

TRANSMISSION RULES FOR THE DVB-S (Satellite) NETWORK

For New Zealand Free to Air Digital Broadcasting

Version 1.8

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Acknowledgement

This document is based upon previous work carried out by NorDig. The NorDig document known as;

“NorDig Rules of Operation for NorDig Unified Receiver Networks version 1.0”

has been used as a template for the preparation of this “Transmission Rules for FreeView Networks” document.

1 General

Freeview is the name given to the hybrid digital satellite (DVB-S) and digital terrestrial (DVB-T) free-to-air platforms for New Zealand. The digital satellite network forms an umbrella-like coverage over the whole country using an Optus D1 satellite positioned at 160 degrees east longitude

The DVB-S network conforms to DVB broadcast rules and standards and requires MHEG-5 middleware for interactive application (including the Freeview EPG - http://freeviewnz.tv/index.php?section_id=7).

The specified requirements in this document are requirements and clarifications to DVB and ETSI international standards that describe the operational rules for a Freeview DVB-S receiver operating in New Zealand. All receivers which operate on the NZ Freeview DVB-S network must adhere to these international standards.

This document therefore describes which SI / PSI tables and descriptors will be transmitted on the Freeview DVB-S network and acts as a guideline for how the digital receiver manufacture should interpret this data

This document fully adheres to ETSI and DVB standards.

1.1 Document History

Version	Date	Comments
0.1	10AUG2006	This is first draft of the FreeView Transmission Rules for FreeView networks in New Zealand.
0.3	11AUG2006	This draft version, still incomplete, was circulated internally for comment.
0.41	18AUG2006	This draft version includes DVB-SSU descriptors.
0.5	29AUG2006	This draft brings the document to "pre-release" status.
0.6	20SEP2006	Overall revision prior to formal release
1.01	04OCT2006	Removal of Enhanced Teletext requirement
1.02	01JAN2009	First Draft including PVR extensions
1.03	10JAN2009	Second Draft including PVR extensions
1.04	16JAN2009	Third Draft including PVR extensions
1.05	30JAN2009	Fourth Draft including Kordias comments
1.06	25MAR2009	Final Draft for Manufactures review
1.07	24APR2009	Minor Updates
1.08	19MAR2014	Update to section 2.8

1.2 Abbreviations

API	Application Programming Interface
AIT	Application Information Table
BAT	Bouquet Association Table
CA	Conditional Access
CAT	Conditional Access Table
CID	Content Identifier Descriptor
CRID	Content Reference Identifier Descriptor
DSM-CC	Digital Storage Media – Command and Control
DTR	Digital Television Recorder
DTT	Digital Terrestrial Television
DVB	Digital Video Broadcasting
DVB-S	DVB – Satellite
EBU	European Broadcasting Union
EIT	Event Information Table
EPG	Electronic Programme Guide
ESG	Event Schedule Guide
GUI	Graphical User Interface
IRD	Integrated Receiver Decoder
ISO	International Organisation for Standardisation
MPEG	Moving Pictures Expert Group
NIT	Network Information Table
PAT	Program Association Table
PMT	Program Map Table
PSI	Program Specific Information
p/f	present / following
RST	Running Status Table
SDT	Service Description Table
SI	Service Information
SKY	SKY Digital Satellite TV
SSU	System Software Update
ST	Stuffing Table\
STB	Set-top-box, or domestic satellite receiver, or IRD
TS	Transport Stream
Uimsbf	unsigned integer most significant bit first

UNT	Update Notification Table
UTC	Universal Time, Co-ordinated
VBI	Analogue video vertical blanking interval

2 PSI/SI

2.1 General – DVB-S

This document is dedicated to providing the detail of how MPEG parameters and DVB-S specified tables are to be used within the Freeview DTH network. The sections which follow do provide that detail. A separate document covers the relevant DVB-T tables configuration information for the Freeview HD Terrestrial service.

2.2 Descriptors

The table that follows identifies the standard descriptor set that will be present in FreeView DVB-S Transport Streams.

Descriptor	Tag Value	NIT	BAT	SDT	EIT	TOT	CAT	PMT
Reserved	0x00-0x01	-	-	-	-	-	-	-
video stream descriptor	0x02	-	-	-	-	-	-	Mb Mr
Audio stream descriptor	0x03	-	-	-	-	-	-	Ob Or
CA descriptor- see clause 2.3	0x09	-	-	-	-	-	Ob	-
ISO 639 language descriptor	0x0A	-	-	-	-	-	-	Mb Mr
Smoothing Buffer descriptor	0x10	-	-	-	-	-	-	Ob Or
Carousel ID descriptor	0x13	-	-	-	-	-	-	Mb Mr
Network name descriptor	0x40	Mb Mr	-	-	-	-	-	-
Service List descriptor	0x41	Ob Or	Mb Mr	-	-	-	-	-
Satellite del. system descriptor	0x43	Mb Mr						
Bouquet name descriptor	0x47	-	Mb Mr	-	-	-	-	-
Service descriptor	0x48	-	-	Mb Mr	-	-	-	-
Linkage descriptor	0x4A	Ob Mr	-	-	-	-	-	-
Short event descriptor	0x4D	-	-	-	mb Mr	-	-	-
Extended event descriptor	0x4E	-	-	-	Ob Or	-	-	-
Component descriptor	0x50	-	-	-	Ob Or	-	-	-
Stream identifier descriptor	0x52	-	-	-	-	-	-	Mb Mr
Content descriptor	0x54	-	-	-	Ob Mr	-	-	-
Parental Rating Descriptor	0x55	-	-	-	Ob Or*note	-	-	-
Teletext descriptor	0x56	-	-	-	-	-	-	Ob Or
Local time offset descriptor	0x58	-	-	-	-	Mb Mr	-	-
Subtitling descriptor	0x59	-	-	-	-	-	-	Ob Mr
Private data specifier descriptor	0x5F	-	Mb Mr	-	-	-	-	-
Data broadcast id descriptor	0x66	-	-	-	-	-	-	Mb Mr
AC-3 descriptor	0x6A	-	-	-	-	-	-	Ob Mr
FreeView Private LCN Descr.	0x83	-	Mb Mr	-	-	-	-	-
Default Authority Descriptor	0x73	-	-	Ob Or*note	-	-	-	-
Content Identifier Descriptor	0x76	-	-	-	Ob Or*note	-	-	-
Forbidden	0xFF	Fb	Fb	Fb	Fb	Fb	Fb	Fb

