

# Advanced Compression Decoder Technology Enables On-Demand Video Services Over DSL

Technology sponsored by:



# “Triple-Play” for Telcos

As the popularity of the Internet and the proliferation of wireless technology continue to reshape the telecommunications landscape, telephone companies (telcos) face increasing competition for market segment share. Customers are replacing their landline phones with wireless services, and in many cases turning to cable companies for Internet data services. At the same time, cable multiple system operators (MSOs) are expanding their traditional business model, promoting themselves as single-source providers of MPEG-2-based digital video content, broadband Internet service, and now, voice over Internet Protocol (VoIP). On the plus side, local exchange carriers have advantages in copper infrastructure, and they have been expanding the deployment of digital subscriber line (DSL) technology to deliver IP-based data services to residential and business customers. The challenge is how to use this existing network infrastructure to provide bundled services to reduce customer churn, grow average revenue per user (ARPU) and expand the total available market while maximizing their market segment share. Telephone companies now have the opportunity to meet these objectives by offering customers compelling new bundled packages of high-revenue “triple play” services, including video, data and voice delivered over DSL.

## Contents

“Triple-Play” for Telcos . . . . .	2
Advanced Video Compression . . . . .	3
Reaching New Customers . . . . .	3
Driving ARPU with Personalized and Interactive Services . . . . .	5
The Thomson IP1000 Series IP Decoder Platforms . . . . .	5
Flexible Platform Configurations . . . . .	6
Conclusion . . . . .	7
About Thomson . . . . .	8
About Intel . . . . .	8
For More Information . . . . .	8

While some telephone companies have offered their customers MPEG-2 video over existing copper telephone wires, the relatively high bandwidth requirements of this technology have limited video delivery. The recent advent of advanced video compression technologies, including Windows\* Media Player\* 9 and H.264/MPEG-4 Part 10 codecs (coder-decoders), is helping to overcome the bandwidth limitation by reducing the bit rate required for transmission of broadcast-quality digital video. This will enable telephone companies to complete the “triple play” package of services by delivering high-quality video over the local copper loop using existing network infrastructure equipment. Taking advantage of the latest video compression technologies requires a new generation of customer premises hardware platforms to decode and display such content to their televisions and stereo systems and provide users

with a new dimension of control over their video viewing experience and interactive TV services. Thomson and Intel are working together to meet this need, while helping telephone companies bring the advantages of video over DSL technology to consumers. Working in cooperation with Intel Consumer Electronics Group, Thomson has developed the IP1000 Series Advanced Compression Decoder family. This family of flexible and expandable video delivery appliances, based on Intel Architecture hardware, enables telecommunications operators to compete more effectively by providing DSL subscribers with a new range of triple-play services including true video-on-demand (VOD), interactive TV, personal video recording and more.

## Advanced Video Compression

The new generation of advanced video compression technologies, including MPEG-4 Part 10 (also known as H.264/MPEG-4 AVC) and Windows Media Player 9, are key to the distribution of broadcast-quality video over IP networks. As shown in Figure 1, advanced video compression reduces bandwidth requirements for high-quality video by about half compared to existing MPEG-2 technology.

The ability to implement the new advanced video compression standards has important benefits for service providers:

- Using advanced compression, telcos can deliver entertainment at a quality similar to other digital television such as cable and satellite in real time at lower bit rates. It enables operators to simultaneously deliver and charge for multiple channels of digital video, while minimizing equipment requirements in the system head end and network infrastructure.
- Typical DSL service providers can offer such video services to a majority of their subscribers, without the expensive and time-consuming infrastructure upgrades needed to reduce the average length of digital loop carriers and copper wiring.

- Download time is sharply reduced, which saves transmission costs.
- Smaller file sizes help minimize storage utilization on network VOD servers or hard disk drives within the IP1000 series of products.
- Software-based codecs enable operators to implement multiple advanced video compression standards, providing content support for multiple formats and increasing both the availability of content and the flexibility to support new formats.

