DEUTSCHE TV-PLATTFORM

DVB-T 111

DVB-T Minimum Requirements

and Guideline for DVB-T Receivers

Version 1.1

Status: 15.08.2003

DEUTSCHE TV-PLATTFORM

Contents

Introduction 3

Rough Structure 3

1. Parameters of Receivers 4

1.1. Minimum Requirements Hardware (overview) 4

1.2. Minimum Requirements Software (overview) 5

2. Format Indication and Service Information in DVB transmission signals 6

2.1. Introduction 7

2.2. Format indication for all DVB transmission schemes 7

2.2.1. Indication of aspect ratio 7
2.2.2. Indication of audio format 9
2.2.3. Indication of VPS 10
2.2.4. Subtitles 11
2.2.5. Dynamic PMT 11

2.3. Supplements for DVB-T 12

2.3.1. Allocation of IDs for DVB-T 12
2.3.2. SI-data for third multiplexes 12
2.3.3. Indication for handover for mobile reception 12
2.3.4. Unified indicated channel lists for navigators 13
2.3.5. Software update via DVB-T network 13
2.3.6. Requirements to devices for feeding analogue cable channels 13
2.3.7. Aspect ratio 16:9 13
2.3.8. Stereo sound / dual channel sound 13
2.3.9. Teletext 13
2.3.10. Data line 16 13
2.3.11. Dynamic PMTs 13

2.4. Contact persons from ARD/ZDF/IRT 14

2.5. Overview Abbreviations 15

2.6. Comparison of e-Book – ARD/ZDF/IRT document 16

2.7. Event Information Tables (annex B) 17

3. Software Update 18

3.1. Minimum requirements to DVB-T receivers 18

3.1.1. Profile 18
3.1.2. SI Indication 18
3.1.3. Data Carousel 19
3.1.4. Update Notification Table 19

3.2. Required UNT Descriptors 19

4. ANNEX 21

Introduction

This ‘Description of Minimum Requirements‘ for DVB-T receivers contains the physical parameters, an obligatory format indication (obligatory specification for the broadcaster and the manufacturer) as well as a complete software download description. As far as possible, already existing specifications have been used, especially references to the e-Book (actual draft version 2.0.2., this version will be completed in the next months and will be published as ‘public‘ version) are made. This means that these specifications will serve as reference and will not be translated into German language in the German version of this document. In addition to the minimum requirements, recommendations for additional elements, e.g. CI or MHP, will be defined.

This document has been translated into English language (original document in German language) to facilitate its use within international manufacturing companies and international committees.

Rough Structure

1. Parameters of Receivers

This chapter mainly refers to the actual e-Book, additions are only made where parameters are missing. Furthermore, the essential software/user interface elements are defined (see also annex C: List of desired DVB-T receiver features).

2. Format Indication and Service Information

This chapter is based on the ARD/ZDF/IRT document (actual version 2.3), which has also been harmonised with the e-Book activities.

