DVB Interim Specification

IP Datacast Baseline Specification,

PSI/SI Guidelines for IPDC DVB-T/H Systems

DVB Document A079

April 2004

Contents

Introduction

The present document describes the usage of PSI/SI information in IPDC DVB-T/H System. The document intentionally constrains PSI/SI to simplify requirements for prototype equipment which will be developed to validate the IPDC DVB-T/H concept. Similarly, the requirement specified here for streams carrying IP data not to be scrambled is a constraint applied only for such non-commercial trial systems. The document will be superseded by ETSI standards for IPDC which are expected to be developed during 2004.

Intended readers of this document are those implementing or operating IPDC DVB-T/H Networks as well as those implementing IPDC DVB-T/H Receivers. 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 DVB-T/H System. An operator of an IPDC DVB-T/H Network should understand what information should be available, and an IPDC DVB-T/H Receiver vendor should understand how the information is available.

1 Scope

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

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

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

The scope of this "PSI/SI Guidelines for IPDC DVB-T/S Systems" is in the first hand to enable common direction to pilots and technical trials for IP Datacast over DVB-T/H.

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 Technical Report (TR), 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] ETSI TR 101 202: "DVB Implementation Guidelines for Data Broadcasting"

[7] ISO/IEC 13818-6: "Extension for Digital Storage Media Command and Control"

[8] ISO 8859: "Information processing – 8-bit single byte coded graphic character sets, Latin alphabets"

[9] ISO 639.2: "Code for representation of names and languages"

[10] ISO/IEC 8802-1: "Telecommunications and information exchange between systems; Local and metropolitan area networks; Specific requirements"

Part 1: Overview of Local Area Network Standards

Part 1a: Sub Network Attachment Point (SNAP)

[11] ISO/IEC 8802-2: "Telecommunications and information exchange between systems; Local and metropolitan area networks; Specific requirements"

Part 2: Logical link control (LLC)

[12] IETF RFC 1112: "Host extension for IP multicast"

[13] IETF RFC 2464: "Transmission of IPv6 Packets over Ethernet Network"

[14] ETSI EN 300 744: "Framing structure, channel coding and modulation for digital terrestrial television"

[15] IETF RFC 2119: "Key words for use in RFCs to Indicate Requirements Level"

[16] ETSI TR 101 154: "Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications"

[17] DVB: "Transmission System for Handheld Terminals (DVB-H)"

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-T/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)" [17].

Elementary Stream: Stream of Transport Stream 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-T/H Receiver may expect to be available on IPDC DVB-T/H Bearer (data transmission baseband) and the IPDC DVB-T/H Network is expected to make available on the IPDC DVB-T/H Bearer.

IP datagram stream: A stream of IPv6 or IPv4 datagrams each sharing the same IP source and destination address. An IP datagram stream is identified within an IP platform by its source and destination addresses. IP datagram stream on different IP platforms may have the same source/destination addresses, but are considered different IP datagram streams. IP datagram stream may be delivered over one or more IP streams.

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

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

IPDC DVB-T/H Receiver: The equipment or the system that consumes or uses IP Datacast based services provided over the IP Datacast Baseline on DVB-T/H.

IPDC DVB-T/H System: Consists of one or more IPDC DVB-T/H Networks and one or more IPDC DVB-T/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 datagram streams 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 data stream delivering exactly one MPE encoded IP datagram stream. IP stream is identified by transport_stream_id, original_network_id, service_id, component_tag, and IP source/destination addresses.

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

MPE section stream: A stream of MPE sections each sharing the same MAC-address and delivered within an Elementary Stream. MPE section stream is identified within an Elementary Stream 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 used for mapping PSI/SI information introduced in the present document into Transport packets.

Transport Stream: Stream of transport_packets, as defined in ISO/IEC 13818-1 [1]

Transport 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
BCD	Binary Coded Decimal
bslbf	Bit string, left bit first
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
kbps	kilo bits per second
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
rpchof	remainder polynomial coefficients, highest order first
RST	Running Status Table
SDT	Service Description Table
SI	Service Information
SIT	Selection Information Table
ST	Stuffing Table
TDT	Time and Data Table
TOT	Time Offset Table
TPS	Transmission Parameter Signalling
TS	Transport Stream
TSDT	Transport Stream Description Table
uimsbf	unsigned integer, most significant bit first
UTC	Universal Time, Co-ordinated

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

The contents of this clause are informative.

4.1 PSI/SI and DVB network

A DVB network is identified by a globally unique network_id. DVB network consist of one or more Transport Streams (TSs), each carrying a multiplex and being transmitted by one or more DVB signals. Information about DVB network is available within NIT sub_table (identified by network_id). NIT lists all multiplexes and DVB signals available within the DVB network. NIT is carried within each TS of the DVB network.

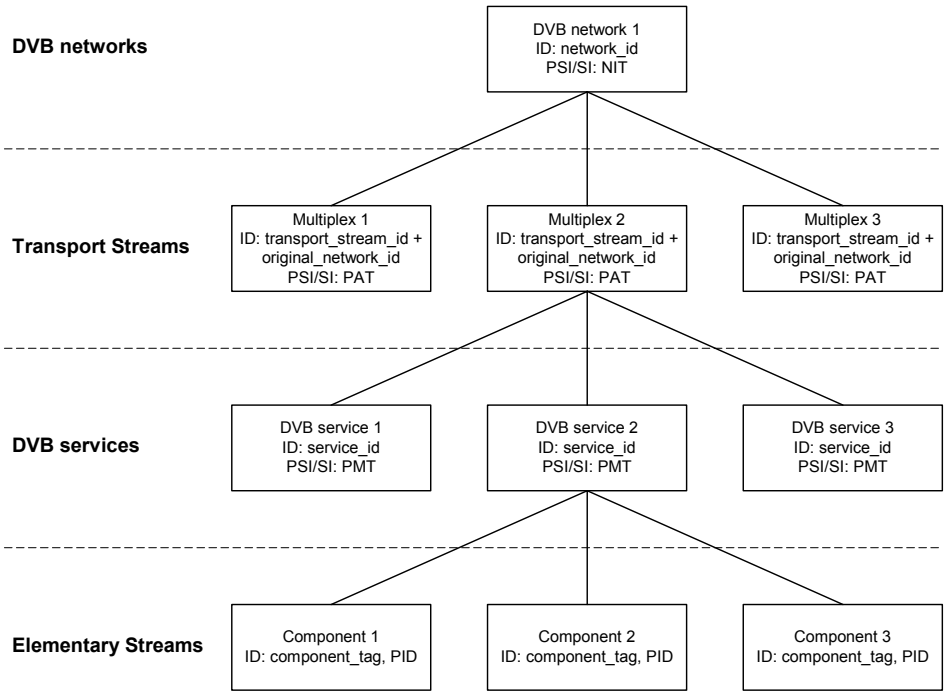

Figure 1: Relation between DVB networks, Transport Streams, DVB services and components

A multiplex is a set of DVB services multiplexed together, and carried on a TS. A TS carries exactly one multiplex. A multiplex and the TS 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 TS. However, if the DVB signals belong to different DVB networks, the TS 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 TSs.

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

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

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

A DVB service is a set of components, each carried in its own ES. A DVB service containing no components is a NULL-service, carrying no content. DVB service is identified by service_id. Service_id is unique within a multiplex. DVB service is globally uniquely identified by transport_stream_id, original_network_id and service_id (all three together).

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 multiplex.

A component is identified by component_tag. Component_tag is unique within a DVB service. Component is carried within an Elementary Stream (ES), identified by PID. PID is unique within a TS. Mapping between component_tag and PID is signalled in PMT.

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

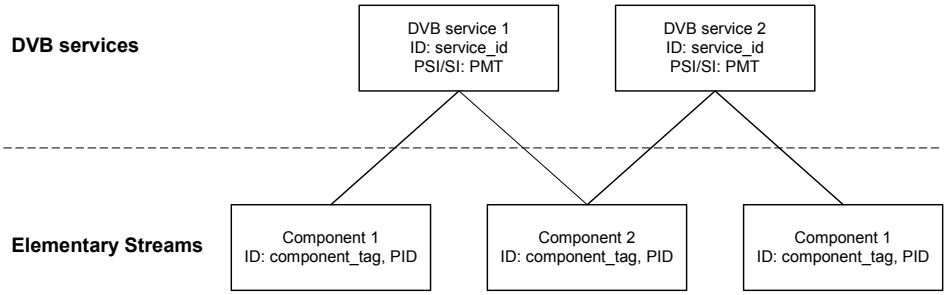

Figure 2 : Two DVB services sharing a component.

4.2 IP platform, IP datagram stream and IP stream

An IP platform is a set of IP datagram streams 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 TSs, within one or multiple DVB networks. In such case, each of the TSs may carry any subset of the IP datagram streams of the IP platform.

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 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 IP platform is globally uniquely identified by combination of both platform_id and network_id.

Each IP platform contains one or more IP datagram streams, each delivered on one or more IP streams. An IP datagram stream is identified within an IP platform by its source and destination addresses. IP datagram stream on different IP platforms are always considered different IP datagram stream, even if they have the same source/destination addresses. Each IP datagram stream may be delivered over one or more IP streams.

