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Technical Report

Digital Video Broadcasting (DVB); IP Datacast over DVB-H: Use Cases and Services

Reference
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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Contents

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Foreword

This Technical Report (TR) has been produced by Joint Technical Committee (JTC) Broadcast of the European Broadcasting Union (EBU), Comité Européen de Normalisation ELECtrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI).

NOTE: The EBU/ETSI JTC Broadcast was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC Broadcast became a tripartite body by including in the Memorandum of Understanding also CENELEC, which is responsible for the standardization of radio and television receivers. The EBU is a professional association of broadcasting organizations whose work includes the co-ordination of its members' activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 60 countries in the European broadcasting area; its headquarters is in Geneva.

European Broadcasting Union
CH-1218 GRAND SACONNEX (Geneva)
Switzerland
Tel: +41 22 717 21 11
Fax: +41 22 717 24 81

Founded in September 1993, the DVB Project is a market-led consortium of public and private sector organizations in the television industry. Its aim is to establish the framework for the introduction of MPEG-2 based digital television services. Now comprising over 200 organizations from more than 25 countries around the world, DVB fosters market-led systems, which meet the real needs, and economic circumstances, of the consumer electronics and the broadcast industry.

Introduction

IP Datacast over DVB-H is an end-to-end broadcast system for delivery of any types of digital content and services using IP-based mechanisms optimized for devices with limitations on computational resources and battery. An inherent part of the IP Datacast system is that it comprises a unidirectional DVB broadcast path that may be combined with a bi-directional mobile/cellular interactivity path. IP Datacast is thus a platform that can be used for enabling the convergence of services from broadcast/media and telecommunications domains (e.g. mobile/cellular).

The concept of the present document is to provide a number of elementary use cases which can be combined to complex real-life IP Datacast use cases. In clause 4.1, those elementary use cases are listed in logical groups. They are described and requirements and data flows are shown. In clause 4.2, services are presented, serving as examples on how to use those elementary use cases.

1 Scope

The present document reflects use cases and services which may be used with IP Datacast over DVB-H. Information on other parts of the system may be found in TS 102 468 [2].

2 References

For the purposes of this Technical Report (TR) the following references apply:

[1] ETSI EN 302 304: "Digital Video Broadcasting (DVB); Transmission System for Handheld Terminals (DVB-H)".

[2] ETSI TS 102 468: "Digital Video Broadcasting (DVB); IP Datacast over DVB-H: Set of Specifications for Phase 1".

[3] ETSI TS 102 471: "Digital Video Broadcasting (DVB); IP Datacast over DVB-H: Electronic Service Guide (ESG)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Broadcast and/or Broadcast Network Operator: provides the broadcast network that carries the mobile broadcast services

connected device: connected device is a terminal that has access to an interaction channel

content provider: ultimate owner of the content delivered as a part of the mobile broadcast service

NOTE: The Content Provider may or may not also be the owner and source of the auxiliary data.

end user: consumes the mobile broadcast service and digital content delivered within the services

Mobile Network Operator: provides the network to establish the interactive link

NOTE: The interactive link may for example be UMTS.

service provider: provides the mobile broadcast service to the End User

NOTE: The Service Provider broadcasts the mobile broadcast service e.g. in form of audiovisual content, as well as auxiliary data associated with the services.

terminal vendor: provides the end user's terminal

unconnected device: unconnected device is a terminal that has no access to an interaction channel

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AV	Audio/Video
CBMS	Convergence of Broadcast and Mobile Services
DVB	Digital Video Broadcasting
DVB-H	DVB-Handheld
ESG	Electronic Service Guide (see TS 102 471 [3])

FTA Free-To-Air
IPDC IP DataCast

4 Elementary use cases

In this clause, elementary use cases for IP Datacast are presented. These use cases do not reflect entire application examples for the IP Datacast system. They are intended as a toolbox.

The elementary use cases have been aggregated in logical groups. These logical groups are fairly orthogonal to each other, so they may be combined according to the needs for a certain system.

4.1 Interactivity mode based elementary use cases

These use cases are based on type of content regarding user interaction und show different cases how it may be consumed by the user.

Elementary Use Case	**4.1.1 Using non-interactive content**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X	(X) related to flow (3)	X	X
Description	The terminal displays a service transmitted by the broadcast network without any interactivity.					
Pre-conditions	The user has gained access to the ESG.					
Post-conditions	The user stops consuming the service.					
Flow	1. The end user utilizes the ESG to get the entire service offer of available services. 2. The user selects one service containing non-interactive content. 3. (Optional) The End User acquires rights for receiving the service / consuming the content. For this option the mobile network operator is a potential actor. 4. The user consumes the service.					
Requirements						
Interactivity from the user point of view	None.					
Interactivity from the network point of view	None.					
Quality of service (delay, time of response)	High.					
Bandwidth	Content-dependant.					
Security and conditional access	All access modes are possible.					
Other requirements						

Elementary Use Case	**4.1.2 Using remotely interactive content**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X	X	X	X
Description	The terminal displays a service transmitted by the broadcast network. Interactive elements of the service triggered by the user open an outbound communication via the interaction channel.					
Pre-conditions	The user has gained access to the ESG.					
Post-conditions	The user stops consuming the service.					
Flow	1. The end user utilizes the ESG to get the entire service offer of available services. 2. The user selects one service containing remotely interactive content. 3. (optional) The end user acquires rights for receiving the service/ consuming the content. For this option the mobile network operator is a potential actor. 4. The user consumes the service including remotely interactive elements. 5. The interactive entry points open an outbound communication. 6. (optional) The interactivity results in a response by the network.					
Requirements						
Interactivity from the user point of view	High.					
Interactivity from the network point of view	High.					
Quality of service (delay, time of response)	Minimum delay and time of response in interaction.					
Bandwidth	Content-dependant.					
Security and conditional access	All access modes are possible.					
Other requirements						

Elementary Use Case	**4. 1.3 Using locally Interactive content**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X	(X) related to flow (3)	X	X
Description	The terminal displays a service transmitted by the broadcast network. Interaction of the user is only local, the network infrastructure is agnostic of it.					
Pre-conditions	The user has gained access to the ESG.					
Post-conditions	The user stops consuming the service.					
Flow	1. The end user utilizes the ESG to get the entire service offer of available services. 2. The user selects one service containing locally interactive content. 3. (optional) The end user acquires rights for receiving the service/ consuming the content. For this option the mobile network operator is a potential actor. 4. The user consumes the service including locally interactive elements.					
Requirements						
Interactivity from the user point of view	Only local.					
Interactivity from the network point of view	None.					
Quality of service (delay, time of response)	High.					
Bandwidth	Content-dependant.					
Security and conditional access	All access modes are possible.					
Other requirements						

4.2 Access control based elementary use cases

These use cases show different cases of how services may be accessed by the user / the terminal.

