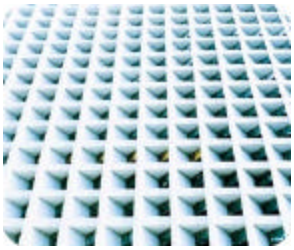

Rich Media Solutions

June 2002

business white paper
industry standard servers

enterprise digital media solution guide

part I: e-learning

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Abstract

This paper describes the business benefits and the infrastructure requirements for deploying digital media technology for e-learning in an enterprise setting. The paper is intended for business and technical decision-makers. Products and technologies from both Microsoft and HP are described in relation to the solutions presented. This paper will help you understand what to consider when deploying a digital media solution.

Introduction

Conducting business is more competitive and complex than ever before. Companies are continuously challenged to deliver new and innovative products faster, with better quality and customer service. Keeping a company's workforce trained and prepared is critical to staying competitive. Learning groups are at the forefront of this challenge, looking for innovative ways to reach more employees quickly, with better quality content and at a lower cost.

This paper takes an introductory look at e-learning and how digital media can make an immediate impact on improving e-learning initiatives. It identifies the Microsoft and HP products and technologies available to build cost-effective, reliable digital media e-learning solutions.

This paper is intended for learning and IT decision makers. It begins by describing three business scenarios for implementing e-learning solutions. It explores the paradigm shift taking place in e-learning, the increased business value being realized and how digital media can meet emerging e-learning needs. Finally, it presents a brief overview of Microsoft and HP digital media products and technologies, and looks at what is involved in deploying digital media-based e-learning solutions.

What is Digital Media?

Digital media refers to a content format, a type of media that has been digitized. Digitizing content involves using encoders to convert analog input into a digital media file like the Microsoft Windows® Media Format file. Digital media can be easily manipulated and visualized by computers, and is easily transmitted over computer networks.

Streaming media is a method of delivering digital media content across a network. Streaming occurs when a client begins to download content from a server and is able to play the content before the entire file has been downloaded. The client plays the content as the bits get transferred across the network in real time. Digital content can be streamed via unicast or multicast. A unicast stream serves a single client with a single stream from a central server, while a multicast can serve multiple clients with a single stream, similar to a radio or television broadcast.

E-Learning Scenarios

Today's corporate enterprise is more dynamic than ever, undergoing continuous change with constant pressure for sustained growth. The need to train and educate employees remains important, and with diverse, distributed workforces the challenge has never been greater. For companies to stay competitive, their workforce must have quick access to the most current information on a broad range of topics, and be able to rapidly develop new skills. Human resource (HR) groups, training, organizational development, knowledge management and recruiting are addressing these challenges and developing tools and processes that can deliver content in a timely and cost-effective way through e-learning. Trends point towards increasingly dispersed yet collaborative workforces, shorter lifecycles, and continuing complexity. These issues and trends present HR professionals with challenges that, when addressed have a significant impact on the bottom line.

Turning to technology as an enabler to overcome obstacles is not new to HR. HR professionals have continually leveraged technology in the past, using videotape, computer-assisted instruction and interactive multi-media CDs, and lately have taken advantage of the Internet and corporate intranets to develop their organizations.

The catalyst behind the e-learning revolution that enables HR professionals to prepare their organizations for the future is digital media technology. Digital media is a set of technologies that can create and deliver digital media presentations over the corporate intranet or Internet to a

user's computer. These presentations are an integrated combination of audio, video, simulations, slides and web content forming an interactive experience for the user. The result is a medium, which is well suited to deliver learning content and accommodate various learning styles.

Digital media technologies allow organizations to create e-learning solutions and leverage their intranets to deliver customized, interactive training content to employees when, where and how they need it. This reduces the travel and opportunity costs of traditional training methods.

The following three scenarios help to illustrate the benefits of leveraging digital media in e-learning. The scenarios cover three business settings:

- Sales and marketing - product training
- Human resources - safety training
- Human resources - employee review process

Sales and Marketing - Product Training

Sales, marketing, and customer service depend on continuous product training to function effectively and keep up with changes in the marketplace. Improving product training is key in enabling a company to stay ahead of its competition, while providing customers with the quality and service they expect. Quicker dissemination of product information cuts time-to-market and allows for better customer support of new products. Training utilization can be tracked and monitored to determine the sales/field personnel current product knowledge. Conducting product training with digital media content ensures consistency and timeliness while reducing costs. Digital media enables just-in-time training on the features of new products for the remote sales force and customer service representatives, allowing familiarization on new products while maintaining critical schedules.

Business Challenge: A global sales force located across multiple time zones needs to keep pace with product introductions and new features.

Opportunity: Increase productivity of sales personnel; reduce travel and lodging costs, offer easy access to the latest information from subject matter experts.

Solution: The company product managers and design engineers create a series of rich media presentations on the newly redesigned product. The product managers and designer engineers build a library of content addressing the details of the new product. The product managers use Microsoft PowerPoint and video to provide an overview of the product changes and how these will affect their clients. The presentation also runs through a mock sales process to convey to the field sales force how the new product should be positioned and sold. The design engineers use a digital video camera to shoot a series of videos on the new product, where they discuss the design changes and demonstrate the new modifications. The video presentation allows the designers themselves to show field personnel how to articulate the product features.
Two weeks before the new product launch, the series of six presentations are put on the company intranet and extranet for the sales force to review. The product managers send out emails with direct URLs to the presentations, making it as easy as 'point and click' to watch. All of the presentations are monitored and logged to track who has reviewed the information. Two days before the product launch, the reports show that 95% of the sales force has viewed all of the content, confirming that they are ready to drive demand and increase sales. To reinforce retention, the six presentations are stored for on-demand access virtually anywhere.

