Modern Video Streaming in the Enterprise: Protocols, Caching, and WAN Optimization

The video streaming industry is undergoing a sea change. As video has become a mainstream medium for business communication and learning, the approach to delivering video files has shifted from overlay networks, custom protocols and specialized servers to chunked, HTTP-based “Modern Streaming.”

Organizations that implement their live and on-demand video infrastructure using Modern Streaming stand to benefit from reductions in cost and network management complexity, and from improvements in scalability and the viewing experience. Because modern video protocols have been built to leverage the architecture of the internet and corporate WANs, they work in concert with organizations’ existing web caching infrastructure and WAN optimization technologies.

For organizations with video infrastructure built on legacy streaming protocols like RTMP, MMS, and RTSP, and organizations that have invested in multicast video communication, Modern Streaming represents an inflection point. Although continued investment in legacy video technology limits near-term disruption, it prolongs an inevitable technology transition, increases the eventual cost of switching, and limits the choice of technology providers who are actively divesting from the technologies.
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An Industry That Evolves Through Upheaval

In the video ecosystem, it’s rare for competing technologies to peacefully coexist for long.

The now-famous videotape format war of the late 1970s and 1980s demonstrated the speed with which the industry could tip in favor of one technology, and the devastating impact this could have on its competition. When the industry cast its collective vote for VHS in 1975, it took less than three years for the technology to overtake Betamax.

Beta vs. VHS market share: A case study in how suddenly the video ecosystem can tip. Source: Business History Review.

In a subsequent market shift between 1999 and 2004, VHS sales were overtaken, and then quickly dwarfed, by DVDs.
Online media has experienced similar seismic shifts. In January 2010, only 10 percent of online videos were encoded using the H.264 compression format. Less than two years later, that number had ballooned to 80 percent.

In each of these event horizons, market inertia yielded to a media technology whose time had come. And in 2015, the industry is approaching its next point of no return.
In the last ten to twelve years, online video has become essential to how people are entertained, how students learn, and how businesses communicate. It’s estimated that more than two-thirds of global consumer internet traffic is already comprised of video (Cisco), and that large businesses already stream over 14 hours of video per employee per month (Gartner).

A Seismic Shift is Underway

During this time, media distribution technology has evolved in four phases.
HTTP Download

When video files were first shared online, they were distributed using Hypertext Transfer Protocol (HTTP) — the same delivery mechanism used by HTML pages, images, documents and other types of web-based content.

Initially, videos had to be downloaded in their entirety before playback could begin. This process, called download and play, had several notable shortcomings. First, dial-up speeds of 28 to 56 kbps meant that users would almost always encounter long playback delays. Second, there was no mechanism to efficiently scale to multiple simultaneous viewers. Finally, limited bandwidth was often wasted on unwatched segments of video. For example, if a user clicked on a 10-minute video and only watched the first three minutes, the remaining seven minutes would have been superfluously downloaded across the network.

Apple addressed some of the issues of HTTP-based video download when they released support for Fast Start, more commonly known as progressive HTTP download. This approach placed important metadata at the top of the media file, allowing video playback to begin before the entire file was downloaded. Although progressive download is still in use today, it was largely superseded in the early 2000s by custom protocols and servers built for a new type of online video delivery called streaming.
Custom Streaming Protocols

Compared to other types of content shared online, video files are massive. A single minute of iPhone video can take up as much as 80 to 120 MB of disk space. In that same amount of space, you could store between 250 and 350 average-sized Word documents (Microsoft).

This characteristic made it difficult to distribute video files over bandwidth-constrained networks. So as video became more prevalent on the web and in corporate networks, media companies and software vendors began developing custom protocols for video streaming. RealNetworks and Netscape collaborated on the development and standardization of the Real Time Streaming Protocol (RTSP). Adobe, through its acquisition of Macromedia, implemented the Real Time Messaging Protocol (RTMP) for Flash-based video streaming. Microsoft developed a third streaming protocol, Microsoft Media Server (MMS), for use in various Windows applications.

RTSP, RTMP, and MMS all treated video as a special case. They constructed “overlay networks” in which protocol-specific streaming servers sat alongside traditional HTTP servers. When a user initiated a request to play back video, the request was routed to the streaming server, which then opened a persistent (or “stateful”) connection to the user’s video player.
Custom streaming protocols overcame many of the challenges of HTTP progressive download. Video was buffered, processed and played back as it was being delivered over the network, enabling users to abandon a video mid-stream with minimal bandwidth waste. Random access was supported, enabling viewers to seek and quickly start playback from any point in the video. The persistent connection from streaming server to client provided more predictable latency. And in all cases, these overlay networks helped organizations offload video traffic from the primary WAN transport, reducing the chance that video congestion would jeopardize the delivery of higher-priority information and transactional data.

RTMP, RTSP, and MMS were not without limitations, however. Because these protocols treated video as a special-case data type, they increased the cost and complexity of video delivery. First, the protocols required a separate set of specialized servers to be deployed throughout the corporate network, adding hardware and software infrastructure costs. Second, streaming protocols created a binding between the delivery and caching mechanisms. This required organizations to support two separate caching technologies (one for HTTP-based traffic, one for video), effectively doubling the complexity of network management. Third, RTMP, RTSP, and MMS required administrators to open additional network ports for communication (1935, 554, and 1755 respectively). This expanded the attack surface of the network and increased the likelihood that the protocols would be blocked by corporate firewalls. Finally, custom streaming protocols were often incompatible with mobile devices. For example, RTMP required Flash for playback, a format that famously isn’t supported on iOS devices. Beyond the iOS ecosystem, mobile clients have frequent connectivity interruptions and IP address changes. This would often require the active RTMP connection to be re-established multiple times during a single event.

Multicast

The claim that multicast was a distinct phase of online video delivery is a generous one, considering the technology never reached critical mass in either the enterprise or on the consumer internet. However, there was intense interest in multicast for video in the mid-2000s, and the technology persists in some corporate networks, so it bears discussion.
Multicast was a network technology that allowed a sender to distribute the same data to multiple recipients at the same time. Conceptually, it was not unlike listening to the radio. A single radio signal is sent to all listeners rather than unique signals being sent to each person tuning in. When implemented properly, multicast created incredible efficiencies in data delivery. This drove a period of interest in the use of multicast for video delivery.

Using multicast, an organization could theoretically deliver live video across the corporate network using a fraction of the bandwidth required by traditional unicast transmission. As a result, organizations often looked to multicast as a way get additional ROI from their bandwidth-constrained networks rather than upgrade network infrastructure.

Unfortunately, the infrastructure requirements of multicast made it infeasible for most organizations. In order to distribute video (or any data) using multicast, the source, recipients, and connecting network infrastructure all had to support the protocol. Specifically, every router, hub, switch, and firewall within a corporate network had to be multicast-compliant. This requirement of homogeneous infrastructure was neither practical nor resilient.

For example, if an attempted multicast communication failed, the fallback would typically have been a traditional unicast transmission. In most cases, this unicast transmission didn’t benefit from any network optimization such as data caching or other WAN acceleration techniques, since multicast was the only implemented form of optimization.
In addition, because multicast required a homogeneous networking environment, it was fundamentally at odds with the network topologies that still dominate businesses and consumer online communication. The internet is built for a wide range of network speeds, connection types, quality of service (QoS), and endpoint devices. Its foundation is HTTP—a stateless, media-independent protocol built specifically to work in this heterogeneous environment. Similarly, the networks behind corporate firewalls are increasingly heterogeneous. The trend toward bring your own device (BYOD) means that employees are carrying a range of tablets and smartphones with varied capabilities and networking requirements. And ongoing industry consolidation makes it less and less likely that a newly-acquired branch office in London uses the same network architecture as the home office in Seattle.

In summary, multicast was a lofty but unrealistic aspiration for video delivery. In the past decade, interest in the technology has been steadily declining.
Modern HTTP Streaming

In 2008, Microsoft introduced Smooth Streaming, a hybrid approach to video delivery that offered many benefits of custom streaming protocols while leveraging HTTP and existing network infrastructure. Smooth Streaming also supported adaptive bitrate (ABR) delivery, providing viewers with faster startup and seek times, minimal buffering, and a smoother playback experience.

Adaptive bitrate streaming provides faster startup and seek times, minimal buffering, and a smooth playback experience by dynamically adjusting video quality based on client connection speed.

HTTP-based streaming quickly gained momentum, and other market leaders were quick to invest in the technology. In 2009, Apple entered the market with the introduction of HTTP Live Streaming (HLS). In 2010, Adobe shifted its focus away from custom streaming protocols with the release of HTTP Dynamic Streaming (HDS). And since 2010, major streaming and media companies, including Microsoft, Google, Adobe, Netflix, Ericsson, and Samsung, have been collaborating on MPEG-DASH, an open standard for adaptive video streaming over HTTP.

Innovations like Smooth Streaming, HLS, HDS, and DASH have driven a resurgence in HTTP-based video delivery, and an upheaval in the way that businesses distribute video over their networks.
An Overview of Modern Streaming

Shortly after the introduction of Smooth Streaming, modern HTTP-based video was put to the ultimate test. In August 2008, for the first time ever, every minute of every event of the Summer Olympic Games would be streamed online in high definition. The event would be delivered using Smooth Streaming through a partnership between NBC and Microsoft.

During the two weeks of competition, 50 million unique visitors initiated 70 million video streams and watched 10 million hours of video (an average of 27 minutes at a time). In a single event, "Modern Streaming" had proven that the internet was capable of scalable, reliable, broadcast-quality video.

The 2008 Olympics opening ceremony kicked off 2,200 hours of online video streamed in a two-week period.

The success of the 2008 Olympics, and of HTTP streaming more broadly, was based on a simple but powerful architectural tenet: Modern Streaming fully embraced the topology of its underlying network. Unlike custom streaming protocols, which compete with the stateless, cache-friendly architecture of the internet and corporate WANs, HTTP streaming could leverage the architecture to deliver high-quality video at unprecedented scale.
Seven Characteristics Define Modern Streaming

What makes a video streaming protocol modern? Similarities across HLS, Smooth Streaming, HDS, and DASH yield seven common characteristics:

1. **Chunked delivery**: With modern streaming, video files are divided into short multi-second segments that are sent across the wire. Depending on the protocol, the segments can range from 2-10 seconds in length. By contrast, custom streaming protocols treat videos as monolithic blobs of information.

2. **HTTP communication**: Video segments are sent across the internet or corporate WAN using the standard HTTP protocol. Specifically, all Modern Streaming communications rely on TCP ports 80 (for unencrypted HTTP communication) and 443 (for SSL-encrypted communication).

3. **Stateless Interaction**: When a client is watching a video stream, each request for subsequent video segments is independent of previous requests. In other words, there’s no persistent connection between client and origin server during video playback.

4. **Cache-friendly**: Chunked delivery is what enables Modern Streaming to work in concert with HTTP caches that are ubiquitous on the internet, in content delivery networks (CDNs), and in many corporate networks. This has major benefits for network bandwidth management and WAN optimization—topics discussed in greater detail below.

5. **Adaptive-bitrate (ABR) playback**: Videos delivered using modern protocols are encoded at multiple quality levels. During playback, the client’s available bandwidth determines which quality level will provide the smoothest playback experience, and adjustments are made dynamically to minimize buffering while providing high quality playback.

6. **Passive network architecture**: When video fragments are in transit on the network, intermediary nodes simply route the fragments toward their final destination, and in some cases, also cache the fragment. The intermediaries never execute any specialized code or modify the video fragments.

7. **Internet-Intranet symmetry**: By default, modern protocols like HLS, DASH, Smooth, and HDS treat corporate WANs works no differently than the public internet. Both are passive, stateless networks comprised of hardware and software that can route video chunks to their final destination and cache video segments as needed.
Four Benefits of Modern Streaming

The seven characteristics of Modern Streaming define a video delivery model that doesn’t fit traditional categories of unicast, multicast, and broadcast. Instead, modern protocols simply put a sequence of short video segments on a server and allow any client to fetch them, either live or on-demand. What makes Modern Streaming unique is that there is actually very little unique about it. Modern protocols like HLS treat video files no differently than any other content being delivered across the network. In doing so, they homogenize the transport layer of all enterprise content to HTTP.

Modern Streaming unifies the network transport to HTTP, and provides a single, consistent caching infrastructure for improving the performance of video, images, documents, and other content.

When video is no longer a special-cased data type, IT organizations benefit from reduced management complexity, reduced cost, improved scalability, and improved playback experiences.
Reduced management complexity

Modern Streaming enables organizations to consolidate video network traffic to HTTP using TCP ports 80 and 443. In doing so, it eliminates the need to deploy and manage a separate caching infrastructure.

In addition, Modern Streaming can improve manageability at the edge of the network by helping video content traverse firewalls. In most corporate networks, some level of protocol and port restriction is used to minimize attack surface area. While ports 80 and 443 are almost always open for the flow of generic web traffic, this luxury isn’t always extended to RTMP, RTSP, and other legacy protocols.

Reduced costs

Custom streaming protocols drive up infrastructure costs in two ways. First, they require organizations to invest in server hardware and software that form the backbone of the “video overlay” network. Second, their inefficiency in caching content can increase the amount of bandwidth required to stream popular video across the network.

Modern Streaming overcomes both of these challenges. Protocols like HLS leverage the existing HTTP server network, enabling organizations to save costs that would otherwise be spent on specialized hardware and software. And as the use of video increases, HTTP caching proxies dramatically reduce the bandwidth costs associated with uncached video.

Improved scalability

The ubiquity of HTTP servers, and the protocol’s native support for mirroring and edge caching, make HTTP the ideal choice for streaming large-scale live events and frequently-accessed, on-demand content. When organizations invest in a modern protocol, scalability is an inherent benefit of the underlying network. By contrast, scalability with legacy protocols like RTMP is achieved only through additional investment in specialized hardware and software.

Improved playback

Modern Streaming offers two benefits to the video playback experience. First, the use of HTTP and widely adopted codecs (e.g. H.264 for video and AAC for audio) helps ensure compatibility with a wide range of mobile devices.

In addition, the use of adaptive bitrate streaming helps ensure that employees around the world get the best possible playback experience whether they’re at their desks on gigabit ethernet or in the field consuming media over a 3G network.
Special Cases Create Complexity

When enterprise technologies are on the fringe, they’re often special-cased. In the early days of the smartphone market, businesses created one-off mobile versions of their websites (“m-dot sites”). These special cases required additional upfront development and ongoing maintenance of duplicate content. As smartphones and tablets became mainstream, organizations transitioned to the more efficient responsive model of web development, using standard HTML5 and CSS to serve the same web content to desktop and mobile form factors.

A similar transition is happening in the video industry. When video was a peripheral medium for communication, it required a special case, along with the associated cost and complexity. Now that video has become mainstream, those special cases are being abandoned.

“The advent of dynamic, HTTP-based media technologies—from the aforementioned Smooth Streaming and DASH to Apple’s HTTP Live Streaming (HLS)—has made it not only practical but desirable to consolidate video traffic from overlay networks to traditional HTTP-centric data networks.”
- Streaming Media Magazine
What Modern Streaming Means for Your Organization

“We believe strongly that the future of CDN-based streaming video delivery is via cacheable, HTTP streaming protocols.”
- Chris Bay, Vice President, Highwinds

For many organizations, Modern Streaming presents new opportunities to use existing network infrastructure for more scalable, cost-effective video delivery. For other organizations, the rise of HTTP streaming presents an inflection point in how network traffic will be managed. The extent to which organizations can reap immediate benefits from Modern Streaming is based on their network infrastructure investments of the past five to ten years, and on their ability to consolidate network traffic to the HTTP transport.

Companies That Have Invested in Web Caching Systems

As HTML pages, images, documents, and other types of content traverse the internet and corporate networks, they pass through a series of intermediaries, or proxy servers. A caching proxy server, also known as a web cache or an HTTP cache, stores local copies of frequently-requested resources. When subsequent requests for a resource are made, the web cache can serve the content to the client rather than make a full round trip to the origin server. Web caching systems improve the response times of websites, reduce the load on content origin servers, and improve resource availability by using cached content in cases where the origin server is unavailable. Popular web caching technologies include Nginx, Squid, Varnish, and WinGate, as well as the Apache and Microsoft IIS web servers.

In recent years, most large businesses have implemented web caching as part of their network infrastructure. For these organizations, Modern Streaming offers nothing but opportunity. HLS, DASH, and other HTTP streaming protocols were built explicitly to work with web caching infrastructure. And through the use of expiration policies and effective cache management, the impact of video traffic on other web-based content can
Another advantage of pairing Modern Streaming with web caches is the simple, cost-effective upgrade path as network load increases. Future upgrades come in the form of expanded HTTP edge caches—a commodity with ever decreasing prices.

Storage prices per gigabyte continue to drop, providing a cost-effective path to scaling HTTP caches. Source: mkomo.com

For organizations that stream media using HTTP, a web caching solution will often be all that is needed to optimize video delivery over the corporate network.

For organizations that haven’t yet invested in any form of caching or optimization, an HTTP cache should be the first step. Why? Planning for effective network management and planning for increased video traffic reduce to the same answer—content caching at the edge of the network.
Companies That Have Implemented WAN Optimization Technology

Like HTTP caching systems, WAN Optimization (WANop) technologies improve the performance of data delivery across a wide area network. Typically deployed “symmetrically” at both the corporate data center and in branch offices as physical or virtual appliances, WANop solutions provide a superset of the functionality available in simple caching solutions. Their capabilities may include:

- **Data compression:** When a client within a branch office requests information from the data center, the information is compressed at the data center, sent across the wire, and then decompressed at the branch office. This process improves network performance in two ways. First, it reduces the total amount of data being sent from the data center to the branch. Second, it allows larger chunks of data to be sent, reducing the number of round trips between the branch and the data center.

- **Traffic shaping:** As information flows across a corporate network, WANop solutions often use fingerprinting tools to identify applications based on their type (e.g. VoIP, CRM, web conferencing, e-learning, gaming, P2P). The WANop appliance then uses this information to delay the transmission of lower-priority data and ensure quality of service (QoS) for business-critical traffic.

- **Predictive data delivery:** Some WANop appliances can anticipate data requests and parallelize activities in order to improve performance. For example, if a user at a branch office clicks on a network file that resides in the data center, they must first be authenticated before the file is transmitted. While the user is being authenticated, the WANop system begins sending the file to the branch office appliance. When the authentication process is complete, the requested file already resides in the local branch office and can be delivered to the user more quickly.
Like web caches, WANop solutions were built to work in concert with chunked data distribution—the same approach to distribution used by modern video protocols. This means that, at the most basic level, WANop systems can efficiently cache video chunks being streamed by HLS, DASH, or other HTTP-based protocols.

In addition, WAN optimization technologies like those offered by Riverbed, Blue Coat, and Silver Peak can apply traffic shaping and predictive data delivery to HTTP-based video just as they would with any other type of data. For example, traffic shaping policies could be set to identify different classes of video (recreational video from sites like YouTube, Skype for Business video calls, e-learning on-demand video, etc), and to throttle recreational video in order to prioritize business-critical web conferences and eLearning content.

Other WANop capabilities that can be applied to HTTP streaming protocols include:

- **Live stream splitting**: A process similar to caching, but designed for the unique challenges of live webcasts. With live streaming, requests for the same video fragment are received almost simultaneously, usually before the cache can be populated. Some WANop solutions can identify this condition, consolidate the incoming requests, and then send a single request to the origin server. When the video fragment is received from the origin server, it is served from the local cache to improve performance for all subsequent requests.

- **Byte caching**: WANop solutions can sometimes reduce round trips to the origin server by identifying common fragments across different videos, and serving those fragments from the local cache. For example, if a common pre-roll bumper is used across all training videos, the fragments that comprise that bumper can be stored in the local cache. As subsequent requests for various training videos are made, the pre-roll fragments can be served from the local cache, reducing round trips to the origin server.

- **Time-based distribution**: For frequently-accessed on-demand content, some WANop systems can set policies that distribute the videos to branch office caches during low usage hours.
Byte caching example: User 1 (top right) requests file 1. The file is downloaded from the server and cached on the local WANop virtual appliance. User 2 (bottom right) then requests file 2. The WANop appliance sees duplicative content with file 1 (chunks 1-5), and then only requests non-cached chunks (A-K) from the server.

For organizations that have already invested in WAN optimization technology, Modern Streaming provides the perfect complement. Through the use of stateless, chunked video delivery, protocols like HLS and DASH integrate with native functionality in leading WANop solutions, providing an improved video playback experience while maximizing network throughput.
Many large organizations built their video infrastructure prior to the advent of Modern Streaming, when the only viable option was an overlay network using RTMP, MMS, or RTSP. Although these protocols, particularly RTMP, are still in widespread use, their adoption peaked several years ago, and their ongoing use is sustained by inertia, not by continued investment in the space.

This trend is visible across the industry, as content delivery networks, operating system vendors, hardware manufacturers, and media companies abandon legacy protocols in favor of Modern Streaming:

• All major CDN vendors have ceased support for the MMS protocol. Limelight, the last major content delivery network to end support, did so in March, 2015.
• Leading-edge CDN vendors like Highwinds have completely transitioned away from RTMP and related protocols to HTTP-based streaming.
• Microsoft has removed Windows Media Services (WMS)—the streaming media server built around the MMS protocol—from its Windows Server product. In recent years, the company has thrown its support behind the standardization of Dynamic Adaptive Streaming over HTTP (DASH).
• Apple has bypassed legacy streaming, instead leveraging HLS across its products.
• Android tablets and smartphones have also largely moved beyond legacy protocols. Native support for RTMP playback is not included in the operating system.
• Hulu currently streams video to its more than six million subscribers using HLS and DASH.
• Netflix formats its media files as multibitrate DASH.

What does this mean for organizations that have built their internal media networks on legacy protocols? As with any technology that is being sunset, they face a Hobson’s choice. In this case, repurpose their custom streaming servers and re-encode legacy videos, or face a market end-of-road.
Companies That Have Invested in Multicast

“At this point if you’re considering a streaming technology, the overwhelming sentiment is to deliver via HTTP.”
- Streaming Media Magazine

In recent years, the shift to Modern Streaming has unified the network transport layer, eliminating special-cased data delivery. Multicast was a lofty aspiration, but it represents the ultimate, all-or-nothing special case in network management and content delivery.

The death of MMS and other special-cased streaming protocols also signals the death of multicast. This puts companies invested in the technology behind the eight ball, and presents two options:

1. Increase the bandwidth of their network
2. Extend support for multicast

Option two may appear to be less disruptive. However, to choose this approach is to continue an investment in the past. At some point, every organization will have exhausted its ability to squeeze efficiency out of a bandwidth-constrained multicast network.

In addition, continued investment in multicast also limits the choice of technology providers, as more and more divest from a dying technology. Those who do continue offering multicast solutions are maintaining the fiction that multicast will persist into the next decade as a viable data delivery mechanism. At best, this calls into question the vendor’s understanding of video futures. At worst, it calls into question whether they have their customers’ long-term interests in mind.
Panopto and Modern Streaming

Panopto is the first video platform built from the ground-up for Modern Streaming. In December 2014, the company released a major update to its video capture and management software—the first of its kind to implement an end-to-end media pipeline based on HLS, the de facto standard for HTTP streaming.

HLS has become the de facto standard for Modern Streaming, with adoption extending far beyond the iOS ecosystem. Source: encoding.com.

This means that, from the point of video capture to the point of playback on any device, regardless of whether the video is being streamed live or on-demand, and regardless of whether the content is being delivered to internal or external audiences, Panopto leverages all of the advantages inherent in a modern HTTP-based protocol:

**Support for existing web caching infrastructure**
Panopto is built to work out of the box with popular HTTP caching systems like Squid, Nginx, Apache, and IIS.

**Support for symmetric WAN optimization technology**
Through the use of chunked, stateless video delivery, Panopto integrates seamlessly with leading WANop appliances and software from Riverbed, Blue Coat, Silver Peak, and others.
Support for asymmetric WANop

As more and more organizations deploy video platforms like Panopto to the cloud, there is a need to optimize the delivery of media content that originates from external data centers. To address this need, Panopto integrates with a range of “asymmetric” WAN optimization solutions from leading vendors. Specifically, Panopto’s video platform supports Riverbed’s Steelhead Cloud Accelerator solution, in which Riverbed optimization technology is hosted within Akamai’s globally-distributed points of presence. Panopto also supports Blue Coat’s asymmetric object caching, in which “warm data” requests are accelerated through caching servers in the branch office.

Support for P2P WANop ECDNs

In addition to symmetric and asymmetric WANop, an emerging class of P2P technologies is delivering on the efficiency promises of multicast while using modern streaming protocols. For example, Kollective (formerly Kontiki) is a software-defined, peer-to-peer enterprise content delivery network (ECDN) built for companies that live stream frequently, that have complex network topologies, or that have small-to-midsized video archives. Panopto works seamlessly with P2P ECDNs like Kollective. For live webcasts, Panopto pre-populates the ECDN with HLS segments. For on-demand streaming, Panopto pre-populates popular content to the ECDN, reducing network impact.
Summary

In the past several decades, changes in video technology have frequently occurred through seismic shifts in ecosystem support. The triumph of VHS over Betamax, the subsequent shift from VHS to DVD, and the rise of H.264 have all followed a pattern in which the industry rallies around a technology and solidifies its position in the market.

In 2015, the next seismic shift is underway. Legacy video streaming protocols built on overlay networks, custom protocols, and specialized servers are giving way to connectionless, HTTP-based Modern Streaming.

The benefits of Modern Streaming include reduced network management complexity, lower maintenance costs, improved scalability, and enhanced playback. Modern Streaming protocols also integrate with organizations’ WAN optimization technologies, homogenizing the network transport and caching infrastructure.

Panopto is the first video platform built from the ground-up for Modern Streaming. It uses HLS for video capture, live streaming, and on-demand distribution, enabling organizations to efficiently deliver video using existing network infrastructure. Named a “Leader” in Gartner’s Magic Quadrant for Enterprise Video Content Management, Panopto is the ideal choice for IT organizations looking to future-proof their video investments.

For more information, visit www.panopto.com.