IP stream is a data stream delivering exactly one MPE encoded IP datagram stream. 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 TS.

- service_id and component_tag together identify a single ES within a TS. Note that ES is also identified by PID.
- IP source/destination addresses identify a single IP stream within an ES. This is required if multiple IP streams are carried within an ES. Note that it is not possible to deliver single IP datagram stream on multiple IP streams within an ES, since the Receiver would consider such IP streams as one (the only way to differentiate IP streams within an ES is the IP source/destination address).

Two IP streams carrying the same IP datagram stream imply, that content is carried in two different locations. Typically such IP streams are located in different multiplexes. In such case, a Receiver may accomplish a handover between these multiplexes while receiving the IP datagram stream.

Note that INT doesn't always announce the source address of an IP datagram stream. This is done to optimise the usage of INT. For such IP streams, the source address shall be ignored, and IP streams differentiated based on destination address only.

IP stream is a single data stream delivering an IP datagram stream. IP stream has associated parameters indicating its location (network_id, original_network_id, transport_stream_id, service_id and component_tag). IP datagram stream represents the data content of a stream. It may be delivered over multiple IP streams, and doesn't have a location (i.e. it may be delivered on any DVB network, any TS and any ES). IP datagram stream belongs to exactly one IP platform.

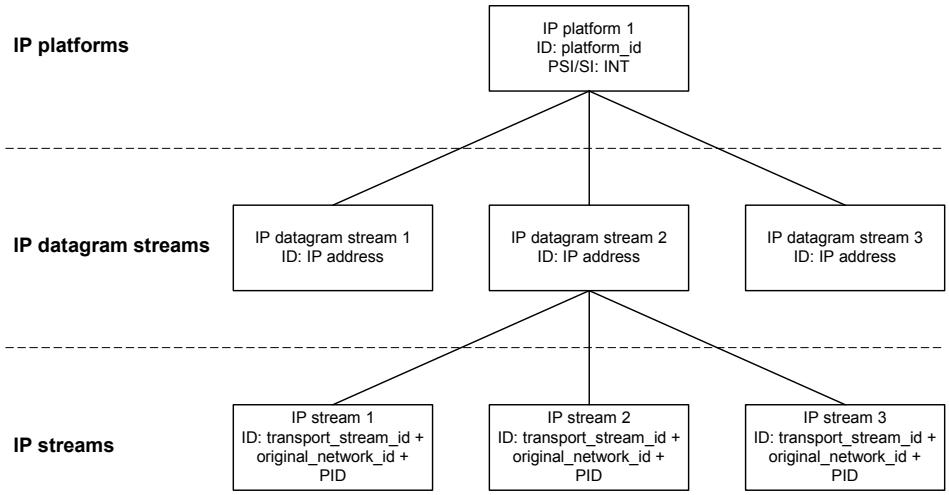

Figure 3 : Relation between IP platform, IP datagram stream and IP stream.

4.3 Multiprotocol Encapsulation (MPE)

DVB has introduced multiprotocol encapsulation (MPE) for encoding OSI-model layer 3 datagrams into TS. MPE is defined in ETSI EN 301 192 [5]. Each IP datagram is encoded into a single MPE section. The IP datagram starts right after MAC_address_1 field. Maximum size for an IP datagram (including the IP datagram header) is 4080 bytes.

Single ES may contain multiple MPE section streams. Within an ES, MPE section stream is identified by its MAC_address field. Note that IPDC DVB-T/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 Receiver, there is no need to differentiate MPE section streams within an ES.

For each ES carrying MPE encapsulated IP stream(s), SDT_actual contains a data_broadcast_descriptor. Following applies to the descriptor:

- data_broadcast_id is set to 0x0005, indicating the Multiprotocol Encapsulation Info Structure is used.
- selector_length is set to 2.
- Max_sections_per_datagram is set to 1, indicating that each IP datagram is carried within a single MPE section.
- component_tag is set to the value announced within the PMT sub_table of the DVB service for the referred component.

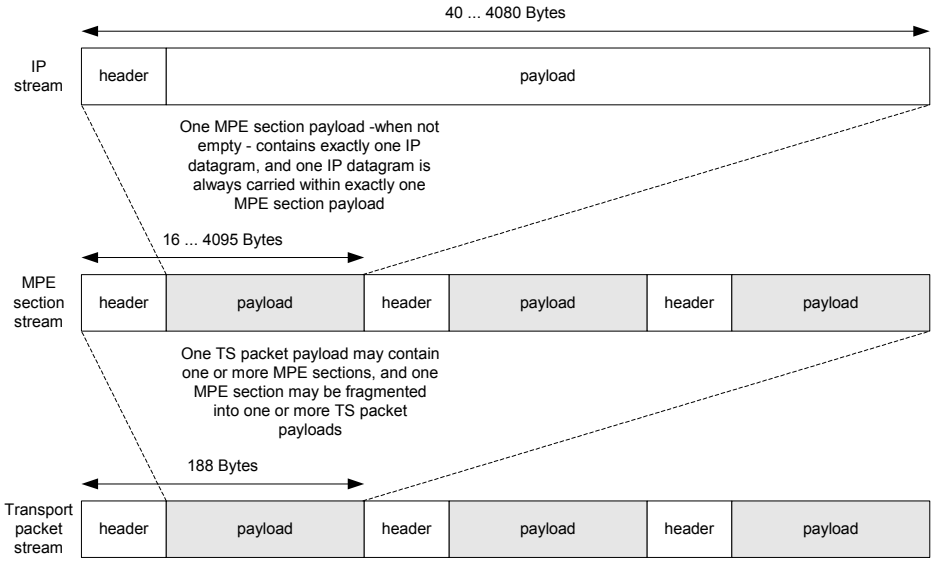

Figure 4 : Relation between Transport packet stream, MPE section stream and IP stream.

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 ESs, each labelled with a PID. DVB services, ESs or parts thereof may be scrambled for conditional access. However, PSI shall not be scrambled.

In TS, PSI is classified into table structures. While these structures may be thought of as simple tables, they shall be segmented into sections and inserted in TS packets, some with predetermined PIDs and others with user 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.
- Within each TS, bandwidth used by elementary streams carrying PSI data about a DVB service does not exceed 80 kbps. Note that this limitation applies to the bandwidth used by all mentioned ESs together, rather than to each individual ES. The bandwidth is calculated adding the bandwidth of the ES carrying PAT and bandwidth of the ES carrying concerned PMT sub_table. If any component of the DVB service is scrambled, the ES carrying CAT table is also included into the calculation.
- Any addition, removal or change in content of any section within a sub_table affects 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 is 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 TS 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 ES associated with PID 0x0000. All sections of PAT shall be transmitted at least once in every 100 ms.

DVB network transmits PAT in each of its TS. PAT contains no descriptors. The program loop within PAT contains information about each DVB service within the actual TS. If the program_number 0x0000 is announced, the corresponding network_PID field is set to 0x10.

Program_number of each DVB service available within the TS is announced. The corresponding program_map_PID contains the PID of the PMT sub_table of the DVB service. A PMT sub_table is carried within an ES with PID value between 0x0020 ... 0x1FFE. PMT sub_tables may be spread over multiple ESs (i.e. PMT sub_table for each DVB service may be delivered in different ES).

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

4.4.2 Program Map Table (PMT)

Program Map Table (PMT) provides the mappings between program numbers and the program elements that comprise them. A PMT sub_table announces mapping for a single DVB service. Within a TS, a PMT sub_table is identified by program_number. A PMT sub_tabel is also referred as a “program definition”. The PMT is the complete collection of all program definitions (i.e. all PMT sub_tables) for a TS.

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 ESs.

Each PMT sub_table is delivered in ES associated with PID announced in PAT. All transmitted sections of PMT shall be transmitted at least once in every 100 ms. Program_number of each DVB program shall be unique within the network.

Descriptors in PMT important for use in IPDC DVB-T/H System:

- 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) shall be located in the ES_info loop. Each INT sub_table shall be announced.

- stream_identifier_descriptor

  For each component containing IP streams, this descriptor shall be located in the ES_info loop. The component_tag announced within the descriptor shall be unique for each component within the DVB service.

DVB network transmits PMT sub_table of each DVB service within the actual TS. All transmitted sections of PMT are transmitted at least every 100 ms.

4.4.3 Conditional Access Table (CAT)

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

4.4.4 Transport Stream Description Table (TSDT)

Transport Stream Description Table (TSDT) provides information about the entire TS, 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 shall apply to the entire TS.

4.5 SI Tables

In addition to the PSI, data is needed to provide identification of DVB services for 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 TS, the additional SI information provides information on DVB services carried by different multiplexes, and even on other DVB networks.

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 affects version number change. Two sequential transmissions of a sub_table without version_number change have the same number of sections, and the content and order of sections is identical.

4.5.1 Network Information Table (NIT)

Network Information Table (NIT) conveys information relating to the physical organization of the multiplexes/TSs 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 TS 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 TS containing the NIT is a part) has 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 an 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 NIT is carried in the ES associated with PID 0x10. All transmitted sections of NIT are transmitted at least every 10 s.