Elementary Use Case	**4.2.1 Accessing free-to-air content**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X		X	X
Description	Watching free-to-air services.					
Pre-conditions	The user has gained access to the ESG.					
Post-conditions	The user consumes the service.					
Flow	1. The end user utilizes the ESG to get the entire service offer of available free-to-air services. 2. The user selects one service. 3. The user consumes the service.					
Requirements						
Interactivity from the user point of view	None specifically for this access mode.					
Interactivity from the network point of view	None.					
Quality of service (delay, time of response)	High (standard for broadcast).					
Bandwidth	No additional bandwidth.					
Security and conditional access	Free to air.					
Other requirements						

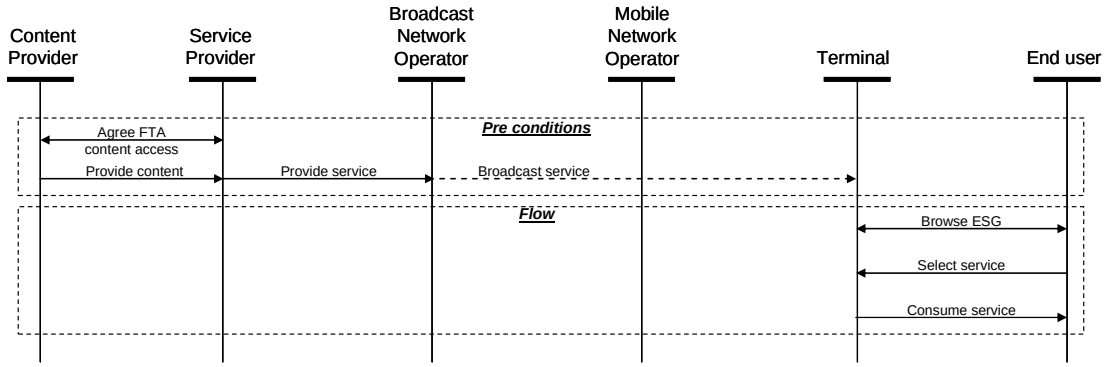

Figure 1: Accessing free-to-air content

Elementary Use Case	**4.2.2 Accessing free-to-view content**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X	(x)	X	X
Description	Watching free services for entitled users.					
Pre-conditions	The user has gained access to the ESG. The user needs to be a regular user entitled by the operator to view the content. This content is not free to air, but does not require a valid clearance. It can for example be limited to an operator's customer base who did not choose the DVB-H subscription or after expiration of a subscription. This can be the minimal service available when the subscription is over.					
Post-conditions	The user consumes the service.					
Flow	1. The end user utilizes the ESG (one or more ESGs may be selectable) to get the entire service offer of available free-to-view services. 2. The user selects one service.					
Requirements						
Interactivity from the user point of view	None specifically for this access mode.					
Interactivity from the network point of view	Low. Providing the free-to-view rights objects to the user after registration to free-to-view services requires interaction.					
Quality of service (delay, time of response)	High (standard for broadcast).					
Bandwidth	No additional bandwidth, local processing, no interaction with authorization server.					
Security and conditional access	Free to view (e.g. entitled user without any valid subscription), but still to be managed by the security and conditional access system.					
Other requirements	Content is scrambled, but does not need a valid subscription. It needs to be in the entitled ones.					

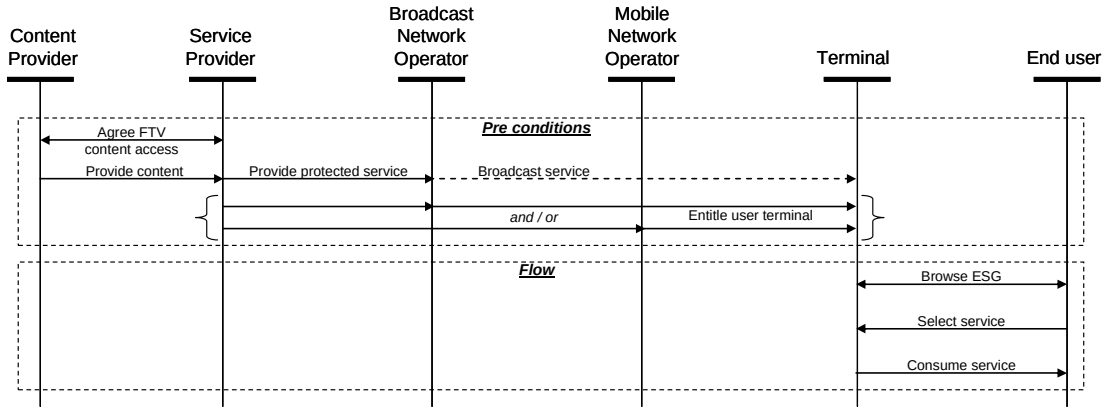

Figure 2: Accessing free-to-view content

Elementary Use Case	**4.2.3 Accessing subscription based content**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X	(X)	X	X
Description	Watching broadcast pay services on a subscription base.					
Pre-conditions	The user has gained access to the ESG.					
Post-conditions	Once the subscription is over or not renewed, the user cannot consume the content anymore.					
Flow	1. The end user utilizes the ESG to get the entire service offer of available pay services. 2. The user selects one of the offered pay services included in its up-to-date subscription package. Or if the interactive link is available, the user may subscribe online to a specific service or package. 3. The Network Operator has interfaced the network's Service Purchase and Protection system into the appropriate systems of all Pay Service Providers (e.g. billing, SMS gateway). The subscription can also be done off-line (e.g. internet, phone call, shop, prepaid means). The subscription of connected and non connected devices is considered in a similar way. 4. (Optionally) The end user acquires rights for receiving selected Pay Service and consuming the content. 5. The user consumes the service.					
Requirements						
Interactivity from the user point of view	Low. Requesting (if not subscribed yet) and receiving the rights (terminal) requires interaction for connected devices.					
Interactivity from the network point of view	None if the user is a regular subscriber. Low if the user subscribes to the service or package for acquiring rights.					
Quality of service (delay, time of response)	No delay if the user has already subscribed to the service or package. Standard broadcast. Transaction delay if the user subscribes to the package online. Transaction delay may be higher if the user subscribes offline.					
Bandwidth	If the user is a regular subscriber, no additional bandwidth is required. If the user is subscribing online through an interactive channel, no additional bandwidth is required as the rights object is transmitted over the interactivity channel. If the device is not connected, the transmission of access rights requires extra bandwidth (compared to free-to-air case).					
Security and conditional access	Network's service purchase and protection system is needed.					
Other requirements						