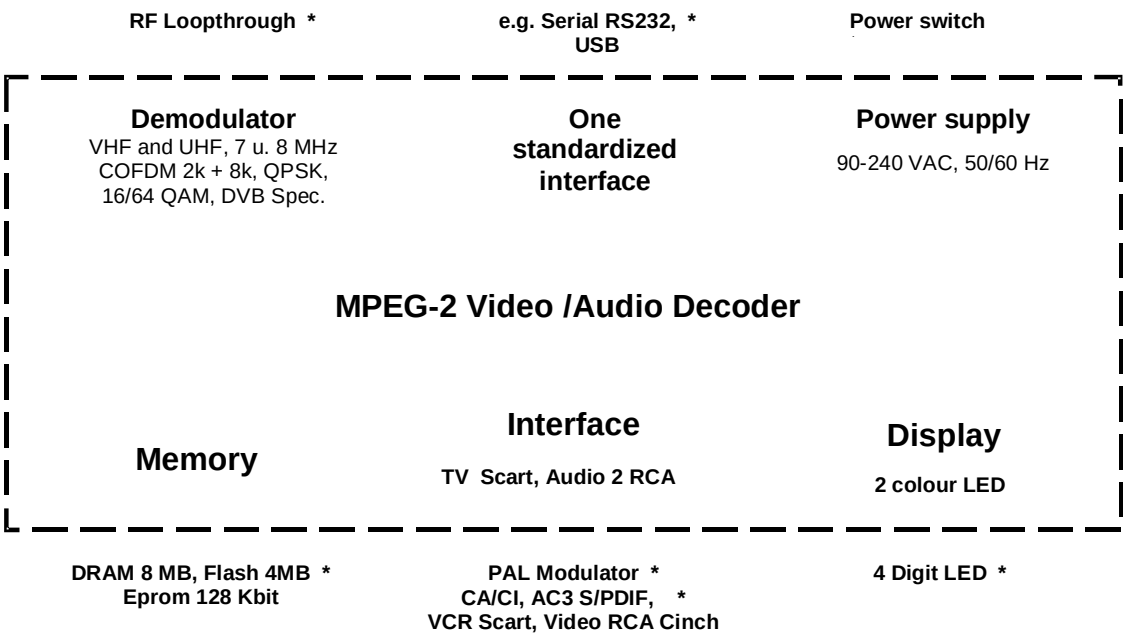
3. Software Update

Basically, the ‘Enhanced Profile‘ is recommended here, further parameters have been added and some optional parameters have been named.

1. Parameters of Receivers

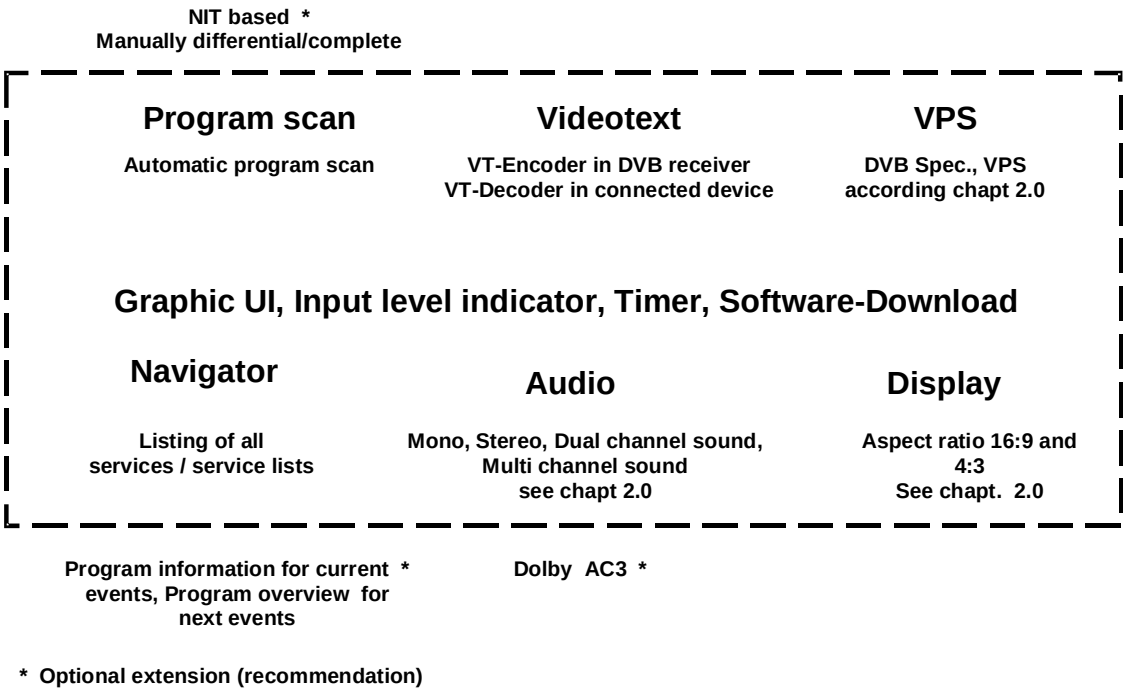
see also ‘List of desired DVB-T receiver features‘, annex C

1.1. Minimum Requirements Hardware (overview)



- **Optional extension (recommendation)**

1.2. Minimum Requirements Software (overview)



Annex A : e-Book draft version 2.02 (from EICTA) on website (www.ueberall-tv.de)

2. Format Indication and Service Information in DVB transmission signals

Status of document:

This document has been elaborated by ARD/ZDF/IRT and kindly provided as reference for this minimum requirement document.

