

Proposed usage of visual services on Digital Radios supporting DAB/DAB+/DMB-R

- For the digital radio launch in Germany -

Edition 1.0

0. Change history

version/ revision	date	author	Description
0.1	2012-02-06	Sebastian Kett	Initial document
0.2	2012-03-05	Oliver Kranz	Document updated / commented
0.3	2012-03-09	Carsten Friedrich Rüdiger Hentze Sebastian Kett Olaf Korte Oliver Kranz	Telco with working group
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1.0	2012-05-25	Ralf Hinz Sebastian Kett Oliver Kranz Christoph Kruse	Feedback from working group included ### feature-freeze as Edition 1 ###

1. Foreword

Public and commercial broadcasters, system operators, network providers, receiver manufacturers and authorities in Germany are working together on the start, subsequent roll-out and extension of digital terrestrial radio on national as well as on regional and local digital terrestrial radio multiplexes.

Since February 2011, broadcast receiver related (technical/technology standard) matters have been addressed by a device working group hosted by the German Federal Ministry of Economics and Technology (BMWi) to ensure appropriate decoding and provision of broadcasted services by the receivers and a consistent media experience for the customer. This working group consists of all interested stakeholders in the digital radio ecosystem.

1.1 Intention of this document

This document describes how it is proposed to display visual information on modern digital radio receivers – with a specific focus on in-car reception in particular.

The information incorporated in this document is the result of mutual discussions in the device working group and also test results provided by participants of this group. The intention of this document is to propose guidelines how visual services should be implemented from broadcasters and how they should be processed/displayed on receivers.

Only the representation of visual information is covered within this document. Specific functions are not covered.

Driver distraction is a very important aspect while displaying visual content on infotainment equipment in cars. Fast changing content on displays or the need to interact with the radio should always be reduced to a minimum.

This paper is intended to be used as guideline, it is not a specification.

Please note that any information contained in this document may be subject to change without notice to address errata.

2. Basic conditions for representation of visual content

CE devices with graphic displays are commonly used in a fixed position (e.g. entertainment cabinet, bedside table). Mobile CE devices (e.g. pocket radio) usually don't have an appropriate display for representing visual content. In both reception environments there are no specific restrictions for the representation of visual content. The listener normally has enough time to process the content displayed without putting others at risk.

In-car devices are used in mobile reception environments and usually have appropriate displays for the representation of visual content available. As the driver's attention shall be applied to the street, all visuals should be designed carefully in a way that the listener is able to gather the whole content within three seconds at the maximum.

Relevant documents dealing with driver distraction are listed below:

- **EU:**
DIN EN ISO 15008 – Road vehicles, Ergonomic aspects of transport information and control systems - Specifications and test procedures for in-vehicle visual presentation
http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=50805
- **US:**
Statement of Principles, Criteria and Verification Procedures on Driver Interactions with Advanced In-Vehicle Information and Communication Systems
http://iems.net/2005/webzine/newsletter/v10n2/Overseas_report/AAM_Guidelines.pdf
- 77 FR 24764 - Visual-Manual NHTSA Driver Distraction Guidelines for In-Vehicle Electronic Devices
<http://www.gpo.gov/fdsys/search/pagedetails.action?granuleId=2012-9953&packageId=FR-2012-04-25&acCode=FR>

3. Transmission duration vs. update of content

Visuals broadcasted via DAB are transmitted using the MOT protocol. It is important to distinguish between the transmission duration of a MOT object and the appearance of the so transmitted content (i.e. the visual itself) on the receiver display.

It could be assumed that a slide of 20 kB in size which shall be transmitted in the 8 kbps large PAD of an audio service appears on the receiver display after 20 seconds. However this is not the case as the whole transmission duration depends on various parameters (e.g. how often each MOT object is repeated) and the required processing time of the receiver.

The following parameters exist for the delivery of visuals:

- Visuals with larger file size need more transmission time
- Higher data rates for the slideshow service (e.g. PAD) reduce the transmission time
- Repeating the transmitting of a MOT object improves the reception quality in areas with poor coverage due to the potential erroneous distribution channel

The service provider/broadcaster should always consider coming to the best compromise between a preferably reliable transmission (e.g. more repetitions of each MOT object) and a preferably quick appearance on the display of a receiver that has 'just now' tuned into the audio service.

Possible compression algorithms

According to the DAB standard JPEG and PNG compression is allowed for visuals. The Institut für Rundfunktechnik (<http://www.irt.de>) investigated, which compression algorithm works best for which sort of content. As to these investigations it should be considered to:

- Use PNG format for text-heavy visuals as for an subjectively acceptable quality (image artefacts) PNG allows smaller file sizes
- Use JPEG format for picture-heavy visuals as for an subjectively acceptable quality (image artefacts) JPEG allows smaller file sizes

Given a text-heavy visual (PNG compressed) at an average file-size of 6446 Byte the following cycle times per repetition are possible:

Data rate kbps	4	6	8	10	12	14	16
Cycle time seconds	12,89	8,59	6,54	5,16	4,30	3,68	3,22

Given a picture-heavy visual (JPEG compressed) at an average file-size of 15342 Byte the following cycle times per repetition are possible:

Data rate kbps	4	6	8	10	12	14	16
Cycle time seconds	30,68	20,46	15,34	12,27	10,23	8,77	7,67

Note: The tables above are a part of the survey "Data rates and compression of JPEG and PNG files for DAB slideshow services" of Institut für Rundfunktechnik. Please see the survey (author: Alexander Erk) for further details.

