

# Video-Enhanced Web Services

Delivering interactive television and switched video broadcast services

*An Oracle, DIGITAL, Ericsson, and Acorn White Paper  
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# Video-Enhanced Web Services

## **EXECUTIVE OVERVIEW**

The Video-Enhanced Web Services solution jointly created by Digital Equipment Corporation, Ericsson, Oracle Corporation, and Acorn integrates Oracle's video server software and the DIGITAL™ AlphaServer™ platform with World Wide Web clients — enabling service, selection, and navigation through Web pages and enabling services to include high-quality video. The video is full-screen, high-quality, and real-time — a far cry from the low-resolution “postage stamp” images delivered over conventional systems.

This state-of-the-art solution, which enables telecommunications enterprises to provide customers with access to full-streaming, high-quality video from an Internet environment, integrates new and leading products from each contributing company: a set-top device from Acorn, the new ATM-based multiservice access network from Ericsson, video server application software from Oracle, and the high-performance, Alpha-based video server platform provided by DIGITAL.

With the introduction of Video-Enhanced Web Services, television and the World Wide Web converge — inaugurating an era of high commercial potential for telecommunications companies in today's rapidly evolving multiservice market.

## **INTRODUCTION**

As competition in the telecommunications marketplace escalates, telecom businesses are seeking to differentiate themselves, build customer loyalty, and expand market share by offering appealing, innovative services to customers. Today, it is at last possible for telecom operators and new service providers to deliver a leading-edge service that once seemed beyond reach: high-quality interactive television transmission via a very high-speed broadband access network.

This elusive goal is finally a reality, made possible by today's convergence of high-bandwidth bidirectional networks, digital video technology, streaming video capabilities, low-cost network computers and set-top devices, and the user friendly style of interactivity popularized by the meteoric rise of the World Wide Web, the Internet's commercial "hot spot."

In fact, this breakthrough is driven by a fundamental convergence between the technology revolution in telecommunications and the Web's increasing availability to consumers at home via television.

### **Broadband meets the Web**

From the early days of telephone networking, the telecommunications industry has undergone a stunning, market-driven growth that is climbing to new proportions in our time. Recent decades have witnessed an unprecedented technological evolution, from analog telephony lines to high-speed data transmission capabilities such as ISDN and advanced IN services.

Developing efficient multiplexing and new modulation technologies are key to generating new access solutions that make it possible to take advantage of broadband capabilities that deliver multiple services. Until recently, these solutions have not been available. Now however, an industry-leading ATM-based access network has been pioneered by Ericsson, one of the contributing companies in the Video-Enhanced Web Services solution. As a result, operators now have the ability to address the market for interactive TV services.

Much the same observations can be made concerning the exponential growth of that global communication phenomenon, the Internet, since its beginnings as a "network of networks" for information sharing among the scientific community. With the advent of hypertext and multimedia capabilities and the spread of high-bandwidth networking, both the Internet and its fast-growing "hot spot," the World Wide Web, have exploded into a pervasive and popular medium that is revolutionizing education, business, and consumer commerce.

## **Maximizing your commercial reach**

Now, with the introduction of Video-Enhanced Web Services, the rapidly evolving media of iTV and the Web are converging — and triggering the development of a wide range of high-speed interactive TV and PC applications. As a result, a multitude of new services will bring the Internet to a consumer market well beyond PC users.

Early entrants in this emerging arena have the opportunity to shape and expand the market for such services as customized marketing, distance learning, telecommuting, and online gaming and lotteries. For today's telecommunications operator, these and many other near-future interactive applications add up to powerful business potential.

In this White Paper, you will learn the details of the groundbreaking Video-Enhanced Web Services developed by a group of innovative telecommunications and networking leaders — the ideal solution for maximizing the commercial reach of your telecommunications network and adding value to your portfolio of offerings in today's rapidly evolving multiservice market.

## **VIDEO-ENHANCED WEB SERVICES: AN OVERVIEW**

The Video-Enhanced Web Services solution jointly created by Digital Equipment Corporation, Ericsson, Oracle Corporation, and Acorn integrates Oracle's video server application software and DIGITAL's Alpha-based video server platform with World Wide Web clients — enabling Web pages to include broadcast-quality video as easily as they can currently include images and text. The video is full-screen, high-quality, and real-time — a far cry from the low-resolution “postage stamp” images delivered over conventional systems.

Additionally, access times to images and other multimedia objects are dramatically improved in comparison with normal dial-up access. Video and other multimedia objects delivered by the DIGITAL/Oracle® server solution can be referenced both from Web pages stored locally or from remote Web pages anywhere on the Internet.

