

IP Datacasting – Bringing TV to the Mobile Phone



Bringing TV to Mobile Phones

In the near future morning commuters will be able to pass the time on the train by selecting the market news channel on their Mobile phone TV and watching the latest news in real time before reaching the office. In the extra minutes before arriving at the station and walking to the office, consumers can switch over to the music channel and enjoy their favorite tunes and videos.

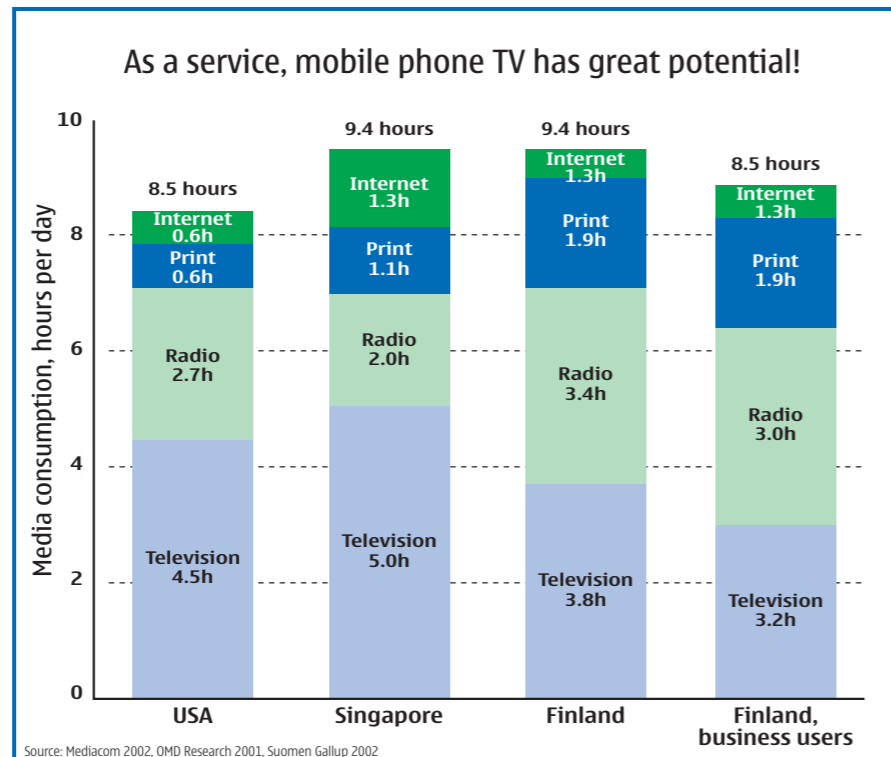
To make this scenario a reality in two to five years, the industry needs to finalize the required standards, create the networks, mobile handsets and select compelling content that will enable Mobile phone TV.

In this paper we introduce the technology and business system which will facilitate the Mobile phone TV reality. This technology, a combination of Digital Broadcast and Internet Protocol, is called IP Datacast over DVB-H (Digital Video Broadcast – Handheld), or simply IP Datacast. In addition to bringing a new form of multimedia enjoyment to the consumers, IP Datacast also opens up new market opportunities for the telecommunications, broadcasting and media industries.

Broadcasting and Mobility Converge

Broadcasting has brought entertainment and information to mass audiences around the world for nearly a century. The first 60 years of broadcast technology development was based on analog technology. In the last ten years, digitalization of the content has begun to reshape the global broadcasting landscape.

Digital broadcast technologies, such as the European DVB-T standard and the Japanese ISDB- (Integrated Services



Digital Broadcasting - Terrestrial) standard, moved TV broadcast into the digital age. Taking the concept one step further, the emerging DVB-H standard is adding support to small handheld terminals like mobile phones for mobile broadcast reception.

From a business perspective, digital broadcasting is attractive because it makes use of high bandwidth channels with high transmission speeds. This means that high quality and a wide selection of content such as TV services can be made available to consumers using mobile phones. Once some of this content is broadcast, there is no limit to how many people can receive the content within the coverage area. This makes broadcasting a very cost effective means to deliver media content to large audiences, when compared to the use of point-to-point connections and networks.