## Reaching New Customers

Beyond these clear advantages, the major benefit of advanced video compression is its ability to extend the effective reach of video delivery to more customers over existing DSL copper loops. A key element in the telco’s ability to serve video to customers is the bandwidth the DSL lines can handle. To understand how advanced compression makes a difference, let’s look at how much bandwidth is needed for video and data as illustrated in Figure 1.

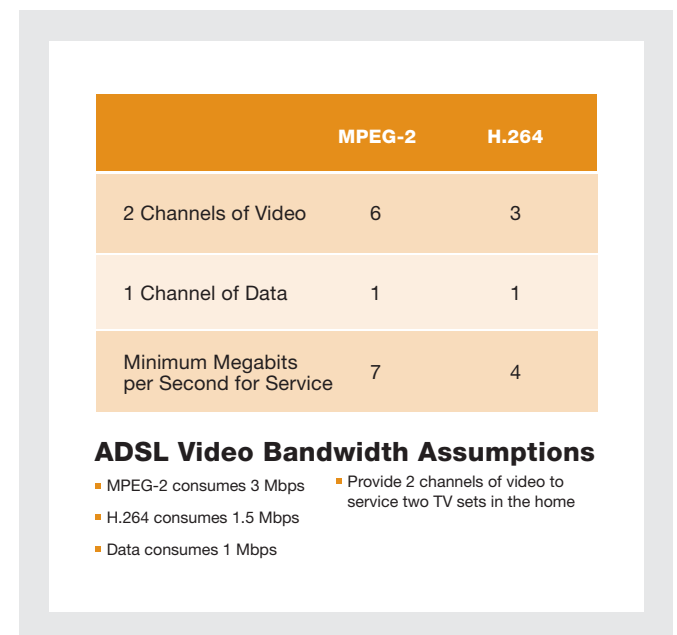


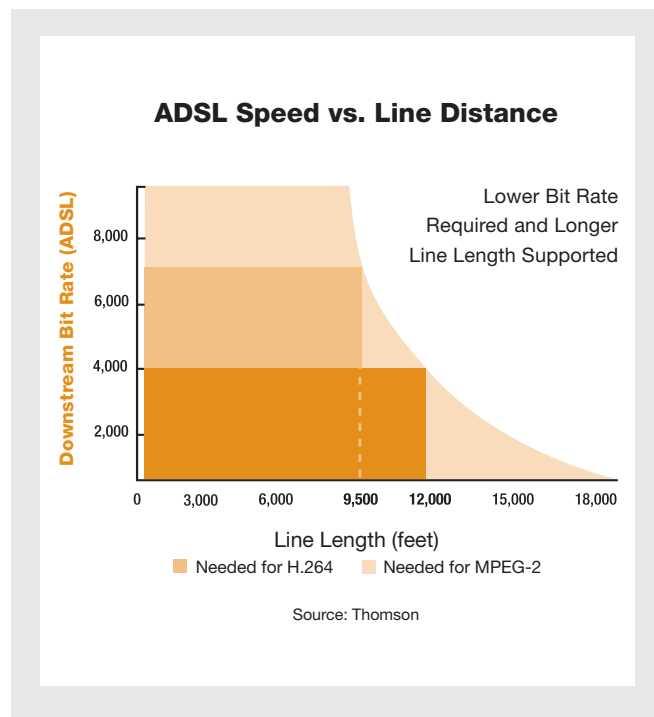
Figure 1 ADSL video bandwidth reduction with advanced video compression.

As shown in Figure 1, using MPEG-2 to deliver two simultaneous high-quality video signals, plus 1 Mbps data service, over an ADSL (asynchronous DSL) connection requires bandwidth of 3 Mbps per video channel, for a total bandwidth of 7 Mbps. Using advanced video compression can reduce the bandwidth required for each video channel by about a factor of two, so that each channel requires just 1.5 Mbps and the total bandwidth is reduced to 4 Mbps. This bandwidth reduction can help phone companies extend the reach of IP-based video over their existing phone lines.

