

WHITEPAPER

The Thomson Mobile TV Primer

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The distribution of video services over handheld devices is a growing market with a rapidly increasing number of deployments based on different technologies. This whitepaper will provide you with an overview of the mobile TV market, its challenges, and the solutions available to meet those challenges.

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Contents

Introduction	1
Mobile TV Technologies	2
Broadcast Video	2
Cellular Unicast Video	2
DVB-H	2
DVB-IPDC	3
OMA BCAST	3
Mobile TV Delivery Chain	4
The Thomson Mobile TV Solution	5
Thomson Mobile TV System Architecture	6
The Thomson Mobile TV Solution: The Right Choice	7
The Thomson End-to-End Solution: A Unique Know-How	7
Open Architecture: Minimizing Interoperability Issues	7
Business Model Optimization: Optimizing and Sharing Infrastructure	8
Value-Added Services: Making Money Now	8

Introduction

The reception of video services over handheld devices is taking shape with a rapidly increasing number of deployments based on different technologies.

2.5, 3 and now 3G+ networks already offer video-on-demand (VOD) and live streaming content. However, where VOD requires a unicast link between the end user and a video server, alternative and more efficient solutions can be implemented to deliver live TV channels to numerous subscribers. Broadcast technologies such as DVB-H are specifically designed to address these types of requirements, providing a solution complementary to cellular unicast to address mass markets.

A complete mobile video system can thus be made of a broadcast path, based on DVB-H or similar technologies, and a bi-directional unicast cellular path, based on GPRS/EDGE/UMTS/HSPA. With a dedicated radio broadcast network infrastructure, mobile video moves up a gear while redefining the video and mobile communications landscape.

In this maturing market, operators need to provide robust and optimized video services with a feature rich and comprehensive offer. Indeed, broadcasters are experiencing the digitization of the terrestrial spectrum, freeing up new frequencies enabling the delivery of new video applications, and telecom operators are facing the migration of mobile networks to 2.5G and 3G standards, with the aim of adding rich media to voice services.

The leading technologies to deliver video broadcast with interactive services to mobile devices are DVB-H and DVB-IPDC, defined by the DVB forum with BCASD defined by the Open Mobile Alliance (OMA). These new standards offer the opportunity of broadcasting and managing audiovisual content services on mobile and handheld terminals over digital terrestrial networks.



Mobile TV Technologies

Broadcast Video

Broadcast video means the delivery of a large amount of content to large user groups at a relatively low cost, but is very limited with respect to interactivity and content personalization. It can be characterized by the following points:

- Suitable transport mechanisms include streaming, carousels, and download
- Large amounts of data are transferred
- Possible push of contents to terminals
- Contents are simultaneously broadcasted to a large audience
- Subscription-free or subscription-based services

Cellular Unicast Video

With the deployment of 2.5 and 3G networks, cellular operators have already started to deliver streaming video services. Once the 2.5 and 3G investments have been made, mainly for voice and regular data services, the cost to complete the networks with a unicast video solution was limited to the headend system itself with encoders and streaming servers.

These affordable solutions allowed mobile network operators (MNOs) to start deploying video services leveraging their 2.5/3G infrastructures, and address the market of highly personalized video. The cellular networks are indeed perfect for enabling the delivery of additional and personalized contents and services.

This mode of content delivery can be characterized by the following points:

- Suitable transport mechanisms include streaming and download
- A suitable bi-directional transport mechanism including full IP connectivity allowing various types of individual interactions
- Possible personalized delivery
- May contain a charging and billing infrastructure

However, the communication delivery in these cases is unicast, which implies the allocation of a certain amount of bandwidth on the radio interface for each new video session. As long as the services remained limited in audience, compared to regular digital terrestrial TV broadcast, mobile networks can accept the additional load, but real broadcast technology is required once the audience reach a certain size.

