



**IP Datacast over DVB-H:  
PSI/SI**

**DVB Document A079 Rev. 1  
November 2005**

# Contents

Introduction .....	4
1 Scope .....	5
2 References .....	5
3 Definitions, symbols and abbreviations .....	5
3.1 Definitions .....	5
3.3 Abbreviations .....	6
4 Introduction to DVB-H and PSI/SI (Informative) .....	8
4.1 PSI/SI and DVB network .....	8
4.2 IP platform, IP flow and IP stream .....	9
4.3 Multiprotocol Encapsulation (MPE) .....	10
4.4 PSI Tables .....	11
4.4.1 Program Association Table (PAT) .....	11
4.4.2 Program Map Table (PMT) .....	12
4.4.3 Conditional Access Table (CAT) .....	12
4.4.4 Transport Stream Description Table (TSDT) .....	12
4.5 SI Tables .....	13
4.5.1 Network Information Table (NIT) .....	13
4.5.2 Bouquet Association Table (BAT) .....	15
4.5.3 Service Description Table (SDT) .....	15
4.5.4 Event Information Table (EIT) .....	15
4.5.5 Running Status Table (RST) .....	16
4.5.6 Time and Date Table (TDT) .....	16
4.5.7 Time Offset Table (TOT) .....	16
4.5.8 Stuffing Table (ST) .....	16
4.5.9 IP/MAC Notification Table (INT) .....	16
4.6 Descriptors .....	17
4.6.1 network_name_descriptor .....	17
4.6.2 service_descriptor .....	17
4.6.3 linkage_descriptor .....	18
4.6.4 stream_identifier_descriptor .....	18
4.6.5 terrestrial_delivery_system_descriptor .....	18
4.6.6 data_broadcast_descriptor .....	18
4.6.7 data_broadcast_id_descriptor .....	18
4.6.8 transport_stream_descriptor .....	19
4.6.9 cell_list_descriptor .....	19
4.6.10 cell_frequency_link_descriptor .....	19
4.6.11 target_IP_address_descriptor .....	19
4.6.12 target_IPv6_address_descriptor .....	19
4.6.13 IP/MAC_platform_name_descriptor .....	19
4.6.14 IP/MAC_platform_provider_name_descriptor .....	19
4.6.15 target_IP_slash_descriptor .....	20
4.6.16 target_IP_source_slash_descriptor .....	20
4.6.17 target_IPv6_slash_descriptor .....	20
4.6.18 target_IPv6_source_slash_descriptor .....	20
4.6.19 IP/MAC_stream_location_descriptor .....	20
4.6.20 time_slice_fec_identifier_descriptor .....	20
4.7 Transmission Parameters Signalling (TPS) .....	20
4.8 Announcing INT .....	21
4.8.1 IP/MAC Notification Service .....	21
4.8.2 IP/MAC Notification NIT/BAT .....	21
4.9 Time-slicing and MPE-FEC .....	22
4.10 UNT and SSU .....	22
4.10.1 PSI, SI and Related UNT Signalling .....	22

5	PSI/SI for IPDC in DVB-H Systems.....	24
5.1	DVB network and IP platform.....	24
5.2	Multiprotocol Encapsulation (MPE).....	26
5.4	PSI Tables.....	27
5.4.1	Program Association Table (PAT).....	27
5.4.2	Program Map Table (PMT).....	27
5.4.3	Conditional Access Table (CAT).....	28
5.4.4	Transport Stream Description Table (TSDT).....	28
5.5	SI Tables.....	28
5.5.1	Network Information Table (NIT).....	29
5.5.1.1	NIT_actual.....	29
5.5.1.2	NIT_other.....	30
5.5.2	Bouquet Association Table (BAT).....	31
5.5.3	Service Description Table (SDT).....	32
5.5.4	Event Information Table (EIT).....	33
5.5.5	Running Status Table (RST).....	33
5.5.6	Time and Date Table (TDT).....	33
5.5.7	Time Offset Table (TOT).....	33
5.5.8	Stuffing Table (ST).....	33
5.5.9	IP/MAC Notification Table (INT).....	33
5.6	Transmission Parameter Signalling (TPS).....	36
5.7	Update Notification Table (UNT).....	36
5.8	Announcing INT.....	36
5.8.1	IP/MAC Notification Service.....	36
5.8.2	IP/MAC Notification NIT.....	37
5.8.3	IP/MAC Notification BAT.....	37

## Introduction

The present document describes the usage of PSI/SI information in IPDC in DVB-H System. The document intentionally constrains PSI/SI to simplify requirements for equipments developed for IPDC in DVB-H Systems.

Intended readers of this document are those implementing or operating IPDC in DVB-H Networks as well as those implementing receivers for such networks. The reader is assumed being familiar with MPEG/DVB defined PSI/SI information.

The aim of this document is to define the way PSI/SI information is used in IPDC in DVB-H Systems. An operator of an IPDC in DVB-H Network should understand what information should be available, and a receiver vendor should understand how the information is available.

The contents of this document are normative for IPDC DVB-H Networks and IPDC DVB-H Receivers, unless otherwise stated.

# 1 Scope

The focus of the present document is on PSI/SI tables and descriptors used in IPDC in DVB-H Systems.

Tables and descriptors are introduced, and their usage is described.

The document defines the set of PSI/SI data an IPDC DVB-H Receiver may expect to be available on an IPDC DVB-H Bearer (data transmission baseband) and the IPDC DVB-H Network is expected to make available on the IPDC DVB-H Bearer.

The scope of this “PSI/SI for IPDC in DVB-H Systems” is to support coherent and interoperable signalling on data link layer on all IPDC DVB-H Networks

This document draws from a number of existing specifications listed in clause 2. In case of ambiguity these original documents shall be considered as authoritative.

## 2 References

For the purposes of this document, the following references apply:

- [1] ISO/IEC 13818-1: “MPEG-2 Systems Standard”
- [2] ETSI EN 300 468: “DVB Specification for Service Information”
- [3] ETSI TR 101 211: “Guidelines on implementation and usage of Service Information”
- [4] ETSI TR 101 162: “Allocation of Service Information (SI) codes for DVB systems”
- [5] ETSI EN 301 192: “DVB specification for Data Broadcasting”
- [6] IETF RFC 1112: “Host extension for IP multicast”
- [7] IETF RFC 2464: “Transmission of IPv6 Packets over Ethernet Network”
- [8] ETSI EN 302 304: “Transmission System for Handheld Terminals (DVB-H)”
- [9] ETSI TS 102 006 : ” Specification for System Software Update in DVB Systems”

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

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

**delivery system:** The physical medium by which one or more multiplexes are transmitted. E.g. satellite system, wide-band coaxial cable, fibre optics, terrestrial channel of one emitting point.

**DVB network:** A collection of MPEG-2 Transport Streams, each carrying a multiplex, and transmitted on a single delivery system. DVB network is identified by `network_id`.

**DVB service:** A collection of associated Elementary Streams. DVB service is identified by `program_number` (in PSI), or `service_id` (in SI).

**DVB signal:** Radio signal carrying a Transport Stream of a DVB network.

**DVB-H:** A transmission system targeted to provide IP-based services to handheld terminals over terrestrial radio channels, as defined in “Transmission System for Handheld Terminals (DVB-H)” [8].

**Elementary Stream:** Stream of Transport packets within a Transport Stream sharing a common packet identified (PID).

**INT Notification NIT/BAT:** NIT or BAT sub\_table containing a linkage\_descriptor with linkage\_type 0x0C.

**IP Datacast Baseline:** The minimum core protocol profile an IPDC DVB-H Receiver may expect to be available on IPDC DVB-H Bearer (data transmission baseband) and the IPDC DVB-H Network is expected to make available on the IPDC DVB-H Bearer.

**IP Flow:** A flow of IP datagrams each sharing the same IP source and destination address. An IP flow is identified within an IP platform by its source and destination addresses. IP flows on different IP platforms may have the same source/destination addresses, but are considered different IP flows. IP flows may be delivered over one or more IP streams.

**IPDC DVB-H Bearer:** The link and physical layers into which IP platform is encapsulated.

**IPDC DVB-H Network:** DVB network that makes the IP Datacast based services and the IP Datacast Baseline available over DVB-H for an IPDC Datacast Receiver.

**IPDC DVB-H Receiver:** The equipment or the system that acquires IP Datacast based services provided over the IP Datacast Baseline on DVB-H.

**IPDC in DVB-H System:** Consists of one or more IPDC DVB-H Networks and one or more IPDC DVB-H Receivers.

**IP/MAC Notification Info Structure:** Structure in data\_broadcast\_id\_descriptor when data\_broadcast\_id is set to 0x0B.

**IP/MAC Notification Service:** DVB service with a component carrying one or more INT sub\_tables.

**IP/MAC Notification Service Structure:** Structure in linkage\_descriptor when linkage\_type is set to 0x0B.

**IP platform:** A set of IP flows managed by an organisation. The IP platform represents a harmonised IP address space that has no address collisions. An IP platform may span several Transport Streams within one or more DVB networks. Several IP platforms may co-exists in the same Transport Stream. IP platform is identified by platform\_id.

**IP stream:** A physical mapping of an IP Flow to transport\_stream\_id, original\_network\_id, service\_id, component\_tag, and IP source/destination addresses. IP stream is delivered on an MPE section stream.

**multiplex:** A set of DVB services multiplexed together into a form that can be carried on a Transport Stream.

**MPE-FEC section:** A MPE-FEC\_section as specified in ETSI EN 301 192 [5].

**MPE section:** A datagram\_section as specified in ETSI EN 301 192 [5].

**MPE section stream:** A stream of MPE sections each sharing the same MAC-address and delivered within a particular Elementary Stream. Within an Elementary Stream, MPE section stream is identified by its MAC address.

**Multiprotocol Encapsulation Info Structure:** Structure in data\_broadcast\_descriptor and data\_broadcast\_id\_descriptor when data\_broadcast\_id is set to 0x0B.

