

RADIO DATA SYSTEM APPLICATIONS

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Abstract

The Radio Data System (RDS) provides a low-rate digital broadcast channel that is specific to the radio station an FM receiver tunes to. While RDS is mainly intended for delivering simple information about the station and current program, we argue that it can be employed to enable a broad range of new applications and enhance existing ones. In this paper, we discuss a number of applications that can be enabled or enhanced by RDS.

Keywords: radio data system, broadcasting, transmission system

I. Introduction

The Radio Data System (RDS) is an add-on data service, used by many 87.5 to 108 MHz FM radio stations. The purpose of RDS is to increase the system functionality. During the development of RDS it was essential to ensure, that the data signal would be compatible and inaudible in both Mono and Stereo reception. It was also "designed" so that the data is particularly suitable for mobile reception, covering, at least, the Mono service area. The system is flexible for a large number of applications and has been left open for future features[1].

II. Rds Features

RDS concept imposed the following characteristics[2,3] :

-Alternate Frequency (AF/EON) :avoids that e.g. car drivers have to manually change the frequency while driving. If the chosen signal turns weak, the RDS tuner automatically switches to an alternative frequency. This works by a list of alternative frequencies, which is transmitted via RDS.

-Traffic Announcement / Traffic Program Indication (TA/TP) :can be used to mark a station that offers traffic information (TP) and to indicate if there is ongoing traffic information. An RDS tuner can be set to only unmute audio if there is ongoing traffic information (TA).

-TMC - Traffic Information via Traffic Message Channel :Can be used to forward special traffic information. This could be information about traffic jams, which are used by navigation systems for optimized routing.

-Station name, Program Type, Radio Text (PS/PTY/PTYN/RT) :RDS tuners can display the station name (PS) instead of the frequency or display program related information (PTY/PTYN).

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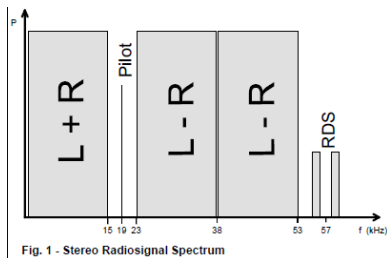
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- Specific user data forwarding (TDC) :can be used to forward any transparent data via RDS.
- Radio Paging (RP) - Paging via RDS :RDS offers pager capability. Specific pagers can receive individual messages via RP.
- EWS - Emergency Warning System:RDS offers an Emergency Warning System. Special EWS receivers can be alerted in the case of emergencies or disasters. This means fast and also cost-efficient warning for the population when dangers like tsunami-flood waves, industry accidents with hazardous emissions etc.

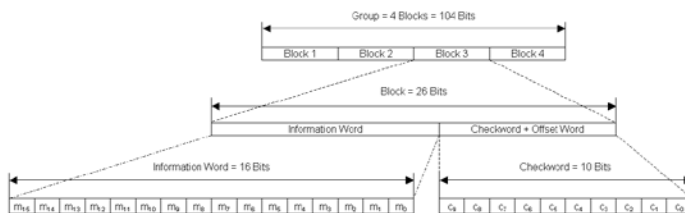
III. Position Of The Rds Signal In The Modulation Spectrum

The lower 15 kHz contain the monophonic audio signal. The stereophonic audio signal is placed between 23 and 53 kHz. The RDS data is contained in sidebands at 57 kHz. The RDS technology enables data rates of about 1187 bit/s. Fig. 1 shows the signals in the frequency domain.



IV. Rds Groups

RDS data is formatted in groups. There are 16 groups, divided into type A and type B. These groups contain different data like PTY or EON data. A group is formatted as follows: It contains 104 bits and is divided into 4 blocks. A block contains 26 bits and is divided into the Information Word and the Check word with the Offset . The Information Word contains 16 bits and carries data. The Check word with the Offset is for error correction and synchronization. Fig. 2 shows the coding structure.