DVB-H

Based on DVB-T, the digital broadcast terrestrial standard, DVB-H (H for hand-held) provides additional features to cope with the unique characteristics of handheld terminals, such as limited battery, limited processing power and memory size, mobility, and smaller screens. The DVB-H features are:

- On the transmission system link layer (implemented in the DVB-H IP encapsulation gateway):
 - Time-slicing: This feature reduces average power consumption by sending the data in burst mode to the terminals. It also enables smooth and seamless frequency handover
 - MPE-FEC: This feature gives additional robustness and mobility by improving C/N-performance and Doppler performance in mobile channels, and also by improving tolerance to impulse interference

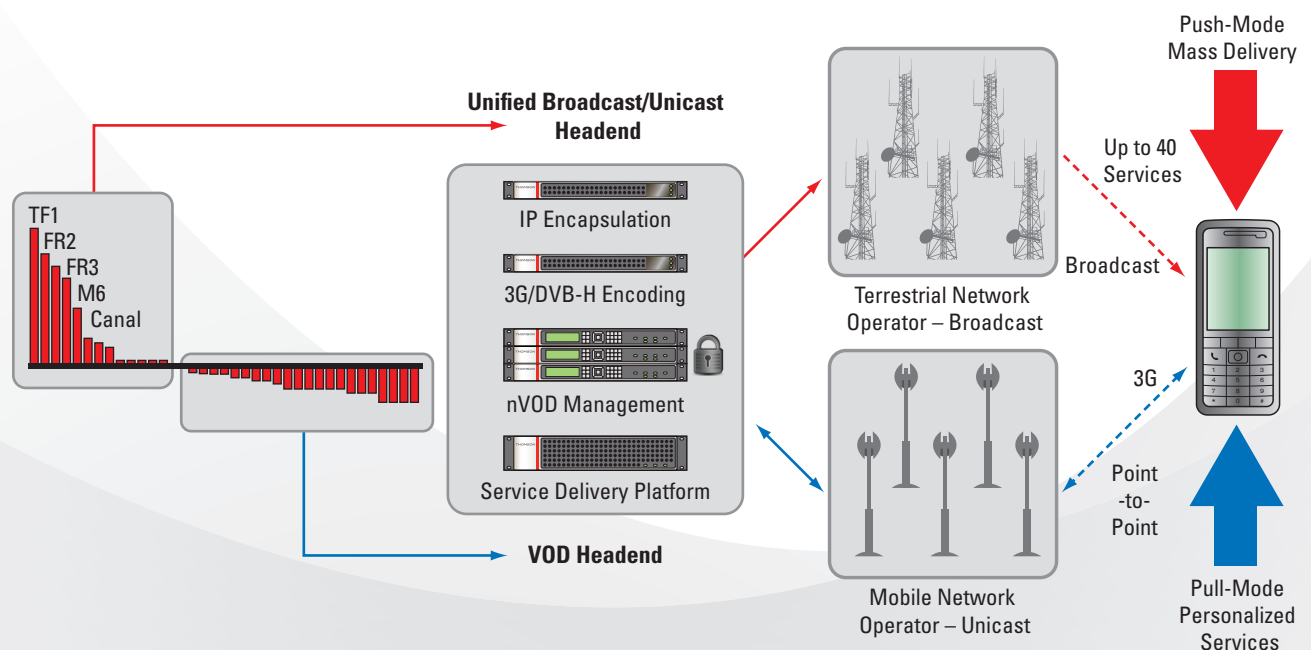


Figure 1 – Broadcast and unicast mobile TV.

Mobile TV Technologies (cont.)

- On the transmission system physical layer (implemented in the DVB-H modulator):
 - DVB-H signaling in the TPS-bits to enhance and speed up service discovery
 - 4K-mode for trading off mobility and SFN cell size, allowing single antenna reception in medium SFNs at very high speed, thus adding flexibility in the network design
 - In-depth symbol interleaver for the 2K and 4K modes to improve robustness in a mobile environment and impulse noise conditions

DVB-IPDC

The DVB-H standard is defined to transmit IP-based services to handheld terminals. IP datacast (IPDC) is an end-to-end broadcast standard defined by the DVB-TM ad-hoc group CBMS (Convergence of Broadcast and Mobile Services), specifying the delivery of any type of digital content and services using IP-based networks. In particular, IPDC is designed to allow services reception on terminals, without having to connect to a cellular network.

