



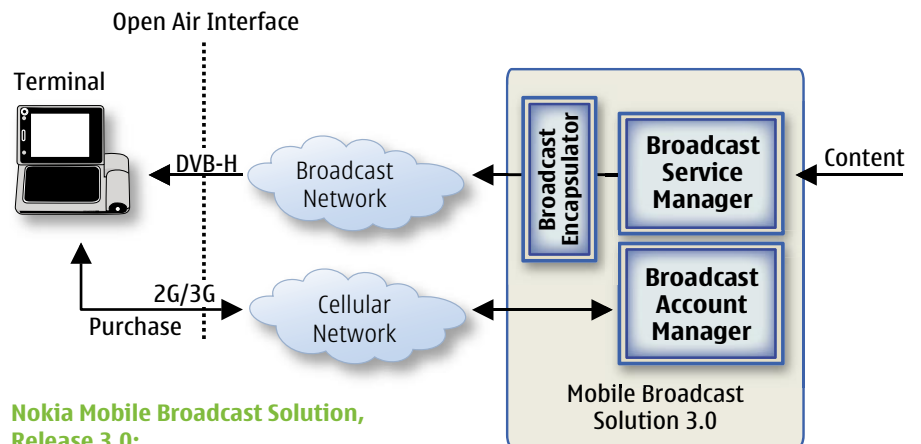
Nokia Mobile Broadcast solution

Release 3.0.

NOKIA
Connecting People

A future-proof solution for mobile TV broadcasting

Nokia Mobile Broadcast Solution is an open standard server solution to support broadcasting digital content via DVB-H to mobile terminals. It is a safe, secure, and future-proof choice of server solution for Mobile TV broadcasting.



Nokia Mobile Broadcast Solution, Release 3.0:

- Generates and maintains Electronic Service Guide
- Real time streaming control for multiple content sources and destinations
- Supports both free-to-air and paid broadcast services
- Service protection and support for content protection
- Support for interactive services
- Based on open standards
- Professional services for 24/7 support, maintenance, delivery, and integration

Open and commercial solution

Nokia's Mobile Broadcast Solution is globally the first DVB-H server platform intended for commercial Mobile TV services. These services can utilize the current TV content with minimal impact to the existing production systems. The system output can be broadcast with any standards-compatible DVB-H transmitters, even nationwide.

In August 2005, Nokia published version 1.0 of the Open Air Interface specification for the Mobile TV service at www.nokia.com/mobiletv. The Nokia Mobile Broadcast Solution 3.0 fully implements the published specification, thus enabling the same services to be offered through multiple handset makers' mobile terminals. When the still-proceeding standardization activities for the protocols are complete, Nokia is committed to the standards while maintaining backwards compatibility to the published specification.

Nokia offers also training, implementation, integration, maintenance, and support services to facilitate the offering of commercial Mobile TV services to the consumers.

Summary of benefits

Content Provider / Broadcaster

- Streaming with freedom to select the encoding product vendor

- Supports interactive content to enhance TV
- Electronic Service guide promoting channels in handset
- Accurate viewing statistics collected automatically by the platform

Datacast / Broadcast Network Operator

- Tested technology and architecture (third generation)
- Dynamic traffic configuration to support a country-wide DVB-H deployment
- Supports multiple pricing models for same services offered by different operators
- Open Air Interface supporting multi-vendor mobile terminal market
- Future backwards compatibility to the first generation of mobile terminals

Mobile / TV Service Operator

- Open standards to support commercial roll-out of industry
- Interoperability supporting multiple device manufacturers
- Accommodates multiple subscription types including free view, preview, ongoing, and pay-per-view possibilities
- Post- and pre-paid subscriber support in single platform
- Customer self-management for keeping operations costs low

General

- Nokia Mobile TV experience with server platform operation and mobile TV terminals since 2003
- Credible development roadmap for both the mobile terminal and broadcast solution towards a mature, fully standardized market and even more features