Following applies to the transport_stream_loop:

- Each iteration announces a DVB signal carrying a TS of the announced DVB network.
- Each TS belonging to the announced DVB network is announced.
- If a TS is transmitted in multiple DVB signals, each such DVB signal may be announced in separate iteration of the loop.

Descriptors in NIT_actual important for use in IPDC DVB-T/H System:

- 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 NIT_actual, 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, each IP platform having an INT sub_table available within the DVB service is 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 NIT_actual, 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 TS within the DVB network that contains full network SI and bouquet SI. If a linkage_descriptor with linkage_type 0x04 is available in NIT_actual, following applies:

- The NIT and BAT tables within TS referred contain at least all the information carried in NIT and BAT tables within any other TS of the actual DVB network.

- terrestrial_delivery_system_descriptor

  The second descriptor loop contains exactly one delivery_system_descriptor (terrestrial_delivery_system_descriptor if of DVB-T/H network), announcing the physical parameters for the concerned TS. If the announced TS is available in multiple frequencies, the other_frequency_flag is set to 1. In such case, either frequency_list_descriptor or cell_frequency_link_descriptor is also available.

- frequency_list_descriptor

  If the announced multiplex is transmitted on multiple frequencies within the DVB network, this descriptor is used to list those frequencies. If the descriptor is preset, the list is complete. If cell_frequency_link_descriptor is used, this descriptor does not appear.

- cell_list_descriptor

  This descriptor is used to list the cells of the DVB network. If cell identification by means of TPS bits is supported, then the descriptor is present. If the descriptor is present, it 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

  If the announced multiplex is transmitted on multiple frequencies within the DVB network, this descriptor is used to list those frequencies. If the descriptor is preset, the list is complete. If frequency_list_descriptor is used, this descriptor need not appear.

- Time_slice_fec_identifier_descriptor

  This descriptor indicates, whether Time Slicing and/or MPE-FEC is used on the concerned TS. This descriptor may occur in the first and in the second descriptor loop. In the first loop, the descriptor applies to all TSs referred within the table. In the second loop, the descriptor applies to the concerned. 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 boundary of a DVB network. The BAT is segmented into bouquet_association_sections. Any sections forming part of a BAT are transmitted in TS packets with a PID value of 0x0011. The sections of a BAT sub_table describing particular bouquet have the bouquet_id field taking the value assigned to the bouquet described in ETSI TR 101 162 [4]. All BAT sections take a table_id value of 0x4A.

Descriptors in BAT (not comprehensive list):

- bouquet_name_descriptor

  This descriptor is used to transmit the name of the bouquet. This descriptor is available exactly once in each sub_table of the BAT.

- Linkage_descriptor

  If a NIT announced a BAT sub_table by using linkage_descriptor with linkage_type 0x0C, following applies:

  - The announced BAT sub_table contains linkage_descriptor with linkage_type 0x0B announcing all IP/MAC Notification Services within the DVB network. For each IP/MAC Notification Service, each IP platform having an INT sub_table available within the DVB service is announced.
  - The descriptor is located in the first descriptor loop.
  - The descriptor may appear more than once in the loop.

4.5.3 Service Description Table (SDT)

Service Description Table (SDT) contains data describing the DVB services in the system e.g. name of the DVB service, the service provider, etc. Each sub_table of the SDT describes DVB services contained within a particular TS. Depending on the table_id, announced DVB services are available on the actual TS or on other TSs.

The SDT is segmented into service_description_sections. Any sections forming part of a SDT are transmitted in TS packets with a PID value of 0x0011. Any sections of an SDT which describe the actual TS (that is, the TS 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 TS other than the actual TS takes a table_id value of 0x46.

The transmission of the SDT for the actual TS is mandatory. The SDT lists all DVB services of the TS.

Descriptors in SDT for the actual TS (table_id 0x46) important for use in IPDC DVB-T/H System:

- 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 ES 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 concerning events or programmes such as event name, start time, duration, etc. The EIT provides information in chronological order regarding the events contained within each DVB service.

Four classifications of EIT have been identified, distinguishable by the use of different table_id values:

- actual TS, present/following event information, table_id 0x4E

- other TS, present/following event information, table_id 0x4F
- actual TS, event schedule information, table_id 0x50...0x5F
- other TS, event schedule information, table_id 0x60...0x6F

All EIT sub_tables for the actual TS 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 give DVB service on either the actual TS or another TS, 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 TS or other TSs contain a list of events, in the form of a schedule, namely, including events taking place at some time beyond the next event. The EIT schedule tables are optional. The event information is chronologically ordered.

EIT is segmented into event_information_sections. Any sections forming part of an EIT are transmitted in TS packets with a PID value of 0x0012.

The SI bit stream has two sections per DVB service for 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 constrains 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.

DVB network transmits EIT present/following sub_table for each DVB service available within the actual TS, and all sections are transmitted 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. 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 TS packets with a PID value of 0x0013, and the table_id takes the value 0x71.

4.5.6 Time and Date Table (TDT)

Time and Date Table (TDT) carries only the UTC-time and date information. TDT consists of a single section. This TDT section is transmitted in TS packets with a PID value of 0x0014, and the table_id takes the value 0x70.

Transmission of 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)

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 TS packets with a PID value of 0x0014, and the table_id takes the value 0x73.

Transmission of 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 boundary 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 anywhere that 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)

IP/MAC Notification Table (INT) is used to signal the availability and location of IP streams in DVB networks. INT describes the availability and location of IP streams. There may be one or many INTs covering all IP streams for a DVB network. INT is referenced by the data_broadcast_id_descriptor 0x000B, in the ES_info loop of the PMT.

Each IP platform having IP streams available within a TS, is announced in exactly one INT sub_table in the TS. INT announces all IP streams available within the actual TS. INT may announce IP streams on other TSs. INT may (but need not) announce all IP streams on all TSs of the DVB network that a Receiver has access (by re-tuning), while having access to the TS containing the INT (i.e. DVB signals that have overlapping or adjacent coverage areas).

Descriptors of INT important for use in IPDC DVB-T/H System:

- 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.

- 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.

- 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 these descriptors in 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 these descriptors in 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 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 is used on a particular ES. This descriptor may occur in platform descriptor loop and in target descriptor loop. In the platform loop, the descriptor applies to all ESs referred within the table. In the target loop, the descriptor applies to all ESs referred within the loop after the appearance of the descriptor. Each occurrence overwrites any possible earlier occurrences. Multiple occurrences are allowed.

4.6 Descriptors

In Table 1 and Table 2, possible locations of descriptors within DVB and SSU scope are marked with character 'x'. If a referred table contains multiple descriptor loops, each loop is marked separately, the left most character indicating the first of the loops. Descriptors important in IPDC DVB-T/H System are marked with grey colour.