**NIT\_actual:** NIT sub\_table describing the actual delivery network. NIT\_actual has table\_id value 0x40.

**section:** A syntactic structure, defined in ISO/IEC 13818-1 [1].

**Transport Stream:** Stream of transport\_packets, as defined in ISO/IEC 13818-1 [1]

**Transport (stream) packet:** A data structure defined in ISO/IEC 13818-1 [1]

### 3.3 Abbreviations

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

BAT	Bouquet Association Table
CA	Conditional Access
CAT	Conditional Access Table

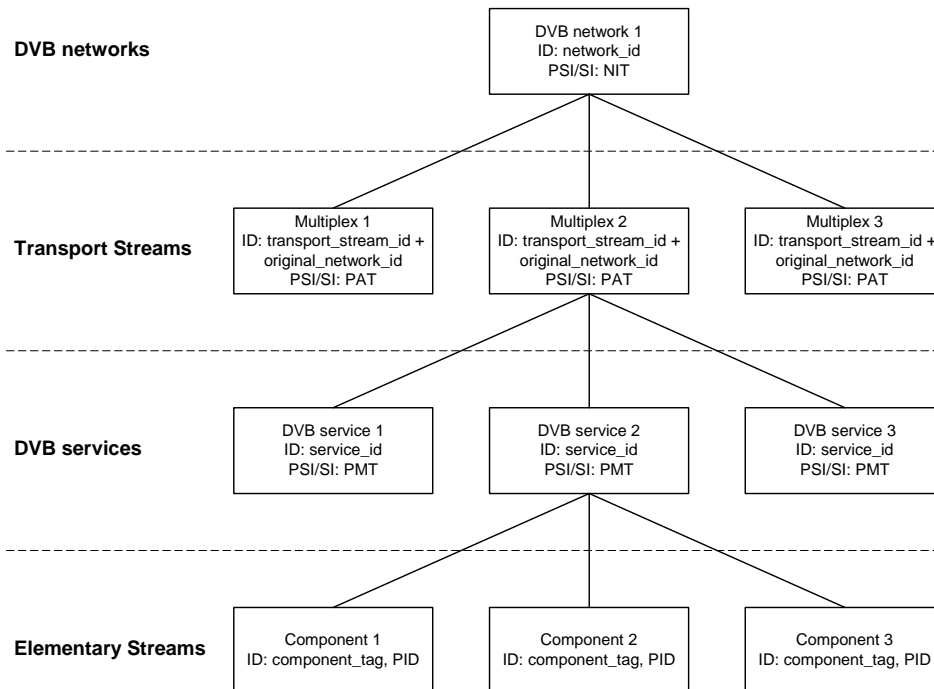
CRC	Cyclic Redundancy Check
DVB	Digital Video Broadcasting
EIT	Event Information Table
ES	Elementary Stream
INT	IP/MAC Notification Table
IP	Internet Protocol
IPv4	Internet Protocol, version 4
IPv6	Internet Protocol, version 6
IPDC	IP Datacast
Mbps	Mega bits per second
MPEG	Moving Picture Expert Group
NIT	Network Information Table
NVOD	Near Video On Demand
PAT	Program Association Table
PID	Packet Identifier
PMT	Program Map Table
PSI	Program Specific Information
RST	Running Status Table
SDT	Service Description Table
SI	Service Information
ST	Stuffing Table
TDT	Time and Data Table
TOT	Time Offset Table
TPS	Transmission Parameter Signalling
TS	Transport Stream
TSDT	Transport Stream Description Table
UTC	Universal Time, Co-ordinated

## 4 Introduction to DVB-H and PSI/SI (Informative)

The contents of this clause are informative.

### 4.1 PSI/SI and DVB network

A DVB network is uniquely identified by a `network_id`. A DVB network consist of one or more Transport Streams (TS), each carrying a multiplex and being transmitted by one or more DVB signals. Information about a DVB network is available within the NIT sub\_table (identified by `network_id`). The NIT lists all multiplexes and DVB signals available within the DVB network. The NIT is carried within each DVB network.



**Figure 1: Relation between DVB networks, Transport Streams, DVB services and components**

A multiplex is a set of DVB services multiplexed together, and carried on a Transport Stream. A Transport Stream carries exactly one multiplex. A multiplex and the Transport Stream carrying it are identified by `transport_stream_id` and `original_network_id`. `transport_stream_id` is unique within `original_network_id`. `original_network_id` is the `network_id` of the DVB network generating the multiplex.

If one multiplex is transmitted on two different radio signals (i.e. DVB signals) within a DVB network, the DVB signals carry the same Transport Stream. However, if the DVB signals belong to different DVB networks, the Transport Stream is different. In both cases, the set of DVB services, PSI information and multiplex identifiers (`transport_stream_id` and `original_network_id`) are identical. However, in later case, SI information (particularly the information about the actual DVB network, i.e. content of `NIT_actual`) is different. In such case, only one multiplex occurs, even though carried on two different Transport Streams.

Therefore a multiplex is a set of DVB services, while a Transport Stream is a bitstream carrying a multiplex and related PSI/SI information. A multiplex may be delivered on multiple DVB networks, while a Transport Stream belongs to exactly one DVB network. The `network_id` of the DVB network transmitting the Transport Stream is announced in the `NIT_actual` carried within the Transport Stream.

Within a DVB network, a Transport Stream may be carried on multiple DVB signals. A DVB signal using non-hierarchical modulation carries one Transport Stream, while a DVB signal using hierarchical modulation carries two Transport Streams.



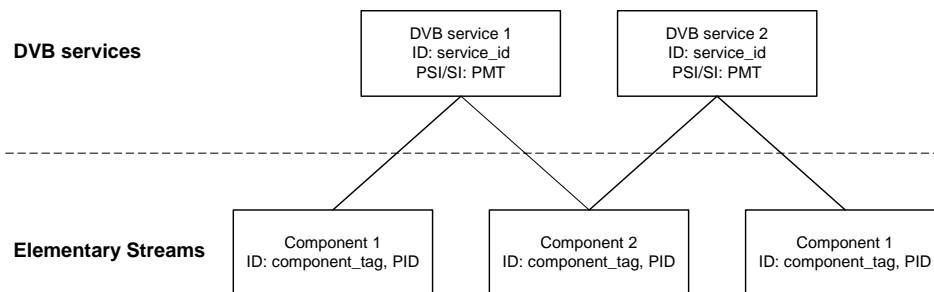
Information about a particular multiplex is available within the PAT carried within the multiplex. The PAT lists all DVB services available within the multiplex. On each multiplex exactly one PAT is available.

A DVB service is a sequence of programme events, each of which groups together a set of components, each carried in its own Elementary Stream. A DVB service containing no components is a NULL-service, carrying no content. A DVB service is globally and uniquely identified by the triplet of (service\_id, transport\_stream\_id, original\_network\_id). The service\_id is unique at least within a multiplex.

All the components of a DVB service (if any) are carried within a single multiplex. Information about a DVB service is available within a PMT sub\_table (identified by service\_id), carried within the same multiplex.

A component is identified by the component\_tag. The component\_tag is unique within a DVB service. The component is carried within an Elementary Stream (ES), identified by the PID. The PID is unique within a Transport Stream. Mapping between component\_tag and PID is signalled in PMT.

It is possible to have one Elementary Stream carrying a component of more than one DVB service, as illustrated in Figure 2.



**Figure 2 : Two DVB services sharing a component.**

## 4.2 IP platform, IP flow and IP stream

An IP platform is a set of IP flows managed by an organisation. The IP platform represents a harmonised IP address space that has no address collisions.

An IP platform may be available on multiple Transport Streams, within one or multiple DVB networks. In such case, each of the Transport Streams may carry any subset of the IP flows of the IP platform.

An IP platform is identified by platform\_id. Platform\_id values are divided into two ranges (see annex D of [5]). One range consist of platform\_id values that are globally unique. If such a platform\_id value is signalled in two different DVB networks, it refers to the same IP platform. The other range consist of platform\_id values unique only within the scope of a DVB network. Data from an IP platform identified by such platform\_id is not available in any other DVB network. Such an IP platform is globally and uniquely identified only by combination of both platform\_id and network\_id.

Each IP platform contains one or more IP flows, each delivered on one or more IP streams. An IP flow is identified within an IP platform by its source and destination addresses and port number. IP flows are IP platform specific, and two different IP flows on two different IP platforms may use the same source/destination addresses. Each IP flow may be delivered over one or more IP streams.

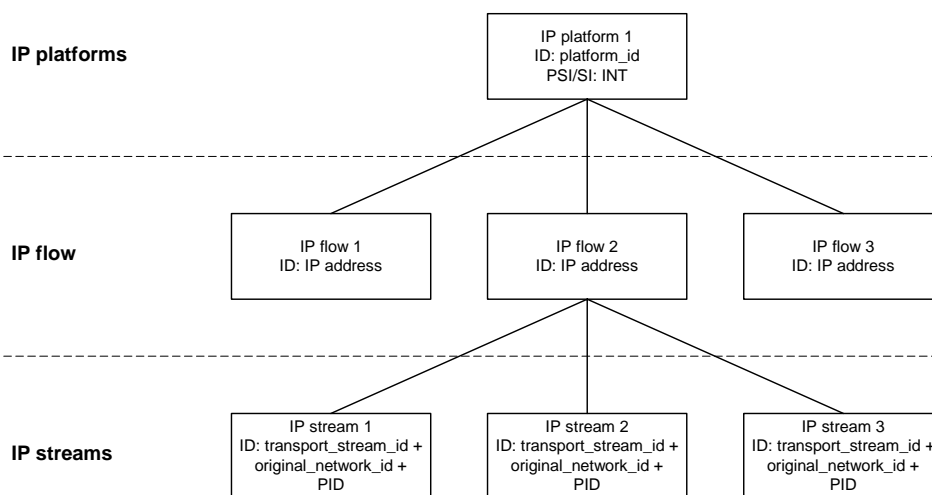
An IP stream is a data stream delivering exactly one instance of an MPE encoded IP flow. An IP stream is identified by transport\_stream\_id, original\_network\_id, service\_id, component\_tag, and IP source/destination addresses (all together).

- `transport_stream_id` and `original_network_id` together identify a single Transport Stream.
- `service_id` and `component_tag` together identify a single Elementary Stream within a Transport Stream. Note that an Elementary Stream may also be identified by its PID.
- IP source/destination addresses identify a single IP stream within an Elementary Stream. This is required if multiple IP streams are carried within the Elementary Stream. Note that IP streams within an Elementary Stream are differentiated by the IP source/destination address only.

Two different elementary streams, carrying IP streams which contain the same IP flow may be located in different multiplexes. In such case, an IPDC DVB-H Receiver may accomplish a handover between these multiplexes while receiving the IP flow.

Note that the INT does not always announce the source address of an IP flow. This is done to optimise the bandwidth required by the INT. In such case, IP stream differentiation is based on the destination address only.

An IP stream is a single data stream delivering an IP flow. An IP stream is identified by associated parameters indicating its location (`network_id`, `original_network_id`, `transport_stream_id`, `service_id` and `component_tag`). An IP flow represents the data content of a stream, while an IP stream represents an instantiation of such an IP flow. An IP flow belongs to exactly one IP platform. Note that an IP stream may be announced by multiple INT sub\_tables, eventually making it part of multiple IP platforms.



**Figure 3 : Relation between IP platform, IP flow and IP stream.**

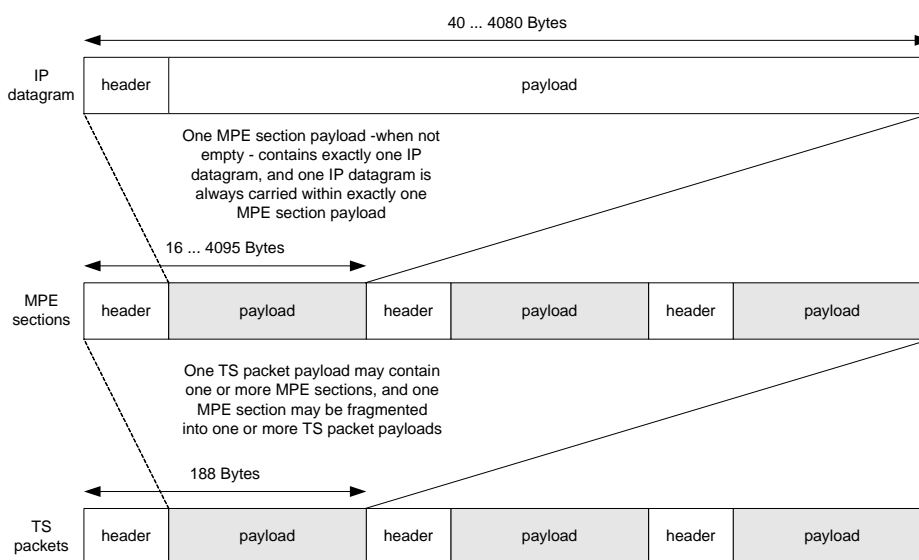
## 4.3 Multiprotocol Encapsulation (MPE)

DVB has introduced multiprotocol encapsulation (MPE) for encoding OSI-model layer 3 (Network Layer) datagrams into Transport Stream packets. MPE is defined in ETSI EN 301 192 [5]. Each IP datagram is encoded into a single MPE section. The IP datagram starts immediately after the `MAC_address_1` field. The maximum size of an IP datagram (including the IP datagram header) is 4080 bytes.

