these new types of aggressive network-usage applications, they may be increasingly difficult to deploy and manage.

Therefore, medianet features are designed for automated, easy deployments and the ability to ingest new features without hassle. The addition of new devices and applications into the network should be an easy task both for the network operator and the end user, especially when the administrators of the network, telephony, and video applications are in distinct groups within an organization. However, as medianets look to simplify the provisioning and management experience, considerations of organizational security must not be sacrificed.

A medianet must deliver a certain performance experience, and a network operating at a sub-par level because of improper deployment can have severe effects, not only for the network and applications but also for the loss of confidence in the network and application. Predeployment validation can lower the barrier to enabling new applications and incorporating newer versions of software and network infrastructure.

A complex system composed of many components in various changing states can be difficult to troubleshoot as well. A medianet is application- and endpoint-aware. It monitors the performance of applications and network infrastructure and can alert the operator when, where, and what kind of maintenance is needed.

Part of being endpoint-aware is closing the gap between the application and the network infrastructure. Currently many applications send their data through the network to remote endpoints on the other side of the network. These applications do not really inform or communicate with the network infrastructure itself. With the application communicating its service queries, capabilities, and desires with the network, the network can automatically configure the right policies for the application, eliminating the administrative overhead. The network can also help the application self-configure, relaying alerts to both application administrator and the network administrator, allowing the business to scale the rollout and support a greater number of applications with a limited number of resources.

Medianet Service Categories

The delivery of the various kinds of functions and benefits can be divided into several “service categories”. The medianet services describe the kinds of services the network, host, and application can provide to the end user or network administrator.

Quality of Experience

The concept of quality of experience (QoE) extends the monitoring, accounting, tracking, and improvement of the user’s experience of an application. Different types of video applications have varying requirements of the network. High-quality, real-time interactive video applications have stringent requirements on delay, jitter, loss, reliability, and bandwidth. These requirements directly affect the QoE and the effectiveness of the video application in conveying an idea and facilitating business.

A medianet optimizes user experiences by using its awareness of the media, network, and the user to adapt to environments that are changing while adhering to business policies. With an application-to-network interface, the video application can specify and request specific quality service levels from the network. The network, in response, can validate the requests against business policies, make the proper reservations within the infrastructure, and respond to the video application requests. Using this method, the QoE expectation is set from the beginning of the session and protected throughout the session.

A medianet then continually validates the video application experience and the network performance in meeting the demands of the applications. If necessary, a medianet can adapt either within the application or in the network -- whichever offers users the best experience.

Adaptation in the network may be in many forms such as changes in the network path, addition of redundant network paths, access to redundant or backup data, and awareness of proximity and location. In addition, admission-control mechanisms can be used to restrict access to the network based on a predetermined control hierarchy.

On the application side, adaptation may include setting the proper expectation with the user or providing transparent visibility of the network state to the network operator and the application user. The application may, depending on current conditions and restrictions, decide not to allow the session if the QoE is at an unacceptable level. Alternatively, the application may scale back the demands on the network such that they are deemed acceptable within the current environment and business rules.

Session Control

As mentioned previously, the ability is needed to monitor, authenticate, and manage individual sessions at a very granular level. This level of detailed control also extends to the applications themselves, many of which are using multiple forms of media. Many video conferencing systems try to connect multiple parties (more than two) and coordinate voice, video, and document imaging. The session-control services of a medianet enhance multimedia session coordination and responsiveness across applications and network boundaries.

Whereas QoE services measure and determine QoE, session control relates to how devices and the network negotiate and coordinate movement to a new resolution that requires less bandwidth or a new network path that can deliver higher amounts of bandwidth.

Video applications are also converging. Digital signs that display video-on-demand (VoD) content, formerly limited to PC desktops, and the mixing of traditional phone conferencing with web casting are only the beginnings of such application combinations. Session control acts as the “glue” that allows the applications to coordinate content generation, mixing, and display. The presentation of the material is an integrated experience that does not require much administrator or user overhead because no new application is actually created.

Session control is useful not only when coordinating different applications but also when trying to interwork across different types of networks. Trying to connect a video application across an enterprise’s WAN can create problems if the WAN does not support multicast, even if the campus network does. Similarly, business-to-business communications over either a shared extranet or the Internet is challenging. Session control can be used to organize the options and offer alternative transport mechanisms while helping identify network-embedded transport-conversion devices.

Content Virtualization

The written word can be searched, indexed, and transformed (consider cascading style sheets in HTML, or a marked-up Microsoft Word document) into any number of formats. With content virtualization, which allows for the generation, delivery, and consumption of media using any application, these same properties will be available in other forms of media.

Currently a multitude of media formats are available in the marketplace of applications and devices. No common media-formatting methods are available, and formats may differ in the display (aspect ratio), resolution, media codec used, and even the number of sound channels. Any one of these differences can prevent playback on or consumption by a device. Content virtualization makes media universally accessible by providing it in a format that is digestible for a specific device. This virtualization can be done by conversion from the original format to one that is more suited for a particular device as well as carrying the media in a common transport format such as Real-Time Transport Protocol (RTP). Content virtualization is critical to enabling a ubiquitous, multiapplication, multiplatform experience.

