



NorDig Rules of Operation, ver 1.0

NorDig Rules of Operation

for

NorDig Unified Receiver Networks

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1 General

The NorDig Rules of Operation contain a set of minimum transmission rules, which are necessary - in addition to other applicable standards - to support the basic functionalities of the NorDig compliant receivers in primary and secondary networks. In general it is assumed that the transmissions targeted for the NorDig digital receivers are compliant with the NorDig Unified specifications..

These Rules of Operation therefore only contain further specification of the configuration of transmission parameters and the interpretation of signalling etc. in the NorDig receivers. The Rules of Operation may also be a guideline for digital receiver manufacturers how to interpret the NorDig compliant transmissions. This specification specifies some basic rules for transmission of the NorDig standard API, DVB MHP 1.1.1 [11], but not any for the legacy API's (like OpenTV or MediaHighway).

1.1 Document History

| Version | Date | Comments |
|---------|------------|--|
| 0.9 | 2002-05-30 | This is the first approved version of the NorDig Rules of Operation for NorDig I and II Receiver Networks |
| 1.0 | 2004-10-28 | Updated to reference to NorDig Unified v 1.0.2 receiver specification, which includes following relevant changes/updates: <ul style="list-style-type: none"> - Reference to NorDig Unified receiver specification (v1.0.2 Nov 2004), instead of NorDig I and II receiver specifications - Includes the new NorDig private descriptor; Logical Channel Descriptor version 2 - Includes the PMT descriptor; Carousel id descriptor, for MHP applications - Removal of the Service Move descriptor, to be in line with the NorDig IRD specification. - Updated versions of references to international specifications (ETSI etc) |

1.2 Abbreviations

| | |
|--------|---|
| API | Application Programming Interface |
| AIT | Application Information Table |
| BAT | Bouquet Association Table |
| Bslbf | bit string, left bit first |
| CA | Conditional Access |
| CAT | Conditional Access Table |
| DIT | Dithering Information Table |
| DTTV | Digital Terrestrial Television |
| DVB | Digital Video Broadcast |
| EIT | Event Information Table |
| EPG | Electronic Programme Guide |
| ESG | Event Schedule Guide |
| GUI | Graphical User Interface |
| IRD | Integrated Receiver Decoder |
| LSN | Local Service Network |
| MFN | Multiple Frequencies Network |
| NIT | Network Information Table |
| NVOD | Near Video On Demand |
| OUI | (IEEE) Organization Unique Identifier |
| PAT | Program Association Table |
| PMT | Program Map Table |
| PSI | Program Specific Information |
| p/f | present / following |
| RST | Running Status Table |
| SDT | Service Description Table |
| SFN | Single Frequency Network |
| SI | Service Information |
| SIT | Selection Information Table |
| ST | Stuffing Table |
| TS | Transport Stream |
| Uimsbf | unsigned integer most significant bit first |
| UTC | Universal Time, Co-ordinated |

2 PSI/SI

2.1 General

The subsequent sections identify the PSI/SI tables transmitted in all transport streams. *All services existing in the network may be identified through PSI/SI. Exceptions to this rule may occur for proprietary applications/services such as Business TV and data.*

An overview of descriptors of what is minimum required for broadcast in NorDig networks and what the NorDig IRD specification minimum specify the IRD to handle (of SI descriptors), is showed in **Table 1**, (not including the DVB MHP AIT descriptors). Additional broadcast outside this (additional descriptors etc), is up to each broadcaster to specify. Table also shows descriptors not yet required by NorDig in grey and overlined.

| Descriptor | Tag value | NIT | BAT | SDT | EIT | TOT | CAT | PMT |
|---|-----------|-------|-----|-------|-------|-----|-------|---------------------|
| Reserved | 0x00-0x01 | - | - | - | - | - | - | - |
| video_stream_descriptor | 0x02 | - | - | - | - | - | - | mb Mr |
| audio_stream_descriptor | 0x03 | - | - | - | - | - | - | mb Or |
| Hierarchy_descriptor | 0x04 | - | - | - | - | - | - | - |
| Registration_descriptor | 0x05 | - | - | - | - | - | - | - |
| data_stream_alignment_descriptor | 0x06 | - | - | - | - | - | - | - |
| target_background_grid_descriptor | 0x07 | - | - | - | - | - | - | Ob Or |
| video_window_descriptor | 0x08 | - | - | - | - | - | - | Ob Or |
| CA_descriptor | 0x09 | - | - | - | - | - | mb Mr | mb Mr |
| ISO_639_language_descriptor | 0x0A | - | - | - | - | - | - | mb Mr |
| system_clock_descriptor | 0x0B | - | - | - | - | - | - | - |
| Multiplex_buffer_utilization_descriptor | 0x0C | - | - | - | - | - | - | - |
| Copyright_descriptor | 0x0D | - | - | - | - | - | - | - |
| Maximum_bitrate_descriptor | 0x0E | - | - | - | - | - | - | - |
| private_data_indicator_descriptor | 0x0F | - | - | - | - | - | - | - |
| Smoothing_buffer_descriptor | 0x10 | - | - | - | - | - | - | - |
| STD_descriptor | 0x11 | - | - | - | - | - | - | - |
| IBP_descriptor | 0x12 | - | - | - | - | - | - | - |
| Carousel_id_descriptor | 0x13 | - | - | - | - | - | - | mb Mr ¹⁾ |
| ISO/IEC 13818-1 Reserved | 0x14-0x3F | - | - | - | - | - | - | - |
| network_name_descriptor | 0x40 | Mb Mr | - | - | - | - | - | - |
| service_list_descriptor | 0x41 | Ob Mr | - | - | - | - | - | - |
| stuffing_descriptor | 0x42 | - | - | - | - | - | - | - |
| satellite_delivery_system_descriptor | 0x43 | mb Mr | - | - | - | - | - | - |
| cable_delivery_system_descriptor | 0x44 | mb Mr | - | - | - | - | - | - |
| VBI_data_descriptor | 0x45 | - | - | - | - | - | - | - |
| VBI_teletext_descriptor (SIS-28) | 0x46 | - | - | - | - | - | - | - |
| Bouquet_name_descriptor | 0x47 | - | - | - | - | - | - | - |
| service_descriptor | 0x48 | - | - | Mb Mr | - | - | - | - |
| country_availability_descriptor | 0x49 | - | - | * | - | - | - | - |
| linkage_descriptor | 0x4A | mb Mr | - | Ob Mr | * | - | - | - |
| NVOD_reference_descriptor | 0x4B | - | - | - | - | - | - | - |
| time_shifted_service_descriptor | 0x4C | - | - | - | - | - | - | - |
| short_event_descriptor | 0x4D | - | - | - | mb Mr | - | - | - |
| Extended_event_descriptor | 0x4E | - | - | - | Ob Mr | - | - | - |
| time_shifted_event_descriptor | 0x4F | - | - | - | - | - | - | - |
| Component_descriptor | 0x50 | - | - | - | Ob Mr | - | - | - |
| mosaic_descriptor | 0x51 | - | - | - | - | - | - | - |
| Descriptor | Tag value | NIT | BAT | SDT | EIT | TOT | CAT | PMT |