Table 1: .Descriptor locations: DVB scope

Descriptor	Tag	PMT	CAT	TSDT	NIT	BAT	SDT	EIT	TOT	UNT	INT
network name	0x40	-|-	-	-	x|-	-|-	-	-	-	-|-|-	-|-|-
service list	0x41	-|-	-	-	-|x	-|x	-	-	-	-|-|-	-|-|-
stuffing	0x42	-|-	-	-	x|x	x|x	x	x	-	-|-|-	-|-|-
satellite delivery system	0x43	-|-	-	-	-|x	-|-	-	-	-	-|-|-	-|-|-
cable delivery system	0x44	-|-	-	-	-|x	-|-	-	-	-	-|-|-	-|-|-
VBI data	0x45	-|x	-	-	-|-	-|-	-	-	-	-|-|-	-|-|-
VBI teletext	0x46	-|x	-	-	-|-	-|-	-	-	-	-|-|-	-|-|-
bouquet name	0x47	-|-	-	-	-|-	x|-	x	-	-	-|-|-	-|-|-
service	0x48	-|-	-	-	-|-	-|-	x	-	-	-|-|-	-|-|-
country availability	0x49	-|-	-	-	-|-	x|-	x	-	-	-|-|-	-|-|-
linkage	0x4A	-|-	-	-	x|-	x|-	x	x	-	-|-|-	-|-|-
NVOD reference	0x4B	-|-	-	-	-|-	-|-	x	-	-	-|-|-	-|-|-
time shifted service	0x4C	-|-	-	-	-|-	-|-	x	-	-	-|-|-	-|-|-
short event	0x4D	-|-	-	-	-|-	-|-	-	x	-	-|-|-	-|-|-
extended event	0x4E	-|-	-	-	-|-	-|-	-	x	-	-|-|-	-|-|-
time shifted event	0x4F	-|-	-	-	-|-	-|-	-	x	-	-|-|-	-|-|-
component	0x50	-|-	-	-	-|-	-|-	-	x	-	-|-|-	-|-|-
mosaic	0x51	x|x	-	-	-|-	-|-	x	-	-	-|-|-	-|-|-
stream identifier	0x52	-|x	-	-	-|-	-|-	-	-	-	-|-|-	-|-|-
CA identifier	0x53	-|-	-	-	-|-	x|-	x	x	-	-|-|-	-|-|-
content	0x54	-|-	-	-	-|-	-|-	-	x	-	-|-|-	-|-|-
parental rating	0x55	-|-	-	-	-|-	-|-	-	x	-	-|-|-	-|-|-
teletext	0x56	-|x	-	-	-|-	-|-	-	-	-	-|-|-	-|-|-
telephone	0x57	-|-	-	-	-|-	-|-	x	x	-	x|-|x	x|-|x
local time offset	0x58	-|-	-	-	-|-	-|-	-	-	x	-|-|-	-|-|-
subtitling	0x59	x|x	-	-	-|-	-|-	-	-	-	-|-|-	-|-|-
terrestrial delivery system	0x5A	-|-	-	-	-|x	-|-	-	-	-	-|-|-	-|-|-
multilingual network name	0x5B	-|-	-	-	x|-	-|-	-	-	-	-|-|-	-|-|-
multilingual bouquet name	0x5C	-|-	-	-	-|-	x|-	-	-	-	-|-|-	-|-|-
multilingual service name	0x5D	-|-	-	-	-|-	-|-	x	-	-	-|-|-	-|-|-
multilingual component	0x5E	-|-	-	-	-|-	-|-	-	x	-	-|-|-	-|-|-
private data specifier	0x5F	x|x	-	-	x|x	x|x	x	x	x	x|x|x	x|x|x
service move	0x60	x|-	-	-	-|-	-|-	-	-	-	-|-|-	-|-|-
short smoothing buffer	0x61	-|-	-	-	-|-	-|-	-	x	-	-|-|-	-|-|-
frequency list	0x62	-|-	-	-	-|x	-|-	-	-	-	-|-|-	-|-|-
partial transport stream	0x63	-|-	-	-	-|-	-|-	-	-	-	-|-|-	-|-|-
data broadcast	0x64	-|-	-	-	-|-	-|-	x	x	-	-|-|-	-|-|-
Reserved for future use	0x65											
data broadcast id	0x66	-|x	-	-	-|-	-|-	-	-	-	-|-|-	-|-|-
transport stream	0x67	-|-	-	x	-|-	-|-	-	-	-	-|-|-	-|-|-
DSNG	0x68	-|-	-	x	-|-	-|-	-	-	-	-|-|-	-|-|-
PDC	0x69	-|-	-	-	-|-	-|-	-	x	-	-|-|-	-|-|-
AC-3	0x6A	-|x	-	-	-|-	-|-	-	-	-	-|-|-	-|-|-
ancillary data	0x6B	-|x	-	-	-|-	-|-	-	-	-	-|-|-	-|-|-
cell list	0x6C	-|-	-	-	x|-	-|-	-	-	-	-|-|-	-|-|-
cell frequency link	0x6D	-|-	-	-	-|x	-|-	-	-	-	-|-|-	-|-|-
announcement support	0x6E	-|-	-	-	-|-	-|-	-	x	-	-|-|-	-|-|-
application signalling	0x6F											
adaptation field data	0x70	-|x	-	-	-|-	-|-	-	-	-	-|-|-	-|-|-
service identifier	0x71	-|-	-	-	-|-	-|-	x	-	-	-|-|-	-|-|-
service availability	0x72	-|-	-	-	-|-	-|-	x	-	-	-|-|-	-|-|-
time slice and fec identifier	0x73	-|-	x	-	x|x	-|-	-	-	-	-|-|-	x|-|x

Table 2: Descriptor locations: SSU scope

Descriptor	Tag	UNT	INT
scheduling	0x01	x|-|x	-|-|-
update	0x02	x|-|x	-|-|-
ssu location	0x03	x|-|x	-|-|-
message	0x04	x|-|x	-|-|-
ssu event name	0x05	x|-|x	-|-|-
target smartcard	0x06	-|x|-	-|x|-
target MAC address	0x07	-|x|-	-|x|-
target serial number	0x08	-|x|-	-|x|-
target IP address	0x09	-|x|-	-|x|-
target IPv6 address	0x0A	-|x|-	-|x|-
ssu subgroup association	0x0B	-|-|x	-|-|-
IP/MAC platform name	0x0C	-|-|-	x|-|-
IP/MAC platform provider name	0x0D	-|-|-	x|-|-
target MAC address range	0x0E	-|-|-	-|x|-
target IP slash	0x0F	-|-|-	-|x|-
target IP source slash	0x10	-|-|-	-|x|-
target IPv6 slash	0x11	-|-|-	-|x|-
target IPv6 source slash	0x12	-|-|-	-|x|-
IP/MAC stream location	0x13	-|-|-	-|-|x
ISP access mode	0x14	-|-|-	x|-|x

4.6.1 network_name_descriptor

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

This descriptor appears exactly once in the first descriptor loop of any NIT sub_table.

4.6.2 bouquet_name_decriptor

This descriptor is used to transmit the name of the bouquet the following DVB services are allocated, e.g. "THE NEWS BOUQUET", "HEAVEN MOVIE CHANNELS", etc.

This descriptor appears exactly once in the first descriptor loop of any BAT sub_table. The descriptor may appear in the descriptor loop of SDT.

4.6.3 service_descriptor

This descriptor provides the names of the DVB service provider and the DVB service together with the service_type. Two 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.

4.6.4 linkage_descriptor

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

A TS carrying an INT sub_table should contain NIT or BAT carrying linkage_descriptor with linkage_type 0x0B announcing the IP/MAC Notification Service carrying the INT sub_table.

NIT or BAT sub_table containing linkage_descriptor with linkage_type 0x0B announces all IP/MAC Notification Services within the DVB network.

If linkage_descriptor with linkage_type 0x0B is located in the NIT, it should be located in the NIT of each TS of the DVB network.

If linkage_descriptor with linkage_type 0x0B is located in the BAT, each NIT_actual of the DVB network should contain linkage_descriptor with linkage_type 0x0C announcing the BAT.

NIT or BAT sub_table containing linkage_descriptor with linkage_type 0x0C announces all NIT and BAT sub_tables containing linkage_descriptor with linkage_type 0x0B within the DVB network.

4.6.5 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 second descriptor loop of PMT sub_table.

4.6.6 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 in each iteration of the loop containing the second descriptor loop in each NIT sub_table describing terrestrial DVB network. This descriptor shall not appear in NIT describing non-terrestrial DVB network.

4.6.7 private_data_specifier

This descriptor is used to identify the source of any private descriptor or user defined field within any descriptor. If this descriptor is located within a descriptor loop of any SI or PSI Table then it applies to all following descriptors in the particular descriptor loop until its end, or until another occurrence of a private_data_specifier_descriptor, whichever comes first.

The effect of a private_data_specifier_descriptor in a descriptor loop does not propagate to any following descriptor loop.

4.6.8 frequency_list_descriptor

This descriptor lists the additional frequencies used in transmission of a multiplex on other frequencies within the DVB network. If a TS is transmitted in multiple DVB signals, this descriptor can be used to list all those DVB signals.

If the descriptor is transmitted, it appears exactly once in each iteration for which there is a delivery system descriptor.

If the descriptor is present, the list of frequencies is complete.

Note that only the frequency of the DVB signals is announced. Other transmission parameters (like constellation or transmission mode) are announced in corresponding delivery_system_descriptor.

If a TS is transmitted in multiple frequencies, this descriptor is used to list all those frequencies. cell_frequency_link_descriptor does the same, but also gives the cell and subcell information. If cell information is in use, it is preferred to use cell_frequency_link_descriptor instead of frequency_list_descriptor.

4.6.9 data_broadcast_descriptor

This descriptor identifies the type of data component.

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

- The descriptor appears for each component carrying MPE section streams within the DVB service.
- data_broadcast_id field is set to 0x0005, indicating the use of the Multiprotocol Encapsulation Info Structure.
- selector_length field is set to 0x02.
- component_tag field is set to the value announced within PMT sub_table of the DVB service for the referred component.

4.6.10 data_broadcast_id_descriptor

This descriptor identifies the type of data component.

This descriptor may appear in the second descriptor loop of PMT for each ES carrying INT sub_tables. When present, following applies:

- data_broadcast_id field is set to 0x000B.

4.6.11 transport_stream_descriptor

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

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

- 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 TS is compliant with DVB.

4.6.12 cell_list_descriptor

This descriptor is used to list the cells of the DVB network about which the NIT sub_table informs. The descriptor also lists the locations of the listed cells.

If this descriptor is transmitted, it appears in the first descriptor loop of NIT sub_table describing terrestrial DVB network. This descriptor does not appear in a NIT describing non-terrestrial DVB network.

If cell identification by means of the TPS bits is supported, the descriptor is present.

If the descriptor is present, 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.

4.6.13 cell_frequency_link_descriptor

This descriptor lists the additional frequencies used in transmission of a multiplex on other frequencies within the DVB network. If a TS is transmitted in multiple DVB signals (typically each one in a different cell), this descriptor can be used to list all those DVB signals. It gives a complete list of cells and identifies the frequencies that are in use in these cells for the multiplex described.

If this descriptor is transmitted, 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.

If a TS is transmitted in multiple frequencies (in the same or different cells), this descriptor is used to list all those frequencies (together with the cell and subcell information). Frequency_list_descriptor is used to list all frequencies carrying a given TS. This descriptor does the same, but also gives the cell and subcell information. If cell information is in use, it is recommended to use cell_frequency_link_descriptor instead of frequency_list_descriptor.

4.6.14 target_IP_address_descriptor

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

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

4.6.15 target_IPv6_address_descriptor

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

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

4.6.16 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.