1.1.1 TABLE 1 – Overview of Descriptors Used In FreeView DVB-S Broadcast and Reception

Definition of Acronyms Used In Table

Descriptor not applicable

Mb Mandatory to Broadcast if applicable, i.e. if relevant criteria are met

Ob Optional to Broadcast, but recommended if applicable

Fb Forbidden to Broadcast (may cause misrepresentation)

Mr Mandatory to receive and interpret (if Broadcast)

Or Optional to receive and interpret (if Broadcast)

Or *_{note} Mandatory to receive and interpret if a DTR type device (if Broadcast)

2.2.1 Field Sizes of the Descriptors

In the Freeview network, text strings shall be coded using the Character code table 00 – Latin Alphabet) as specified in ISO 6937 (see EN 300 468 Annex A). It is required that the receivers embedded character set is Character code table 00 – Latin Alphabet. It is not required for receivers to support any other character sets.

Broadcasters will not exceed the maximum field lengths for text fields as defined in the table below.

Name Field	Name Length	Comments and Examples
Network Name	24	Example: "Freeview"
Service Provider Name	20	Example: "Maori Television"
Full Service Name	22	Example: "The NZ Racing Channel"
Short Service Name	12	Example: "NZ Racing"
Event Name	40	Example: "The Rugby World Cup 2011"
Short Event Description	200	
Extended Event Description	255	
Component Description	32	
Application Name	32	

All "Name" fields shall contain meaningful data.

"Description" fields may be left empty

Text string formatting of name and description fields as described in TR 101 211 [7] section 4.

2.3 Program Association Table (PAT)

Table_id 0x00 PAT is mandatory and shall always be transmitted on PID 0x0000. PAT provides a link between the program_number (service_id) and the corresponding PMT PID.

2.4 Conditional Access Table (CAT)

Table_id 0x01 CAT shall be transmitted whenever at least one service component in the transport stream is scrambled. CAT shall be transmitted on PID 0x0001.

No FreeView service will be scrambled and FreeView STBs/IRDs/receivers are not required to process the CAT. however a CAT table shall be generated within FreeView TS, and will contain *conditional_access_descriptors* to support inter-operation with the SKY network.

2.4.1 Mandatory Descriptors

CA_descriptor: When inserted in the CAT, the *CA_descriptor* identifies the *CA_System_ID* of the CA operator as well as the EMM PID. Private data may be inserted into the *CA_descriptor*.

2.5 Program Map Table (PMT)

Table_id 0x02 For each service in a transport stream there shall be a corresponding Program Map Table. The PMT shall be encoded according to ISO/IEC 13818-1 [1]. There shall be a separate *program_map_PID* for each service which corresponds with the service number or *service_id*.

2.5.1 Mandatory Descriptors

Video_stream_descriptor *Descriptor_tag 0x02*

ISO_639_language_descriptor *Descriptor_tag 0x0A* This descriptor shall be inserted for every audio component defined. The audio type is currently set to "Undefined", but any value defined by ISO/IEC 13818-1 [1] is allowed.

Stream_identifier_descriptor *Descriptor_tag 0x52*. Shall be included when required by TR 101 211

Teletext_descriptor *Descriptor_tag 0x56* Mandatory whenever a teletext component is defined. The syntax shall be according to ETR 300 468 [6].

Subtitling_descriptor *Descriptor_tag 0x59* Mandatory whenever DVB bitmap subtitles are transmitted.

Private_data_specifier_descriptor Mandatory whenever private defined descriptors are used, as specified in TR 101 211 [7].

Data_broadcast_id_descriptor *Descriptor_tag 0x66* Mandatory whenever associated MHEG-5 applications are transmitted or when the DVB bootloader –(system Software update – SSU) is used. When used for the purposes of an SSU it shall be used in conjunction with *Data_broadcast_id* of 0x0A The OUI value in the PMT shall match the OUI value in the NIT in the NIT linkage to bootloader descriptor. Refer to

section 6 for its inclusion in a multiplexer.

2.5.2 Optional Descriptors

Smoothing_buffer_descriptor *descriptor_tag 0x10*

2.5.3 MHEG-5 Data Carousel Descriptors within the PMT

The transport protocol for the purposes of data carousel and object carousel is as defined in the specification DVB EN 301 192; DVB specification for data broadcasting. For detailed reference please refer to this document.