The manipulation of media not only transforms it from one format to another, but also includes the splicing and joining of real-time and stored media. This facility is particularly important in the insertion of advertisements that may be commercial in nature, or even regular enterprise announcements and alerts.

Because each application is responsible for the delivery of its own content, multiple delivery systems can be built on top of the network. Content virtualization allows users to be unconcerned of the exact location of the content, or the manner that it is delivered to their device. The content may be stored in a data center on a different continent, or a copy might be cached through a CDN

on the same LAN segment as the user. Many of these mechanisms reduce download times as well as bandwidth usage over the WAN. For resiliency purposes, multiple copies might be in storage, ready to be streamed from multiple geographic locations, to provide consistent access to the content. In terms of cache usage, centralized and distributed storage content virtualization breaks the barriers that have been traditionally created for the storage system of each application. The distributed global storage pool can be efficiently allocated and reallocated based on users, applications, and business policies.

Users must be able to find the content before they can view it. There is no common standard for the indexing, searching, and retrieval of such media. Even if users know where to look, it is increasingly difficult to locate a needed stream because many video applications are in the network, each with its own storage and retrieval system. A medianet has a common metadata strategy whereby each element in the system can understand the information about the content.

Mobility

With mobility comes the challenge of maintaining a multimedia session as the user moves from location to location and from device to device. Even with the same location, a user may want to move a multimedia session from a small mobile phone screen to the large home theater display without any loss or interruption. A medianet provides constant matching of QoE with the user, adjusting to bandwidth, display format, and size. In certain situations, the media session may move back and forth between public infrastructure and private networks -- whichever is providing the best experience while keeping security and cost as part of the equation.

Security

As with many other types of business transactions, conversations, and communications, secure conversations and transport of all different types of media is desirable. Sensitive business transactions may occur over a video conference, or prerecorded confidential product updates may be delivered only to a select community. In both cases security, confidentiality of information, and access control are essential.

The identification of users, devices, and applications plays a vital role in securing the access and establishing a trust boundary for interacting and accepting information into the network. As the network provides increasingly advanced and powerful services, it becomes ever more important to protect it and connected end hosts. In the area of confidentiality, merely encrypting all traffic over the network fails to provide the network with any context of the application and importance of the traffic. Therefore, a communications channel is needed outside of the encrypted flow to provide this additional metadata to the network.

The security model for a medianet needs to be pervasive as well as end-to-end. If a video conference session uses access controls and video, audio, and document channel encryption but is not recorded to an encrypted state with similar access controls for retrieval, the overall security of the session is compromised. The solution also needs to provide flexibility -- especially in the area of mixing capabilities. Consider the case of a secure conference bridge that has encryption between the participants and the joining of an additional member over the unencrypted public-switched-telephone-network (PSTN) network. Such a change in the overall security should warrant a notification to the participants and possibly termination of the bridge if the business policies do not allow such a situation.

Management

Management comprises provisioning as well as visibility and monitoring services. The provisioning aspect allows for consistent network design and deployment, as well as for translating complicated policies and desires into multidevice configuration touches. The visibility and monitoring portion of management gives the network operator the tools to see arising problems before they become service-affecting.

With a medianet, the device-configuration management can assume a simplified role -- and often an automatic one. The endpoint can discover its place in the network and can self-configure accordingly. Additionally, using network-assisted discovery, the video application can register itself with the video management station -- similar to what Cisco IP telephones do today, as well as with the network management tools. With the network and endpoints themselves assuming the role of configuration, it becomes possible to allow the user community to self-manage the applications with oversight of business policies. For example, a management application that is network- and application-aware can help users coordinate impromptu and scheduled high-bandwidth sessions that include the reservation of room bandwidth and other network resources. This type of user interaction alleviates the workload on the video application and network managers and allows them to scale the number of both applications and users.

Video applications can be very complicated to monitor and troubleshoot. A problem that is occurring at one time during the day may not happen at other times -- or at other locations. Multiple users may be part of a multipart video conferencing session, but only some of them may observe a loss of QoE. Adding further difficulty, only a few may actually report the problem. The network management tools can help in this area by collecting information about media flows from the media-enabled network and endpoints, and correlating them to produce meaningful reports that provide visibility and quicker resolution for problems. These same management tools collect information about usage and trends and provide a guide for future network design, planning, and refinements to business policies.

To bring the goals of these services categories to their full potential, well-defined interactions between the network and the application are needed. A standard set of protocols is needed to link the application running on the endpoint with the network. Fortunately, many of these protocols exist and are standardized today. However, the host operating system often does not offer these protocols, the protocol implementation is incomplete, or the mechanism for use of these protocols is convoluted and difficult. To accelerate the binding between the application, the end host, and the network, better integration with application-network interfaces are needed. A medianet uses host-to-network protocols to allow the network to optimize media flows and the experience.