DVB-CBMS defined different work-groups, one addressing each of the following topics:

- Video and audio coding format and rate recommendation, in relation with receivers screen size and processing power
- Electronic service guide format definition and delivery over the broadcast network. The ESG is used by receivers to discover broadcast services, and display related information, mainly purchase information and electronic program guide (EPG), as well as interactivity data

- Content delivery, such as files, in a broadcast mode to a large number of terminals. This includes the protocols used to deliver the ESG and ESG-related vignettes, but also bitmaps, texts, clips, etc. used by interactive services
- Service selection and purchase, which implies content protection and user rights propagation on an IP broadcast system



OMA BCAS

The Open Mobile Alliance has brought a new set of standards for mobile broadcast services—OMA BCAS—leveraging the unidirectional one-to-many broadcast paradigm with the bi-directional unicast paradigm of the mobile network.

OMA BCAS specifications address functional areas which are generic enough to be common to many broadcast services, and which can be defined and implemented in a bearer-independent way. These functions are the following: service guide, file distribution, stream distribution, service protection, content protection, service interaction, service provisioning, terminal provisioning, and notification.

Even though OMA BCAS reuses the video and audio coding formats and the content delivery protocol (FLUTE) from IPDC, it proposes a competing solution to IPDC, especially concerning the ESG and service protection.

The OMA BCAS ESG is significantly different from IPDC because of it:

- Supports standardized interactivity
- Supports several video delivery technologies: broadcast (DVB-H), multicast (3GPP MBMS), and unicast streaming over cellular networks
- Provides its own distribution over a broadcast or interactive channel, i.e., through HTTP access over the cellular network. This allows bandwidth usage limitation of the broadcast multiplex, and a standard interface for program and interactivity data distribution to streaming mobile phones

OMA BCAS also brings two standardized service protection solutions, referred to as DRM Profile and SmartCard Profile (SCP). The DRM Profile solution is based on the OMA DRM standard, adapted to TV broadcast, and relies on a standardized software agent in the mobile handset. The other OMA BCAS service protection, called SmartCard Profile, also relies on standardized software agent in mobile handset. The SmartCard Profile reuses the four layer model key hierarchy of IPDC OSF, and differentiates with pre-provisioned secret keys stored on SIM cards and the interactive cellular radio interface for authentication, registration, and long-term key message exchanges.



Mobile TV Delivery Chain

Mobile TV is at the junction of two markets: mobile telephony and TV broadcasting. Both industries started by using their own set of technologies to deliver content to their customers. These two worlds are now working together to create a mobile TV offering.

In broadcast mobile video delivery, four business roles can be defined:

- **Content Providers:** Provide the live channels and non-streamed contents, i.e., files such as clips, music, ringtones, text files, etc.
- **Multiplex Operators:** Build and manage the multiplex, the service plan, and the bandwidth shared between the services.
- **Mobile Broadcast Video Subscription Retailers:** Offer broadcast video services subscriptions to the end users. This role depends on the fact that the service is subscription-based, and is irrelevant in the case of a free-to-air services.

Actors playing this role are MNOs that already offer unicast video and decide to offer a complete mobile TV offering consisting of unicast and broadcast services. This role may also be played by pay TV operators who wants to provide mobile TV to their existing customers, DVB-H service providers, or content providers who decide to address directly the end user market.

Regardless, the retailer manages a subscription database, a protection system, and usually enriches the service with interactivity, with online subscriptions being the basic one.

- **End Users:** Want to receive TV on their mobiles or portable media players. They are willing to pay for premium, dedicated content, such as mobisodes, weather reports, stock exchange news, sport, music, and other targeted programs.

The roles defined above allow us to describe the various business situations that might appear. For example, an MNO may also cover the role of content provider, providing its own channels and file distribution services such as podcast, push bulletin news, etc.

For each of these roles, one can decide which technical solution should be set up:

- An end user needs a DVB-H enabled terminal, possibly with decryption and interactivity capabilities
- A content provider must broadcast its content and may also provide information about interactivity linked to it, for instance a Web link to an online forum dedicated to a specific program, a voting choice, information for a traditional-TV program, etc.
- A retailer has to manage the broadcast subscription management system, interfaced with a key management system and may also manipulate interactive data, especially for subscription advertisement and monitoring. The DVB-H multiplex operator maintains the DVB-H headend, made of DVB-H IP encapsulators, the encoders for the common channels, and, optionally, the ESG aggregators.

The Thomson Mobile TV Solution

Going mobile requires that you move quickly to keep pace with the growing demand and opportunity. To speed your deployment, Thomson offers a single source, end-to-end solution. From content generation to transmission, we lead the industry in every single technology component found in mobility systems. No other equipment provider offers such a complete, proven, and wide range of mobility products and services.

