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Technical Specification

Digital Video Broadcasting (DVB); IP Datacast: Electronic Service Guide (ESG) Implementation Guidelines; Part 2: IP Datacast over DVB-SH

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Contents

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Foreword

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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.

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The present document is part 2 of a multi-part deliverable covering the IP Datacast Electronic Service Guide implementation guidelines over DVB-H and DVB-SH as identified below:

Part 1: Part 1: IP Datacast over DVB-H;

Part 2: Part 2: IP Datacast over DVB-SH.

Introduction

IP Datacast is an end-to-end broadcast system for delivery of any types of digital content and services using IP-based mechanisms. An inherent part of the IPDC system is that it comprises a unidirectional DVB broadcast path and a bi-directional mobile/cellular interactivity path. IPDC is thus a platform for convergence of services from mobile/cellular and broadcast/media domains. The present document gives the implementation guidelines on the use of the Electronic Service Guide in IP Datacast over DVB-SH system. [2] is a corresponding document guidelining on the use of Electronic Service Guide in IP Datacast over DVB-H system.

1 Scope

The present document gives implementation guidelines on the use of the electronic service guide in IP Datacast over DVB-SH system ([4] to [6]) for the announcement of services to the terminal.

The present document intends in particular to guide implementers of IP Datacast over DVB-SH Services, Servers and Terminals to make best use of the specification IP Datacast over DVB-H: Electronic Service Guide TS 102 471 [1]. The document must also be considered as complementary to the implementation guidelines applicable in DVB-H context [2], in particular for supporting ESG regionalization, one of the specific features provided by a DVB-SH network.

The prresent document is structured into three main clauses. Clause 4 provides an overview of hypothesis and requirements followed in the DVB-SH context. Clause 5 describes how regionalization can be ensured in some specific scenarios. Annex A provides guidance on different types of ESG implementation, including DVB-H, and their interoperability. Annex B provides more details on the DVB-SH network physical capabilities.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI TS 102 471 (V1.2.1): "Digital Video Broadcasting (DVB); IP Datacast over DVB-H: Electronic Service Guide (ESG)".

[2] ETSI TS 102 592-1 (V1.1.1): "Digital Video Broadcasting (DVB); IP Datacast: Electronic Service Guide (ESG) Implementation Guidelines; Part 1: IP Datacast over DVB-H".

[3] IP Datacast over DVB-H: Electronic Service Guide (ESG) - A099r1 (dTS 102 471 v1.3.1).

[4] ETSI TS 102 585: "Digital Video Broadcasting (DVB); System specifications for satellite services to Handheld devices (SH) below 3 GHz".

[5] ETSI EN 302 583 (V1.1.1): "Digital Video Broadcasting (DVB); Framing Structure, channel coding and modulation for Satellite Services to Handheld devices (SH) below 3 GHz".

[6] ETSI TS 102 584: "Digital Video Broadcasting (DVB); DVB-SH implementation Guidelines".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area**.** For non-specific references, the latest version of the referenced document (including any amendments) applies.

[i.1] ETSI TS 102 472 (V1.2.1): "Digital Video Broadcasting (DVB); IP Datacast over DVB-H: Content Delivery Protocols".

[i.2] ETSI TS 102 591 (V1.1.1): "Digital Video Broadcasting (DVB); IP Datacast over DVB-H: Content Delivery Protocols (CDP) Implementation Guidelines".

[i.3] ETSI TS 102 470-2: "Digital Video Broadcasting (DVB); IP Datacast: Program Specific Information (PSI)/Service Information (SI); Part 2 : IP Datacast over DVB-SH".

[i.4] ETSI TS 102 611-2: "Digital Video Broadcasting (DVB); IP Datacast: Implementation Guidelines for Mobility; Part 2: IP Datacast over DVB-SH".

[i.5] DVB A131 (11/2008): "MPE IFEC Specification".

NOTE: Intended as annex to ETSI EN 301 192.

[i.6] ETSI EN 300 468: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".

[i.7] ETSI EN 301 192: "Digital Video Broadcasting (DVB); DVB specification for data broadcasting".

[i.8] ISO/IEC 13818-1: "Generic coding of moving pictures and associated audio information: Systems".

[i.9] IETF RFC 3926: "FLUTE - File Delivery over Unidirectional Transport".

3 Definitions and abbreviations

3.1 Definitions

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

acquisition information: information necessary to acquire a service or content

common service: service available on all cells where the TS is transmitted

content: atomic content part of the service described, and scheduled separately

delivery area: abstract area enabling to decouple the generation of regionalized ESGs from the knowledge of physical transmission areas

NOTE: The ESG provider defines delivery areas and binds the IP streams scoped by an ESG to these delivery areas. Some network entity binds these delivery areas to cells in the network, via DVB service management and SDT generation.

delivery area ID: integer value uniquely identifying a delivery area in the scope of a {TS, ProviderURI}

elementary stream: stream of transport packets within a transport stream sharing a common Packet Identifier (PID)

NOTE: The elementary stream definition differs from the one defined in MPEG-2 (ISO/IEC 13818-1 [i.8]).

ESG access descriptor: in the bootstrap session, descriptor providing the link between the declaration of the ESGs (in the ESG ProviderDiscovery descriptor) and their respective acquisition entry point (the announcement carousel)

ESG announcement carousel: FLUTE session used as an entry point by the terminal to acquire a given ESG

ESG auxiliary data: ESG data, which is referenced from an instance of the XML based data model, e.g. an SDP file, an HTML page or a PNG file

NOTE: Even though SDP files can be considered as ESG auxiliary data, it is possible to transport them within the ESG fragment stream or as files within a FLUTE session.

ESG bootstrap session: FLUTE session used as an entry point by the terminal to discover the ESGs available in a given IP platform of the actual TS

ESG container: structure to group ESG data into one transport object for delivery purposes

ESG Entry: in the ESG Access descriptor, entry providing the tuning parameters of one announcement carousel

ESG fragment: fragment of ESG data delivered in the ESG fragment stream and referred to by a fragment reference in the encapsulation structure

NOTE: Namely an ESG fragment can be an ESG XML fragment, ESG auxiliary data or private auxiliary data.

ESG Fragment ID: URI uniquely identifying a fragment in one ESG

ESG init container: ESG container carrying data structures for initialization, such as the ESG init message and the ESG main fragment

ESG init message: initialization information to decode ESG fragments

ESG ProviderDiscovery descriptor: in the bootstrap session, descriptor providing information on ESGs available in a given IP platform of the actual TS

ESG session partition declaration: tells the terminal, how the ESG is partitioned in ESG Sessions, what are the partitioning criteria for each session

ESG XML fragment: ESG fragment of an XML instance which is an instantiation of a datatype

NOTE: A limited set of ESG XML fragment types have been defined in TS 102 471 [1].

IP/MAC stream_location_descriptor: INT descriptor providing the locations of the instances (IP streams) of one IP flow in the actual Transport Stream and the neighbouring Transport Streams

NOTE: This descriptor is especially used by the terminal to perform two procedures:

- IP address → PID resolution;
- handover decision making.

IP platform: set of IP flows managed by an organization

NOTE: The IP platform represents a harmonized IP address space that has no address collisions. The concept of IP platforms is described in more detail in TS 102 470-2 [i.3].

IP flow: flow of IP datagrams each sharing the same IP source and destination address

Local service: service available on some cells (but not all cells) where the TS is transmitted

private auxiliary data: data of which the format is not specified in TS 102 471 [1]

providerURI: unique identifier of an ESG Provider

NOTE: When referring to TS 102 471 [1] and TS 102 592-1 [2], it also uniquely identifies one ESG.

providerID: integer value used as a shortcut to designate a ProviderURI

purchase channel: purchase system, through which a service may be purchased

purchase information: information to display to the user that a service needs to be purchased and the information that is necessary to access and acquire rights to consume a service or content

purchase item: service bundle to which pricing information is attached

schedule event: broadcast event which is described separately

service: offer from a service provider and has media content related to it

service: service offering e.g. Broadcast TV Channel, soap opera service

serviceID: fragment identifier of a Service fragment. It can also be a partition criterion in the ESG session partition declaration

service_availability_descriptor: SDT descriptor that may be included in a service entry of an SDT sub-table, to signal that the related DVB service is subject to cell-based transmission restrictions

service bundle: group of services composed respectively offered by a single party

3.2 Abbreviations

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

DVB	Digital Video Broadcasting
DVB-H	Digital Video Broadcast - Handheld
DVB-SH	Digital Video Broadcast - Satellite to Handheld
ESG	Electronic Service Guide
FLUTE	File deLivery over Unidirectional Transport
IANA	Internet Assigned Numbers Authority
ID	IDentifier
INT	IP Notification Table
IP	Internet Protocol
IPDC	IP DataCast
MPEG	Moving Picture Expert Group
NIT	Network Information Table
paTS	partially available Transport Stream
PID	Packet IDentifier
PNG	Portable Network Graphics
PSI/SI	Program Specific Information/Service Information
RFC	Request For Comments
SDP	Session Description Protocol
SDT	Service Description Table
SFN	Single Frequency Network
TS	Transport Stream
TSI	Transport Session Identifier
TV	TeleVision
URI	Uniform Resource Identifier
WEB	last part of world wide WEB
XML	eXtensible Markup Language

4 Hypothesis

The DVB-SH provides different possible physical network configurations described in TS 102 584 [6], some of which are recalled in annex B.

SFN configuration (DVB-SH A SFN) is actually strictly identical to TS 102 471 [1] in terms of ESG. Non-SFN configurations are new compared to TS 102 471 [1] in the sense that two frequencies (the satellite and the terrestrial) are used to distribute same TS. Therefore, due to the possibility to configure the physical layer differently between the two frequencies, some form of content regionalization is possible and described in TS 102 584 [6]. In this case, ESG is more complex than TS 102 471 [1] and there are new requirements:

- The terminal MUST be able to differentiate from the ESG what content is provided where; in particular the satellite content SHALL be found in any locations, whether satellite or terrestrial, whereas the local content MAY be available in only selected locations; this information SHOULD be available to terminals so that they do not, for instance, attempt to display content that is not available.
- Satellite bandwidth MUST not be overloaded with ESG data dedicated to announce local content; therefore some form of "partitioning" between ESG bootstrap sessions, ESG announcement carrousels, ESG fragment FLUTE sessions SHALL be ensured.
- Service continuity SHALL be possible so that a terminal moving from the satellite area to a terrestrial area having different ESG conditions shall be able to complement but not contradict the already received ESG by, e.g. the local one (and vice-versa).
- ESG distribution SHOULD allow a terminal located on one area to receive ESG fragments pertaining to an adjacent area.