Components of the Solution

Software: The video is encoded using Windows Media Encoder software and the rich media presentations are created using Microsoft Producer. All digital media content is hosted on a

Windows Media server.

Hardware: The Windows Media Encoder and Windows Media server are hosted and streamed from a ProLiant DL360 G2 server from the new HP and the presentations themselves are distributed and cached using a content delivery network based on ProLiant servers.

Human Resources – Safety Training

Safety training and compliance rely heavily on training employees who may need to demonstrate knowledge of OSHA standards. A workforce that is knowledgeable about safety issues reduces liability and damages, satisfies compliance requirements and increases productivity, as knowledgeable workers maintain more time on the job. Digital media-based e-learning content on corporate policies and safety procedures enables targeted training tailored specifically for those who need it. Employees can get current information as well as simulations of particular safety standards. Using digital media, employees can view and review new safety standards whenever they have questions or concerns and quickly return to their tasks. Since the content has been digitized, it can be distributed to any desktop or laptop on the network or remotely via VPN (all of this contributes to the success of an organization and provides competitive advantage).

Business challenge: A global manufacturing company needs to increase safety and productivity ratings at all facilities (reduce personal injuries and damage to equipment and facilities).

Opportunity: Create a strong safety culture for employees and link to company's strategic business model.

Solution: To ensure relevant workplace safety training, the company decides to produce content specific to their company. Professional instructors are hired to produce a series of educational content pieces on safety in the workplace. The instructors use PowerPoint to capture their curriculum while the IT group uses a digital video camera to capture video of the work place illustrating safety issues. Once all of the core content has been created, it is integrated into several rich media presentations, synchronizing PowerPoint slides with the video. Because all materials are produced using digital content, it is easy to maintain the curriculum over time and make revisions as needed.

The content is made available at regional offices by pushing the content out via the content delivery network (CDN). The presentations are distributed to all offices globally during off hours to conserve on bandwidth during the day. After 48 hours, the content is populated locally at each site, which allows the users to view the streamed video on their local area networks, so as not to impact the WAN during business hours. All employee access to the content is tracked for compliance reasons, to insure that everyone has had the proper training on safety. Since the content is available on-demand, users can watch the online presentations more than once if they require a second look or just a refresher on one topic.

After 6 months, more than three-quarters of the target audience viewed the e-learning safety program. Additionally, consistency is assured, as manufacturing plants across the world experience the same training and the employees can re-view on demand. A culture of safety is enhanced through digital media delivery of safety tips, supporting the enterprise's safety vision.

Components of the Solution

Software: The video is encoded using the Windows Media Encoder software and all digital media content is hosted on a Windows Media server.

Hardware: The Windows Media Encoder and Windows Media server are hosted and streamed from a ProLiant DL360 G2 and the video content is distributed and cached using a content delivery network based on ProLiant servers.

Human Resources – Employee Review Process

Educating managers on employee review procedures using a written document can be challenging because learning an employee review process is not only about completing the required forms but having an understanding of the objective and the organizational impact. Building this understanding with managers can be done using voice and video from a respected leader in the organization.

Success depends on participants' ability to understand their role and tasks in conducting performance feedback with as little variation as possible. A digital media web-enabled module on performance review can include help text on how to record forms, and role-play videos with audio that engage the learner and increase learning retention.

Business Challenge: Roll out a newly updated performance review process and broadcast to 8,000 managers across the country.

Opportunity: Establish consistent performance feedback to encourage employee development.

Solution: In order to distribute a timely update to the performance review process, the company decides to broadcast a presentation by the Director of Human Resources discussing the changes. The broadcast will be live and is intended for all managers and supervisors. The production includes live video along with PowerPoint slides on how to fill out the appropriate forms. The broadcast is well promoted and is viewed by nearly 75% of the intended audience. With only a few days of promotion and preparation, the HR department has made a significant impact in building awareness of the new employee review process. The managers that were unable to see the live broadcast can view the recorded presentation on-demand from the corporate intranet.

Secure access to the presentation is assured using secure protocols, and attendee participation is tracked to ensure delivery. Managers keep up to date with revisions by accessing a modified version of the presentation. Supporting e-learning modules accompany the stored presentation, which includes video scenarios and role-play activities. Managers make choices from the role-plays, and receive feedback reinforcing optimum responses. The managers' progress is tracked as they complete modules, and follow-up material is tailored to their performance. Consistency is assured, attendance is tracked, and learning objectives are met.

Components of the Solution

Software: The broadcast is encoded and multicast using the Windows Media Encoder.

Hardware: The Windows Media Encoder server is run on a ProLiant DL360 G2 server.

Benefits of E-Learning

Supplementing conventional training with digital media e-learning can lead to savings in time, effort and dollars. Digital media is quickly emerging as an effective and efficient learning aid in the industry. As a result, many HR professionals are turning to digital media content as a primary means of improving their organization's learning experience.

Benefits of digital media:

- Enables visual imagery, which facilitates retention. Most people tend to remember 70% to 80% more of what they see than what they read. Live and on-demand scenarios bring the learning event closer to the participant.
- Allows learning organizations to broaden their reach by providing students with greater and more flexible access to the material.
- Enables instructional designers, implementers of adult learning theories, and performance support specialists to capture their expertise, reducing instructor and content variation

and inaccuracy.

- Provides an efficient means of delivering educational content to a large and dispersed audience. Because most corporate networks and desktop PCs are already equipped with voice and video capabilities, digital media solutions typically require little additional equipment.

Data Point: U.S. Spending on e-learning is expected to reach $14.8 billion by 2004, according to International Data Corp. research.