Unified Mobile TV Solution

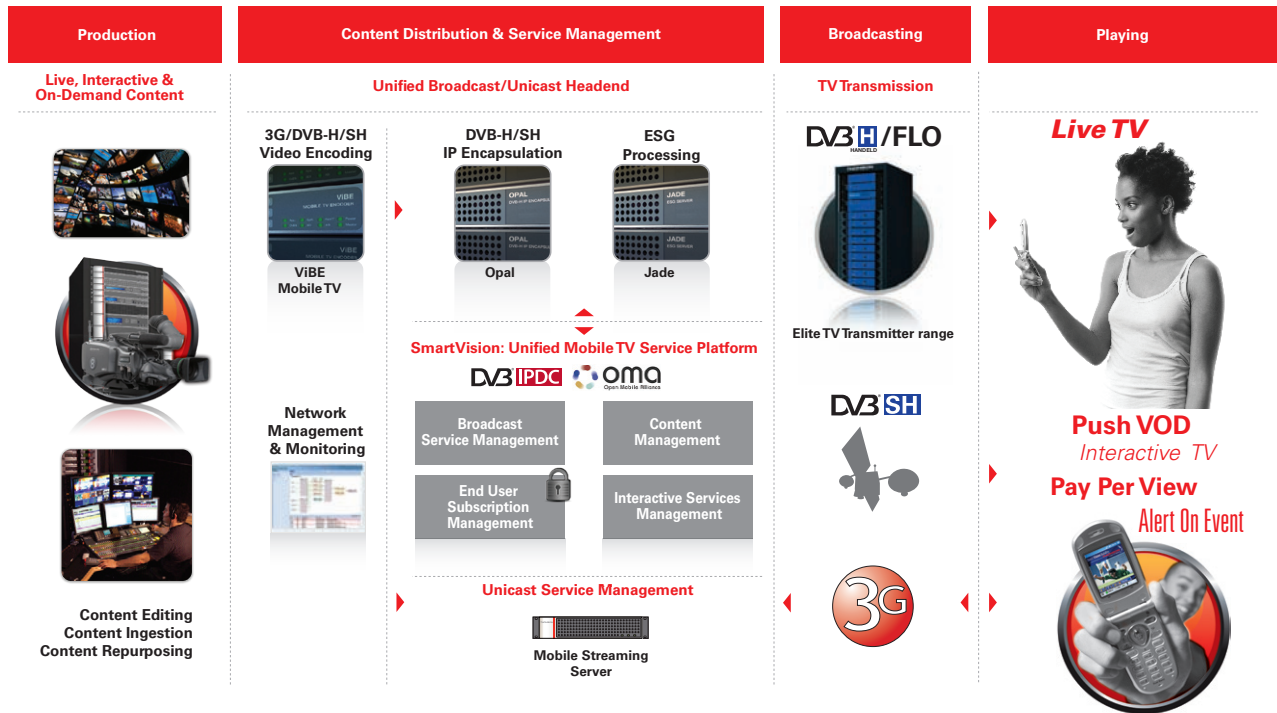
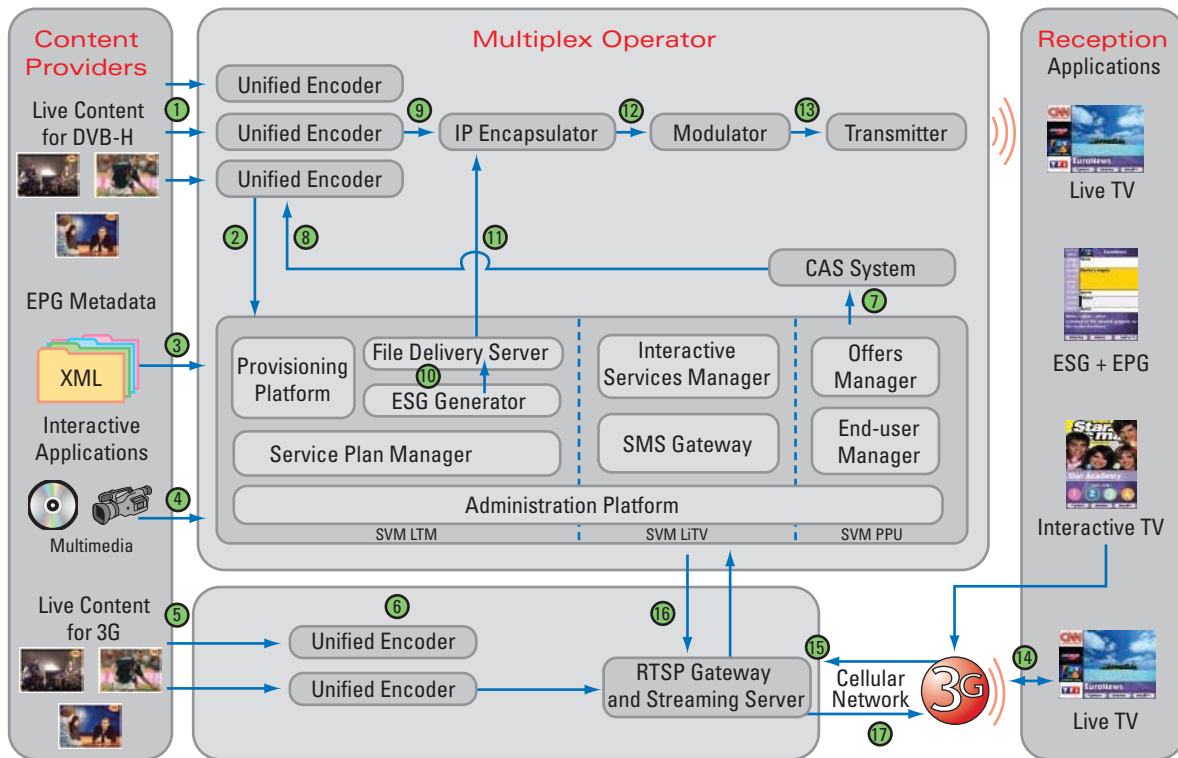