V. Group Format

The groups are formatted as follows:

Block 1 of each group contains the PI code of the station.
 Block 2 contains the following data:
 Group Type Code (identifies the present transmitted group)
 Version Flag (identifies the group as type A or type B)
 TP Flag
 PTY
 5 group individual bits
 Block 3 and 4 contain group specific data.
 Fig. 3 shows the group format.

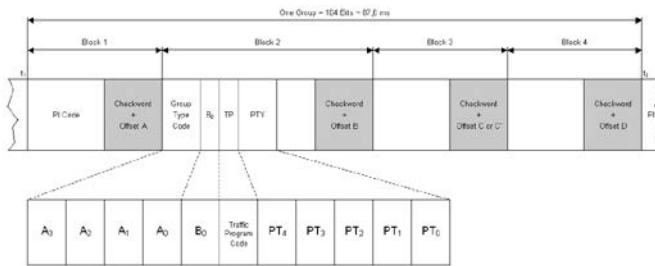


Fig. 3 - RDS Group Format

VI. Rds Information For Indication

The main functions according standards, are:

- Program Service Name (PS) / Scrolling Program Service Name (SPS) :the Program Service Name contains max. 8 alphanumeric characters. It can be used to inform the user about the station ID. The PS is usually displayed by every RDS enabled tuner.
- Program Type Name (PTYN):the PTYN can be used for detailed description of the PTY by 8 digits.

The Program Type Name is transmitted in the group 10A.

- Radio Text (RT) :Radio Text offers another opportunity to transmit alphanumeric digits. RT offers to transmit long text messages of 64 digits. Additionally RT offers to transmit chain messages.Radio Text is transmitted in the groups 2A and 2B.
- Clock Time and Date (CT) :RDS has the capability to transmit the present time and date. The CT is transmitted in the group 4A.RDS control information
- Program Identification and Extended Country Code (PI und ECC):the Program Identification Code is used for the identification of the transmitted content. Every program has a specific PI code. It enables the RDS tuner to distinguish between different countries and areas with the same program. The PI code is transmitted in every RDS group.The Extended Country Code is transmitted in the group 1A.
- Program Type (PTY):the Program Type is an identification number and should be transmitted by every program. The PTY code is transmitted in every RDS group.
- Traffic Program Identification (TP) :the Traffic Program Identification Flag is used to identify stations that offer traffic program. The flag is set if the station automatically sets the TA flag on traffic announcements. the TP can be used for automatic station searching.The Traffic Program Identification Flag is transmitted in every group.

- Traffic Announcement Identification (TA) :The Traffic Announcement Identification Flag is used to indicate an ongoing traffic announcement.The Traffic Announcement Flag is transmitted in the groups 0A, 0B and 15B.
- Music/Speech Switch (M/S) :the Music/Speech switch is used to identify if music or speech program is transmitted. The Music/Speech switch is transmitted in the groups 0A, 0B and 15B.
- Decoder Identification (DI) and Dynamic PTY Indicator (PTYI) :The Decoder Identification identifies different operating modes.The decoder information is transmitted in the groups 0A, 0B and 15B.
- Alternative Frequencies (AF) :Alternative frequency lists are used for sending frequencies that transmit the same program.

VII. Radio Data System Applications

There are various development application of RDS :