Every service on the DTT platform shall reference an MHEG-5 object carousel.

The following mandatory descriptors shall be transmitted in the elementary stream loop of the PMT to indicate that the component contains the Download Server Initiate message in the object carousel and that applications carried on this component are conformant to MHEG-5 UK Profile1.06.

Carousel_ID_descriptor *descriptor_tag 0x13* The Carousel id descriptor is mandatory when associated MHEG-5 Carousel data is transmitted.

Stream_identifier_descriptor *Descriptor_tag 0x52* Mandatory whenever associated MHEG-5 applications are transmitted.

Data_broadcast_id_descriptor *Descriptor_tag 0x66* Mandatory whenever associated MHEG-5 applications are transmitted. When used for the purposes of MHEG-5 it shall be used in conjunction with *Data_broadcast_id* of 0x0106.

Freeview DTH MHEG-5 structure syntax example

```

ElementaryStream {
  streamType   = 0x0b
  elementaryPID = 0xnnn
  ESInfoLength = 0xnxxx
  ESInfo {

  StreamIdentifierDescriptor {
    tag       = 0xnn
    length    = 0x01
  }
}

```

```

    componentTag = 0x0b
  }

  DataBroadcastIdDescriptor {
    tag          = 0x66
    length       = 0x06
    dataBroadcastId = 0x0106
    {
      applicationTypeCode = 0x0505 (*note 1)
      bootPriorityHint    = 0x00
      appSpecificDataLength = 0x00
    }
  }

  CarouselIdentifierDescriptor {
    tag          = 0x13
    length       = 0x05
    carouselId  = 0xnxxxxxxxx
    formatId    = 0x00
  }

```

n – arbitrary value

Note 1: Signify's MHEG-5 NZ Profile ver. 1.06 which is based on the UK MHEG-5 profile ver 1.06 with NZ extensions (see MHEG_profile_nz_1.0.3.pdf document)

2.6. Blank

2.7 Network Information Table

The NIT (actual) shall be transmitted in each transport stream in the network. The NIT shall be encoded according to ISO/IEC 13818-1, EN 300 468 and ETR 101 211.

NIT_actual table_id 0x40 shall be transmitted

NIT shall always be transmitted on PID 0x0010.

The NIT shall be transmitted at least every 10sec.

2.7.1 Mandatory Descriptors

Linkage_descriptor	Descriptor_tag 0x4A (with the linkage type 0x09) shall refer to a transport stream carrying a system
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software update service (SSU). It shall be inserted into the primary NIT loop. It shall only be broadcast when a SSU update takes place. These private data bytes will provide the identity of the organisation that is providing the system software update service and may also provide additional information that identifies the update as being specific to a particular manufacturer's model.

- Network_name_descriptor:* A *network_name_descriptor* (0x40) shall be inserted for each NIT sub-table.
- Service_list_descriptor* A *service_list_descriptor* (0x41) shall be inserted for each transport stream defined in each NIT section. All services targeted for the network in a transport stream shall then be listed.
- Satellite_delivery_system_descriptor* A *satellite_delivery_system_descriptor* (0x43) shall be inserted for each transport stream in a satellite network. All transport streams in a network shall be defined in the appropriate NIT section.

2.7.2 Optional Descriptors

- SSU Scan Linkage_descriptor* Descriptor Tag 0x4A; (when used in conjunction with the linkage type 0x09.) The linkage descriptor shall be signalled within the NIT when a DVB-SSU data broadcast is to be delivered. It is optional for the receiver to interpret this linkage descriptor. If the descriptor is used it will quickly identify the *transport_stream_id* of the transport stream that contains the system software update. It shall only be broadcast when a SSU update takes place. It differs from the linkage descriptor type 0x09 as it does not contain any OUI specific data.

2.8 Bouquet Association Table (BAT)

The BAT shall be transmitted in each transport stream in the network. The BAT shall be encoded according to ISO/IEC 13818-1, EN 300 468 and ETR 101 211.

BAT table_id 0x40 shall be transmitted

BAT shall always be transmitted on PID 0x0011.

The BAT shall be transmitted at least every 10sec.

It is mandatory to transmit the Bouquet Association Tables for all FreeView services.

The BAT tables will group relevant Network / Originating Network ID services according to the geographic location of FreeView viewers.

There are eleven bouquet IDs assigned to FreeView. They are;

- 0x1000 AUCKLAND
- 0x1100 WAIKATO
- 0x1200 CENTRAL
- 0x1300 WELLINGTON
- 0x1400 CHRISTCHURCH
- 0x1500 DUNEDIN
- 0x1600 RESERVED REGION 7
- 0x1700 RESERVED REGION 8
- 0x1800 RESERVED REGION 9
- 0x1900 RESERVED REGION 10
- 0x2000 Engineering Test Bouquet

2.8.1 Mandatory Descriptors

Service_list_descriptor A *service_list_descriptor* (0x41) shall be inserted for each transport stream that is contained within each bouquet. This descriptor shall list all services that are relevant to FreeView that are contained within that transport stream.

Bouquet_name_descriptor A *bouquet_name_descriptor* (0x47) shall be inserted for each bouquet that is defined for FreeView.