Conclusion

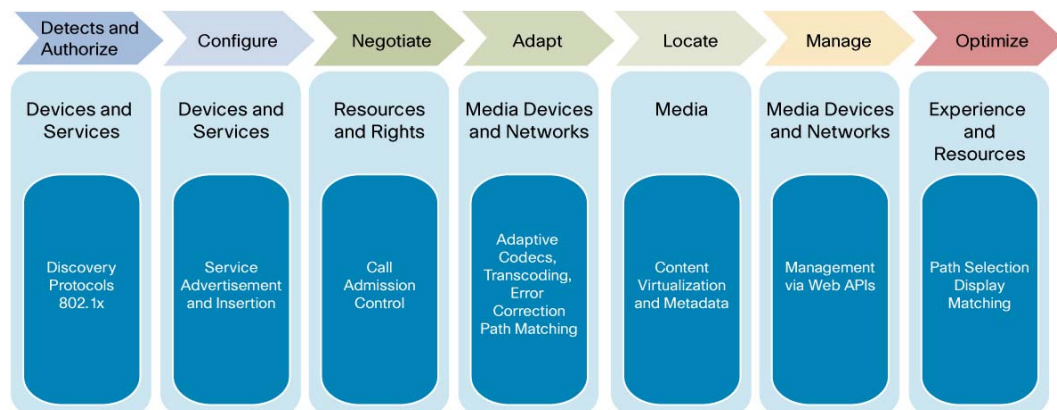
Video is a very compelling media form. It can attract attention, provide immediate context, and effectively facilitate communication. Video applications can, however, be very demanding on the network and can be very disruptive to the existing applications. Better integration is needed between the video application and the network such that the entire infrastructure is optimized for the generation, process, delivery, and display of all forms of media.

These applications need to be able to make network requests, learn from the network, and respond to network conditions. The network, on its side, needs to be able to match video applications with available services, control access to the network, and match network paths.

An application network interface will allow for the bridging of information between the video applications and the network by providing a mechanism for the video application to communicate with the network. On each of the services being worked on in a medianet -- QoE, security, management, mobility, session control, or content virtualization -- an application-network interface will play a critical role in providing an integrated solution.

As each session gets started and delivered, it goes through the medianet lifecycle shown in Figure 2.

Figure 2. Medianet Lifecycle



When an end host connects to the network, it is authenticated using a protocol such as 802.1x and its entry is validated. If allowed into the network, the application on the end host is discovered through discovery protocols such as Cisco Discovery Protocol or Link Layer Discovery Protocol (LLDP) and the network then reconfigures the attachment devices for the video application. If the application is well-known, the network may already have best-practice configurations designed by Cisco for the network device connected to the application. However, the network operator can override the default configuration with a site-specific one, addressing local conditions and needs. At the same time, the network can provide bootstrapping as well as clarifying information about network services to the video applications.

When session creation begins, an accounting of the required resources is performed and the relevant request is made into the network. If the medianet can accommodate the request -- accounting for the current network conditions, capabilities of the devices along the path and of the receiver(s), and business policies -- then the media stream is allowed to proceed. If the session control detects a resource contention, other sessions may need to adapt if they have a lower priority in the business policy, or this session may need to be placed on an alternate optimized path in the network. If the network cannot accommodate the media session, then the video application may choose to redefine its resource needs to something less demanding. The media stream and the devices along the path may adapt to attain the highest possible QoE.

Content virtualization techniques can be used to create indices describing the data and allowing for easy searching. Because the content may be stored in a different format from the manner it needs to be consumed, it may need to be converted to the relevant format. The search capability spans several locations and dimensions, creating freedom for end users, because they do not need to be concerned with the location of the content.

Management of medianet devices and services allows for rapid, worry-free deployments. Monitoring and reporting of session quality and network usage protect the user session from impairment-laden changing network conditions. This monitoring framework provides a real-time and historical feed of information of the state of the medianet and allows the network and devices to be constantly adapting and optimizing for the best possible experience.

Some video applications are already available today, and installation in the network has begun. Network operators need design guidelines and configuration best practices for solutions that work and have been validated against the multiple dimensions of predictability, performance, quality, and security. Design guides are already available for video-enabled networks and video applications, including well-known video applications such as TelePresence, digital signage, IP video surveillance, regular phone-based video conferencing, VoD, and IPTV. As the medianet solution is expanded and implemented over the years, validated designs and deployment guides will be produced at milestones that include new products and increased functions.

With the Cisco media-ready network, businesses can be assured that the current video applications running on the network have a solid foundation on which to build a medianet. A medianet will provide a media-aware network and a network-aware video application integration that will allow users to find and consume video anytime, anywhere, and from any device at the highest possible quality.

For More Information

Business video design guides are available at:

http://www.cisco.com/en/US/netsol/ns813/networking_solutions_solution_segment_home.html.

For more information about Medianet please visit: <http://www.cisco.com/go/medianet>.



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