Elementary Use Case	4.2.3 Accessing impulsive pay-per-view content					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X	(X)	X	X
Description	Watching pay-per-view selected events in broadcast services.					
Pre-conditions	The user has gained access to the ESG.					
Post-conditions	The user can view the event until the number of viewing occurrences is over. After that, the user cannot consume the event anymore.					
Flow	1. The end user utilizes the ESG (one or more ESGs may be selectable) to get the entire service offer by pay-per-view. 2. The user selects one service. 3. The user pays for the service using the interactive channel (on-line or SMS) and receives the entitlement to consume the service as answer to his request; alternatively he can use an out-of-band channel (e.g. direct phone call to customer care, use of WEB site).					
Requirements						
Interactivity from the user point of view	Low. Requesting (user) and receiving the rights (terminal) requires interaction.					
Interactivity from the network point of view	Transaction for acquiring rights over the mobile network or by using any off-line means for non connected devices.					
Quality of service (delay, time of response)	No delay if the user has already purchased the event. Standard broadcast. Transaction delay if the user purchases the event online. Transaction delay may be higher if the user purchases the event offline.					
Bandwidth	(Optionally) low additional bandwidth for acquiring rights if the rights are broadcasted to non connected devices.					
Security and conditional access	Network's service purchase and protection system needed.					
Other requirements						

Elementary Use Case	4.2.5 Accessing content for free during a limited preview period (floating preview)					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X		X	X
Description	Watching pay content / event for a time limited period during the event. The content can be accessed by any user any time in any place of the event during the allowed preview time.					
Pre-conditions	The user has gained access to the ESG. The terminal is a connected device. The user needs to be entitled by the operator to view the content for a limited period of time. This content is not free to air, but does not require a valid clearance for the preview period. It can for example be limited to an operator's customer base who did not choose the DVB-H subscription (as a trailer) or after expiration of a subscription. This can be the minimal service available when the subscription is over.					
Post-conditions	The preview allows the user to view the content during a limited period. Once this period is expired (in one or more sessions) within a certain time frame (e.g. 5 min per service or PPV events per day), the user cannot view the content anymore and is asked to buy the pay-per-view event or to subscribe to the service.					
Flow	1. After navigating in the ESG (one or more ESGs may be selectable) the user has selected one of the offered subscriptions of PPV services. 2. He is then immediately able to access the desired content, especially Audio and Video without any restrictions during the preview duration.					
Requirements						
Interactivity from the user point of view	None towards the network in order to be able to watch the free preview.					
Interactivity from the network point of view	None, standard broadcast.					
Quality of service (delay, time of response)	High (standard for broadcast).					
Bandwidth	No additional bandwidth, local process.					
Security and conditional access	Service purchase and protection system needed.					
Other requirements	No connection to any authorization server required. Local processing. Full anonymous process, no record anywhere on the server.					

Elementary Use Case	**4.2.6 Accessing pay content by using token**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X		X	X
Description	Watching pay content and paying this in an anonymous way using a local wallet of prepaid tokens.					
Pre-conditions	The user has gained access to the ESG.					
Post-conditions	The user consumes the service.					
Flow	1. The end user utilizes the ESG to get the entire service offer of available services. 2. The user selects one service. 3. The user agrees to consume the number of required tokens from his wallet. If he does not have enough tokens, he will be prompted to buy additional tokens (either on-line or off-line). 4. The wallet is decremented by the number of required tokens.					
Requirements						
Interactivity from the user point of view	None specifically for this access mode.					
Interactivity from the network point of view	None, standard broadcast.					
Quality of service (delay, time of response)	High (standard for broadcast).					
Bandwidth	No additional bandwidth, local processing.					
Security and conditional access	Network's service purchase and protection system needed.					
Other requirements	No connection or interaction with any server required. The consumption occurs fully anonymously and locally. Tokens are purchased by connected or non connected or prepaid means, but are not linked to any specific content or type of content. The operator has no information nor any means to acquire information about the use of the tokens. It is a fully anonymous process, no record anywhere on the server.					

Elementary Use Case	**4.2.7 Accessing pay content in postpaid mode (impulsive)**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X	(X)	X	X
Description	Watching pay content services without first being granted access from a server. Consumption list will be given to the server later: when device is connected the consumption list will be downloaded and billed (e.g. once a month by callback). The amount of services that can be consumed may be limited (cannot exceed a maximum value set up in advance by the user / operator.					
Pre-conditions	The user has gained access to the ESG. The terminal is a connected device.					
Post-conditions						
Flow	1. The end user utilizes the ESG to get the entire service offer as pay services. 2. The user selects one service. 3. The user acknowledges to be charged for this service. 4. The user consumes the service. 5. When the device is asked, it connects to the server in order to upload consumption information (for example the list of the previously consumed services or an equivalent number of consumption units), in order to be billed. This can be done once a month, or when the device is again in the coverage of a mobile network.					
Requirements						
Interactivity from the user point of view	None specifically for this access mode.					
Interactivity from the network point of view	None (standard broadcast).					
Quality of service (delay, time of response)	High (standard for broadcast).					
Bandwidth	No additional bandwidth.					
Security and conditional access	Network's service purchase and protection system needed.					
Other requirements						

Elementary Use Case	**4.2.8 Accessing pay content in prepaid mode**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X		X	X
Description	Watching pay services in a pre-paid mode. Event or subscription purchased and paid in advance. No registration required, service granted anonymously.					
Pre-conditions	The user has gained access to the ESG.					
Post-conditions	The user consumes the service. Once the prepaid credit/service/event expired, the service is not accessible anymore.					
Flow	1. The end user utilizes the ESG to get the entire service offer of available services. 2. The user selects one service. 3. The user agrees that his prepaid credit is reduced according to the price of the service. If the prepaid credit is not big enough, service access is not possible. 4. The prepaid credit is reduced according to the price of the service.					
Requirements						
Interactivity from the user point of view	None specifically for this access mode.					
Interactivity from the network point of view	None standard broadcast.					
Quality of service (delay, time of response)	High (standard for broadcast).					
Bandwidth	No additional bandwidth.					
Security and conditional access	Network's service purchase and protection system needed.					
Other requirements	User registration not required, consumption occurs anonymously, no record about service/event consumed. User never needs to be known by the network operator.					

Elementary Use Case	**4.2.9 Service Purchase**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable		X	X	X	X	X
Description	Necessary information for purchase transactions for each end-user (channel of a service provider, pricing of a service by a service provider etc.) is provided.					
Pre-conditions	Relevant purchase information (e.g. through ESG or by other means) has been received. End-user is interested to consume a pay service (bundle) but has no rights to access the service (bundle).					
Post-conditions	End-user is able to start consuming the service.					
Flow	1. Terminal filters purchase information relevant to the end-user (associated with a service provider) 2. An end-user selects a service (bundle), accepts the purchase conditions (e.g. price) and activates the purchase channel (on-line or off-line). 3. End user receives the rights to use the service (bundle). NOTE: Another end-user follows the same flow but utilizes purchase information associated with **his** service provider.					
Requirements						
Interactivity from the user point of view	Availability of interaction channel may be required for transactions.					
Interactivity from the network point of view	Availability of interaction channel may be required for transactions.					
Quality of service (delay, time of response)	Fast response time.					
Bandwidth	Low.					
Security and conditional access	Acquisition of rights to pay services (e.g. through ESG information).					
Other requirements						

4.3 ESG use cases

These use cases show how the ESG may be built and used.