Main features

Electronic Service Guide

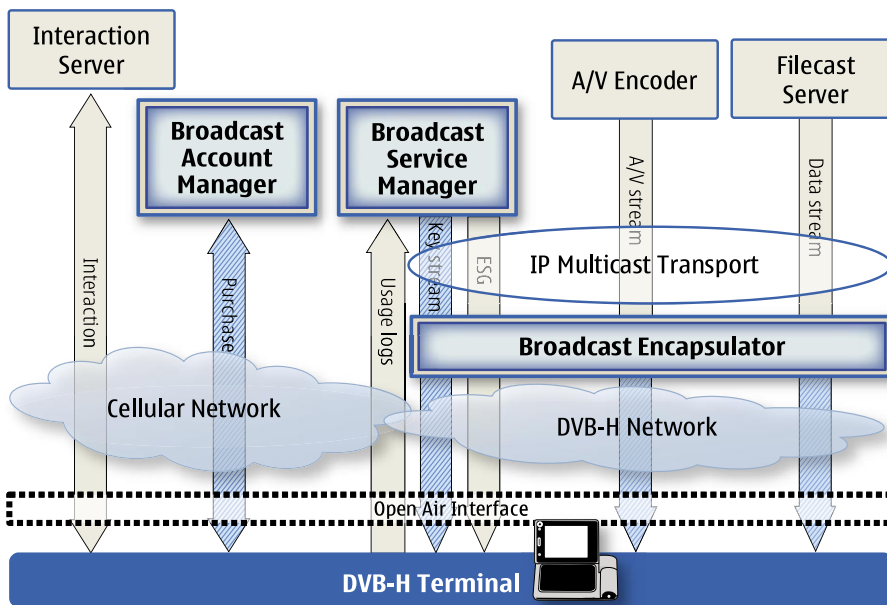
Electronic Service Guide (ESG) is the service discovery tool both for the consumer and for the client applications on the mobile terminal. The ESG provides the consumers with rich, up-to-date information about the services. ESG also serves the mobile terminal middleware with signaling data to enable service look-up from the DVB-H stream and playback with the correct client software and codecs.

The ESG enables the user of a new Mobile TV device to automatically discover all the service platforms and services available in the usage area, and it even prompts the user to make purchases.

The ESG implementation also offers a tool to strengthen customer loyalty to the services through brand imagery and various possibilities to interact with the broadcast service. In addition to the multiple audio and video streams, a service can include dynamic links and a whole dedicated data stream that populates the mobile terminal memory with files supporting the experience with the live stream.

Examples:

- During a sports broadcast the data stream can be utilized for athlete introduction and background material
- During a music program the data channel can offer the songs as ring tones, which the user can try out and buy
- During a commercial for a product the data channel can transfer product details



Main features

and specifications in HTML format to the mobile terminal, from which the consumer can access a web shop to buy the advertised product

The ESG protocol supported by the Nokia Mobile Broadcast Solution 3.0 is fully described in the publicly available Open Air Interface 1.0 specification.

Streaming

All the content, be it audio, video, or data, is transmitted as multicast streams with the Nokia Mobile Broadcast Solution. The signaling for the mobile terminal to be able to select the correct application is achieved with the SDP files in the ESG, which are generated by the Broadcast Service Manager based on administrator-generated profiles.

Protocols, which are compatible with the Open Air Interface 1.0 specification, are FLUTE/ALC for file transport and H.264 AVC/ RTP and AAC+/RTP for video and audio, respectively. The Broadcast Service Manager also supports any other multicast protocol via the configurable profiles and user-defined ESG extensions – a dedicated mobile terminal client is, of course, required to receive such services.

Relying on IP multicast in the network end has many advantages. Firstly, while the nature of the DVB-H sub-channeling is quite static, the multicast routing of streams to these channels is not. Thus the bandwidth allocated for a service, such as a TV channel, may vary. Additionally, the bouquet of services can vary from one network area to another and the Nokia Mobile Broadcast

Solution automatically generates an ESG to match the content offering. Finally, using multicast optimizes the capacity of each link in the transport network between the head end and broadcast cells provided that IP transport is used.

The streaming protocols supported by the Nokia Mobile Broadcast Solution 3.0 are described in the publicly available Open Air Interface 1.0 specification (see www.nokia.com/mobiletv).

Service Protection and Payment

Recent studies indicate that the consumers are ready to pay for receiving even the basic TV services on their mobile terminals. The Nokia Mobile Broadcast Solution features a comprehensive protection, purchase and payment system to realize this revenue potential.

Any broadcast services can be offered as free-to-air, pay-per-view, subscribed, or as a combination of both pay-per-view and subscribed. In addition to the service access, also the content may be protected to prevent forwarding of recorded content from the consumer's mobile terminal to other users. The pay-services can include a short free preview. The ESG contains all the packaging and pricing details of each service, which can be presented to the consumers as an embedded function in the mobile terminal application. Having the pay-service discovery and purchase integrated into the mobile terminal client greatly enhances the likelihood of impulse purchases.