Private_data_specifier_descriptor Descriptor Tag 0x5F . This is mandatory to whenever private descriptors are used. For the Freeview logical channel descriptor then the *private_data_specifier_value* shall be 0x0000 0029.

Freeview_Logical_channel_descriptor
 A Freeview_logical_channel_descriptor (tag 0x83) shall be inserted in the second descriptor loop of the BAT. This descriptor shall list all services from that transport stream that are contained within the multiplex and specify the logical channel that is assigned to each of those services. For a detailed explanation see section 3.1.6

2.9 Service Description Table –Actual (SDT-Actual)

Table_id 0x42 An SDT_actual table is mandatory for each individual transport stream in the network.

2.9.1 Mandatory Descriptors

Service_descriptor: A *service_descriptor* (0x48) shall be inserted for each service defined in the SDT.

2.9.2 Optional Descriptors

Default_authority_descriptor
 (Mandatory for DTR devices) A *default_authority_descriptor* (0x73) defined in ETSI TS 102 323 [98], may be used to shorten the CRIDs carried within EIT by defining an appropriate CRID authority over a defined scope. If shorten CRIDs are to be used a *default_authority_descriptor* will be inserted in either the NIT, BAT or SDT. However Freeview practice to date has been to confine the use to the SDT. Refer to D Book section 8.5.3.13 for details

2.10 Service Description Table – Other (SDT-Other)

Table_id 0x46 An SDT_other table is mandatory within each actual TS to describe all other transport streams in the FreeView network. The SDT_other table shall describe all services within the FreeView network .

2.10.1 Mandatory Descriptors

Service_descriptor: A *service_descriptor* (0x48) shall be inserted for each service defined in the SDT.

2.10.2 Optional Descriptors

Default_authority_descriptor
(Mandatory for DTR devices)

A *default_authority_descriptor* (0x73) defined in ETSI TS 102 323 [98], may be used to shorten the CRIDs carried within EIT by defining an appropriate CRID authority over a defined scope. If shorten CRIDs are to be used a *default_authority_descriptor* will be inserted in either the NIT, BAT or SDT. Refer to D Book section 8.5.3.13 for details

2.11 Event Information Table - Actual (EIT-actual)

Table_id 0x4E – EIT_actual_p/f – It is mandatory to transmit EIT p/f sections for all “visible” services in the actual transport stream and for each service where there is a reference to that service in an SDT (actual or other) in the multiplex for which the EIT_present_following_flag is set.

Visible services are those services which are listed within the Logical Channel Descriptor with the visible_service_flag set to “1”.

2.11.1 Mandatory Descriptors – EIT_actual_p/f

Short_event_descriptor; Descriptor tag 0x4D, contains title and possibly a short (less than 200 characters) text information about the event.

Content_descriptor; Descriptor tag 0x54, classifies the event according to certain content classes specified by the DVB SI specification (EN 300 468) [6].

2.11.2 Optional Descriptors – EIT_actual_p/f

Content_identifier_descriptor
(Mandatory for DTR devices) A *content_identifier_descriptor* (0x76) defined in ETSI TS 102 323 [98], is used to associate a CRID to an event for recording identification and is placed within the event loop of EIT. It shall be used within EIT schedule sub-tables, usage shall be consistent between EIT schedule actual and other. The content identifier descriptor may additionally be used within EITpf. If CID is present in EITpf a receiver should use this in preference to the CID for the same event in EIT schedule. Multiple instances of the descriptor may be present. A single descriptor may contain multiple CRIDs. Freeview will support CRID_types 0x31, 0x32, 0x33. Refer to D Book section 8.5.3.12 and 8.7.2 for details

Parental_rating_descriptor
(Mandatory for DTR devices) Descriptor tag 0x55, provides the recommended age rating and identifies the country (New Zealand).

Component_descriptor; 0x50 This descriptor may be used to identify the specific type of component stream and / or to provide a text description of the elementary stream.

Extended_event_descriptor; Descriptor tag 0x4E, provides a detailed text description of an event, which may be used to provide supplementary information to that described in the *short_event_descriptor* field.

2.11.3 Mandatory Descriptors – EIT_actual_schedule

Table_id 0x50 *EIT_actual_day_0..3*

Table_id 0x51 *EIT_actual_day_4..7*

Short_event_descriptor; Descriptor tag 0x4D, contains title and possibly a short (less than 200 characters) text information about the event.

Content_descriptor; Descriptor tag 0x54, classifies the event according to certain content classes specified by the DVB SI specification (EN 300 468) [6].

2.11.4 Optional Descriptors – EIT_actual_schedule

Content_identifier_descriptor
(Mandatory for DTR devices)

A *content_identifier_descriptor* (0x76) defined in ETSI TS 102 323 [98], is used to associate a CRID to an event for recording identification and is placed within the event loop of EIT. It shall be used within EIT schedule sub-tables, usage shall be consistent between EIT schedule actual and other. The content identifier descriptor may additionally be used within EITpf. If CID is present in EITpf a receiver should use this in preference to the CID for the same event in EIT schedule. Multiple instances of the descriptor may be present. A single descriptor may contain multiple CRIDs. Freeview will support CRID_types 0x31, 0x32, 0x33. Refer to D Book section 8.5.3.12 and 8.7.2 for details

Parental_rating_descriptor
(Mandatory for DTR devices)

Descriptor tag 0x55, provides the recommended age rating and identifies the country (New Zealand).