To support these additional requirements, some new innovative features are introduced such as delivery areas and explicit and implicit ESG fragment tagging. In the remaining of the document, we shall refer to the term "ESG regionalization" to designate the mechanisms allowing first a global ESG instance to announce common and local IPDC services, and second this ESG instance to be partially delivered on some areas depending on local IPDC services availability as well as bandwidth considerations. The present document therefore describes the guide lining of TS 102 471 [1] in order to support ESG regionalization for those DVB-SH scenarios that support it.

It is assumed that such recommendations pertain to the only DVB-SH networks and terminals, excluding any DVB-H terminals to receive in any circumstances such forms of ESG instantiations. Therefore interoperability with DVB-H ESG is not primarily targeted although the foundations are strictly compliant and some form of compatibility between DVB-H ESG clients and DVB-SH ESG is possible Therefore the present document proposes several types of network (ESG server) and terminal (ESG client) implementations, all interoperable with each other, with some functional limitations in some cases. These implementations are detailed in annex A.

5 ESG regionalization

5.1 Detection procedure (on terminal side)

All types of terminals (see annex A) can normally acquire non-regionalized ESGs as defined in TS 102 471 [1] and TS 102 592-1 [2].

In addition, for regionalized ESGs:

- A Type 0 terminal, although not capable of detecting that an ESG is regionalized, will seamlessly tune to the common announcement carousel and acquire the common components of a regionalized ESG (and in final will be able to tune to common IPDC services, while not being aware of the existence of local IPDC services).
- A Type 1 or Type 2 terminal will detect that an ESG (identified by a given ProviderURI) is regionalized if for the associated ProviderID it encounters multiple consecutive ESGentries in the ESG Access descriptor.

5.2 Specification

5.2.1 Overview

5.2.1.1 Principles

This clause presents the principles of ESG for DVB-SH.

The Partially Available Transport Stream carries the IP flows of one single IP platform.

For a given ESG Provider URI, there is one single ESG, spanning over all the cells on which the TS is transmitted. However, since the TS is filtered on some of these cells, only a portion of this ESG will be valid on one given cell (i.e. a portion of this ESG will declare IPDC services actually available on this cell). When moving to another cell, the terminal acquires new portions of the ESG, complementing the other portions acquired in previous cells.

The received TS comprise common DVB service(s) and eventually local DVB service(s). There is no explicit signalling for common and local DVB services in a Partially Available TS, however for sure the DVB service carrying the ESG bootstrap FLUTE session is a common DVB service.

A non-regionalized DVB-SH ESG is a DVB-H compliant ESG as defined in TS 102 471 [1] and TS 102 592-1 [2]. A regionalized DVB-SH ESG is characterized by the presence in the ESG Access descriptor of multiple ESGentries associated with the providerID identifying the ESG, each ESG Entry declaring one ESG announcement carousel. In the received TS, only one (one common) or two (one common, one local) of these ESG announcement carousels are actually transmitted, as signalled by INT and SDT. The terminal using an IP stream availability function (designed to check the actual transmission of some given IP stream(s) of a given IP platform ID) can determine which announcement carousels are actually transmitted in the TS. In case two ESG announcement carousels are transmitted, the terminal selects the local ESG announcement carousel, not the common ESG announcement carousel (how to distinguish each is specified hereafter). Indeed, the local ESG announcement carousel announces local and common ESG FLUTE sessions, whereas the common ESG announcement carousel announces common ESG FLUTE sessions only.

The selected ESG announcement carousel declares multiple ESG FLUTE sessions via the ESG session partition declaration of the ESG Init Container. In this partition declaration, the declared ESG FLUTE sessions may be carried in any transmitted DVB service, and will at least include the common ESG FLUTE sessions (the ones carried in common DVB services), since all fragments delivered in common ESG FLUTE sessions are of interest on all cells. How ESG FLUTE sessions should be organized in the Transport Stream is guided by two considerations: firstly share FLUTE sessions between ESG announcement carousels whenever possible (instead of duplicating them), and secondly allow fine-tuned ESG complementing scenarios over broadcast channel.

In order to decouple regionalization of ESG data from below-IP transport information and network infrastructure information, the concept of "delivery area" is introduced. Basically, the ESG provider groups in distinct "virtual" delivery areas the IP flows scoped by the same ESG instance (from ESG bootstrap session down to audio/video/key streams), and some entity in the network (generally the network operator) has the responsibility to bind each delivery area to a given set of cells in the DVB-SH network, which is technically achieved using the indirection of DVB service allocation and SDT generation. The delivery area is scoped by the ProviderURI, and has a unique ID in this scope. The delivery area IDs are not used the same way on network side and terminal side. On network side, the TS encapsulator needs to know the delivery area ID of each session so to correctly decide on the grouping of IP streams in DVB services, whereas on terminal side the terminal needs only to determine the delivery area ID of the announcement carousels.

For a Type 1 terminal:

The concept of delivery area is not directly used. The terminal first builds an implementation-specific identifier for each ESG FLUTE session (e.g. based on TSI, source IP address, destination IP address, etc) transmitted for the selected announcement carousel. Then at the time of storage, each fragment is tagged by the terminal by the identifier of the FLUTE session which delivered the fragment. When browsing the ESG on any cell, and knowing the ESG FLUTE sessions currently transmitted for the selected announcement carousel, the terminal can quickly retrieve from the stored ESG which fragments are presumably valid to be presented to the user, i.e. which fragments announce IPDC services that are actually available on current cell. However since the ESG provider may choose to deliver in ESG FLUTE sessions some fragments which are not valid on current cell, and since a Type 1 terminal does not know if the ESG provider delivers such fragments, the terminal, before tuning to any IPDC stream, must systematically check for the availability of these IPDC streams using an IP stream availability function.

The tagging mechanism is called "implicit ESG fragment regionalization based on FLUTE session identifier", implicit because not signalled in the fragment payload itself.

Fragments not tagged by the current FLUTE session identifiers are for sure not valid on current cell, fragments tagged by any of the current FLUTE session identifiers may be valid on current cell, and an additional availability check on the IPDC streams declared by the tagged Acquisition fragments is needed to confirm this validity. Said otherwise, this FLUTE session ID-based tagging reduces the number of IP stream availability checks for Type 1 terminals.

For a Type 2 terminal:

The concept of delivery area is directly used to determine which acquired ESG fragments of the ESG instance are valid on the current cell. At the time of storage, each fragment is tagged by the terminal by a delivery area ID, which represents the delivery area where this fragment is valid. When browsing the ESG on any cell, and knowing the IDs of the delivery areas it is currently located in, the terminal can quickly retrieve from the stored ESG which fragments are valid to be presented to the user, i.e. which fragments announce IPDC services that are actually available on current cell.

The main tagging mechanism is called "implicit ESG fragment regionalization based on delivery area ID", implicit because not signalled in the fragment payload itself. Generally this mechanism consists in tagging the fragment by the delivery area ID contained in the "serviceID" criterion of the partition that declares the ESG FLUTE session delivering the fragment.

However, implicit ESG fragment regionalization implies some restrictions and prevents ESG complementing scenarios that can help ESG acquisition service continuity. The tagging of individual fragments called "explicit ESG fragment regionalization based on delivery area ID" can therefore be used as a complementary mechanism. For this, ESG for DVB-SH proposes to encode the delivery area ID in the URI of the fragment ID, and in the URI of ESG Auxiliary Data.

5.2.1.2 Example

Figure 1 illustrates an example of ESG for DVB-SH. Taking the case where the transmitter transmits the Partially Available TS on a cell belonging to "Terrestrial Group of Cells 1", it will transmit DVB services 14, 5 and 53, but not DVB service 11 (filtered).

A Type 0 terminal will behave like a DVB-H ESG client and select the first ESG Entry matching the selected ProviderID. As this first ESG Entry declares the common ESG carousel 0, this terminal will seamlessly tune to this carousel and then to the related common ESG FLUTE sessions. The terminal will then tune to the common IPDC services, while ignoring the existence of local IPDC services.

A Type 1 or Type 2 terminal will detect that the selected ESG (ProviderURI) is regionalized by the presence of multiple ESGentries given for the related ProviderID. The terminal will use a (typically low-level) IP stream availability function to determine which announcement carousels are transmitted. Internally this function will find in the INT one matching target_IPxx_address descriptor for each declared carousel. The IP/MAC stream_location_descriptor of carousel 2 (224.10.8.37) will indicate that this IP stream belongs to DVB Service 11, and service_availability descriptor in SDT will indicate that this DVB service 11 is filtered. Thus, the terminal can conclude that carousel 2 is not transmitted.

From the two addresses remaining (224.3.2.04 and 224.7.1.12), the terminal will select 224.7.1.12 since appearing second in the ESG Entry loop. ESG announcement carousel to be monitored is then on this remaining address 224.7.1.12 carried on DVB service 5.

The subsequent selection and tuning to ESG FLUTE sessions follows IPDC phase 1 rules. In order to achieve implicit ESG regionalization later on, the terminal needs in addition to remember some delivery information (for Type 1 terminals: the FLUTE session identifier of each monitored ESG FLUTE session; for Type 2 terminals: the delivery area ID of the selected carousel, as well as, for each monitored ESG FLUTE session the delivery area ID contained in the "serviceID" criterion of the partition declaring this session).