Understanding ROI Factors

Digital media based e-learning solutions provide an almost immediate financial advantage over traditional training methods. Digital media simplifies communication paths and can dramatically increase the speed of information dissemination, at lower production costs overall. No longer is it necessary for trainers and employees to be present in the same physical space. The elimination of the physical constraints of traditional learning methods reduces overhead and expenses. The production and distribution of materials is streamlined, travel time and expenses are reduced, and the time and effort of the trainers and participants is used more effectively.

Not only will the implementation of digital media-based e-learning solutions allow companies to deliver content in a timelier and more cost-effective manner, it will also help those companies establish informational synergies and economies of scale. This promotes consistency and effectiveness. In the competitive business environment, a company's ability to develop and to capitalize on intangible assets, such as worker knowledge, has become a decisive factor in its performance. By creating and maintaining a central depository of information, communication in the enterprise can be better managed and the quality of its learning tools enhanced. Top management is able to align its training and learning with the company mission, strategic vision and culture. This message is then delivered consistently, accurately and efficiently to all levels of the organization. Interactive capabilities will allow for the integration of feedback loops and compliance documentation. By coordinating, communicating and tracking standard practices, a company can standardize and leverage its collective institutional knowledge.

Expenditures for implementing a digital media e-learning infrastructure are justifiable through the cost avoidance of items such as:

- Travel and time away from work place
- Reproduction of course materials
- Facilities, including building, hire and maintenance

Although the savings identified above are immediate and substantial, there are long-term benefits that provide additional return:

- Increased knowledge retention and productivity
- Enhanced consistency of corporate communications
- Lower per-user costs of training materials due to economies of scale
- Shorter cycle times due to increased speed of information dissemination
- Improved customer service and sales support
- Improved product quality

Cost Factors

Providing the end-user with a quality e-learning experience begins with planning the content production. The audio and video streams are then captured, encoded and readied for delivery. The encoded file is stored on a Windows Media Server where it is managed and staged for delivery to cache nodes located at the edge of the network. Finally, the end-user can view and interact with the content via their client device.

Digital media solutions like this are affordable and have a quick return on investment. The cost elements will vary for each company, but for the most part the costs can be generalized and are predictable, based on the factors listed below. Solution costs break down into three areas; hardware, software and services. Typical cost factors include:

- Infrastructure: number of locations, network complexity, network bandwidth
- Content: amount of content, support for multiple bit rates, hardware and software for content creation
- End-points (users): number of users, desktop configuration

The infrastructure costs are a function of the number of office locations and the current state of the network. If the network is not well positioned to support the additional bandwidth consumption that

digital media solutions demand, this may require a more significant investment in cache appliances or a network upgrade. There are options when preparing the network infrastructure, for example a solution that uses low bit rate video-on-demand that is distributed during non-business hours will reduce the need to increase the capacity of the central network and WAN, but will require additional storage at local sites. Conversely, if content is distributed on-demand across the corporate network during business hours, storage needs at the local site will be reduced, but the capacity of the central network and WAN will need to be upgraded.

The costs associated with content are a function of the volume of content generated, but also the number of bit rates that must be supported. The bit rate content is encoded at determines the bandwidth required to stream. It is typical to require that content be encoded at low, medium and high bit rates (56kbps, 128kbps, 256kbps) to support the various network connections users may have, such as dial up VPN, across the corporate WAN or LAN. There will also be costs associated with the hardware and software required to create content. For example, Microsoft Producer requires PowerPoint 2002 and Windows 2000 or Office XP, so if Producer is going to be a standard for business users to create rich media presentations additional client software may need to be deployed. Modifying studio environments or creating mini-studios will also require additional hardware, such as a video camera, microphone, channel mixer, teleprompter, capture card and lighting.

Preparing the client devices will tend to have the least effect on cost. The Windows operating system includes the Windows Media Player, which is usually all that is required to play digital media content.

Other Advantages

Flexibility and Accessibility

The new style of digital media-based e-learning also offers other, less obvious advantages. Individuals can access learning content anytime from any location. Digital media allows employees to take charge of their own training by accessing a library of video-on-demand content. Employees can access both critical institutional knowledge or policies and their own training sessions in accordance with their immediate knowledge needs and work schedules E-learning offers learners a risk-free setting, enabling them to make mistakes and experiment with new ideas without risk, and allowing for reflection and review. It has been shown that interactive simulations make learning more interesting and engaging, resulting in increased retention.

Adaptability for Complex Topics

Training on complex topics or processes is an area traditionally left to small-group, hands-on classroom training. In the past, these areas needed expert instructors and special training facilities. These topics are challenging because students find it difficult to visualize complex concepts when they are just presented verbally or in writing. Simply porting the existing course to an online environment can often make the situation worse, because students cannot clarify their understanding with the instructor.

However, it has been shown that careful use of multimedia or digital media can improve the learning process. By introducing audio and video-enabled digital media content, students can be shown to process complex information more efficiently (Campbell, Lum, & Singh 2000).

Creating content using digital media technology enables instructors to present complex topics more effectively than the instructor's words alone. For example, in an engineering setting, engineers can record a video of a nuclear reactors turbine engine while it is being serviced during the yearly outage. Since access to the turbine is limited to once a year, a video with the accompanying engineer's commentary is very valuable for year round use. Audio-video presentations, securely streamed over the Internet to clients, can involve them by allowing question and answer using voice, text, or video and help increase sales. In a chemical course, an engineer may need to observe the results of mixing chemicals together. In many cases, the reaction may not complete until after the class, preventing the engineer from experiencing the entire reaction. Using digital media technology, the same reaction can be captured and edited into a condensed version, enabling the engineer to experience the entire chemical reaction process.

Performance-Based Training

HR professionals frequently take on the role of performance consultants within their organizations. Performance-based training involves assessing the effectiveness of individuals and organizational structures, diagnosing the causes of performance problems, and recommending interventions to improve the situation. Using digital media technologies to diagnose problems, present solutions, and measure results can have an immediate effect on organizational performance. Data is easier and cheaper to collect with focus groups and interactive surveys conducted online. Training can be more easily focused on problem areas.