- Date: 17.04.2003
- Status: to be published
- Version: 2.3
- File name: DVB-Signalisierung_ARD-ZDF_V2_3.pdf
- Last editor: K. Merkel

Chronological list of changes:

Date:	Reference of change:	Version-no.:	Author:
06.08.02	Finalisation Version 1.0	1.0	K. Merkel
28.02.03	Supplements to points 2.1.2, 2.3.2	1.1	D. Lüdemann
02.04.03	New: chapter 3+4 (DVB-T, analogue feeding of cable)	2.0	K. Merkel
04.04.03	Further supplements in chapter 3+4	2.1	K. Merkel
14.04.03	More details in chapter 2.3, 2.5, 3.1 and 3.5	2.2	K. Merkel
17.04.03	Modification in chapter 4.4, Update of address list	2.3	K. Merkel

2.1. Introduction

According to the initiative of the German government to digitise broadcasting, the future broadcasting standard should be based on the Digital-Video-Broadcast specification (DVB) in order to make better use of the existing transmission capacities and to create value-added services for the customer by using the additional technical possibilities.

Within the DVB transmission standard there are different possibilities for picture and audio format indication for radio and TV programs transmitted by the broadcasting corporations.

The present document describes which of the possible format indications are used by ARD and ZDF for digital transmissions according to the DVB standard, including necessary response of the receivers (set-top-boxes) and correct display for the customer.
The indications described in chapter two are valid for all DVB transmission schemes (DVB-S, DVB-C and DVB-T).
Chapter 3 describes all DVB-T specific supplements.
Chapter 4 provides a list of requirements to head end stations for feeding analogue cable channels.

The guidelines for the decoder response should be independent from possible internal-running APIs.

2.2. Format indication for all DVB transmission schemes

2.2.1. Indication of aspect ratio

2.2.1.1. Transmitter

At the transmitter end the formats 4:3 as well as 16:9 are supported. Actually, no letterbox indication is planned.

All indications of the current aspect ratio are transmitted in the video-MPEG-elementary stream in compliance to *ISO/IEC 13818-2*. The ‘aspect_ratio_information’ is transmitted in the sequence header (0x02 for 4:3, 0x03 for 16:9). The formats 16:9 and 4:3 are standardised in this specification. This does not apply to letterbox.

Actually, a supplementary transmission of pan vectors in 16:9 is not planned.

In parallel to the transmission of the aspect ratio indication within the MPEG transport stream the equivalent information is also included in the Service Information (EIT component_descriptor). The aspect ratio information of the EIT should only be used as customer information and not for switching the aspect ratio.

2.2.1.2. Receiver

Expected response of the decoder:

At the receiver end (set-top-box / decoder) the format indication described in 2.1.1 should permanently be evaluated in compliance to ISO/IEC 18313-2 and the output signal of the set-top-box should be adjusted in real time according to the connected display unit.

The signal should be processed accordingly for the TV set (4:3 or 16:9 screen) which is connected to the set-top-box in order to make sure that the complete picture content is displayed.

For display units that only can display 4:3 signals, transmissions with 16:9 indication have to be changed inside the set-top box into a letterbox signal and transferred to the relevant display unit. The method of creating letterbox signals should guaranty a good picture quality on the display unit. The cutting of the left or right side of the picture is not acceptable.

For 16:9 capable display units, transmissions with 16:9 and 4:3 indication must be transferred to the display unit without any changes so that 16:9 programs are fully displayed on 16:9 screens with full resolution. In case of 4:3 signals, black regions will become visible on the left and right side when displayed in full height on 16:9 screens.
Especially for 16:9 capable display units with 4:3 screens (by reducing vertical deflecting voltage) the corresponding indication of the set-top-box for the TV set has to be guaranteed.

	Display unit:	**4:3 Signal**	**16:9 Signal**
1.	Only 4:3 capable:	No signal processing	Display in letterbox format
2.	16:9 capable:		
2.1	16:9 screen	Horizontal compression	No signal processing

2.2	4:3 screen	No signal processing	16:9 signalling for tv set

2.2.2. Indication of audio format

2.2.2.1. Transmitter

The indication supports the following audio formats:

On every PID:

- Mono-,
- Stereo-,
- Dual channel sound

The transmission is done via MPEG1 layer 2 on one PID (exception: Dolby).