The protection architecture is implemented

according to the so-called 18C specification. The services are protected at two levels:

1. The actual payload IP traffic is encrypted with 128-bit AES encryption in the Broadcast Encapsulator with a frequently changing key (even every few seconds).
2. The traffic decryption keys for each service are broadcast along the encrypted service in the OMA DRM 2.0 protected key stream so that only a mobile terminal with the proper DRM rights object can decrypt it and access the service.

Both the service key (OMA DRM Rights Object) purchase order and delivery are carried out via the cellular network so that the user may start consuming the content immediately after making the purchase. The architecture allows several distinct service operators to package and price a common set of broadcast services to their own customer bases with great flexibility. In addition to the common services, a service operator can offer exclusive content to differentiate from the competition.

Although Solution 3.0 implements stronger encryption algorithms and OMA DRM 2.0, the purchase and protection architectures are essentially the same as the one trialed successfully in more than a dozen deployments of the previous 2.2 release.

Usage Tracking

The TV application in the Nokia DVB-H mobile terminals supports collection of TV usage log data. The Nokia Mobile Broadcast Solution collects and combines the logs for analysis purposes. Accurate viewing statistics are vital in order to match the services offered to the Mobile TV user profiles and usage patterns, which differ greatly from the traditional TV ones.

Nokia Mobile Broadcast Solution 3.0 architecture

Broadcast Service Manager, Release 3.0

The Broadcast Service Manager controls the encapsulation, multicast routing, encryption, ESG generation, and DRM aspects of the mobile broadcast services. One Broadcast Service Manager instance is able to manage a large DVB-H service deployment with multiple DVB-H networks, service operators and content providers/sources. Broadcast Service Manager allows each content provider to manage their accessible capacity as if it were their own; via either user or system-to-system interfaces. The broadcast plans of all the different content providers are stored in a central repository. The Broadcast Service Manager

constantly controls the IP encapsulation process to execute these stored plans in all parts of the network, so that correct streams are broadcast.

The Broadcast Service Manager also generates and multicasts the ESG for each broadcast area. The mobile terminals in that area pick up the ESG transmission and update their local ESG databases accordingly.

Service protection is controlled by the service operators, via a similar interface as the content providers have at their disposal. Service operators can configure their own service packages and prices, which are also stored in the central repository. The stored packaging data continuously drives the encryption process for pay-services and the ESG generation so that the consumers are presented with the correct purchase options.

Broadcast Account Manager, Release 2.0

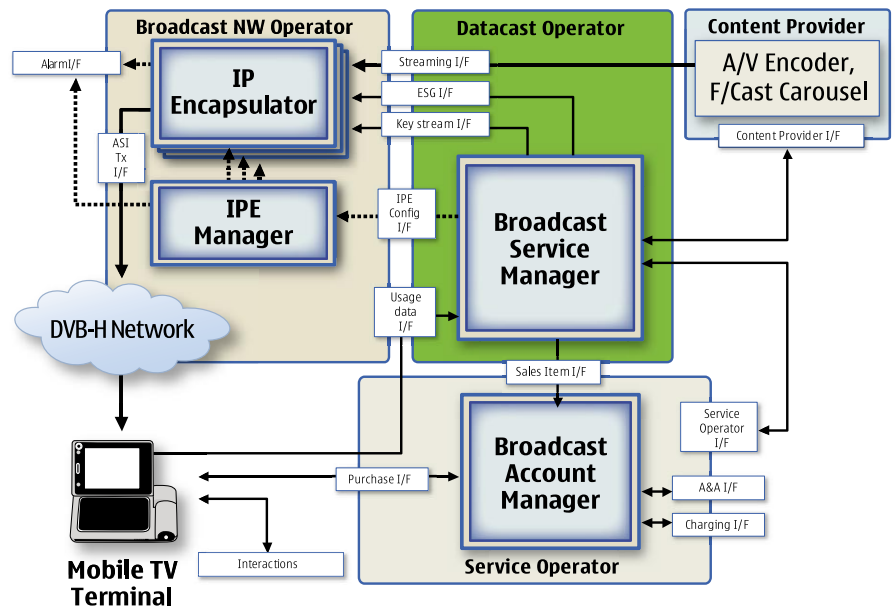
The Broadcast Account Manager is an on-line service fulfillment and charging solution for paid mobile broadcast services. A consumer who selects a pay-service from the ESG is prompted to try it and buy it. If the user agrees to make the purchase, a request is routed via the cellular packet IP services to the Broadcast Account Manager, which processes the request and responds with the appropriate rights. The consumer may then proceed to enjoy the service while the service operator is entitled to charge the consumer.

