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Digitalna videoradiodifuzija (DVB) – Specifikacija za servisne informacije (SI) v sistemih DVB

Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems

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Foreword

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

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

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

National transposition dates	
Date of adoption of this EN:	17 November 2000
Date of latest announcement of this EN (doa):	28 February 2001
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Date of withdrawal of any conflicting National Standard (dow):	31 August 2001

1 Scope

The present document specifies the Service Information (SI) data which forms a part of DVB bitstreams, in order that the user can be provided with information to assist in selection of services and/or events within the bitstream, and so that the Integrated Receiver Decoder (IRD) can automatically configure itself for the selected service. SI data for automatic configuration is mostly specified within ISO/IEC 13818-1 [1] as Program Specific Information (PSI).

The present document specifies additional data which complements the PSI by providing data to aid automatic tuning of IRDs, and additional information intended for display to the user. The manner of presentation of the information is not specified in the present document, and IRD manufacturers have freedom to choose appropriate presentation methods.

It is expected that Electronic Programme Guides (EPGs) will be a feature of Digital TV transmissions.

The definition of an EPG is outside the scope of the present document (i.e. the SI specification), but the data contained within the SI specified in the present document may be used as the basis for an EPG.

Rules of operation for the implementation of the present document (i.e. EN 300 468) are specified in ETR 211 [7].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

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

[2] ISO 3166 (all parts): "Codes for the representation of names of countries and their subdivisions".

[3] ISO 639-2: "Codes for the representation of names of languages - Part 2: Alpha-3 code".

[4] ETSI ETS 300 706: "Enhanced Teletext specification".

[5] ISO/IEC 8859 (all parts): "Information technology - 8-bit single-byte coded graphic character sets".

[6] ETSI ETR 162: "Digital Video Broadcasting (DVB); Allocation of Service Information (SI) codes for DVB systems".

[7] ETSI ETR 211: "Digital Video Broadcasting (DVB); Guidelines on implementation and usage of Service Information (SI)".

[8] ISO/IEC 10646-1: "Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Part 1: Architecture and Basic Multilingual Plane".

[9] ISO/IEC 6937: "Information technology - Coded graphic character set for text communication - Latin alphabet".

[10] IEC 1883-1: "Consumer audio/video equipment - Digital interface - Part 1: General".

[11] IEC 1883-4: "Consumer audio/video equipment - Digital interface - Part 4: MPEG2-TS data".

[12] ETSI ETR 154: "Digital Video Broadcasting (DVB); Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications".

[13] IEEE 1394: "IEEE Standard for a High Performance Serial Bus".

[14] ETSI ETS 300 231: "Television systems; Specification of the domestic video Programme Delivery Control system (PDC)".

[15] ETSI EN 301 210 (V1.1): "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for Digital Satellite News Gathering (DSNG) and other contribution applications by satellite".

[16] ETSI EN 301 775: "Digital Video Broadcasting (DVB); Specification for the carriage of Vertical Blanking Information (VBI) data in DVB bitstreams".

[17] ETSI TS 101 699 (V1.1.1): "Digital Video Broadcasting (DVB); Extensions to the Common Interface Specification".

[18] KSC 5601 (1987): Korea Industrial Standards Association, "Code for Information Interchange (Hangul and Hanja)," Korean Industrial Standard, 1987, Ref. No.

[19] ITU-R Recommendation BS.1196 (1995) (annex 2): "Audio coding for digital terrestrial television broadcasting".

[20] ETSI EN 300 401: "Radio broadcasting systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".

[21] ISO/IEC 11172-3: "Information technology - Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s - Part 3: Audio".

[22] ISO 8601 (1988): "Data elements and interchange formats - Information interchange - Representation of dates and times".

[23] ISO/IEC 13818-3: "Information technology - Generic coding of moving pictures and associated audio information - Part 3: Audio".

[24] ETSI EN 301 790: "Digital Video Broadcasting (DVB); Interaction channel for satellite distribution systems".

3 Definitions and abbreviations

3.1 Definitions

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

AC-3: refers to the coding of audio using the Dolby AC-3 method ITU-R Recommendation BS.1196 [19]. The Service Information requirements for AC-3 streams carried in DVB systems is described in annex E of the present document. The carriage of AC-3 elementary streams as private data within MPEG systems is described in annex C of ETR 154 [12].

bouquet: collection of services marketed as a single entity.

broadcaster (SERVICE Provider): organization which assembles a sequence of events or programmes to be delivered to the viewer based upon a schedule.

cell: cell is a geographical area that is covered with DVB-T signals by means of one or more transmitters each radiating a particular transport stream on only one frequency. The cell may in addition contain repeaters. Two neighbouring cells may have an intersection. The cell_id that is used to uniquely identify a cell shall be unique within each original_network_id.

component (ELEMENTARY Stream): one or more entities which together make up an event, e.g. video, audio, teletext.