<i>Component_descriptor;</i>	<i>0x50</i> This descriptor may be used to identify the specific type of component stream and / or to provide a text description of the elementary stream.
<i>Extended_event_descriptor;</i>	Descriptor tag <i>0x4E</i> , provides a detailed text description of an event, which may be used to provide supplementary information to that described in the <i>short_event_descriptor</i> field.

2.12 Event Information Table - Other (EIT-other)

Table_id 0x4F EIT_other_p/f It is mandatory to transmit EIT p/f sections for all “visible” services in ‘other’ transport streams that form part of the FreeView service. Visible services are those services which are listed within the Logical Channel Descriptor with the *visible_service_flag* set to “1”.

Transmission of EIT schedule information for ‘other’ transport streams is mandatory for the FreeView service, but is optional on a service ID by service ID basis, (i.e. channel by channel basis).

2.12.1 Mandatory Descriptors – EIT_other_p/f

<i>Short_event_descriptor;</i>	Descriptor tag <i>0x4D</i> , contains title and possibly a short (less than 200 characters) text information about the event.
<i>Content_descriptor;</i>	Descriptor tag <i>0x54</i> , classifies the event according to certain content classes specified by the DVB SI specification (EN 300 468) [6].

2.12.2 Optional Descriptors – EIT_other_p/f

<i>Content_identifier_descriptor</i> (Mandatory for DTR devices)	A <i>content_identifier_descriptor</i> (<i>0x76</i>) defined in ETSI TS 102 323 [98], is used to associate a CRID to an event for recording identification and is placed within the event loop of EIT. It shall be used within EIT schedule sub-tables, usage shall be consistent between EIT schedule actual and other. The content identifier descriptor may additionally be used within EITpf. If CID is present in EITpf a receiver should use this in preference to the CID for the same event in EIT schedule. Multiple
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instances of the descriptor may be present. A single descriptor may contain multiple CRIDs. Freeview will support CRID_types 0x31, 0x32, 0x33. Refer to D Book section 8.5.3.12 and 8.7.2 for details

Parental_rating_descriptor
(Mandatory for DTR devices)

Descriptor tag 0x55, provides the recommended age rating and identifies the country (New Zealand).

Extended_event_descriptor;

Descriptor tag 0x4E, provides a detailed text description of an event, which may be used to provide supplementary information to that described in the short_event_descriptor field.

Component_descriptor;

0x50 This descriptor may be used to identify the specific type of component stream and / or to provide a text description of the elementary stream.

2.12.3 Mandatory Descriptors – EIT_other_schedule

Table_id 0x60 EIT_other_day_0..3

Table_id 0x61 EIT_other_day_4..7

Short_event_descriptor;

Descriptor tag 0x4D, contains title and possibly a short (less than 200 characters) text information about the event.

Content_descriptor;

Descriptor tag 0x54, classifies the event according to certain content classes specified by the DVB SI specification (EN 300 468) [6].

2.12.4 Optional Descriptors – EIT_other_schedule

Content_identifier_descriptor
(Mandatory for DTR devices)

A *content_identifier_descriptor* (0x76) defined in ETSI TS 102 323 [98], is used to associate a CRID to an event for recording identification and is placed within the event loop of EIT. It shall be used within EIT schedule sub-tables, usage shall be consistent between EIT schedule actual and other. The content identifier descriptor may additionally be used within EITpf. If CID is present in EITpf a receiver should use this in preference

to the CID for the same event in EIT schedule. Multiple instances of the descriptor may be present. A single descriptor may contain multiple CRIDs. Freeview will support CRID_types 0x31, 0x32, 0x33. Refer to D Book section 8.5.3.12 and 8.7.2 for details

Parental_rating_descriptor
(Mandatory for DTR devices)

Descriptor tag 0x55, provides the recommended age rating and identifies the country (New Zealand).

Component_descriptor;

0x50 This descriptor may be used to identify the specific type of component stream and / or to provide a text description of the elementary stream.

Extended_event_descriptor;

Descriptor tag 0x4E provides a detailed text description of an event, which may be used to provide supplementary information to that described in the short_event_descriptor field.

2.10 Time Date Table (TDT)

Table_id 0x70 TDT is mandatory in each transport stream in the network. The time accuracy shall be within ± 2 seconds from UTC. Each section of the TDT shall be transmitted at least once every 30 seconds.

2.11 Time Offset Table (TOT)

Table_id 0x73 TOT is mandatory in each transport stream in the network. The time accuracy shall be within ± 2 seconds from UTC. Each section of the TOT shall be transmitted at least once every 30 seconds.

2.11.1 Mandatory Descriptors

Local_time_offset_descriptor

The *local_time_offset_descriptor* shall be transmitted and will operate in the range of UTC +11 to **UTC + 13**, depending upon whether New Zealand is operating within daylight saving time.

The parameter *country_code* shall be defined as 'NZL' within this descriptor.

The parameter *country_region_id* shall be set to zero for *country_code* NZL.

3 Operational Use – Service Mapping

The tuning of FreeView branded STBs / DTRs is based upon NIT signalling in SI. The FreeView network will mostly include services that originate from within its own transport streams, however some services may originate from within Sky Digital transport streams by commercial agreement between all relevant parties.