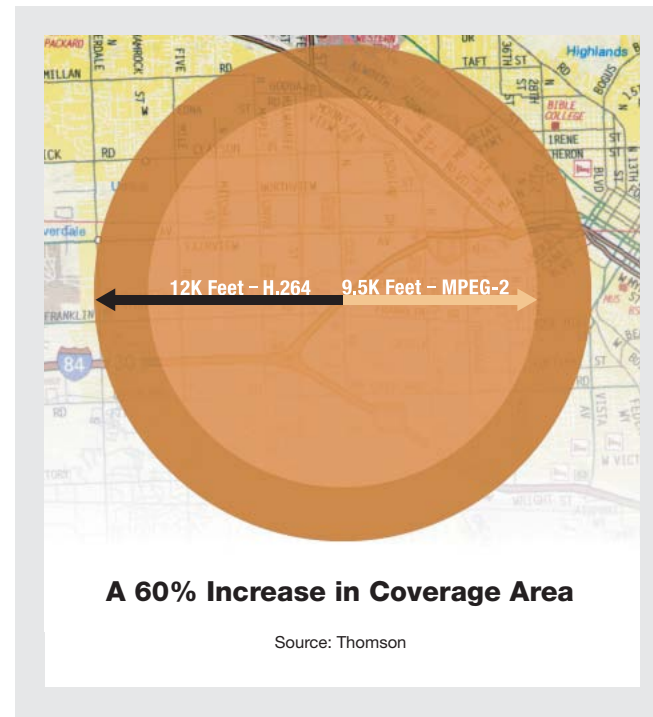
Figure 2 shows how the 7 Mbps requirement for the MPEG-2 video streams and the data stream limits the reach of these services to approximately 9,500 feet in

a typical network. Reducing the bandwidth requirement to 4 Mbps using the advanced video compression example extends the practical line length to in excess of 12,000 feet.

As shown in Figure 3, a line length of 9,500 feet encompasses a service area of approximately 6,500 acres, which in a typical "R-3" residential zoning configuration can include approximately 20,000 households. As shown in the example, extending the reach of video over DSL service to 12,000 feet with advanced compression enlarges the service area to about 10,400 acres, or approximately 32,000 households, representing a 60 percent increase in potential customers that can be reached without costly network upgrades.



**Figure 2** Advanced compression expands the consumer market for telco video.



**Figure 3** Advanced video compression can extend the reach of video over ADSL by up to 60 percent.

## Driving ARPU with Personalized and Interactive Services

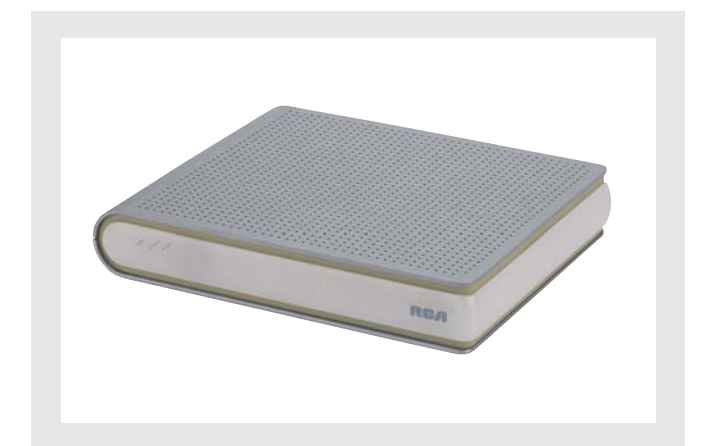
Thomson IP1000 Series Advanced Compression decoders enable telcos to drive higher ARPU by providing their customers with a range of compelling new IP video services, ranging from true video-on-demand and IP TV programming to digital media services including Internet games, music and interactive TV applications for homes and businesses. One of the unique competitive advantages for telcos is the point-to-point characteristic of the DSL broadband connection itself. Unlike cable, with its "one-to-many" topology, DSL enables continuous two-way communication using the point-to-point delivery mechanisms from the head-end through the network all the way to the decoder at the user's home or business. This in turn establishes a direct relationship between the viewer and the service provider with additional benefits. This direct two-way connection can be used to provide service providers, advertisers and content creators with real-time data on individual customer preferences, viewing patterns and channel switching behavior. This capability enables advertisers to more effectively target high-affinity audiences over selected IP TV channels and immediately measure return-on-investment, while the one-to-one communication channel can enable viewers to interactively request information on advertised products and services. The one-to-one nature of video over IP service also enables phone companies to administer security policies and enforce conditional access to selected content.