Figure 2 – Only Thomson offers a single source, end-to-end solution for Mobile TV. From content generation to transmission, we lead the industry in every single technology component found in mobility systems.

Thomson Mobile TV System Architecture

The Thomson mobile TV solution is based on:

- The video headend composed of ViBE mobile TV encoders with integrated scrambling and the Opal IP encapsulator
- The Jade ESG aggregator and SmartVision service platform which provides ESG management, user and pricing management, interactivity, and advanced services
- The Elite TV transmitter family
- Third-party key management systems (often referred to as a conditional access systems)



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| <p>① Content providers feed unified encoders (DVB-H/SH, 3G, etc.) with the live TV streams</p> <p>② SmartVision Mobility downloads SDP files from encoders and WM9 streaming servers</p> <p>③ Content providers upload via FTP XML EPG files compliant with DVB-IPDC and OMA BCAST standards</p> <p>④ Interactive application providers provision the relevant components</p> <p>⑤ The unified headend manages both DVB-H and cellular unicast live channels</p> <p>⑥ SmartVision retrieves the SDP file generated from the video encoders in order to reference it into the ESG</p> <p>⑦ The offers created in the platform are communicated to the CAS system (note that the offers can also be create at the level of the CAS system and provisioned in SmartVision afterwards). DVB-IPDC and OMA BCAST content protection are supported</p> <p>⑧ The CAS system transmits the ECM/EMM to the encoders</p> | <p>⑨ The encoded, scrambled streams and the ECM/EMM are delivered to the DVB-H/SH IP Opal encapsulator</p> <p>⑩ ESG containers, bootstrap information, SDP, interactive components are transmitted to the file delivery server</p> <p>⑪ The file delivery server OpenCast carousels the ESG in IP packets using the FLUTE protocol</p> <p>⑫ The IP packets are encapsulated into MPEG-2 transport streams (TS) according to DVB-H/SH standards</p> <p>⑬ The MPEG-2 TS is modulated according to the relevant DVB-H/SH scheme</p> <p>⑭ The customer can use the mobile network as a return channel for interactive services or for accessing live unicast streams</p> <p>⑮ The 3G end user request is sent to the RTSP gateway either through the ESG or a WAP portal</p> <p>⑯ The RTSP request is transmitted the service platform for rights control</p> <p>⑰ The relevant streamer streams the live TV content on the 3G network</p> |
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Figure 3 – The interactions between the components of the Thomson Mobile TV solution.