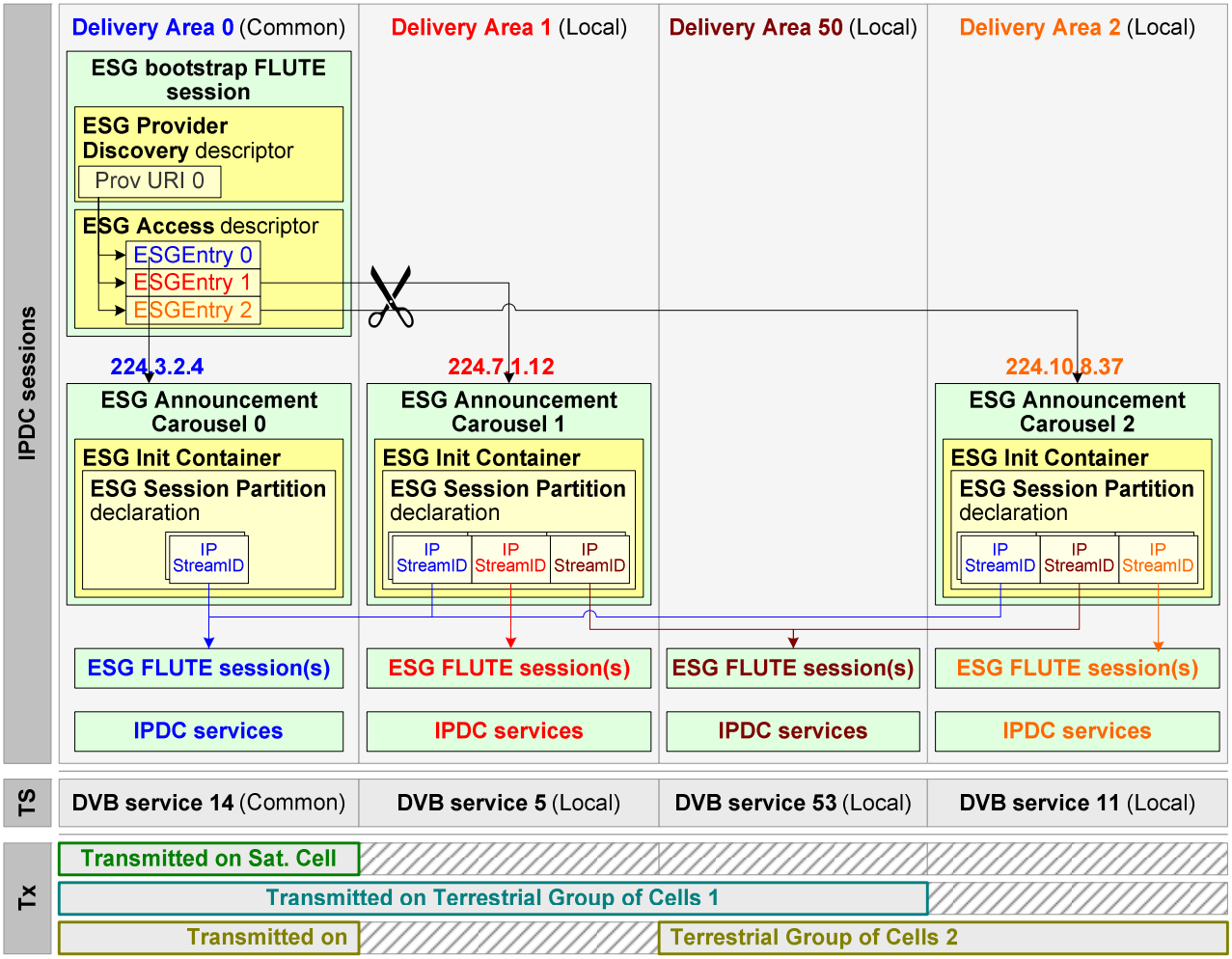


Figure 1: Example of ESG transport in a DVB-SH Partially Available Transport Stream

Some comments on figure 1:

- Relationship between ESG FLUTE sessions and IPDC services is not represented because this relationship is potentially complex (for example an Acquisition fragment distributed in an ESG FLUTE session of Delivery Area 1 can announce an IPDC service of Delivery Area 2 if it is explicitly tagged by delivery area ID = 2).
- As illustrated, DVB service numbering is totally decoupled from delivery area numbering.

5.2.2 Transport Stream, delivery areas, ESG and IPDC services configurations

5.2.2.1 Transport Stream configuration

This clause explains how the network must configure the Transport Stream in order to deploy ESG for DVB-SH.

The Transport Stream must carry the IP streams of one single IP platform.

The Transport Stream must be composed of the following DVB services:

- One common DVB service or more, available on all cells (satellite and terrestrial) where this TS is transmitted. In order to reduce PMT bitrate, the recommended configuration is one common DVB service.
- One local DVB service or more, not available on some of the cells where this TS is transmitted. On a given cell, zero, one or more local DVB services may be transmitted.

5.2.2.2 ESG sessions configuration

In case of DVB-SH full Transport Stream, the constitutive DVB services are by definition all common, and:

- the distributed ESGs can only be non-regionalized, i.e. they strictly comply with DVB-H ESG (TS 102 471 [1] and TS 102 592-1 [2]).

In case of DVB-SH Partially Available Transport Stream, the constitutive DVB services are common and local, and:

- the distributed ESGs announcing common IPDC services but no local IPDC services are typically not be regionalized (and then they strictly comply with DVB-H ESG as defined in TS 102 471 [1] and TS 102 592-1 [2]) however they can be regionalized also if it is wanted to use local DVB services to carry complementing common ESG data (see ESG instantation mechanism 5).
- the distributed ESGs announcing common and local IPDC services must be regionalized.

One common DVB service has the particularity of carrying the ESG bootstrap FLUTE session of the single IP platform of the TS (indeed it is recognized by the terminal as being common due to this particularity). For each ESG Provider URI, this DVB service must also carry the common ESG announcement carousel, which declares ESG FLUTE sessions transporting fragments valid for this ESG on all cells where the TS is transmitted. In case other common DVB services are transmitted, they must not carry ESG announcement carousels. For a regionalized ESG instance, ESG announcement carousels may also be carried by local DVB services. For a given ESG Provider URI, there must be at most one local ESG announcement carousel transmitted. Via the ESG session partition declaration, each local ESG announcement carousel can announce:

- at least all the ESG FLUTE sessions announced by the common ESG announcement carousel;
- other ESG FLUTE sessions carried by transmitted local DVB services.

The ESGEntries of a given ESG Provider ID must be carried by one single ESGAccessDescriptor. An ESGAccessDescriptor can be shared by multiple ESG ProviderIDs. The recommended IPDC phase 1 configuration (one single ESGProviderDiscovery descriptor, one single ESGAccessDescriptor) satisfies this model.

In this ESGAccessDescriptor, the ESGEntries of this ESG Provider ID must appear as a continuous sequence in the ESG Entry loop. In this sequence, the ESG Entry declaring the common ESG announcement carousel must appear first.

ESG FLUTE sessions declared from the current announcement carousel must all be available in the transmitted portion of the Transport Stream (said otherwise, the terminal never needs to check for the availability of an ESG FLUTE session declared from the selected announcement carousel). This implies in particular that an ESG FLUTE session declared from the common announcement carousel must always be carried by a common DVB service.

5.2.2.3 Delivery areas

A delivery area is a conceptual area defined to achieve regionalization of ESG data while at the same time decoupling ESG data and ESG sessions from below-IP transport information (like DVB service_id) and network infrastructure information (like cell_id).

For the ESG provider and service provider, a delivery area is a transport-agnostic and network-agnostic conceptual area where a well-defined set of related ESG sessions and IPDC services are instantiated. Delivery areas are defined by the ESG provider, in the scope of one ESG instance (ProviderURI).

For the Transport Stream originator or network provider, the delivery area is to be bound to an actual area of transmission in the DVB-SH network, i.e. in practice a subset of cells in the group of cells where the Partially Available Transport Stream is transmitted. The present document does not specify which entity in the network is in charge of defining this binding.

For the (Type 2) terminal, the delivery areas are used in a more restrictive manner, for the basic purpose of determining which acquired fragments are valid on the current cell. Type 0 and Type 1 terminals do not use delivery areas.

The ESG providers must indicate to the entity building the TS the following:

- For each IP stream (ESG sessions, other IPDC sessions), which ProviderURI/delivery area ID pair(s) it belongs to.
- For each ProviderURI, what are the dependencies between the related delivery area IDs (e.g. area 0 has no dependencies, area 1 has dependencies with area 0 and area 500, etc.)

From this information, the DVB services of the Partially Available Transport Stream can be safely constructed according to the following rules:

- IP streams assigned to delivery areas with ID = 0 (regardless of ProviderURI) must be carried by common DVB service(s).
- IP streams assigned to delivery areas with ID ≠ 0 (regardless of ProviderURI) must be carried by local DVB service(s).
- IP streams assigned to same ProviderURI/same delivery area ID must be carried by one single DVB service.
- IP streams assigned to same ProviderURI/different delivery area ID must be carried by different DVB services.
- IP streams assigned to different ProviderURIs may be carried or not in same DVB service.
- In the TS, the number of common DVB services and local DVB services should be minimal.

In a last step, and given some specified binding between delivery areas and DVB-SH cells, it is possible to construct the SDT and the service_availability_descriptor (if relevant) for each service entry.

Note that this binding is dynamic over time:

- For a given ProviderURI/delivery area defined by the ESG provider, the network entity in charge of the binding can decide to change TS identification or DVB service structuring or transmission cell selection, and this change is transparent for the ESG provider.
- For a given network binding (TS identification, DVB service structuring, transmission cell selection), a change of distribution area definition by the ESG provider (addition or deletion of an IP stream, change in distribution area dependencies) are likely however to impact at least on the DVB service structuring.

The delivery area is identified by 3-digit identifier (called "delivery area ID") unique in the scope of an ESG instance (ProviderURI). Several ranges of values are defined:

- 0: identifies the common delivery area targeted by the common announcement carousel.
- 1 to 499: identifies a local delivery area targeted by a local announcement carousel.
- 500 to 999: identifies a local delivery area targeted by no specific announcement carousel. This range allows some specific ESG instantiation mechanisms (6, 7 and 8).

For the range 0 to 499, the delivery area ID represents the index of ESG Entry declaring the targeting announcement carousel, index starting from zero in the continuous sequence of ESGentries assigned to the ProviderID.