| Descriptor | Tag value | NIT | BAT | SDT | EIT | TOT | CAT | PMT |
|--|-----------|---------------------|-----|---------------------|-------|-------|-----|---------------------|
| stream_identifier_descriptor | 0x52 | - | - | - | - | - | - | Ob Mr |
| CA_identifier_descriptor | 0x53 | - | - | Ob Mr | Ob Or | - | - | - |
| content_descriptor | 0x54 | - | - | - | mb Mr | - | - | - |
| Parental_rating_descriptor | 0x55 | - | - | - | Ob Mr | - | - | - |
| teletext_descriptor | 0x56 | - | - | - | - | - | - | mb Mr |
| Telephone_descriptor | 0x57 | - | - | - | - | - | - | - |
| local_time_offset_descriptor | 0x58 | - | - | - | - | Mb Mr | - | - |
| Subtitling_descriptor | 0x59 | - | - | - | - | - | - | mb Mr |
| Terrestrial_delivery_system_descriptor | 0x5A | mb Mr | - | - | - | - | - | - |
| Multilingual_network_name_descriptor | 0x5B | * | - | - | - | - | - | - |
| Multilingual_bouquet_name_descriptor | 0x5C | - | - | - | - | - | - | - |
| Multilingual_service_name_descriptor | 0x5D | - | - | * | - | - | - | - |
| Multilingual_component_descriptor | 0x5E | - | - | - | * | - | - | - |
| private_data_specifier_descriptor | 0x5F | mb Mr | - | mb Mr | mb Mr | - | - | mb Mr |
| service_move_descriptor | 0x60 | - | - | - | - | - | - | Ob Mr |
| short_smoothing_buffer_descriptor | 0x61 | - | - | - | * | - | - | - |
| Frequency_list_descriptor | 0x62 | Ob Mr | - | - | - | - | - | - |
| partial_transport_stream_descriptor | 0x63 | - | - | - | - | - | - | - |
| data_broadcast_descriptor | 0x64 | - | - | * | * | - | - | - |
| CA_system_descriptor (note 2) | 0x65 | - | - | - | - | - | - | - |
| data_broadcast_id_descriptor | 0x66 | - | - | - | - | - | - | mb Mr |
| Transport_stream_descriptor | 0x67 | - | - | - | - | - | - | - |
| DSNG_descriptor | 0x68 | - | - | - | - | - | - | - |
| PDC_descriptor | 0x69 | - | - | - | - | - | - | - |
| AC-3_descriptor | 0x6A | - | - | - | - | - | - | mb Mr |
| Ancillary_data_descriptor | 0x6B | - | - | - | - | - | - | - |
| cell_list_descriptor | 0x6C | - | - | - | - | - | - | - |
| cell_frequency_link_descriptor | 0x6D | - | - | - | - | - | - | - |
| announcement_support_descriptor | 0x6E | - | - | - | - | - | - | - |
| Application_signalling_descriptor | 0x6F | - | - | - | - | - | - | mb Mr ¹⁾ |
| service_identifier_descriptor | 0x71 | - | - | Ob Mr ¹⁾ | - | - | - | - |
| user defined | 0x80-0xFE | - | - | - | - | - | - | - |
| Viasat private: Logic_channel_descriptor | 0x82 | - | - | - | - | - | - | - |
| NorDig private: Logic_channel_descriptor version 1 | 0x83 | Ob Or | - | - | - | - | - | - |
| EICTA (E-book) private: Logic_channel_descriptor | 0x83 | - | - | - | - | - | - | - |
| EICTA (E-book) private: Preferred_name_list_descriptor | 0x84 | - | - | - | - | - | - | - |
| EICTA (E-book) private: Preferred_name_identifier_descriptor | 0x85 | - | - | - | - | - | - | - |
| EICTA (E-book) private: EICTA_stream_identifier_descriptor | 0x86 | - | - | - | - | - | - | - |
| NorDig private: Logic_channel_descriptor, version 2 | 0x87 | Ob Mr ²⁾ | - | - | - | - | - | - |
| Senda private: Channel_list_descriptor | 0xF4 | - | - | - | - | - | - | - |
| Forbidden | 0xFF | Fb | Fb | Fb | Fb | Fb | Fb | Fb |

| |
|---|
| <p>- <i>Descriptor not applicable to be inserted</i></p> <p>Mb Mandatory to Broadcast, always/all time</p> <p>mb Mandatory to Broadcast if applicable, i.e. if certain criteria is met (e.g. if scrambling is used)</p> <p>Ob Optional to broadcast, but recommended (if applicable)</p> <p>Fb Forbidden to broadcast (may cause misinterpretation)</p> <p>Mr Mandatory to receive and interpret if broadcast</p> <p>Or Optional to receive and interpret (if broadcasted)</p> <p>Note 1) Mandatory for IRDs with any profile of DVB MHP API, i.e. optional for basic IRDs without API</p> <p>Note 2) Usage of this descriptor is recommended for NorDig Networks and will be Mandatory to receive for new NorDig IRD released after July 2007.</p> |
|---|

Table 1 Overview over used descriptor in NorDig member's broadcast and reception

2.1.1 Text strings and field sizes of the descriptors

In NorDig transmission, text strings shall be coded using the 'Latin Alphabet number 5' as specified in ISO 8859-9 [i.e. our Nordic characters] (and then signalled with a first byte '0x05' in the text field) or optional using the 'Latin Alphabet' as specified in ISO/IEC 6937 (see EN 300 468 [6] Appendix A).

Broadcasters are strongly advised not to exceed the maximum recommended lengths for text fields defined in the following table. Note: The figures are given for the number of displayable characters that are required to represent the text field (including spaces but excluding any control codes). The number of bytes required will depend on the use of control codes and whether one or two byte character representation is used.

| Name Field | Name Length | Comments and examples |
|-----------------------------------|-------------|--|
| Network Name | 24 | Example: "Teracom Stockholm" |
| Service Provider Name | 20 | Example: "Sveriges Television" |
| (Full) Service Name | 22 | Example: "SVT Östnytt 24 timmar" Full name for display on the set-up menus |
| (Short) Service Name ¹ | 12 | Example: "SVT Östnytt" A short version for display on browse and listing display. Shortened from full name by using control codes, see below. |
| Event Name | 40 | Example: "Ice hockey World Championship" It is allowed to add an episode title within the space: Example: "Ice hockey World Cup:Final" |
| Short Event Descripton | 255 | Example: "From the final, Sweden - Finland. Commentator: Arne Hegerfors / Glenn Strömberg" |
| Extended Event descripton | 255 | This limitation is for all extended event information related to a specific event. |
| Component Descripton | 32 | See Event Name |
| Application Name | 32 | See Event Name |
| Channel List Name | 24 | Example: "Canal Digital Sverige" Used in NorDig private descriptor Logical Channel Descriptor version 2. |

Control codes can be used to define how a name shall be shortened, see TR 101 211 [7]. The control codes are

1. 0x86 short_name_on;
2. 0x87 short_name_off.

These codes may only be used in pairs.

Example, service name:

'The digital [0x86] Sport Channel [0x87]', full name: 'The digital Sport Channel', short name: 'Sport Channel'.

Broadcaster are also strongly advised not to exceed the recommended maximum lengths of (unique) event data during a 24 h period defined below (not including repetitions) per service:

¹ This shorter version of the service name may be needed as in some menus where more information has to be displayed there may be some lack of space on the TV set if all information shall be readable.

- For short event descriptors 9600 characters.
- For extended event descriptors 40960 characters.

All name fields shall contain meaningful data. Description fields may be empty at the broadcaster's discretion.

Text string formatting name and description fields as defined in TR 101 211 [7] section 4.6 may be used by broadcasters and shall be supported by receivers.

2.2 Program Association Table (PAT)

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.

2.3 Conditional Access Table (CAT)

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

2.3.1 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. It is allowed to insert private data into the *CA_descriptor*.

2.4 Program Map Table (PMT)

For each service in a transport stream there shall be a corresponding Program Map Table. PMT shall be encoded according to ISO/IEC 13818-1 [1]. There shall be separate program_map_PIDs for each service.

2.4.1 Mandatory descriptors

CA_descriptor: A *CA_descriptor* shall be inserted whenever a service or service component is scrambled. *CA_descriptor* may be inserted both in the first (service level) and second (component level) descriptor loop. It is optional to insert any private data into the *CA_descriptor* in PMT.

Video_stream_descriptor Mandatory whenever still pictures (i.e. MPEG stills) are transmitted

Carousel id descriptor The Carousel id descriptor is mandatory in case that MHP applications are transmitted. The descriptor is used to identify the PID on which the DSI message for an Object Carousel is broadcast. It also labels the stream with an id necessary to resolve references to that specific carousel by other objects. See MHP specification (TS 101 812) for details.

