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| **ITU-T** | **J.383** | |
| TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU | | (01/2019) |
|  | SERIES J: CABLE NETWORKS AND TRANSMISSION OF TELEVISION, SOUND PROGRAMME AND OTHER MULTIMEDIA SIGNALS  Digital transmission of television signals - Part 3 | | | |
|  | **Conversion of type length value (TLV) packet and transport stream for advanced cable transmission systems** | | | |
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# Draft Recommendation ITU-T J.383 (ex. J.atrans-tlvts)

# Conversion of type length value (TLV) packet and transport stream for advanced cable transmission systems

**Summary**

Recommendation ITU-T J.383 describes the conversion schemes of data structures defined in [ITU-R BO.2098-0] for cable television systems on the basis of [ITU-T J.382].

[ITU-R BO.2098-0] specifies two data structures, MPEG-2 TS and TLV. MPEG-2 TS data packets are directly transmitted while any transmission control signals and service information are transmitted using a descriptor specified in [ETSI TS 102 991]. TLV packets are not directly transmitted in TLV format but converted to GSE [6] packet format specified in [ITU-T J.382].

The EWS control signal specified in [ITU-R BO.2098-0] is also converted into physical layer signalling specified in [ITU-T J382], to wake up the receiver when the Emergency Warning System is activated.

Draft Recommendation ITU-T J.383 (ex. J.atrans-tlvts)

Conversion of type length value (TLV) packet and transport stream for advanced cable transmission systems

# Scope

The scope of this recommendation is to define a conversion scheme for type length value (TLV), a data structure specified in [ITU-R BT.1869], and MPEG-2 transport stream (TS) defined in [ITU-T BO.1408-1], for their transmission over cable television systems designed on the basis of [ITU-T J.382].

# References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T J.382] Recommendation ITU-T J.382 (2016), *Advanced digital downstream transmission systems for television, sound and data services for cable distribution*.

[ITU-R BO.1408-1] Recommendation ITU-R BO.1480-1 (2002), *Transmission system for advanced multimedia services provided by integrated services digital broadcasting in a broadcasting satellite channel*.

[ITU-R BO.2098-0] Recommendation ITU-R BO.2098-0 (2016), *Transmission system for UHDTV satellite broadcasting*.

[ITU-R BT.1869] Recommendation ITU-R BT.1869 (2010), *Multiplexing scheme for variable-length packets in digital multimedia broadcasting systems*.

[ITU-R BT.2074-0] Recommendation ITU-R BT.2074-0 (2015), *Service configuration, media transport protocol, and signalling information for MMT-based broadcasting systems*.

[ETSI TS 102 606-1] ETSI TS 102 606-1 v 1.2.1 (2014), *Digital Video Broadcasting (DVB); Generic Stream Encapsulation (GSE); Part 1: Protocol*.

[ETSI TS 102 606-2] ETSI TS 102 606-2 v 1.1.1 (2014), *Digital Video Broadcasting (DVB); Generic Stream Encapsulation (GSE); Part 2: Logical Link Control*.

[ETSI TS 102 991] ETSI TS 102 991 v 1.2.1 (2011), *Digital Video Broadcasting (DVB); Implementation Guidelines for a second generation digital cable transmission system (DVB-C2)*.

[ETSI EN 302 769] ETSI EN 302 769 v 1.2.1 (2010), *Digital Video Broadcasting (DVB); Frame structure channel coding and modulation for a second generation digital transmission system for cable systems (DVB-C2)*.

# Definitions

# Terms defined elsewhere

None.

# Terms defined in this Recommendation

None.

# Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AMT Address Map Table

DVB-C2 DVB system for second generation cable transmission

EWS Emergency Warning System

GSE Generic Stream Encapsulation

ISDB-S3 Integrated Services Digital Broadcasting for Satellite, 3rd generation

LLC Logical Link Control

MPEG-2 Motion Picture Experts Group version 2

NIT Network Information Table

NPD Null Packet Deletion

TLV Type Length Value

TMCC Transmission and Multiplexing Configuration Control

TS Transport Stream

# Convention

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus this requirement need not be present to claim conformance.

The keywords "is prohibited from" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "can optionally" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

In the body of this document and its annexes, the words shall, shall not, should, and may sometimes appear, in which case they are to be interpreted, respectively, as is required to, is prohibited from, is recommended, and can optionally. The appearance of such phrases or keywords in an appendix or in material explicitly marked as informative are to be interpreted as having no normative intent.