Elementary Use Case	**4.3.1 ESG Startup**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable		X	X		X	X
Description	Gives an overview of all ESG's in the reception area.					
Pre-conditions	No information about services is available. The terminal needs to know about the ESGs available over the broadcast network or through the mobile network before one can be selected and the service discovery process starts.					
Post-conditions	ESG descriptions are stored in the device for faster access at a later time.					
Flow	While switching on a hand-held device a navigator like function enables the user to get an immediate overview of available ESGs. The user has the choice to select one ESG to use. Alternatively, the terminal may be restricted to the use of only one ESG.					
Requirements						
Interactivity from the user point of view	Depends on the user interface. Should be as easy as possible.					
Interactivity from the network point of view	Not required.					
Quality of service (delay, time of response)	High. The updating cycle could be rather slow whereas the access to available ESGs should be on very low layer.					
Bandwidth	Low to medium, depends on the required discovery time.					
Security and conditional access	Free to air.					
Other requirements						

Elementary Use Case	**4.3.2 Service list description**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable		X	X	(X)	X	X
Description	Gives an overview of all services available in the scope of an ESG in the reception area.					
Pre-conditions	The terminal knows how to access a specific ESG, either selected by the user, or restricted to a general subscription.					
Post-conditions	Service descriptions in the scope of that particular ESG may be stored in the device for faster access at a later time.					
Flow	Once a specific ESG selected, the terminal acquires the list of services in the scope of that ESG through the broadcast network, the mobile network, or both. Descriptions provide information for the terminal to decide whether a specific service can be used (e.g. formats, access conditions, connectivity information, current program, next program, etc.).					
Requirements						
Interactivity from the user point of view	Depends on the user interface. Should be as easy as possible.					
Interactivity from the network point of view						
Quality of service (delay, time of response)	High. The updating cycle could be rather slow whereas the access to available ESGs should be on very low layer.					
Bandwidth	Low to medium, depends on the required discovery time.					
Security and conditional access	Free to air.					
Other requirements						

Elementary Use Case	**4.3.3 Service specific ESG information**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable		X	X	X	X	X
Description	Gives an overview of all contents/programs available within one service.					
Pre-conditions	The terminal has acquired the list of services and may be stored in the terminal for faster access. The user has selected a specific service he wants to have more information about. User may need to purchase specific service access to acquire detailed service description.					
Post-conditions	ESG service descriptions may be stored in the device for faster access at a later time. User may have selected a specific content to "consume". Access parameters are processed by the relevant application (e.g. media player, download client, user-defined application, etc.).					
Flow	While selecting a specific service, the terminal receives the detailed description of the service contents (list of contents, program schedule, detailed descriptions, access conditions, etc.).					
Requirements						
Interactivity from the user point of view	Depends on the user interface. Should be as easy as possible. May require interaction with the service provider or the mobile network operator for rights purchase.					
Interactivity from the network point of view	Not required.					
Quality of service (delay, time of response)	High. The updating cycle could be rather slow. The access to available ESG information could/should be within the application associated to the related service.					
Bandwidth	Low to medium, depends on the required discovery time.					
Security and conditional access	Free to air or protected.					
Other requirements						

Elementary Use Case	**4.3.4 "Physical aggregation" of service-specific ESG information**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable		X	X			
Description	To optimize ESG acquisition for terminals, the broadcast network operator gathers all ESG flows from multiple service providers and assigns them to the same packetized elementary stream, or to the same time slice burst.					
Pre-conditions	The terminal knows which elementary stream to look at in order to gather the service specific ESG information.					
Post-conditions	The terminal may store the service specific ESG information gathered all together. Presentation of the ESG is up to the terminal.					
Flow						
Requirements						
Interactivity from the user point of view	None.					
Interactivity from the network point of view	None.					
Quality of service (delay, time of response)						
Bandwidth	The broadcast network operator may perform bandwidth control to limit the capacity assigned to ESG delivery overall.					
Security and conditional access						
Other requirements						

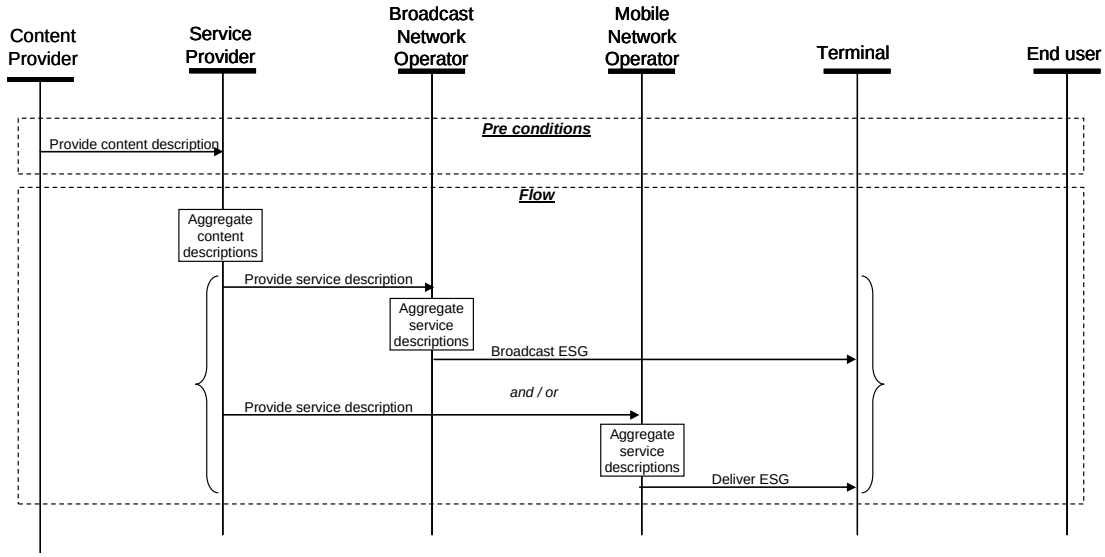

Figure 3: Physical aggregation of ESG information

Elementary Use Case	**4.3.5 "Value-added aggregation" of service specific ESG information**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable		X	X			
Description	To optimize ESG acquisition and management for terminals, the broadcast network operator gathers all ESG information and generates a **single** ESG flow to be transmitted in a single packetized elementary stream, or single time slice burst.					
Pre-conditions	The terminal knows which elementary stream to look at in order to gather the service specific ESG information.					
Post-conditions	The terminal may store the service specific ESG information. Presentation of the ESG is up to the terminal.					
Flow						
Requirements						
Interactivity from the user point of view	None.					
Interactivity from the network point of view	None.					
Quality of service (delay, time of response)						
Bandwidth						
Security and conditional access						
Other requirements						