ISO_639_language_descriptor This descriptor shall be inserted for every audio component defined, if more than one audio stream with different languages is present within a service. The descriptor should be inserted in any case, also when there is only one language. The audio_type is currently set to "Undefined", but any value defined by ISO/IEC 13818-1 [1] is allowed. For dual mono components one *ISO_639_language_descriptor* shall contain two language codes. The first one refers to the left audio channel while the second one refers to the right audio channel.

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

Subtitling_descriptor Mandatory whenever DVB bitmap subtitles are transmitted.

Private_data_specifier Mandatory whenever private defined descriptors is used, as specified in TR 101 211 [7]. For NorDig private defined descriptors (e.g. NorDig Logic Channel Descriptor), then *private_data_specifier_value* shall be set to 0x00000029, (see TR 101 162 [10]).

Data_broadcast_id_descriptor Mandatory whenever transmission of DVB bootloader (system software update) is used. When used as DVB bootloader (System Software Update) data broadcast id descriptor, the *data_broadcast_id* shall be set to 0x000A. The *id_selector_bytes* shall be used as specified in the DVB System Software Update (“bootloader”) spec [14]. Update_type 0x0 (proprietary update solution) shall not be used. The OUI value in the PMT shall match the OUI value in the NIT linkage to bootloader descriptor.

Used to indicate the location of a DVB software download stream or a DVB SSU UNT (table). The type indication of the download is contained in the descriptor as per TS 102 006.

Application_Signalling_Descriptor Mandatory whenever a DVB MHP data application component is defined. To avoid transition states and mismatches with the AIT, it is recommended to not set the ‘application_type’ and ‘verion_no’ in this descriptor, (i.e. set to 0). The *stream_type* in the PMT for this component/PID shall be set to 0x05 (private_sections)

2.4.2 Optinal descriptors

Target_background_grid Used as specified in TR 101 154 [15]

Descriptor

Video_window_descriptor Used as specified in TR 101 154 [15]

Stream_identifier_descriptor Used as specified in TR 101 211[7]

Data_broadcast_id_descriptor May be used with transmission of other data.

When used as MHP data broadcast id descriptor, the *data_broadcast_id* shall be set to 0x00F0 for MHP Object carousels and to 0x00F1 for MHP Multi Protocol Encapsulation

2.4.3 Data Broadcast Id descriptor for DVB bootloader (system software update)

IEEE OUI (as described in IEEE 802-1990) of the organization providing a system software update service on the transport-stream/service. DVB has defined OUI 0x00015A to signal that the stream is from any OUI.

2.5 Application Information Table (AIT)

For each service containing a DVB MHP application-(s) in a transport stream there shall be a corresponding Application Information Table. AIT shall be encoded according to DVB MHP 1.1.1 specification (TS 102 812) [11]. There shall be separate AIT PIDs for each service (Service ID). The minimum repetition rate of each AIT subtable is 1 seconds.

Stream_type for data application shall be set to 0x05, ITU-T Rec H.222.0 | ISO/IEC13818-1 [1] *private_sections*.

An overview of DVB MHP AIT descriptors of what is minimum required for DVB MHP broadcast in NorDig networks is shown in Table 2. Additional AIT broadcast outside this (additional descriptors etc), is up to each broadcaster to specify. Table also shows descriptors not yet required by NorDig in grey and overlined.

| Descriptor | Tag value | AIT | PMT | SDT |
|--|-----------------|--------------|---------------------|--------------|
| Application descriptor | 0x00 | mb Mr | - | - |
| Application name descriptor | 0x01 | mb Mr | - | - |
| Transport protocol descriptor | 0x02 | mb Mr | - | - |
| DVB-J application descriptor | 0x03 | mb Mr | - | - |
| DVB-J application location descriptor | 0x04 | mb Mr | - | - |
| External application authorisation descriptor | 0x05 | mb Mr | - | - |
| Routing Descriptor IPv4 | 0x06 | Ob Mr | - | - |
| Routing Descriptor IPv6 | 0x07 | Ob Mr | - | - |
| DVB-HTML application descriptor | 0x08 | mb Mr | - | - |
| DVB-HTML application location descriptor | 0x09 | mb Mr | - | - |
| DVB-HTML application boundary descriptor | 0x0A | * | - | - |
| Application icons descriptor | 0x0B | Ob Mr | - | - |
| Pre-fetch descriptor | 0x0C | Ob Mr | - | - |
| DII location descriptor | 0x0D | * | - | - |
| delegated application descriptor | 0x0E | * | - | - |
| Plug-in descriptor | 0x0F | * | - | - |
| Application storage descriptor | 0x10 | Ob Mr | - | - |
| reserved to MHP for future use | 0x11-0x5E | * | - | - |
| private data specifier descriptor | 0x5F | mb Mr | - | - |
| reserved to MHP for future | 0x60-0x7F | * | - | - |
| User defined | 0x80-0xFE | * | - | - |
| | | | | |
| Carousel id descriptor | 0x13 | - | mb Mr ¹⁾ | - |
| Data broadcast id descriptor, (see ch 2.4 PMT) | 0x66 | - | Ob Mr ¹⁾ | - |
| Application Signalling Descriptor, (see ch 2.4 PMT) | 0x6F | - | mb Mr ¹⁾ | - |
| Service identifier descriptor, (see ch 2.7 SDT) | 0x71 | - | - | Ob Mr |
| <p>- Descriptor not applicable to be inserted</p> <p>Mb Mandatory to Broadcast, always/all time</p> <p>mb Mandatory to Broadcast if applicable, i.e. if certain criteria is met</p> <p>Ob Optional to broadcast, but recommended (if applicable)</p> <p>Fb Forbidden to broadcast (may cause misinterpretation)</p> <p>Mr Mandatory to receive and interpret if broadcast</p> <p>Or Optional to receive and interpret (if broadcasted)</p> <p>Note 1: Mandatory for IRDs with any profile of DVB MHP API, i.e. optional for basic IRDs without API</p> | | | | |

Table 2 Overview of descriptors in use for DVB MHP application

2.5.1 Mandatory descriptors

Transport_protocol_descriptor

Mandatory whenever an MHP application is defined and carried via OC, it identifies the transport protocol associated with a service component and possibly provides protocol dependent information. These protocols may be OC (object carousel) IP or the interaction channel.

Application_descriptor

Mandatory whenever an MHP application is defined. The 'application_profile' field lists the profiles and versions of these profiles on which this application may be executed. The 'service_bound_flag' field indicates whether or not this application may live on to an other service. The 'visibility' field is used to signalise whether or not an application shall be visible in the navigator or an EPG. The 'application_priority' field is

| | |
|--|--|
| <i>Application_name_descriptor</i> | used to set priority for simultaneously run application, if the platform have limited resources. Mandatory whenever an MHP application is defined, it is an informative descriptor giving a name to the application |
| <i>DVB-J_application_descriptor</i> | Mandatory whenever an MHP DVB-J based application is defined. |
| <i>DVB-J_application_location_descriptor</i> | Mandatory whenever an MHP DVB-J based application is defined. The 'base_directory_byte' field contains a string specifying a directory name starting from the root of the file system. This directory is used as a base directory for relative path names. The 'classpath_extension_byte' contains a string specifying a further extension for the DVB-J class path. The 'initial_class_byte' contain a string specifying the name of the object in the file system that is the class implementing the Xlet interface. |
| <i>external_application_authorisation_descriptor()</i> | Mandatory whenever external applications are allowed to "survive" zapping from another service and to run on this one. (These applications cannot be launched from this service). Shall then be inserted in the first descriptor loop of the AIT. Service bound for applications listed in this descriptor, shall then in its originated service-(s) be set to '0', survive zapping. |
| <i>DVB-HTML_application_descriptor</i> | Mandatory whenever an MHP DVB-HTML based application is defined. |
| <i>DVB-HTML_application_location_Descriptor</i> | Mandatory whenever an MHP DVB-HTML based application is defined. |

2.5.2 Optional descriptors

| | |
|---|---|
| <i>application_icons_descriptor()</i> | May be used to reference associates an PNG-based image to the application |
| <i>ip_routing_descriptors</i> <i>routing_descriptor_IPv4</i> <i>routing_descriptor_IPv6</i> | May be used for multicast IP for MHP applications |
| <i>prefetch_descriptor()</i> | May be used. It is defined to enable implementations to start fetching files that will be required during the early part of an application 's life. Later in an application's life it can actively request file pre-fetching using API mechanisms. This descriptor do not have a relation to the API-based pre-fetching |
| <i>application_storage_descriptor()</i> | May be used. It advertises that an application can be stored and provides some indications of its properties. The descriptor contains among others the 'storage_property', 'version' and 'priority' fields. Along with this descriptor there must also be an Application Description File. The 'storage_property' field indicates whether this is a broadcast related application or a stand-alone application. The 'version' field provides the version number of the application. The 'priority' field indicates the priority of this application for storage relative to the other applications signalled in this service. |

Application Description File

May be used, it is an XML-based file containing information on which files need to be stored etc. The name and the location of the file are defined by MHP v1.1.1 [11]. This file must be present whenever an application is supposed to be stored.