This approach has many advantages:

1. The Video-Enhanced Web Services solution (using the multiservice access network from Ericsson) can deliver video services in a timely fashion. Conventional servers (with a routed network) have neither the timing nor the replication capabilities this requires.
2. The Web paradigm of client-independent applications provides access to a rich variety of mainstream and specialized application authoring tools and access to visual and text-based interaction, as well as a rapidly growing pool of authoring expertise. The server-based HTML environment makes it much easier to develop and deploy new services and is a significant enabler for low-cost clients for the domestic market. In addition, client-based extensions based on Java™ will allow highly interactive applications, such as games, to be deployed.

3. The familiar interface is one that users find intuitive.
4. The Video-Enhanced Web Services solution provides high-bandwidth Web access across a new or existing infrastructure. Conventional Web servers have to wait for the networks to catch up. (This also addresses the problem of slow access to images and other large binary objects, which are becoming common features of Web content.)
5. The ability to support the existing delivery point of presence in users' homes and offices by providing the necessary high-bandwidth, ATM-based, bidirectional network infrastructure is a key marketing advantage for telecommunications network providers.

### Industry-leading components

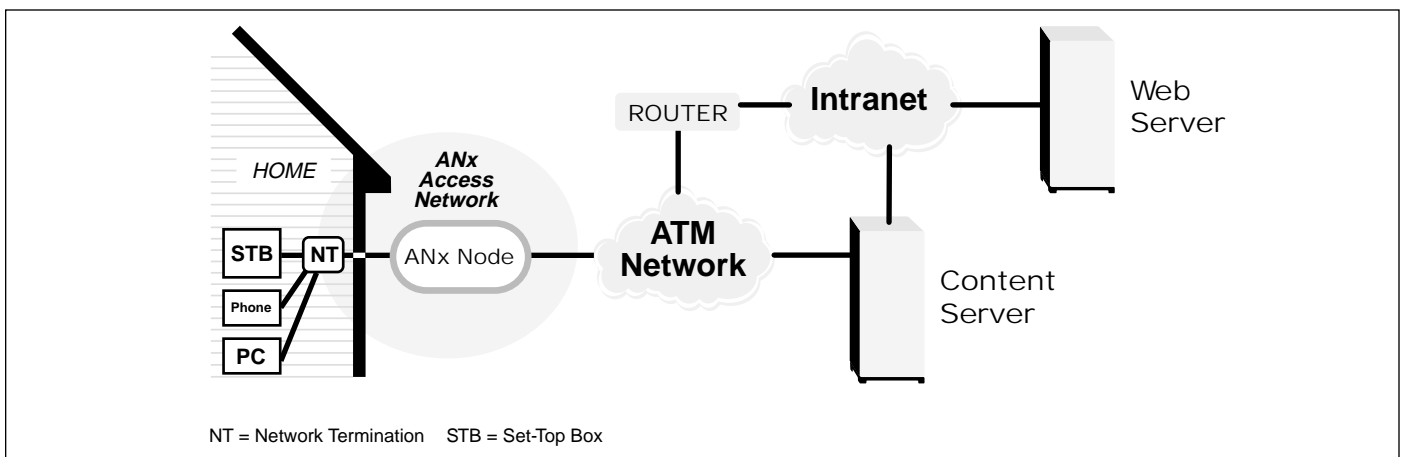
Taking advantage of significant new developments (advanced Web authoring tools now available, an infrastructure that supports new and emerging back-end modules needed to run a business application, and the move to add broadband services in existing metropolitan infrastructures), four leading companies in networking and telecommunications have jointly architected the Video-Enhanced Web Services solution described in this section.

This state-of-the-art solution integrates new and leading products from each contributing company: a set-top device from Acorn, the new multiservice access network from Ericsson, video server software from Oracle, and DIGITAL's Alpha-based, high-performance video server platform.

### Solution configuration

The elements of the Video-Enhanced Web Services solution, which enables telecommunications companies to provide customers with access to full-streaming, high-quality video from an Internet environment, are diagrammed in Figure 1.

As shown in Figure 1, the Set-Top Box (STB) connects through an access network, then through an Asynchronous Transfer Mode (ATM) switched network, to an intranet. A Permanent Virtual Circuit (PVC) is open from the STB through to the router into the intranet. The ATM circuit is terminated by the STB at one end and the router on the intranet at the other end. That circuit, which will be used for normal Internet access, can be of whatever bandwidth is agreed upon. Within the intranet environment, one or more Web servers are available. The STB accesses them in the same way as any Internet environment — over the PVC.



For video delivery, a high-bandwidth ATM Switched Virtual Circuit (between 2 and 8 Mbits per second) is provided by Oracle's video server software running on the DIGITAL AlphaServer platform linked with Ericsson's signaling structure. The Video-Enhanced Web Services solution constructs and opens this "pipe" only when it is needed for active transmission.

Here is how an iTV service would operate using the Video-Enhanced Web Services solution.