# System overview

The system overview is show in Figure 1.

Satellite television systems on the basis of [ITU-R BO.2098-0] supports two data structures, MPEG-2 TS and TLV packets. MPEG-2 TS can be directly transmitted over cable television systems on the basis of [ITU-T J.382]. Transport control signals are generated directly in the headend. On the other hand, TLV packets cannot be directly transmitted on the basis of [ITU-T J.382]. Therefore, TLV packers are converted to GSE packets and the TLV service information is encapsulated to LLC GSE packets, specified in [ETSI TS 102 606-2].

An EWS control signal in the TMCC signal defined in [ITU-T BO.2098-0], which wakes up the receiver when the EWS is activated, is mapped onto the L1 signalling specified in [ETSI TS 102 991].



**Figure 1 – System overview**

# Conversion schemes

# Transmission of MPEG-2 TS

# Transmission of MPEG-2 TS packets

MPEG-2 TS packets shall be transmitted on the basis of [ITU-T J.382] Appendix I directly without any conversion.

# Generation of MPEG-2 TS transmission control signals

Transmission control signals for MPEG-2 TS shall be transmitted on the basis of [ITU-T J.382] using the C2\_delivery\_system\_descriptor in the TS loop of the NIT descriptor, specified in [ETSI TS 102 991]. The assignment of the descriptor\_tag is 0xF4 as shown in Table 1. The data structure for the C2\_delivery\_system\_descriptor is shown in Figure 2. The descriptor tag extension assigned for this descriptor is 0x00 and other values are reserved for future use.

Table 1 - Descriptor tag assignment value

|  |  |
| --- | --- |
| descriptor\_tag | Assignment |
| 0xF4 | C2\_delivery\_system\_descriptor |



**Figure 2 – Data structure for transmission control signals descriptor (Descriptor tag extension 0x00)**

# Conversion of TLV packets

# Conversion of TLV packets to GSE packets

TLV packets, except for TLV service information, shall be converted to GSE packets by modifying the packet header, and keeping the payload the same. This is more efficient than encapsulating a TLV packet in a GSE packet entirely. **Error! Reference source not found.**The detail of conversion from the TLV packet header to a GSE packet header is shown in Figure 3.

TLV NULL packets shall not be converted to GSE packets. Instead, L1 padding as specified in [ETSI EN 302 769] should be used as necessary.

The GSE profile used shall be decided based on the TLV packet payload size. The signalling of the NPD/GSE-Lite bit within the BBHeader, specified in [ETSI EN 302 769], depends on the GSE profile. The NPD/GSE-Lite bit shall be set equal to one for the GSE-Lite profile. Table 2 defines the relationship between TLV packet payload size and GSE profile.

**Figure 3 – Conversion from TLV packet to GSE packet**

**Table 2 – Relationship between TLV payload size and GSE profile**

|  |  |
| --- | --- |
| **TLV payload size** | **GSE profile** |
| Less than 1800 bytes | GSE-Lite |
| Less than 4093 bytes | GSE (without fragmentation) |
| More than 4094 bytes | GSE (fragmentation) |

# Conversion of TLV service information to LLC GSE packets

TLV service information shall be converted to LLC GSE packets, specified in [ETSI TS 102 606-2], with protocol type 0x0087. LLC GSE packets are GSE packets which contain signalling and transmission control signals. Particularly note that TLV-NIT and AMT packets shall be converted to GSE tables with table\_id 0xC0 and 0xC1 within the LLC GSE packet. The data structure for TLV-NIT and AMT tables, specified in [ITU-R BT.2074-0], are stored into table\_content\_byte. An index which gathers the table information in a packet is added to the beginning of the table. The LLC index table\_id value used is 0xB3.

# Retransmission of EWS control signal

The EWS control signal is transmitted in the Transmit/receive control information in the TMCC, specified in [ITU-R BO.2098-0]. Figure 4 shows the structure of TMCC, which contains the Transmit/receive control information.



**Figure 4 – Bit configuration of TMCC signal**

Figure 5 shows structure of Transmit/receive control information. The first 1 bit is assigned as the EWS control signal.