4.6.17 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.

4.6.18 target_IP_slash_descriptor

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

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

4.6.19 target_IP_source_slash_descriptor

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

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

4.6.20 target_IPv6_slash_descriptor

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

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

4.6.21 target_IPv6_source_slash_descriptor

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

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

4.6.22 IP/MAC_stream_location_descriptor

This descriptor is used to announce a location for IP streams announced within corresponding target-loop.

If present, the descriptor appears in the operational-loop of an INT sub_table.

4.6.23 time_slice_fec_identifier_descriptor

This descriptor identifies whether Time Slicing and/or MPE-FEC are used on an elementary stream.

When located in the first descriptor loop of NIT, the descriptor applies to all ESs within all TSs within the DVB network. When located in the second descriptor loop of NIT, the descriptor applies to all ESs within the referred TS, overwriting any descriptors in the first descriptor loop. When located in the platform descriptor loop of INT, the descriptor applies to all ESs referenced within the table, overwriting any descriptors in the NIT. When located in the target descriptor loop, the descriptor applies to all ESs referenced within the target descriptor loop following the appearance of the descriptor, overwriting any descriptors in the platform descriptor loop and in the NIT.

Note that the descriptor applies only to ESs with stream_type 0x90.

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

4.7 Transmission Parameters Signalling (TPS)

Transmission Parameters Signalling (TPS) bits are used for the purpose of signalling parameters related to the transmission scheme, i.e. to channel coding and modulation.

The TPS carriers convey information on:

- modulation including the a value of the QAM constellation pattern
- hierarchy information
- guard interval
- inner code rates
- transmission mode
- frame number in a super-frame
- cell identification.

The eight TPS bits s_{40} to s_{47} are used to identify the cell to which the DVB signal belongs to. These bits either contain the cell_id, or value '0'.

Note that cell identification is 16 bits. Therefore TPS bits , LSB and MSB are interleaved.

4.8 Announcing INT

INT table within a TS may consist of one or more INT sub_tables. INT sub_tables are differentiated by platform_id and action_type. Platform_id is used to identify concerned IP platform, and action_type identifies the action to be performed. Currently the only action type supported is 0x01, which indicates 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 called as IP/MAC Notification Service.

Each component carrying an INT sub_table is announced using IP/MAC Notification Info Structure. IP/MAC Notification Info Structure announces each INT sub_table carried within the announced component. The structure is located in data_broadcast_id_descriptor, with data_broadcast_id field set to value of 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 second descriptor loop of the PMT sub_table announcing the IP/MAC Notification Service.

4.8.2 INT Notification NIT/BAT

Each IP/MAC Notification Service within the DVB network is announced using IP/MAC Notification Service Structure. Each collection of IP/MAC Notification Service Structures carried within a NIT or BAT sub_table 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 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 NIT/BAT is called INT Notification NIT/BAT.

Each INT Notification NIT/BAT announces each IP/MAC Notification Service within the DVB network. For each such DVB service, each IP platform having one or more INT sub_tables carried within components of the DVB service is announced.

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

If INT Notification BAT is used, following applies:

- The BAT sub_table should be announced within some or all NIT sub_tables describing the actual delivery system.
- To announce a BAT sub_table, a NIT has a linkage_descriptor with linkage_type set to value of 0x0C.

4.9 Time Slicing and MPE-FEC

An ES carrying MPE sections may be time sliced. When time sliced, the transmission of sections within the ES occurs in bursts. Each burst contains at least one MPE section. Other sections are also allowed.

An ES carrying MPE section may carry MPE-FEC sections. These sections carry FEC data, supporting 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. Empty MPE sections are not allowed on an elementary stream where Time Slicing or MPE-FEC is used.

5 PSI/SI in IPDC DVB-T/H Systems

The contents of this clause are normative for IPDC DVB-T/H Networks and IPDC DVB-T/H Receivers.

5.1 DVB network and IP platform

If at least one IP stream of an IP platform is carried within a TS, the TS SHALL carry the INT sub_table of the IP platform.

INT sub_table of a particular IP platform SHALL NOT be carried in multiple ESs (i.e. only one copy allowed).

An ES carrying INT sub_table SHOULD NOT carry any other data but INT sub_tables.

IPDC DVB-T/H Receiver MAY ignore all other data on an ES carrying INT sub_tables.

An ES SHOULD NOT carry multiple INT sub_tables (i.e. INT sub_table of each IP platform in different ES).

IPDC DVB-T/H Receiver SHALL support carriage of multiple INT sub_tables on a single ES.

An ES SHALL NOT carry IP streams of multiple IP platforms (i.e. all IP streams SHALL belong to a single IP platform).

IPDC DVB-T/H Receiver SHOULD assume all IP streams on an ES belong to a single IP platform.

An ES carrying IP stream(s) SHOULD NOT carry any other type of data streams but IP streams.

IPDC DVB-T/H Receiver MAY ignore all non-IP streams on an ES carrying IP stream(s).

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

IPDC DVB-T/H Receiver SHALL support decoding of IPv6 datagrams carried on MPE.

IPDC DVB-T/H Receiver MAY support decoding of IPv4 datagrams carried on MPE..

IP streams carried within components of a DVB service SHOULD belong to a single IP platform, i.e. there SHOULD NOT be IP streams from multiple IP platforms carried within a single DVB service.

IPDC DVB-T/H Receiver SHALL support different IP platforms on different components of a DVB service.

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-T/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 ESs used to carry IP streams of a particular IP platform SHOULD be announced in a single PMT sub_table.

INT sub_table of an IP platform SHOULD be announced in the PMT sub_table announcing the ESs used to carry IP streams of the IP platform.

IPDC DVB-T/H Receiver SHALL support usage of multiple PMT sub_tables on a TS for a single IP platform.

Within a TS, 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_bradcast_id_descriptor within a PMT sub_table.

The service type announced in service_descriptor (in SDT) for a DVB service carrying INT sub_table and/or IP stream SHOULD be set to 0x0C, indicating that the DVB service is a data broadcast service.

IPDC DVB-T/H Receiver SHALL NOT assume any particular value for the service type.

Figure 5 illustrates this. Two IP platforms have IP streams available on a TS. IP platform 1 has twelve IP streams, while IP platform 2 has eight IP streams available in the TS. IP streams are arranged in groups of four IP streams, each group carried in different ES. ESs 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. Number of ESs required for the IP platform 1 is assumed too big to be announced within a single PMT sub_table (i.e. all ESs cannot be part of a single DVB service). Therefore two 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 ESs would be required.

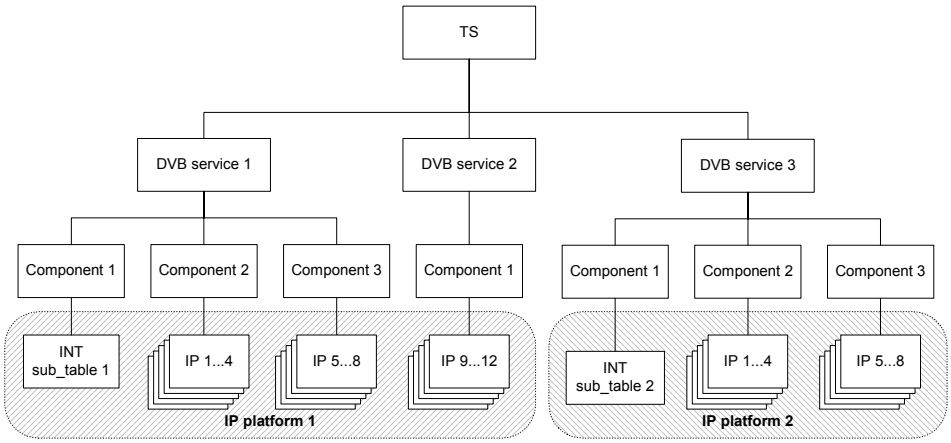

Figure 5 : A Transport Stream and two IP platforms, approach 1.

Note that this collects ESs used to carry IP streams and the INT sub_table of a given IP platform. ESs 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 aims to make it easier for an IPDC DVB-T/H operator to manage ESs used for an IP platform.

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

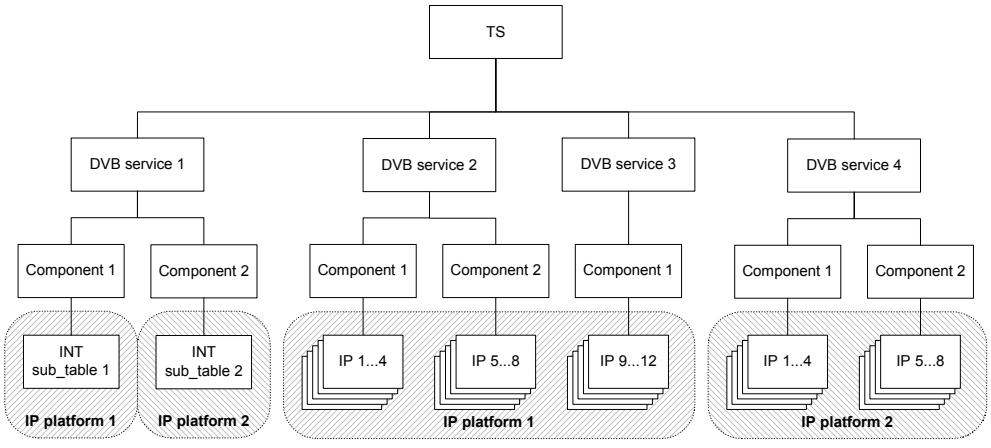

Figure 6 : A Transport Stream and two IP platforms, approach 2.