2.6 Network Information Table (NIT)

NIT shall be transmitted in each transport stream in the network. Both NIT_actual and NIT_other may be transmitted. NIT shall always be transmitted on PID 0x0010.

2.6.1 Mandatory descriptors

network_name_descriptor:

A *network_name_descriptor* shall be inserted for each NIT sub-table.

satellite_delivery_system_descriptor:

A *satellite_delivery_system_descriptor* 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.

cable_delivery_system_descriptor:

A *cable_delivery_system_descriptor* shall be inserted for each transport stream in a cable network. All transport streams in a network shall be defined in the appropriate NIT section.

Reference to analogue services (PAL) may be used and then they shall be regarded as a "transport stream". The *cable_delivery_system_descriptor* for analogue services shall contain the correct centre frequency for the vision carrier, while the other parameters shall be set to zero (i.e. not defined). The *service_list_descriptor* for this "transport stream" shall list only one service with service type set according to Table 72 in EN 300 468 [6] (0x07, PAL coded signal). An example of these two descriptors is shown in Figure 1

terrestrial_delivery_system_descriptor:

A *terrestrial_delivery_system_descriptor* shall be inserted for each transport stream in a terrestrial network. All transport streams in a network shall be defined in the appropriate NIT section.

linkage_descriptor:

Currently the following *linkage_descriptors* are mandatory in the first descriptor loop (when applicable):

- linkage_type 0x04:
Linkage to transport stream which carries EIT schedule information for all of the services in the network (i.e. "barker" service see section 3.2)
- Linkage_type 0x09:
Used for signalling of DVB/ETSI system software download service (bootloader) transmission.
- linkage_type 0x81:
Used for signalling of NorDig system software download service (bootloader) transmission.

private_data_specifier

Mandatory whenever private defined descriptors is used, as specified in TR 101 211 [7]. For NorDig private defined descriptors (e.g. NorDig Logic Channel Descriptor), then *private_data_specifier_value* shall be set to 0x00000029, (see TR 101 162 [10]).

```

; ----- Cable Delivery System Descriptor (0x44) -----
DESCRIPTOR 0x44
Descriptor Tag      : 0x44 ; (68)
Descriptor Length   : 0x0B ; (11)
Frequency           : 0x06312500 ;
Reserved            : 0x000 ;
FEC Outer           : 0x0 ;
Modulation          : 0x00 ; (0)
Symbol Rate        : 0x0000000 ;
FEC Inner           : 0x0 ;
END (OF DESCRIPTOR)

; ----- Service List Descriptor -----
DESCRIPTOR 0x41
Descriptor Tag      : 0x41 ; (65)
Descriptor Length   : 0x03 ; (3)

; ----- Service #1 -----
Service Id          : 0x0087; (135)
Service Type       : 0x07 ; (7)
END (OF DESCRIPTOR)

```

Figure 1 Example of cable_delivery_system_descriptor and service_list_descriptor for analogue services

2.6.2 Optional descriptors

Service_list_descriptor:

A *service_list_descriptor* may 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.

Logic_channel_descriptor version 1

(Older) NorDig private descriptor. Inserted in 2nd descriptor loop. All services targeted for the network in the transport stream should then be listed.

Logic_channel_descriptor version 2

(Newer) NorDig private descriptor. Inserted in 2nd descriptor loop. All services targeted for the network in the transport stream should then be listed.

Linkage_descriptor:

The use of this descriptor is highly recommended. Currently the following *linkage_descriptors* are optional in the 1st loop:

- linkage_type 0x02: EPG service

Frequency_list_descriptor

Complete list of all alternative frequencies to the *delivery_system_descriptor*'s frequency / centre_frequency.

2.6.3 Description of NorDig private descriptor

Logical_channel_descriptor version 1 (Tag 0x83)

The *logical_channel_descriptor version 1* is a privately defined descriptor (i.e. not DVB specified) intended for use in terrestrial networks. If used, this descriptor shall be inserted in the second descriptor loop in NIT. The descriptor is used to comply to the fact that some services are to the viewers related to a specific channel position. The use of the *logical_channel_descriptor version 1* shall be as below:

1. It is not necessary to include all services in the network into the *logic_channel_descriptor* (Not included services will be "visible", but located last in the service list, without control of order). The numbers used may start at any value, and need not be continuous.

2. For each service type, the `logical_channel_number` shall be unique across the network (defined by the `network_id`). In areas where several network intersect and the same logical channel number is used by several services, only the service belonging to the preference network (see 3.5.1 for definition) will be assigned to its logical channel number.

Logical_channel_descriptor version 2 (Tag 0x87)

The *logical_channel_descriptor version 2* is a privately defined descriptor (i.e. not DVB specified) intended for use in cable, satellite and terrestrial networks. If used, this descriptor shall be inserted in the second descriptor loop in NIT. The descriptor is used to comply to the fact that some services are to the viewers related to a specific channel position. The use of the `logical_channel_descriptor version 2` shall be as below:

1. It is not necessary to include all services in the network into the `logic_channel_descriptor` (Not included services will be “visible”, but located last in the service list, without control of order). The numbers used may start at any value, and need not be continuous.
2. For each service type, the `logical_channel_number` shall be unique across the network (defined by the `network_id`). In areas where several network intersect and the same logical channel number is used by several services, only the service belonging to the preference network (see 3.5.1 for definition) will be assigned to its logical channel number.

2.7 Service Description Table (SDT)

SDT_actual is mandatory for each transport stream in the network. Transmission of SDT_other is optional. In case of reference to analogue services, SDT_other is mandatory

2.7.1 Mandatory descriptors

service_descriptor:

A *service_descriptor* shall be inserted for each service defined in the SDT.
Service_type 0x81 shall be used for software download service.

private_data_specifier

Mandatory whenever private defined descriptors is used, as specified in ETR 211. For NorDig private defined descriptors (e.g. NorDig Logic Channel Descriptor), then `private_data_specifier_value` shall be set to 0x00000029, (see TR 101 162 [10]).

2.7.2 Optional descriptors

CA_identifier_descriptor:

This descriptor is recommended to use whenever at least one service component is scrambled. `CA_system_id` is allocated by ETSI and is given by TR 101 162 [10].
This may be used static (recommended), then it shall be set according to the services regular/normal scrambling status. Or it may be used dynamic, following the services scrambling status.

Linkage_descriptor

0x01, linkage to information service, may be used to reference to a DVB MHP super teletext service (i.e. a MHP data application service with nicer GUI that intend to replace an EBU teletext service/component. (*Targeting parallel transmission of both EBU teletext and MHP super teletext,*

where non-MHP receivers will launch the EBU teletext and where MHP receivers will launch the MHP super teletext service when pressing the “text”-button).

0x03, linkage to a CA replacement service, may be used to automatically link a receiver to another service, a replacement service, if the receiver is not able to descramble the original service.

0x05, linkage to a service replacement service, may be used to automatically link a receiver to another service, a replacement service, when the running status is set to “not running” (0x01).

The service that is linked/referenced to as a replacement service (with 0x03 or 0x05), shall not contain any (further) linkage 0x03 or 0x05, when the original service linkage criteria is fulfilled (i.e. when scrambling is true for 0x03 or when running status is “not running” for 0x05).