Case Studies

The following are case studies highlighting the ROI of digital media centered e-learning.
Mercedes-Benz USA
http://www.microsoft.com/windows/windowsmedia/archive/casestudies/mbusa/default.asp
Hyundai/Kia Motors
http://www.microsoft.com/windows/windowsmedia/archive/casestudies/hyundai/default.asp

Industry Example

In a call center, after a company introduced training via digital media, new hires achieved order accuracy faster, and overall cycle time decreased by 40%. Rework costs were reduced, and supervisors' time to coach new hires was halved.

In another example, employing e-learning boosted employee performance at an automotive sales organization that works with more than 88,000 people across 8,000 dealerships. Sending employees out the door for training was expensive both in dollars and in lost sales and time on task. The company estimates large savings from improved worker productivity by using e-learning.

http://www.informationweek.com/story/IWK20020411S0011

- Increased productivity
- Increased sales
- Increase reach of communications
- Improved decision making
- Improved customer service
- Improved product quality

Infrastructure Requirements

The framework for an enterprise digital media solution has three main areas:

- Content creation
- Content distribution and management
- Content consumption

Considering the specific requirements of each area will enhance the quality, scalability, manageability, and reliability of the resulting solution.

Content Creation

Content creation can be seen as a set of guidelines, processes and tools, which enable personnel to efficiently create and prepare digital media content. There are four primary infrastructure requirements for creating content:

- Encoding
- Storage
- Authoring tools
- Development tools

Companies will want to address video production needs if they are creating original content in a professional studio setting. This is not addressed in this paper, but is worth considering when implementing a digital media solution.

Encoding

Encoding is the process of digitizing analog audio and video input into a desired format for distribution and play back. Encoding is a two-phase process; analog content is first digitized by a hardware-based encoder card that produces a "raw" uncompressed format, this is typically .AVI or .WAV. These raw files are then encoded by a software-based encoder (Windows Media Encoder) into the specified format with the desired bandwidth and quality settings. This two phase process is typically done as one seamless process, where the hardware encoder will feed the software encoder in real time, sometimes avoiding the production of the raw digital files. The Windows Media Encoder outputs the Windows Media format, .WMA and .WMV.

Storage for Original Content

When producing original audio or video content, encoding existing VHS or Beta tapes or encoding final produced content, storage requirements are significant. It is advantageous if all original content can be saved in its raw, highest-quality format so it can be re-purposed in the

future if required.

Content production groups will generally want to maintain their own libraries of content, in its various phases of production. Often, multiple versions of a content element will exist to facilitate review and simultaneous work by several groups, in a similar way to when a large document is written. Scalable and reliable storage is essential.

Authoring / Development Tools

The right authoring tools and development tools are key to a good final product. The value of digital media lies in the integration and synchronization of content to make compelling presentations. There are two ways to achieve this, either use authoring tools or more sophisticated development tools.

- Authoring tools simplify the process by allowing drag and drop functionality in a graphical user interface. Two examples are Microsoft Producer and Microsoft Movie Maker, which are both intended to be end user applications. Distributing the content creation process out to end users will help increase the rate at which content is published and also reduce the burden on central IT groups.
- Development tools, typically in the form of SDKs are intended for web developers to program custom solutions. There are situations where it will be desired to create more sophisticated content for special events, such as integration of Flash or DHTML into a presentation.

The use of authoring applications is preferred if the creation process is going to be part of the business process on a regular basis. Leveraging development resources to create digital media presentations can be costly and generally more time consuming.

Content Distribution and Management

Once a piece of digital media content has been produced, it needs to be distributed to the intended audience in a timely and cost effective manner. Enterprises will want to manage this distribution process to ensure appropriate availability and security. The majority of the infrastructure work for distribution and management falls into three areas:

- Storage
- Content delivery network
- Media services

Storage

As content is produced and made available to end users, large amounts of network and server storage will be required. Typically, content will be centrally managed but highly distributed. This means that the source content is found in one central location, but copies of the content are found near the edge for user consumption. Storage solutions can be implemented in a variety of ways, but one large central repository with many smaller repositories on the edge is a common design principle.

When designing a storage solution, consider the access requirements, as this will often dictate the solution with the appropriate bandwidth for getting storage off the disks. Typical options include direct attached storage, network attached storage (NAS) or a storage area network (SAN). NAS is an appliance that is network addressable by multiple devices across the IP network, while a SAN is based on a fiber channel storage system, connecting multiple hosts to central storage via 2GB fiber.

Content Delivery Network (CDN)

The CDN handles the distribution and management of the digital media content. This is key to any digital media solution serving a dispersed audience to ensure a quality experience.

The CDN will typically need to handle two forms of streaming content: live and on-demand. Delivering "live" digital media is similar to a live television broadcast in that the streamed content is delivered in real time, so that all participants view it at the same time while the event itself is taking place. On-demand delivery of digital media is similar to a VCR player, allowing viewers to select content and then to control its playback by rewinding, pausing and fast forwarding.

Digital media will impose demands on the network. Introducing it will most likely require a cache-based CDN solution. Caching technology enhances network capabilities without needing to increase bandwidth or upgrade network components. Using ProLiant servers as edge servers, provides an industry-standard platform for rapid deployment, reliability and scalability. Adding content distribution capabilities gives the ability to deliver live and on-demand content throughout the enterprise without impacting the network performance or bandwidth needs. Content can be proactively scheduled to be distributed to specific locations within the enterprise ensuring availability and improving viewing quality while minimizing WAN expense.

