

Unlocking the Power of Video





Medianet and the Impact of Video on the Enterprise

Foreword

This whitepaper is designed for IT and Business leaders to understand the impact of IP video applications and technologies and the benefit of taking an architectural approach to video.

Video is the next ‘killer app’

Lower technology barriers make production, access, and distribution of digital video available to anyone. For consumers, this creates more choices for entertainment and social networking—from user-generated content to streaming video to IP/TV for everything from interactive TV to live two-way video. For the enterprise, globalization, faster business cycles, and talent scarcity are driving deployment of video for many uses—video conferencing, video-based distanced learning, events, communications and safety and security. For telecommunications providers, video presents opportunities for new revenue streams in video-on-demand and hosted business services.

Pervasive video adoption is placing unprecedented demands on IT infrastructure

By 2014¹ video will exceed 91 percent of global internet traffic. Overall IP traffic is forecasted to grow four-fold from 2009 to 2014. Video and the rise of video-enabled mobile devices (smart-phones, pads, net-books, and PCs) lie behind much of the growth in traffic. An hour of HD video requires multiple gigabytes of storage or network bandwidth. Consumers are loading 35 hours of video to YouTube every minute.² This places unprecedented demands on the IT infrastructure to store, manage, access, and deliver videos. Rising quality expectations, device proliferation and innovation will continue to fuel rapid video growth well into the future.

Networked video is moving from “experimentation” to business-critical. Small video windows, low frame rates, and dropped streams are no longer acceptable. Improvements in camera technologies, video algorithms, and network performance mean HD-quality video for large-screen, immersive experiences. Additional innovations such as mobile video calling, analytics and 3D will drive even more demand for video in the future.

¹ Visual Networking Index 2011

² <http://youtube-global.blogspot.com/2010/11/great-scott-over-35-hours-of-video.html>

Video is causing the transformation of IP networks

As video grows, it will shape networks. They will get larger to handle the volume of traffic and proliferation of video-enabled devices, and smarter to handle the demands of video application—latency, distribution, management and interoperability—that can only be optimized at the network level. Both of these forces will give rise to the emergence of next-generation networks optimized for video.

This transformation affects all networks—service provider, business and home

Increasingly, video traffic is traversing a ‘network of networks’—from an enterprise or consumer, over commercial networks to another enterprise or consumer. This requires networks optimize with common standards and protocols for end-to-end quality of experience and an architectural approach that can scale.

Cisco Medianet is a unique architectural approach for video needs

As a global leader in networking, communications and video, Cisco has a unique perspective on the exploding impact of video on IT infrastructure. Cisco offers a broad array of video solutions for organizations, consumers and service providers, bringing insight into the needs and requirements of producers and consumers of video. The Cisco Medianet architecture provides a blueprint to help successfully deploy video at scale and efficiently evolve to meet future needs.

The video revolution and medianet

Enabling broad use of video requires an architectural approach that optimizes current investments and builds a framework for future needs. Understanding the interplay between video systems, network-based services and infrastructure is the foundation for such a video architecture and for your participation in the video revolution.

Chapter 1: Why Video?

In 1995, the web was new for many. Five years later, it had become pervasive, driving new business models such as e-commerce by virtualizing transactions. By 2000, web traffic had grown to half of all Internet traffic³ and the service-oriented-architecture (SOA) required to support pervasive web applications reshaped the technology landscape.

We are now at the advent of another transformational market transition—pervasive video. This is being driven by various technological, economic, and social trends:

- Declining costs for the capture, transmission, and sharing of high-quality video
- Ubiquitous video capture and playback capabilities in consumer devices, combined with and decreasing costs for all video capture devices
- Faster product cycle times driving need to accelerate collaboration in distributed organizations
- Knowledge capture for aging workforces to train large numbers of new and younger workers
- Increasing consumer entertainment choices available via providers or over-the-top alternatives
- Increasing performance of networks enables increased video scale and usage
- HD and 3D video technologies mean new immersive experiences
- Rising income levels in emerging markets are creating new video consumers

These trends will enable changes in entertainment, broadcast, sharing and collaboration as new business models, new companies, and new technologies emerge. This is pervasive video.

³ The Web is Dead. Long Live the Internet”, Wired, August 17, 2010.