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

Two TSs carrying IP streams of a particular IP platform, MAY carry the same, partially different, or entirely different set of IP datagram streams of the IP platform.

Two IP datagram streams carried on a single ES on a particular TS, MAY (but NEED NOT) be carried on different ESs on another TS.

A TS carrying IP stream(s) SHALL have cell_id defined. The cell_id SHALL be announced in TPS bits of each DVB signal delivering the TS. The NIT_actual of the TS SHALL contain both cell_frequency_link_descriptor and cell_list_descriptor announcing all cells within the DVB network.

A cell SHOULD NOT contain multiple TSs.

A cell MAY contain multiple subcells.

5.2 Multiprotocol Encapsulation (MPE)

To encode IP datagram stream onto TS, Multiprotocol Encapsulation (MPE) SHALL be used.

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

Each MPE section SHOULD contain a complete and unbroken IP datagram, with appropriate source and destination addresses.

An ES carrying IP streams SHALL NOT contain empty MPE sections. Empty MPE section contains no payload.

IPDC DVB-T/H Receiver MAY discard any MPE section not containing a complete and unbroken IP datagram.

An MPE section SHOULD NOT contain multiple IP datagrams.

IPDC DVB-T/H Receiver MAY discard any MPE section containing multiple IP datagrams.

Stream_type (within PMT) for an ES carrying one or more IP streams SHOULD be set to 0x0D, if Time Slicing is not used on the particular elementary stream. If Time Slicing is used, stream_type SHOULD be set to 0x90.

IPDC DVB-T/H Receiver SHALL NOT assume any particular value for the stream_type.

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

The MAC address of the MPE section stream carrying a particular IP stream within an ES SHALL NOT change over time.

On different ESs or different TSs, different MAC addresses for a particular IP datagram stream MAY be used.

IPDC DVB-T/H Receiver SHOULD ignore MAC address when filtering IP streams.

IPDC DVB-T/H Receiver NEED NOT support filtering based on MAC addresses.

An ES MAY carry multiple IP streams.

An MPE section stream MAY carry multiple IP streams (i.e. one MAC address associated with multiple IP streams).

For each ES carrying IP stream(s), SDT_actual SHOULD contain exactly one data_broadcast_descriptor with the data_broadcast_id set to 0x05 and seletor_length set to 2, indicating that Multiprotocol Encapsulation Info structure is included. The descriptor SHALL be associated with the ES by means of service_id and component_tag.

Within a Multiprotocol Encapsulation Info Structure, alignment_indicator SHALL be set to 1, indicating that alignment of 8 bits is used. Also, max_sections_per_datagram SHALL be set to 1, indicating that each IP datagram is carried within a single MPE section.

If alignment_indicator or max_sections_per_datagram contain any other value, IPDC DVB-T/H Receiver MAY ignore the referred ES and all data carried on it.

On each MPE section, CRC_32 SHOULD be used.

IPDC DVB-T/H Receiver SHALL support CRC_32 checking in MPE sections.

IPDC DVB-T/H Receiver NEED NOT support checksum checking in MPE sections. If a Receiver does not support checksum checking in MPE sections, it SHOULD ignore MPE sections where section_syntax_indicator has the value of 0.

On each MPE section, payload SHOULD NOT be scrambled.

IPDC DVB-T/H Receiver MAY ignore any MPE section where payload_scrambling_control is set to any other value but 0.

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

IPDC DVB-T/H Receiver MAY ignore any MPE section where address_scrambling_control is set to any other value but 0.

Each MPE section SHOULD contain exactly one IP datagram.

IPDC DVB-T/H Receiver MAY ignore any MPE section where last_section_number is set to any other value but 0.

If the MAC_IP_mapping_flag in Multiprotocol Encapsulation Info Structure in data_broadcast_descriptor is set to 1, IP to MAC mapping SHALL be as described in RFC 1112 [12] for IPv4 multicast addresses and RFC 2464 [13] for IPv6 multicast addresses.

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

This document does not cover how MAC address is formed if MAC_IP_mapping_flag is set to 0.

Note that MAC_address_range in Multiprotocol Encapsulation Info Structure may limit the number of bytes used to carry MAC address in MPE section header.

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

5.3 Time Slicing and MPE-FEC

An ES carrying IP stream(s) SHOULD be Time Sliced and SHOULD support MPE-FEC.

If an ES is Time Sliced, following applies:

- Only MPE sections are allowed. If the ES also supports MPE-FEC, MPE-FEC sections are also allowed.
- Each burst SHALL contain at least one MPE section.
- Each MPE section SHALL carry a complete IP datagram.

If an IPDC DVB-T/H Receiver doesn't support Time Slicing, it MAY ignore all real-time parameters in any sections.

If an IPDC DVB-T/H Receiver doesn't support error correction by means of MPE-FEC, it SHOULD ignore all MPE-FEC sections.

5.4 PSI Tables

5.4.1 Program Association Table (PAT)

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

- Receiver SHOULD detect changes in PAT table.
- If the received IP stream is carried on a Time Sliced ES, following applies:
    - When receiving a burst, Receiver SHOULD receive the PAT table at least once to detect whether the version_number of the table has changed. To do this, Receiver may e.g. make sure it remains waken at least 100 ms (All transmitted sections of PAT table are re-transmitted at least once in 100 ms). Receiver MAY ignore PAT filtering during the off-period of Time Sliced ES.

5.4.2 Program Map Table (PMT)

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

IPDC DVB-T/H Receiver MAY ignore PCR if available.

Following descriptor types are important in IPDC DVB-T/H System and may appear in a PMT sub_table:

- stream_identifier_descriptor
- data_broadcast_id_descriptor

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

For each component carrying IP stream(s), stream_type SHOULD be set to value of 0x0D (Time Slicing and MPE-FEC not supported) or 0x90 (Time Slicing or MPE-FEC or both supported).

IPDC DVB-T/H Receiver SHALL NOT assume any particular value for the stream_type.

ES_info_loop associated with an ES carrying IP stream(s) SHALL contain stream_identifier_descriptor announcing the component_tag for the ES. Announced component_tag SHALL be unique within the DVB service. An ES SHALL NOT have more than one component_tag values associated with it (i.e. multiple component_tag values are not allowed). The announced component_tag SHALL have the same value as the corresponding data_broadcast_descriptor in SDT (if any).

For each component carrying INT sub_table(s), stream_type SHOULD be set to value of 0x05.

IPDC DVB-T/H Receiver SHALL NOT assume any particular value for the stream_type.

Each INT sub_table within an ES SHALL be announced using data_broadcast_id_descriptor in the corresponding PMT sub_table. The descriptor SHALL be located in ES_info_loop associated with the component. Descriptor SHALL appear exactly once for each INT sub_table carried within the ES. In the data_broadcast_id_descriptor, data_broadcast_id SHALL be set to value of 0x000B, indicating that the descriptor contains IP/MAC Notification Info Structure.

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

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

- Receiver SHOULD be prepared to detect changes in INT sub_table within the TS announcing the received IP stream. To do so, Receiver SHOULD detect changes in PMT sub_table announcing the DVB service containing the component within which the IP stream is delivered (i.e. the PMT sub_table announcing the received ES). By doing so, Receiver should detect whether new version of INT sub_table is signalled.

- If the received IP stream is carried on a Time Sliced ES, following applies:
    - When receiving a burst, Receiver SHOULD receive the PMT sub_table at least once to detect whether the version_number of the sub_table has changed. To do this, Receiver may e.g. make sure it remains waken at least 100 ms (All transmitted sections of each PMT sub_table are re-transmitted at least once in 100 ms). Receiver MAY ignore PMT filtering during the off-period of Time Sliced ES.

5.4.3 Conditional Access Table (CAT)

ES carrying any IP stream or any PSI/SI information required by an IPDC DVB-T/H Receiver SHALL NOT be scrambled.

IPDC DVB-T/H Receiver MAY ignore CAT, when present.

5.4.4 Transport Stream Description Table (TSDT)

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

A TSDT sub_table MAY contain following descriptor types:

- transport_stream_descriptor

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

If TSDT is transmitted, transport_stream_descriptor SHOULD be present. If the descriptor is present, the descriptor_legnth SHALL be set to value of 3, and the following three bytes SHALL contain values 0x44, 0x56, 0x42 (ASCII: ‘D’, ‘V’, ‘B’).

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

5.5 SI Tables

Following applies to all SI tables:

- Time between transmitting sequential sections of a sub_table SHOULD NOT exceed 100 ms, and SHALL not be less than 25 ms.
- Bandwidth used by an ES 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.