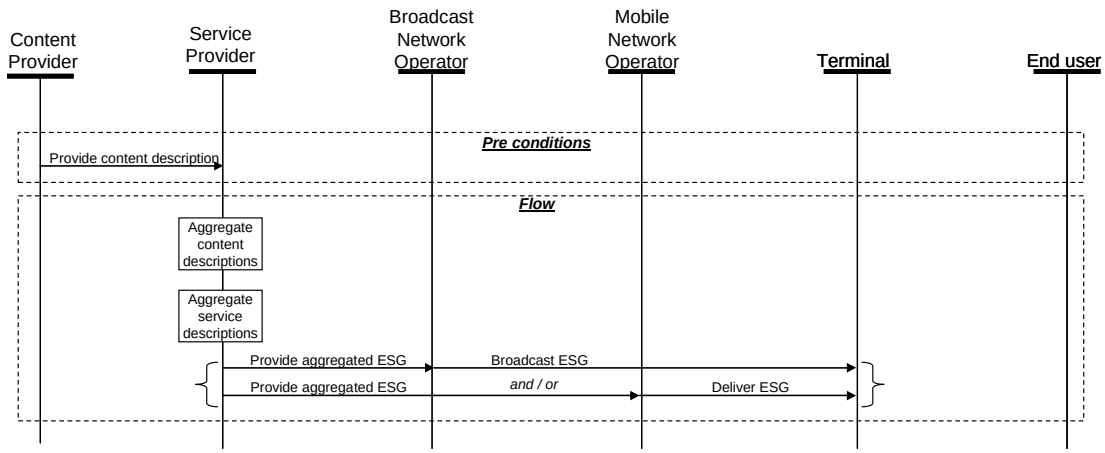

Figure 4: Value Added ESG aggregation

Elementary Use Case	4.3.6 Fetching parts of ESG through interactive channel					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable			X	X	X	X
Description	Fetching pieces of richer ESG over interactive channel.					
Pre-conditions	The terminal has to know how to retrieve ESG information through interaction channel (e.g. pre-stored information, information available within broadcast ESG). Terminal with interactive channel in use; regular ESG may or may not be available through broadcast channel.					
Post-conditions	The ESG database of the terminal has been updated with latest available information.					
Flow	1. The end user activates ESG application for richer ESG information or updates. 2. The ESG application activates interactive channel to fetch wanted ESG information. 3. Wanted pieces of information (fragments) will be transferred to terminal database.					
Requirements						
Interactivity from the user point of view	Interactive channel used.					
Interactivity from the network point of view						
Quality of service (delay, time of response)						
Bandwidth						
Security and conditional access						
Other requirements						

4.4 Content type based elementary use cases

These use cases show different types of content regarding the transmission method.

Elementary Use Case	4.4.1 Using streamed content					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X	(X)	X	X
Description	Accessing streamed content like TV or radio services.					
Pre-conditions	The user has gained access to the ESG.					
Post-conditions						
Flow	1. (optional) The End User acquires rights for receiving the service/ consuming the content. For this option the mobile network operator is a potential actor. 2. The terminal receives the streamed content.					
Requirements						
Interactivity from the user point of view	Depends on service type.					
Interactivity from the network point of view	Depends on service type.					
Quality of service (delay, time of response)	High.					
Bandwidth	Depends on service type.					
Security and conditional access	All access modes are possible.					
Other requirements						

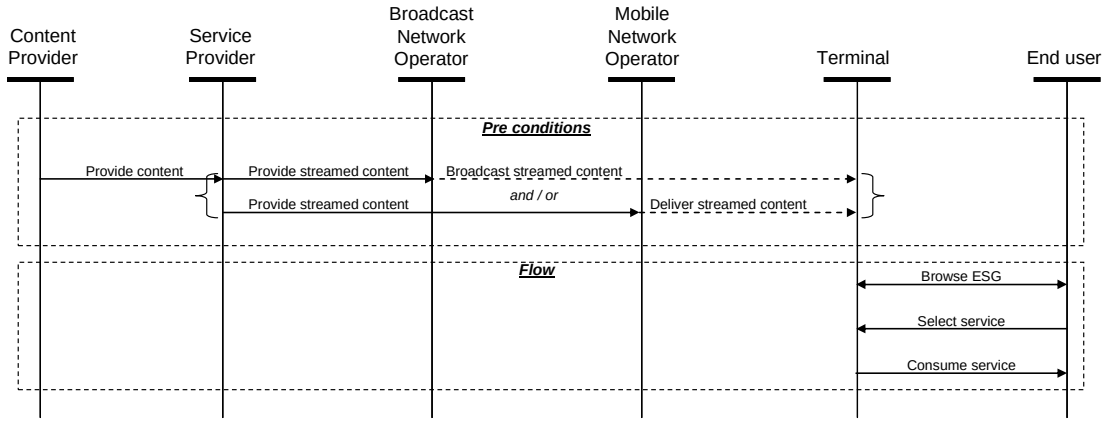

Figure 5: Using streamed content

Elementary Use Case	**4.4.2 Using file-based content**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X	(X)	X	X
Description	Accessing file based services like video clips for offline consumption. Files may, depending on DRM, be stored for further use, possibly also transferred to other devices.					
Pre-conditions	The user has gained access to the ESG.					
Post-conditions						
Flow	1. (optional) The End User acquires rights for receiving the service/ consuming the content. For this option mobile network operator is a potential actor. 2. The terminal receives the files.					
Requirements						
Interactivity from the user point of view	Depends on service type.					
Interactivity from the network point of view	Depends on service type.					
Quality of service (delay, time of response)	Low.					
Bandwidth	Depends on service type.					
Security and conditional access	All access modes are possible.					
Other requirements						

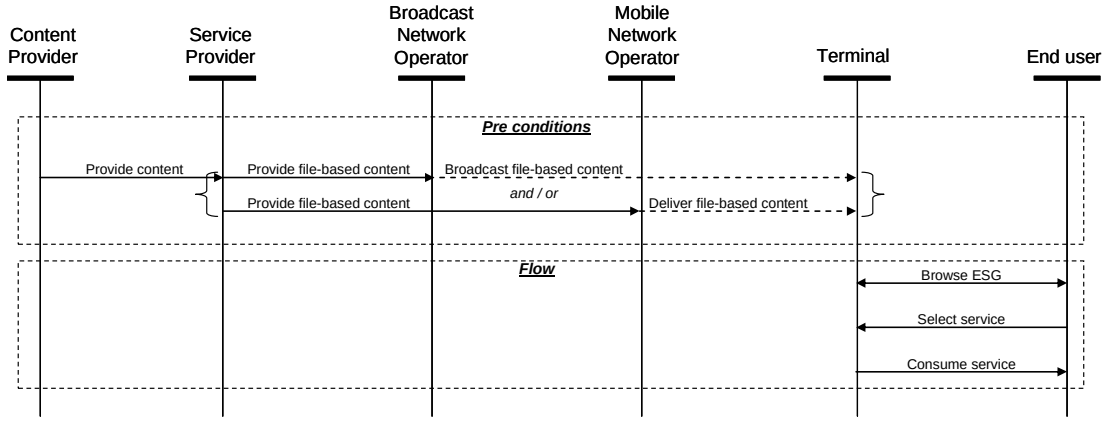

Figure 6: Using file-based content

4.5 Mobility based elementary use cases

These use cases provide information on handovers and roaming.