Video for the enterprise

Organizations are facing increasing pressure to reduce costs, decrease cycle times, and expand globally. Globalization requires collaboration across time zones, teams and organizations. Decrease of business cycle times requires instant access to expertise. Capturing knowledge and expertise is crucial as generational or location shifts occur in the workplace. At the same time, demands for greater work-life balance focus means freeing workers from particular locations.

Having largely focused on automating transactions over the past two decades, IT organizations are now focused on how to deliver human talent at scale and enable effective collaboration. Now, for the first time, pervasive video is a possibility in the enterprise to address this.

Organizations are deploying video to enable a number of use cases:

- Meetings: drive faster decisions and better collaboration internally and across supply chains
- Education and Training: share expertise anywhere, anytime
- Organizational Communications: drive change and alignment
- Safety and Security: improve protection and response times
- Events: extend reach and personalization
- Customer/Patient Interaction: expert-on-demand
- Advertising: enable personalized and interactive content

Increasingly, organizations are deploying video at larger scale—for multiple applications and use cases and for large deployments for many employees. Video is being integrated across all devices: desk phones now include video cameras, web-conferencing has high-quality video, hand-held devices offer integrated HD video. More powerful PCs are enabling higher quality video capture, transform and sharing experiences. Immersive TelePresence rooms are taking the place of business travel and speeding collaboration. Digital signs playing rich media are not only replacing paper signs but are being treated as video endpoints for broadcast communications. Customer care is being transformed with virtual experiences in stores and online. Surveillance cameras with analytics can count the number of customers waiting in line and create “heat maps” of most trafficked areas in a store. Mobile video devices are bringing video capture and streaming capabilities to the factory, shop floor, or in the field.

Another dynamic is introduced by the consumerization of IT—increasingly employees are bringing consumer technologies into the workplace and using them for work tasks. The majority of these devices have video capture and playback capabilities that will further accelerate the adoption of video in the workplace. The worlds of enterprise and consumer video will progressively merge, not only with new devices introduced at work, but also new services for consumers from businesses and other organizations. Interoperability and standards are paramount so video systems can share video between all users, content and endpoints. Business and consumer devices will be used interchangeably across all enterprise video use cases.

In the enterprise, adoption of video will be use-case driven, typically starting with meetings and then moving on to other use cases like organizational communications or training. The video revolution will mean reinvention of many industries—healthcare, education, retail, and professional services, which are typically localized. It will also mean fundamental changes in citizen or customer services, development, manufacturing, and other functions which can be spread over wide regions or globally. With an expert available at the click of a button, new business models and companies will emerge to take advantage of the new opportunities at a global level.

Video for consumers

Existing digital cable and satellite transmission of TV is being disrupted with IPTV, which offers greater consumer choice and flexibility by transmitting video over broadband IP networks. IPTV offers the ability to time-shift (watch later), place-shift (watch anywhere), as well as device-shift (watch on any device: mobile, tablet, PC, or TV). These new capabilities are enabled by networked delivery of media and software innovations (browser-based user interfaces or dedicated applications) on consumer-electronic devices. Traditional fixed media (e.g. DVD or Blu-Ray) is being eclipsed by online media (streaming). Providers such as Netflix are offering streaming-only plans, representing a substantial shift in consumption habits.

Providers such as Amazon and Netflix are offering consumers freedom to access many sources of content on multiple devices. This change is disrupting the traditional TV model (see below) while changing how users access content. This means the ability to have a seamless experience from the living room, to mobile devices to PCs.

In addition to professional content, consumers are driving a user-generated content revolution by using inexpensive webcams, digital cameras, and mobile phones to create and share their own videos. Integrated live video conferencing capabilities are also changing how consumers can communicate from a variety of devices. By 2014, consumer traffic will represent 87% of total IP traffic worldwide.⁴

Video for service providers

Facing increasing pressure from the erosion of revenue from traditional voice services, telecom service providers are looking to so-called “triple-play” (voice, Internet, and video) to capture higher average revenue per user. Cable operators are similarly offering triple play to increase stickiness and revenue. These traditional providers are facing increased competition from new entrants such as Netflix, Apple and others.

Service providers must also now compete to deliver content to any device—television, tablets, mobiles, and PCs. This creates new content delivery and infrastructure costs: traditional digital ingest and distribution to set-top boxes and new IPTV to consumer electronics devices. This will lead to pressure to standardize on an all-IP delivery infrastructure. A converged infrastructure enables delivery to all devices: IP set-top boxes, Internet TVs, tablets, mobiles and PCs.