- digital voiced signal transmitting and pager receiving system with RDS: The digital voiced signal transmitting and pager receiving system with RDS application receiving is a telegraph code simultaneously the same channel. It contains a voiced predictive signal in the telegraph code application. When the system receives the voiced predictive signal, it can receive a digital voiced signal asynchronously in another channel with RDS. In the application, the RDS system can provide voiced signal transmission and be used to compensate the disadvantage of regular pager in which can only display literally and number information.
- standard time and date-corrected system : the application is that the radio station transmits correct time information and receiver receives the correct time
- telegraph code broadcasting system of weather:the telegraph code broadcasting system of weather application is used to replace the conventional weather broadcasting system such as TV or FM stereo system. By transmitting international standard weather code in the RDS system, it provides another real-time weather information service. The overall weather broadcasting system contains 3 main functions: the weather collection, encoding and RDS encoder and its receiver. In the weather information collection, we can gather the real-time weather information from internet, then we can correct the weather information into the international standard weather code. The international standard weather code is transmitted by RDS system in the numerical form and thus be received and displayed in the receiver
- wireless emergent announcing system : in the wireless emergency announcement system application it is a emergency announcement system. The main device is a radio receiver with speaker. It can also has a wireless transmitter and receiver which is used to transmit the rescuing signal and receive the radio. Also, it may have high brightness LED which can be use to become a lighting equipment and a high capacity battery. It can receiving the broadcasting signal when the power failure. Therefore using the powerful features of RDS system the radio station can transmit correct signal. when most of communication channel is failed by accident, it can provide emergency rescue
- method and apparatus for character information receiver of RDS :the method and apparatus for character information receiver of RDS application contains a receiving apparatus and algorithm of digital information for wireless broadcasting systems.

-in house applications (IH) :can be used by the provider to transmit any data for internal purposes. Usual customer tuner should ignore these data.Can be used e.g. for remote switchin.

A representative set of applications that can be enabled or enhanced by an RDS-based data broadcast.[4] RDS constitutes a low-rate, low-cost data broadcast channel for the radio station (Fig. 4) Given the virtually universal availability of FM radio, RDS can support many delay tolerant low rate data services in lieu of or in addition to cellular or Wi-Fi connectivity.

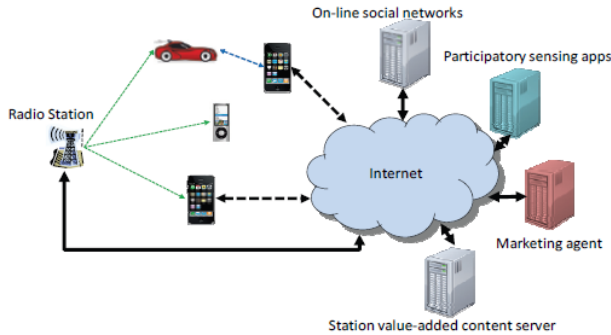


Figure 4. RDS can enable new applications on mobile devices with a low-rate but highly available digital broadcast channel for each radio station

RDS can act as a data link layer for custom applications, it lacks the packet caching and assembly capabilities to transfer either a stream or data chunks for the applications with RDS-Link protocol which provides an interface between applications and the RDS enabled FM receiver (Figure 5). Applications may subscribe to certain types of data chunks from one or more radio stations. Whenever RDS-Link receives a chunk for a subscribing application, it forwards the received chunk to the application. To support existing RDS-unaware applications, such as a web browser, one can develop an RDS-aware intermediate application to receive certain chunk types from a station and save them as files. The browser or other RDS-unaware applications can then access the locally stored files through a Uniform Resource Locator (URL)[5]

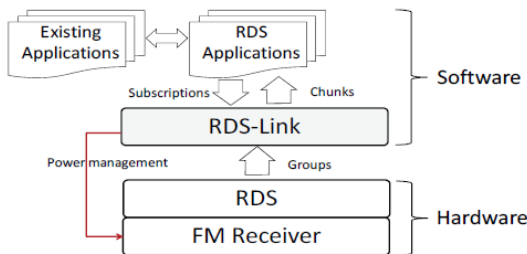


Figure 5. Relationship between RDS-Link, applications, and hardware

VIII. Conclusion

The highly available FM radio data system (RDS) provides a low data rate digital broadcast channel alongside each FM channel. In this work, we demonstrate that it is feasible to utilize RDS to support services beyond its originally intended usage. We present a broad range of services that can be enabled or enhanced by RDS .

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