A service shall not contain both linkage 0x03 and 0x05. The linkage shall be transmitted at least the interval for the replacement, but is recommended to be transmitted quasi-static.

To be aware of when using linkage is that the receiver is still expected to display information of the original service (i.e. like that the IRD is still scanned to the original service, but replacing the elementary streams coming from the replacing service).

May be used for textual service identifiers in parallel with the Service_ID, Transport_stream_ID and the Original_Network_ID, for MHP IRDs.

Service_identifier_descriptor

2.8 Event Information Table (EIT)

It is mandatory to transmit EIT p/f sections for all “visible” services in the actual transport stream. With visible service means all services that are not listed in any NorDig Logic Channel Descriptor as “hidden”, i.e. visible_service_flag set to ‘0’. (Typically service like bootloaders etc will be hidden, for example). Transmission of EIT p/f for other transport streams is optional.

Transmission of EIT schedule information, for actual and other transport streams is optional. (EIT schedule information could be transmitted in only one transport stream, called the "Barker Channel", in the network). All transport streams in the network that has its EIT schedule information located on another transport stream shall contain a link to this EIT schedule information, implemented by a linkage_descriptor in the NIT. Linkage_type 0x04 is used for the EIT schedule information. (The parameter "service_id" in the linkage_descriptor is not applicable when linkage_type 0x04 is used, i.e. shall be set to 0x0000 according to DVB SI specification (EN 300 468) [6]).

2.8.1 Mandatory descriptors

| | |
|--------------------------------|---|
| <i>short_event_descriptor:</i> | Contains title and possibly a short (less than 256 characters) text information about the event. |
| <i>content_descriptor:</i> | Classifies the event according to certain content classes specified by DVB SI specification (EN 300 468) [6]. |
| <i>private_data_specifier</i> | Mandatory whenever private defined descriptors is used, as specified in TR 101 211 [7]. For NorDig private defined descriptors (e.g. NorDig Logic Channel Descriptor), then private_data_specifier_value shall be set to 0x00000029, (see TR 101 162 [10]). |

2.8.2 Optional descriptors

| | |
|------------------------------------|---|
| <i>extended_event_descriptor:</i> | Contains an extended text information about the event and acts as a supplement to the <i>short_event_descriptor</i> . |
| <i>parental_rating_descriptor:</i> | Recommended age rating. |
| <i>CA_identifier_descriptor:</i> | This descriptor may be use whenever at least one service component is scrambled. <i>CA_system_id</i> is allocated by ETSI and is given by [10]. If used then it shall be used dynamically, i.e. following the services scrambling status. (Mainly targeting the ESG/EPG) |
| <i>component_descriptor:</i> | Identifies the components (e.g. video, audio) associated with the service for the running event. |

2.9 Time Date Table (TDT)

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 second.

2.10 Time Offset Table (TOT)

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 second.

2.10.1 Mandatory descriptors

| | |
|--------------------------------------|---|
| <i>local_time_offset_descriptor:</i> | Currently the following <i>country_codes</i> are defined in this descriptor: <ul style="list-style-type: none">• NOR• SWE• DNK• FIN• ICE The parameter " <i>country_region_id</i> " is set to zero for all these countries. |
|--------------------------------------|---|

3 Operational use for service mapping

The tuning of the NorDig IRD can either be based on the NIT signalling in SI or on scanning.

3.1 Use of DVB specific identifiers

The broadcaster shall make services uniquely identified in the broadcast through the combination of only *original_network_id* – *service_id*. (The IRD however identify a service uniquely through the combination *original_network_id* – *transport_stream_id* – *service_id*). These, and some other mandatory parameters, are described in the following sections.

3.1.1 Original_network_id

Each network operator originating broadcasting signals shall apply for a 2-byte *original_network_id* according to ETR 162 [10].

Original_network_ID within 0xFF00 – 0xFFFF (temporary_private_use), shall only be used for test and (shorter) demonstration transmission. IRD will not install or display services within these *original_network_ids*

3.1.2 Network_id

Each network operator shall also apply for a 2-byte *network_id* (or for terrestrial networks range of *network_ids*), independent of originating signals or not. Allocation of *network_id* is done by ETSI, and allocated values are available in the ETSI document TR 101 162 [10].

For terrestrial networks a unique *network_id* shall be allocated to each LSN² in the network. An LSN consists of all transport streams transmitted from the same emitting points and have the “same” coverage. The allocation shall comply to the TR 101 162 [10] 4-colour-map approach, this gives the possibility to allocate up to 256 *network_ids* within the network.

Network_ID within 0xFF01 – 0xFFFF (temporary_private_use), shall only be used for test and (shorter) demonstration transmission. IRD will not install or display services within these *network_ids*.

3.1.3 Transport_stream_id

The *transport_stream_id* shall uniquely define a transport stream within the network. Each operator allocates *transport_stream_ids* on an individual basis. However, it is recommended that operators originating signals allocate a unique *transport_stream_id* for each transport stream in the network.

Within a given terrestrial network two transport streams are identified as identical as long as the transport streams contains the same set of services. This interpretation is to simplify the use of mobile IRDs.

3.1.4 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. It is recommended that operators originating signals allocate a unique *service_id* for each service in the network (*original_network_id*).

3.1.5 Event_id

The *event_id* is a 16-bit field which contains the identification number of the described event. Each service provider is free to allocate *event_ids* within their *service_id* domain, with the restriction that an *event_id* shall be unique within the transmitted schedule. An *event_id* shall be associated with a single event within the schedule, i.e. if an event is rescheduled within the currently transmitted schedule, it shall not change its *event_id*. If the event is removed from the schedule (or rescheduled to outside the transmitted schedule) then its *event_id* shall be removed from the schedule. Any replacement event shall be allocated a new *event_id* unique within the transmitted schedule.

² Local Service Network. Please refer to section 3.5.2 for further explanation.

A recommended allocation method for new *event_id* in terrestrial networks is to use odd values for national events and even values for regional events, this to avoid that events that are inserted at different locations will be allocated the same *event_id*.

3.2 Barker Channel

Operators may provide a "barker channel", i.e. a transport stream containing complete EIT schedule information for all services from each operator. Usually the "barker channel" is a dedicated transport stream, and all other transport streams of that operator shall then contain a linkage to this "barker channel".

3.2.1 Link to EIT schedule

Generally the linkage to the EIT schedule is implemented by inserting a *linkage_descriptor* in the first descriptor loop in the NIT. Linkage_type 0x04 ("Transport Stream containing complete network/bouquet SI") is used for this purpose.

A problem occurs whenever multiple operators offer services from the same transport stream, since only one EIT schedule information service can be addressed by the linkage_descriptor in NIT. The problem may be avoided by careful planning of transport stream composition.

3.2.2 Link to bootloader software / download

Bootloading software download streams/services are identified by the original_network_id, transport_stream_id and service_id and are usually transmitted in a dedicated transport stream. Normally all transport streams contain a link to this transport stream. This link is implemented by a number of *linkage_descriptor* with linkage_type 0x81, inserted in the first descriptor_loop of NIT one per bootloader/download service (service_id).

An operator may choose to broadcast several bootloader software streams ("services") under the same service_id, then they shall all be signalled inside one and the same bootloader descriptor using the loop inside the descriptor.

3.3 Specific service mapping for satellite networks

3.3.1 Multiple operators in the same physical network

One physical network (orbital satellite position) may be shared between multiple operators, e.g. each operator manages different transponders in the same physical network.

On satellite networks, NIT_actual on each transponder shall describe all transport streams operated by the operator of the actual transport stream as well as all transport streams operated by other operators in the same satellite network. NIT_other may describe transport streams operated by any other operator in another network (i.e. retransmission into secondary networks).

The principle of multiple operators in the same satellite network is best illustrated by an example.