Multiple business models for content will co-exist: advertising, subscription, and pay-per-view. Free and fee content will compete for viewers.

4 VNI 2011 report

Service providers also seek to provide to the enterprise managed video services such as telepresence, video-conferencing, unified communications, hosted web-conferencing, streaming, content distribution, digital signage, or video-surveillance. For smaller organizations, this can be an effective way to offload complex and costly infrastructure. For larger organizations, it may provide deployment and scale options for new video services. Service providers can leverage multi-tenancy and virtualization technologies to create competitive video offerings for business.

Video across customer segments

Of all the major IT trends currently underway, video is unique in that it is growing quickly across enterprises, consumers, and service providers. While it presents new opportunities, video is different from other IT data types in that it imposes very strict demands in terms of infrastructure. Delay, packet loss, storage, and bandwidth capacity can all adversely affect video quality. When video degrades it quickly becomes useless and frustrates users. Significant processing power, storage, and bandwidth are required for high-quality video.

Quality, reliability, security, cost, and simplicity in ease of use will drive high utilization of video. Video will increasingly be used between organizations and consumers: companies want to provide better, richer customer experiences and consumers want the ability to use video when they talk to other consumers and organizations. Both require new and different SP offerings.

Increasingly the industry is settling on standards for video formats (e.g. H.264) and signaling (e.g. SIP). Nevertheless, tremendous endpoint and system diversity means multiple formats, resolutions, aspect ratios, and signaling protocols. In addition, the variability of network connection speeds can lead to the need to adapt media formats to bandwidth constraints. Every day new video devices with new capabilities are introduced. Interoperability is still nascent. An intelligent infrastructure can help ensure video can be played anywhere, any time, on any device. We call this medianet.

Chapter 2: Cisco's Vision for Video

Video will fundamentally change the way we work, live, play, and learn. Cisco is helping organizations take advantage of the pervasive video market transition by enabling standards-based video across the entire Cisco product and services portfolio.

Three beliefs about the future of video underpin the Cisco video vision:

- Video is the most compelling media for entertainment and collaboration
- Video should be available on any endpoint, anywhere, any time
- A medianet architecture is required for pervasive deployment of video

Video is the most compelling media for entertainment and collaboration

Human beings are inherently visual beings: 64% of all communication is non-verbal⁵ while one-third of the human cortex is dedicated to the processing of vision.⁶ For communications and collaboration, video aids retention rates, speeds time to trust, and enables faster decision making.

5 Kandola, Pearn "The Psychology of Effective Business Communications in Geographically Dispersed Teams", Sept 2006

6 Vision Group Research, FMRI, University of Oxford, UK

Video should be available anywhere, any-time, on any device

The incremental cost of adding video to an existing mobile phone, computer, or consumer electronic device is low. This is why new mobile phones incorporate cameras, phones are becoming videophones, and internet TV's and game consoles are adding interactive video. With the pervasive availability of video-capable devices, interoperability becomes a key requirement.

Today, there are still many video formats, such as MPEG-2, H.264, or Flash. Devices offer different resolutions (e.g. 1080p: 1920x1080, 720p: 1280x720, VGA: 640x480) and aspect ratios: 16:9, 4:3. The ability to display smooth high quality video is constrained by the speed and quality of network. Rapid innovation in video means new devices, codecs, screen sizes, and other video technologies such as 3D are still coming to market quickly. Older devices may not be able to adapt to these new capabilities so incompatibility between endpoints is likely to persist for some time.

Some video endpoints still must use closed and proprietary directories (e.g. Skype, FaceTime) which restrict users of one service from calling users on another. Standards-based technologies exist (e.g. XMPP) to enable seamless interoperability between organizations.

Video is an incredible force for economic development which will only reach full potential when interoperability constraints are lifted. Cisco maintains a full "any-to-any" vision for video where anyone can communicate with anyone else on any other device or application. Further, an intelligent network infrastructure can remove various interoperability barriers and enable seamless connectivity. A medianet architecture can convert incompatible signaling and media, bridge communications across multiple directories, and dynamically adapt video quality to network capacity limitations.

A medianet architecture is required for pervasive deployment of video

Enabling pervasive video requires full interoperability and great video experiences.