3.1 Use of DVB Specific Identifiers

The IRD shall identify a service uniquely through the combination of;

- Original_network_id, plus
- Transport_stream_id, plus
- Service_ids which have a Bouquet Association Table Logical Channel Number descriptor

Only services which are listed in the Freeview NIT (Network_id=0x2F) and with a FreeView LCN descriptor within the Freeview Bouquet Association Tables will be relevant to FreeView.

3.1.1 Network_id

TR 101 162 [10]. The FreeView network_id is 0x2F, the Sky Digital network_id is 0xA9. TR 101 162 [10]

3.1.2 Original_network-id

The FreeView original_network_id is 0x2F, the Sky Digital Original_network_id is 0xA9. TR 101 162 [10].

3.1.3 Transport_stream_id

The *transport_stream_id* shall uniquely define a transport stream within the network. All transport streams within both the Sky and Freeview networks will carry a unique *transport_stream_id* Freeview currently operate *transport_stream_id*'s 21 and 22.

3.1.4 Bouquet_id

All services within FreeView will be defined within one or more bouquets of the bouquet association table (BAT). Each bouquet shall have its own *bouquet_id*. Each service that is defined within a bouquet shall be assigned a logical channel number using the *descriptor_tag 0x83*. Within each bouquet the logical channel numbers shall be unique for each service.

3.1.4.1 Bouquet Association Table The purpose of the bouquet association tables within the FreeView service is to restrict the distribution of regional content via satellite to just the relevant geographical region.

- 3.1.4.2 FreeView services intended to be available for viewers with the AUCKLAND geographic region shall be defined within *bouquet_id=0x1000*. All services within this bouquet shall be assigned a logical channel number using the *logical_channel_descriptor 0x83*.
- 3.1.4.3 FreeView services intended to be available for viewers with the WAIKATO geographic region shall be defined within *bouquet_id=0x1100*. All services within this bouquet shall be assigned a logical channel number using the *logical_channel_descriptor 0x83*.
- 3.1.4.4 FreeView services intended to be available for viewers with the CENTRAL geographic region shall be defined within *bouquet_id=0x1200*. All services within this bouquet shall be assigned a logical channel number using the *logical_channel_descriptor 0x83*.
- 3.1.4.5 FreeView services intended to be available for viewers with the WELLINGTON geographic region shall be defined within *bouquet_id=0x1300*. All services within this bouquet shall be assigned a logical channel number using the *logical_channel_descriptor 0x83*.
- 3.1.4.6 FreeView services intended to be available for viewers with the CHRISTCHURCH geographic region shall be defined within *bouquet_id=0x1400*. All services within this bouquet shall be assigned a logical channel number using the *logical_channel_descriptor 0x83*.
- 3.1.4.7 FreeView services intended to be available for viewers with the DUNEDIN geographic region shall be defined within *bouquet_id=0x1500*. All services within this bouquet shall be assigned a logical channel number using the *logical_channel_descriptor 0x83*.
- 3.1.4.8 FreeView services intended to be available for viewers with the REGION 7 (spare) geographic region shall be defined within *bouquet_id=0x1600*. All services within this bouquet shall be assigned a logical channel number using the *logical_channel_descriptor 0x83*.
- 3.1.4.9 FreeView services intended to be available for viewers with the REGION 8 (spare) geographic region shall be defined within *bouquet_id=0x1700*. All services within this bouquet shall be assigned a logical channel number using the *logical_channel_descriptor 0x83*.
- 3.1.4.10 FreeView services intended to be available for viewers with the REGION 9 (spare) geographic region shall be defined within *bouquet_id=0x1800*. All services within this bouquet shall be assigned a logical channel number using the *logical_channel_descriptor 0x83*.
- 3.1.4.11 FreeView services intended to be available for viewers with the REGION 10 (spare) geographic region shall be defined within *bouquet_id=0x1900*. All services within this bouquet shall be assigned a logical channel number using the *logical_channel_descriptor 0x83*.
- 3.1.4.12 All FreeView services shall be available for testing / engineering purposes in one bouquet known as ALL FTA which shall have *bouquet_id=0x2000*. All services within this bouquet shall be assigned a logical channel number using the *logical_channel_descriptor 0x83*.

3.1.5 Service_id

Each service shall be associated with a 2-byte *service_id*. The *service_id* is equivalent to the *program_number* used in PAT and PMT.

The allocated *service_ids* on both the Sky and Freeview networks shall be unique.

3.1.6 Logical_channel_descriptor

All services within FreeView shall be assigned a logical channel number using the *logical_channel_descriptor* 0x83. Some services will be assigned a LCN that is unique. Some other services for which there is a slightly different version available for different geographic regions, will be assigned the same LCN but in different bouquets.

For example, the version of TVONE which has advertisements which are of interest primarily to the people of Christchurch and surrounding areas, will appear within *bouquet_id=0x1400* with LCN=1. The version of TVONE however which has advertisements relevant primarily to the people of Waikato, and with a different *service_id* to that of the above TVONE, will appear within *bouquet_id=1100*, but also with LCN=1

The private Freeview_logical_channel_descriptor is based on the Australian Logical Channel Descriptor "Free TV Australia Operational Practice OP-41" and the French Logical_channel_number_descriptor (Services Et Profil De Signalisation Pour La Diffusion de La TV Numerique De Terre section 4.18.1). Both these documents are a variation to the UK D Book specification.

All services within Freeview shall be assigned a logical channel number using the *logical_channel_descriptor* 0x83.