Example: One satellite network *X-sat* consists of 4 transport streams. There are two independent operators managing these transport streams according to the following rule:

- TS1 - transport_stream_id 0x0001: operated by "Operator A"
- TS2 - transport_stream_id 0x0002: operated by "Operator A"
- TS3 - transport_stream_id 0x0003: operated by "Operator B"
- TS4 - transport_stream_id 0x0004: operated by "Operator B"

The network_id of *X-sat* is 0x0040, while the original_network_id of "Operator A" and "Operator B" is 0x0041 and 0x0051, respectively.

"Operator A" transmits EIT schedule information in TS1, while "Operator B" transmits EIT schedule information in TS3.

The physical network operator ("*X-sat*") is responsible for NIT generation. All transport streams shall be signalled in NIT_actual, both from "Operator A" and "Operator B" (refer to Figure 3). An example of the NIT transmitted in all transport streams is shown in Figure 3. Please note that link to EIT Schedule is not included in this example.

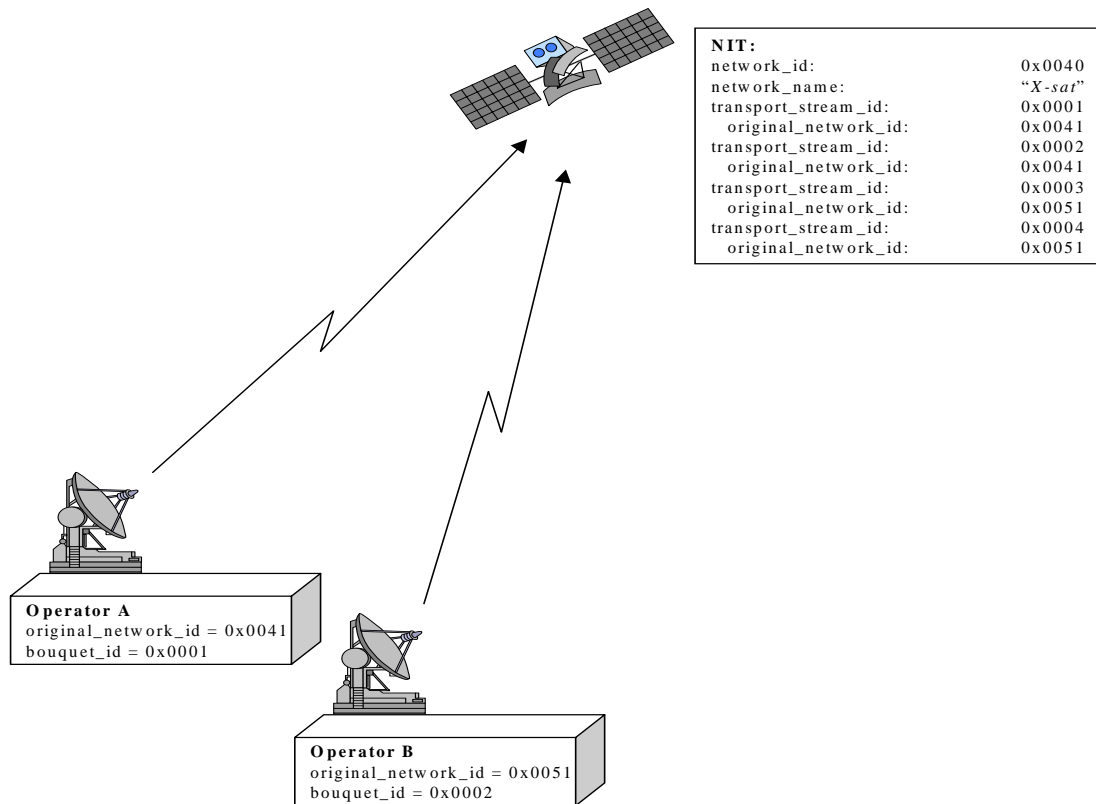


Figure 2 NIT transmission with multiple operators

```

network_information_section(){
    table_id      0x40          (NIT_actual)
    network_id    0x0040 (X-sat)
    #first loop descriptors{
        network_name_descriptor(){
            network_name "X-sat"
        }
        linkage_descriptor(){      # link to NorDig software
            download
            transport_stream_id 0x0001
            original_network_id 0x0041
            service_id          0x000A
            linkage_type        0x81
            private_data        <according to NorDig
                                specification>
        }
    }
    #transport stream definitions{
        transport_stream_id      0x0001
        original_network_id      0x0041 (Operator A)
        #second loop descriptors{
            satellite_delivery_system_descriptor()
            service_list_descriptor()
        }
        transport_stream_id      0x0002
        original_network_id      0x0041 (Operator A)
        #second loop descriptors{
            satellite_delivery_system_descriptor()
            service_list_descriptor()
        }
        transport_stream_id      0x0003
        original_network_id      0x0051 (Operator B)
        #second loop descriptors{
            satellite_delivery_system_descriptor()
            service_list_descriptor()
        }
        transport_stream_id      0x0004
        original_network_id      0x0051 (Operator B)
        #second loop descriptors{
            satellite_delivery_system_descriptor()
            service_list_descriptor()
        }
    }
}

```

Figure 3 Example of NIT from "X-sat"

An independent organisation should verify that NIT contains information about all transport streams transmitted from the physical network.

3.4 Specific service mapping for cable networks

Cable operators may use both NIT_actual and NIT_other due to two reasons:

1. Cable operators often distribute signals to several subnets located in different geographical areas. Different *network_id* is used to distinguish between these subnets.
2. Cable operators retransmitting signals from satellite may insert the network information as NIT_other via satellite.

3.4.1 Transmission of multiple NIT_other tables

Cable operators must be able to provide multiple NIT tables for different networks. The NorDig IRD should provide a menu for the user to enter the network number³ of the physical network connected to. An example illustrates this:

Example: The satellite network *X-sat* transmits NIT_actual containing network information for the satellite network. In addition, NIT_other from *X-sat* contains network information for the following SMATV operators:

- “SMATV A”: network_id = 0x0090
- “SMATV B”: network_id = 0x0091

The following transport streams are transmitted in SMATV A:

- TS1 – transport_stream_id = 0x0001
- TS2 – transport_stream_id = 0x0002

The following transport streams are transmitted in SMATV B:

- TS3 – transport_stream_id = 0x0001
- TS4 – transport_stream_id = 0x0002

The NIT transmitted via satellite is indicated in Figure 4.

```

network_information_section(){
    table_id      0x40          (NIT_actual)
    network_id    0x0040 (X-sat)
    #first loop descriptors{
        network_name_descriptor(){
            network_name "X-sat"
        }
        linkage_descriptor(){      # link to NorDig software
            download
            transport_stream_id 0x0001
            original_network_id 0x0041
            service_id          0x000A
            linkage_type        0x81
            private_data        <according to NorDig
                                specification>
        }
    }
    #transport stream definitions{
        <Definition of transport streams in satellite network>
    }
}
network_information_section(){
    table_id      0x41          (NIT_other)
    network_id    0x0090 (SMATV A)
    #first loop descriptors{
        network_name_descriptor(){
            network_name "SMATV A"
        }
        linkage_descriptor(){      # link to NorDig software
            download
            transport_stream_id 0x0001
            original_network_id 0x0040
            service_id          0x000A
            linkage_type        0x81
            private_data        <according to NorDig
                                specification>
        }
    }
}

```

³ Network number is identical to *network_id*. The network operator is responsible for informing the users about the appropriate network number.

```

#transport stream definitions{
  transport_stream_id      0x0001
  original_network_id      0x0040
  #second loop descriptors{
    cable_delivery_system_descriptor()
    service_list_descriptor()
  }
  transport_stream_id      0x0002
  original_network_id      0x0040
  #second loop descriptors{
    cable_delivery_system_descriptor()
    service_list_descriptor()
  }
}
network_information_section(){
  table_id      0x41      (NIT_other)
  network_id    0x0091 (SMATV B)
  #first loop descriptors{
    network_name_descriptor(){
      network_name "SMATV B"
    }
    linkage_descriptor(){      # link to NorDig software
      download
      transport_stream_id 0x0001
      original_network_id 0x0040
      service_id          0x000A
      linkage_type        0x81
      private_data        <according to NorDig
                          specification>
    }
  }
  #transport stream definitions{
    transport_stream_id      0x0001
    original_network_id      0x0040
    #second loop descriptors{
      cable_delivery_system_descriptor()
      service_list_descriptor()
    }
    transport_stream_id      0x0002
    original_network_id      0x0040
    #second loop descriptors{
      cable_delivery_system_descriptor()
      service_list_descriptor()
    }
  }
}

```

Figure 4 Satellite NIT

3.5 Specific service mapping for terrestrial networks

Terrestrial transmission is somewhat different from both satellite and cable transmission due to several reasons, particularly the following two:

- One network operator may cover the same geographical area from several transmitters, i.e. the same services may be received from different transmitters.
- The network may offer regional signals, i.e. signals receivable only in a part of the total network.