Conditional Access (CA) system: system to control subscriber access to services, programmes and events e.g. Videoguard, Eurocrypt.

delivery system: 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.

Entitlement Management Messages (EMM): are private Conditional Access information which specify the authorization levels or the services of specific decoders. They may be addressed to individual decoder or groups of decoders.

event: grouping of elementary broadcast data streams with a defined start and end time belonging to a common service, e.g. first half of a football match, News Flash, first part of an entertainment show.

forbidden: term "forbidden" when used in the clauses defining the coded bit stream, indicates that the value shall never be used.

MPEG-2: refers to the standard ISO/IEC 13818-1 [1]. Systems coding is defined in part 1. Video coding is defined in part 2. Audio coding is defined in part 3.

multiplex: stream of all the digital data carrying one or more services within a single physical channel.

network: collection of MPEG-2 Transport Stream (TS) multiplexes transmitted on a single delivery system, e.g. all digital channels on a specific cable system.

original_network_id: unique identifier of a network.

programme: concatenation of one or more events under the control of a broadcaster e.g. news show, entertainment show.

Repeater: repeater is an equipment which allows to receive a DVB-T signal and to re-transmit it. It does not allow to change the TPS bits and thus the cell_id.

reserved: term "reserved" when used in the clause defining the coded bit stream, indicates that the value may be used in the future for ISO defined extensions. Unless otherwise specified within the present document all "reserved" bits shall be set to "1".

reserved_future_use: term "reserved_future_use", when used in the clause defining the coded bit stream, indicates that the value may be used in the future for ETSI defined extensions. Unless otherwise specified within the present document all "reserved_future_use" bits shall be set to "1".

section: section is a syntactic structure used for mapping all service information defined in the present document into ISO/IEC 13818-1 [1] TS packets.

service: sequence of programmes under the control of a broadcaster which can be broadcast as part of a schedule.

service_id: unique identifier of a service within a TS.

Service Information (SI): digital data describing the delivery system, content and scheduling/timing of broadcast data streams etc. It includes MPEG-2 PSI together with independently defined extensions.

subcell: subcell is a geographical area that is part of the cells coverage area and that is covered with DVB-T signals by means of a transposer. In conjunction with the cell_id the cell_id_extension is used to uniquely identify a subcell.

sub_table: sub_table is collection of sections with the same value of table_id and:

- for a NIT: the same table_id_extension (network_id) and version_number;
- for a BAT: the same table_id_extension (bouquet_id) and version_number;
- for a SDT: the same table_id_extension (transport_stream_id), the same original_network_id and version_number;
- for a EIT: the same table_id_extension (service_id), the same transport_stream_id, the same original_network_id and version_number.

The table_id_extension field is equivalent to the fourth and fifth byte of a section when the section_syntax_indicator is set to a value of "1".

table: table is comprised of a number of sub_tables with the same value of table_id.

Transmitter: equipment, that allows to modulate a baseband transport stream and to broadcast it on one frequency, is called transmitter.

Transport Stream (TS): TS is a data structure defined in ISO/IEC 13818-1 [1]. It is the basis of the DVB standards.

transport_stream_id: unique identifier of a TS within an original network.

Transposer: transposer is a type of repeater which allows to receive a DVB-T signal and to re-transmit it on a different frequency.

The relationships of some of these definitions are illustrated in the service delivery model in figure 1.