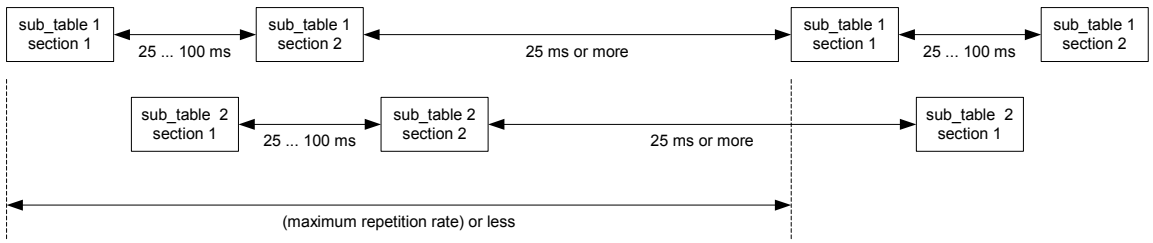

Figure 7 : Times between sections of sub_tables.

5.5.1 Network Information Table (NIT)

IPDC DVB-T/H Network SHALL transmit the NIT_actual on each TS of the DVB network. The NIT_actual SHALL contain exactly one delivery system descriptor for each of TSs of the actual delivery system, containing valid information about the associated TS.

Following descriptor types are important in IPDC DVB-T/H System and MAY appear in a NIT_actual sub_table:

- network_name_descriptor
- linkage_descriptor
- terrestrial_delivery_system_descriptor
- frequency_list_descriptor
- cell_list_descriptor
- cell_frequency_link_descriptor

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

Following applies to each TS carrying one or more INT sub_tables:

- The NIT_actual SHOULD contain linkage_descriptor with linkage_type 0x0B.
- If the NIT_actual carries linkage_descriptor(s) with linkage_type 0x0B, following applies:
    - The descriptor(s) SHALL announce each DVB service carrying INT sub_table(s) within the actual TS.
    - The descriptor(s) SHOULD announce each DVB service carrying INT sub_table(s) within the actual DVB network.
- If the NIT_actual doesn't contain linkage_descriptor with linkage_type 0x0B, then the TS SHALL carry BAT containing linkage_descriptor with linkage_type 0x0B.
- If the actual TS carries BAT containing linkage_descriptor with linkage_type 0x0B, then following applies:
    - The descriptor(s) SHALL announce each DVB service carrying INT sub_table(s) within the actual TS.
    - The descriptor(s) SHOULD announce each DVB service carrying INT sub_table(s) within the actual DVB network.
    - NIT_actual on the actual TS SHALL contain linkage_descriptor with linkage_type 0x0C, announcing the BAT within the actual TS.
    - NIT_actual on the actual TS SHOULD contain linkage_descriptor(s) with linkage_type 0x0C, announcing each IP/MAC Notification BAT within the actual DVB network.

Following applies to each TS not carrying any INT sub_tales:

- The TS SHOULD carry linkage_descriptor with linkage_type 0x0C within its NIT_actual, announcing at least one NIT_actual or BAT within the DVB network containing linkage_descriptor with linkage_type 0x0B

Following applies to each NIT_actual and BAT containing linkage_descriptor with linkage_type 0x0B:

- Each linkage_descriptor with linkage_type 0x0B SHALL carry exactly one IP/MAC Notification Service Structure announcing one or more IP/MAC Notification Services.
- List of IP/MAC Notification Services announced within the NIT_actual/BAT 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 linkage_type 0x0B.

Following applies to 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).

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 TS).
- If the announced TS is available in multiple frequencies, the other_frequency_flag SHALL be set to '1'. In such case, either frequency_list_descriptor or cell_frequency_link_descriptor SHALL be available.

Following applies to the cell_list_descriptor:

- If cell identification by means of the TPS bits is supported the descriptor SHALL be present in the first descriptor loop. Note that in an IPDC DVB-T/H Network, cell identification by means of the TPS bits is mandatory.
- If the descriptor is present, the cell and subcell list SHALL be complete.
- The descriptor MAY appear more than once within the descriptor loop.

Following applies to the cell_frequency_link_descriptor:

- If cell identification by means of TPS bits is supported, this descriptor SHALL appear for the TS in the transport_stream_loop to list those frequencies. Note that in an IPDC DVB-T/H Network, cell identification by means of the TPS bits is mandatory.
- If the descriptor is present, the list of announced frequencies SHALL be complete.

IPDC DVB-T/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-T/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).

5.5.2 Bouquet Association Table (BAT)

IPDC DVB-T/H Network SHOULD prefer usage of INT Notification NITs over INT Notification BATs.

IPDC DVB-T/H Receiver MAY ignore any BAT sub_tables except INT Notification BAT, when present.

IPDC DVB-T/H Receiver SHALL support usage of INT Notification BAT.

All transmitted sections of BAT SHALL be transmitted at least every 10 s.

If INT Notification BAT is used, IPDC DVB-T/H Receiver MAY assume the content of such BAT being static (i.e. not changing) during the time it is attached into a DVB network. Therefore a Receiver may read the content of the BAT only when it attaches to the DVB network. Receiver SHOULD read the content of INT Notification BAT every time it is attaching a DVB network (either when powered on, or when changing from a DVB network to another).

5.5.3 Service Description Table (SDT)

IPDC DVB-T/H Network SHALL transmit SDT sub_table for actual TS (table_id 0x46). All transmitted sections of SDT for the actual multiplex SHALL be transmitted at least every 2 s.

Services_loop of the SDT SHALL contain information about each DVB service available within the TS. Each DVB service SHOULD NOT be announced more than once within an SDT sub_table.

Following descriptor types are important in IPDC DVB-T/H System and may appear in SDT:

- service_descriptor
- stream_identifier_descriptor
- data_broadcast_descriptor

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

Following applies to SDT when announcing a DVB service carrying INT sub_table or IP streams:

- 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 TS. IPDC DVB-T/H Receiver MAY ignore schedule information if present.
- EIT_present_following_flag SHOULD be set to value of 0x00, indicating that the EIT present/following information for the DVB service is not present in the TS. IPDC DVB-T/H Receiver MAY ignore present/following information if present.
- running_status SHOULD be set to value of 0x04, indicating that the DVB service is currently running.
    - IPDC DVB-T/H Receiver SHOULD ignore this field, and assume that the DVB service is always running (i.e. the content is always available).
- free_CA_mode SHOULD be set to value of 0x00, indicating that all of the component streams of the DVB service are not scrambled. IPDC DVB-T/H Receiver NEED NOT support reception of any scrambled component stream.
- Following applies to service_descriptor:
    - The descriptor SHALL be present.
    - The service_type within the descriptor SHOULD be 0x0C, indicating that the DVB service is data broadcast service. IPDC DVB-T/H Receiver SHALL NOT assume any particular value for the service_type.
    - service_provider_name_length SHOULD be set to value 0x00, indicating that the service provider name is not provided. IPDC DVB-T/H Receiver SHOULD ignore service provider name.
    - service_name_length SHOULD be set to value 0x00, indicating that the DVB service name is not provided. IPDC DVB-T/H Receiver SHOULD ignore service name.
- Following applies to data_broadcast_descriptor:
    - The descriptor SHALL be present for each component carrying one or more MPE section streams within the DVB service.

- Multiple occurrences MAY occur. IPDC DVB-T/H Receiver MAY ignore them all but one, for which the following applies:
  - 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, following applies:
    - If the ES is time sliced, 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 2464 [13] 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-T/H Receiver MAY ignore the text description of the data component, if present.

Note that an IPDC DVB-T/H Receiver doesn't use MAC address for filtering MPE section streams. Therefore the Receiver doesn't need the information carried within the SDT, and MAY ignore it, when present.

5.5.4 Event Information Table (EIT)

IPDC DVB-T/H System doesn't use events (as referred by EIT). Therefore the information carried within EIT is not relevant for IPDC DVB-T/H Receiver.

IPDC DVB-T/H Network SHOULD use values presented in Table 3, when building an EIT present/following sub_table:

Table 3: Values for an empty EIT present/following.

Field	Present event	Following event
section_length	0x00F	0x00F
section_number	0x00	0x01
last_section_number	0x01	0x01
segment_last_section_number	0x01	0x01
last_table_id	0x4E	0x4E
event_id	field not preset	field not preset
start_time	field not preset	field not preset
duration	field not preset	field not preset
running_status	field not preset	field not preset
free_CA_mode	field not preset	field not preset
descriptors_loop_length	field not preset	field not preset

IPDC DVB-T/H Receiver MAY ignore EIT, when present.

5.5.5 Running Status Table (RST)

IPDC DVB-T/H System doesn't use events (as referred by EIT). Therefore the information carried within RST is not relevant for an IPDC DVB-T/H Receiver.

IPDC DVB-T/H Network NEED NOT transmit RST.

IPDC DVB-T/H Receiver MAY ignore RST, when present.

5.5.6 Time and Date Table (TDT)

IPDC DVB-T/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-T/H Receiver MAY use TDT to synchronize its internal clock.

5.5.7 Time Offset Table (TOT)

IPDC DVB-T/H Network NEED NOT transmit TOT.

IPDC DVB-T/H Receiver MAY ignore TOT, when present.

5.5.8 Stuffing Table (ST)

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

5.5.9 IP/MAC Notification Table (INT)

IPDC DVB-T/H Network SHALL transmit INT sub_table for each IP platform delivering IP streams within actual TS. All transmitted sections of INT SHALL be transmitted at least once in every 30 s.