Single Elementary Stream may contain multiple MPE section streams. Within an Elementary Stream, MPE section stream is identified by its `MAC_address` field. Note that IPDC DVB-H Receiver may differentiate MPE encoded IP streams by checking the IP source and/or destination address in the IP datagram carried within an MPE section. In such case the Receiver does not differentiate MPE section streams, but is directly filtering IP streams. For such a Receiver, there is no need to differentiate MPE section streams within an Elementary Stream.

For each Elementary Stream carrying MPE encapsulated IP stream(s), the SDT\_actual contains a data\_broadcast\_descriptor. The following applies to this descriptor:

- The data\_broadcast\_id field is set to 0x0005, indicating the Multiprotocol Encapsulation Info Structure is used.
- The selector\_length field is set to 2.
- The max\_sections\_per\_datagram field is set to 1, indicating the maximum number of sections that can be used to carry a single datagram unit.
- The component\_tag field is set to the value announced within the PMT sub\_table of the DVB service for the referred component.



**Figure 4 : Relation between Transport packet stream, MPE section stream and IP stream.**

## 4.4 PSI Tables

Program Specific Information (PSI) consist of data enabling a decoder to demultiplex DVB services. DVB services are composed of one or more Elementary Streams, each carried on a PID. DVB services, Elementary Streams or parts thereof may be scrambled for conditional access. However, PSI shall not be scrambled.

In a Transport Stream, the PSI is carried in MPEG-2 private table structures. While these structures may be thought of as simple tables, they are segmented into sections and inserted into Transport Stream packets, some with predetermined PIDs and others with operator selectable PIDs.

Following applies to all PSI tables:

- The section number of the first section of each sub\_table is 0x00.
- The section\_number is increment by 1 with each additional section of a sub\_table.
- Any addition, the removal or change in content of any section within a sub\_table affects a version number change. Two sequential transmissions of a sub\_table using the same version\_number have the same number of sections, and the content and order of sections are identical.

### 4.4.1 Program Association Table (PAT)

Program Association Table (PAT) provides the correspondence between a program\_number and the PID value of the Transport Stream packets which carry the DVB service definition. The program\_number is the numeric label associated

with a DVB service. The overall table is contained in one or more sections. It may be segmented to occupy multiple sections.

PAT is always delivered in the Elementary Stream with the PID 0x0000. For video and audio coding in broadcasting applications based on the MPEG-2 Transport Stream it is recommended that all sections of PAT are transmitted at least once in every 100 ms.

A DVB network transmits the PAT on every Transport Stream. The PAT contains no descriptors. The program loop within PAT contains information about each DVB service within the actual Transport Stream. If the program\_number 0x0000 is announced, the corresponding network\_PID field is set to 0x10.

The program\_number of each DVB service available within the Transport Stream is announced. The corresponding program\_map\_PID indicates the PID of the PMT sub\_table for the DVB service. A PMT sub\_table is carried within an Elementary Stream with PID value between 0x0020 ... 0x1FFE. PMT sub\_tables may be spread over multiple Elementary Streams (i.e. PMT sub\_table for each DVB service may be delivered on a different Elementary Stream).

The PAT table does not contain multiple iterations of the program loop with the same value of the program\_number field (i.e. each program\_number is announced only once).

#### 4.4.2 Program Map Table (PMT)

The Program Map Table (PMT) provides mappings between program numbers and the program elements that comprise them. A PMT sub\_table announces the mapping for a single DVB service. Within a Transport Stream, a PMT sub\_table is identified by the program\_number. A PMT sub\_table is also referred to as a “program definition”. The PMT is the complete collection of all program definitions (i.e. all PMT sub\_tables) for a Transport Stream.

Each PMT sub\_table is transmitted in exactly one section, where the section\_number field is set to 0. Different PMT sub\_tables may be delivered on different Elementary Streams.

Each PMT sub\_table is delivered in an Elementary Stream on the PID announced in the PAT. For video and audio coding in broadcasting applications based on the MPEG-2 Transport Stream it is recommended that all transmitted sections of PMT are transmitted at least once in every 100 ms. The program\_number of each DVB program should be unique within the network. The PMT sub\_table for a particular DVB service is transmitted on the same Transport Stream as the referred DVB service.

Descriptors in the PMT important for use in IPDC in DVB-H Systems are:

- data\_broadcast\_id\_descriptor

For each component containing INT sub\_table(s), this descriptor with data\_broadcast\_id set to 0x000B (IP/MAC Notification Info Structure) is located in the ES\_info loop. Each INT sub\_table within the Elementary Stream is announced.

- stream\_identifier\_descriptor

For each component carrying IP streams, this descriptor is located in the ES\_info loop. The component\_tag announced within the descriptor is unique for each component within the DVB service.

#### 4.4.3 Conditional Access Table (CAT)

Conditional Access Table (CAT) provides information on the CA systems used in the multiplex.

#### 4.4.4 Transport Stream Description Table (TSDT)

Transport Stream Description Table (TSDT) provides information about the entire Transport Stream, for example the type of target receiver (DVB, ATSC) or the kind of application (e.g. satellite contribution link). All descriptors carried within the table apply to the entire Transport Stream.

## 4.5 SI Tables

In addition to the PSI, data is needed to provide identification of DVB services to the user. The coding of this data is defined in ETSI EN 300 468 [2]. In contrast with the PAT, CAT, and PMT of the PSI, which give information only for the multiplex in the actual Transport Stream, the additional SI information can provide information on DVB services carried by different multiplexes, and even on other DVB networks.

The following applies to all SI tables:

- The section number of the first section of each sub\_table is 0x00.
- The section\_number is increment by 1 with each additional section of a sub\_table.
- Time from the transmission of the last byte of a sub\_table section to the transmission of the first byte of the next section of the same sub\_table is at least 25 ms.
- Any addition, removal or change in content of any section within a sub\_table effects a version number change. Two sequential transmissions of a sub\_table without a version\_number change have the same number of sections, and the content and order of sections are identical.

### 4.5.1 Network Information Table (NIT)

Network Information Table (NIT) conveys information relating to the physical organization of the multiplexes/Transport Streams within a given DVB network, and the characteristics of the DVB network itself. DVB networks are assigned individual network\_id values, which serve as unique identification codes for DVB networks. The allocation of these codes may be found in ETSI TR 101 162 [4].

It is possible to transmit a NIT for other DVB networks in addition to the actual one. Differentiation between the NIT for the actual DVB network (NIT\_actual) and the NIT for other DVB networks (NIT\_other) is achieved using different table\_id values.

The NIT is segmented into network\_information\_sections. Any sections forming part of an NIT are transmitted in Transport Stream packets with a PID value of 0x0010. Any sections of the NIT which describe the actual DVB network (that is, the DVB network of which the Transport Stream containing the NIT is part of) have the table\_id 0x40, and share the same table\_id\_extension (network\_id). The network\_id field takes the value assigned to the actual DVB network in ETSI TR 101 162 [4]. Any sections of a NIT which refer to a DVB network other than the actual DVB network take a table\_id value of 0x41 and the network\_id takes the value allocated to the other DVB network in ETSI TR 101 162 [4].

Each sub\_table of the NIT is carried in an Elementary Stream with the PID 0x10. All transmitted sections of a NIT are transmitted at least every 10 s.

The following applies to the transport\_stream\_loop:

- Each iteration announces a DVB signal carrying a Transport Stream of the announced DVB network.
- Each Transport Stream belonging to the announced DVB network is announced.

Descriptors in the NIT\_actual important for use in IPDC in DVB-T/H Systems are:

- linkage\_descriptor

Linkage\_type 0x0B is used to announce the DVB services containing INT sub\_table(s) (i.e. IP/MAC Notification Services). If a linkage\_descriptor with linkage\_type 0x0B is available in the NIT\_actual, the following applies:

- The descriptor is located in the first descriptor loop.

- The list of announced IP/MAC Notification Services is complete, meaning that all IP/MAC Notification Services within the actual DVB network are announced. For each IP/MAC Notification Service, all IP platforms for which an INT sub\_table is available within the DVB service are announced.
- The descriptor may appear more than once in the loop.

Linkage\_type 0x0C is used to announce an INT Notification NIT/BAT, i.e. NIT or BAT sub\_table containing a linkage\_descriptor with linkage\_type 0x0B. If a linkage\_descriptor with linkage\_type 0x0C is available in the NIT\_actual, the following applies:

- The descriptor is located in the first descriptor loop.
- The list of announced INT Notification NIT/BAT sub\_tables is complete, meaning that all INT Notification NIT/BAT sub\_tables within the DVB network are announced.
- The descriptor may appear more than once in the loop.

Linkage\_type 0x04 is used to announce Transport Streams within the DVB network that contain full network SI and bouquet SI. If a linkage\_descriptor with linkage\_type 0x04 is available in NIT\_actual, the following applies:

- The NIT and BAT tables within Transport Stream referred contain complete description of the actual DVB network.

Linkage\_descriptor\_type 0x09 is used to announce System Software Update service and conveys the location of the transport stream carrying a system software update service within a network or bouquet respectively. If the descriptor is used the following applies :

- The descriptor shall be carried in the first loop of the NIT or in the first loop of a specifically identified BAT (called system softwareupdate BAT).

Linkage\_descriptor\_type 0x0A is used to define a pointer to a transport stream carrying a system software update BAT or NIT with detailed signalling information about system software update services.

- terrestrial\_delivery\_system\_descriptor

Each iteration of the second descriptor loop contains exactly one delivery\_system\_descriptor (terrestrial\_delivery\_system\_descriptor in case of IPDC DVB-H Network), announcing the physical parameters for the concerned Transport Stream. If the announced Transport Stream is available in multiple frequencies, the other\_frequency\_flag is set to 1. In which case, either frequency\_list\_descriptor or cell\_frequency\_link\_descriptor is also available.

- cell\_list\_descriptor

This descriptor is used to list the cells of a terrestrial DVB network. The list is complete (i.e. all cells and subcells are announced). The descriptor may appear more than once in the loop.

- network\_name\_descriptor

This descriptor is used to transmit the name of the DVB network. The descriptor is available in the first descriptor loop, and should appear exactly once.

- cell\_frequency\_link\_descriptor

This descriptor announces all frequencies used to transmit the Transport Stream within the DVB network. The list is complete.

- Time\_slice\_fec\_identifier\_descriptor

This descriptor indicates, whether time-slicing and/or MPE-FEC are used on the Transport Stream. This descriptor may occur in the first and in the second descriptor loop. In the first loop, the descriptor applies to all Transport Streams of the announced DVB network. In the second loop, the descriptor applies to the particular Transport Stream only. Each occurrence overwrites any possible earlier occurrences. Multiple occurrences are allowed.

## 4.5.2 Bouquet Association Table (BAT)

Bouquet Association Table (BAT) provides information regarding bouquets. A bouquet is a collection of DVB services, which may traverse the boundaries of a DVB network. The BAT is segmented into bouquet\_association\_sections. Any sections forming part of a BAT are transmitted in Transport Stream packets with a PID value of 0x0011. The sections of a BAT sub\_table describing particular bouquet all have the bouquet\_id field set to the value assigned to the bouquet described in ETSI TR 101 162 [4]. All BAT sections take a table\_id value of 0x4A.