Due to these reasons, some special precautions have to be taken for terrestrial transmission. The following sections identify these precautions.

3.5.1 Definition of terrestrial network concepts

- MFN:** Multiple Frequency Network is a network that over a specified area transmits with several different frequencies and thereby has the possibility to transmit different transport streams over that area. This property is what we in this document call a **Scaleable Network (SN)**.
- Preference Network:** Can be seen as the main network of a viewer in an intersection area of several networks, this network is usually chosen by the user during installation of the NorDig IRD.
- SFN:** Single Frequency Network is a network where one transport stream is feeding several main-transmitters all transmitting on the same frequency. The transport stream has to be identical in all main-transmitters. This property, that the transport stream is identical over a bigger region, is what we have called a **Non Scaleable Network (NSN)** in this document. A NSN can be caused by a SFN or that only one multiplexer is feeding several frequencies.

3.5.2 Cross-Carriage of SI

It should always be possible to present all services and events (present and following) to the viewer, which the viewer has the possibility to receive within a Local Service Network (see below). This requires that all SI is cross-distributed over all frequencies in that specific region. The cross-carriage of SI is limited to the finest level of regionality, called a Local Service Network (LSN). The Local Service Network can be defined as the coverage area of a transport stream, i.e. if several transport streams covers exactly the same area they belong to the same Local Service Network. The cross carriage shall be limited within the Local Service Networks with the exception of region who have a mixture of SFN and MFN (see Figure 5).

The native service navigator, i.e. ESG, shall not display any service that the IRD can not receive, due to low RF level.

The definition that a service is possible to receive is that it is included in the *service_list_descriptor* in a received NIT_actual table. By using this definition the IRD can by a very simple algorithm decide whether or not to present the cross distributed service. Such an algorithm is presented in section 3.2.1, and is repeated here for convenience:

```
If Service_id is available in any received NIT_actual (service_list_descriptor)
    display the service in the (ESG/EPG )
else
    do not display the service
```

- The IRD should only display a service once, even if the same service is received from multiple transmitters. The IRD shall chose the service belonging to the "preference network", see definition in section 3.5.1. (For national service that have shorter local/regional news insertion, ads etc and when the content provider wishes that the viewer that can receive from several regions, shall be able to choose which local/regional window he wants to belong to, shall therefore have different service_id at the different regions).

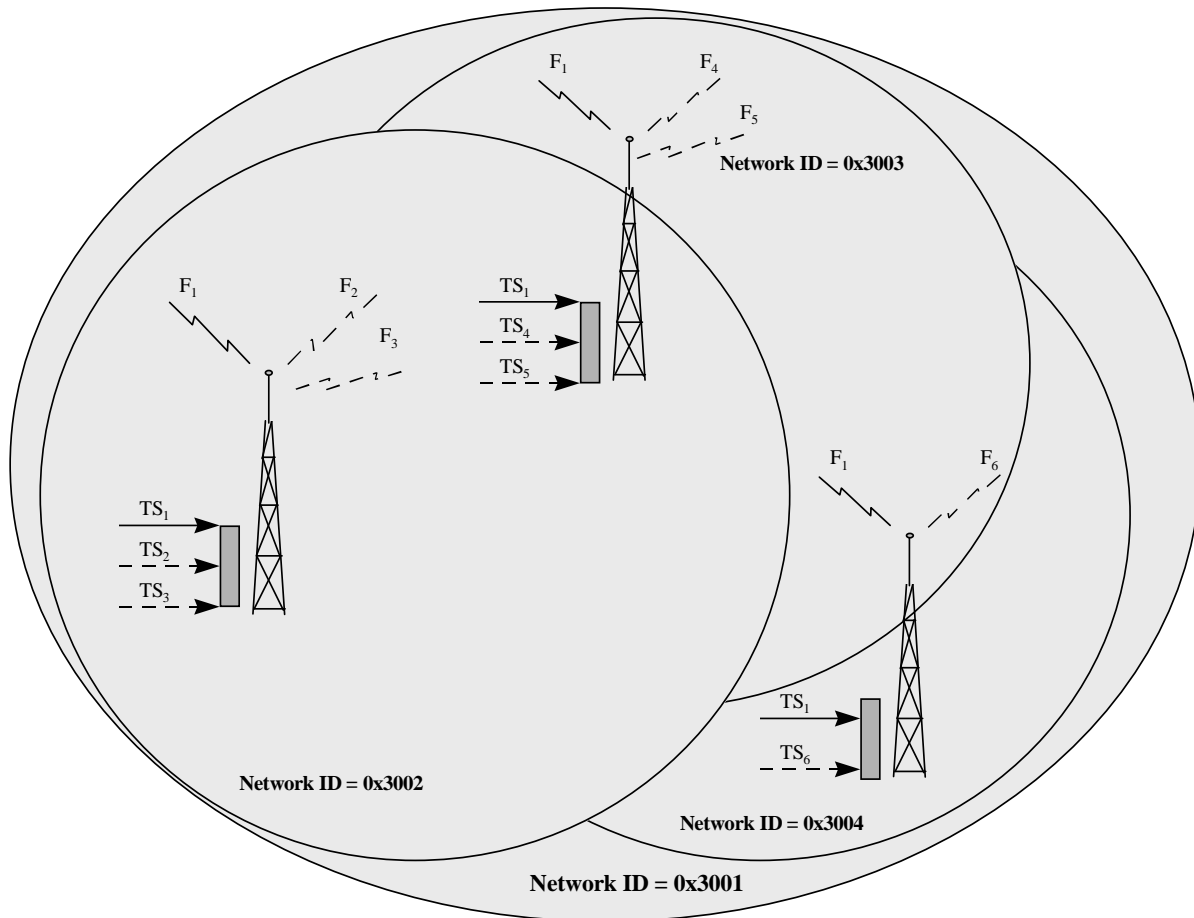


Figure 5 An example of the mixture of Multiple- and Single Frequency Networks

TS = Transport Stream
 SI_X = The part of SI that will be cross-distributed, see

below

```
for all Transmitting Sites  $\subseteq$  DTTV{
    Cross distribute SI_X for all TS that is part
    of the Transmitting site.
}
```

Due to limited bandwidth in the terrestrial network the cross distribution of the SI shall be limited to the following tables:

- SDT other for all services in the LSN, i.e. listed in the NIT (actual)
- EIT other (present and following) for all services listed within each SDT other. The EIT_present_following_flag shall be set to "1", which indicates that the EIT_present_following information for the services is present in the current TS.

The LSN can for the purpose of SI be treated as a single terrestrial network, unique within the network. The delivery system model is then similar to Figure 1 of EN 300 468 [6]. This restriction is to optimise the use of the bandwidth within the terrestrial network. Depending on aerial installation and IRD location, a IRD may be able to receive multiplexes from more than one LSN. There is normally no cross-carriage of SI specified between LSN, and the IRD must therefore treat the LSN as independent networks. However, where a IRD finds the same combination of original_network_id / service_id in multiplexes received from different LSN the services may be considered to be identical.

As specified above there is an exception to the rule of no cross-distribution between LSN. The cross-distribution in the case of mixture of SFN and MFN will be limited to the SFN. The best way to explain this is probably by the example of Figure 5.