When combined with IP, DVB-H can be used to distribute any kind of digital content including television broadcast, music, web pages and games. This combination of IP and DVB-H,

or IP Datacast, broadens the types of content that can be broadcast and enables mobile reception of that content.

Today most consumers have a mobile phone and would like to have access to their favorite content and media wherever they go. Increasingly, mobile multimedia is being enjoyed on a daily basis around the world. The billing mechanisms that the mobile industry has already established provide a good method for charging for the new broadcast services.

These factors – the development of digital content, the ability to broadcast and bill for that content and the growth of the number of mobile users - brings forward a natural evolution that converges the already familiar TV and mobile worlds and brings new, compelling services to the consumer.

Specifically, this white paper addresses IP Datacasting over DVB-H, the key technology enabling this digital convergence, and its first application, Mobile phone TV.

IP Datacast Technology Optimizes Mobile Broadcast

IP Datacast technology is an enabler for the broadcast of digital content, like TV, to mobile handheld receivers. The technology is based on a combination of the DVB-H standard and the IP technology that has penetrated our everyday lives through the Web. IP Datacast is optimized for mobile content distribution and reception. The underlying DVB-H radio standard is being developed by the DVB Organization.

With IP Datacast, all content is delivered in the form of IP data packets - the same format used for distributing digital content on the Internet. This provides the additional advantage that all IP-based digital content is available for broadcast, as well as traditional TV content. As a result, the consumer can experience the optimum combination of broadcast and multimedia content with their mobile handset.

While IP Datacast, in essence, brings TV to the mobile environment, there are several points where the resulting Mobile phone TV differs from conventional

	Digital TV over DVB-T	IP Datacasting over DVB-H
Display	large TV screen	Smaller, mobile phone screen
Antenna	Large, roof top	Internal
Power Supply	Fixed, continuous	Battery powered, limited
Reception mode	Fixed	Mobile

Technology Comparison between Digital TV and Mobile phone TV

digital TV. The conventional digital TV system is designed for stationary receivers, like the living room TV set, with an external or rooftop antenna and access to a continuous power supply.

The mobile environment demands a different system to support handheld receivers as these devices do not have an external antenna, large screens or continuous power supply. Savings in the power consumption of the receiver are achieved by the 'time-slicing' technology supported by DVB-H. In order to enable a longer battery lifetime for a mobile device, DVB-H receives the content in high speed bursts, which are buffered and played back over a longer period of time. Between bursts the receiver can be shut down and considerable power savings can be achieved.


Another technical advantage is that IP Datacast can easily adapt to the smaller

screen sizes of handheld terminals. Only 128 to 384 kbs per 'channel', per TV program, is required to deliver a high quality video experience on the smaller screen. This increases broadcasting efficiency and makes it possible to send 50 to 80 TV programs over one network. A conventional digital TV broadcast which is configured for a large screen and utilizes a wide bit stream of 3 to 5 Mbs delivers 3 to 5 programs over a similar network.

IP Datacast networks will be designed to support indoor coverage for devices with small, built-in antennas. This differs significantly from conventional TV broadcast networks that make use of rooftop or other external antennas in the receivers. The indoor coverage for Mobile phone TV networks is very important as service usage will be similar to the usage of cellular services, i.e. also inside buildings and moving vehicles.

Using IP Datacast technology to make TV mobile.


MPEG-2 over DVB-T
24 Mbps



4-5 Mbps

3-4 TV programs for large screen

IP Datacast over DVB-H
11 Mbps



128 - 384 kbps

25-80 video streams for small screen

Bringing out the best of broadcast and cellular technologies

An integral part of the mobile IP Datacast concept is the availability of an interactive return channel. The broadcast content is delivered via the broadcast channel, but the possible interactivity, such as content purchasing, voting or viewing additional on-line information, takes place via an interactive channel over the cellular network. The broadcast and cellular networks complement each other and can be used to create a wide range of new content and services for consumers -starting with Mobile phone TV.

The key elements in the convergence of broadcast and mobile systems are:

- The future of broadcast is digital.
- Digital broadcasting will enable new mobile distribution channels and methods for media.
- The broadcasting paradigm will come to the mobile environment with the handset as the convergence point.
- IP Datacasting technology can provide the needed capacity, broadcast capability, and consumer experience to make Mobile phone TV and other mobile broadcast multimedia commercially successful.
- Suitable digital content for mobile broadcast already exists, it can be billed for, and there is consumer demand for it.