It is strongly recommended to NOT apply an (optional) compression on image files as described in the MOT standard. Although the standard allows it (e.g. in EPG advanced profile) it should be considered that JPEG and PNG image files become larger when GZIP compressed.

To reduce file-sizes of PNG images, it should be considered to use PNG image options for reducing color information if possible. Particular graphics (as opposed to photographs) often use a rather limited palette of colors. Such images can be encoded with 4-bit or 8-bit color depth without visible loss of quality, but with significant reduction of file size.

The following visual is 26kB in size as JPEG, but would be 9.3kB as PNG with 16colors that has no visually apparent difference to the JPEG file:

SWR2 Programmhinweise

SWR2 Treffpunkt Klassik (seit 10:30 Uhr)
Am Mikrofon: Wolfgang Scherer

Georg Friedrich Händel:
Sonata D-Dur HWV 371 für Violine und Basso continuo
Ricardo Minasi (Violine)
Musica Antiqua Roma

Wolfgang Amadeus Mozart:
Klavierkonzert Nr. 20 d-Moll KV 466
Arthur Schoonderwoerd (Hammerklavier)

Gleich kommt (Um 11:57 Uhr)
SWR2 Kulturservice

Future use – the categorized Slideshow

In normal case the DAB-Slideshow is a self-running presentation of individual visuals, which are not necessarily related to the live audio service. A particular visual is received, then displayed for a certain amount of time and finally replaced by the next received visual. Just the listener, who looked at the right point of time on the receivers' display, will enjoy this additional service.

For this purpose the regular Slideshow is currently going to be advanced to the „Categorized Slideshow“ which offers two modes:

- In „normal mode“ a selection of already received visuals will be displayed by the receiver in the shape of an ordinary DAB-Slideshow.
- In addition the listener can switch to „interactive mode“. Doing so, the normal presentation of visuals is interrupted and the navigation to every already received visual is possible.

Every categorized visual will therefore carry a few more metadata to allow its caching in a certain category. Furthermore the metadata will signal the receiver if the visual should be displayed in „normal mode“, in „interactive mode“ or in both.

A radio receiver wishing to display a categorized slideshow must be enabled to cache received visuals into local memory for later retrieval by the listener. Furthermore it must offer a user interface to allow the navigation to the already received/cached visuals.

The „categorized Slideshow“ is currently specified at the WorldDMB Technical Committee. It can be anticipated that the cat. SLS will become a part of the DAB-Slideshow enhanced profile.

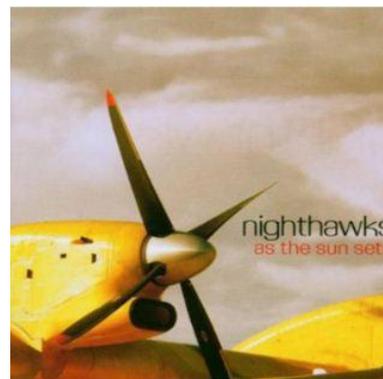
4. Broadcaster: guidelines for the creation of visuals

Given the requirement that visuals should be recognized within three seconds at a maximum, the following suggestions for the design and creation of visual content should be considered:

a) Visuals are the figurehead of your station

- Design each slide in a way that allows the listener to gather the content within three seconds
- Involve professional designers to maximise the experience for the listeners
- Focus on content related to the audio programme as visuals support the audio service and not vice versa
- Decide carefully which textual content should be given in the visuals and for which DLS/DL+ is more suitable¹
- Be careful with advertisements and ensure that they're in the look-and-feel of the other visuals

b) Less is more – bigger is better

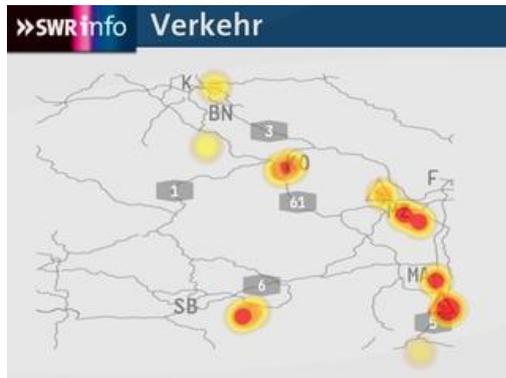


The more text a visual should contain, the smaller the text must be. It should be considered to:

- Use font size 10 pt at a minimum for any text on slides (i.e. for visuals of 320x240 px in size; for other sizes the font sizes should be converted true to scale). As long as the font is large enough the amount of text is less critical. In small font only short text is readable.
- Focus on three text messages per slide at an average (e.g. news slide)
- Separate headings from continuous/bulk text (e.g. bold print, larger font size)