## 4.5.3 Service Description Table (SDT)

Service Description Table (SDT) contains data describing the DVB services in the system, e.g. the name of the DVB service, the service provider, etc. Each sub\_table of the SDT describes DVB services contained within a particular Transport Stream. Depending on the table\_id, the services are available on the actual Transport Stream or on other Transport Streams.

The SDT is segmented into service\_description\_sections. Any sections forming part of a SDT are transmitted in Transport Stream packets with a PID value of 0x0011. Any sections of an SDT which describe the actual Transport Stream (that is, the Transport Stream containing the SDT) have the table\_id value 0x42 with the same transport\_stream\_id and original\_network\_id. Any section of an SDT which refer to a Transport Stream other than the actual Transport Stream takes a table\_id value of 0x46 with the same transport\_stream\_id and original\_network\_id.

The transmission of the SDT for the actual Transport Stream is mandatory. The SDT lists all DVB services of the referred Transport Stream.

The descriptors in the SDT for the actual Transport Stream (table\_id 0x46) important for use in IPDC in DVB-H Systems are:

- service\_descriptor

This descriptor contains the basic textual identifications of a DVB service such as service name and provider name. The descriptor is allowed only once in each loop. It is mandatory to be transmitted.

- data\_broadcast\_descriptor

For each Elementary Stream containing MPE section stream, this descriptor with data\_broadcast\_id set to 0x0005 (Multiprotocol Encapsulation Info Structure) is available.

## 4.5.4 Event Information Table (EIT)

Event Information Table (EIT) contains data describing events or programmes such as event name, start time, duration, etc. The EIT provides information on the events contained within each DVB service in chronological order.

Four classifications of EIT have been identified, distinguishable by the use of different table\_id values:

- actual Transport Stream, present/following event information, table\_id 0x4E
- other Transport Stream, present/following event information, table\_id 0x4F
- actual Transport Stream, event schedule information, table\_id 0x50...0x5F
- other Transport Stream, event schedule information, table\_id 0x60...0x6F

All EIT sub\_tables for the actual Transport Stream have the same transport\_stream\_id and original\_network\_id values.

The present/following table contains only information pertaining to the present event and the chronologically following event carried by a DVB service on either the actual Transport Stream or another Transport Stream, except in the case of a NVOD reference service where it may have more than two event described. The event schedule tables for either the actual Transport Stream or other Transport Streams contain a list of events covering a longer schedule. The EIT schedule tables are optional. The event information is chronologically ordered.

The EIT is segmented into event\_information\_sections. Any sections forming part of an EIT are transmitted in Transport Stream packets with a PID value of 0x0012.

Every SI bit stream carries two sections per DVB service with an EIT present/following with the section\_number 0x00 reserved for the description of the present event and section\_number 0x01 for the following event. These constraints do not apply in the case of an NVOD reference service which may have more than one event description per section, and may have more than two section in the EIT present/following.

A DVB network transmits EIT present/following sub\_table for each DVB service available within the actual Transport Stream at least every 2 s.

#### 4.5.5 Running Status Table (RST)

Running Status Table (RST) allows accurate and rapid updating of the timing status of one or more events. This may be necessary when an event starts early or late due to scheduling changes and the EIT tables can not be updated for other reasons. The use of a separate table enables fast updating mechanism to be achieved.

RST shall be segmented into running\_status\_sections. Any sections forming part of an RST are transmitted in Transport Stream packets with a PID value of 0x0013, and the table\_id takes the value 0x71.

#### 4.5.6 Time and Date Table (TDT)

The Time and Date Table (TDT) carries the UTC-time and date information. The TDT consists of a single section. This TDT section is transmitted in Transport Stream packets with a PID value of 0x0014, and the table\_id takes the value 0x70.

Transmission of the TDT is mandatory, and it is transmitted at least every 30 seconds. The encoded time is intended to be valid when the section becomes valid as described in figure 3 of ETSI TR 101 211 [3].

#### 4.5.7 Time Offset Table (TOT)

The Time Offset Table (TOT) carries the UTC-time and date information and local time offset. The TOT consists of a single section. This TOT section is transmitted in Transport Stream packets with a PID value of 0x0014, and the table\_id takes the value 0x73.

Transmission of the TOT is optional. If transmitted, it is transmitted at least every 30 seconds. The encoded time is intended to be valid when the section becomes valid as described in figure 3 of ETSI TR 101 211 [3].

#### 4.5.8 Stuffing Table (ST)

The purpose of this section is to invalidate existing sections at a delivery system boundaries e.g. at a cable head-end. When one section of a sub\_table is overwritten, then all the sections of that sub\_table are overwritten (stuffed) in order to retain the integrity of the section\_number field.

A stuffing section may occur wherever a section belonging to an SI table is allowed. STs may be used to replace or invalidate either sub\_tables or complete SI tables.

#### 4.5.9 IP/MAC Notification Table (INT)

The IP/MAC Notification Table (INT) is used to signal the availability and location of IP streams in DVB networks. The INT describes the availability and location of IP streams. There may be one or many INTs covering all IP streams of a DVB network. The INT is referenced by a data\_broadcast\_id\_descriptor with a data broadcast id of 0x000B, in the ES\_info loop of the PMT.

Each IP platform having IP streams available within a Transport Stream, is announced in exactly one INT sub\_table in the same Transport Stream. The INT announces all IP streams available within the actual Transport Stream. The INT may announce IP streams on other Transport Streams as well. The INT may announce all IP streams on all Transport Streams of the DVB network that a Receiver can access (by re-tuning).



The descriptors of the INT important for use in IPDC in DVB-H Systems are:

- target\_IP\_address\_descriptor
- target\_IP\_slash\_descriptor
- target\_IP\_source\_slash\_descriptor

These descriptors are used to announce a single or a group of IPv4 destination addresses. These descriptors may occur in the target-loop.

- target\_IPv6\_address\_descriptor
- target\_IPv6\_slash\_descriptor
- target\_IPv6\_source\_slash\_descriptor

These descriptors are used to announce a single or a group of IPv6 destination addresses. These descriptors may occur in the target-loop.

- IP/MAC\_platform\_name\_descriptor

This descriptor is used to announce the name of the IP platform. There may be zero, one or more occurrences of this descriptor in the platform-loop. This descriptor may appear more than once, if different ISO\_639\_language\_codes are used.

- IP/MAC\_platform\_provider\_name\_descriptor

This descriptor is used to announce the name of the IP platform provider. There may be zero, one or more occurrences of this descriptor in the platform-loop. This descriptor may appear more than once, if different ISO\_639\_language\_codes are used.

- IP/MAC\_stream\_location\_descriptor

This descriptor is used to announce the location of an IP stream in a DVB network. This descriptor occurs in the operational-loop. Multiple occurrences are allowed.

- Time\_slice\_fec\_identifier\_descriptor

This descriptor indicates, whether time-slicing and/or MPE-FEC are used on a particular Elementary Stream carrying MPE sections. This descriptor may occur in the platform descriptor loop and in the target descriptor loop. In the platform loop, the descriptor applies to all Elementary Streams referred to within the sub\_table. In the target loop, the descriptor applies to all Elementary Streams referred to within the iteration of the loop after the appearance of the descriptor. Each occurrence overwrites any possible earlier occurrences. Multiple occurrences are allowed.

## 4.6 Descriptors

The complete list of the descriptors, their use in different tables, and descriptor tags may be found in EN 300 468 [2] and EN 301 192 [5].

### 4.6.1 network\_name\_descriptor

This descriptor is used to transmit the name of a physical network, e.g. "TERACOM".

This descriptor appears exactly once in the first descriptor loop of any NIT sub\_table.

### 4.6.2 service\_descriptor

This descriptor provides the names of the DVB service provider and the DVB service itself together with the service\_type. The names are provided in text form.

Each iteration of the descriptor loop of any SDT sub\_table contains exactly one occurrence of either service\_descriptor or time\_shifted\_service\_descriptor.

### 4.6.3 linkage\_descriptor

This descriptor is used to give a link to another DVB service.

A Transport Stream carrying an INT sub\_table should contain NIT or BAT carrying a linkage\_descriptor with a linkage\_type of 0x0B announcing the IP/MAC Notification Service carrying the INT sub\_table.

If a NIT or BAT sub\_table contains one or more linkage\_descriptors with a linkage\_type of 0x0B, these linkage descriptors announce all IP/MAC Notification Services within the DVB network.

If a linkage\_descriptor with a linkage\_type of 0x0B is located in the BAT, each NIT\_actual of the DVB network should contain a linkage\_descriptor with a linkage\_type of 0x0C announcing that BAT.

A NIT or BAT sub\_table containing linkage\_descriptors with linkage\_type 0x0C announce all NIT and BAT sub\_tables containing linkage\_descriptors with linkage\_type 0x0B within the DVB network.

### 4.6.4 stream\_identifier\_descriptor

This descriptor is used to label component streams with an unique tag value. The tag (component\_tag) is unique within the DVB service.

If the descriptor is transmitted, it appears in the ES\_info loop of PMT sub\_table.

### 4.6.5 terrestrial\_delivery\_system\_descriptor

This descriptor is used to transmit the physical parameters for each DVB signal in the DVB network.

This descriptor appears exactly once for each transport stream in each NIT sub\_table describing the terrestrial DVB network. This descriptor shall not appear in a NIT describing a non-terrestrial DVB network.

### 4.6.6 data\_broadcast\_descriptor

This descriptor identifies the type of data component.

This descriptor appears in the descriptor loop of the SDT for each DVB service carrying MPE sections. When present, the following applies:

- The descriptor appears for each component carrying MPE sections within the DVB service.
- The data\_broadcast\_id field is set to 0x0005, indicating the use of the Multiprotocol Encapsulation Info Structure.
- The selector\_length field is set to 0x02.
- The component\_tag field is set to the value announced within the PMT sub\_table of the DVB service for the referred component.

### 4.6.7 data\_broadcast\_id\_descriptor

This descriptor identifies the type of data component.

This descriptor may appear in the ES\_info loop of the PMT for each Elementary Stream carrying INT sub\_tables. When present, the following applies:

- The data\_broadcast\_id field is set to 0x000B.

### 4.6.8 transport\_stream\_descriptor

This descriptor indicates the compliance of the actual Transport Stream with an MPEG based system.

This descriptor may appear in the TSDT. If present in a DVB signal, the following applies:

- The descriptor\_length field is set to 0x03, indicating three following bytes.
- The three bytes contain the value 0x44, 0x56, 0x42 (ASCII: "DVB"), indicating that the Transport Stream is compliant with DVB specifications.

### 4.6.9 cell\_list\_descriptor

This descriptor lists all the cells of the DVB network. The descriptor also lists the locations of the listed cells.

The descriptor appears in the first descriptor loop of a NIT sub\_table describing an IPDC DVB-H Network.

The cell list is complete.

Due to the definition regarding the sign of latitudes and longitudes the south-western corner of the rectangle is specified.

### 4.6.10 cell\_frequency\_link\_descriptor

This descriptor lists all the frequencies used in transmission of a multiplex within the DVB network. It gives a complete list of cells and identifies the frequencies that are in use in these cells for the multiplex described.

The following applies:

- It appears not more than once in each iteration for which there is a delivery system descriptor.
- The list of frequencies is complete.

### 4.6.11 target\_IP\_address\_descriptor

This descriptor is used to announce IPv4 destination addresses of IP streams within an Elementary Stream.