CDN Management

Adding web-based management tools to the CDN allows administrators to monitor stream quality, content bandwidth utilization and cache location performance. Content may be prioritized to ensure that business-critical content is delivered with the highest quality.

Media Services

Media services are a set of digital media components that determine the encoding standards, media servers, use of unicast or multicast distribution and media player functionality for playing media files. The Windows Media Services platform is the media service and it provides the fundamental building blocks for creating an enterprise solution. The media services affect the format of the content, how it is assembled, how it is streamed, how content is secured and options for playback. The media services (Windows Media) play a vital role in determining how an enterprise solution is implemented and how it is supported.

Content Consumption

Content is accessed from a PC or PDA and can be viewed with a standalone media player or with an embedded player found inside an intranet portal or Web page. This part of the solution framework has three infrastructure requirements:

- Device support (PC, PDA etc)
- Media player support
- Media portal

A user may be directed to a media portal to locate materials for viewing. Once the content is located, the user expects a quick and easy way of viewing it.
The three solution areas are interdependent; a weakness in any one can undermine the effectiveness of the overall solution. For an end-to-end solution to be viable and add value, content, created cost-effectively on a regular basis is needed. This can then be distributed and viewed by the target audience.

Implementation Challenges

The greatest challenge in implementing a digital media solution is selecting the right technology and delivering a cost-effective solution that meets the business need. A unique challenge enterprises face is identifying clear owners for the solution. Digital media attracts stakeholders from many business units, and several factions within IT. This often makes decision-making more difficult, since many business units will provide funding, and the networking, infrastructure and desktop groups each will participate in the design. Other key challenges are:

- Selecting an infrastructure provider with broad offerings that scale. Utilizing a variety of vendors increases the need for expensive custom integration.
- Selecting a digital media platform that will grow and scale as your business needs demand it. The applications of digital media are developing fast, so allow for rapid growth.
- Delivering an initial solution that is sure to get a few early wins. It's best not to over-engineer the first version.
- Developing business processes to drive the creation, distribution and consumption of digital media content.

Deployment Process

Implementing a digital media solution can be accomplished in only a few months and begin delivering value immediately. This includes design, development, testing, and production deployment. Digital media solutions tend to transcend the organization, bringing a cross-functional team together as stakeholders. Typical stakeholders include:

- Infrastructure managers
- Network managers
- PR, corporate communications and HR

When deploying a digital media solution three primary steps are worth taking to ensure success. The first step is to fully understand and document the requirements and goals. The requirement-gathering process is typically straightforward and takes a few weeks to conduct depending on the organization size and complexity. The second step is designing and developing the solution. Depending on the requirements and current capability of the network, this should take 6-8 weeks. The third and final step is the physical deployment of the digital media solutions. This typically consists of hardware and software installations, network configuration and training on how to use the solution components. A typical project plan will have three phases:

- Requirements
- Design and development
- Production deployment

Phase	Description of tasks	Duration
Requirements	Define business requirements, define critical success factors, enlist stakeholders	2- 4 weeks
Design / Development	Design server infrastructure (storage and web servers), network changes, CDN, client devices, encoding process, and studio build-out.	6 – 8 weeks
Deployment	Lab testing and QA, pilot, production deployment	4+ weeks

Microsoft and HP Technologies for Digital Media Solutions

Microsoft and HP provide a comprehensive set of technologies and products to deliver a digital media solution for the enterprise.

Microsoft has several enterprise digital media technologies:

- Windows Media Services
- Microsoft Producer
- Windows Media Broadcast as part of the Microsoft Solutions for Intranets

HP has server platforms and infrastructure products designed to support digital media deployments:

- ProLiant DL and BL servers
- Compaq EVO and iPAQ client devices from the new HP
- HP Enterprise Storage Network Architecture (ENSA)
- ProLiant Essentials Software

Technologies for Capturing Content

- Microsoft Producer
- Windows Media Encoder
- Windows Media Services
- Windows Media SDK

Microsoft Producer for PowerPoint 2002

Microsoft Producer is a desktop tool used to create digital media content. It was designed so that enterprise media professionals and business users could easily create compelling digital media presentations. Producer allows users to combine and synchronize audio and video with Microsoft PowerPoint slides, HTML, and images, either manually or through its built-in wizards. Producer simplifies the process of creating and distributing digital media presentations, enabling even the novice business user to leverage digital media in professional-looking presentations.

Producer reduces the cost of creating rich media presentations by allowing end users to do the work themselves, without any intervention from IT. This reduces the cost of content creation, and increases the number of rich media presentations that an organization can publish.