The Freeview_logical_channel_descriptor shall be used in the second descriptor loop of the BAT.

All services which are defined as unique on the network will be assigned a unique LCN. Some services, which differ in regional advertising interstitials only, will be assigned the same LCN.

The proposed new syntax and semantics of the Freeview_logical_channel_descriptor is indicated in Table 12.1, as follows;

Table 3.1.6. Logical Channel Descriptor Syntax

Syntax	No. of bits	Identifier
Identifier		
logical_channel_descriptor(){		
descriptor_tag	8	uimsbf
descriptor_length	8	uimsbf
for (i=0; i<N;i++){		
service_id	16	uimsbf
visible_service_flag	1	bslbf
reserved	5	bslbf
logical_channel_number	10	uimsbf

Syntax	No. of bits	Identifier
<pre> } } </pre>		

descriptor_tag: This shall be assigned to be 0x83.

service_id: This is a 16-bit field which serves as a label to identify this service from any other service within the Transport Stream. The *service_id* is the same as the *program_number* in the corresponding *program_map_section*. Services shall be included irrespective of their running status.

visible_service_flag: This 1-bit field when set to '1' indicates that the service is normally visible and selectable (subject to the service type being suitable etc.) via the receiver service list. When set to '0' the receiver shall not offer the service to the user in normal navigation modes or in the service list. the services shall be selectable by direct keypad entry of the LCN.

reserved: All "reserved" bits shall be set to "1".

logical_channel_number: this is a 10-bit field which indicates the broadcaster preference for ordering services.

Freeview shall allocate every service on the network a unique LCN in the range of 1 – 799.

If a service is found which is not allocated an LCN, then the receiver should allocate the next available channel number from 800.

3.1.7 Event_id

The *event_id* is a 16-bit field which contains the identification number of the described events that are listed in the *event_information_tables*. The *event_id* shall be included in the following EIT tables;

- EIT_actual_p/f
- EIT_other_p/f
- EIT_actual_schedule
- EIT_other_schedule

Where Content Identifier Descriptors are used to carry CRID's for events, *event_id* shall also be included to ensure receivers can resolve rescheduled event recording as specified in D-Book section 8.11.3

3.2 Specific Service Mapping for the FreeView Satellite Network

3.2.1 Two Satellite Operators in the Same Physical Network

There will be two satellite operators within the same physical network within New Zealand. This document describes the Transmission Rules for the FreeView Network. Also sharing the same satellite at the same orbital position will be Sky Digital, the digital pay network of the Sky Network Television Limited Company of New Zealand.

The NIT-actual table of each FreeView transport stream, of which there will be two at the commencement of the Service, will identify and describe all of the FreeView services. It will list the two transport streams that are actually generated from the two satellite multiplex sets that are operated by FreeView, as well as all transport streams that are operated by Sky Digital that contain services that are also accessed by FreeView.

4. MPEG2 Video and Audio Transmission

4.1 Multi-channel Audio, AC-3 (Dolby Digital)

If AC-3 multi-channel audio is transmitted, it shall be encoded as described in TR 101 154, Annex C (Guidelines for the Implementation of AC-3 Audio in DVB Compliant Transport Streams [15]). The DVB specified AC_3_descriptor shall be included in the PMT for this elementary stream.

(Stream id shall be set to private stream type 1, stream type set 0x06 (PES packet private data), include PTS)

5. MHEG5 Application Transmission

MHEG 5 applications that may be procured or developed by FreeView will be streamed from a data object carousel Any MHEG 5 applications that are used will conform to the MHEG 5 Version 1.06 (U.K.) standard (with the inclusion of the NZ profile MHEG 5 extensions)

Relevant descriptors are listed in the table at clause 2.2.

6. Bootloader Transmission

6.1 System Software Updating

The updating of the receivers software via over-the-air processes is via the ETSI 102 006 DVB SSU process with the “Simple Profile” being the minimum level of functionality that is required. There are no immediate intentions to launch the UNT profile. The UNT profile will only be implemented if a particular manufacturer insists that this added dimension of data transfer integrity is necessary for one or more specific receivers in its range.

Whether or not the simple profile alone, or UNT profile additionally is used, Freeview will work with individual manufacturers to provide a solution that will work with their product(s).

The “Simple Profile” based software update services for this network utilise signalling in the NIT and PMT only.

The NIT table shall carry the linkage_descriptor 0x09 and may also carry the scan_linkage_descriptor 0x0A during a system software upgrade for one or more receivers, or when such an upgrade is planned.

The PSI reference for a planned system software update will be included within the PMT of the data_broadcast_id_descriptor with the data broadcast value of 0x000A.

For the simple profile mode of DVB-SSU Freeview will create relevant and unique NIT table signalling for each individual receiver model, and also broadcast the associated ASI data broadcast stream as a data carousel input to the multiplex. This data broadcast stream will be reflected in the PSI (PMT) as a standalone data broadcast service that will be independent of all other services.

Freeview will work with each individual manufacturer during the receiver conformance testing, and afterwards as necessary, to develop a robust and reliable DVB-SSU process.

The “Enhanced Profile” which may be a capability that is resident in some receivers, will additionally provide more sophisticated signalling via use of the “Update Notification Table”.