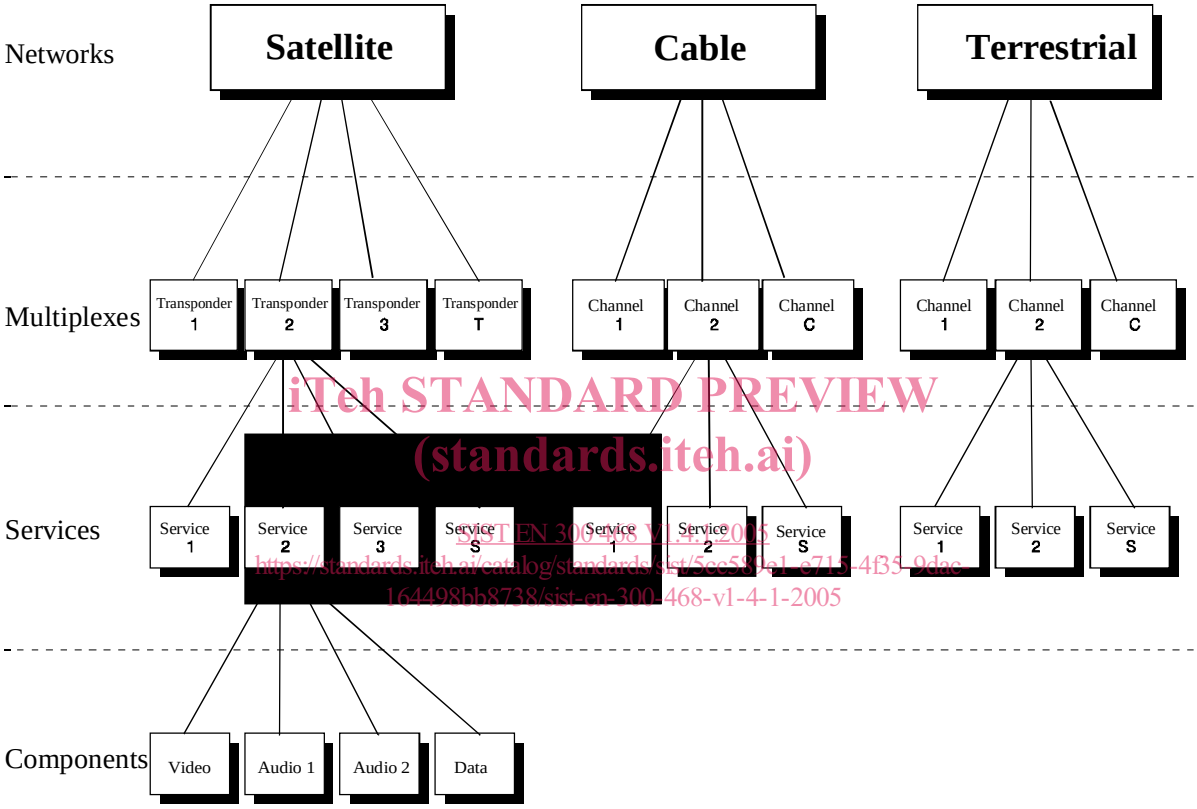


Figure 1: Digital broadcasting, service delivery model

3.2 Abbreviations

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

AC-3	Dolby AC-3 audio coding (ITU-R Recommendation BS 1196 [19])
BAT	Bouquet Association Table
BCD	Binary Coded Decimal
bslbf	bit string, left bit first
CA	Conditional Access
CAT	Conditional Access Table
CLUT	Colour Look-Up Table
CRC	Cyclic Redundancy Check
DAB	Digital Audio Broadcasting
DIT	Discontinuity Information TableDVB Digital Video Broadcasting
DVD	Digital Versatile Disc
EBU	European Broadcasting Union
EIT	Event Information Table

EMM	Entitlement Management Message
EPG	Electronic Programme Guide
ETS	European Telecommunication Standard
FEC	Forward Error Correction
IEC	International Electrotechnical Commission
IRD	Integrated Receiver Decoder
ISO	International Organization for Standardization
LSB	Least Significant Bit
MJD	Modified Julian Date
MPEG	Moving Pictures Expert Group
NIT	Network Information Table
NVOD	Near Video On Demand
PAT	Program Association Table
PDC	Programme Delivery Control
PID	Packet IDentifier
PMT	Program Map Table
PSI	Program Specific Information
PSTN	Public Switched Telephone Network
QAM	Quadrature Amplitude Modulation
QPSK	Quaternary Phase Shift Keying
rpchof	remainder polynomial coefficients, highest order first
RS	Reed - Solomon
RST	Running Status Table
ScF	Scale Factor
SDT	Service Description Table
SI	Service Information
SIT	Selection Information Table
SMI	Storage Media Interoperability
ST	Stuffing Table
TDT	Time and Date Table
TOT	Time Offset Table
TPS	Transmission Parameter Signalling
TS	Transport Stream
uimsbf	unsigned integer most significant bit first
UTC	Universal Time, Co-ordinated
VBI	Vertical Blanking Interval
VPS	Video Programme System
WSS	Wide Screen Signalling

4 Service Information (SI) description

ISO/IEC 13818-1 [1] specifies SI which is referred to as PSI. The PSI data provides information to enable automatic configuration of the receiver to demultiplex and decode the various streams of programs within the multiplex.

The PSI data is structured as four types of table. The tables are transmitted in sections.