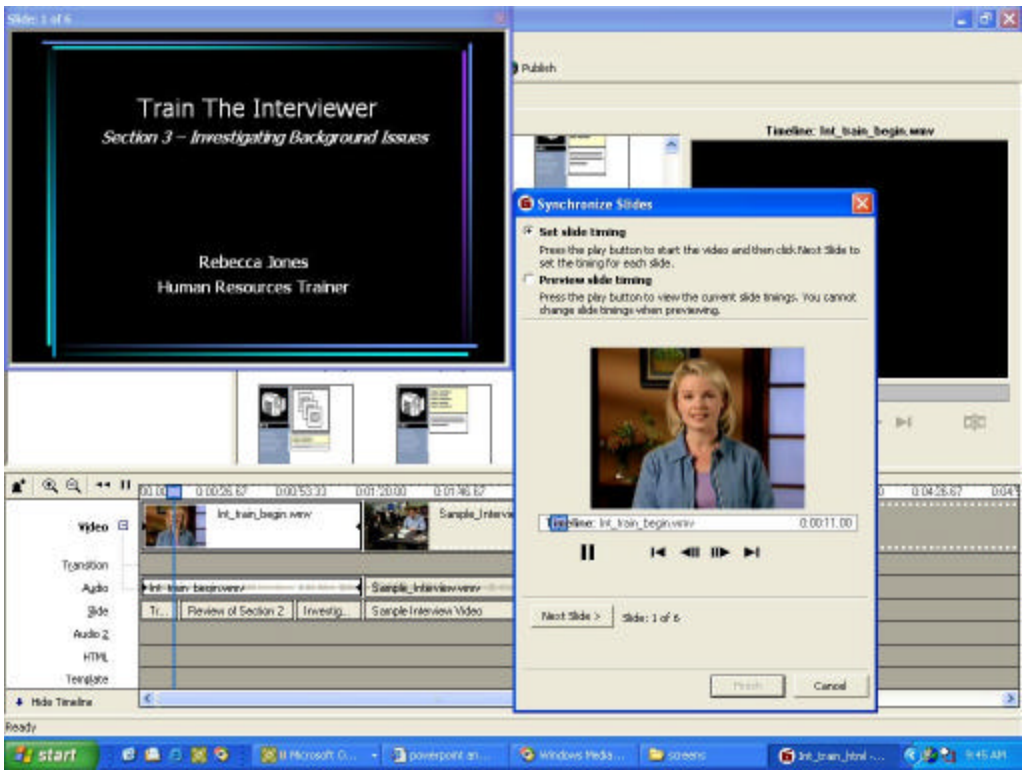

Figure 1: Microsoft Producer – Synchronizing PowerPoint with video

Windows Media Encoder

The Microsoft Windows Media Encoder is part of Windows Media Services. The encoder takes analog audio and video input and digitizes the content in Windows Media Audio (WMA) or Windows Media Video (WMV) formats. The Windows Media Encoder leverages some of the most advanced codecs for producing high-quality content at low bit rates.

The Windows Media Encoder is available free from the Internet and can be downloaded from microsoft.com and installed on any Windows 2000 or Windows NT Server. The software is easy to install and configure. With minimal time and no money invested you can begin encoding audio and video content into the Windows Media format.

Windows Media Services

Media Services provides the framework and origination of media content for distribution. Microsoft Windows Media Services 4.1 provides the most reliable, scalable, and highest-quality digital media platform offered today for enterprise solutions. Windows Media Services on Windows 2000 Advanced Server is the premier origin server and delivers superior quality audio and video to the desktop.

Windows Media includes the Encoder, Media Server and Media Player, which come as part of the Windows 2000 platform. The entire platform is extensible via SDKs, which enable third parties to build custom solutions. The extensibility of Windows Media is for many customers the most important factor.

Windows Media Development Tools and SDK

Developing digital media content often requires the integration of audio, video, HTML, DHTML, PPT and Flash. Microsoft offers a robust development environment to integrate and synchronize audio, video and web content. Windows Media supports the entire Microsoft development suite of

tools including Visual Basic, VB Script, HTML + Time and SMIL 2.0.

The Windows Media 7.1 SDK makes it possible to develop sophisticated content that is flexible, allowing developers to use the development tools they are most comfortable with. The SDK enables application developers and systems integrators to develop Web applications that are Windows Media compatible. There are five components in the Windows Media 7.1 SDK:

- Windows Media Player SDK
- Windows Media Encoder SDK
- Windows Media Services SDK
- Windows Media Rights Manager SDK
- Windows Media Format SDK

For more information on the Windows Media SDK, visit:
http://msdn.microsoft.com/library/?url=/library/en-us/dnwmt/html/wm_ds_options.asp

Content Management and Distribution

- Dynamic Internet Solution Architecture (DISA) from the new HP
- ProLiant BL and DL servers
- Enterprise Network Storage Architecture (ENSA)
- ProLiant Essentials for Advanced Management and Deployment

Dynamic Internet Solution Architecture (DISA)

DISA provides the basis for building scalable, highly available Internet environments. Leading Internet application architects are utilizing multi-tiered, distributed architectures. Rather than a single server that performs all application functions, the trend is toward environments that involve many servers working together to deliver the application to the end user, with the ability to increase computing power, storage and network resources dynamically. DISA also addresses:

- Server clusters for storage and data
- Caching and load balancing
- Web servers and application servers

The ProLiant line of servers scales from ultra-high density ProLiant BL server blades to high-end DL servers. ProLiant servers are well suited for streaming applications because they can scale from powerful encoding servers to edge devices for serving streams.

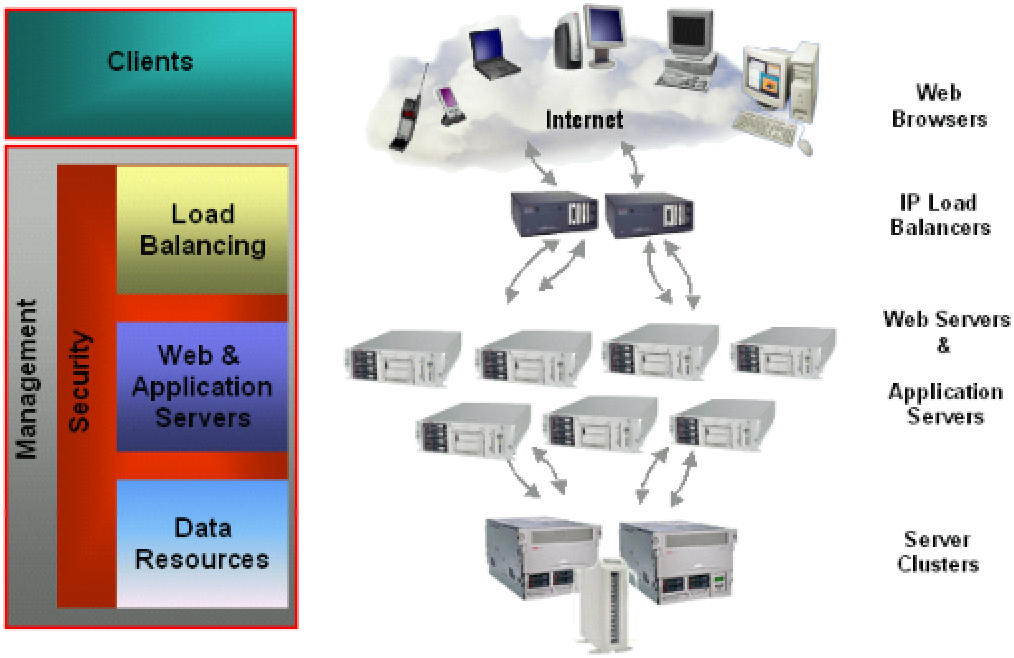

Figure 2: Dynamic Internet Solution Architrecture (DISA)