For interoperability, incompatible signals and media must be transparently converted or transcoded to handle differences between source, destination, and the quality of the link between them. In a medianet architecture, such connections are automatically routed through gateways that perform the required conversion on demand and in real time. These gateways can also adjust to the available bandwidth between the endpoints and transcode video.

For reliable and high-quality video, the optimum bit-rate for transmission, appropriate priority for video traffic, and bandwidth and other video resources (e.g. gateways) reservations are required. This becomes important as video endpoints deployments and network demands increase. A single HD video call can consume up to 200 times more bandwidth than a voice call. Today, HD video surveillance streams send video 24 hours a day. Mobile video devices are easily moved between locations, which can place additional strain on infrastructure. For PCs running many applications, providing a reliable way to classify the video streams separately from traffic generated by other applications is essential to ensure great video experiences. Security and manageability are also important, as video traffic will share common infrastructure with other data types.

For great experiences, reliability, simplicity and high quality are required. If video experiences are not reliable or if quality is poor, it will not be used. Worse, the investment in video endpoints will be wasted and the business benefits from pervasive video won't be realized.

Video interoperability and management are inherently dynamic problems: until a connection is attempted, we don't know which endpoints are trying to communicate, what the current link speed is, and which applications/devices are trying to use the same infrastructure at that time. The common element is the underlying network: it is shared by all applications and devices. Cisco therefore has focused medianet on embedding intelligence into the network layer. This intelligence uses the dynamic and adaptive nature of IP networking: as conditions change, it also adapts.

Cisco Medianet technologies are extensions of traditional IP network technologies. These are embedded into four main infrastructure areas:

- **Endpoints & applications:** the Medianet Service Interface (MSI) is a set of protocols and APIs being deployed across Cisco's entire video and collaboration portfolio including surveillance cameras, digital media players, WebEx client, videophones, and TelePresence. This enables plug and play simplicity for endpoints, with endpoint auto-discovery, auto-configuration, and automatic optimization. This reduces deployment complexity and increases manageability.
- **Networking:** the protocols embedded into the endpoint via MSI have their counterparts in the switches, routers and other components in the underlying network fabric. These devices communicate with endpoint MSI to detect, configure, and optimize traffic. This can include forwarding requests from endpoints to the nearest server, reserving bandwidth via mechanisms such as RSVP, or alerting the system to packet loss due to congestion. This also includes medianet capabilities embedded into security for campus and remote access with secure network services and content along with management for planning, end-to-end monitoring and dynamic troubleshooting.
- **Shared services:** As more video applications move on to IP networks, common shared services are required to eliminate unnecessary duplication. This can include services like directories, recording, analytics, conferencing or transcoding. The market transition to e-commerce required such services: load balancers, application acceleration appliances, and firewalls provided shared services across web applications. In a medianet, these shared services are discovered and accessed dynamically as needed by endpoints.
- **Cloud services:** Some of the shared services will reside off-premise in cloud, possibly hosted by service providers. These will provide capabilities such as hosted video surveillance recording, multipoint video calling, on-demand interoperability, or business-to-business video calling capabilities. It is likely that businesses will use a mix of on-premise and cloud-based shared video services.

These medianet capabilities build upon the foundation of IP networking and use standards-based technologies to ensure the widest possible adoption. Cisco is committed to embedding these technologies into all of its video endpoints and network infrastructure.

Fig 1. Cisco's Enterprise Video Medianet Architecture



Chapter 3: Cisco's Video Leadership Role

Uniquely among technology companies, Cisco is a leading provider of endpoints, applications, and underlying infrastructure to deliver video at scale. It is also one of the few technology companies with a leadership position across all customer segments.

Cisco is the leading provider of video devices and applications

Cisco maintains a #1 or #2 market share position in enterprise voice, web conferencing, unified messaging, TelePresence, video conferencing, audio conferencing, contact center, and set-top box

Cisco itself is one of the most video-enabled businesses in the world, with over 10,000 video conferencing endpoints and almost 1,500 immersive rooms Cisco TelePresence systems used for meetings on average more than 5 hours a day per room. Cisco also has a widespread deployment of desktop video sharing and IP-TV, more than 2,000 digital signs, and 2,000 video surveillance cameras deployed. Every month, Cisco employees create over 3,000 video-on-demand clips. Video is currently (on average) about 25% of Cisco's overall wide-area network (WAN) traffic (and growing at 36% per year).⁷ Lessons learned from internal deployments of video technologies are turned into design guides, best-practices, and used to train our services team to enable customers to benefit from this experience.