EXAMPLE:

In the ESG ProviderDiscovery descriptor:

ProviderURI=myProv1.com ProviderID=18

ProviderURI=myProv2.com ProviderID=21

ProviderURI=myProv3.com ProviderID=54

In the ESG Access descriptor:

ESGentry 0 ProviderID=54 delivery area ID=0 for myProv3.com

ESGentry 1 ProviderID=54 delivery area ID=1 ""

ESGentry 2 ProviderID=21 delivery area ID=0 for myProv2.com

ESGentry 3 ProviderID=21 delivery area ID=1 ""

ESGentry 4 ProviderID=21 delivery area ID=2 ""

ESGentry 5 ProviderID=18 delivery area ID=0 for myProv1.com

ESGentry 6 ProviderID=18 delivery area ID=1 ""

5.2.2.4 IPDC services configuration

Similar to TS 102 471 [1] and TS 102 592-1 [2], with the additional consideration that is the responsibility of the ESG provider to properly instantiate the ESG so that a terminal of any type (0, 1 or 2), using Acquisition fragments and related SDP files, is never in the situation where it attempts to tune to an IPDC stream for which there is no PID (i.e. case of a local IP stream not transmitted). If the ESG provider follows ESG instantation mechanisms described in clause 5.3, proper terminal implementations should not face this error situation.

5.2.2.5 Explicit ESG fragment regionalization

Explicit ESG fragment regionalization is a mechanism that Type 2 servers can apply to individual ESG fragments of regionalized ESGs, to explicitly signal the delivery area of validity of these fragments. This signalling consists in storing the ID of this delivery area in the fragment ID (URI) of the fragment itself. More specifically:

- The fragment ID of a regionalized fragment must be a valid URI.
- Unless otherwise stated below, construction of this URI should follow the guidelines provided by TS 102 592-1 [2], clause "Identifiers within ESG XML fragments".

- In the URI, the pattern 'area999' (without quotes) must immediately follow the URI scheme (and the double slashes '//' if any), where 999 represents the 3-digit delivery area ID value in decimal representation (059, 002, etc). Valid examples are:

  somescheme:**area059**somecharacters

  dvbipdc://**area059**.myprovider/Channel1/Content1

  http://**area059**.myprovider.com/Channel1/Content1

- In line with TS 102 471 [1] and TS 102 592-1 [2], the present document does not mandate the use of a specific URI scheme in DVB-SH regionalized fragment identifiers. In any case, including the pattern 'area999' in the URI should satisfy the semantics defined by the URI scheme and should besides not trigger the obligation to register the area ID value with IANA or DVB, etc. In this regard, "urn:" scheme for a regionalized URI might not be a suitable choice, whereas "http:" scheme or "dvbipdc:" scheme (proposed in TS 102 592-1 [2]) would be.

- In a regionalized ESG delivered over DVB-SH, all fragment identifiers must use the same URI scheme. This constraint is meant to ensure that 'area999' pattern is included at a fixed position in all fragment identifiers of the same ESG.

For non-regionalized ESGs delivered over DVB-SH (instantiated by Type 0 and Type 1 servers):

- ESG fragments must not be explicitly regionalized (i.e. 'area999' pattern must not be found in fragment identifiers).

For regionalized ESGs delivered over DVB-SH (instantiated by Type 1 servers):

- All fragment identifiers of the same ESG must use the same URI scheme. This constraint allows the terminal to find the 'area999' pattern (when present) at a fixed position in the fragment IDs of the same ESG.

- All Service fragments of the ESG must be explicitly regionalized. This constraint is meant to enable proper definition and comparison of ESG session partitioning range values, as serviceID of Service fragment is one ESG session partition criterion:

  dvbipdc://**area059**.myprovider/Channel1/

  dvbipdc://**area059**.myprovider/Channel2/

  dvbipdc://**area002**.myprovider/Channel3/

- ESG fragments other than Service fragments must be explicitly regionalized whenever ESG instantiation mechanisms in use require so (as per clause 5.3).

- Otherwise, ESG fragments may or may not be explicitly regionalized. If a fragment is not explicitly regionalized, delivery area ID of validity will be implicitly inferred by the terminal (implicit ESG fragment regionalization). Systematically applying explicit regionalization to all fragments simplifies fragment identifier generation, whereas relying on implicit regionalization (when possible) saves transport bandwidth and terminal storage space (at least 7 bytes per fragment).

5.2.3 Terminal behaviour

5.2.3.1 ESG Bootstrap

5.2.3.1.1 Tuning to ESG Bootstrap session of preferred IP platform

Identical to TS 102 471 [1] and TS 102 592-1 [2].

5.2.3.1.2 Selecting ESG provider URI from ESG ProviderDiscovery descriptor(s)

Identical to TS 102 471 [1] and TS 102 592-1 [2].

5.2.3.1.3 Selecting ESG Entry from ESG Access descriptor(s)

Identical to TS 102 471 [1] and TS 102 592-1 [2].

5.2.3.1.4 Tuning to ESG announcement carousel

Identical to TS 102 471 [1] and TS 102 592-1 [2], with the following change for Type 1 and Type 2 terminals if multiple ESGentries are found for the same ESG Provider URI:

- In that case, this denotes a regionalized ESG.
- Starting from first ESG Entry associated to a given ProviderURI, the terminal then determines for each ESG Entry if the associated ESG announcement carousel is transmitted or not, using an IP stream availability function.
- The terminal stops parsing the ESGEntries if next ESG Entry is associated with another ESG Provider URI, or if two transmitted ESG announcement carousels are found.
- If one single transmitted ESG announcement carousel is found, this is the common ESG announcement carousel, to be monitored.
- If two transmitted ESG announcement carousels are found, the terminal knows that the first one appearing in the loop is the common carousel, and therefore the other one is the local ESG announcement carousel, to be monitored.

NOTE: The terminal can also identify the common ESG announcement carousel as the carousel carried by the DVB service transporting also the ESG bootstrap session.

- From the position of selected ESG Entry in the ESG Entry loop, the terminal can infer the ID of the delivery area of the announcement carousel.

5.2.3.2 ESG acquisition

5.2.3.2.1 Selecting ESG FLUTE sessions from ESG Session Partition Declaration

Identical to TS 102 471 [1] and TS 102 592-1 [2].

5.2.3.2.2 Tuning to ESG FLUTE sessions

Identical to TS 102 471 [1] and TS 102 592-1 [2].

5.2.3.2.3 Using ESG indexing

Identical to TS 102 471 [1] and TS 102 592-1 [2].

5.2.3.2.4 ESG storage

Identical to TS 102 471 [1] and TS 102 592-1 [2], with the following changes, in case the ESG instance (identified by one ProviderURI) is regionalized, as signalled by the presence of multiple ESGentries for the corresponding ProviderID:

For Type 1 terminals:

- Implicit ESG fragment regionalization, which consists for Type 1 terminals in tagging each fragment with the identifier of the FLUTE session which delivered the fragment:
  - How the terminal defines the identifier of a FLUTE session is implementation-dependent, however for a given ProviderURI this identifier must be unique given the set of {IP version, source IP address, destination IP address, port, TSI} found in IPstreamID declaration.

For Type 2 terminals:

- Tagging of each stored fragment with the three-digit ID of the delivery area for which this fragment is deemed valid:
  - (**Implicit regionalization**, for fragments other than Service fragments) The delivery area ID to be used for tagging is by default the ID of the delivery area of the selected carousel (inferred from ESG Entry position in entry loop of ESG Access descriptor).
  - (**Implicit regionalization**, for fragments other than Service fragments) The delivery area ID determined in previous step is overridden by the delivery area ID inferred from the serviceID criterion of the partition which declares the ESG FLUTE session delivering the fragment, under the condition that this delivery area ID is well-defined, which is the case if:
    - both 'start_field_value' and 'end_field_value' of serviceID criterion are URI starting by "dvbshipdc:" scheme (which implies the presence of 'area999' pattern).
    - start_field_value and end_field_value express one single value (and not a range) of delivery area ID.

EXAMPLE:

The delivery area ID would be equal to 001 if:

```
start_field_value = "dvbipdc://area001.myprovider/" and
end_field_value   = "dvbipdc://area001.myprovider/Ch3"
```

But would be undefined whenever a range of areaIDs is expressed:

```
start_field_value = "dvbipdc://area001.myprovider/" and
end_field_value   = "dvbipdc://area003.myprovider/"
```

Or when 'area999' is not following URI scheme:

```
start_field_value = "dvbipdc://myprovider.com/Ch1" and
end_field_value   = "dvbipdc://myprovider.com/Ch3"
```

  - (**Explicit regionalization**): The delivery area ID determined in previous step(s) is overridden when present by the delivery area ID explicitly signalled in the URI of the fragment ID itself (as defined above).

5.2.3.3 ESG browsing and service consumption

5.2.3.3.1 Displaying ESG information relevant to current location

For Type 0 terminal implementations, identical to TS 102 471 [1] and TS 102 592-1 [2]. However, if the ESG provider uses ESG instantiation mechanisms 12 and 13, this type of terminal might attempt to purchase a service bundle which includes not only common services but also local services.

- The first issue will be commercial: the user can purchase local services for which his or her terminal cannot access to.
- The second issue will be operational: as a Type 0 terminal does not implement any IP stream availability function, it will get an error when attempting to tune to non-transmitted local IP streams (declared by Acquisition fragments referenced by the local Service fragments parts of the service bundle).

To avoid this situation:

- ESG providers instantiating mechanisms 12 and 13 should describe the content of the service bundles very clearly.
- Terminals of type 0 might at a minimum check for the presence of a pattern /area999/ in the ID of the Service fragments part of a Service Bundle, and if the area ID is different from 000, do not propose the user to purchase this bundle.

For Type 1 terminal implementations, identical to TS 102 471 [1] and TS 102 592-1 [2], with the following changes:

- When tuned to a Partially Available Transport Stream, and subsequently to ProviderURI selection, the terminal must determine the IDs of all the ESG FLUTE sessions declared in the ESG session partition declaration (all of them, not just the ESG FLUTE sessions of immediate interest for the terminal).
- Knowing this list of FLUTE session IDs, the terminal should present to the user a current ESG subset made of:
  - the ESG fragments currently stored in the terminal which are tagged by any of these FLUTE session IDs.
- The terminal must in a second stage remove from this subset the fragments which are not valid in the current location. This can be done for instance as follows:
  - First check for the actual validity of the Acquisition fragments of the subset, which consists in verifying (using an IP stream availability function) if all the IP addresses given in the related SDP are really transmitted in the actual TS.
  - Second discard from the ESG subset the invalid Acquisition fragments, as well as the invalid ScheduleEvent and Service fragments (i.e. which reference no valid Acquisition fragments), as well as the invalid Content fragments (i.e. which reference no valid Service fragment).

