

## **Journaline - the Information Service for Digital Broadcast**

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Journaline was internationally standardised by WorldDMB for use in DAB in 2007. Its core functionality resembles that of an electronic magazine or teletext on a TV set. The listener can access interactively both program related and program independent textual information. The former may comprise services like background information on the program, the station's contact information, or the phone number to participate in a radio chat show. The latter covers current news, stock market tickers, sports results, the latest airport arrival and departure times, etc. It is up to the broadcaster to tailor the content to the needs of his specific audience.

Optional parts of the standard specification support text-to-speech playback optimization in the receiver device through speech hinting, geo-referencing of information, and interactivity features like links to online web sites and support to establish phone calls. On broadcast side, Journaline enjoys a growing support, as it demonstrates the convenience and extra benefits of digital radio to listeners.

Journaline decoders are available for software based radio receivers, both for professional equipment and monitoring products, as well as for open-source projects. The functionality provided by the Journaline application and some technology background is presented below in more detail.

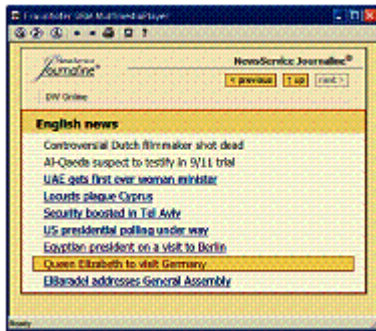
### **Functionality**

The concept of Journaline is based on the following requirements:

- Provision of pure text information with world-wide applicability
- Interactive, immediate access by the user to all provided information
- Easy integration of existing information sources by the broadcaster (RSS, XML standards)
- Efficient information encoding and transport to support any radio standard
- Smallest possible decoder, memory and user interface footprint in the receiver
- Optional support for text-to-speech playback of text information in receivers, interactivity (back channel establishment), and geo tagging of information to enable location based services

- Easy future extensibility, maintaining full backward compatibility to existing decoders

In the Journaline application, textual information is selected through a menu structure. The immediate access to all available information is enabled by organizing all service elements in a hierarchical tree structure.



Menus allow for a quick selection of currently relevant topics and information.

Every menu and every text page is a self-describing and self-contained object. At no moment does the receiver need to build-up or evaluate any internal object hierarchies or directories-one building block for low mini-mum memory requirements.

Hence, the decoder could even work without any cache memory: by waiting for the reception of the main menu and presenting it to the user, by then waiting for the selected target object and presenting it upon reception, and so on. Of course the provision of some cache memory greatly enhances the service responsiveness to the user.



Every object (menu or text) is efficiently encoded in JML (Journaline Markup Language), a binary representation of XML formatted content. Finally a compression scheme is applied to the plain textual information.

In addition, all aspects of the service are restricted to sensible maximum values, which should hardly ever be reached in a real-world Journaline service. This applies to the object size, maximum object count per service, maximum number of selection targets per menu, maximum number of menu hierarchy levels, and so on. These restrictions enable the efficient implementation of a Journaline decoder even on embedded and restricted microcontroller platforms, and thereby serve the goal of supporting all classes of digital radio receivers.

## Types of Information Pages

Every information page (i.e. object) represents one menu or one text page. It is encoded and transmitted independently from any other object, and distinguished by a unique ID within the Journaline service.

Currently four types of information pages are defined. They will briefly be introduced along with their individual features and behavior rules.

"Menus" allow the user to select other (sub-)menus and text pages:

```

Sports - Germany - Soccer
Bundesliga 32nd Round
[Second Bundesliga 32nd Round]
Regional League North
[Regional League South]

```

They are composed of a title and a range of link targets, while marking the current selection position of the user.

Optionally the cache status of a link target may be visually hinted-if a linked information page is already in the cache, the user can access it immediately without waiting for its next reception.

Upon reception of a new version of the currently presented "Menu", it shall be updated immediately on the screen while maintaining the user's current selection position.

A "Plain Text Message" is composed of a title and the body text:

```

Germany tops EU service report (17:13)
Research by the European Union's
statistical arm Eurostat has placed
Germany top of the EU productivity
league in a range of services. The

```

The user can vertically scroll through the full text. If an updated version of the text is received, this may be indicated to the user, but no automatic update of the screen content should be performed.

Information pages of type "List/Table" are especially helpful when it comes to presenting sports results or financial information like stocks values:

```

Soccer - Bundesliga 32nd Round (16:15)
TSV 1860 - Cottbus      3:0
Dortmund - Nürnberg    4:1
Hertha - Bayern         3:6
Stuttgart - Bremen     0:1

```

If an updated version of such a page is received while it is shown on screen, the display should be redrawn immediately while keeping the user's current scroll position. So if the user has scrolled down to have his favorite sports club visible on screen during a match, he will just notice the scores go up over time.

A "Ticker Message" is composed of a single title element without any body text:

```

The housing boom continued in the first
quarter - Home prices nationwide spiked
7 percent.

```

If possible, it should completely be visible on screen without any user interaction. Other than plain text messages, ticker messages are automatically updated on screen as soon as a new version of the object is received. This functionality resembles that of DAB Dynamic Labels, however, as part of the Journaline menu structure each ticker message page covers one specific topic.

## Formatting of Information Pages

All information pages are restricted to a maximum size of 4 kB, independent of their type. The Unicode representation format UTF-8 is used for all text character encoding. This enables a Journaline service to support any international script and character set like Chinese, Arabic right-to-left, Cyrillic, etc.

### Transmission of Journaline in DAB



Journaline supports two ways to organize the transmission of objects, and both ways can easily be mixed within one single Journaline service: carousel mode and real-time transmission.

Regular content is broadcast in form of a data carousel. As soon as a receiver starts decoding a Journaline service, it collects all received information objects and stores them in the cache for immediate future access by the user-until the objects are updated or removed from the carousel. An updated object can be re-transmitted immediately, as there is no adjustment to any global directory structure required. Using individual priority classes for different parts of the Journaline service, regularly updated content can be broadcast more often than static content. And menus like the main menu page can be broadcast more often than other information pages to make the initial service startup as fast as possible.

Information pages in form of ticker messages are updated regularly with changing content. This feature enables services like news tickers (every ticker message optionally linked to a detailed information page), dynamic program accompanying content (like song lyrics for Karaoke), or video subtitles in various languages. In case of an update, these ticker messages are immediately broadcast and thereby briefly "interrupt" the running data carousel(s)