The action_type field of an INT sub_table SHOULD be set to value of 0x01, indicating that the location of IP streams in DVB networks is announced.

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.

Following descriptors MAY be used 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. If the descriptor is present, exactly one occurrence SHOULD contain ISO_639_language_code indicating English language. Other language codes MAY appear. The coding of the platform_name announced using English language SHALL follow rules specified in chapter 5.8.2 . Each occurrence of the platform_name SHOULD be identical with the platform_name announced using the same language code in NIT/BAT containing IP/MAC Notification Service Structure.

- private_data_specifier_descriptor

  This descriptor with private_data_specifier set to value of 0x06 SHALL appear before any time_slice_fec_identifier_descriptor in platform_loop.

- time_slice_fec_identifier_descriptor

  If this descriptor is present in platform_loop, it indicates that all ESs referred within this INT sub_table are time sliced with parameters announced in this descriptor.

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

Following descriptors MAY be used in target-loop:

- target_IPv6_address_descriptor

- target_IPv6_slash_descriptor
- target_IPv6_source_slash_descriptor
- target_IP_address_descriptor
- target_IP_slash_descriptor
- target_IP_source_slash_descriptor

Each iteration of 2nd 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 datagram stream).

An IP datagram stream SHOULD NOT be announced in more than one iteration of 2nd loop of INT table.

IPDC DVB-T/H Receiver MAY ignore all other descriptors in target-loop.

Following applies to each target_IPv6_address_descriptor within the 2nd loop of INT table:

- This descriptor SHOULD NOT be used. Usage of two other descriptors instead is recommended.
- The descriptor can contain maximum of 15 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 datagram stream with any source address and any of the announced destination address.

Following applies to each target_IPv6_slash_descriptor within the 2nd loop of INT table:

- The 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 datagram stream with any source address and any of the announced destination address.

Following applies to each target_IPv6_source_slash_descriptor within the 2nd loop of INT table:

- The 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 datagram stream with any of the announced source address and any of the announced destination address.

IPDC DVB-T/H Network SHOULD avoid announcing an IP datagram stream within the INT sub_table by using different masks. Following is an example of this:

Within the INT sub_table, one target_IPv6_slash_descriptor has content:

IPv6_addr: 2001:770:18:2:260:cfff:fe20:f400

IPv6_slash_mask: 120 (0x78)

This announces all IP destination addresses from 2001:770:18:2:260:cfff:fe20:f400 to 2001:770:18:2:260:cfff:fe20:f4ff. Descriptor doesn't announce source address, and therefore every source address is applied.

Within the same INT sub_table, another target_IPv6_slash_descriptor has content:

IPv6_addr: 2001:770:18:2:260:cfff:fe20:f480

IPv6_slash_mask: 121 (0x79)

The second descriptor announces all IP destination addresses from 2001:770:18:2:260:cfff:fe20:f480 to 2001:770:18:2:260:cfff:fe20:f4ff. Note that these destination addresses are also covered by the first descriptor. Descriptor doesn't announce source address, and therefore every source address is applied.

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 2nd loop of INT table), IPDC DVB-T/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 datagram stream is announced multiple times using different masks, Receiver SHOULD prefer the one with more precise mask (i.e. the mask with more bits set).

In the example above, the Receiver SHOULD prefer the second location, as the mask on the second descriptor is more restricting.

Following descriptors MAY be used in location-loop:

- IP/MAC_stream_location_descriptor

  Each iteration of 2nd 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 2nd loop of INT table.

- private_data_specifier_ descriptor

  This descriptor with private_data_specifier set to value of 0x06 SHALL appear before any time_slice_fec_identifier_descriptor in target_loop.

- time_slice_fec_identifier_descriptor

  If this descriptor is present in target_loop, it indicates that all ESs 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 loop or to the next time_slice_fec_identifier_descriptor, which ever comes first.

  Note that the descriptor can also be used to indicate that the referred ESs are not time sliced. This is done by setting the time_slicing field to the value of 0. This can be used e.g. if the descriptor appeared in the platform-loop stating that all referred ESs are time sliced, in which case this appearance could state that following ESs are not time sliced.

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

IPDC DVB-T/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 TS (i.e. target-loop SHALL contain a descriptor announcing the IP address of the corresponding IP datagram stream, and the corresponding operational-loop SHALL contain a descriptor announcing the location of the IP stream within the actual TS).

INT sub_table SHOULD announce each IP stream of the IP platform available on the neighbouring TSs. Neighbouring TS is a TS that an IPDC DVB-T/H Receiver may access by only retuning when receiving the actual TS.

5.6 Descriptors

5.7 Transmission Parameters Signalling (TPS)

Following applies to each DVB signal belonging to an IPDC DVB-T/H Network:

- Each TS contains IP streams SHALL have cell_id defined.
- Each DVB signal carrying a TS with cell_id defined SHALL have TPS bits announcing the cell_id (i.e. supports the cell identification by means of TPS bits).
- IPDC DVB-T/H Receiver SHOULD support decoding of MPE streams on a DVB signal where cell_id is not announced on TPS bits. I.e. if a receiver has (by any means) found an IP stream carried on an MPE stream, the receiver SHOULD support reception of the IP stream.
- IPDC DVB-T/H Receiver NEED NOT support hand-over to a DVB signal where cell_id is not announced on TPS bits.

5.8 Announcing INT

5.8.1 IP/MAC Notification Service

If an ES carries multiple INT sub_tables, they all SHOULD have the same platform_id. In such case, each INT sub_table SHALL have different action_type. Since only single action_type is currently supported, there SHOULD NOT be multiple INT sub_tables within an ES.

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 SHOULD have the same platform_id and different action_type.
- 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.
- The structure SHOULD NOT contain any private data.

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.

5.8.2 INT Notification NIT/BAT

IP/MAC Notification Service Structure SHOULD appear in NIT_actual of each TS containing one or more IP/MAC Notification Services.

i.e. linkage_descriptor with linkage_type 0x0B SHOULD appear in NIT rather than BAT. Also, the descriptor SHOULD appear in each TS carrying one or more INT sub_tables.

For an IPDC DVB-T/H Network containing IP/MAC Notification Services, each NIT_actual not containing linkage_descriptor with linkage_type 0x0B (i.e. IP/MAC Notification Service Structure), SHOULD contain linkage_descriptor with linkage_type 0x0C announcing at least one TS containing NIT_actual with linkage_type 0x0B within the DVB network.

i.e. in a TS that contains no INT sub_tables, NIT_actual SHOULD contain linkage_descriptor with linkage_type 0x0C announcing a TS where linkage_type 0x0B is available.

Following applies to each IP/MAC Notification Service Structure:

- The structure SHOULD NOT contain any private data.

Following applies to each NIT/BAT containing IP/MAC Notification Service Structure:

- List of announced IP platforms SHALL be complete, so that each INT sub_table within the entire DVB network is referred by at least one linkage_descriptor containing IP/MAC Notification Service Structure.
- Platform_name SHALL be announced for each announced IP platform. Platform_name MAY be announced just once within each NIT/BAT containing IP/MAC Notification Service Structures.
- At least one of the occurrences of each announced platform_name SHALL have ISO_639_language_code field set to value indicating English language (i.e. "eng" or "ENG").
- Following applies when ISO_639_language_code field is set to indicate English language:
    - The platform_name_length SHALL contain value greater than 0x00, indicating the presence of the platform_name.
    - platform_name SHALL contain the name of the platform. To the name, following applies:
        - The name SHALL be coded using Latin alphabet (see ETSI EN 300 468 [2], annex A, table 00).
        - The name SHALL NOT contain any other symbols but those listed below:
            - ' ' (0x32, whitespace)
            - '0'...'9' (0x30 ... 0x39)
            - 'A'...'Z' (0x41 ... 0x5A)
            - 'a'...'z' (0x61 ... 0x7A)
        - The name SHALL contain at least one of the above listed symbols, which SHALL NOT be a whitespace.
        - Each occurrence of the name within the entire DVB network SHOULD be identical. Note that the name may occur in IP/MAC Notification Service Structures as well as in platform_name_descriptors.
        - The name SHOULD be unique for each IP platform within each DVB network.
- The coding of platform_name for any other value of ISO_639_language_code is not specified in this version of this document.

To get the names of each available IP platform within a DVB network, an IPDC DVB-T/H Receiver would read the NIT (or BAT) containing linkage_descriptors with linkage_type 0x0B. Within such NIT (or BAT), names of each

available IP platform are announced, and at least one occurrence of each platform_name uses English language code. Names coded using English language code use Latin-1 character codes. The Receiver would read the platform_name coded with English language code, and ignore all bytes starting from byte with value 0x96 (if any). The Receiver would ignore all other occurrences of the platform_name, within the same NIT (or BAT), as well as in any other SI table within the DVB network (since the name is assumed to be identical in every occurrence).

History

Document history		
<Version>	<Date>	<Milestone>
V0.0.1	16.10.2003	First draft delivered to DVB-UMTS I_MT
V 0.0.2	12.01.2004	Delivered to DVB-UMTS
V0.0.3	21.01.2004	Comments from DVB-GBS
V1.0.0	01.04.2004	Publication as A079