In addition to supporting hundreds of channels of interactive programming, one of the most compelling services for consumers will be true video-on-demand. Telcos will be able to offer an extensive library of movies and other digital video programming, making any title available to viewers at any time.

Consumers can also receive a variety of other highly personalized information services as an adjunct to their IP TV and video content, including electronic program guides (EPG) with information about available programming, premium services and other digital media, specialized news, weather, stock quotes and sports scores, in addition to personal telephony services such as caller ID, which can be unobtrusively delivered through a graphical on-screen interface. For example, subscribers could be offered e-mail, electronic news and information and chat services simultaneously while they watch TV and video programs. For business customers, telcos will be able to provide IP-based communications and information services enhanced with interactive video to schools, hospitals, buildings and business campuses.

## The Thomson IP1000 Series IP Decoder Platforms

Thomson IP1000 Series decoders (Figure 4) build on Thomson's extensive experience in the design of set-top boxes, middleware and network solutions for satellite, cable, digital terrestrial and IP-based services. This new generation of



**Figure 4** Thomson IP1000 Series Decoder Platform

flexible and upgradeable platforms incorporates hardware and software architecture that enables telcos and allied service providers to provide an enhanced package of video, data and voice services tailored to meet specific customer needs. The platform design supports a choice of operating systems, including Windows\* CE\* .NET\*, Windows\* XP or Linux\*, and advanced compression codecs that execute in software running on general-purpose Intel® processors and chipsets. The use of standard PC-based building blocks provides the programmability and processing headroom to support applications and user interfaces. In addition to PC platform architecture, the Intel Architecture development environment includes authoring tools, drivers, applications and peripherals designed to speed the implementation of new applications and services. The software codecs, middleware and hardware/software platform enable fast product development without the need for extensive hardware reengineering.

The flexible platform design also enables vendors and operators to prepare for the future by supporting a variety of codecs, including MPEG-2, Windows Media Player 9 or MPEG-4 Part 10 AVC, and the system can be upgraded by the operators to support different codecs as needed in the future. System memory and processing capabilities are scalable, and the easily upgradeable platform is designed to support the addition of satellite or terrestrial tuners, a video encoder for analog TV input and digital recording, an IDE hard drive, AC-3 Dolby\* Digital\* 5.1 Surround Sound, a variety of CD, MP3 and DVD drives, wireless interfaces and a wide range of USB peripherals and PCI hardware expansion options.

## Flexible Platform Configurations

The Thomson IP1000 Series platform is designed from the ground up to maximize configuration flexibility, enabling telcos and service providers to easily accommodate a wide spectrum of application demands, customer usage scenarios and business models:

### Advanced compression streaming video platform

This configuration supports advanced compression to reduce bandwidth requirements throughout the network and to enhance reach. In addition to emerging real-time advanced video compression encoders, the platform supports legacy MPEG-2 video distribution systems. The platform is designed to support the delivery of complementary Internet-based services, including Web browsing, e-mail, chat and instant messaging.

**Content-on-demand platform** Adding a hard disk drive to the system creates new opportunities for telcos to deliver VOD over DSL and other content-on-demand, including music and gaming. VOD enables subscribers to purchase a movie stored on the network, watch it at any time, and store the movie on the platform's local hard drive for multiple viewing during the rental period, with DVD-like controls including pause, play and fast forward.

For networks with insufficient bandwidth to support broadcast streaming services, this configuration can enable the telco to provide value-added video services that complement traditional broadcast TV. With local storage, the platform can be used to cache new releases trickled to subscribers through an IP multicast system. Alternatively, this set-top box configuration can be used to receive specific downloads purchased on a pay-per-view or subscription model. Content aggregators can use this configuration to help differentiate their services by offering convenient access, rapid download times and rich catalogs of niche content, such as syndicated TV shows and classic movies.