6.2 SSU Process

Manufacturers shall ensure that the receiver offered will only respond to a unique OUI code, (Organisation Unique Identifier). This means that the receiver will not react to any other OUI from any other manufacturer nor react to any other OUI from the same manufacturer which relates to a different model.

When a new software upgrade is required for a particular receiver the manufacturer shall be required to deliver two compliant (188 packets) ASI transport streams containing relevant converted binary image files, together with all relevant NIT and PMT data necessary for their receiver to properly

undergo a successful DVB-SSU operation. There shall be within the menu structure of the receiver the current software version number.

The receiver is to at least automatically check if new software is available when changing multiplexes by re-processing the NIT (actual) or every 10 seconds as recommended by DVB TR 101 211.

It must NOT require a rescan of any or all the multiplexes to acknowledge the presence of a DVB-SSU service.

The receiver manufacturer has the option of implementing the download of new software to the receiver as a background activity that does not interfere with normal television viewing while the receiver is in the on-mode or one which may be controlled by waiting until the receiver is switched to a "Standby" mode.

Alternatively the receiver may require the user to actively accept a SSU upgrade. This should be performed (or a similar procedure) as detailed below;-

If new software is available then the receiver may display a message as below (or similar to);-

"A software upgrade is available. Please select YES to upgrade now – this will take X minutes – or leave in standby (off button on remote) when finished viewing to upgrade later. Thank You."

The message box shall have a YES or NO button. The YES button will be highlighted by default.

1. If YES is selected the OAD would proceed.
2. If NO, the OAD would wait until the user switches the receiver to standby when it would happen automatically and without further user intervention.
3. If there is no user intervention for a period of three minutes, then by default, the OAD should be performed automatically.
4. If the user unplugs the mains power during an OAD, the receiver should reboot using the pre-existing installed software version.

While the receiver is in the process of downloading the new software – it should display the message (or similar to);-

"Your receiver is currently downloading an essential software upgrade. This will only take a few minutes. Please DO NOT adjust your receiver or switch OFF during this time. Thank You."

The receiver shall display a progress indicator during the download and re-flash process.

7. Teletext and Subtitling Transmission

7.1 EBU Teletext

For selected channel services within FreeView there will be an accompanying Teletext service. The Teletext system used is defined at [8] i.e. ITU-R System B Teletext in DVB Bitstreams. Teletext is also generically known as “EBU Teletext”. Using that same system closed captioning shall be provided on line 21 of the VBI for selected programmes within associated channels or services.

The minimum requirement for this service is that the STB / IRD shall deliver the Teletext and line 21 sub-titling information as an OSD image. Delivery of this information to Teletext decoder equipped TV receivers via the VBI is optional.

The SI reference to Teletext components of channels / services is the PMT reference to the;

Teletext_descriptor Descriptor_tag 0x56 Mandatory whenever a teletext component is defined.

7.2 DVB SubTitles

At the outset this network will not operate with DVB Subtitles [9] however the ability to satisfy the requirements of EN 300 743 – Digital Video Broadcast (DVB); Subtitling Systems, is mandatory.

Subtitling streams are signalled in the ISO/IEC 13818-1 – Programme Map Table (PMT) using stream type 0x06 indicating PES packet private data and with a *subtitling_descriptor* associated with the subtitle stream component.

The subtitling descriptor defined in section 6 of the DVB SI specification EN 300 468 enables different subtitling streams to be distinguished by their *ISO-639_language_code*, *subtitling_type*, *composition_page_id* and *ancillary_page_id*.

8. Conditional Access

This service does not utilise conditional access systems. EMM PIDs shall be carried within the Freeview Transport Streams on behalf of Sky Digital to enable Sky STBs and other Sky receiving devices to function correctly.

9. Wide Screen Signalling

FreeView will not transmit VBI line 23 WSS (wide-screen-signalling). The reason for this operational intent is that it will place the onus for switching individual display devices mostly with the viewer.

Notwithstanding this approach, FreeView will not alter the SCART connector signalling standard. In the New Zealand retail market-place the prevalence of SCART equipped display devices is quite low, but for those relatively few viewers who will have access both to SCART equipped receivers and to SCART equipped displays, automatic display format switching based upon AFD broadcast will be a viewing option.

10. References

- [1] ISO/IEC 13818-1 Information Technology-Generic coding of moving pictures and associated audio information – Part 1 : Systems
- [2] ISO/IEC 13818-2 Information Technology-Generic coding of moving pictures and associated audio information – Part 2 :Video
- [3] ISO/IEC 13818-3 Information Technology-Generic coding of moving pictures and associated audio information – Part 3 : Audio
- [4] ETS 300 421 Framing Structure, channel coding and modulation for 11/12 GHz satellite services.
- [5] ETC 300 429 Framing Structure, channel coding and modulation for cable systems.
- [6] EN 300 468 Specification for Service Information (SI) in DVB systems.
- [7] TR 101 211 Guidelines on implementation and usage of Service Information (SI)
- [8] ETS 300 472 Specification for conveying ITU-R System B Teletext in DVB bitstreams.
- [9] EN 300 743 Digital Video Broadcasting (DVB); Subtitling Systems
- [10] TR 101 162 Allocation of Service Information (SI) codes for DVB systems.
- [12] OP 41A Free TV Australia Operational Practice OP-41 – Logical Channel Descriptor
- [14] TS 102 006 Specification for System Software Update in DVB Systems.

- [15] TR 101 154 Implementation Guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications.