

**MANAGED DELIVERY—
TAKING eCDNs TO THE NEXT LEVEL**

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Executive Summary

We believe there is a hole in the current delivery market, one that managed delivery solutions were created to fill. This paper defines and discusses managed delivery technology, a solution that enables enterprises to effectively deliver content to enterprise end users, regardless of network connection speed. Managed delivery takes advantage of unused network capacity to download large files at a regulated speed over time. Because the content is downloaded to the desktop (not streamed in real-time), quality is not dependent on network resources. The digital asset can be downloaded to and opened from the desktop using local computing resources. Managed delivery is an important advance in the evolution of the eCDN market.

Introduction

The use of digital media is playing an increasing role in business, enabling enterprises to be more effective through a range of uses, from interactive eLearning to software updates and product launches. The use of new digital media continues to grow as enterprises strive to be more competitive. However, distributing large digital files throughout a network presents a significant challenge. The use of new and existing technology remains a critical facet of enterprise differentiation, judged on the effectiveness of marrying technology with business goals. The use of digital video continues to increase with enterprises; according to The HTRC Group's 2001 "Developing Enterprise Edge: Streaming Media and CDNs in the Enterprise" study completed in July, streaming in the enterprise increases from 35% in 2001 to 42% in 2002. In the enterprise market, the use of digital video files continues to increase in popularity, driving the need to find suitable delivery mechanisms.

Video is just one example of a large content file that traverses an enterprise network. For this paper, we are defining content as digital assets, those things of value to the enterprise in digital format (which tend to be large) such as video, professionally-produced presentations for the sales force, software updates, PDF files, PhotoShop files, and electronic product designs (CAD, CAM). Digital assets such as multimedia presentations and quality video will continue to grow in size overtime. Existing delivery mechanisms, such as e-mail and FTP, were not created to deliver such digital assets to ever larger numbers of employees, partners, and customers.

Enterprise content delivery network (eCDN) solutions are those that enable content to be intelligently delivered through an overlay network of CDN devices, such as caches, located strategically close to end users. By delivering content closer to end-users, organizations can dramatically reduce costs by making more effective use of the existing network, reducing bandwidth demand on local area networks (LANs) and wide area networks (WANs). Many of the enterprises that are implementing eCDN solutions are doing so to facilitate the delivery of digital video. The digital video revolution in the enterprise has begun - however, not without barriers, including network capacity and saturation. eCDN solutions are a critical market enabler. According to The HTRC Group's "The Developing Enterprise Edge" study, of enterprises that are or plan to implement streaming, 30% were also



employing the use of eCDN technology in their network in 2001, a figure that is rising to 54% in 2002. eCDNs solve most of the network problems created by transporting large digital media files, such as network capacity problems, wide area network (WAN) congestion, network saturation, and decreased performance for critical enterprise applications. There is a noteworthy correlation between organizations offering streaming in the enterprise network and those that use content delivery technology. This correlation shows that organizations deploying streaming media will probably look to build their networks with eCDN technology.

Large enterprise networks are complex, comprised of varied technologies implemented over time to make up a non-uniform topology. For example, those operating on the fringe of the enterprise network do not have adequate network capacity to experience quality video and fast file downloads. Road warriors and other narrowband users can't readily download large digital assets.

The Market

Enterprise networks consist of a heterogeneous mix of legacy network equipment implemented over the years. As a company grows, the network is retrofitted to accommodate new sites, users, and applications. Further complicating enterprise network environments are company acquisitions and global expansion. Most enterprise networks maintain a highly non-uniform topography of IP infrastructure out of necessity. For example, the diagram below shows a headquarter site with two regional offices. Each regional office has satellite offices attached. Each office is connected with the connection appropriate for the location. Enterprise network capacity includes two basic areas, the local area network (LAN) at each site, and the wide area network (WAN) that connects sites. In our example, each location may include engineering and sales people that operate out of home offices. For existing applications such as email and instant messaging, the current network will suffice. However, the need for distributing large digital asset files is changing the network requirements.

While there may be abundant bandwidth within the corporate headquarters and regional offices, the satellite and home offices have limited network connections. The non-uniform topography creates great difficulties in provisioning bandwidth for applications such as streaming. Because each location maintains existing network applications and has a different connection speed, the optimal utilization of bandwidth is unique to the location. One download speed is not suitable for every connection. Figure 1 below illustrates the non-uniformity of most enterprise networks.

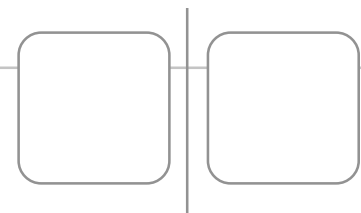
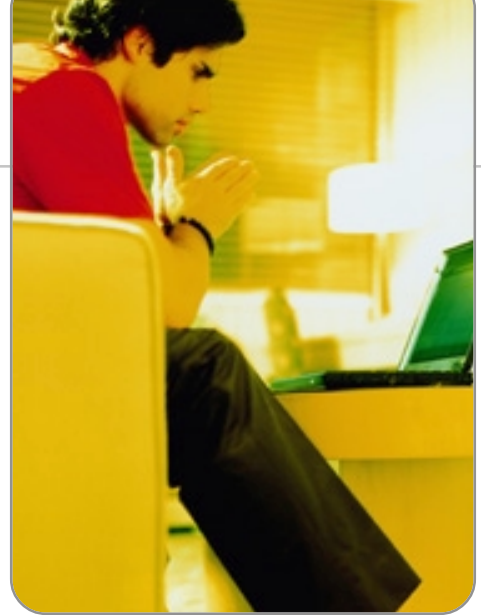


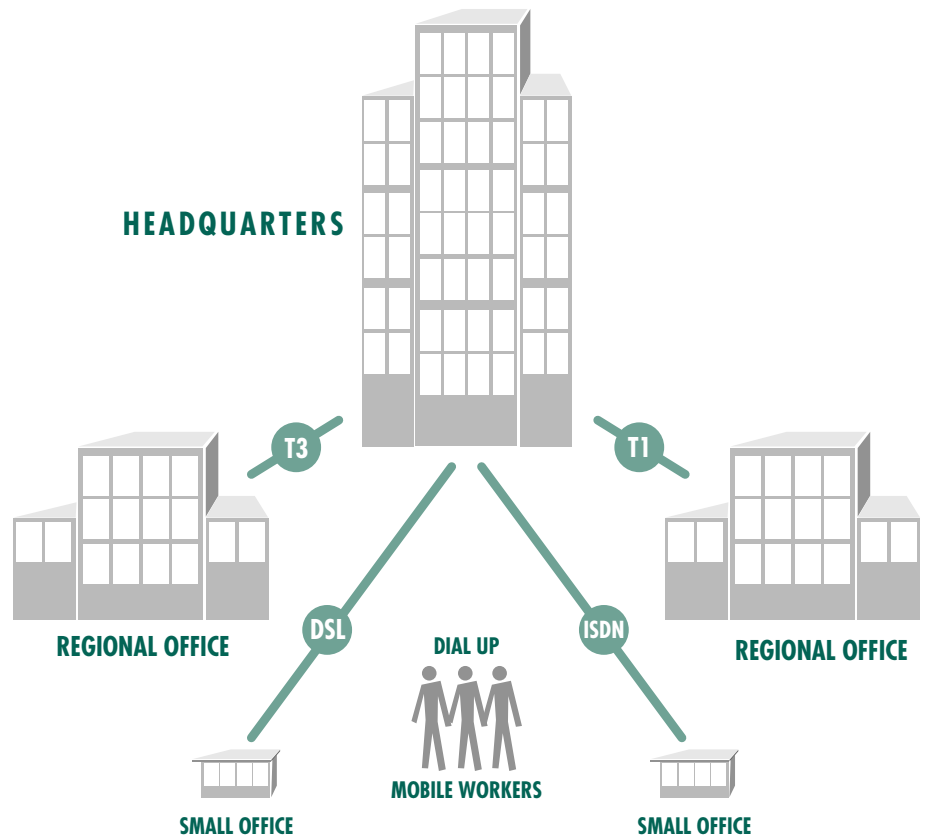
Figure 1

Bandwidth is not free, and increasing network capacity to accommodate new applications is costly; however the nature of an eCDN solution with managed delivery technology offers enterprises a way to defer costly network build-outs by more effectively managing existing network resources. Today, most large video files are transferred to tape or disk and distributed via physical delivery services, such as FedEx and interdepartmental mail.

Managed Delivery Defined

Managed delivery is a new approach to digital content distribution. Managed delivery combines the ability to schedule and guarantee file transfers to servers and to end-user desktops, with the ability to optimize utilization of network resources through a smart approach to scheduling, caching, and bandwidth management. Managed delivery solutions give organizations control over how and when video and other large digital files are sent to whom. For example, if content needs to be viewed immediately, user clients can be initiated to start downloading. If the urgency is low or file size is very large, IT groups can schedule the download based on policies to take advantage of off-peak network capacity.

Files can be bundled together to create “digital packages” that fulfill a particular business purpose. For example, a software update can be bundled with a pdf document and an instructional video file to create a content package for internal or external users upgrading an existing desktop application. Strategically bundling digital assets into content packages for targeted users creates a new process we define as content aware delivery. Content aware delivery as a subscription service can deliver the appropriate content bundles for different groups in public or private networks.



As of the writing of this paper, only Radiance Technologies produces a managed delivery solution for the enterprise. The inclusion of managed delivery technology all the way to the client marks a new direction for the eCDN industry. Nearly all existing eCDN solutions extend to edge CDN devices, but go no further. Managed delivery technology that includes the client delivers content to the enterprises true edge—the hard drive on an individual’s desktop or laptop.

Enduring Value

The value of any specific digital asset pivots on size of the content, popularity, and the ability to deliver that content to intended users. For example, the larger the audience is, the bigger the file is likely to be. High production content, such as video and multimedia, tends to be justified only for important communications that need to be distributed to larger audiences. Moving very popular large content files around an enterprise network is challenging.

At times, digital assets are required for all users in an enterprise organization, such as the viewing and understanding of new processes in procedures. Arguably, communication defines an enterprise organization internally and externally. The farther an office or person is from where the executives sit, the greater is the need for rich communication, since face-to-face meetings are impractical, and it’s easy to be out of touch. Enterprise networks tend to have their greatest bandwidth within the walls of the main campus, with decreasing bandwidth out to regional and local offices. For example, a sales engineer on the fringe of the network has the greatest need, but the worst connection. He needs a delivery system that can bring him high-quality content over thin pipes.

Managed Delivery in the Market

Managed delivery solutions are just beginning to enter the market. Radiance’s managed delivery solution marks the first shipping product targeting the enterprise. With this introduction, digital assets can be delivered over a network in three basic ways: through the traditional network (as a file transfer or streamed), delivered through a public or private CDN, or through a managed delivery solution. Digital assets delivered using the traditional network are feasible in relatively small implementations. For example, delivering streaming media from a centralized server does not scale to meet the quality and performance needs for an entire enterprise organization without significant network capacity increases to all desktops. Delivering digital video throughout an entire organization requires an intelligent delivery solution that makes the most efficient use of existing network capacity.

The first generation of CDN solutions were created to improve Web site performance by caching relatively small objects throughout a distributed network of intelligent caches. eCDN solutions are beginning to increase in popularity, driven by the need to increase Intranet

performance and facilitate streaming media delivery. Technology in the CDN market continues to evolve, and product manufacturers are creating new solutions that are capable of executing applications at the edge. eCDN solutions have recently emerged, and will likely include managed delivery functions in the near future.

The managed delivery segment is primarily made up of software developers creating solutions for enterprise and Internet applications. These managed delivery solutions distribute any digital package to any person, group, or server on a scheduled basis. While the core technology works in both enterprise and Internet market segments, each has different requirements. For the enterprise, solutions must address the needs of enterprise networks and focus on the business goals of the company. Enterprise managed delivery solutions will be used over Intranet and Extranet to deliver digital assets to employees, customers, suppliers, and business partners. Managed delivery solutions for the Internet require mechanisms for delivering digital assets over the public network where operators have no control. Many of the digital assets delivered over the Internet will be for business-to-business and business-to-consumer business models, and need to tie into billing and accounting solutions.

The Video Driver

The use of digital audio and video in the enterprise provides enterprises with competitive advantages, with applications such as e-Learning and corporate communications over Intranets and Extranets. As we mentioned earlier, the increasing use of digital video in the enterprise is one example of a digital asset that traverses the network. The growing use of digital video presents a significant delivery challenge for enterprise network operators. The adoption and use of digital video in the enterprise will drive the need for managed delivery solutions. Because the use of digital video is increasing, it is a relevant example that illustrates the benefits of managed delivery solutions.

Market Challenges

Expertise

The ultimate goal of any IT department is to cost-effectively implement technologies that promote competitive advantages and market differentiation. One ongoing challenge that all IT professionals have is keeping up with the rapid pace of new and developing technologies. Because of this change, expertise is scarce for emerging technologies. The increasing use of digital assets is driving the need to find a suitable delivery solution for enterprise and Internet networks. Because expertise is scarce, successful delivery solutions will leverage existing knowledge and expertise. Managed delivery solutions are similar to legacy network technologies such as FTP, familiar to network operators. Familiar technologies provide a reduced learning curve and can be easier to implement, shortening the time it takes to implement the solution.

Performance

Performance and scalability are two difficult hurdles to negotiate when deploying any bandwidth intensive application, such as digital video. For most enterprise organizations,

network and computer upgrades are inevitable in order to accommodate new applications such as digital video. PC performance can be a significant issue when viewing high quality multimedia content. With the prices for mass storage continuing to drop considerably, delivery from local storage that resides in the user's PC is the best cost-effective way to guarantee service quality, rather than depending on the Internet or enterprise network.

Distribution Cost Models

To illustrate the prohibitive costs to enterprises distributing high-production video content, we will compare the cost of managed delivery and the cost of producing and distributing VHS cassettes. While these media have different requirements for viewing the content, we chose this comparison because it represents how most companies currently distribute video content. In our hypothetical example, a major pharmaceutical company must distribute video content to 3,000 users/customers. The video contains a one-hour training session on the latest product.

The cost of running an enterprise network varies widely, largely depending on financial resources, expertise, effective use of equipment, depreciation, WAN costs, and management. Enterprise managed delivery mechanisms use off peak bandwidth and can be set to use only unutilized bandwidth; therefore, network costs are negligible. Investments made in network equipment and managed delivery solutions are depreciated over time. Managed delivery solutions reside on servers that require ongoing management and maintenance, accounting for ongoing human resources network operations and application management costs.

The cost of content reproduction on video tapes will vary greatly, and depend largely on volume discounts, length of content, formatting for international VCRs (NTSC to PAL or SECAM), tape case, and tape case cover art. Tape reproduction and materials can range from \$9.55 to \$35 per tape. Time will also be a variable that determines costs. For example, if a VHS tape must be reproduced and sent overnight around the world, the cost per tape will be significantly more. We can safely assume in our hypothetical cost model that shipping for a rush order for 3,000 tapes to be produced, packaged, and sent around the world through an overnight shipper that can track packages can range from \$16 to \$38 per tape. For our cost model, we will need to rush the production of 3,000 tapes, putting our costs on the higher end of the scale, around \$20 per tape, and with shipping to cost roughly \$27 per tape (assuming roughly half are delivered within the US and half delivered internationally). The resulting costs for the tape reproduction are \$60,000 with shipping costs at \$81,000, totaling \$141,000. The costs for VHS tape reproduction and delivery will vary greatly; however, let us stress that the costs reflected in this model represent real world scenarios.

There are some significant differences in the delivery media in our example; first, video distributors have no way of determining if the content was actually viewed. Managed delivery solutions can provide an important audit function that determines if the digital asset was opened and viewed. Managed delivery of digital assets requires only that the user have a computer that can open and run the asset. Videotapes require a VCR and television in order to view the content. While most enterprises have the equipment to play videotapes, few users can view the tape from their desk.

Managed delivery brings a critical economic digital asset delivery mechanism to the market. In essence, a managed delivery solution enables a company to become its own digital delivery service, similar to the way FedEx and UPS deliver packages today.

Managed Delivery Products Forecast

The 2002 enterprise managed delivery product forecast covers products, primarily software and eCDN solutions with managed delivery functionality, deployed within enterprise networks. We use the term enterprise loosely to include business, government, and educational private networks. Managed delivery solutions are driven by the use of digital assets, such as video for corporate communications and e-Learning, as well as software updates and large data files. Currently, the economy is in a downturn, which is impacting capital expenditures. Managed delivery in the enterprise holds the promise of saving significant amounts of money with applications such as e-Learning. The forecasts were based on demand-side interviews and supply-side research conducted by The HTRC Group. Following are significant market factors influencing our forecasts:

Market Factors

- Cost is the largest barrier to the immediate adoption of enterprise streaming media
- Streaming use increases from 35% to 42% from 2001 to 2002
- Digital video creation, production, and encoding expertise does not scale with demand; enterprises will outsource more IT functions
- New applications for high production digital assets in the enterprise will drive network upgrades
- Respondents' network capacity grows from 510Mbps in 2001 to 831Mbps in 2002
- FTP is one of the planned delivery mechanisms for video content by 40% of respondents in 2001, and 46% of respondents in 2002
- Digital video enabled desktops is not a barrier for rolling out streaming video in the enterprise
- The growth of digital video in the enterprise over the next 12 to 18 months will be influenced by the health of regional economies
- The growth of e-Learning is driving the adoption of streaming, eCDNs, and Managed Delivery solutions
- The increased use of online education through the Internet and Intranet sources will familiarize enterprise employees with digital video
- Security is a critical part of streaming in the enterprise, which may lengthen sales cycles
- eCDN products will incorporate managed delivery functions over time
- IT shops will implement enterprise CDNs and managed delivery technologies to reduce the impact of digital video on existing networks to defer network capacity build-out plans





Methodology

The 2002 enterprise managed delivery product forecast examines the opportunity for manufacturers of managed delivery products. This forecast is based on primary and secondary information sources. To understand the total population of enterprises, we considered public information gathered on the total number of businesses by size. For this we used statistics gathered in 1998 and aggregated by the Office of Advocacy of the US Small Business Administration. For our forecast, we used extrapolation techniques and market factors to estimate the market and growth for enterprise streaming media products.

Forecast

What's Included

Included in this forecast are managed delivery products that enterprise organizations use and plan to use in the delivery of digital assets spanning Intranets and Extranets.

Products counted for this report include the following:

- Managed delivery products
- eCDN solutions with managed delivery functionality

What's Not Included

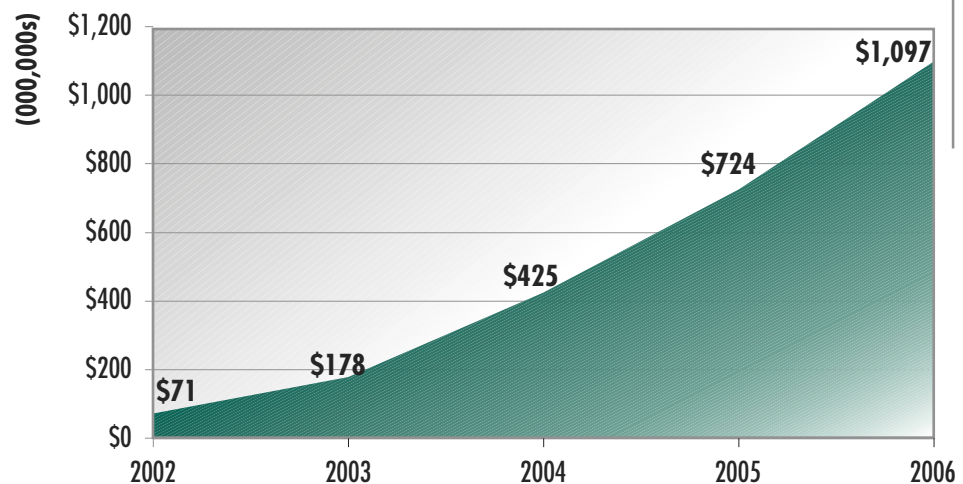
This forecast does not include the following revenue sources for managed delivery products:

- General purpose operating systems
- Server hardware

The market for managed delivery solutions grows from \$71 million in 2002 to \$1 billion in 2006.

Chart 1:

2002-2006 Enterprise Managed Delivery Product Forecast



Requirements for Managed Delivery Solutions

Optimized Use of Bandwidth

A close examination of enterprise network traffic generally includes a number of mission critical applications, such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM). These various applications must operate in order for the company to function properly. Enterprise managed delivery must utilize existing free capacity, thus optimizing network bandwidth and not interfering with existing mission critical applications.

Client Management

Managed delivery solutions must include a client component to manage delivery to the desktop. Unmanaged downloads to the desktop can consume local disk resources and increase the time needed to maintain desktops.

Centralized Management

Management tools should include an intuitive, secure, Web-based interface which lets users manipulate options and access reporting features. Upload tools should also include a secure, easy to use interface that lets users quickly move digital assets. Management tools and reporting will likely be the grounds for future differentiating features.

In order to maintain network performance, the management solutions must have the capacity to monitor digital rights management, bandwidth, storage space, and the health of the network between content servers and the end users. Management tools should include the capacity to offer and measure a range of performance SLAs. The platform should be able to dynamically change managed delivery schedules to best suit the performance and financial goals of the provider. Management tools should also include the capacity to gather a wide range of information for understanding user demographics.

Fault Tolerance and Scalability

An effective architecture must include a redundant and extensible framework that supports the integration of current and future features, products, and services. The development of standardized “interface-compatible” components in a managed delivery solution enables quick integration of future features, as well as product and service compatibility.



Delivery Verification—Auditability

Verifying that users have received intended digital assets is a complicated process, which involves determining the best source of data, access privileges, and delivering the data. Managed delivery solutions should include the capacity to audit the delivery of digital assets. Administrators will know which users received what digital assets, and when users received them.



Security

Security has become a major issue, especially as awareness of network security grows. Enterprise managed delivery solutions must include mechanisms that guarantee only authorized users access to digital assets. Enterprise managed delivery should include methods such as monitoring idle connections and monitoring suspicious activity (e.g., unauthorized access attempts). Security plays a significant role in the utility of the platform. Communications channels between digital assets and intended users should include a variety of security mechanisms, as not all enterprises will use the same algorithms, key-exchanges, and authentication mechanisms.

Conclusion

We believe managed delivery technology fills a major hole in the current delivery market. Enterprise networks are comprised of non-uniform topologies; those operating on the fringe of the enterprise network do not have adequate network capacity to readily receive digital assets. Managed delivery takes advantage of unused network capacity to deliver and guarantee the delivery of digital assets in a regulated manner.

Digital assets of all types in the enterprise have increased over the last few years, and are poised to grow considerably in the next few years. Managed delivery solutions offer an economical and efficient way to distribute digital assets for intended users. Managed delivery will be fundamental to enterprise networks; they enable secure and scalable digital asset delivery while optimizing the use of existing bandwidth. Enterprise managed delivery solutions provide a technology that enterprise IT departments are familiar with and know how to manage.