Example: One multiplexer, TS₁ (Transport Stream), is feeding three main-transmitters all transmitting on the same frequency, F₁, in a Single Frequency Network, i.e. a regional network. Each of these transmitter nodes has other transmitters that are transmitting on the frequencies F₂, F₃, F₄, F₅ and F₆. These three local transmitters are fed by their own multiplexers, TS₂, TS₃, TS₄, TS₅ and TS₆, respectively.

All the transport streams covering the same regional network will cross-distribute the SI⁴ between them, just as specified before. But the SFN that covers several LSN will cross-distribute the SI from all the LSN it covers, and the SI from the SFN is cross-distributed to the MFN.

An overview of the Network Information Tables for TS₁ and TS₂ in our example is described below (only the interesting parameters are presented):

For TS₁:

```

Network_information_section() {
    table_id            0x40 ( actual )
    network_id          0x3001
    transport_stream_id 0x0001
    {
        list of services
    }

    network_information_section() {
        table_id            0x41 ( other )
        network_id          0x3002; 0x3003; 0x0004 (one for
each NIT other table) ↓ ↓ ↓
        transport_stream_id 0x0002 -3;0x0004-5; 0x0006
(for each NIT other table)
    {
        list of services
    }
}

```

For TS₂:

```

network_information_section() {
    table_id            0x40 ( actual )
    network_id          0x3002
    transport_stream_id 0x0002-3
    {
        list of services
    }

    network_information_section() {
        table_id            0x41 ( other )
        network_id          0x3001
        transport_stream_id 0x0001
    {
        list of services
    }
}

```

⁴ According to the cross-distribution restrictions that is specified above.

4 MPEG2 Video and audio Transmission

4.1 Still pictures

If still pictures are transmitted this shall be indicated by setting the "still_picture_flag" in the *video_stream_descriptor* in the PMT to "1". The *video_stream_descriptor* is mandatory in the PMT whenever still pictures are transmitted.

4.2 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 DVB MHP Application Transmission

5.1 AIT, service bound

TBD later

5.2 AIT, multiple services

TBD later

5.3 Certification

All transmitted MHP application via NorDig broadcast networks, shall be signed with certification as described in DVB MHP 1.1 specification [11].

5.4 Timing of streaming events

TBD later

5.5 Application transmission bandwidth

Maximum bandwidth for transmitted applications are [TBD] kbit/s

6 Bootloader Transmission

6.1 System software updating

Within NorDig networks, three different models for updating the IRD's system software over-the-air are defined;

- via using the more recent DVB specification with a standardized 2-layer DVB data carousel and signalling as described in the DVB specification [14] or
- via using the NorDig-specified way of signalling [12] or

The preferred model within NorDig networks for newer implementations is the DVB method.

6.1.1 NorDig system Software Updating

Due to lack of a common API for the NorDig IRD there are some legacy system software implementations. These are regarded as specific for the different network operators. To obtain download of the different systems, the download signalling should contain a reference to a specific hardware version of the relevant manufacturer. The general procedures of the bootloading are described in NorDig IRD specification.

6.1.2 Proprietary system Software Updating

If an proprietary solution is used, it shall not interfere with other transmitted applications (e.g. MHP) or other receivers than the one targeting.

7 Teletext and Subtitling Transmission

7.1 Teletext

Two restrictions apply when considering transmission of teletext for on-screen display:

- The size of the text «packet» that can be handled correctly in the IRD.
- The time delay for presentation of text in real time.

For services intended for transcoding to PAL teletext must be inserted such that allowable lines in the recoded PAL signal are utilised. The exact line numbers to be used must be established in each particular case.

7.1.1 PES Packet Length

PES packets containing the teletext pages shall not exceed 1504 bytes in length. A maximum of two fields per PES packet shall be transmitted⁵.

MPEG-2 System specification [1] specifies the maximum number of stuffing bytes in the PES packet header to 32 bytes. This limitation is not valid for PES packets containing ITU-R teletext. When PTS data fields are omitted in the PES packet header, the number of stuffing bytes are 36.

7.2 Subtitling

Subtitling may be provided through ITU-R system B Teletext [8] or through the DVB Subtitling System [9].

7.2.1 ITU-R System B Teletext Subtitling

Use of a timing model (ie PTS data fields) for ITU-R teletext subtitles is optional. Thus, in order to ensure acceptable delay in the presentation of the subtitles the following rules must be observed:

- For a teletext service carrying a mix of text and subtitles no restriction other than that given in section 7.1 applies.
- In a subtitles-only teletext service the PES packets must be limited to contain those text pages that shall be displayed simultaneously (multiple language subtitling). Moreover those text pages must fill an entire PES packet, with the aid of stuffing bytes if necessary.

7.2.2 DVB Subtitling System

The use of a subset of DVB subtitling is supported by the NorDig IRDs. There are some limitations regarding graphics and character object handling, to reduce processor capacity and memory allocation.

Any broadcasted DVB subtitling shall minimum be of graphic objects of object_type 'basic_object, bitmap' (0x00).

The broadcasted DVB subtitling stream should not require more than 112960 pixels per frame for decoding. The broadcasted DVB subtitling stream should not contain more than 128 objects per subtitle display

The region_level_of_compatibility (RLOC) should not be set to more than 4 bit (0x02). This will allow a decoder with restricted capacity to perform an 8-bit to 4-bit reduction. If RLOC is set higher than decoder capacity the region will not be visible.

(information:

The use of non-modifying color flag is optional on decoder side.

A minimum set of transparent levels for black is defined in NorDig.)

⁵ One TV frame consists of two fields, meaning that a teletext PES packet shall not contain more teletext lines than is inserted in one frame in the source PAL signal.

8 Conditional Access

8.1 ECM

At least one ECM stream shall be allocated for each unique scrambled service/component. Both service scrambling (ie CA_descriptor inserted in the first descriptor loop in PMT) and component scrambling (i.e. CA_descriptor inserted in the second descriptor loop in PMT) may be employed

8.1.1 ECM repetition/cycle period

The ECM repetition/cycle period should be (less than) 100ms (recommended), but shall at least be less or equal than 500ms (this to ensure zapping time).

8.2 EMM

The broadcaster may broadcast all EMMs in all transport streams or /and use a barker channel.

8.3 Scrambling of AIT

AIT shall not be scrambled

9 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 | ETSI “Digital broadcasting systems for television, sound and data services; Framing structure, channel coding and modulation for 11/12 GHz satellite services”. |
| [5] | ETS 300 429 | ETSI “Digital broadcasting systems for television, sound and data services; Framing structure, channel coding and modulation for cable systems”. |
| [6] | EN 300 468 | ETSI “Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems”, v1.5.1 (2003-05) |
| [7] | TR 101 211 | ETSI “Digital Video Broadcasting (DVB); Guidelines on implementation and usage of Service Information (SI)”, v1.6.1 (2004-05). |
| [8] | ETS 300 472 | ETSI “Digital broadcasting systems for television, sound and data services; Specification for conveying ITU-R Teletext in Digital Video Broadcasting (DVB) bitstreams”. |
| [9] | ETS 300 743 | ETSI “Digital Video Broadcasting (DVB); DVB subtitling system”, June 1997 |
| [10] | TR 101 162 | ETSI “Digital broadcasting systems for television, sound and data services; Allocation of Service Information (SI) codes for Digital Video Broadcasting (DVB) systems” |
| [11] | TS 102 812 | ETSI (DVB) “DVB MHP 1.1 “Digital Video Broadcasting (DVB); Multimedia Home Platform (MHP) Specification 1.1.1.”, v1.1.1 |
| [12] | NorDig U | NorDig “NorDig Unified Requirements for profiles; Basic TV, Enhanced, Interactive and Internet, for Digital Integrated Receiver Decoders for use in cable, satellite, terrestrial and IP-based networks”, version 1.0.2 (2004-11) |
| [14] | TS 102 006 | ETSI “Digital Video Broadcasting (DVB); Specification for System Software Update in DVB Systems”, v1.3.1 (2004-05) |
| [15] | TR 101 154 | ETSI “Digital Video Broadcasting (DVB); Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications”, v1.5.1 (2004-05) |