For Type 2 terminal implementations, identical to TS 102 471 [1] and TS 102 592-1 [2], with the following changes:

- When tuned to a Partially Available Transport Stream, and subsequently to ProviderURI selection, the terminal must determine the IDs of the delivery areas it is currently located in. This list of delivery area IDs includes:
  - the ID of the delivery area of the selected carousel, inferred from the position of the related ESG Entry in the ESG Access descriptor;
  - the delivery area ID "zero" (if not already included in the list);
  - any delivery area ID in range 500 to 999 encountered in "serviceID" partition criteria of the ESG session partition declaration.
- Knowing this list of delivery area IDs, the terminal should present to the user a current ESG subset made of:
  - the ESG fragments currently stored in the terminal which are tagged by any of these delivery area IDs;
  - any other fragments referenced by these fragments, and then any fragments referenced by these other fragments, etc. ESG instantiation mechanisms described in the present document ensure that the chain of fragment references can always been resolved.
- The terminal must in a second stage block the use of the referenced Acquisition fragments which are not tagged by delivery area IDs.
- As an example, in ESG instantiation mechanisms 12 and 13, the terminal on satellite cell would present:
  - the common ServiceBundle fragments;
  - the common and local Service fragments referenced by these common ServiceBundle fragments;
  - the Acquisition fragments referenced by the common Service fragments;
  - the common "interactive" Acquisition fragments referenced by the local Service fragments;
  - but would block the use of the local Acquisition fragments referenced by the local Service fragments.

5.2.3.3.2 Accessing IPDC services from ESG

Broadcast access to IPDC services is announced in the ESG, via Acquisition fragments and associated SDP files. At the time of service consumption, the question arises in which case the terminal should check (using an IP stream availability function) the availability of the related IP streams (audio/video streams, key streams, generic file delivery sessions, etc.) before tuning to them:

- If the ESG is not regionalized, Type 0, Type 1 and Type 2 terminals do not need this check as a non-regionalized ESG always scopes common IP streams.
- If the ESG is regionalized:
  - A Type 0 terminal implementation (which is not able to perform this check anyway) will safely tune to the announced IP streams, as all Acquisition fragments delivered in common area declare common IPDC services.
  - A Type 1 terminal implementation must systematically check the availability of these IP streams.
  - A Type 2 terminal implementation does not need to perform this check, as it is guaranteed that the Acquisition fragments tagged by a given delivery area ID declare IPDC streams distributed on this same delivery area.

5.2.3.4 Mobility and acquisition service continuity

For Type 0, Type 1 and Type 2 terminals moving to target cell where a different TS is transmitted: identical to TS 102 611-2 [i.4]. In most cases (and as signalled in the INT), very few IP streams should be common between source cell and target cell. It is unlikely also that a global ESG instance (identified by a ProviderURI) can be transmitted identically in two different Transport Streams, meaning ESG acquisition restart is expected when tuning on target TS. For Type 0 terminals moving to target cell where same TS is transmitted: identical to TS 102 611-2 [i.4]. These terminals can only be tuned to IP streams carried by common DVB services, which are transmitted everywhere. Said otherwise, this is the handover case "same TS, change of cell_id, same or different network_id" based in NIT only.

For Type 1 and Type 2 terminals moving to target cell *where same TS is transmitted*, two cases of ESG acquisition service continuity should be considered:

1) The terminal is acquiring the ESG (and may consume IPDC services at the same time).

   If the set of DVB services transmitted on source and target cell are exactly the same, then handover can be performed on all received sessions (including the ESG ones).

   Otherwise, some ESG sessions are likely to differ from source cell to target cell, however a rerun of full ESG bootstrapping procedure on target cell should be avoided. Instead, the terminal should attempt to perform a handover on ESG sessions monitored on source cell, that are known to be transmitted on target cell. This typically includes the ESG bootstrap FLUTE session and the common ESG FLUTE sessions.

   The terminal should also attempt service continuity on the ESG announcement carousel, when possible. For this, various strategies are possible:

   a) The terminal could determine in advance (on source cell, before attempting handover) the IP address of ESG Announcement Carousel on target cell (according to ESG Access descriptor of common ESG bootstrap session, and using an IP stream availability function). This selection follows the principles of selection of ESG announcement carousel in actual TS.

      Two cases depending if IP addresses of source and target carousels are the same or not:

      If they are the same, service continuity for all ESG sessions (bootstrap, carousel and FLUTE sessions) should be attempted.

      If they are different, and since at least the ESG bootstrap FLUTE session and the common ESG FLUTE sessions are IP flows common to source and target cells, the terminal should attempt ESG acquisition service continuity on these, while tuning to target ESG Announcement Carousel in the background. In any case, a full ESG bootstrapping procedure should be avoided.

b) Alternatively, the terminal could avoid determining in advance (on source cell) the ESG carousel on target cell, by always tuning to common ESG carousel when moving on target cell. In a second stage (on target cell in the background), the terminal would then determine if a local ESG carousel is transmitted, and tune to it if there is one. This method is quite efficient for the transitions:

"satellite → terrestrial" (handover on common ESG carousel, followed by carousel selection procedure that will indicate the local ESG carousel to tune to).

"terrestrial → satellite" (tuning to common ESG carousel, followed by carousel selection procedure that will confirm common ESG carousel is the one to be tuned to).

But is less efficient for the other transition:

- "terrestrial → terrestrial, different ESG carousel" (tuning to common ESG carousel, followed by carousel selection procedure that will select a local carousel - transition thus involving two ESG carousel tunings on target cell).

NOTE: Transition "terrestrial → terrestrial, same ESG carousel" should occur in the situation "same DVB services transmitted on both source and target cell", for which there is no service continuity issue.

2) The terminal is not acquiring the ESG (but could consume IPDC services at the same time).

The terminal should determine if the set of DVB services being transmitted has changed or not, from source cell to target cell.

If it has not changed, the terminal may defer ESG bootstrapping and acquisition.

If it has changed, the terminal could initiate ESG bootstrapping and acquisition.

5.3 ESG instantiation mechanisms

This clause describes how a complete ESG (identified by one ESG Provider URI) can be instantiated in a Partially Available Transport Stream. This description consists in a set of instantiation mechanisms which the ESG provider may combine to achieve various ESG distribution scenarios.

For the clarity of the description, a few concepts are defined:

- **Current delivery area:** in the scope of the selected ESG instance (ProviderURI), delivery areas where a (Type 2) terminal is currently located. Current delivery areas are by definition bound to current cell. Practically, all the ESG and IPDC sessions instantiated in this delivery area are available to the (Type 2) terminal on current cell. The terminal may be located in several delivery areas at a time, and this list includes at least the delivery area of the selected carousel, as well as the common delivery area.

- **Neighbouring delivery area:** delivery area scoped by the selected ESG instance (ProviderURI), bound to a neighbouring cell but not to the current cell. The (Type 2) terminal can determine the presence of neighbouring delivery areas by checking the availability on neighbouring cells of local carousels different from currently selected carousel, using an IP stream availability function as well as the ESGentries of same ProviderID in the ESG Access descriptor.

- **Valid fragment:** ESG fragment which the terminal can safely present to the user with regard to the IPDC services available on the current cell. Technically, a fragment is valid if it is tagged by the ID of one of the current delivery areas.

- **Common fragment:** ESG fragment valid in the common delivery area, i.e. on all the cells where the ESG instance is transmitted.

- **Local fragment:** ESG fragment valid in a local delivery area.

- **Complete ESG:** consistent ESG instance identified by one ProviderURI. The complete ESG spans over one, several or all cells where the TS is transmitted. Typically, only self-contained ESG subsets of this complete ESG are transmitted on a given cell.

- **ESG subset (or regionalized ESG):** consistent subset of a complete ESG, aiming to announce the IPDC services available on a defined list of delivery areas. This subset is self-contained, i.e. fragments referenced by the fragments of this subset are also part of the subset. An ESG subset has no identifier. When moving from one cell to another, the terminal would typically acquire a new ESG subset. ESG subsets acquired in the different cells where the ESG is transmitted can be safely merged into the terminal so to construct the complete ESG.
- **Current ESG subset:** ESG subset delivered on the current delivery area(s) aiming to announce the IPDC services available on these delivery areas.
- **Neighbouring ESG subset:** ESG subset delivered on the current delivery area aiming to announce the IPDC services available on a neighbouring delivery area where the ESG instance is also transmitted.
- **Common ESG subset:** ESG subset aiming to announce the IPDC services available on common delivery area.
- **Local ESG subset:** ESG subset aiming to announce the IPDC services available on some local delivery area(s).

The described instantiation mechanisms pay special attention to ESG consistency, so to guarantee that any type of terminal cold-bootstrapping on any cell, and with no interaction channel capabilities, can still acquire a self-contained consistent ESG subset announcing all the IPDC services available on this cell. To achieve ESG subset consistency, the following rules apply:

- A fragment distributed in a set of delivery area(s) can only reference fragments distributed in this set.
- For a given ESG (Provider URI), fragments identified by a given pair {fragment ID, version} and distributed in delivery areas must all be equal bitwise.

5.3.1 ESG instantiation mechanism 1

Title	Delivering a common ESG subset, for minimal announcement of common programs (available everywhere)
Usage	A user cold-bootstrapping on satellite cell can discover all common programs, and purchase access to them.
Implementations	Server: Type 0 and Type 1. Terminal: Type 0, Type 1 and Type 2.
Technical realization	Common ESG subset is delivered by so-called common ESG FLUTE sessions, targeting common delivery area. Common ESG FLUTE sessions are announced by common ESG carousel, and must be announced also by each local ESG carousel. In order to save satellite bandwidth, common ESG FLUTE sessions are typically partitioned using « time » criterion, so to limit time depth of common ESG subset (e.g. < 3 days). Type 1 servers must explicitly tag common Service fragments with delivery area ID 'zero'. Otherwise (for other types of fragments), implicit ESG regionalization is sufficient.
Comments	For ESG consistency reasons, a common ServiceBundle cannot reference local Service fragments, so a mixed « common + local » Service Bundle cannot be part of this common ESG subset. This means that a terminal cold-bootstrapping on satellite cell would first subscribe to a common ServiceBundle, and when moving to a terrestrial cell, would then subscribe to a local ServiceBundle encompassing both common and local IPDC services. Note that common ServiceBundles should always be instantiated (even if common+local ServiceBundles are besides available on local areas) for two reasons: first, a Type 0 terminal will never see the common+local ServiceBundles, second a Type 1 or Type 2 terminal cold-bootstrapping on satellite must have a means to purchase access to the common IPDC services.
Dependencies	None.
Status	This mechanism must be used by ESG providers.
Example	See figure 2.