1) Program Association Table (PAT):

   - for each service in the multiplex, the PAT indicates the location (the Packet Identifier (PID) values of the Transport Stream (TS) packets) of the corresponding Program Map Table (PMT). It also gives the location of the Network Information Table (NIT).

2) Conditional Access Table (CAT):

   - the CAT provides information on the CA systems used in the multiplex; the information is private (not defined within the present document) and dependent on the CA system, but includes the location of the EMM stream, when applicable.

3) Program Map Table (PMT):

- the PMT identifies and indicates the locations of the streams that make up each service, and the location of the Program Clock Reference fields for a service.

4) Network Information Table (NIT):

- the location of the NIT is defined in the present document in compliance with ISO/IEC 13818-1 [1] specification, but the data format is outside the scope of ISO/IEC 13818-1 [1]. It is intended to provide information about the physical network. The syntax and semantics of the NIT are defined in the present document.

In addition to the PSI, data is needed to provide identification of services and events for the user. The coding of this data is defined in the present document. In contrast with the PAT, CAT, and PMT of the PSI, which give information only for the multiplex in which they are contained (the actual multiplex), the additional information defined within the present document can also provide information on services and events carried by different multiplexes, and even on other networks. This data is structured as nine tables:

1) Bouquet Association Table (BAT):

- the BAT provides information regarding bouquets. As well as giving the name of the bouquet, it provides a list of services for each bouquet.

2) Service Description Table (SDT):

- the SDT contains data describing the services in the system e.g. names of services, the service provider, etc.

3) Event Information Table (EIT):

- the EIT contains data concerning events or programmes such as event name, start time, duration, etc.;
- the use of different descriptors allows the transmission of different kinds of event information e.g. for different service types.

4) Running Status Table (RST):

- the RST gives the status of an event (running/not running). The RST updates this information and allows timely automatic switching to events.

5) Time and Date Table (TDT):

- the TDT gives information relating to the present time and date. This information is given in a separate table due to the frequent updating of this information.

6) Time Offset Table (TOT):

- the TOT gives information relating to the present time and date and local time offset. This information is given in a separate table due to the frequent updating of the time information.

7) Stuffing Table (ST):

- the ST is used to invalidate existing sections, for example at delivery system boundaries.

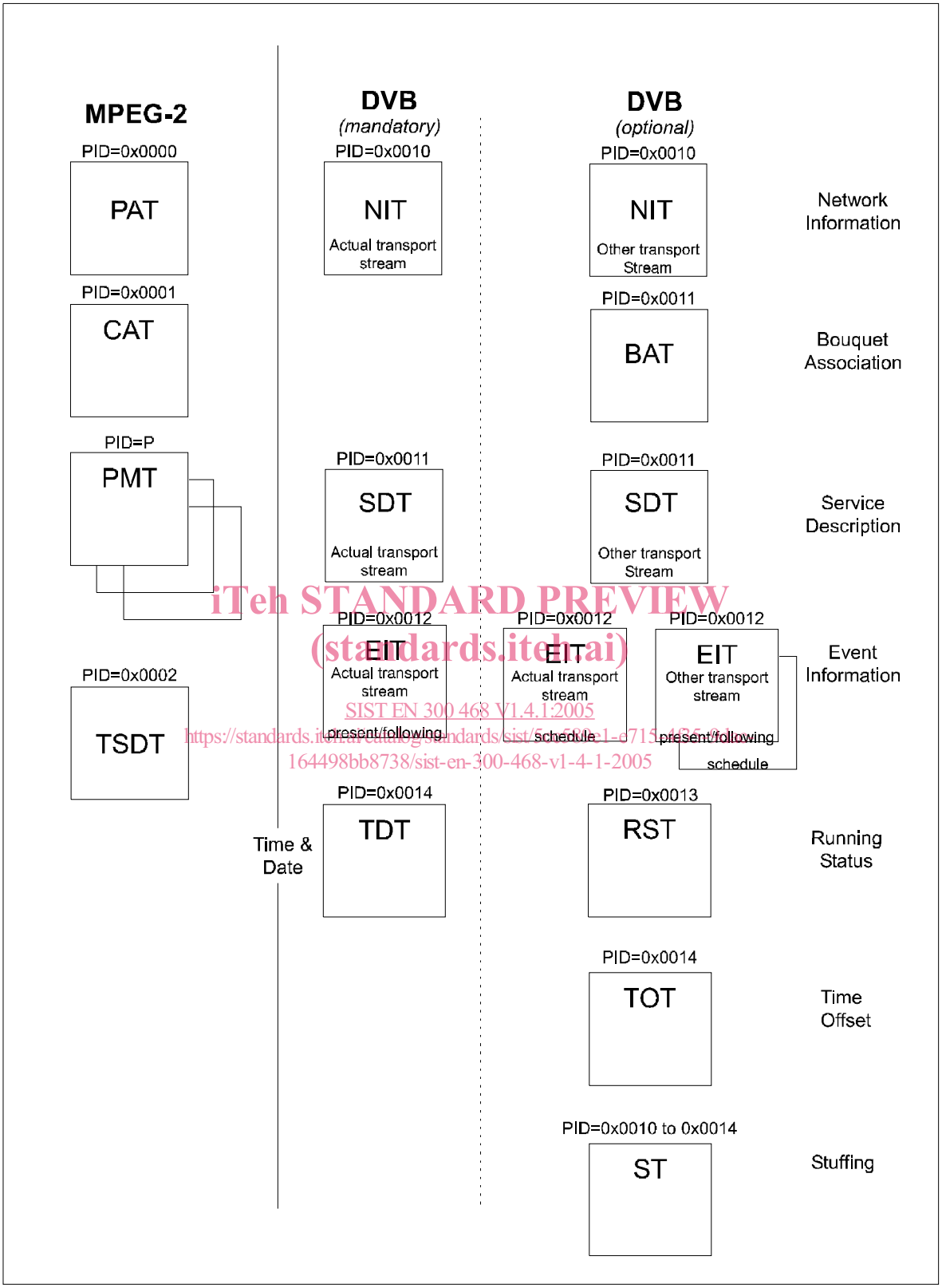
8) Selection Information Table (SIT)