IP Datacast Builds and Expands Business Opportunities

The IP Datacasting business ecosystem brings together existing telecommunications, media and broadcasting industry players and makes use of their core competencies while at the same time,

opening new market opportunities for all. IP Datacast builds on the concept that mobile TV-like content delivery is subscription-based and the service is protected with careful encryption.

The most likely key players to implement a datacast service include media companies, TV broadcasters, cellular operators and broadcast network operators. To implement the service, IP Datacast capable handsets, network infrastructure and service management systems are needed from the vendors. In the end consumers will play the key role as users of the service.

The basic functions required for a datacast service business are depicted in the figure below. This business system or connected value chains will give rise to numerous business models and various role combinations for the participating companies. These roles are briefly described with some notes on how existing companies can benefit from the opportunity that IP Datacast and Mobile phone TV provides.

Content Provisioning:

The role for content providers in this new business ecosystem remains much like their current roles in traditional broadcasting.

But, Mobile phone TV in conjunction with IP Datacast technology presents a number of new business opportunities for content providers. Mobile phone TV offers a new distribution channel for existing or re-purposed content, provides access to new, mobile audiences and enables the use of the distribution channel with limited additional costs. Mobile phone TV also reaches current customers in new ways - when they aren't at home in front of traditional TV. This may result in a new, additional "TV prime time or in new types of popular Mobile phone TV shows.

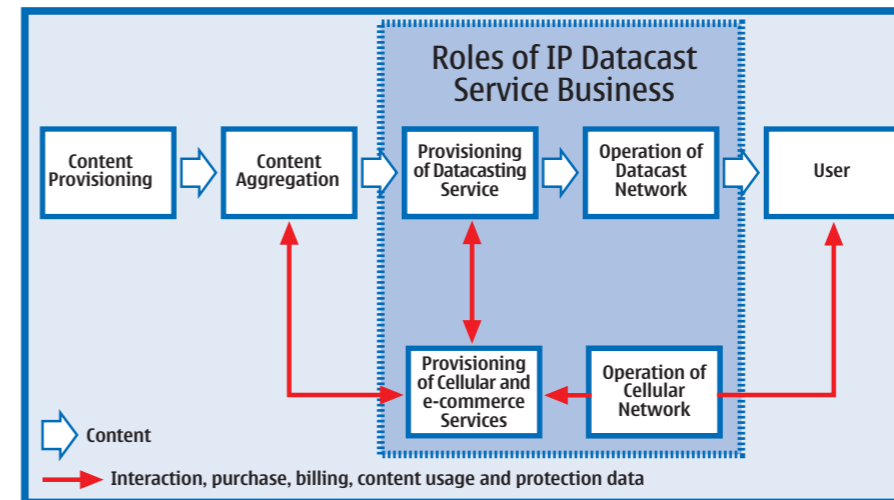
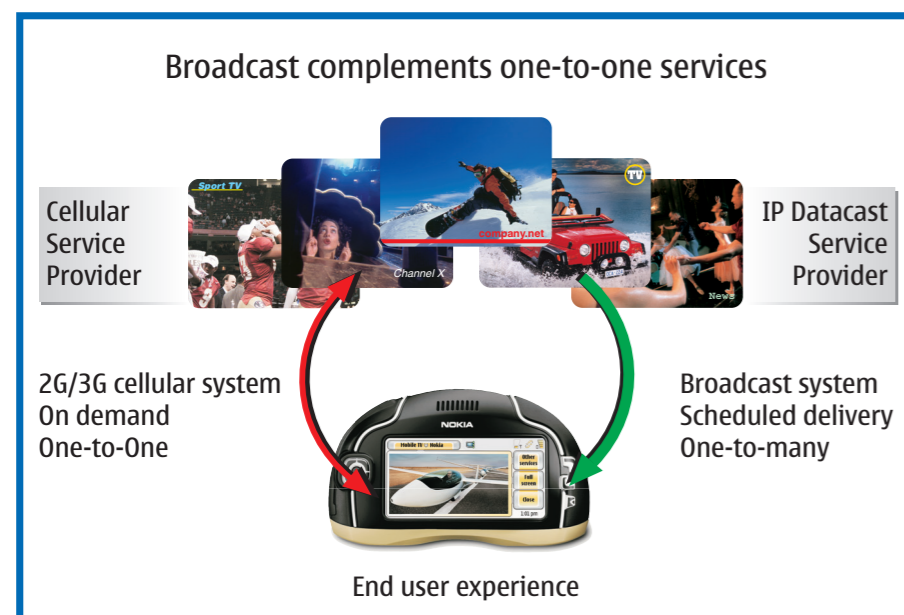
Content Aggregation:

The role of content aggregators is similar to today's TV broadcasters' role - purchasing content from content providers. Content aggregators sell content through various channels, based on the distribution rights. Eventually, the content is delivered to consumers based on their subscriptions. For content aggregators, IP Datacast is a new media distribution channel that reaches mobile users while on the move.

Datacast Service Provisioning:

The company which operates the datacast service controls the IP Datacast distribution capacity available on digital broadcast networks. It can sell this capacity directly to content aggregators. The arrangements between the IP Datacast service provider and content aggregators may vary - from selling a fixed amount of "raw capacity" for long periods of time - to providing "turnkey" delivery of a particular content at agreed times with the necessary content protection, e-commerce, billing and refunding services.

In addition to capacity, the "Electronic Service Guide" is another offering from the IP Datacast service provider. The guide is broadcast alongside the content and contains information on the available services and content and at what time they are offered. For the consumer, this guide is the key to accessing the IP Datacast services. The same is true



for using e-commerce services where rights to protected content must be purchased.

The IP Datacast Service provider takes care of ensuring the protection of the broadcasted content from illegal viewing.

Datacast Network Operation:

In the IP Datacast system, the operator of the IP Datacast network owns and operates the digital broadcast infrastructure such as, transmitters, mast sites and the necessary connections to the site. That operator may also be the frequency license holder. Consequently, it sells broadcast capacity and coverage to those companies operating IP Datacast services. The system is cost efficient as several IP Datacast service operators can buy capacity from the same broadcast network operator. Companies currently operating broadcast networks for Digital TV operation can use their existing infrastructure and competencies to implement broadcast networks for IP Datacast services.

Cellular Network Operation:

Like the broadcast network operator, the operator of the cellular network owns and operates the cellular network infrastructure, holds the frequency licenses, and often sells network capacity to various service providers.

Companies operating cellular networks may also consider building and running

an IP Datacast network. This may provide an opportunity for new revenues and reuse of existing sites and infrastructure to improve return on investment.

Provisioning of Cellular and e-commerce Services:

The cellular service provider offers the two-way access necessary for content purchase and the use of other interactive services related to the IP Datacast service. Beyond connections, an operator of a cellular service can offer much more in the form of consumer authentication, advanced and cost-efficient billing services, and customer relationship management and support.

The provision of e-commerce services means operating an electronic shop that the mobile user can access and from which he can buy subscriptions for mobile TV content. The subscriptions may be for a longer period of time, e.g. one month, or of a pay-per-view nature. Consumer purchases are recorded in a customer database and fed into a billing system for collecting the content-related revenues. The provider of e-commerce services reimburses content aggregators their share of the revenue and provides data on content usage.

IP Datacast will present telecom service operators with the possibility of offering new services to their customers. The TV-like services supported by IP Datacast technology will be an important addition

to the portfolio of mobile services they currently offer. All forms of interactivity with TV programs can easily be implemented with the IP Datacast terminal as the return channel is in the same device.

Cellular service operators can also act as distributors or retailers of the IP Datacast services for their own customer base in the role of an e-commerce service provider. E-commerce services can also be provided separately from the cellular service.

Handset Manufacturers:

Digital convergence is already underway in handsets, as evidenced by the number of features available today on mobile devices including radio, digital cameras, text and multimedia messaging and Internet connectivity. But good quality TV is still missing from the offering. General industry developments are driving up the memory and processor capacity of mobile phones, which will technologically support the addition of new handset features and functionalities.