ProLiant DL 360 G2 and 380 G2

The ProLiant DL360 G2 and 380G2 servers are the leading industry-standard servers. They are well suited for encoding as they feature full size expansion slots for the Osprey-500 digital capture card. The ProLiant DL server line also has the performance capabilities and the required form factor for running the Windows Media Encoder software.

ProLiant BL e-class server

The ProLiant BL server blades are part of the DISA architecture and provide ultra-high density servers. The ProLiant BL line has a power-efficient blade architecture that delivers the most processor power per U, reducing power and rack space requirements as well as cooling costs. The ProLiant BL server is ideal for highly scalable front-end Web applications.

The ProLiant BL server blades are ideal for last minute, rapid allocation of computing power to support the next quarterly broadcast from the CEO or an important announcement about a recent merger. When additional web servers, media servers, caches or firewalls need to be mobilized rapidly, the ProLiant BL server blades make it easy to deploy. The ProLiant Essentials Rapid Deployment Pack is used to manage and configure the server blades remotely, which saves on time and resources for large deployments.

ProLiant Essentials Software

ProLiant Essentials Software provides the tools to rapidly deploy and manage ProLiant DL and BL servers remotely. ProLiant Essentials Software is part of the Insight Management Suite from the new HP, providing:

- Rapid deployment of ProLiant BL, DL and ML servers
- Advanced optimization
- Advanced SmartStart scripting

ProLiant Essentials Software makes a distributed server environment manageable, with out-of-the-box functionality for the entire line of ProLiant servers. The console has drag and drop functionality for applying automated builds and configurations to remote servers.

Enterprise Network Storage Architecture (ENSA)

Storage costs can often account for up to 50% of the total costs of a digital media solution, which indicates its significance. HP has a broad range of storage solutions, including DAS (Direct Attached Storage), NAS (network attached storage) and SAN (Storage Area Network).

HP has created an integrated approach to storage called the Enterprise Network Storage Architecture, or ENSA, which supplies topologies, tools, and a roadmap for the future of enterprise storage. ENSA answers the full range of customer needs by addressing Direct Attached Storage, NAS andSAN. ENSA is already in its second generation. ENSA 2 encompasses six advanced technologies designed to scale, virtualize, automate, and simplify storage while remaining open and protecting your investments in ENSA solutions, as well as increasing the business value of your storage.

The ENSA architecture supports the creation of an "Open Networked Storage Infrastructure". The HP DAS to SAN architecture provides instant consolidation of existing DAS data into an HP SAN or NAS solution for simple storage consolidation and minimizes application disruption during data migration.

Content Delivery Networks

The design and implementation of an enterprise Content Delivery Network (CDN) is a crucial phase in the delivery of a true enterprise digital media solution. The solution components from content creation to user consumption are interdependent; however, the CDN is the technology that enables the network to support the distribution of digital media content. HP ProLiant servers can be used to implement a wide variety of edge server solutions that can often support forward and reverse proxy configurations.

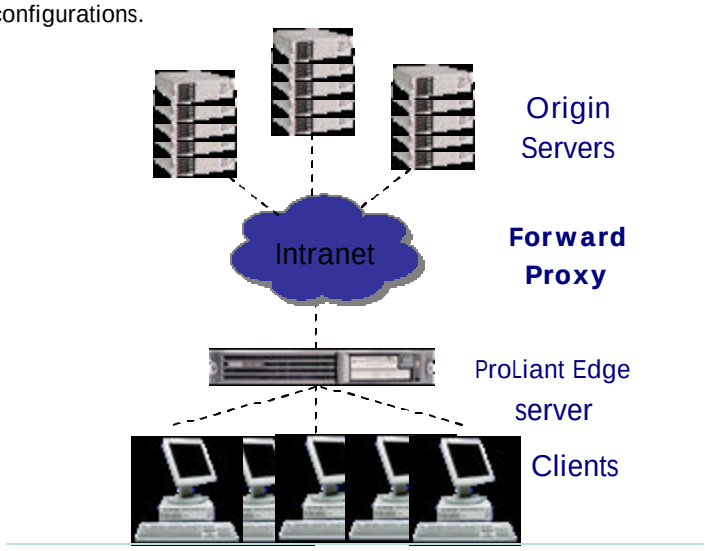

Figure 3: Forward Proxy CDN

ProLiant Content Consumption

The presentation of digital media content is critical to the overall user experience. Microsoft and HP offer an integrated user experience with the Windows Media Player

on HP desktops, notebooks and PDAs.

Desktop, Notebook or PDA

HP and Microsoft have partnered to deliver the complete Windows Media experience on the entire line of products for the business, including:

- Compaq Evo desktops and notebooks
- iPAQ client devices

The digital media experience is fully supported on the desktop, notebook and PDA. Microsoft has a Windows Media Player for Pocket PC making it possible to play video and audio content on an iPAQ Pocket PC via a wireless network (802.11b).