In MPEG, an indication of the current sound format is transmitted in the audio elementary stream in compliance to ISO/IEC 11172-3. The ‘mode’ is transmitted in the ‘header’ (0x00 for stereo, 0x01 for joint stereo, 0x02 for dual channel sound and 0x03 for mono)

In case of dual channel sound, the left sound channel is used for the German language.

On multiple PIDs:

- Multi-channel sound
- Dolby AC3

Several different languages can be supported by multiple PIDs. The language is indicated by the component_descriptor.

In parallel to the transmission of the format indication within the MPEG transport stream the equivalent information is also included in the Service Information (EIT component_descriptor). The same statements as mentioned in 2.1.1 are valid.

2.2.2.2. Receiver

Expected response of the decoder:

There are no further requirements to the set-top-box for the indication of mono or stereo.
In case of two or multi-channel sound, the customer should be given the possibility to choose one channel in the GUI of the STB.

Changes of the status are to be noticed in real time as well as changes within the PMT.

2.2.3. Indication of VPS

In DVB-services the pre-programming should always be done by using the EIT schedule and the event_id.
But at the same time the VPS-method is still supported in DVB for optional evaluation in the connected devices.

2.2.3.1. Transmitter

The VPS label is transmitted in the PDC_descriptor of the corresponding EIT in compliance to ETS 300 468.

2.2.3.2. Receiver

STB without HD (control of external recording units):

- The control of an external VHS recorder must be made possible by a switching voltage of the SCART-output or by generating data line 16 inside the STB.

STB with HD:

- Direct recording control via PDC_descriptor of the EIT on the internal hard disk drive.

Independent of the device type a GUI is necessary for the pre-programming of recording-relevant content.

2.2.4. Subtitles

2.2.4.1. Transmitter

Subtitles are transmitted as usual in teletext data.
It is planned for services without own teletext to transmit subtitle information based on the teletext standard (ETS 300 472) in order to have a standardised method.
The use of DVB subtitles is not planned.

2.2.4.2. Receiver

The subtitles can be displayed via re-insertion on the TV set or directly on the GUI of the decoder.
For the display by the decoder it must be possible to switch this function on and off.

2.2.5. Dynamic PMT

For display / indication of different components which change dynamically as e.g.:

- Switching-on of regional programs by broadcasters
- Additional sound channels
- TTX subtitles

it is necessary to evaluate dynamically changing PMTs correctly and in real time.

2.2.5.1. Transmitter

At the transmitter end the different PMTs are transmitted in time with different configurations of the elementary stream and descriptors.
With every change the version number of the PMT is incremented.

2.2.5.2. Receiver

The changes of the PMT have to be taken over in real time and the changed data or components are to be evaluated and displayed correctly.

2.3. Supplements for DVB-T

2.3.1. Allocation of IDs for DVB-T

The DVB Project Office in Geneva has fixed the value 0x2114 as original_network_id for all DVB-T-networks in Germany.
The allocation of the network_id is done by the RegTP; consequently also the range of values for the transportstream_id and cell_id are fixed.

2.3.2. SI-data for third multiplexes

In general, SI-data for third multiplexes is not transmitted.
The NIT other is also not transmitted for all other multiplexes because of the inconsistent transmission characteristics of each multiplex.
This means for the channel scan that the complete frequency area has to be scanned for DVB carriers.

2.3.3. Indication for handover for mobile reception

In case of a decrease of the field intensity in mobile reception of DVB-T, the handover to other frequencies is supported by corresponding indication.
The following rules apply:
1. The cell_list_descriptor and the cell_frequency_link_descriptor in the NIT are supported and should be evaluated by mobile (and portable) receivers.
2. The NIT other is only used to refer to neighbouring networks containing programs of the current multiplexes (networks). The NIT other allows a quick handover and should be evaluated by mobile (and portable) receivers.
3. The linkage_descriptor which is giving the possibility to refer to regional variants of the current program, is supported at the transmitter end and should be evaluated by mobile (and portable) receivers.
In the period when two neighbouring regional programs transmit identical content, the indication is done by a tag (to be defined) in the content_descriptor ‘national content within regional programme’. In case of a decrease of field intensity, the receiver can change to a new frequency without problems.
4. When using the cell_frequency_link_descriptor, the frequency_list_descriptor may be ignored; for this reason it is not supported from the transmitter end.