**Personal Video Recorder (PVR)/combination broadcast content delivery appliance** Adding one or more tuners to the platform provides consumers the additional option of receiving broadcasts through terrestrial, cable or satellite networks. The hard disk drive provides digital video recording capability.

**"Media Manager" configuration** This configuration provides optical disk playback and recording capability, including support for audio CD, MP3 and CD-R, DVD playback and the ability to archive PVR VOD content to recordable DVD media. The media manager configuration is capable of seamlessly dealing with content from packaged media in addition to multiple distribution networks. It can also provide a simple user interface that helps consumers acquire, access and manage digital content throughout the home. DVD recording capability, coupled with the appropriate digital rights management software, can enable new kinds of business models. For example, a new business model could allow the secure delivery of protected content onto removable media.

## Conclusion

Cable companies deliver video and data services to millions of consumers worldwide. Now cable operators are completing their triple-play offerings by adding voice services to the mix, and telephone companies need to respond. In addition to providing traditional voice services, telcos have been leaders in the deployment of broadband data services in the form of DSL. To compete effectively for market segment share with cable companies, telephone companies need to complement data and voice services by providing video entertainment over existing phone lines. Until recently, the bandwidth demands of video compression technology have limited the ability of telcos to provide video services to more than a limited subset of customers. The emergence of advanced video compression technologies such as Windows Media 9 and MPEG-4 Part 10 provides telcos with new opportunities to expand market segment share in today's hypercompetitive telecommunications environment.

Developed in cooperation with Intel, the Thomson IP1000 Series Advanced Compression Decoder Platform enables telecommunications operators to deliver a suite of home entertainment services over existing DSL networks. This flexible Intel Architecture-based platform supports current and next-generation video compression technologies, enabling telephone companies to deliver high quality "triple-play" digital video, data and voice services while extending the reach of existing DSL networks.

## About Thomson

Thomson is a leading provider of technology and service solutions for integrated media and entertainment companies. By capitalizing on and expanding its leadership positions at the intersection of entertainment, media and technology, Thomson provides end-to-end solutions to content creators, video network operators, manufacturers and retailers through its Technicolor, Grass Valley, THOMSON and RCA brands. For more information: [www.thomson.net](http://www.thomson.net)

Thomson's Broadband Access Products activity, part of Thomson's Video Network Solutions division, is a leading supplier of digital entertainment receivers to the world's major satellite, cable and terrestrial broadcasters. It is also one of the leading suppliers of high-speed modems, IP set-top boxes, and telephones to telephone companies around the globe. Products are marketed under a variety of brands including RCA, THOMSON, and SpeedTouch.

## About Intel

Intel is a supplier of products and technologies that support the vision of exciting new consumer electronics usage models. In addition to developing platforms, Intel is working with hardware, software and content and service companies to help enable the complete ecosystem required to deliver on the promise of the digital home. Intel, the world's largest chip maker, is also a leading manufacturer of computer, networking and communications products. Additional information about Intel is available at [www.intel.com/pressroom](http://www.intel.com/pressroom).

## For More Information

For more information on the Thomson IP1000 Series Advanced Compression Decoder Platform, contact Keith Wehmeyer at +1(317) 587-3267, or visit [www.thomson.net/ipsolutions](http://www.thomson.net/ipsolutions).

For more information on Intel consumer electronics products and industry enabling programs, visit <http://developer.intel.com/design/celect/>.

Intel does not make any representations or warranties whatsoever regarding quality, reliability, functionality, or compatibility of the Thomson devices or technologies featured. These devices and technologies may be subject to change without notice.

Intel Corporation may have patents or pending patent applications, trademarks, copyrights, or other intellectual property rights that relate to the presented subject matter. The furnishing of documents and other materials and information does not provide any license, express or implied, by estoppel or otherwise, to any such patents, trademarks, copyrights, or other intellectual property rights.

Intel and the Intel logo are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

\*Other names and brands may be claimed as the property of others.