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OF TELEVISION, SOUND PROGRAMME AND OTHER
MULTIMEDIA SIGNALS

Digital transmission of television signals - Part 3

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

Recommendation ITU-T J.383

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

Summary

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

Recommendation 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 a TLV format but converted to the GSE 6 packet format specified in Recommendation ITU-T J.382.

The emergency warning system control signal specified in Recommendation ITU-R BO.2098-0 is also converted into physical layer signalling specified in Recommendation ITU-T J.382, to wake up the receiver when the emergency warning system is activated.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T J.383	2019-01-13	9	11.1002/1000/13836

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

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Recommendation ITU-T J.383

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

1 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-R BO.1408-1], for their transmission over cable television systems designed on the basis of [ITU-T J.382].

2 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 (2018), <i>Advanced digital downstream transmission systems for television, sound and data services for cable distribution</i> . |
| [ITU-R BO.1408-1] | Recommendation ITU-R BO.1408-1 (2002), <i>Transmission system for advanced multimedia services provided by integrated services digital broadcasting in a broadcasting satellite channel</i> . |
| [ITU-R BO.2098-0] | Recommendation ITU-R BO.2098-0 (2016), <i>Transmission system for UHDTV satellite broadcasting</i> . |
| [ITU-R BT.1869] | Recommendation ITU-R BT.1869 (2010), <i>Multiplexing scheme for variable-length packets in digital multimedia broadcasting systems</i> . |
| [ITU-R BT.2074-1] | Recommendation ITU-R BT.2074-1 (2017), <i>Service configuration, media transport protocol, and signalling information for MMT-based broadcasting systems</i> . |
| [ETSI EN 302 769] | ETSI EN 302 769 V 1.2.1 (2015), <i>Digital Video Broadcasting (DVB); Frame structure channel coding and modulation for a second generation digital transmission system for cable systems (DVB-C2)</i> . |
| [ETSI TS 102 606-1] | ETSI TS 102 606-1 V1.2.1 (2014), <i>Digital Video Broadcasting (DVB); Generic Stream Encapsulation (GSE); Part 1: Protocol</i> . |
| [ETSI TS 102 606-2] | ETSI TS 102 606-2 V 1.2.1 (2016), <i>Digital Video Broadcasting (DVB); Generic Stream Encapsulation (GSE); Part 2: Logical Link Control</i> . |
| [ETSI TS 102 991] | ETSI TS 102 991 V 1.3.1 (2016), <i>Digital Video Broadcasting (DVB); Implementation Guidelines for a second generation digital cable transmission system (DVB-C2)</i> . |

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

None.

4 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

5 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.

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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.

6 System overview

The system overview is shown in Figure 1.

Satellite television systems on the basis of [ITU-R BO.2098-0] support 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 packets are converted to generic stream encapsulation (GSE) packets and the TLV service information is encapsulated to logical link control (LLC) GSE packets, specified in [ETSI TS 102 606-2].

An EWS control signal in the transmission and multiplexing configuration control (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].