2.3.4. Unified indicated channel lists for navigators

An indicated channel list that is unified for all multiplexes (like ‘logical channel’ according to e-Book) is not supported.
It is assumed that all DVB-T decoders may have a pre-programming that has been adapted to market expectations and that allows the user any sorting he may choose.

2.3.5. Software update via DVB-T network

All DVB-T decoders should have the possibility of a software update via the DVB-T network. The ‘enhanced profile’ of the DVB update specification is to be used for software updates.

2.3.6. Requirements to devices for feeding analogue cable channels

The following requirements have to be met for the use of DVB-S as well as for DVB-T signals for feeding analogue cable channels.

2.3.7. Aspect ratio 16:9

Content in 16:9-full format (see 2.1.1) is to be changed into letterbox format at the head end station.

2.3.8. Stereo sound / dual channel sound

The sound channels (see 2.2.1) are to be transcoded correctly at the head end station.

2.3.9. Teletext

Teletext has to be transcoded correctly at the head end station, i.e. re-inserted into the vertical blanking period.

2.3.10. Data line 16

The line 16 has to be generated at the head end station.
For this, the VPS label has to be taken from the PDC descriptor in the EIT (see 2.3.1).
The sound status has to be adapted according to the DVB indication (see 2.2.1).

2.3.11. Dynamic PMTs

Dynamic PMTs are to be evaluated correctly according to 2.5.1.

2.4. Contact persons from ARD/ZDF/IRT

for this document (chapter 2)

Name	Company	Telephone	Email
Klaus Merkel	IRT	089-32399-225	merkel@irt.de

for each broadcaster:

Name	Company	Telephone	Email
Siegfried Werz	BR	089-5900-4499	Siegfried.Werz@brnet.de
Fritz Kümmel	DW	030-4646-7207	kuemmel@dw-world.de
Manfred Petersen	hr	069-155-3116	mpetersen@hr-online.de
Stephan Kämmerer	MDR	0341-300-6306	Stephan.Kaemmerer@mdr.de
Dr. Uwe Ladebusch	NDR	040-4156-2213	u.ladebusch@ndr.de
Dirk Lüdemann	ORB	0331-731-9701	d.luedemann@ard-digital.de
Peter Rossberg	SFB	030-3031-5150/5151	peter.rossberg@sfb.de
Willi Kuhnert	WDR	0221-220-6150	wilhelm.kuhnert@wdr.de
Bernhard Gronerad	ZDF	06131-70-3017	Gronerad.B@zdf.de

2.5. Overview Abbreviations

API	**A**pplication **P**rogramming **I**nterface
DVB	**D**igital **V**ideo **B**roadcasting
EIT (p/f)	**E**vent **I**nformation **T**able (present/following)
GUI	**G**raphical **U**ser **I**nterface
HD	**H**ard **D**isk (bei STB mit Festplatten)
MPEG	**M**otion **P**icture **E**xperts **G**roup
PDC	**P**rogram **D**elivery **C**ontrol
PID	**P**acket **ID**entifier
PMT	**P**rogram **M**ap **T**able
RFA	**R**und**f**unk**a**nstalt
STB	**S**et **T**op **B**ox (DVB- Receiver)
VPS	**V**ideo **P**rogramm **S**ystem
VTX	**V**ideo**T**e**X**t

2.6. Comparison of e-Book – ARD/ZDF/IRT document

Comparison of e-Book (draft version 2.02) with the document ‘Format Indication and Service Information in DVB transmission signals‘ (ARD/ZDF/IRT - version 2.3 annex C)

The requirements according to the e-Book and the ARD/ZDF document are in general uniform and consistent.
The e-Book is providing more details but does not contain the requirements for ‘dual mono‘ on a PID and does not give information on handover for mobile reception.
Furthermore, the e-Book does not provide an own profile for feeding analogue cable channels from DVB distribution schemes.