If this descriptor is transmitted, it appears in the target-loop of an INT sub\_table.

### 4.6.12 target\_IPv6\_address\_descriptor

This descriptor is used to announce IPv6 destination addresses of IP streams within an Elementary Stream.

If this descriptor is transmitted, it appears in the target-loop of an INT sub\_table.

### 4.6.13 IP/MAC\_platform\_name\_descriptor

This descriptor is used to provide the name of the IP platform, e.g. "SONERA GOLD".

If this descriptor is transmitted, it appears in the platform-loop of an INT sub\_table.

### 4.6.14 IP/MAC\_platform\_provider\_name\_descriptor

This descriptor is used to provide the name of the IP platform provider, e.g. "SONERA".

If this descriptor is transmitted, it appears in the platform-loop of an INT sub\_table.

#### 4.6.15 target\_IP\_slash\_descriptor

This descriptor is used to announce ranges of IPv4 destination addresses of IP streams within an Elementary Stream.

If this descriptor is transmitted, it appears in the target-loop of an INT sub\_table.

#### 4.6.16 target\_IP\_source\_slash\_descriptor

This descriptor is used to announce ranges of IPv4 destination and source addresses of IP streams within an Elementary Stream.

If this descriptor is transmitted, it appears in the target-loop of an INT sub\_table.

#### 4.6.17 target\_IPv6\_slash\_descriptor

This descriptor is used to announce ranges of IPv6 destination addresses of IP streams within an Elementary Stream.

If this descriptor is transmitted, it appears in the target-loop of an INT sub\_table.

#### 4.6.18 target\_IPv6\_source\_slash\_descriptor

This descriptor is used to announce ranges of IPv6 destination and source addresses of IP streams within an Elementary Stream.

If this descriptor is transmitted, it appears in the target-loop of an INT sub\_table.

#### 4.6.19 IP/MAC\_stream\_location\_descriptor

This descriptor is used to announce a location of service components carrying IP streams announced within the corresponding target-loop.

If present, the descriptor appears in the operational-loop of an INT sub\_table.

#### 4.6.20 time\_slice\_fec\_identifier\_descriptor

This descriptor identifies whether time-slicing and/or MPE-FEC are used on an elementary stream. This descriptor is used to announce each time-sliced Elementary Stream.

When located in the first descriptor loop of NIT, the descriptor applies to all Elementary Streams within all Transport Streams within the DVB network. If located in the second descriptor loop of NIT, the descriptor applies to all Elementary Streams within the referred Transport Stream, overriding any time-slicing or FEC information from the first descriptor loop.

If located in the platform descriptor loop of an INT, the descriptor applies to all Elementary Streams referenced within the table, overriding any time-slicing or FEC information from the NIT. If located in the target descriptor loop, the descriptor applies to all Elementary Streams referenced within the current iteration of the target descriptor loop following the appearance of the descriptor, overriding any time-slicing or FEC information from the platform descriptor loop and in the NIT.

Note that the descriptor applies to Elementary Streams with stream\_type 0x90. Other stream\_type values may be specified later.

The descriptor may appear more than once, in which case each new occurrence overrides previous occurrence(s).

### 4.7 Transmission Parameters Signalling (TPS)

The Transmission Parameters Signalling (TPS) bits are used to signal parameters related to the transmission scheme, i.e. to channel coding and modulation.

The TPS carriers convey information on:

- constellation including the alpha value of the QAM constellation pattern
- hierarchy and interleaving information
- guard interval
- inner code rates
- transmission mode
- frame number in a super-frame
- cell identification
- Time-slicing indicator
- MPE-FEC indicator

The eight TPS bits  $s_{40}$  to  $s_{47}$  are used to identify the cell to which the DVB signal belongs. These bits contain the `cell_id`.

Note that cell identification is 16 bits. Therefore when carried in TPS bits, the LSB and MSB of the `cell_id` are interleaved.

## 4.8 Announcing INT

An INT table may consist of one or more INT sub\_tables. INT sub\_tables are differentiated by `platform_id` and `action_type`. The `platform_id` is used to identify the IP platform, and the `action_type` indicates the action to be performed. Currently the only action type supported is 0x01, which means that location of IP streams in DVB networks is announced.

### 4.8.1 IP/MAC Notification Service

Each INT sub\_table is carried within a component of a DVB service, also referred to as “IP/MAC Notification Service”.

Within the PMT, each component carrying an INT sub\_table is signalled using an IP/MAC Notification Info Structure. The IP/MAC Notification Info Structure announces each INT sub\_table carried within the announced component. The structure is located in the selector field of a `data_broadcast_id_descriptor`, with the `data_broadcast_id` field set to 0x000B.

If multiple INT sub\_tables are carried within a single component, they may be announced in one or more IP/MAC Notification Info Structures. Each structure is carried within exactly one `data_broadcast_id_descriptor`, located in the `ES_info` loop of the PMT sub\_table announcing the IP/MAC Notification Service.

### 4.8.2 IP/MAC Notification NIT/BAT

Each IP/MAC Notification Service within a DVB network is announced using an IP/MAC Notification Service Structure. Each collection of IP/MAC Notification Service Structures is carried in a NIT or BAT sub\_table that announces each IP/MAC Notification Service within the actual DVB network. The structure is located in a `linkage_descriptor`, with `linkage_type` field set to value of 0x0B.

If multiple IP/MAC Notification Services are available within the actual DVB network, they may be announced in one or more IP/MAC Notification Service Structures. Each such structure is carried within exactly one `linkage_descriptor`, located in the first descriptor loop of a NIT announcing the DVB network carrying the DVB services, or in the first descriptor loop of a specifically identified BAT sub\_table. Such a NIT/BAT is called “IP/MAC Notification NIT/BAT”.

Each IP/MAC Notification NIT/BAT announces each IP/MAC Notification Service within the DVB network. For each such DVB service, each IP platform for which INT sub\_tables are carried in components of the service, is announced.

The linkage\_descriptor containing an IP/MAC Notification Service Structure may appear more than once within a descriptor loop.

If an IP/MAC Notification BAT is used, the following applies:

- The BAT sub\_table should be announced within the NIT sub\_tables describing the actual delivery system.
- To announce a BAT sub\_table, a NIT carries a linkage\_descriptor with the linkage\_type set to 0x0C.

## 4.9 Time-slicing and MPE-FEC

An Elementary Stream carrying MPE sections is time-sliced. i.e. the transmission of sections within the Elementary Stream occurs in bursts. Each burst contains at least one MPE section. Sections of other tables (i.e. non MPE) may also be carried.

An Elementary Stream carrying MPE sections may also carry MPE-FEC sections. These sections carry FEC data, supporting forward error correction for data packets on MPE section payloads.

Each MPE section and MPE-FEC section contains real-time parameters, indicating the time to the next burst in the Elementary Stream. Empty MPE sections are not allowed.

## 4.10 UNT and SSU

DVB has defined a System Software Update providing a means of software update for any type of devices from multiple manufacturers. The method uses linkage descriptors from either NIT or BAT to the location of the UNT (Update Notification Table), or directly to the update stream.

The UNT (Update Notification Table) has been defined in order to provide a wide range of information and selectors for the updates (e.g. scheduling of updates, versioning of updates per manufacturers, location of updates, mandatory or user agreement required for updating the devices etc).

The complete description of the DVB-SSU mechanism is available in the ETSI specification **ETSI TS 102 006** : ”Specification for System Software Update in DVB Systems”

### 4.10.1 PSI, SI and Related UNT Signalling

The PMT references the UNT by including the data\_broadcast\_id\_descriptor (data\_broadcast\_id = 0x000A) in the ES\_info loop, where the update\_type in the system\_software\_update\_info is set to 0x2 or 0x3. The system\_software\_update\_info OUI, may be either set to the DVB reserved IEEE OUI of 0x00015A to indicate that selection is only possible by analysing the UNT (referenced by this stream in this PMT entry) or the OUI must contain another valid IEEE OUI corresponding to a UNT sub-table index.

Once a candidate UNT has been selected, a search of the table for a sub-table corresponding to the platform’s IEEE OUI will proceed. If a sub-table is found, a sequential search through each sub-table section’s outermost loop, comparing the compatibilityDescriptor is performed.

For each compatibilityDescriptor match, the target descriptors (if any) must also be compared. The target descriptor loop targets a specific platform device via one or more of the target descriptors defined in this specification. In the case of sequential parsing of the sub-table sections, a match on the compatibility descriptor and the appropriate target descriptors ends the search, and no further searching need be performed.

A successful search will yield, depending upon the action(s) to be performed, a reference to the appropriate data carousel via the SSU\_location\_descriptor’s association\_tag. This association\_tag is used in conjunction with the deferred\_association\_tag\_descriptor() in the program descriptor loop of the PMT, or the stream\_identifier\_descriptor() in the ES\_info loop of the PMT.

If the update is scheduled, but not yet available, a memorisation of start time and location can be performed.

Complete list of descriptors used in UNT may be found in TS 102 006 [9].

Descriptors from the DVB SI range (0x40 – 0x7F) shall have their standard semantics as defined in EN 300 468.

Equally MPEG descriptors in the range 0x00 – 0x3F can not be used in the UNT.

For the details of each descriptors, please refer to the related DVB- ETSI standard [9]

## 5 PSI/SI for IPDC in DVB-H Systems

The contents of this clause specify the use of PSI and SI tables and related descriptors in IPDC in DVB-H networks. The use of PSI/SI tables and/or descriptors not mentioned within this clause is not restricted for any particular network. Specifying the use of such tables/descriptors is outside of the scope of this document.

### 5.1 DVB network and IP platform

If one or more IP streams of an IP platform are carried within a Transport Stream, the Transport Stream SHALL carry the INT sub\_table describing the IP platform.

The INT sub\_table of a particular IP platform SHALL NOT be carried in multiple Elementary Streams (i.e. only one copy allowed) on a particular Transport Stream.

An Elementary Stream carrying INT sub\_table SHOULD NOT carry any other data but INT sub\_tables.

IPDC DVB-H Receiver MAY ignore any other data on an Elementary Stream carrying one or more INT sub\_tables.

An Elementary Stream MAY carry multiple INT sub\_tables, but it is RECOMMENDED that INT sub\_table of each IP platform is carried on different Elementary Streams.

IPDC DVB-H Receiver SHALL support carriage of multiple INT sub\_tables on a single Elementary Stream.

An IP stream MAY be announced on INT sub\_tables of two or more IP platforms (i.e. one IP stream MAY belong to multiple IP platforms).

NOTE: This requires IP address space harmonization between the IP platforms.

IP streams carried within an Elementary Stream SHALL use the same version of IP protocol. I.e. mixing IPv4 and IPv6 datagrams within a single Elementary Stream is not allowed.

IPDC DVB-H network MAY use IPv4 and/or IPv6. Within one IP platform, only one IP version SHOULD be used.

Component(s) carrying INT sub\_table(s) SHOULD be announced as the first component(s) within the PMT sub\_table of the DVB service.

IPDC DVB-H Receiver SHALL NOT assume the INT sub\_table is announced as the first component within the PMT sub\_table of the DVB service.

All Elementary Streams used to carry IP streams of a particular IP platform SHOULD be announced in a single PMT sub\_table.

An INT sub\_table of an IP platform SHOULD be announced in the PMT sub\_table announcing the Elementary Streams carrying IP streams of the IP platform.

IPDC DVB-H Receiver SHALL support usage of multiple PMT sub\_tables on a Transport Stream for a single IP platform.