¹ Some receivers display visuals in full-screen. Others do not so that both DLS/DL+ and SLS are visible at the same time. Text scales much better on displays with higher resolution than visuals do. Also text can be read aloud e.g. via a connected text-to-speech system.

c) Use symbols instead of text



Text information can sometimes easily be converted into graphics. It should be considered to:

- Use maps, symbols, pictograms instead of continuous text, tables and listings

d) Provide light and dark slides



During night/darkness slides with light background can glare and distract the listener. It should be considered to:

- Provide a day version (light background, dark typo) of a slide during daylight times and a night-mode version (dark background, light typo) during night times²
- Limit the visual brightness level (e.g. use light grey background instead of pure white)

² For in-car use the provision of light/dark slides is not only important as to the alternation of day and night. When driving on dipped headlights (e.g. in tunnels, through storm fronts) visuals in night-mode are also preferred.

It should be considered to offer day/night slides simultaneously as part of a categorized slideshow. Otherwise day/night slides depending on local sunrise/sunset should be offered. The fall-back position of car-manufacturers may be to limit the display brightness which affects the recognizability of the visuals content.

- Nevertheless use the highest possible contrast between content and background

e) Follow ETSI TS 101 499 v2.1.1

The DAB standard contains requirements for the implementation of visuals on receivers. As to these brief requirements it should be considered to:

- Use a resolution of 320 × 240 pixels at a colour/grey scale depth of 8 bits per pixel (1/4 VGA)³
- Use JPEG or PNG format for every visual as a receiver shall ignore any visuals it is unable to decode
- The maximum file size per slide should not exceed 50 kbytes as receivers may not display such visuals
- Use 4:3 (square pixel) aspect ratio as a receiver may otherwise crop or downscale the visuals
- It is strongly recommended to NOT apply an (optional) compression on image files as described in the MOT standard. This will have an adverse effect on file sizes.

f) Limit maximum update rate

Slideshows are not videos. It should be considered to:

- Limit the update rate of visuals to 30 seconds at a maximum for in-car use⁴
- According to the standard the service provider should control the timing of objects (broadcasted visuals) to prevent any object being displayed for a period of less than a few seconds
- Use the “Trigger Time UTC” information in the header of a MOT object to synchronize your visuals with your live audio service

³ It is also possible to offer other resolutions (e.g. 240x240 for cover art). However it should be considered that according to the standard in such case the receiver shall display the visual in the centre of the screen surrounded by a black background if needed.

Also it should be considered that receivers may not be able to display slides with resolutions above 320x240. According to the standard a receiver may downscale such visuals by 50% (which is the only downscaling factor allowed) or crop such visuals at the right and/or the bottom which also affects the recognizability of the visuals content.

⁴ Consider that if visuals are updated more frequently, in-car receivers may discard them. This may lead to missing content from the listeners point of view. The standardization of the categorized slideshow could offer opportunities to flag content with higher priority to provide guidance to the receiver in such case.

5. Receivers: guidelines for the representation of visuals

The DAB standard (see ETSI TS 101 499 V2.1.1 for further details) gives only few guidelines for the representation of visuals in digital radio receiver:

- See above (chapter 4; section e)
- If Trigger Time NOW is used, the slide shall be presented immediately after complete, error-free reception and content decoding (rendering).

In addition to these standard requirements the following presentation guidelines should be considered by receiver manufacturers:

- The receiver should present the last received visual and as long as the next visual is not fully, error-free received and decoded (rendered). However to prevent the receiver from displaying visuals out-of-date (e.g. due to coverage loss) the max. display time should be around 5 mins at a maximum⁵.
- The receiver should present visuals in full-screen mode per default to prevent the listener from superfluous interaction (avoid distraction)⁶.
- The receiver should not discard any received visual in order to extend the presentation length of the previous received visual.
- The receiver should not limit access to the visuals (e.g. for in-car receivers during the vehicle under way)

⁵ If this time out is reached, the receiver should hide the currently displayed visual and/or inform the listener that the slideshow service is currently unavailable. However – this is left to the implementer.

⁶ If the size of the display is larger than the size of the visual that must be displayed, the device should not upscale the received picture to fullscreen in order to prevent a loss of quality. The appearance of the GUI is left to the implementer.

6. Detected problems regarding slideshow broadcast

Typical problems which have been detected by Fraunhofer IIS with some slideshow services / receiver implementations:

- Invalid FIG0/13 signalling: PAD-info was missing or invalid (e.g. wrong DSCTy)
- ContentName did not change for new slide
- Some receivers seem to need ContentsIndicators in each PAD field
- One broadcaster used pre-MOT standard PAD inserter (no data group length indicator [X-PAD AppType 1] was provided)

Warnings:

- Some broadcasters use MOT parameters which are not defined for the slideshow. However these parameters do not seem to cause issues on receivers.

7. Glossary

may

This word, or the adjective "optional", means that an item is truly optional

must

This word, or the terms "required", "mandatory" or "shall", means that the definition is an absolute requirement of the specification

must not

This phrase, or the phrase "shall not", means that the definition is an absolute prohibition of the specification

should

This word, or the adjective "recommended", means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course

should not

This phrase, or the phrase "not recommended", means that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label