The TV-like capabilities enabled by IP Datacast technology will bring a new, appealing feature to manufacturers' product lines and provide a new source of revenue. IP Datacast devices will increase the attractiveness of mobile devices, giving manufacturers the capability of supporting both one-to-one and one-to-many communication in a single device. Consumers are sure to welcome the integration of the new features, thereby eliminating the need to carry numerous single-function devices.

Service and Network Infrastructure Vendors:

New service provisioning infrastructure will be needed to implement IP Datacast services. Most notably, new servers and applications will be required by IP Datacast service operators and e-commerce service providers. This service infrastructure must form a seamless end-to-end solution together with the IP Datacast enabled handsets and the IP Datacast networks.

In addition to investments in service infrastructure, investments in broadcast networks will also be required. Additional transmitters and repeaters will be needed to achieve adequate quality and in-door coverage for Mobile phone TV services.

Consumers:

People have come to depend upon devices that improve their ability to communicate, receive information and be entertained. With today's mobile devices, consumers no longer need to be in a fixed location to conduct any of these activities, with the exception of one - television.

With IP Datacasting and IP Datacast enabled smart phones, the freedom from time and place can be expanded to include broadcasting. Since IP Datacasting also allows consumers to enjoy new types of content and services, the experience goes beyond listening and viewing and towards interacting.

Considering the popularity of TV, it is reasonable to assume that the benefits of mobile broadcast multimedia will be compelling. If approached in the right way, the combined effect of bringing mobility, extended capability and new forms of interactivity to the broadcast medium can be significant.

Basic IP Datacast Network Structure

Using IP Datacast technology to bring TV to mobile devices will provide extensive indoor coverage with a service level comparable to that of the modern cellular networks. In order to reach this level, a new network must be built, as the existing broadcast TV networks are not designed to provide indoor coverage to handheld devices.

These new networks could be financed with consumer subscriptions to the services. According to a study published in 2003, consumers are interested and willing to pay a reasonable fee in order

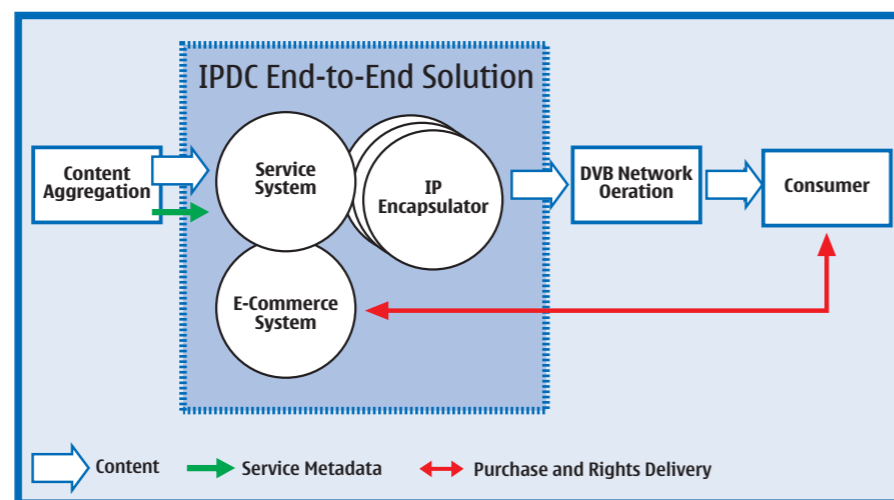
to be able to receive TV on their mobile phones.* The suggested level of subscription fees could compare with the average amount spent on afternoon newspapers or between 10 and 20 € per month for unlimited access to TV-like services on the mobile phone.

The IP Datacast network topology will be a union of the broadcast and cellular networks. In practice, it means more transmission sites than a traditional broadcast network has, but less sites than a traditional cellular network requires. Existing broadcasting and cellular sites can be efficiently reused or co-used in the creation of the IP Datacast network.

* *Mobile video Services: the fourth screen?*” Ovum 2003, “*Mobile Video*” NCRC Studies 2003, “*Mobile television- technology and user experiences*” VTT Publications 2003.

The IP Datacast End-to-End Solution

The digitalization of TV and radio content as well as broadcast networks provides a good starting point for Mobile phone TV and there is abundance of television and radio content available in digital format. Terrestrial DVB equipment is widely available and networks have been deployed. However, some additional elements will be needed in the Mobile phone TV end-to-end solution.