**Figure 5 – Bit configuration of transmit/receive control information in the TMCC signal**

Table 3 shows structure of the L1 signalling part 2 data, specified in [ETSI EN 302 769]. The 1 bit EARLY\_WARNING\_SYSTEM (EWS) is used to retransmit the EWS control signal.

Table 3 - The signalling fields of L1 signalling part 2 data

|  |  |
| --- | --- |
| **Field** | **Size (bits)** |
| NETWORK\_ID | 16 |
| C2\_SYSTEM\_ID | 16 |
| START\_FREQUENCY | 24 |
| C2\_BANDWIDTH | 16 |
| GUARD\_INTERVAL | 2 |
| C2\_FRAME\_LENGTH | 10 |
| L1\_PART2\_CHANGE\_COUNTER | 8 |
| NUM\_DSLICE | 8 |
| NUM\_NOTCH | 4 |
| for i=0..NUM\_DSLICE-1 { |  |
| DSLICE\_ID | 8 |
| DSLICE\_TUNE\_POS | 14 or 13 |
| DSLICE\_OFFSET\_LEFT | 9 or 8 |
| DSLICE\_OFFSET\_RIGHT | 9 or 8 |
| DSLICE\_TI\_DEPTH | 2 |
| DSLICE\_TYPE | 1 |
| if (DSLICE\_TYPE==’1’ { |  |
| FEC\_HEADER\_TYPE | 1 |
| } |  |
| DSLICE\_CONST\_CONF | 1 |
| DSLICE\_LEFT\_NOTCH | 1 |
| DSLICE\_NUM\_PLP | 8 |
| for i=0..DSLICE\_NUM\_PLP-1 { |  |
| PLD\_ID | 8 |
| PLP\_BUNLED | 1 |
| PLP\_TYPE | 2 |
| PLP\_PAYLOAD\_TYPE | 5 |
| if PLP\_TYPE==’00’ or ‘01’ { |  |
| PLP\_GROUP\_ID | 8 |
| } |  |
| if DSLICE\_TYPE==’0’ { |  |
| PLP\_START | 14 |
| PLP\_FEC\_TYPE | 1 |
| PLP\_MOD | 3 |
| PLP\_COD | 3 |
| } |  |
| PSI/SI\_REPROCESSING | 1 |
| if (PSI/SI\_REPROCESSING==’0’ { |  |
| transport\_stream\_id | 16 |
| original\_network\_id | 16 |
| } |  |
| RESERVED\_1 |  |
| } |  |
| RESERVED\_2 |  |
| } |  |
| for i=0..NUM\_NOTCH-1 { |  |
| NOTCH\_START | 14 or 13 |
| NOTCH\_WIDTH | 9 or 8 |
| RESERVED\_3 | 8 |
| } |  |
| RESERVED\_TONE | 1 |
| EARLY\_WARNING\_SYSTEM (EWS) | 1 |
| C2\_VERSION | 4 |
| RESERVED\_4 | 11 |

# Annex I Example of conversion scheme

(This annex does not forms an integral part of this Recommendation)

# I.1 Conversion of MPEG-2 TS transmission control signal

Conversion of the MPEG-2 TS transmission control signal to the C2\_delivery\_system\_descripter is shown in Table I.1.

Table I.1 – Data syntax for transmission control signals (Descriptor tag extension 0x00)

|  |  |  |  |
| --- | --- | --- | --- |
| **Syntax** | **No of bits** | **Value** | **Remarks** |
| C2\_delivery\_system\_descriptor (){ |  |  |  |
| descriptor\_tag  descriptor\_length  descriptor\_tag\_extension | 8  8  8 | 0xF4  -  0x00 |  |
| plp\_id | 8 | - |  |
| active\_OFDM\_symbol\_duration  guard\_interval  bundled\_channel  reserved\_for\_future\_use  for ( i = 0; i < N; ++ i ) {  data\_slice\_id  C2\_tuning\_frequency  C2\_tuning\_frequency\_type  outer\_code  modulation  inner\_code  reserved\_for\_future\_use  } | 3  3  8  2  8  32  2  4  8  4  6 | ‘000’  ‘000’  -  0x3  -  -  ‘00’  ‘0011’  0x01  ‘1001’  0x3f | 000 : 448 us  001 : 597.33 us  Other : Reserved  000 : 1/128  001 : 1/64  Other : Reserved  undefined  Specify tuning frequency based on Tune Freq type (in Hz)  00 : Centre frequency to receive Data Slice  01 : Centre frequency for C2 system  10 : Initial centre frequency to decode L1 when Data Slice cannot decode L1  Other: Reserved  0000 : Undefined  0001 : No Outer Code  0010 : RS(204, 188)  0011 : J.382 (refer L1 transmission control signals)  0x00 : Undefined  0x01 : 16QAM 0x04 : 128QAM  0x02 : 32QAM 0x05 : 256QAM  0x03 : 64QAM 0x07 : 1024QAM  0x80 : J.382 (refer L1 transmission control signals)  0000 : Undefined 0011 : code rate 3/4  0001 : code rate 1/2 0100 : code rate5/6  0010 : code rate 2/3 0101 : code rate7/8  1000 : ISDB-S (refer TMCC signal)  1001 : J.382 (refer L1 transmission control signals)  1111 : No inner code  Other : Undefined |
| } |  |  |  |