Elementary Use Case	**4.5.1 DVB-H cell handover**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable		X			X	
Description	Moving between DVB-H cells within the same network.					
Pre-conditions	The user receives services (or only the ESG) in one cell.					
Post-conditions	The user receives services (or only the ESG) in another cell.					
Flow	1. The terminal receives the PSI/SI tables of the current cell. 2. The terminal monitors the signals of announced adjacent cells. 3. The terminal changes to another cell.					
Requirements						
Interactivity from the user point of view	None.					
Interactivity from the network point of view	None.					
Quality of service (delay, time of response)	If possible, no lost IP packets.					
Bandwidth	Some bandwidth for the transmission of PSI/SI tables needed.					
Security and conditional access	All access modes are possible.					
Other requirements						

Elementary Use Case	**4.5.2 Service roaming**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X	(X)	X	(X)
Description	Service roaming means that the same IPDC services of the "home" network can be accessed in a "foreign" network.					
Pre-conditions	A roaming agreement has to exist. The user receives services (or only the ESG) in the current network.					
Post-conditions	The user receives services (or only the ESG) in another network.					
Flow	1. User accesses the ESG in the foreign network. 2. User selects the same service as in the home network (if available). 3. If the service is available through a DVB-H network, the terminal immediately starts to receive the content. If it is a pay service, it has to acquire rights to access the service before consumption. 4. If the service is available over interaction (cellular) network only, it starts to receive the service through the link provided in the ESG. If it is a pay service, it has to acquire rights to access the service before consumption.					
Requirements						
Interactivity from the user point of view	If the current service is a pay service, the user may have to acknowledge the network change.					
Interactivity from the network point of view	If applicable, new access data has to be provided to the terminal.					
Quality of service (delay, time of response)	If possible, no lost IP packets.					
Bandwidth	Some bandwidth for the transmission of PSI/SI tables needed.					
Security and conditional access	All access modes are possible.					
Other requirements						

Elementary Use Case	**4.5.3 User roaming**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable		X	X	(X)	X	X
Description	User roaming means that a user has access to the IPDC services of a "foreign"' network.					
Pre-conditions	A roaming agreement has to exist.					
Post-conditions	The user is able to receive services in the "foreign" network.					
Flow	1. The terminal gains access to the "foreign" ESG and displays it to the user.					
Requirements						
Interactivity from the user point of view	The user has to select services from the new ESG.					
Interactivity from the network point of view	If applicable, new access data has to be provided to the terminal.					
Quality of service (delay, time of response)	None.					
Bandwidth	No additional bandwidth needed.					
Security and conditional access	All access modes are possible.					
Other requirements						

4.6 Special elementary use cases

The use cases in this clause do not fit into the other categories.

Elementary Use Case	**4.6.1 Dynamic zapping**					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X	X	X		X	(X)
Description	In addition to any actual AV service, a complementing dynamic zapping service may be transmitted in the same TS. This zapping service allows a quick discovery of the current content of the AV service.					
Pre-conditions	The terminal is switched "on" from "standby". Or the terminal is entering a "TV mode" from a "select an application" mode. Or the end user is switching from one AV service to another. Or the terminal in "TV mode" has lost at least a significant portion of one burst of the desired AV service.					
Post-conditions	After presentation of the zapping content, the end user may have to wait for the actual AV service to be received for consumption, or he may select another AV service.					
Flow	1. The user is switching from one AV service to another, e.g. selecting one from a pre-compiled service list. Or one of the other pre-conditions above is met. 2. The zapping service, which complements the selected AV service, is received within e.g. one second, its content is immediately presented. 3. The user evaluates the presented zapping content. 4. Either the user waits for the actual AV service (go to step 5), or he selects another AV service (go to step 2). 5. When the desired AV service is received, it replaces the zapping service.					
Requirements						
Interactivity from the user point of view	Low.					
Interactivity from the network point of view	Low.					
Quality of service (delay, time of response)	The dynamic zapping service is transmitted in a shorter interval, i.e. with a shorter cycle time than the actual service to provide a benefit in access speed. The access time to the zapping service is significantly lower than for the actual service.					
Bandwidth	The zapping service consumes bandwidth, depending on its content and transmission rate: Typically up to 10 % of the related AV service for one picture per second or for low data rate audio. Transmission cycle and update rate of zapping services: A trade-off between delay time to service discovery and allocated bandwidth (cycle time of the time sliced burst) is required. Different cycle times can easily be allocated within the same multiplex.					
Security and conditional access	None.					
Other requirements	Terminal: After reception of the burst, which contains the zapping service, the terminal needs to switch from "reception of zapping service" to "reception of actual service". Several simple or advanced implementations are possible.					

Elementary Use Case	4.6.2 Firmware Download					
Actors	**Content Provider**	**Broadcast Network Operator**	**Service Provider**	**Mobile Network Operator**	**Terminal**	**End User**
Enter "X" where applicable	X (terminal manufacturer?)	X	X	(X)	X	X
Description	Terminal firmware is delivered over the broadcast channel to a set of concerned terminal devices, e.g. a set of devices of one particular terminal model.					
Pre-conditions	The firmware for concerned terminal devices is available on air for a certain time interval.					
Post-conditions	The concerned terminal devices have a different functionality due to the updated firmware.					
Flow	1. The availability of the firmware is announced. 2. Optionally, the concerned users decide to update the terminal. 3. The firmware is downloaded. 4. The terminal is updated.					
Requirements						
Interactivity from the user point of view	Users may decide on updating the firmware of their terminals.					
Interactivity from the network point of view	Low.					
Quality of service (delay, time of response)	Depends on the time interval of the firmware on air.					
Bandwidth	Flexible.					
Security and conditional access	t.b.d.					
Other requirements						

5 Examples for services

In this clause, services with IP Datacast over DVB-H are presented which should serve as examples for combining the elementary use cases to real-life services.

5.1 Mobile TV and Radio

Scenario Description

- Currently the Public Service Broadcasters deliver various television and audio programs over three different distribution networks: terrestrial, satellite and cable transmission in analogue and digital mode. It is envisaged that the whole program offer will be enhanced for reception on mobile devices like cell-phones or PDAs. To ensure the high quality of the well accepted FTA services, it may be necessary to map the entire service offer to the mobile environment. This includes audio, video and additional services like subtitling, teletext and necessary signalling for content delivery. A specific compressed version of e.g. the news or sports program of the Public Service Broadcasters is also desirable for a future mobile user experience.