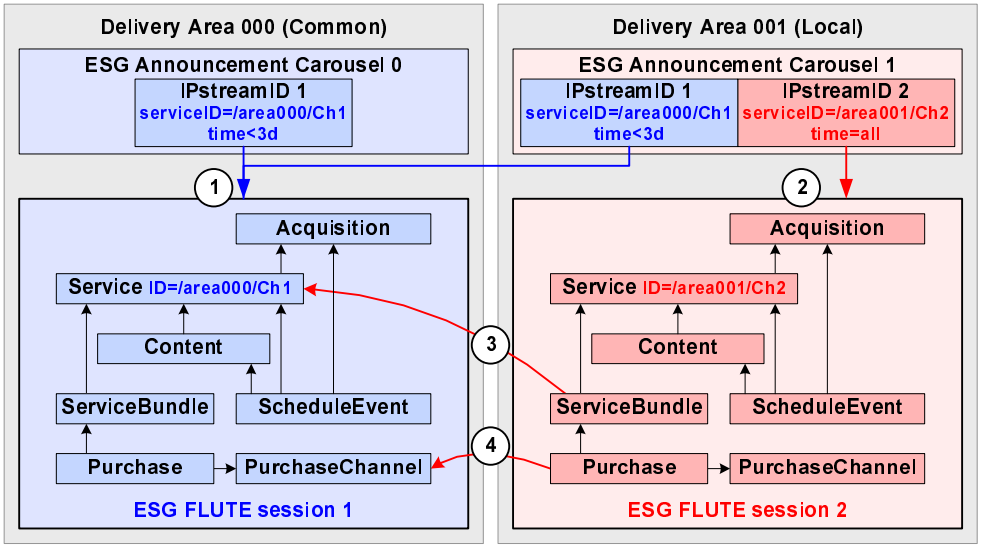


Figure 2: ESG instantiation mechanisms 1, 2, 3 and 4

5.3.2 ESG instantiation mechanism 2

Title	Delivering a local ESG subset, for full announcement of local programs available on current terrestrial reception
Usage	The user can discover and access to all local programs available on current terrestrial reception.
Implementations	Server: Type 1. Terminal: Type 0 (will safely ignore), Type 1 and Type 2.
Technical realization	The fragments of this local ESG subset are delivered in ESG FLUTE sessions belonging to the delivery area of the local « active » ESG carousel. Type 1 servers must explicitly tag the local Service fragments with delivery area IDs in the range of 001 to 499. Otherwise (for other types of fragments), implicit ESG regionalization is sufficient.
Comments	When mechanisms 3 and 4 are not used, common and local ESG subsets are totally independent. Still, they are part of the same ESG instance, identified by ESG Provider URI.
Dependencies	None.
Status	This mechanism must be used by ESG providers which announce local programs.
Example	See figure 2.

5.3.3 ESG instantiation mechanism 3

Title	Merging common and local service bundles
Usage	Reduce the number of service bundles presented to the user. Using this mechanism, one single (local) Service Bundle can encompass all common and local programs available on current terrestrial reception.
Implementations	Server: Type 1. Terminal: Type 0 (will safely ignore), Type 1 and Type 2.
Technical realization	The same local ServiceBundle fragment is referencing common Service fragments as well as local Service fragments.
Comments	For ESG consistency reasons, the other way around is not possible (i.e. a common ServiceBundle fragment cannot reference local Service fragments).
Dependency	This mechanism needs mechanisms 1 and 2 to be deployed also.
Status	This mechanism should be used by ESG providers which announce bundles mixing common and local services.
Example	See figure 2.

5.3.4 ESG instantiation mechanism 4

Title	Sharing common Purchase Channel information
Usage	Reduce the number of PurchaseChannel entry points, while saving terrestrial bandwidth.
Implementations	Server: Type 1. Terminal: Type 0 (will safely ignore), Type 1 and Type 2.
Technical realization	Purchase fragments delivered in local ESG FLUTE sessions can reference a common PurchaseChannel fragment. Transmission of PurchaseChannel fragments in local ESG FLUTE sessions can be avoided this way.
Dependencies	This mechanism needs mechanisms 1 and 2 to be deployed also.
Status	This mechanism may be used by ESG providers.
Example	See figure 2.

5.3.5 ESG instantiation mechanism 5

Title	Complementing the common ESG subset on terrestrial path
Usage	On terrestrial cell, ESG announcement of common services is provided to user with a greater time depth (greater than on satellite cell).
Implementations	Server: Type 1. Terminal: Type 0 (will safely ignore), Type 1 and Type 2.
Technical realization	A local ESG FLUTE session carries fragments belonging to common ESG subset. In local ESG carousel, partition criteria for this FLUTE session are « serviceID » of a common ESG Service fragment, and « time » (e.g. > 3 days). Possible common fragments delivered in this FLUTE session can be Acquisition, Content and ScheduleEvent fragments. NOTE: Since common Service fragments are tagged by delivery area ID 'zero' (see instantiation mechanism 1), the serviceID criterion in local partition declaration is tagged by delivery area ID 'zero' as well.
Comments	Implicit ESG regionalization is sufficient for the fragments delivered this way.
Dependencies	This mechanism needs mechanisms 1 and 2 to be deployed also.
Status	This mechanism may be used by ESG providers.
Example	See figure 3.

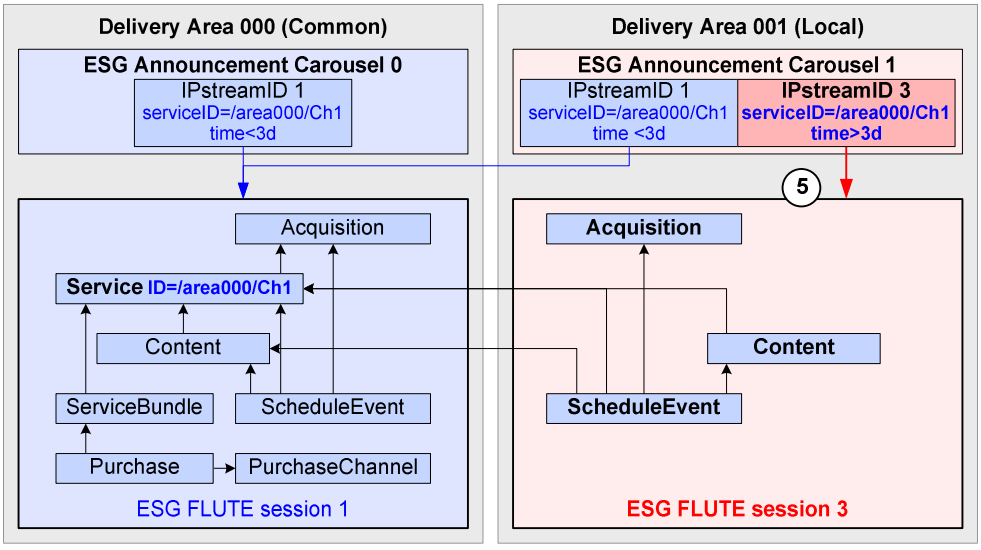


Figure 3: ESG instantiation mechanism 5

5.3.6 ESG instantiation mechanism 6

Title	Announcing global terrestrial services
Usage	Some IPDC services not transmitted on satellite cell may happen to be available on most – if not all - terrestrial cells. Instead of instantiating these IPDC services in each local delivery area, a separate local delivery area can be defined to instantiate once these IPDC services, local delivery area to be bound to most terrestrial cells.
Implementations	Server: Type 1. Terminal: Type 0 (will safely ignore), Type 1 and Type 2.
Technical realization	A global-terrestrial delivery area is specifically created for the distribution of programs available on most terrestrial cells but not on satellite cell. This delivery area instantiates also ESG FLUTE sessions with fragments announcing these programs, but no ESG announcement carousel. Instead, it is up to the ESG carousels of local-terrestrial delivery areas to announce these ESG FLUTE sessions.
Comments	Type 1 servers must explicitly tag global terrestrial Service fragments with delivery area IDs in the range of 500 to 999. Otherwise (for other types of fragments), implicit ESG regionalization is sufficient. Advantage of this mechanism is: better grouping of ESG data and IPDC service distribution. Drawback is: increase of PMT bitrate on terrestrial path.
Dependencies	This mechanism needs mechanism 2 to be deployed also.
Status	This mechanism may be used by ESG providers.
Example	S See figure 4.