The Thomson Mobile TV Solution: The Right Choice

The Thomson End-to-End Solution: A Unique Know-How

Thomson is the only company that provides the broad range of products and services—from creation to the home—needed to make your mobile TV offering a reality. The entire mobile TV network infrastructure, except the key management systems, is provided by Thomson which has developed a unique mobile TV systems know-how. This know-how, also based on years of experience in deploying massive digital TV and IPTV infrastructures, allows Thomson to deploy mobile TV solutions and manage projects with the in-depth understanding of the entire mobile video chain, while optimizing and harmonizing different equipment configurations.

Thomson reframing technology is a good illustration of our solution for small displays used in mobile TV applications. Thomson has developed a patented technology to enhance the mobile TV experience by automatically detecting the visual region of interest within a video sequence. Based on the encoder's configuration, this technology can crop out the visually uninteresting parts of the image while keeping the visually interesting area, resulting in a live, real-time, and automated content re-purposing and encoding process for the mobile TV market.

Another strategy allows the encoder to allocate more quality in the visually interesting part of the image while keeping the complete image during the real-time compression process.

To improve the usage of such technology, Thomson has also developed the real-time detection and removal of logos, banners, and the like.

Open Architecture: Minimizing Interoperability Issues

Thomson follows standards in order to encourage and create future proof solutions, and optimize costs for the operators.

Thomson has made its own service platform both DVB-IPDC and OMA BCAST compliant—making it fully interoperable with a wide variety of terminal and player vendors. Thomson also provides full interoperability with all major conditional access system following OSF DRM Profile and SmartCard Profile standards.

To further ensure compatibility, Thomson works with all major (and most minor) terminal manufacturers.

Reducing Network Costs: From Content to Transmission to Access

To dramatically reduce fixed costs linked to bandwidth use, Thomson strives to optimize its products and overall system performance. To facilitate efficient content encoding, Thomson provides text reprocessing, image reframing, picture enhancement, and the pre-processing of encoder input. Additionally, Thomson delivers statistical encoding and statistical time slicing for a maximum bandwidth allocation per service, and opportunistic data insertion enabling precise and efficient multiplex bandwidth usage.

Thomson also offers a complete range of network design services that help operators create the best balance of network cost and network coverage, regardless of geography or transmission standard.

Thomson's deep expertise covers a wide range of frequencies from VHF and UHF up to L and S bands, as well as a wide range of radiating power from a few watts to tens of kilowatts. Additionally, Thomson low cost transmitters—designed specifically for mobile applications—reduce costs further.

The Thomson Mobile TV Solution: The Right Choice (cont.)

Business Model Optimization: Optimizing and Sharing Infrastructure

Because the business model for deploying a completely new mobile network is evolving, many service providers are looking for cost-effective and flexible ways to share their networks and reduce overall capital and operating costs. Thomson's mobility products support these goals several ways. Thanks to its multi-stream, multi-codec, and versatile input capabilities, common headend products such as encoders can simultaneously serve several mobile TV networks, enabling a profitable wholesale model for the service aggregator serving multiple cellular operators.

In addition to the standard DVB-H features and opportunistic data insertion for bandwidth optimization, the Opal II mobile TV encapsulator allows bandwidth sharing between multiple MNOs by authorizing time-slice sharing with common and dedicated services support.

For regionalization, the Opal II mobile TV encapsulator is used in conjunction with our NetProcessor 9026 demultiplexer. This solution optimizes contribution feeds by only sending the national programs shared by multiple DVB-H streams once, thereby drastically reducing infrastructure costs. Additionally, the powerful SmartVision service platform easily handles MNOs enabling differentiated bootstraps, multiple customer databases, multiple regions, distinct service plans, and advanced ESG coexistence/sharing schemes.

Another way to generate efficiencies as well as economies of scope and scale is to manage users, content, and services at a single point for several distribution networks. This management requires a versatile, carrier-class service platform such as our proven SmartVision platform, which is capable of addressing and managing both IPTV and mobile TV users for unicast and broadcast live TV and VOD services.

Value-Added Services: Making Money Now

Highly scalable and innovative mobile TV services from Thomson provide operators with a huge revenue upside for a host of value-added commercial services. The most successful commercial services generate as many revenue streams as possible—including media revenues from subscriptions and advertising, as well as communication revenues from interactivity and bandwidth consumption.

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