The Broadcast Account Manager is able to fulfill customer orders without any manual operator intervention. There is nothing in the network that needs to be activated or provisioned for a subscriber to make a subscription, which makes the cost of offering broadcast services very low. To maximize the applicable user base, the Broadcast Account Manager supports both post-paid and pre-paid subscriber types, even in a single installation.

From the service operator point of view, the Broadcast Account Manager is a mediator between the new DVB-H broadcast services and the existing authentication and authorization as well as charging solutions. The interfaces offered make it possible to seamlessly integrate the broadcast service offering quickly into the existing infrastructure.

DVB-H Broadcast Encapsulator, Release 3.0

IPE10 is a gateway between the multicast IP network and the DVB-H transmitters. Each IPE10 routes the applicable multicast groups from its ingress Ethernet interface to the egress DVB ASI port, optionally encrypting the content. The Broadcast Service



Manager controls both the routing and the encryption of each IPE10 element.

The IPE Manager mediates the control messages from the Broadcast Service Manager to each IPE10 element. The mediation layer enables control of very large DVB-H deployments by a single Broadcast Service Manager cluster.

Interfaces

In addition to the Open Air Interface for multiple mobile terminal vendor support, the Nokia Mobile Broadcast Solution comes with a comprehensive set of open Application Programming Interfaces (APIs). The APIs allow seamless integration of the solution to all the relevant content creation, monitoring and subscriber management systems.

The following table lists all the protocols used in these interfaces.

System	Interface	Protocol
Broadcast Service Manager	Streaming input i/f	RTP/RTCP multicast FLUTE/ALC
	Content Provider i/f	Web GUI XML upload Web Services Interface
	Service Operator i/f	Web GUI
	RO push i/f (to ECS)	XML over HTTPS
	IPDC air interface (layers above IPv6)	ESG: XML over FLUTE/ALC Streaming: RTP/RTCP Protection: IPSec (AES-128) A/V: eAAC+, H.264 AVC
Usage data i/f	HTTP	
Broadcast Account Manager	Purchase i/f	ROAP (Rights Object Access Protocol)
	Sales Item i/f	HTTPS
	Charging i/f	Post-paid: Nokia Charging Gateway file format, FTP transfer Pre-paid: RMI Plug-in (Nokia Charging Center integration included)
	Authentication & Authorisation i/f	RMI Plug-in
IPE10	Datacast i/f	IPv6 over DVB-H ASI
IPE10, IPE Manager	Monitoring i/f	SNMPv3



Specifications

Server Hardware and Product Variants

Both Broadcast Service Manager and Broadcast Account Manager are also available as clustered, high-availability (HA) configurations, in which no single-point HW failure can cause system outage.

System	Variant	Servers
Broadcast Encapsulator	IPE10	1 x Proliant DL360G4, 2 x CPU, 2 x CPU, RAID1, 2 x PS
	IPE Manager	1 x Proliant DL360G4, 2 x CPU, RAID1, 2 x PS
Broadcast Service Manager	M	1 x Proliant DL360G4, 2 x CPU, RAID1, 2 x PS, 1 x Proliant DL380G4, 2 x CPU, RAID1, 2 x PS, 1 x Cisco Catalyst 2950T
	L (HA)	2 x Proliant DL360G4, 2 x CPU, RAID1, 2 x PS 2 x Proliant DL380G4, 2 x CPU, RAID1, 2 x PS, 1 x External MSA500 cluster disk array, 2 x Cisco Catalyst 2950T
Broadcast Account Manager	M	1 x Proliant DL360G4, 2 x CPU, RAID1, 2 x PS, 2 x Proliant DL380G4, 2 x CPU, RAID1, 2 x PS 1 x Cisco Catalyst 2950T
	XL (HA)	2 x Proliant DL360G4, 2 x CPU, RAID1, 2 x PS 4 x Proliant DL380G4, 2 x CPU, RAID1, 2 x PS 1 x External MSA500 cluster disk array 2 x Cisco Catalyst 2950T

Third Party Software

Nokia Mobile Broadcast Solution relies on best-of-breed third party software components listed in the table below:

System	Function	Component
Broadcast Service Manager	Operating system, clustering platform	RedHat Enterprise Linux Advanced Server RedHat Clustering Suite
	Database server	Oracle 10g
	Application server	Tomcat
	Web server	Apache
Broadcast Account Manager	Operating system, clustering platform	RedHat Enterprise Linux Advanced Server RedHat Clustering Suite
	ROAP Server	CoreMedia ROAP Server
	Database server	Oracle 10g
	Application server	Tomcat
	Web server	Apache
Broadcast Encapsulator	Operating system	FreeBSD

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