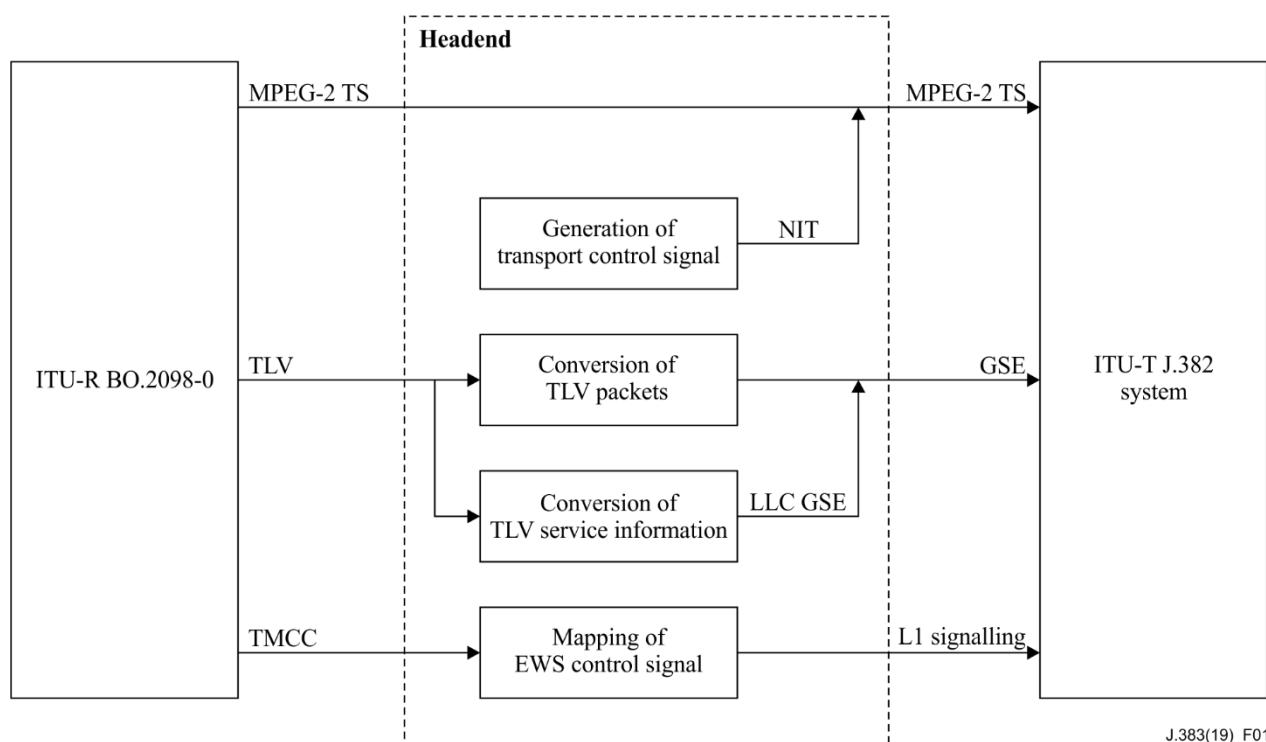


Figure 1 – System overview

7 Conversion schemes

7.1 Transmission of MPEG-2 TS

7.1.1 Transmission of MPEG-2 TS packets

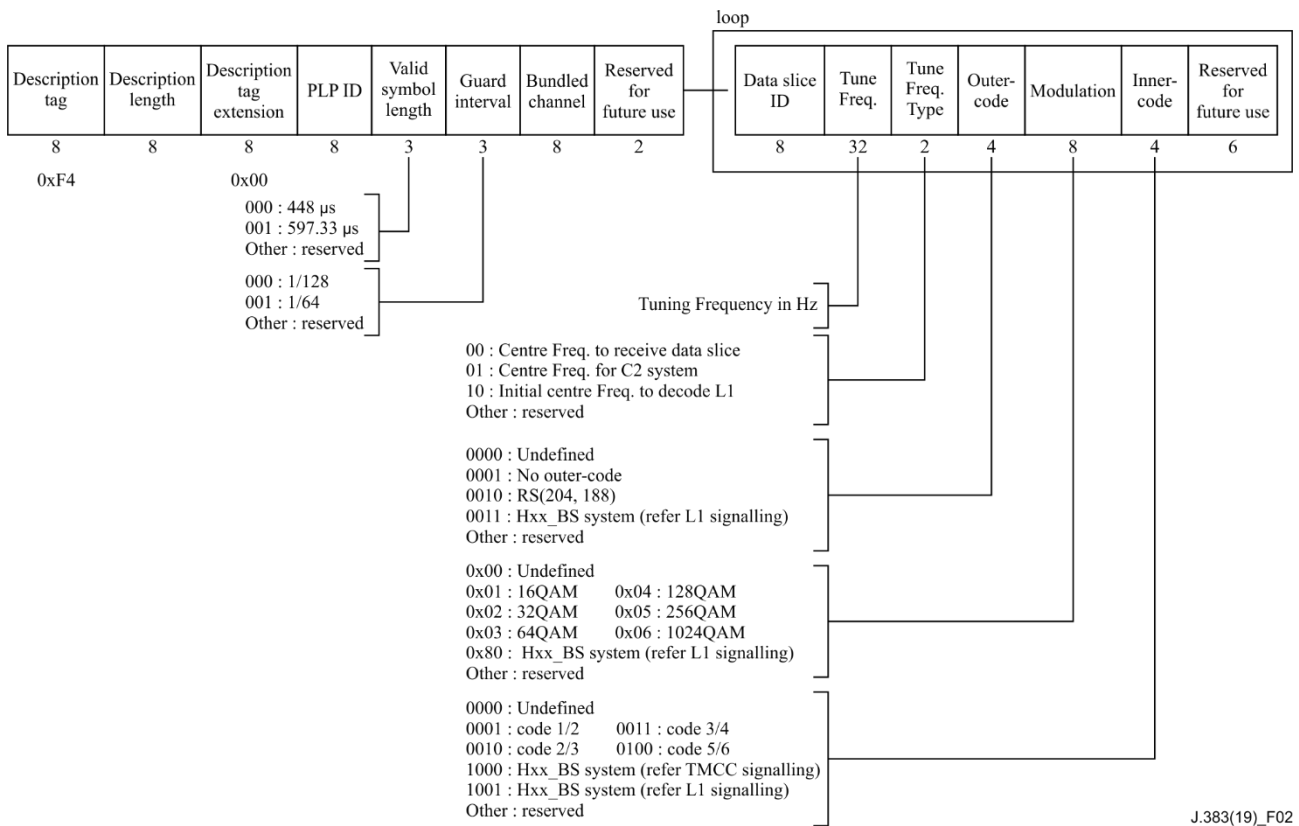
MPEG-2 TS packets shall be transmitted on the basis of [ITU-T J.382] Appendix I directly without any conversion.

7.1.2 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 network information table (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)**

7.2 Conversion of TLV packets

7.2.1 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. 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 the TLV packet payload size and GSE profile.