- For FTA broadcasters there must be the possibility to transmit the content without encryption.

Pre-conditions

- After navigating in the ESG the user has selected one of the offered FTA services mentioned in the Scenario Description. This enables him to immediately access the desired content, especially Audio and Video without any restrictions.

Post-conditions

- In case the user is interested in a different FTA AV program, he should be able to zap between the different channels without going back to the ESG.

Flow

1) The end user utilizes the ESG to get the entire service offer of available (FTA) services. Once he has chosen one service of interest he is immediately in the position to consume the service, e.g. to watch TV.

2) The end user receives the Mobile Broadcast Service he has chosen before, plus the associated auxiliary data like subtitling or teletext. It is also possible that the Audio/Video program is accompanied by a corresponding application that is launched on user demand. The application could possibly display additional information for the content of the audio/video program, e.g. sports results, history information, biographies, etc.

Elementary Use Cases

i. 4. 1.1 Using non-interactive content

ii. 4. 2.1 Accessing free-to-air content

iii. 4. 4.1 Using streamed content

iv. (optional) 4. 5.1 DVB-H cell handover

v. (optional) 4. 6.1 Zapping

vi. 4. 3.1 ESG startup

vii. (optional) 4. 3.2 Service list description

5.2 Interactive TV

This service example might not be possible with IP Datacast release 1.

Scenario Description

- Provided regular broadcast services are carried in DVB-H, the viewer will expect the same sort and range of services as available via DVB-T (e.g. broadcast on-line services). Digital broadcast content includes additional data services offered by the broadcast content providers (e.g. in form of interactive middleware based applications). Additional services can consist of either local interactivity on the terminal or interactivity by using the interactive channel.

- A typical example for the first case is additional information on a sports AV program like team statistics, results, player history etc. For the latter, participating in a quiz show or voting are attractive examples for remote interaction.

Pre-conditions

- After navigating the ESG the user has selected one of the offered FTA Audio/Video services that is linked to an interactive application.

Post-conditions

Flow

1) The end user utilizes the ESG to get the entire service offer of available (FTA) services. He chooses an AV service that is linked to an interactive application.

2) (optional) For remote interactivity the usage of the interactive channel is triggered and confirmed by the user. The cellular network (by TCP/IP, SMS, etc.) is used to connect with the Service Management or Service Application entity.

Elementary Use Cases

i. 4. 1.2 Using remotely interactive content

ii. 4. 1.3 Using locally interactive content

iii. 4. 2.1 Accessing free-to-air content

iv. (optional) 4. 5.1 DVB-H cell handover

v. 4. 3.1 ESG startup

vi. (optional) 4. 3.2 Service list description

5.3 Download of audiovisual content/applications/services/ software to devices

Scenario Description

- It is conceivable that specific content (e.g. a video clip) can be downloaded triggered by a user request. The content could be available on a server hosted by the Public Service Broadcasters. Once the content has been received, the user chooses to consume it whenever he wants.

Pre-conditions

- After navigating the ESG the user has selected one of the offered FTA services for downloading. He is then immediately able to access the desired content, especially Audio and Video without any restrictions and to consume the content later or to distribute it (see next scenario).

Post-conditions

Flow

1) The end user utilizes the ESG to get the entire service offer of available (FTA) services. Once he has chosen one service of interest he is immediately in the position to download the desired content.

2) The content that was selected for download is stored on the CBMS-terminal. It can for example consist of Audio/Video or applications.

Elementary Use Cases

i. 4. 1.1 Using none-interactive interactive content; or

ii. 4. 1.2 Using remotely interactive content; or

iii. 4. 1.3 Using locally interactive content

iv. 4. 2.1 Accessing free-to-air content

v. 4. 4.2 Using file-based content

vi. (optional) 4.1.5.1 DVB-H cell handover

vii. 4. 3.1 ESG startup

viii. (optional) 4. 3.2 Service list description

5.4 Broadcast of audiovisual streams along with auxiliary information streams to be rendered synchronously and (optionally) containing interaction entry points

Scenario Description

- The End User receives a linear audiovisual stream carrying a TV program or other content. Along with the live stream, auxiliary data (containing text, images etc) is received, which is synchronized with the main content (A/V stream). The client application on the terminal renders the service for the display of the device so that the auxiliary data is presented within the main context (links or hotspots in the A/V stream) or next to the main context. This creates additional rich information available to the End User. Moreover, the information may contain interaction entry points.

Pre-conditions

- The End User has finished the service discovery phase and selected a Mobile Broadcast Service. If required, the End User has also acquired rights to access the selected Mobile Broadcast Service and related content.

Post-conditions

- The End User continues receiving the selected Mobile Broadcast Service delivered with auxiliary data. The End User may have concluded a service interaction.

Normal flow

1) The End User discovers a Mobile Broadcast Service of interest and chooses it for immediate consumption. A dedicated application may be required and started on the End User Terminal.

2) (Optionally) The End User acquires rights for receiving the service/consuming the content.

3) The End User receives a Mobile Broadcast Service and associated auxiliary data. The auxiliary data is rendered within the service or next to the service in the End User Terminal. The auxiliary information may consist of text, images, animations and more. An example is the display of a ticker, sports/voting result lists, or subtitles.

Alternative flow

Same as Normal Flow for steps 1 to 3.

1) The End User accesses the interactive element delivered within the auxiliary data. The interactive element may be, for example a web link or a voting button.

2) There are two options:

   a) The interaction is internal to the Mobile Broadcast Service and does not initiate an outbound data connection from the End User Terminal. In this case the End User explores the auxiliary information by navigating through navigation elements presented on the display; or

   b) The interaction results in an outbound data communication from the End User Terminal, for example, to the Service Provider. Examples of this are:

      - The browsing a web link pointing to a resource not stored on the terminal.
      - The initiation of voice calls.
      - The initiation of transactions, such as placing orders or bets and purchases. Interaction may be based on all sorts of communications available on the interaction channel, including phone calls, SMS, MMS, WAP, HTTP, SOAP and other TCP/IP communications.

3) The End User possibly resumes the main Mobile Broadcast Service.

Actor Specific Issues

End User

- May want to be able to toggle the display of auxiliary services "on" or "off" or to select from a set of auxiliary services. An example of this case is the selection of subtitles "on/off" or the selection of subtitling language.

Service Provider

- Wants to be able to provide End Users with Mobile Broadcast Services that allow the End User to interact with the service (e.g. voting), or to initiate separate services (e.g. browsing).

Content Provider

- Wants to provide content or data elements as complementary to the main content, for example, tickers, subtitles, result lists, shopping information. He may do so in order to attract the End User to additional services.