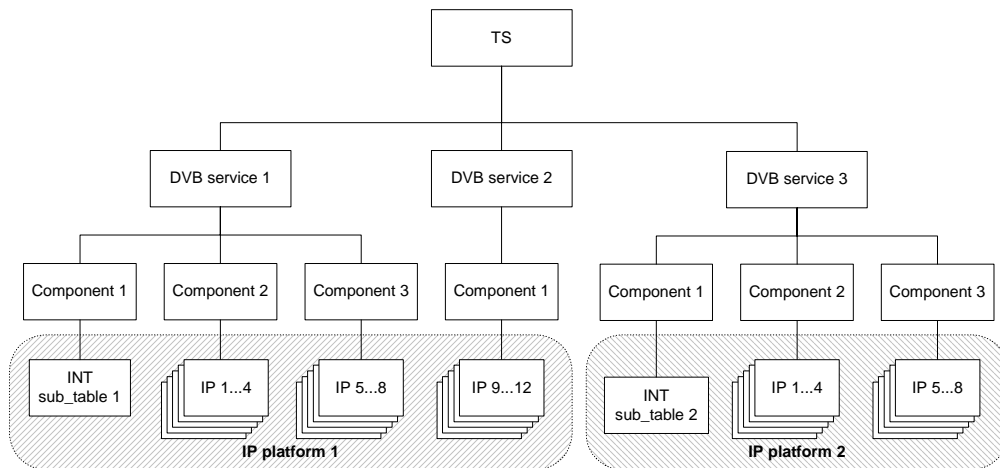
Within a Transport Stream, each carried INT sub\_table SHALL be announced by exactly one IP/MAC Notification Info Structure. One IP/MAC Notification Info Structure MAY announce multiple INT sub\_tables. The IP/MAC Notification Info Structure is carried in data\_broadcast\_id\_descriptor within a PMT sub\_table.

IPDC DVB-H Receiver SHALL NOT assume any particular value for the service\_type for a DVB service carrying only INT sub\_table and/or IP streams.

Figure 5 illustrates this. Two IP platforms have IP streams available on a Transport Stream. IP platform 1 has twelve IP streams, while IP platform 2 has eight IP streams available in the Transport Stream. IP streams are arranged in groups



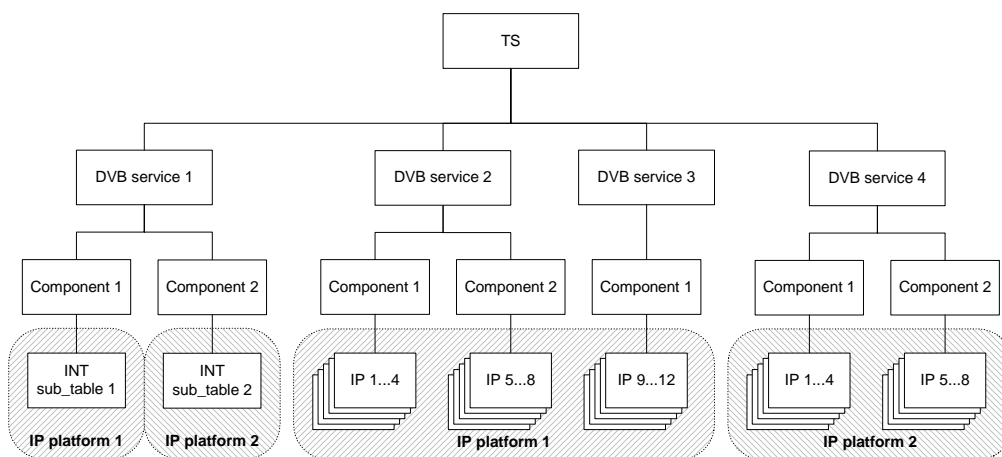
of four IP streams, each group carried in different Elementary Stream. Elementary Streams carrying IP streams of IP platform 2 are components of DVB service 3. The first component of the DVB service is reserved to carry INT sub\_table of the IP platform 2. The number of Elementary Streams required for the IP platform 1 is assumed to be too big to be announced within a single PMT sub\_table (i.e. all Elementary Streams cannot be part of a single DVB service). Therefore two separate DVB services are used. The first component of the DVB service 1 is used to carry the INT sub\_table of IP platform 1. Rest of the components are reserved for IP streams of the platform. If the DVB services would carry any other kind of data streams (e.g. PES streams carrying MPEG-2 coded video or audio), more Elementary Streams would be required.



**Figure 5 : A Transport Stream and two IP platforms, approach 1.**

Note that this collects Elementary Streams which are used to carry IP streams and the INT sub\_table of a given IP platform in a single DVB service. Elementary Streams are collected together as components of one (or more) DVB service, and such DVB services do not contain any data streams that are not part of the IP platform. This makes it easier for an operator of an IPDC DVB-H network to manage the Elementary Streams of an IP platform.

Figure 6 illustrates a slightly different approach, putting all INT sub\_tables in a single DVB service.



**Figure 6 : A Transport Stream and two IP platforms, approach 2.**

An IP platform MAY have IP streams on multiple Transport Streams within a DVB network. An IP platform MAY have IP streams on multiple DVB networks.

Two Transport Streams carrying IP streams of a particular IP platform, MAY carry the same, partially different, or entirely different set of IP flows of the IP platform.

Two IP flows carried on a single Elementary Stream on a particular Transport Stream, MAY be carried on different Elementary Streams on another Transport Streams as well.

## 5.2 Multiprotocol Encapsulation (MPE)

To encode an IP flow into a Transport Stream, Multiprotocol Encapsulation (MPE) SHALL be used.

IPDC DVB-H Receiver SHALL support decoding of IP-on-MPE.

Each MPE section (datagram\_section) SHALL contain exactly one IP datagram. The IP datagram SHALL be complete and unbroken, with appropriate source and destination addresses.

In any Elementary Stream, an IP stream SHALL be carried in a single MPE section stream (i.e. only one MAC address used per IP stream).

On different Elementary Streams or different Transport Streams, different MAC addresses for a particular IP flow MAY be used.

IPDC DVB-H Receiver MAY ignore MAC address when filtering IP streams.

An Elementary Stream MAY carry multiple IP streams.

On a particular Elementary Stream, a single MAC address MAY be associated with multiple IP streams (an MPE section stream MAY carry multiple IP streams).

For each Elementary Stream carrying IP stream(s), the SDT\_actual SHOULD contain exactly one data\_broadcast\_descriptor with the data\_broadcast\_id set to 0x05 and the selector\_length set to 2, indicating that Multiprotocol Encapsulation Info structure is included. The descriptor SHALL be associated with the Elementary Stream by means of service\_id and component\_tag.

Within a Multiprotocol Encapsulation Info Structure, the alignment\_indicator SHALL be set to 1, indicating that an alignment of 8 bits is used. Also, the max\_sections\_per\_datagram SHALL be set to 1, indicating that each IP datagram is carried within a single MPE section.

On each MPE section, the MAC address SHOULD NOT be scrambled.

If the MAC\_IP\_mapping\_flag in the Multiprotocol Encapsulation Info Structure in the data\_broadcast\_descriptor is set to 1, an IP to MAC mapping SHALL be as described in RFC 1112 [6] for IPv4 multicast addresses and RFC 2464 [7] for IPv6 multicast addresses.

The same IP to MAC mapping SHOULD be used for other (non-multicast) addresses, too. This is convenient in that the same rule is used for all IP destination addresses, without making difference between unicast, multicast or any other kind of address.

This document does not cover how the MAC address is formed if MAC\_IP\_mapping\_flag is set to 0.

Note that the MAC\_address\_range in Multiprotocol Encapsulation Info Structure limits the number of bytes used to carry the MAC address in the MPE section header.

IPDC DVB-H Receiver MAY ignore the MAC address, and use the IP source and/or destination addresses carried in the IP datagram delivered in the payload of an MPE section instead.

## 5.4 PSI Tables

### 5.4.1 Program Association Table (PAT)

IPDC DVB-H Network SHALL transmit PAT on each Transport Stream of the DVB network. The repetition period of PAT is RECOMMENDED to be 100 ms or lower.

If an IPDC DVB-H Receiver is receiving an IP stream, the following applies:

- Receiver SHALL detect changes in the PAT table (version number field).
- In connection with receiving a burst, Receiver SHALL check for a new version of the PAT during on-time of the time-sliced Elementary Stream. Receiver MAY ignore PAT filtering during the off-period of the time-sliced Elementary Stream.

### 5.4.2 Program Map Table (PMT)

IPDC DVB-H Network SHALL transmit PMT on each Transport Stream of the DVB network. The repetition period of PMT is RECOMMENDED to be 100 ms or lower.

The PCR\_PID field MAY be set to 0x1FFF, indicating that no PCR is associated with the program.

IPDC DVB-H Receiver MAY ignore PCR even if available.

The following descriptor types are important in IPDC DVB-H System and may appear in a PMT sub\_table:

- stream\_identifier\_descriptor
- data\_broadcast\_id\_descriptor

IPDC DVB-H Receiver MAY ignore all other descriptors, when present.

For each component carrying IP stream(s), the stream\_type SHALL be set to value of 0x90.

The ES\_info\_loop associated with an Elementary Stream carrying IP stream(s) SHALL contain a stream\_identifier\_descriptor announcing the component\_tag of the Elementary Stream. This component\_tag SHALL be unique within the DVB service. The announced component\_tag SHALL have the same value as in the corresponding data\_broadcast\_descriptor in the SDT (if any).

For each component carrying INT sub\_table(s), the stream\_type SHOULD be set to value of 0x05.

Each INT sub\_table within an Elementary Stream SHALL be announced using a data\_broadcast\_id\_descriptor in the corresponding PMT sub\_table. The descriptor SHALL be located in ES\_info\_loop associated with the component. The descriptor SHALL appear exactly once for each INT sub\_table carried within the Elementary Stream. In the data\_broadcast\_id\_descriptor, the data\_broadcast\_id SHALL be set to value of 0x000B, indicating that the descriptor contains IP/MAC Notification Info Structure.

IPDC DVB-H Receiver SHOULD follow changes in PMT sub\_table while accessing components of the DVB service. I.e. while receiving an INT sub\_table or an IP stream carried within the components of a DVB service, a Receiver SHOULD also filter for newer versions of the PMT sub\_table of that DVB service.

If an IPDC DVB-H Receiver is receiving an IP stream, the following applies:

- The Receiver SHALL detect changes in an INT sub\_table within the same Transport Stream announcing the received IP stream by detecting changes in PMT sub\_table announcing the Elementary Stream where INT sub\_table is carried.

- In connection with receiving a burst, Receiver SHALL check for a new version of the corresponding PMT sub\_table during on-time of the time-sliced Elementary Stream. Receiver MAY ignore filtering of the particular PMT sub\_table during the off-period of the time-sliced Elementary Stream.

### 5.4.3 Conditional Access Table (CAT)

The CAT is providing information about the conditional access method used on this network and where the relevant streams can be found. This table is used when the scrambling is performed at the MPEG Transport Stream level.

Note: This table might also be used in order to provide the information of the key management system used at the IP level.

### 5.4.4 Transport Stream Description Table (TSDT)

An IPDC DVB-H Network SHOULD transmit a TSDT. All transmitted sections of the TSDT SHALL be transmitted at least every 10 s.

A TSDT sub\_table MAY contain the following descriptor types:

- transport\_stream\_descriptor

IPDC DVB-H Receiver MAY ignore all other descriptors, when present.