e-Book	ARD/ZDF – document
6.2 video format	-> chapter 2.1 corresponding to e-Book however, only the aspect ratios 4:3 and 16:9 are planned no ‘active format description’ planned
7 Audio system characteristics (e.g. surround sound and audio description)	-> chapter 2.2 also dual mono is planned which is still under discussion in the e-Book audio description is not planned
8 Multiplex and transport stream characteristics	-
9 Service and program specific information 9.2.3.2.6 Dynamic signalling [of PMT]	-> chapter 2.5 identical
9.2.1.1.2 NITother (also 9.4.2.1)	-> chapter 3.2 no contradiction NIT other only for supporting handover
9.2.8.1.1 Cross carriage of EIT info All broadcasts shall carry EITpresent and EITfollowing information for ALL services in the actual network.	-> chapter 3.2 formally contradictory difference is not relevant when every multiplex is a separate network
9.4.1 Use of SI identifiers	-> chapter 3.1
9.4.4 Logical channel numbers (LCN)	-> chapter 3.4 is not supported
10 Subtitles	-> chapter 2.4 DVB subtitles are not supported
11 VBI based services	-> chapter 2.4 Teletext is supported
14 System Software Update	-> chapter 3.5

‘Receivers able to support over air software download shall at least support the simple profile. It is highly recommended that receivers support the UNT profile, in particular for receivers that may require more frequent updating.’	

2.7. Event Information Tables (annex B)

Within EICTA, a table of SI-data has been elaborated which is available on the EICTA website (url will be announced later).

3. Software Update

3.1. Minimum requirements to DVB-T receivers

Minimum requirements to DVB-T receivers for software update via over-air download in compliance to the specification ETSI TS 102 006, ‘Enhanced Profile‘

The aim of this chapter is to explain the necessity of implementing optional functions and possibilities of variation of ‘Digital Video Broadcasting (DVB); specification for system software update in DVB systems’ (ETSI TS 102 006; V1.2.1; 2002-10).
The ‘Enhanced Profile‘ offers a series of indication possibilities which are party absolutely necessary for a working update procedure, but which are also used for operating comfort and automation of procedures.
A small working group, consisting of representatives of manufacturers and one service provider, has examined and evaluated the indication possibilities with regard to ‘minimum requirements’ for DVT-T receivers.

As a result, the following recommendations and definitions are suggested as ‘minimum requirements’ for DVB-T boxes and receivers. At the same time, they are the minimum requirements for the software update service which the provider of the service should make available to the boxes and the manufacturers.

3.1.1. Profile

The data download specification describes 2 profiles:

1. Simple Profile
2. Enhanced Profile with Update Notification Table (UNT).

Due to the better and more transparent distribution of the scarce resource bandwidth and the resulting necessary temporal staggering of the manufacturers’ updates, the second version ‘Enhanced Profile’ is provided with a standard update carousel with several manufacturers.

3.1.2. SI Indication

For fast identification of the transport stream with Update Service there are two linkage descriptors, the ‘SSU Scan Linkage Descriptor‘ (linkage type 0x0A) and the ‘Linkage Descriptor for System Software Update‘ (linkage type 0x09). As there is always a NIT in all networks, but not necessarily a BAT, these descriptors are located in the NIT. The

network with the Update Service contains both linkage descriptors. It cannot be assumed that other networks support the SSU Scan Linkage Descriptor.

The PMT of the Update Service contains the ‘Data Broadcast ID Descriptor‘, which is defined in ETS 102 006, with the ‘System Software Update Info Structure’ for the carousel elementary stream. This descriptor is a link to the UNT. The Update_type is 0x2 (System Software Update with UNT via broadcast). The OUI-values in the OUI-Loop of the ‘System Software Update Info Structure‘ facilitate fast identification of the manufacturer. As the further description of the updates is done via the UNT, the ‘System Software Update Info Structure‘ does not contain ‘update_versionen‘ and ‘selector_bytes’ and therefore the update_versioning_flag is to be set to 0.

3.1.3. Data Carousel

A 2-layer data carousel in compliance with ETS 102 006 is used for the transmission of the update data. The elementary stream is divided between a sensible number of manufacturers (multi-manufacturer carousel). One manufacturer’s data stream should only contain the update for one receiver type, or the manufacturer’s partial bandwidth should be divided among his platforms. Different groups of manufacturers should be considered in the temporal staggering.