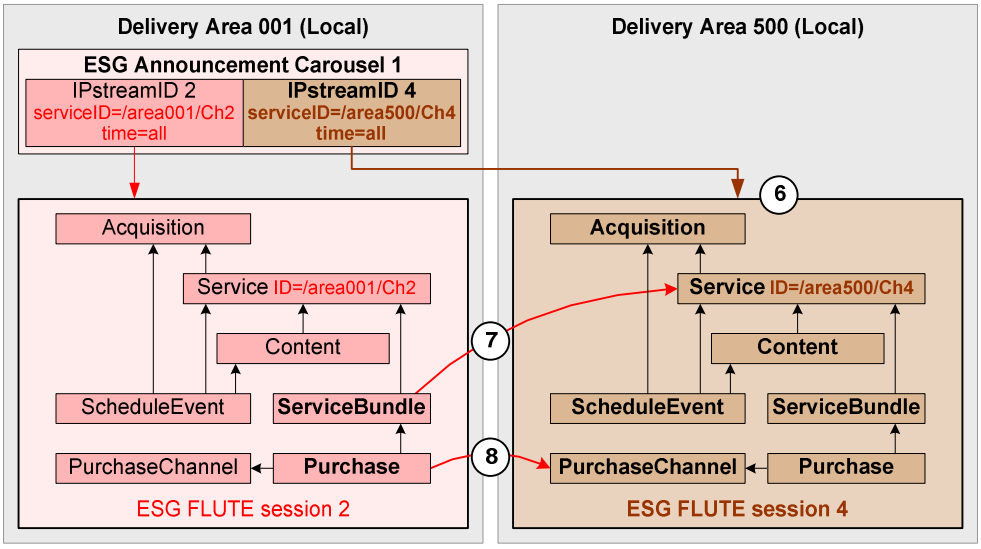


Figure 4: ESG instantiation mechanisms 6, 7 and 8

5.3.7 ESG instantiation mechanism 7

Title	Bundling local and global terrestrial services
Usage	Reduce the number of service bundles presented to the user. Using this mechanism, one local-terrestrial Service Bundle can encompass all local and global terrestrial programs available on current terrestrial cell.
Implementations	Server: Type 1. Terminal: Type 0 (will safely ignore), Type 1 and Type 2.
Technical realization	The same local-terrestrial ServiceBundle fragment is referencing global-terrestrial Service fragments as well as local-terrestrial Service fragments.
Comments	For ESG consistency reasons, the other way around is not possible (i.e. a global-terrestrial ServiceBundle fragment cannot reference local-terrestrial Service fragments).
Dependencies	This mechanism needs mechanism 2 to be deployed also.
Status	This mechanism should be used by ESG providers.
Example	See figure 4.

5.3.8 ESG instantiation mechanism 8

Title	Sharing global-terrestrial Purchase Channel information
Usage	Reduce the number of PurchaseChannel entry points.
Implementations	Server: Type 1. Terminal: Type 0 (will safely ignore), Type 1 and Type 2.
Technical realization	Purchase fragments delivered in local-terrestrial ESG FLUTE sessions can reference a global-terrestrial PurchaseChannel fragment. Transmission of PurchaseChannel fragments in local-terrestrial ESG FLUTE sessions can be avoided this way.
Dependencies	This mechanism needs mechanism 2 to be deployed also.
Status	This mechanism may be used by ESG providers.
Example	See figure 4.

5.3.9 ESG instantiation mechanism 9

Title	Delivering a minimal local ESG subset of a neighbouring delivery area
Usage	Terminal is aware of the presence of a neighbouring delivery area (i.e. using ESG Access descriptor and IP stream availability function, it can determine the availability of another local announcement carousel on a neighbouring cell), and acquires silently on current local delivery area a minimal ESG subset valid for the neighbouring delivery area. When moving to neighbouring cell, the available programs can be presented immediately to the user using this minimal ESG subset.
Implementations	Server: Type 1. Terminal: Type 0 (will safely ignore), Type 1 (must perform systematic IP stream availability check) and Type 2.
Technical realization	On the current local delivery area, the ESG carousel announces specific ESG FLUTE sessions delivering the ESG subset of the neighbouring delivery area. Type 1 servers must explicitly tag the local Service fragments of this ESG subset with delivery area IDs in the range of 1 to 49. Otherwise (for other types of fragments in this subset), implicit ESG regionalization is sufficient.
Comments	Implicit ESG regionalization is here sufficient.
Dependencies	This mechanism needs mechanism 2 to be deployed also.
Status	This mechanism may be used by ESG providers.
Example	See Figure 5.

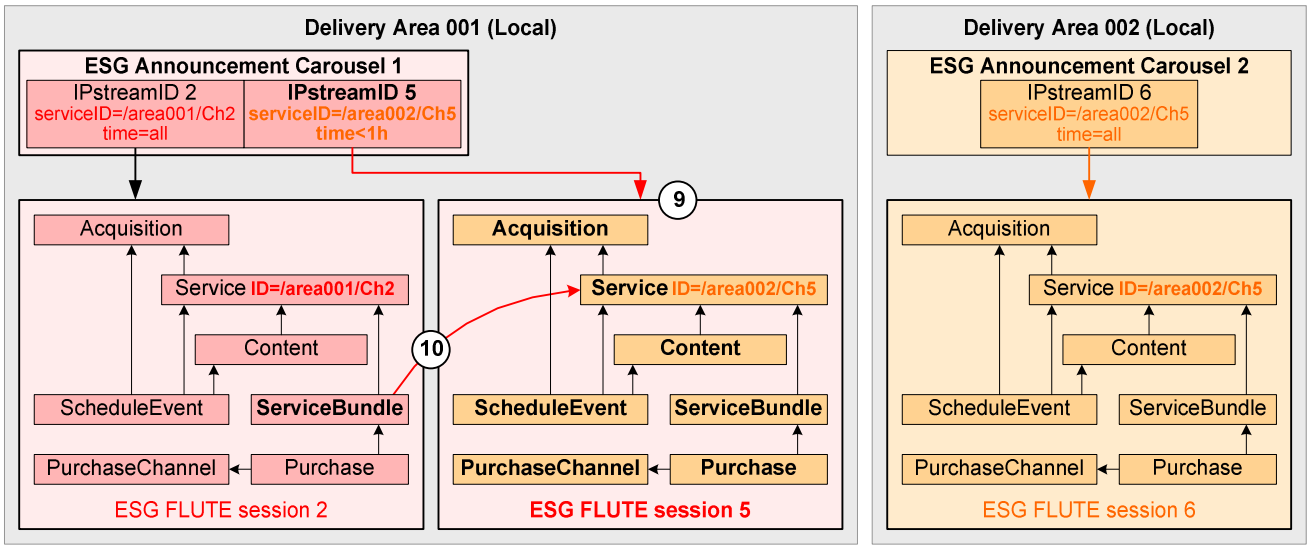


Figure 5: ESG instantiation mechanisms 9 and 10

5.3.10 ESG instantiation mechanism 10

Title	Bundling the offering of IPDC services available in different local delivery areas
Usage	Reduce the number of service bundles presented to the user. Using this mechanism, one local Service Bundle can encompass programs of current local delivery area, and programs of a neighbouring local delivery area, for which local ESG subset is besides delivered in current local delivery area.
Implementations	Server: Type 1. Terminal: Type 0 (will safely ignore), Type 1 (must perform systematic IP stream availability check) and Type 2.
Technical realization	A local ServiceBundle fragment in current local delivery area is referencing Service fragments delivered in this same delivery area, some being valid on current delivery area, others being valid in another local delivery area.
Comments	For ESG consistency reasons, the other way around is not possible (i.e. a global-terrestrial ServiceBundle fragment cannot reference local-terrestrial Service fragments)
Dependencies	This mechanism needs mechanism 9 to be deployed also.
Status	This mechanism should be used by ESG providers.
Example	See Figure 5.

5.3.11 ESG instantiation mechanism 11 (not recommended)

Title	Passively delivering fragments of neighbouring local services
Usage	The user can quickly visualize which local programs are available when moving to a neighbouring local delivery area.
Implementations	Server: Type 1. Terminal: Type 0 (will safely ignore), Type 1 (must perform systematic IP stream availability check) and Type 2.
Technical realization	In the ESG FLUTE sessions of current local delivery area are also delivered a few fragments that are only valid for neighbouring delivery areas. These fragments are explicitly regionalized. The terminal stores them without too much reasoning. They may be used later to resolve dependencies between fragments (like Mechanism 10) or to initialize ESG acquisition when moving to a neighbouring delivery area.
Comments	This mechanism is problematic because the serviceID which the neighbouring fragments relate to is not declared in the ESG partition declaration. Unless indexing is used, the terminal cannot know in which FLUTE session these neighbouring fragments are delivered. Also, these neighbouring fragments do not necessarily constitute a consistent subset on their own (although they might help local ESG subset of current delivery area(s) to remain consistent). Consistency can easily be broken.
Dependencies	This mechanism needs mechanism 2 to be deployed also.
Status	This mechanism should not be used by ESG providers.
Example	See figure 6.

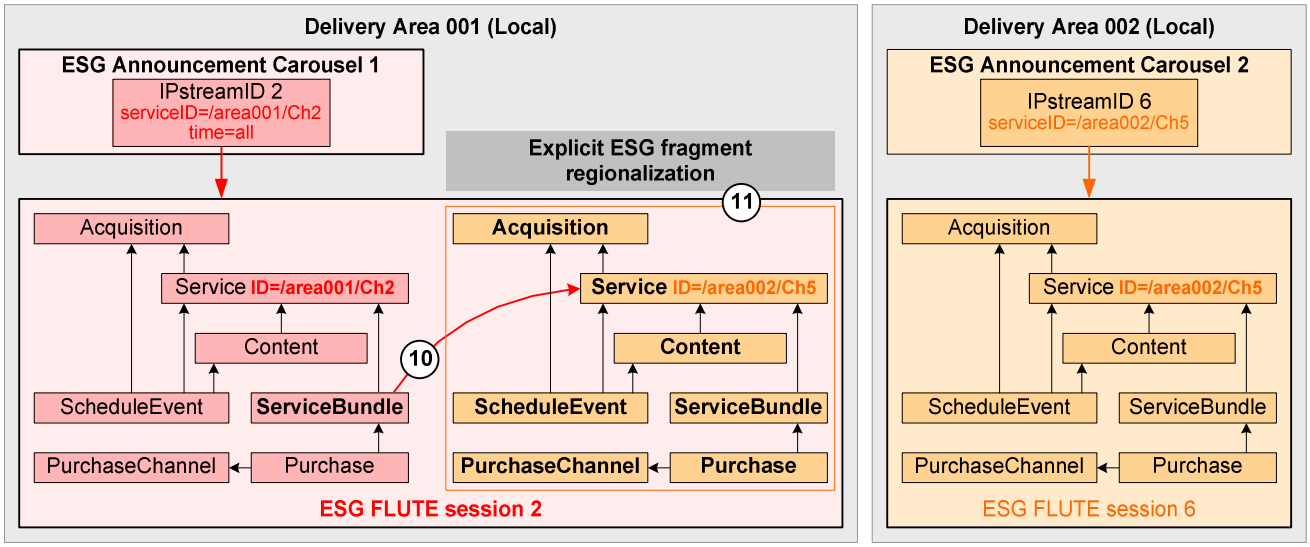


Figure 6: ESG instantiation mechanism 11 (not recommended)

5.3.12 ESG instantiation mechanism 12

Title	Presenting everywhere some minimal information on all common and local IPDC services.
Usage	The user is presented with an elementary description of all common and local IPDC services (even on satellite cell). Further display indication shows which services are available or not on current cell. The user is even able to purchase a mixed bundle of common/local services on satellite cell.
Implementations	Server: Type 1. Terminal: Type 0 (must not display service bundles which include local services), Type 1 (must perform systematic IP stream availability check) and Type 2.
Technical realization	A dedicated ESG FLUTE session is instantiated in common delivery area to deliver all the local Service fragments available on local delivery areas for this ESG instance (ProviderURI), as well as all the Acquisition fragments referenced by these Service fragments (for ESG consistency reasons). The serviceID partition criterion of this session expresses a range of local delivery area IDs.
Comments	All fragments delivered this way must be explicitly regionalized. Local Service and Acquisition fragments delivered on common delivery area must be totally identical as those delivered on local delivery areas. This implies that these local fragments are explicitly regionalized in both common and local services.
Dependencies	This mechanism needs mechanism 2 to be deployed also.
Status	This mechanism is encouraged to be used by ESG providers.
Example	See figure 7.