If TSDT is transmitted, transport\_stream\_descriptor SHALL be present, the descriptor\_length SHALL be set to value of 0x03, and the following three bytes SHALL contain values 0x44, 0x56, 0x42 (ASCII: 'D', 'V', 'B').

IPDC DVB-H Receiver MAY ignore TSDT, when present.

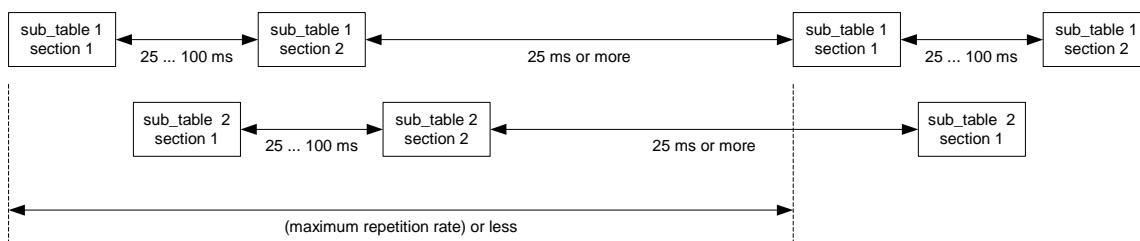
## 5.5 SI Tables

The following applies to all SI tables:

- The time between transmitting sequential sections of a sub\_table SHOULD NOT exceed 100 ms, and the time between the last byte of the preceding section and the first byte of the next section SHALL not be less than 25 ms.
- The bandwidth used by an Elementary Stream transmitting sections of any sub\_table SHOULD NOT exceed 1 Mbps calculated over any period of half a second.

Figure 7 illustrates the requirements for times between sections of a sub\_table. The maximum time of 100 ms is between sequential sections of a sub\_table. The minimum time of 25 ms is between the last section of a sub\_table to the first section of the next occurrence of the sub\_table. The maximum repetition rate of a table defines the maximum time within which all sections of every sub\_table of the table shall be transmitted once.

Note that different sub\_tables of a particular table may be transmitted simultaneously.



**Figure 7 : Times between sections of sub\_tables.**

## 5.5.1 Network Information Table (NIT)

### 5.5.1.1 NIT\_actual

An IPDC DVB-H Network SHALL transmit the NIT\_actual on each Transport Stream of the DVB network. The NIT\_actual SHALL contain exactly one delivery system descriptor for each of Transport Streams of the actual delivery system and provide valid information about the Transport Stream.

The following descriptors are important in IPDC in DVB-H System and SHALL appear in a NIT\_actual sub\_table:

- network\_name\_descriptor
- linkage\_descriptor with a linkage type of 0x0B or 0x0C
- terrestrial\_delivery\_system\_descriptor
- cell\_list\_descriptor
- cell\_frequency\_link\_descriptor

The following descriptor MAY appear in a NIT\_actual sub\_table:

- time\_slice\_fec\_identifier\_descriptor

IPDC DVB-H Receiver MAY ignore other descriptors, when present.

The following applies to each Transport Stream carrying one or more INT sub\_tables:

- The NIT\_actual SHALL contain a linkage\_descriptor with a linkage\_type of 0x0B or 0x0C.
- If the NIT\_actual carries linkage\_descriptor(s) with a linkage\_type of 0x0B, the following applies:
  - The descriptor(s) SHALL announce each DVB service carrying INT sub\_table(s) within the actual DVB network
  - Each of the descriptor(s) SHALL carry exactly one IP/MAC Notification Service Structure announcing one or more IP/MAC Notification Services.
  - The list of IP/MAC Notification Services announced SHALL be complete. The list is complete if all INT sub\_tables within the DVB network are referred to by at least one linkage\_descriptor with a linkage\_type of 0x0B.

The following applies to each Transport Stream not carrying any IP flows:

- The Transport Stream SHOULD carry a linkage\_descriptor with a linkage\_type of 0x0C within its NIT\_actual, announcing at least one NIT\_actual within the DVB network containing a linkage\_descriptor with a linkage\_type of 0x0B.

The following applies to the the network\_name\_descriptor:

- The descriptor SHALL appear exactly once in the first descriptor loop.
- The descriptor SHOULD contain the name of the DVB network (i.e. SHOULD NOT contain an empty string).

The following applies to the terrestrial\_delivery\_system\_descriptor:

- The descriptor SHALL appear exactly once in each iteration of the transport\_stream\_loop (i.e. for each announced Transport Stream).
- If the announced Transport Stream is available in multiple frequencies, the other\_frequency\_flag SHALL be set to '1'.

The following applies to the cell\_list\_descriptor:

- The descriptor SHALL be present in the first descriptor loop.
- The cell and subcell list SHALL be complete.
- The descriptor MAY appear more than once within the descriptor loop.

The following applies to the cell\_frequency\_link\_descriptor:

- This descriptor SHALL appear for the Transport Stream in the transport\_stream\_loop to list all the frequencies where the Transport Stream is available within the DVB network.
- The list of announced frequencies SHALL be complete.

The following applies to the time\_slice\_fec\_identifier\_descriptor:

- When located in the first descriptor loop, the descriptor applies to all elementary streams with stream\_type 0x90 within all transport streams announced within the sub-table.
- When located in the second descriptor loop, the descriptor applies to all elementary streams with stream\_type 0x90 within the specific transport stream. This descriptor overwrites any descriptors in the first descriptor loop.

IPDC DVB-H Receiver MAY assume the content of NIT\_actual being static (i.e. not changing) during the time it is attached to a DVB network. Therefore a Receiver may read the content of NIT\_actual only when it attaches to the DVB network. An IPDC DVB-H Receiver SHOULD read the content of NIT\_actual every time it is attaching a DVB network (either when powered on, or when changing from a DVB network to another).

### 5.5.1.2 NIT\_other

An IPDC DVB-H Network MAY transmit NIT\_other on one or more Transport Streams of the DVB network. NIT\_other has to be valid and only announce an existing network. NIT\_other, if transmitted, SHALL contain exactly one delivery system descriptor for each of the Transport Streams of the actual delivery system and provide valid information about the Transport Stream.

The following descriptors are important in IPDC in DVB-H System and SHALL appear in any transmitted NIT\_other sub\_table:

- network\_name\_descriptor
- terrestrial\_delivery\_system\_descriptor
- cell\_list\_descriptor
- cell\_frequency\_link\_descriptor

The following descriptor MAY appear in a NIT\_other sub\_table:

- time\_slice\_fec\_identifier\_descriptor

IPDC DVB-H Receiver MAY ignore other descriptors, when present.

The following applies to the the network\_name\_descriptor:

- The descriptor SHALL appear exactly once in the first descriptor loop.
- The descriptor SHOULD contain the name of the DVB network (i.e. SHOULD NOT contain an empty string).

The following applies to the terrestrial\_delivery\_system\_descriptor:

- The descriptor SHALL appear exactly once in each iteration of the transport\_stream\_loop (i.e. for each announced Transport Stream).
- If the announced Transport Stream is available in multiple frequencies, the other\_frequency\_flag SHALL be set to '1'.

The following applies to the cell\_list\_descriptor:

- The descriptor SHALL be present in the first descriptor loop.
- The cell and subcell list SHALL be complete.
- The descriptor MAY appear more than once within the descriptor loop.

The following applies to the cell\_frequency\_link\_descriptor:

- This descriptor SHALL appear for the Transport Stream in the transport\_stream\_loop to list all the frequencies where the Transport Stream is available within the DVB network.
- The list of announced frequencies SHALL be complete.

The following applies to the time\_slice\_fec\_identifier\_descriptor:

- When located in the first descriptor loop, the descriptor applies to all elementary streams with stream\_type 0x90 within all transport streams announced within the sub-table.
- When located in the second descriptor loop, the descriptor applies to all elementary streams with stream\_type 0x90 within the specific transport stream. This descriptor overwrites any descriptors in the first descriptor loop.

IPDC DVB-H Receiver MAY assume the content of NIT\_other being static (i.e. not changing) during the time it is attached to a DVB network. Therefore, while attached to a DVB network, a Receiver may read the content of a particular NIT\_other only once.

## 5.5.2 Bouquet Association Table (BAT)

If linkage\_descriptor with linkage type 0x0C is located in the NIT\_actual of the DVB network, then the IPDC DVB-H Network SHALL transmit BAT sub\_table (table\_id 0x4A) on each of the Transport Streams referred by the linkage\_descriptor. If NIT\_actual does not carry linkage\_descriptor with linkage\_type 0x0C, IPDC in DVB-H Receiver MAY ignore BAT, if present.

If linkage\_descriptor with linkage type 0x0C is located in the NIT\_actual of the DVB network, then following descriptor type SHALL appear in the BAT:

- Linkage\_descriptor with linkage\_type 0x0B

If the BAT carries linkage\_descriptor(s) with a linkage\_type of 0x0B, the following applies:

- The descriptor(s) SHALL announce each DVB service carrying INT sub\_table(s) within the actual DVB network
- Each of the descriptor(s) SHALL carry exactly one IP/MAC Notification Service Structure announcing one or more IP/MAC Notification Services.
- The list of IP/MAC Notification Services announced SHALL be complete. The list is complete if all INT sub\_tables within the DVB network are referred to by at least one linkage\_descriptor with a linkage\_type of 0x0B.

### 5.5.3 Service Description Table (SDT)

An IPDC DVB-H Network SHALL transmit SDT sub\_table for the actual Transport Stream (table\_id 0x46). All transmitted sections of the SDT for the actual multiplex SHALL be transmitted at least every 2 s.

The services\_loop of the SDT SHALL contain information about all DVB service available within the Transport Stream. Each DVB service SHOULD NOT be announced more than once within an SDT sub\_table.

In an IPDC in DVB-H System, the following descriptor types SHALL appear in the SDT of an Transport Stream where one or more MPE section streams are available:

- service\_descriptor
- data\_broadcast\_descriptor

IPDC DVB-H Receiver MAY ignore other descriptors, when present.

The following applies to the SDT when announcing a DVB service carrying INT sub\_table or IP streams:

- the EIT\_schedule\_flag SHOULD be set to value of 0x00, indicating that the EIT schedule information for the DVB service is not present in the Transport Stream. IPDC DVB-H Receiver MAY ignore schedule information if present.
- IPDC DVB-H Receiver MAY ignore present/following information if present.
- The running\_status SHOULD be set to value of 0x04, indicating that the DVB service is currently running.
- The following applies to the service\_descriptor:
  - The descriptor SHALL be present.
  - IPDC DVB-H Receiver SHALL NOT assume any particular value for the service\_type.
  - The service\_provider\_name MAY contain the service provider name. IPDC DVB-H Receiver MAY ignore service provider name.
  - The service\_name MAY contain the DVB service name. IPDC DVB-H Receiver MAY ignore service name.
- The following applies to the data\_broadcast\_descriptor:
  - The descriptor SHALL be present for each component carrying one or more MPE section streams within the DVB service.
  - It MAY occur more than once. IPDC DVB-H Receiver MAY ignore them all but one, for which the following applies:
    - The data\_broadcast\_id field SHALL be set to value 0x0005.
    - the component\_tag field SHALL be set to the value of the component announced within the PMT sub\_table of the DVB service.