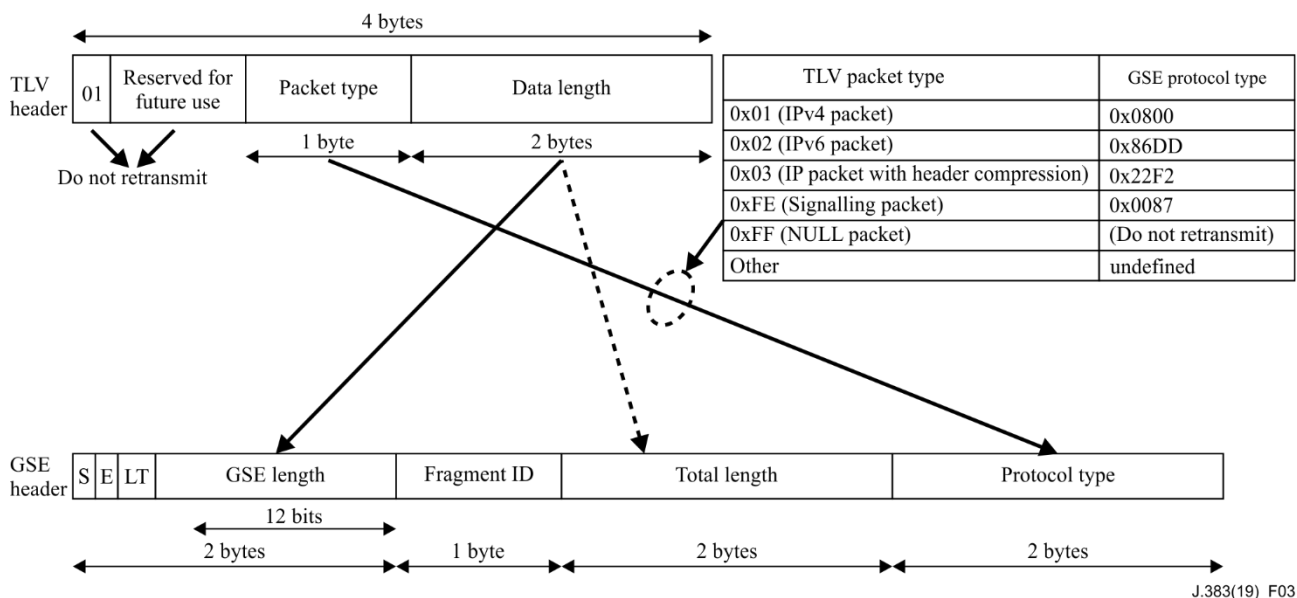


Figure 3 – Conversion from TLV packet to GSE packet

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)

7.2.2 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.

7.3 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.

Order of change	Transmission mode/slot information	Stream type/relative number information	Packet format/relative stream number information	Relative stream number/slot information	Corresponding table between relative stream ID and transmission stream ID	Transmit/receive control information	Extension information
8 bits	192 bits	128 bits	3 840 bits	480 bits	256 bits	8 bits	3 614 bits

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Figure 4 – Bit configuration of TMCC signal

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

IRD activation control signal for emergency warning broadcasting system	Frame indicator for up-link site diversity operation	Main up-link station indicator	Sub up-link station indicator	Reserved
1 bit	1 bit	1 bit	1 bit	4 bits

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

Table 3 shows the 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
}	
}	

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

Field	Size (bits)
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

Appendix I

Example of conversion scheme

(This appendix does not form 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_descriptor 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	8	0xF4	
descriptor_length	8	–	
descriptor_tag_extension	8	0x00	
plp_id	8	–	
active_OFDM_symbol_duration	3	'000'	000 : 448 us 001 : 597.33 us Other : Reserved
guard_interval	3	'000'	000 : 1/128 001 : 1/64 Other : Reserved
bundled_channel	8	–	
reserved_for_future_use	2	0x3	undefined
for (i = 0; i < N; ++ i) {			
data_slice_id	8	–	
C2_tuning_frequency	32	–	Specify tuning frequency based on Tune Freq type (in Hz)
C2_tuning_frequency_type	2	'00'	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
outer_code	4	'0011'	0000 : Undefined 0001 : No Outer Code 0010 : RS(204, 188) 0011 : J.382 (refer L1 transmission control signals)
modulation	8	0x01	0x00 : Undefined 0x01 : 16QAM 0x04 : 128QAM 0x02 : 32QAM 0x05 : 256QAM 0x03 : 64QAM 0x07 : 1024QAM 0x80 : J.382 (refer L1 transmission control signals)
inner_code	4	'1001'	0000 : Undefined 0011 : code rate 3/4 0001 : code rate 1/2 0100 : code rate 5/6 0010 : code rate 2/3 0101 : code rate 7/8 1000 : ISDB-S (refer TMCC signal) 1001 : J.382 (refer L1 transmission control signals) 1111 : No inner code Other : Undefined
reserved_for_future_use	6	0x3f	
}			
}			

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

Conversion of TLV service information to an LLC GSE packet is shown in Table I.2. An 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 an 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

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

Syntax	No. of bits	Value	Remarks
<pre> for (i=0; i<N; i++) { /* TLV_Network_Information_Table */ } } /* gse_table_structure */ gse_table_structure() { table_id interactive_network_id Reserved version_number current_next_indicator for (i=0; i<N; i++) { /* Address_Map_Table */ } } /* gse_table_structure */ } /* GSE packet */ </pre>			TLV-NIT End Table 0 Start Table 1 AMT Network ID Reserved Version 1 Valid AMT End Table 1
	8	0xC1	
	16		
	2	'11'	
	5	1	
	1	1	

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