⁷ Cisco on Cisco Medianet Q&A

Cisco is the leading provider of networked infrastructure for video

Video loads networks, but also changes networks. Infrastructure must get larger and smarter to accommodate video endpoints and applications demands. Cisco is the world's leading provider in the key infrastructure layers that enable video to scale—enterprise and service provider routing, switching and wireless. Cisco is also innovating in application and content management for video, to provide the specific capabilities organizations need to scale video.

Cisco is operating-system and endpoint agnostic, supporting applications on Windows, Mac OS, Android, iOS, and Blackberry. Cisco offers applications in a variety of deployment models: as-a-service, hosted, or on-premise.

As the leading provider of all key infrastructure for entertainment and collaboration delivery, Cisco has developed unique insights on how to deliver video at scale. These insights underpin Medianet development and innovation in video endpoints, shared infrastructure, and networking layers.

Cisco is uniquely able to provide video solutions across all customer segments: consumer, business, and service-provider

Consumers are bringing their own technology into the workplace. Businesses are looking for managed and hosted solutions. Service providers deliver entertainment to consumers and services to businesses over a common IP infrastructure. Video innovations are no longer confined to a single customer segment.

Cisco TelePresence, Unified Communications, Show and Share, Cisco Digital Signage, WebEx, Quad and Physical Security combined with media transformation products and core underlying networking technologies are an unequalled portfolio. Video acquisition, content distribution, mobile gateway, and set top box solutions and infrastructure mean end-to-end-solutions for service providers. Cisco brings the strengths and innovations from each of these segments into the others.

Where to Begin Your Pervasive Video Journey

For consumers, video is creating more entertainment and communication options. Simplicity, quality, cost, and availability (on which endpoints) will be the key considerations for choosing a video provider. Consumers are creating video content. The explosion of content choices means confusion and fragmentation, creating opportunities for companies that harness social networking and recommendation engines to help consumers navigate.

Many organizations will establish a Business Video Manager position responsible for deploying a portfolio of video applications. This typically means a multi-year roadmap, for applications and underlying infrastructure. Businesses may elect to turn to consultants or service providers to help craft a custom video roadmap and to validate ROI. Businesses will identify video “hot spots”: key business processes that can be transformed by the use of the right video technologies. Typically starting with meetings, this rapidly expands to other use cases like training, organizational communications, events, customer interaction, safety and security or advertising. The benefit of considering video as a portfolio is that new video use cases can be deployed faster by leveraging infrastructure and services already deployed. Unit infrastructure costs decrease if items such as bandwidth and storage can be shared by multiple applications. Investing in a medianet infrastructure will mean lower operational expenses while ensuring great experiences. Some video investments will be paid for from savings, such as travel avoidance. Others will be part of some overall strategic investments such as new enterprise applications or processes.

As video becomes pervasive, reduced cycle time, increased employee effectiveness, and growing sales will increase—accelerating more video use. This follows many other examples like telephones, printers, and PCs

For service providers, creating new video offerings is vital to combat commoditization of existing services. New IPTV technologies provide competitive advantage by giving customers the ability to watch broadcast content on a wide range of devices on-demand. The complexity of infrastructure for enterprise video deployment creates “as a service” hosted offerings for video surveillance, video conferencing, TelePresence, and digital signage. These value-added services create stickiness and reduce customer churn. Once basic video services are made available over a medianet infrastructure, offering new video services becomes easy.

The transition to pervasive video is underway and its impact is significant. Technology innovations and new business models mean new participants, and new revenue streams. Video will forever change the way we work, live, learn, and play.

For More Information

For more information about the Cisco Medianet Architecture, go to:

<http://www.cisco.com/en/US/netsol/ns1094/index.html>

For more information about the Cisco Pervasive Video portfolio, go to:

<http://www.cisco.com/en/US/products/hw/video/index.html>

For more information about Enterprise Video use cases, go to:

http://www.cisco.com/en/US/solutions/ns813/pervasive_video.html

For information about service provider video, go to

<http://www.cisco.com/web/solutions/sp/video/index.html>



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