# I.2 Conversion of TLV service information to LLC GSE packets

Conversion of TLV service information to a LLC GSE packet is shown in Table I.2. A LLC GSE packet shall contain either or both TLV-NIT and AMT packet information.

Table I.2 – GSE packet structure when converting TLV service information to a LLC GSE packet

|  |  |  |  |
| --- | --- | --- | --- |
| **Syntax** | **No of bits** | **Value** | **Remarks** |
| GSE\_Packet() { |  |  |  |
| Start\_Indicator | 1 | 1 | Complete packet |
| End\_Indicator | 1 | 1 | Complete packet |
| Label\_Type\_Indicator | 2 | ‘10’ | Broadcast (no label field) |
| GSE\_Length | 12 | - |  |
| Protocol\_Type | 16 | 0x0087 | GSE Signalling packet |
| gse\_table\_structure(){ |  |  | Start Index |
| table\_id | 8 | 0xB3 | LLC index |
| interactive\_network\_id | 16 | - | Network ID |
| Reserved | 2 | ‘11‘ | Reserved |
| version\_number | 5 | 1 | Version 1 |
| current\_next\_indicator | 1 | 1 | Valid |
| for (i=0; i<N; i++) { |  |  |  |
| LLC\_index { |  |  | Each table index |
| num\_table\_entries | 8 | 2 | TLV-NIT and AMT |
|  |  |  |  |
| table\_id | 8 | 0xC0 | TLV\_NIT |
| Reserved | 2 | ‘11’ | Reserved |
| version | 5 | 1 | Version 1 |
| current\_next\_indicator | 1 | 1 | Valid |
| offset | 32 | - |  |
| table\_id | 8 | 0xC1 | AMT |
| reserved | 2 | ‘11’ | Reserved |
| version | 5 | 1 | Version 1 |
| current\_next\_indicator | 1 | 1 | Valid |
| offset | 32 | - |  |
|  |  |  |  |
| } /\* LLC\_index \*/ |  |  |  |
| } |  |  |  |
| } /\* gse\_table\_structure \*/ |  |  | End Index |
| gse\_table\_structure() { |  |  | Start Table 0 |
| table\_id | 8 | 0xC0 | TLV\_NIT |
| interactive\_network\_id | 16 |  | Network ID |
| Reserved | 2 | ‘11’ | Reserved |
| version\_number | 5 | 1 | Version 1 |
| current\_next\_indicator | 1 | 1 | Valid |
| for (i=0; i<N; i++) { |  |  |  |
| /\* TLV\_Network\_Information\_Table \*/ |  |  | TLV-NIT |
| } |  |  |  |
| } /\* gse\_table\_structure \*/ |  |  | End Table 0 |
| gse\_table\_structure() { |  |  | Start Table 1 |
| table\_id | 8 | 0xC1 | AMT |
| interactive\_network\_id | 16 |  | Network ID |
| Reserved | 2 | ‘11’ | Reserved |
| version\_number | 5 | 1 | Version 1 |
| current\_next\_indicator | 1 | 1 | Valid |
| for (i=0; i<N; i++) { |  |  |  |
| /\* Address\_Map\_Table \*/ |  |  | AMT |
| } |  |  |  |
| } /\* gse\_table\_structure \*/ |  |  | End Table 1 |
| } /\* GSE packet \*/ |  |  |  |

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