The DIGITAL/Oracle server contains a sizeable database of media assets — most typically, available feature film titles. Whenever a user wishes to select video content, an application on the server searches the database and dynamically builds up an HTML page reflecting the assets that are available. As with most databases, the user can enter search criteria, limiting the search to adventure films, for example, or searching by actor.

The information retrieved is transmitted to the user's home STB over the existing intranet access network. No high-bandwidth pipe is necessary yet, since only regular Internet accessing is involved. When the user/customer selects a specific film title to be played, the following events are triggered.

The DIGITAL/Oracle server instructs the STB to run a helper application (Oracle's video client software) to control the asset playout. The Oracle application provides VCR emulation, allowing the user to control play with standard, familiar functions. In this way the Web browser acts like a VCR for the duration of the program.

The DIGITAL/Oracle server also opens a high-bandwidth ATM Switched Virtual Circuit (SVC) through the ATM switch within the Ericsson network, to the STB. The high-bandwidth pipe is now available to stream the MPEG-encoded video down.

As soon as the SVC is negotiated through the network, the video server software starts playing the asset over the video link down to the STB. As noted, the user has full control over playout via VCR-like commands. On reaching the end of the program, the high-bandwidth SVC is taken down, the Oracle video client player (VCR emulator) is turned off, and user interactions become regular HTML-style interactions with the DIGITAL/Oracle server or any other Web server.

Note: for a fuller technical description, see the Appendix.

## **CONTRIBUTING COMPANIES**

For well over a year, four networking and telecommunications leaders worked together to perfect the Video-Enhanced Web Services solution — each contributing a unique element.

### **Ericsson: Multiservice access network solution**

<http://www.ericsson.se>

The multiservice access network provides a solution for high-speed delivery of multiple services through the access network. The solution provides various interfaces for backbone networks, including PSTN and ATM/IP networks, and various interfaces with respect to customer premises to interconnect to phones, TV sets, and PCs. Different interface combinations are provided for solutions targeting different network architectures, such as Asymmetric Digital Subscriber Loop (ADSL) and, in the future, fiber optic and radio network connectivity. This highly flexible platform enables delivery of broadband services such as Internet access, broadcast video, iTV and interactive games, and telecommuting services, as well as telephony.

Ericsson's system is intended for networks in which the principal offering is telephony, and in which the full complement of additional narrow and broadband services will generate new revenue streams for operators. The modular design of the central components in the Ericsson system allows network capacity to be expanded gracefully, in line with demand. It also provides efficient use of bandwidth through switched connections.

Ericsson's 100,000 employees are active in more than 130 countries. Their combined expertise in fixed and mobile networks, mobile phones, and infocom systems makes Ericsson the world-leading supplier in telecommunications.

### **Oracle Corporation: video server application software**

<http://www.oracle.com>

Oracle's recently announced Network Computing Architecture (NCA) is a comprehensive, open standards-based software platform — a common set of technologies allowing all PCs, network computers, STBs, and other client devices to work with all Web servers, Universal Servers (including database and video), and application servers over any network. NCA is Oracle's implementation of its vision for network computing, and is designed to help companies protect their technology investments by allowing mainframes, client/server environments, the Internet and intranets, broadband network components, and distributed object software to work together.

Using open Internet standards and unique bridging software that helps application components work together, NCA provides a cross-platform environment for developing and deploying network-oriented applications. NCA recognizes the increasing importance of Web servers, database servers, and application servers working together to enhance communication and deliver a wide array of information on demand.

Oracle's NCA-based video server software is designed to provide storage and retrieval of streaming video and audio content. It is an option available with the Oracle Universal Server, the core of a new generation of extremely powerful information management systems from Oracle, the world's leading provider of advanced information management solutions. Oracle brings to the Video-Enhanced Web Services consortium more than 20 years of experience in large-scale system software development — and significant experience with iTV system development, with two of the world's largest iTV system trials currently under way.

### **Acorn Computers: Set-Top Box**

<http://www.acorn.com/>

The Set-Top Box is widely perceived as a dumb RF tuner — or as a Network Computer. But today's (and tomorrow's) DiTV solutions require much more than dumb STBs. The STB22 from Acorn is dynamic, intelligent, and digital. This is the company's third-generation digital STB, and it is designed to meet and exceed the demands of interactive television. Its uniquely powerful combination of features makes it the natural choice for large-scale trials and volume commercial deployments.

Acorn has been in the interactive TV field since 1994, so they have built relationships with key suppliers in the market. They are developing technologies that recognize the power consumption, integration, and display demands of the future. Demands that require hardware and software delivering the greatest functionality at the lowest cost.

Connecting an ordinary television — such as that found in 99 percent of households in the developed world — to a suitable network, the Acorn STB22 offers immediate access to a wide range of services. The STB22 has been designed to support and encourage active user participation, so selecting movies on demand, shopping from home, or playing networked games are all fully supported.