- the descriptor SHALL contain Multiprotocol Encapsulation Info Structure. For the structure, the following applies:
  - MAC\_address\_range SHALL be set to value of 0x01, indicating that only MAC\_address\_6 in the header of MPE sections carried within the referred component contains valid MAC-address information.
  - MAC\_IP\_mapping\_flag SHOULD be set to '1', indicating that it uses the IP to MAC mapping as described in RFC 1112 [6] for IPv4 multicast addresses, and RFC 2464 [7] for IPv6 multicast addresses.
  - alignment\_indicator SHALL be set to '0', indicating that alignment of 8 bits is used.
  - max\_sections\_per\_datagram SHALL be set to value of 0x01, indicating that each IP datagram is carried in exactly one MPE section.
- IPDC DVB-H Receiver MAY ignore the text description of the data component, if present.

Note that an IPDC DVB-H Receiver doesn't use MAC address for filtering MPE section streams.

An IPDC DVB-H Receiver MAY ignore SDT, when present.

#### 5.5.4 Event Information Table (EIT)

IPDC over DVB-H does not require the use of the EIT. Therefore a IPDC DVB-H Receiver MAY ignore the EIT when present.

#### 5.5.5 Running Status Table (RST)

IPDC over DVB-H does not require the use of the RST. Therefore a IPDC DVB-H Receiver MAY ignore the RST when present.

#### 5.5.6 Time and Date Table (TDT)

IPDC DVB-H Network SHALL transmit TDT at least once in every 30 seconds. The TDT SHALL contain the valid UTC-time and date information.

IPDC DVB-H Receiver SHOULD use TDT to synchronize its internal clock.

#### 5.5.7 Time Offset Table (TOT)

The network MAY transmit TOT.

IPDC DVB-H receiver MAY use TOT for getting time zone information and daylight saving time information.

#### 5.5.8 Stuffing Table (ST)

IPDC DVB-H Receiver SHALL ignore ST, when present.

#### 5.5.9 IP/MAC Notification Table (INT)

Within the actual transport stream, an IPDC DVB-H Network SHALL transmit an INT sub\_table for each IP platform delivering IP streams within the Transport Stream. All transmitted sections of the INT SHALL be transmitted at least once in every 30 s.

The processing\_order field of an INT sub\_table with action\_type 0x01 SHALL be set to value of 0xFF or 0x00, indicating that no ordering is implied.

The following descriptors MAY appear in platform\_descriptor\_loop:

- IP/MAC\_platform\_name\_descriptor

Platform\_loop MAY contain this descriptor, containing the name of the IP platform in one or more languages. The descriptor MAY occur more than once. Each occurrence of the platform\_name SHOULD be identical with the platform\_name announced using the same language code in NIT containing IP/MAC Notification Service Structure.

- time\_slice\_fec\_identifier\_descriptor

If this descriptor is present in platform\_loop, it indicates that all Elementary Streams referred within this INT sub\_table are time-sliced with parameters announced in this descriptor.

IPDC DVB-H Receiver MAY ignore all other descriptors in platform-loop.

Following descriptors MAY appear in target-loop:

- target\_IP\_address\_descriptor
- target\_IP\_slash\_descriptor
- target\_IP\_source\_slash\_descriptor
- target\_IPv6\_address\_descriptor
- target\_IPv6\_slash\_descriptor
- target\_IPv6\_source\_slash\_descriptor

Each iteration of 2<sup>nd</sup> loop of INT table SHALL contain at least one of the above listed target-descriptors in target-loop.

Descriptor\_length field of any descriptor in this loop SHALL NOT be set to "0" (i.e. the descriptor SHALL signal at least one IP flow).

An IP flow SHALL NOT be announced in more than one iteration of 2<sup>nd</sup> loop of INT table.

Following applies to each target\_IP\_address\_descriptor within the 2<sup>nd</sup> loop of INT table:

- The use of target\_IP\_slash\_descriptor or target\_IP\_source\_slash\_descriptor instead is RECOMMENDED.
- Note that this descriptor can contain maximum of 62 IPv4\_addr fields.
- IPv4\_addr\_mask field indicates the bits significant in each IP address announced in the following IPv4\_addr fields within the descriptor.
- This descriptor refers to every IP flow with any source address and any of the announced destination address.

Following applies to each target\_IP\_slash\_descriptor within the 2<sup>nd</sup> loop of INT table:

- Note that this descriptor can contain maximum of 51 IPv4\_addr fields.
- IPv4\_slash\_mask indicates the number of significant bits in the corresponding IPv4\_addr, starting from the msb.
- This descriptor refers to every IP flow with any source address and any of the announced destination address.

Following applies to each target\_IP\_source\_slash\_descriptor within the 2<sup>nd</sup> loop of INT table:

- Note that this descriptor can contain maximum of 25 IPv4\_addr fields.
- IPv4\_source\_slash\_mask indicates the number of significant bits in the corresponding IPv4\_source\_addr, starting from the msb.
- IPv4\_dest\_slash\_mask indicates the number of significant bits in the corresponding IPv4\_dest\_addr, starting from the msb.
- This descriptor refers to every IP flow with any of the announced source address and any of the announced destination address.

Following applies to each target\_IPv6\_address\_descriptor within the 2<sup>nd</sup> loop of INT table:

- The use of target\_IPv6\_slash\_descriptor or target\_IPv6\_source\_slash\_descriptor instead is RECOMMENDED.
- Note that this descriptor can contain maximum of 14 IPv6\_addr fields.
- IPv6\_addr\_mask field indicates the bits significant in each IPv6 address announced in the following IPv6\_addr fields within the descriptor. IPv6\_addr\_mask value ffff:ffff:ffff:ffff:ffff:ffff:ffff:ff00 would indicate that the 8 lsb of the IPv6\_addr value are to be ignored.
- This descriptor refers to every IP flow with any source address and any of the announced destination address.

Following applies to each target\_IPv6\_slash\_descriptor within the 2<sup>nd</sup> loop of INT table:

- Note that this descriptor can contain maximum of 15 IPv6\_addr fields.
- IPv6\_slash\_mask indicates the number of significant bits in the corresponding IPv6\_addr, starting from the msb. IPv6\_slash\_mask\_value 120 would indicate that the 8 lsb of the IPv6\_addr value are to be ignored.
- This descriptor refers to every IP flow with any source address and any of the announced destination address.

Following applies to each target\_IPv6\_source\_slash\_descriptor within the 2<sup>nd</sup> loop of INT table:

- Note that this descriptor can contain maximum of seven (7) IPv6\_addr fields.
- IPv6\_source\_slash\_mask indicates the number of significant bits in the corresponding IPv6\_source\_addr, starting from the msb.
- IPv6\_dest\_slash\_mask indicates the number of significant bits in the corresponding IPv6\_dest\_addr, starting from the msb.
- This descriptor refers to every IP flow with any of the announced source address and any of the announced destination address.

If the IP/MAC\_stream\_location\_descriptors associated with the first descriptor announce different locations than the IP/MAC\_stream\_location\_descriptors associated with the second descriptor (i.e. located in different iteration of 2<sup>nd</sup> loop of INT table), IPDC DVB-H Receiver would need to know which of the locations to use. For such cases, following applies:

- If within an INT sub\_table an IP flow is announced multiple times using different masks, Receiver SHALL use the one with more precise mask (i.e. the mask with more bits set). If several announcement are available it's to the implementation to decide which one to use, not to a DVB standard to specify this.

Following descriptors MAY appear in operational-loop:

- IP/MAC\_stream\_location\_descriptor

Each iteration of 2<sup>nd</sup> loop of INT table SHALL contain at least one IP/MAC\_stream\_location\_descriptor in operational-loop, providing the location of IP streams. Given location SHALL NOT occur more than once within each iteration of 2<sup>nd</sup> loop of INT table.

- `time_slice_fec_identifier_descriptor`

If this descriptor is present in `target_loop`, it indicates that all Elementary Streams referred within this loop after this descriptor are time-sliced with parameters announced in this descriptor. Descriptor applies from the next `IP/MAC_stream_location_descriptor` (if any) to the end of the current iteration of the loop or to the next `time_slice_fec_identifier_descriptor`, which ever comes first.

The `IP/MAC_stream_location_descriptor` SHOULD have different content within each iteration of 2<sup>nd</sup> loop of INT table (i.e. SHOULD announce different location)

IPDC DVB-H Receiver MAY ignore all other descriptors in operational-loop.

INT sub\_table SHALL announce each IP stream of the IP platform available on the actual Transport Stream (i.e. target-loop SHALL contain a descriptor announcing the IP address of the corresponding IP flow, and the corresponding operational-loop SHALL contain a descriptor announcing the location of the IP stream within the actual Transport Stream).

INT sub\_table SHOULD announce each IP stream of the IP platform available on the neighbouring Transport Streams. Neighbouring Transport Streams are Transport Streams, which are transmitted in geographically co-located, adjacent or intersecting cells.

## 5.6 Transmission Parameter Signalling (TPS)

Following applies on each cell of an IPDC DVB-H Network:

- A cell SHALL NOT contain multiple Transport Streams where IP streams are carried over DVB-H, except when hierarchical modulation is used, in which case there MAY be up to two Transport Streams per cell.
- In addition to a Transport Stream carrying IP streams over DVB-H, the cell may contain one or more Transport Streams where IP streams over DVB-H are not carried.
- A cell MAY contain multiple subcells.

## 5.7 Update Notification Table (UNT)

IPDC DVB-H Network MAY use UNT table to signal where, when and how System Software Update services can be found, as specified in [9].

IPDC DVB-H Receiver MAY support System software Update using UNT.

## 5.8 Announcing INT

### 5.8.1 IP/MAC Notification Service

An Elementary Stream MAY carry multiple INT sub\_tables.

Following applies to each IP/MAC Notification Info Structure:

- At least one INT sub\_table SHALL be announced.
- More than one INT sub\_tables SHOULD NOT be announced.
- If more than one INT sub\_tables are announced within a single structure, each SHALL have a different `platform_id`.

- For each announced platform\_id, action\_type 0x01 (location of IP/MAC streams in DVB networks) SHOULD be announced exactly once.
- INT\_versioning\_flag fields SHALL be set to '1', indicating that the INT\_version field reflects the changes of the announced INT sub\_table.

Note: If INT\_versioning\_flag is set to 1, a Receiver needs to filter only the PMT sub\_table to detect changes in PMT and INT sub\_tables. If the flag is set to 0, the Receiver needs to filter both PMT and INT sub\_table, therefore requiring one extra filter.

IP/MAC Notification Service Structure SHALL appear in NIT\_actual of each Transport Stream containing one or more IP/MAC Notification Services, or in BAT carried on at least one of the Transport Streams of the network.

## 5.8.2 IP/MAC Notification NIT

The following applies to each NIT containing IP/MAC Notification Service Structure:

- The list of announced IP platforms SHALL be complete, so that each INT sub\_table within the entire DVB network is referred to by at least one linkage\_descriptor containing an IP/MAC Notification Service Structure.
- A platform\_name SHALL be given for each announced IP platform. The platform\_name MAY be announced just once within each NIT containing IP/MAC Notification Service Structures.

To get the names of each available IP platform within a DVB network, an IPDC DVB-H Receiver would read the NIT containing linkage\_descriptors with linkage\_type 0x0B. Within such NIT, names of each available IP platform are announced.

## 5.8.3 IP/MAC Notification BAT

The following applies to each BAT containing IP/MAC Notification Service Structure:

- A platform\_name SHALL be given for each announced IP platform. The platform\_name MAY be announced just once within each BAT containing IP/MAC Notification Service Structures.

To get the names of each available IP platform within a DVB network, an IPDC DVB-H Receiver would read the BAT containing linkage\_descriptors with linkage\_type 0x0B. Within such BAT, names of each available IP platform are announced.