Windows Media Player

Microsoft Windows Media Player is the most widely deployed media player for business users. The Windows Media Player is included with the Windows operating system (Windows 95, 98, NT, 2000 and XP), so virtually every Windows client is already prepared to play and enjoy the benefits of digital media. The Windows Media Player supports the broadest set of devices and operating systems, giving business users the flexibility to playback digital media content where and when they need it. Windows Media Player supports , MAC OS X, Solaris, Pocket PC and Palm-size PCs.

The Windows Media Player 7.1 is the most advanced player for the business, delivering the best quality audio and video experience for end users. Windows Media also provides the ability to:

- Develop custom skins
- Lock down the player for corporate deployments
- Embed the player in a web browser via the Media Player SDK

SharePoint Media Portal

Microsoft SharePoint Portal Server, Producer for PowerPoint 2002 and Windows Media provide all of the functionality to build an intranet-based media portal. Producer enables users to create digital media content and publish it right from their desktop to the SharePoint server. All of the encoding, and Web integration is handled by Producer, while SharePoint manages the meta-data and source content. The media content is placed on a Windows Media server and the Web content is placed on the SharePoint server automatically.

Microsoft SharePoint Portal Server makes it easy to publish and manage content across the extended enterprise. Users can search, browse and view digital media content right from their browser. By publishing digital media presentations directly from Producer to SharePoint, users can make their knowledge available to the entire organization, without requiring the involvement of IT staff to execute complex Web replication tasks. Once the presentations are published to SharePoint, they can be approved and made available to all users via the Intranet. It's that easy!

Microsoft Solutions for Intranets

The Windows Media Broadcast component of Microsoft Solution for Intranets is a turnkey solution to create and deliver broadcast content to the desktop. The solution leverages Microsoft Windows Media, SharePoint Portal Server, Office XP, SharePoint Team Services and SQL Server 2000. Solutions for Intranets deliver live audio and video communications to the desktop for enterprise broadcasts. It makes it easy and simple to produce, manage and deliver a live broadcast by providing automation of event production, scheduling via a central calendar and automatic archiving of events. Solutions for Intranets deliver clear business value and leverage your existing

investment in Microsoft technologies.

Third-Generation Windows Media

The third generation of Windows Media will be integrated with the .NET Server Platform. Windows Media Services under the .NET platform, currently in beta, will take Windows Media to the next level by delivering value in four key areas:

- Fast stream
- Dynamic content programming
- Industrial strength
- Extensible platform

Fast stream provides an instant-on playback experience on the client, virtually eliminating buffering. Fast stream technology captures the user's attention and engages them in the content as soon as they click the play button. The new Fast Stream feature provides the high performance users expect from an enterprise solution.

Dynamic content programming provides more TV-like broadcast capabilities to digital media solutions by supporting server-side playlists and changing the content on the fly on the backend as content is being delivered. This works both for live and on-demand content.

Windows Media under Microsoft .NET Server is the most scalable and extensible digital media technology available. Windows Media has the industrial strength to scale to the most demanding enterprise solution and provides the reliability necessary for mission-critical systems. The Windows Media Platform is extensible to support the most unique enterprise requirements, allowing developers and third parties to develop custom solutions around your business.

For more Information

The best way to move forward will be different for each organization. Take the time to understand your business requirements and develop a plan to assess the infrastructure. To help you understand the infrastructure requirements in more detail, read the white paper "Enterprise Digital Media Solutions Guide – Part III: Infrastructure", which is the third paper in this series.

HP Online Resources

ProLiant Solutions for Streaming Media -

http://www.hp.com/solutions/streamingmedia

http://www.hp.com/solutions/disa

ProLiant Servers - http://www.compaq.com/products/servers/platforms/index.html

Storage Solutions - http://thenew.hp.com/country/us/eng/prodserv/storage.html

Client and Handheld Solutions -
http://thenew.hp.com/country/us/eng/prodserv/notebooks_handhelds.html

HP Services

HP Services has the expertise to help your business deploy enterprise solutions. For more information visit:
http://www.compaq.com/services/
Mobile and Media Systems Lab-
http://www.hpl.hp.com/research/cp/cmsl/publications/streamingmedia_publications.htm

Microsoft Online Resources

The Windows Media website has a large selection of resources to help you get started, with everything from "How tos" and business justifications to case studies:

Windows Media website – http://www.microsoft.com/windowsmedia

Windows Media in the enterprise -
http://www.microsoft.com/windows/windowsmedia/enterprise.asp

Windows Media download center -
http://www.microsoft.com/windows/windowsmedia/download/default.asp

Microsoft Producer -
http://www.microsoft.com/windows/windowsmedia/technologies/producer.asp

Rapid Economic Justification (REJ) white paper-
http://www.microsoft.com/windows/windowsmedia/enterprise/value.asp#rej

Executive Broadcast white paper -
http://www.microsoft.com/windows/windowsmedia/Enterprise/deploy.asp

Microsoft Consulting Services

Microsoft Consulting Services (MCS) has a national presence and the expertise to help you implement an enterprise digital media solution. The MCS Home page is:

http://www.microsoft.com/business/services/mcs.asp

Microsoft Partners

Microsoft has over 32,000 Certified Partners worldwide that can also help you get started with

their expertise on Windows Media and enterprise solutions:

http://www.microsoft.com/business/partners/

Windows Media Service Providers

http://www.microsoft.com/windows/windowsmedia/service_provider/programs/wmsp.asp

About Approach Inc.

Approach was a contributing author to this paper in conjunction with Microsoft and HP. Approach is a consulting company advising on and delivering digital media solutions for the enterprise. Approach has significant expertise in designing and implementing Windows Media based solutions for the enterprise.

For more information, email digitalmedia@approach.com or visit www.approach.com

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