Actor Specific Benefits

End User

- The End User experiences an enhanced broadcast programme on his end user terminal with auxiliary information that is displayed in a legible manner and allows the user to navigate this information in a certain depth locally.
- The End User can conveniently access dedicated interactions offered through the auxiliary information.

Service Provider

- The broadcast bandwidth is used efficiently for video content. Extra information is not image-encoded and therefore transmitted efficiently.
- The service interaction will generate traffic on the Service Provider's system. Through the interaction links delivered with the Mobile Broadcast service, it may serve as a portal to additional service offerings by the SP.

Operational and Quality of Experience requirements

- None specified.

5.5 Unattended information download with off-line consumption and interaction entry points

Scenario Description

- A potentially large information base is downloaded over the broadcast channel to the terminal. After reception the user can access information at his discretion. The information retrieved by the end user may contain interaction entry points.
- The information offered in such a way may include:
  - Information database(s).
  - All sorts of multimedia information, such as images, movies, and audio content.
  - The service access may be protected and subject to a purchase/subscription fee.
  - Individual content elements may be protected and End User access may require the purchase of a separate rights object.

Pre-conditions

- The End User has finished the service discovery phase and selected a Mobile Broadcast Service. If required, the End User has also acquired rights to access the selected Mobile Broadcast Service and related content.

Post-conditions

- The End User has a set of files stored at the terminal for immediate consumption. It may be required that the End User acquires the rights to access the content, if the content or parts of it are delivered in encrypted form. Optionally, the End User may have concluded a service interaction.

Actor Specific Issues

End User

- Wants to be able to access the information service at any time and in any place. Delivering files and later displaying them provides this flexibility.

Actor Specific Benefits

End User

- The user has a large information base available for instant consumption at any time. No additional interaction is necessary to retrieve from the stored information. The basic service can be attractively priced.
- At the End User's convenience, he may make use of interaction entry points embedded in the information to obtain additional services that require the interaction channel.

Flow

- An information base is downloaded over the broadcast channel to the terminal. This should take place unattended, i.e. no user interaction is involved other than:

  1) The End User discovers a Mobile Broadcast Service of interest and subscribes to it (expresses interest in it). In this case it is a content delivered via the file distribution service.

  2) (Optionally) The End User acquires rights for receiving the service.

  3) The Terminal automatically and unattendedly receives the file set over a broadcast channel, provided it is ready for reception (i.e. it must be switched on and within the reach of the broadcast network). All other configuration set-up, such as scheduling the broadcast reception is handled automatically by the end user terminal. The Terminal stores the files (this may include version management). The data may be received repeatedly, e.g. for daily updates.

  4) (Optionally) The Terminal alerts the End User that new files have been received / the service has new content.

  5) The End User may use the information at any time, even when he is off-line (i.e. not connected to either the broadcast and interactive network). A dedicated application may be required to access/use the information base.

  6) (Optionally) The application may be enhanced with live broadcast(s) that are displayed when the user interacts with the application.

  7) The information accessed by the user through the information retrieval application contains interaction entry points, which will involve outbound communication on the interaction channel, in order to initiate transactions such as:

     - Obtaining up-to-the-minute information updates.
     - Links to additional information that is available over the interaction network.
     - Initiate transactions, such as:
       - Purchase of tickets (e.g. for public transportation, museums, cinemas, theatre and music performances and other events).
       - Purchase of "electronic vouchers", which can be redeemed at locally accessible businesses for merchandise and/or services.
       - Purchase of rights objects for content that has been downloaded but is still DRM-protected (using broadcast as a content superdistribution method).
       - Reservations for restaurants and other facilities.

     Interaction may be based on all sorts of communications available on the interaction channel, including phone calls, SMS, MMS, WAP, HTTP, SOAP and other TCP/IP communications.

     (Optionally) All charges (basic subscription and later user-initiated purchases) may be handled by the interaction network's accounting and billing services.

Operational and Quality of Experience requirements

- None specified.

5.6 Broadcast of a common core of services to all terminals, together with a set of services unique to an individual operator

Scenario Description

- The IPDC Network Operator will build/commission one or more DVB-H networks, and sell capacity on them to both multiple Content Providers (such as Free To Air broadcasters), and multiple Pay Service Providers (such as Mobile Phone Operators).
- The Content Providers probably want as wide a viewer base as possible for their content, so they will not limit their availability to specific Pay Service Providers. These services will therefore constitute a "Common Core" of services available to any terminal, from any Terminal Vendor.
- However, the Pay Service Providers may want to offer content that is unique to their offering, in order to differentiate themselves from their competition, and entice customers to subscribe to their service.
- The presentation to a viewer of such Premium Services will therefore need to be restricted to a sub-set of terminals, with each Pay Service Provider having a unique sub-set.

Pre-conditions

- The Network Operator has interfaced the network's Service Purchase and Protection system into the appropriate systems of all Pay Service Providers (e.g. billing, SMS gateway).

Post-conditions

- The End User can continue to consume FTA Services even when they cease to subscribe to their Pay Service Provider.
- If the End User subscribes to a different Pay Service Operator, the services presented to them comprise only the services offered by the new Operator.

Actor Specific Issues

End User

- Will want to be able to seamlessly move between the Common Core Services and the Premium Services.

Pay Service Provider

- May want to limit the presentation to their customers of Pay Services available, to only those offered by them.

Content Provider

- May want to provide content or data elements to as wide an audience as possible, irrespective of whom the End User chooses as Terminal Vendor, or whether they consume Pay Services.

Network Operator

- Will need to integrate all source data into their broadcast infrastructure, including overlays of all regional variants.

Actor Specific Benefits

End User

- The End User experiences a more personalized choice of services the nature of which will depend on whether or not they elect to use a Pay Service Provider, and who that is.

Pay Service Provider

- The Pay Service Provider can differentiate his offering from the competition through the services he offers over the Mobile Broadcast Network.

Network Operator

- The network Operator can partition the capacity within his network more efficiently.

Normal flow

1) The End User acquires a Terminal from a Terminal Vendor that is also a Pay Service Provider.
2) (Optionally) The End User acquires rights for receiving Pay Services and consuming the content.
3) The End User receives a Mobile Broadcast Service and any associated auxiliary data.

Alternative flow

1) The End User acquires a Terminal from a Terminal Vendor that is independent of a Pay Service Provider.
2) The End User discovers Free-To-Air services, and consumes the content and any auxiliary data.
3) (Optionally) The End User selects a Pay Service Operator, and acquires rights for receiving their Pay Services and consuming the content.
4) The End User discovers only the additional services offered by their Pay Service Operator.

Operational and Quality of Experience requirements

- Service Purchase and Protection systems for each Pay Service Operator shall be compatible with the Service Discovery and Selection mechanisms proposed.

Elementary Use Cases

- None specified.

History

Document history		
V1.1.1	April 2006	Publication