3.1.4. Update Notification Table

The UNT which is referenced by the ‘Data Broadcast ID Descriptor‘ in the PMT provides a list of all valid OUIs (Sub-Table OUI) for the participating manufactures. The ‘Common Descriptor Loop’ must contain all common information about the update of the corresponding manufacturer. The 2. Loop with the ‘Compatibility Descriptor’ which is embedded in the loop mentioned before provides information for the target platforms of the updates. The content of the ‘Compatibility Descriptor‘ must be identical to the ‘ Compatibility Descriptor‘ from the data carousel (DSI-message). The ‘Target Descriptor Loop‘ which is valid for every described platform can be used for the restriction of the update to individual devices of the target platform and should only contain one or several ‘Target Serial Number Descriptor‘ for the minimum requirement. Consequently, only the receivers with referenced serial numbers of the manufacturers (OUI) and type (Compatibility Descriptor) would be called. Due to the fact that for one manufacturer the updates of one or several target platforms could be contained in the multi-manufacturer carousel and the ‘Common Descriptor Loop’ (1. Loop) only contains common update information, the ‘Operational Descriptor Loop’ is used for platform and device-specific update information. The information in this last loop are of higher priority than the information in the ‘Common Descriptor Loop’ and therefore overwriting.

3.2. Required UNT Descriptors

According to chapter 4, the generally required descriptors for the UNT are limited to the descriptors permitted in the ‘Common Descriptor Loop‘ and the ‘Operational Descriptor Loop‘ and the ‘Target Serial Number Descriptor‘ of the ‘Target Descriptor Loop‘. At least the following descriptors are to be evaluated by the DVB-T receivers:

- ‘Scheduling Descriptor‘ – Due to the described bandwidth limitations, the updates of all manufacturers cannot always be on air simultaneously, therefore the receiver/user must get the information on the update schedule for his device. All possible descriptions of the schedule (start-end, periodicity, last broadcasting, duration after start of every period, ...) should be taken into consideration and be evaluated.
- ‘Update Descriptor‘ – This descriptor describes the executing scenario of the update (manual/automatic). In case the manufacturers can only see one scenario – manual, message to user and waiting for user confirmation -, the content of this descriptor can be fixed for the minimum requirements.
- ‘SSU Location Descriptor‘ – As the carousel for the update stream is a SSU two-layer carousel, the ‘Data Broadcast ID‘ must contain the value 0x000A and the ‘Association Tag‘ must contain the value of the ‘Component Tag‘ of the SSU elementary stream.

An evaluation or usage of the following descriptors is not absolutely necessary for the execution and the operation of an update-procedure, but may be relevant e.g. for testing purposes or as additional information for the user.

- ‘Target Serial Number Descriptor’ – Limitation of validity of the update for special receivers with the help of serial numbers.
- ‘Message Descriptor’ – The usage of this descriptor can be useful for the user for transmitting update-relevant description to the receiver.

An evaluation by the DVB-T receiver of the remaining descriptors in the ’Common Descriptor Loop’ and ‘Operational Descriptor Loop’ as described below as well as the descriptors of the ‘Target Descriptor Loop’ is not necessary with regard to minimum requirements.

- ‘SSU Event Name Descriptor’ – Descriptor for transmission of the update event name which is necessary for creating a SSU EPG and event descriptions for the user
- ‘Telephone Descriptor’ – As the minimum configuration can work without interactive channel via modem, the usage of this descriptor is not necessary.
- ‘Private Data Specifier Descriptor’ – With this descriptor, manufacturer specific information that has been neglected up to now, can be transmitted to the target

platform. As these may have different characteristics and length according to the respective manufacturer and therefore the service provider's handling of this information is different (complicated), this possibility should not be used if not absolutely necessary and only after consultation of the respective service provider.

4. ANNEX

The E-book draft version 2.02 is not finalised and public yet. A next official version is planned to publish by EICTA in the next months

Annex A: E-Book draft version 2.02 (www.ueberall-tv.de)
Annex B: SI table overview of EICTA (www.ueberall-tv.de)
Annex C: List of desired DVB-T receiver features (www.ueberall-tv.de)