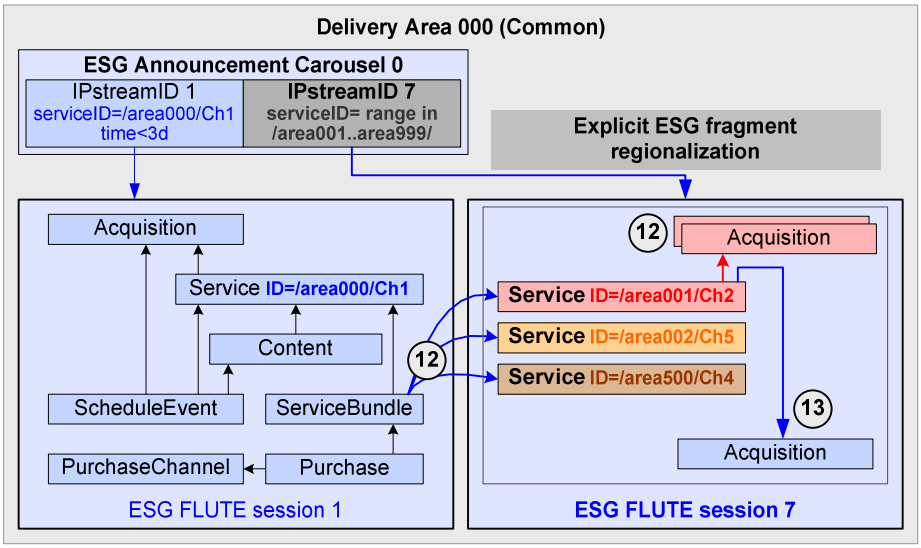


Figure 7: ESG instantiation mechanism 12 and 13

5.3.13 ESG instantiation mechanism 13 (IPDC phase 2)

Title	Giving alternative point-to-point access to local broadcast IPDC services on cells (especially satellite cell) where these local broadcast services are not available
Usage	On satellite cell, the user has no broadcast access to local TV channels, but can still access to them using point-to-point bearers.
Implemen-tations	Server: Type 1. Terminal: Type 0 (must not display service bundles which include local services), Type 1 (must perform systematic IP stream availability check) and Type 2.
Technical realization	If the common ESG FLUTE session which delivers local Service fragments, a common Acquisition fragment of DeliveryChannel type "interactive" is delivered also, pointed by a local Service fragment. This Acquisition fragment is explicitly regionalized (i.e. acquisitionID contains the ID of common delivery area, i.e. zero).
Comments	All fragments delivered this way must be explicitly regionalized. For ESG consistency reason, "interactive" Acquisition fragments delivered in common delivery area must be delivered also on the local delivery areas where the local Service fragments are available (bitwise identical Acquisition fragments, meaning in particular tagged also by common delivery area ID). This instantiation mechanism is provided for information, as Acquisition fragments of DeliveryChannel type "interactive" are not in the scope of the present document.
Dependencies	This mechanism needs mechanisms 1 and 12 to be deployed also.
Status	This mechanism should be used by ESG providers when broadcast services not available on current cell are wanted to be accessed via interactive channel.
Example	See figure 7.

5.4 Summary change from IPDC phase 1

For ESG for DVB-SH, changes that are perceptible to an IPDC phase 1 terminal implementation are the following:

- For Type 0, Type 1 and Type 2 terminal implementations, if the ESG is not regionalized: none
- For Type 0 terminal implementations, if the ESG is regionalized:
  - Display-level filtering of service bundles which include at least one local IPDC service. Practically, it means that terminal must hide ServiceBundle fragments which reference one or more local Service fragments (i.e. serviceID explicitly regionalized, with a delivery area ID in the range of 1 to 999).
- For Type 1 and Type 2 terminal implementations, if the ESG is regionalized:
  - Addition of an "IP stream availability function", which checks in the received TS the actual transmission of some given IP stream(s) of some given IP platform ID. For this check, this function especially relies on cell_id, INT and SDT/service availability descriptors. In the present document it is assumed to be a low-level function exposed to the application layer.
  - In the ESGAccessDescriptor, multiple ESGEntries for the same ESG Provider ID. Selection of proper ESG Entry (i.e. ESG announcement carousel) made using IP stream availability function.
  - ESG fragment regionalization, consisting in tagging by an ID each stored fragment, according to implicit signalling (for Type 1 terminal: FLUTE session ID; for Type 2 terminal: delivery area ID given by ESG Entry position or by serviceID criterion) or explicit signalling (for Type 2 terminal: delivery area ID included in the fragment ID URI)
  - User presented with a regionalized view of ESG according to the current FLUTE sessions transmitted for the selected instance (Type 1 terminal) or to the current delivery areas where the terminal is located (Type 2 terminal).
  - Service continuity optimizations when terminal is acquiring the ESG while moving to another cell.

Annex A (normative): Types of ESG implementations

This annex details several possible levels of ESG implementations for a DVB-SH ESG provider (ESG server) and for a DVB-SH terminal (ESG client).

Types of server implementations:

Type	Deployed ESG mechanisms	Related scenarios
Type 0	Strict instantiations of DVB-H IPDC phase 1 ESG as specified in TS 102 471 [1] and TS 102 592-1 [2].	1
Type 1	Common and local announcement carousels, unlimited area-based fragment tagging, FLUTE sessions delivering valid fragments and (eventually) invalid fragments.	1 to 13

Types of terminal implementations:

Type	Supported mechanisms
Type 0	ESG client strictly conforming to DVB-H IPDC phase 1 as specified in TS 102 471 [1] and TS 102 592-1 [2], plus an eventual filtering on the presented service bundles (see section 5.2.3.3.1)
Type 1	Selection of announcement carousel based on an IP stream availability function, FLUTE-session based fragment tagging, check of IPDC streams availability based on an IP stream availability function
Type 2	Selection of announcement carousel based on an IP stream availability function, area-based fragment tagging

NOTE: Type 1 and Type 2 terminal implementations are assumed to achieve the same level of functionality. They just differ by the technical realization.

These server and terminal implementations can co-exist with no interoperability issues. Table below indicates the limitations implied by some combinations:

Server	Terminal		
	Type 0	Type 1	Type 2
Type 0	OK	OK	OK
Type 1	OK, however terminal will not see the local IPDC services. Also terminal must implement a means to hide to the user the service bundles which include local IPDC services (security against potential deployments of instantiations mechanisms 12 and 13).	OK, however terminal needs to check IPDC sessions availability.	OK

Recommended server implementations is:

- Preferably Type 1.

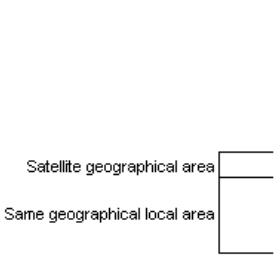
Recommended terminal implementations are:

- Preferably Type 2;
- Eventually Type 1 if the terminal can implement a fast IP stream availability function. This speed is especially critical when the terminal needs to display the user which IPDC services are available on current cell (then the terminal needs to check for the availability of all the IPDC streams scoped by the Acquisition fragments tagged by the identifiers of the current ESG FLUTE sessions).

Annex B (informative): DVB-SH physical layer options for ESG

B.1 SH-A SFN configuration

As presented in figure B.1, the DVB-SH TS 1 being sent on the satellite will be received in exactly the same way wherever the terminal is located.

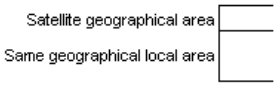


	Hybrid frequency	Non-hybrid frequencies	
	5 MHz	5 MHz	5 MHz
	F1 (satellite)	F2	F3
	TS 1	TS 2	TS 3
SH-A	OFDM	OFDM	OFDM
Mod sat (cellID 1)	X	-	-
Mod CGC (cellID 1)	X	-	-
Mod CGC (cellID 2-ter)	-	X	-
Mod CGC (cellID 3-ter)	-	-	X

Reception conditions				Options	
				DVB-H TS	Unicast
SFN Rx 1	X	X	X		
SFN Rx 2	X	X			
SFN Rx 3	X				
SFN Rx 4		X			
SFN Rx 5		X	X		

Figure B.1: An example of SFN reception

B.2 SH-A non-SFN and SH-B configurations



	Hybrid frequency		Non-hybrid frequency
	5 MHz	5 MHz	5 MHz
	F1(satellite)	F2 (ter)	F3 (ter)
	TS 1		TS 2
SH-A non SFN	OFDM	OFDM	OFDM
SH-B non SFN	TDM	OFDM	OFDM
Mod sat (cellID 1 if OFDM)	X (paTS sat service)		-
Mod CGC (cellID 2-ter)	X (paTS ter service)		-
Mod CGC (cellID 3-ter)	-		X

Reception conditions				Options	
				DVB-H TS	Unicast
non-SFN Rx 1	X	X	X		
non-SFN Rx 2	X	X			
non-SFN Rx 3	X				
non-SFN Rx 4		X			
non-SFN Rx 5		X	X		

Figure B.2: An example of non-SFN reception

History

Document history		
V1.1.1	July 2009	Publication