Acorn's core expertise lies in delivering high-definition anti-aliased fonts and graphics on low quality monitors and TVs. Their technology is ideal when applied to consumer interactive multimedia devices.

In 1994, Acorn ran the world's first digital ATM iTV trial. Acorn technology is featured in the STBs of more DiTV trials around the world than any other technology.

Acorn designs the technology that is required to exploit the emerging global opportunities for the digital interactive arena.

### **Digital Equipment Corporation: Alpha-powered video server platform**

<http://www.digital.com>

DIGITAL Alpha is the world's fastest-growing enterprise computing platform. Leaders in telecommunications and software — MCI, Microsoft, Oracle, and Computer Associates — have formed strategic alliances with DIGITAL to capitalize on the 64-bit DIGITAL Alpha platform. Oracle runs its own mission-critical financial database on two DIGITAL AlphaServer 8400 systems.

DIGITAL provides differentiated enterprise platforms, including Alpha and Intel systems running DIGITAL UNIX®, Windows NT®, and DIGITAL OpenVMS™. On Alpha, the DIGITAL UNIX and DIGITAL OpenVMS 64-bit operating systems offer Very Large Memory (VLM) performance for enterprise applications. Microsoft has announced that it is cooperating with DIGITAL to deliver its 64-bit Windows NT system on the Alpha platform first.

The DIGITAL Alpha platform powers both AltaVista™ and Lycos, two of the world's most popular Internet search services. A DIGITAL AlphaServer 8400 system helps to power Netscape's home page, one of the most heavily used on the Web.

Alpha is winning where the industry is heading: the Internet, massive UNIX databases, Microsoft® Windows NT. The fastest-growing applications are making the most of Alpha's power.

DIGITAL has long been proactively involved in the interactive television arena, participating in more than half of the world's initial iTV market trials. Exploiting the significant benefits of Alpha, DIGITAL has subsequently expanded its expertise and offering to also address DVB-compliant digital TV studio and broadcast solutions, as well as high-performance computing platforms that meet the critical challenges of modern film production studios in the area of video rendering, compositing, and high-speed visualization.

DIGITAL is a leading supplier of high-performance, open client/server, Web-based computing solutions, which help enterprises compete in the global marketplace. DIGITAL's scalable Alpha platforms, storage, clustering and broadband networking, software, and services, together with industry-focused solutions from partners, help organizations compete and win in today's global marketplace.

## **APENDIX**

### **The Video-Enhanced Web Services solution**

#### Technical overview

At the home end, the Set-Top Box (from Acorn) connects to the main broadband network via Ericsson's multiservice access network. The STB connection carries two virtual circuits:

1. The STB has a PVC across the access and broadband networks to a router connected to the intranet. The PVC will be terminated here. This PVC is used for all IP traffic, including access to the home server, the World Wide Web servers, the external Internet, and the back channel to the DIGITAL/Oracle server system for session and motion control. The IP network style is classical IP over ATM AAL5.
2. To support streaming video, a true unidirectional Switched Virtual Circuit (SVC) is then established during video play between the video server and the STB, using UNI3.1 signaling per ATM Forum standards. The DIGITAL/Oracle server system makes an outgoing ATM call from the appropriate Video Pump to the Ericsson access system, requesting an SVC to an NSAP configured in the access network that terminates signaling for the STB. The signaling proxy relieves the STB from having to support the complete UNI stack. On completion of the SVC to the STB, video is delivered on an "MPEG" transport stream over ATM AAL5.

To avoid the necessity of implementing a full ATM signaling stack in the STB, thus minimizing STB cost, the SVC that carries the compressed video material from the server to the STB is terminated at the union of the switched ATM network and the ADSL access network. A PVC then exists between this termination and the STB to complete the delivery path.

A Web server is provided within the DIGITAL/Oracle server system to support video-specific operations. Additional Web servers can be used to provide general Web support for the STB during normal Web browsing operations (for example, proxy services).

Multiple instances of the system elements can be used to construct the required service delivery system. The ATM switching fabric within Ericsson's system, which may be realized as a switched ATM network, can support multiple DIGITAL/Oracle server systems and multiple access networks, and may be used to provide interconnection between elements of the intranet such as routers and servers.

Each access network can support many STBs. For each STB, a PVC must be provided through the ADSL access network and Ericsson's ATM switch to an IP router, where it is terminated. These IP routers are connected to the intranet using point-to-point WAN, LAN, ATM over PVCs, or ATM over SVCs as required by the physical topology, economics, and equipment availability. These factors will likewise determine the physical placement of the router and the choice of router to which it is connected.

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**ORACLE®**

Oracle Corporation  
World Headquarters  
500 Oracle Parkway  
Redwood Shores, CA 94065  
U.S.A.

Worldwide Inquiries:  
415.506.7000  
Fax 415.506.7200

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