The end-to-end IP Datacast solution, which solves the problem, has three major features:

- Streaming - video and audio encapsulation and formatting for the mobile device, followed by stream multicasting to applicable transmitter sites.
- Electronic Service Guide- generation and broadcast of the service metadata so that available services, view service descriptions and purchase new services.
- Service protection - end-to-end control of content encryption, generation of decryption keys and delivery of keys to consumers in billing-integrated manner.

The solution is comprised of three major integrated elements :

- The IP Encapsulators, which are the gateways that enable broadcast delivery of IP content, e.g. Mobile phone TV.
- The Service System, which controls the broadcast and end-to-end protection of streams and generates the Electronic Service Guide.
- The E-Commerce System, which allows the user to buy rights to viewing protected content and produces charging data of the purchase transactions for billing purposes.

The end-to-end solution lowers the barrier for implementing IP Datacast services for all parties within the business system. For content aggregators it enables the use of the existing media production platforms. Network operators can leverage existing infrastructure to a maximum extent. And consumers will find it easy to start enjoying compelling Mobile phone TV services.

Standardization and Regulation to Support IP Datacasting

Achieving interoperability between the mobile communications and digital broadcast worlds requires supporting regulation. Current regulation is undergoing changes to allow multimedia service provision through all types of delivery networks and to create an equal playing field for all actors in the emerging horizontal markets.

Equally important is that spectrum decisions will provide sufficient and appropriate capacity for new IP Datacast services, such as Mobile phone TV. In order to facilitate the development of a global market for IP Datacast services, a universally harmonized spectrum usage should be encouraged through broadcast spectrum management and licensing. The handheld reception mode necessary for mobile broadcast services like Mobile phone TV, is on the agenda of the ongoing CEPT (European Conference of Postal and Telecommunications Administrations) broadcast spectrum re-planning process.

The main objective for the standardization of IP Datacast is to create the basis for a global, horizontally structured market, meaning a multi-vendor market for IP Datacast services, terminals and network infrastructure.

The standardization should avoid re-inventing the wheel. This objective emphasizes the reuse of existing and deployed solutions. The ongoing specification work for DVB-H technology represents the key standardization activity for Mobile phone TV. This work is being conducted by the DVB Organization (www.dvb.org). IP Datacast Forum (www.ipdc-forum.org) is an open, international association of industry players working together to promote the growth of IP Datacast business.

Developments in Finland

Finland was one of the first countries to move ahead on frequency coordination for IP Datacasting, beginning in Spring 2002. In September 2002, a three-year technology trial of the IP Datacast network, covering the Helsinki metropolitan area, was launched by the Radio and Television Technology non-profit consortium (RTT). Plans for similar tests exist in other European countries such as Germany.

Parallel to this work, the Finnish Ministry of Transport and Communications appointed a working group to examine how a market for mobile Datacast services could be created in Finland. In the summer of 2003, this working group published a report – “The Fourth Digital Broadcast Network” – which provided a broad industry view from mobile operators, broadcast operators and TV companies on how they see their role in the development of this market. The latest development is a Mobile phone TV pilot for the Helsinki Metropolitan area. The pilot will commence in the Autumn of 2004 and is supported by the main TV broadcasters, mobile operators and the broadcast TV network operator. Real TV content will be offered to consumers throughout the capital area as the first consumer test of DVB-H providing Mobile phone TV.

IP Datacasting – the solution for Digital Broadcast for the Mobile Environment

In the coming years, as mobile multimedia consumption continues to grow, broadcast content - such as TV - will make its way to the mobile environment.

Today, Nokia presents an end-to-end vision of the future of Mobile phone TV based on the technology optimized for mobile use – IP Datacast over DVB-H. Now is the time to act to make Mobile phone TV a reality in two to five years.

IP Datacast is:

- Cost efficient delivery of multimedia content over broadcast networks to large audiences.
- A new digital channel that can support safe and well-managed distribution of branded, high-value content.
- A technology with the inherent ability to charge for multimedia content and services.
- The technology that can best deliver the consumer benefits of television and mobile communications in one device – the Mobile phone TV.

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