- the SIT is used only in "partial" (i.e. recorded) bitstreams. It carries a summary of the SI information required to describe the streams in the partial bitstream.

9) Discontinuity Information Table (DIT)

- the DIT is used only in "partial" (i.e. recorded) bitstreams. It is inserted where the SI information in the partial bitstream may be discontinuous.

Where applicable the use of descriptors allows a flexible approach to the organization of the tables and allows for future compatible extensions.



NOTE: NIT table entitled "DVB *(mandatory)*" should read "Actual delivery system" instead of "Actual transport stream".
NIT table entitled "DVB *(optional)*" should read "Other delivery system" instead of "Other transport Stream".

Figure 2: General organization of the Service Information (SI)

5 Service Information (SI) tables

5.1 SI table mechanism

The SI specified in the present document and MPEG-2 PSI tables shall be segmented into one or more sections before being inserted into TS packets.

The tables listed in clause 4 are conceptual in that they need never be regenerated in a specified form within an IRD. The tables, when transmitted shall not be scrambled, with the exception of the EIT, which may be scrambled if required (see subclause 5.1.5).

A section is a syntactic structure that shall be used for mapping all MPEG-2 tables and SI tables specified in the present document, into TS packets.

These SI syntactic structures conform to the private section syntax defined in ISO/IEC 13818-1 [1].

5.1.1 Explanation

Sections may be variable in length. The sections within each table are limited to 1 024 bytes in length, except for sections within the EIT which are limited to 4 096 bytes. Each section is uniquely identified by the combination of the following elements:

a) table_id:

- the table_id identifies to which table the section belongs.
- some table_ids have been defined by ISO and others by ETSI. Other values of the table_id can be allocated by the user for private purposes. The list of values of table_id is contained in table 2.

b) table_id_extension:

- the table_id_extension is used for identification of a sub_table.
- the interpretation of each sub_table is given in subclause 5.2.

c) section_number:

- the section_number field allows the sections of a particular sub_table to be reassembled in their original order by the decoder. It is recommended, that sections are transmitted in numerical order, unless it is desired to transmit some sections of the sub_table more frequently than others, e.g. due to random access considerations.
- for the SI tables as specified in the present document, section numbering applies to sub_tables.

d) version_number:

- when the characteristics of the TS described in the SI given in the present document change (e.g. new events start, different composition of elementary streams for a given service), then new SI data shall be sent containing the updated information. A new version of the SI data is signalled by sending a sub_table with the same identifiers as the previous sub_table containing the relevant data, but with the next value of version_number.
- for the SI tables specified in the present document, the version_number applies to all sections of a sub_table.

e) Current_next_indicator:

- each section shall be numbered as valid "now" (current), or as valid in the immediate future (next). This allows the transmission of a future version of the SI in advance of the change, giving the decoder the opportunity to prepare for the change. There is however, no requirement to transmit the next version of a section in advance, but if it is transmitted, then it shall be the next correct version of that section.