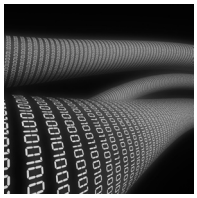

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The European information system for travellers RDS-TMC

J. MŁYŃCZAK[a], K. KĘDZIORA[a]

[a]Faculty of Transport, Silesian University of Technology, Krasinskiego 8, 40-019 Katowice, Poland
EMAIL: jakub.mlynczak@polsl.pl, kacper.kedziora@polsl.pl

ABSTRACT

The role of TTI is an effective supporting the use of transport network for example, in order to improve the capacity and to shorten travel time, delays, fuel consumption. In the time of increasing traffic congestion on the road network, especially on EU freight corridors and in cities, the RDS-TMC deliver the alternatives and it facilitate traveller information by providing powerful travel planning tools. Establishing a national RDS-TMC system is the goal for Poland not only because approaching EURO 2012 but mainly to join to other European countries and as they enjoy the benefits of TMC service. All actions must be supported by the agreement of all players in the information chain which creating the TMC service: ministerial bodies, civil/public services, public road authorities, public broadcasters, road users and industry. Only clear and transparency system of responsibility for maintenance and overseeing could guarantee the high reliability and correct work of TMC service.

KEYWORDS: RTTI, RDS-TMC, travel planning

1. Introduction

A travel by car is an everyday necessity for many millions of people, among which it can be distinguished group of running to work and for which the movement of such vehicles is their work. Of course, groups of vehicle users is much more, for instance rescue services for which fast movement is a priority. But in the way to work, on holidays, during the freight of any goods more and more a waste of time is becoming perceptible in successive obstacles occurred on the way to destination place. For each of above mentioned groups of motorists it is important not only to safely reach the destination point, but also make it efficiently and without unnecessary costs, and a time is one of such costs.

For the considerable majority of drivers a factor making a travel pleasant is a music from radio car. Already in the '70s last century works was taken aimed at providing to users, especially drivers, simple and helpful system extending the possibilities of the UKF FM car receiver. RDS Radio Data System is such a system, which came into operate in the second half of '80s the 20th century and in the short time has become the integral part of every car receiver and the tool used by most radio stations.

2. Characteristics of the RDS system

RDS has become the first pan European (in terms of technology) and commonly available traveller assistant system. The service is realize through standardised functions which provide certain information to drivers.

The number of defined functions exceeds twenty [1], and each of them can be classified into one of the following functional groups:

- Functions that carries information directly to end users (not only drivers but also for „not mobile" listeners) to these may be included for example.:
  PS - Programme Service name – the name of radio station – short text with the name of radio station or other short messages
  RT – RadioText – any text – could contain such information like the title of programme, the song performer and its title, etc.

- Functions to personalize transmitted information – it is achieved through assigning to every broadcast transmission the code identifying character of the broadcast program:
  PTY - Programme TYpe – for example: news, sport, education, culture. (the extended version is PTYN - Programme TYpe Name for example: PTY=4: Sport oraz PTYN: Football)
  EON - Enhanced Other Networks information - provides the means by which the receiver automatically switch to another network, which just began broadcast specific program (PTY).
  TA - Traffic Announcement – this is a signal to indicate when a traffic announcement is on air. The signal could be used in receivers to switch automatically from any audio mode to the traffic announcement. After the end of the traffic announcement the initial operating mode will be restored.
  TP - Traffic Programme - This is a flag to indicate that the tuned programme carries traffic announcements.

- The function which carrying information intended only for the use of radio receivers:
  AF - Alternative Frequencies list – The list which enable receivers to switching, without any user intervention, to another transmitter broadcasting the same programme.
  CT - Clock Time and Date – the current time and date.

- Functions which carries special character information dedicated only for a select group of end users:
  IH - In House application – this refers to data to be decoded only by the operator like: identification of transmission origin, remote switching of networks and paging of staff.
  EWS - Emergency Warning System –these messages will be broadcast only in cases of emergency and will only be evaluated by special receivers.

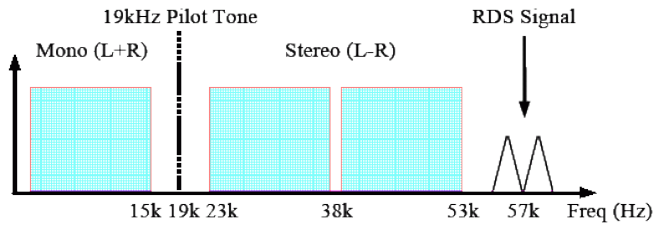

Fig. 1. Distribution of modulating frequency in the radio FM transmission

- The additional features extending the capabilities of RDS system:
  ODA - Open Data Applications - The ODA feature is conveyed additional applications to an RDS service, in a number of allocated groups in an RDS transmission.
  TDC - Transparent Data Channels - The transparent data channels consist of 32 channels which may be used to send any type of data.

All these digital data are transmitted in parallel with conventional broadcast radio on subcarrier frequency 57 kHz.

However the RDS is mostly used to identify the radio station, to display text information intended for the listener on radio receiver, improving the search of transmitters, auto-tuning to the best transmitters broadcasting the same programme. Functions possible to implement in the RDS system are rarely fully used by broadcasters.

3. Traffic and travel information

The role of TTI is an effective supporting the use of transport network for example, in order to improve the capacity and to shorten travel time, delays, fuel consumption by integrating TTI in the process of travel. In this way, the route may be better optimized in different criteria, through a much wider range (dynamic) parameters. The influence of TTI information on the behaviour of travellers can be divided into three basic categories [6]:

- Spatial: optimisation travel time by using different routes which allow for the quickest travel because of speed limits, number of traffic lights, current and predicted congestion, etc.
- Temporal: Temporal adaptation works similar to spatial adaptation. Instead of shifting spatially, travel is optimised by temporal shifts, such as avoiding peak times by conducting the travel before or after the so

called "rush hours". Temporal and spatial adaptation are the most common methods, a combination of both is also possible.
- Modal: Modal adaptation means using one or more alternative modes of transportation for travel. A typical example is the combination of a private vehicle and mean of public transport.

With the previous mentioned functions of RDS from the traveller point of view the information about traffic conditions in the region in which he is located are the most important. However, in the case of Poland, no radio station broadcasting such information using either the TA and TP.

Traffic information delivered in real time are part of the Intelligent Transport Systems services. The potential of TMC is clearly apparent as a support tool to transport policy. The use of TMC improvement efficiency, capacity and safety on roads. More optimised use of infrastructure reduce congestion in cities. The interoperability support cross-border RTTI for best guidelines.

In the time of increasing traffic congestion on the road network, especially on EU freight corridors and in cities, the TMC deliver the alternatives and it facilitate traveller information by providing powerful travel planning tools. Better planning improving mobility for the citizen and for logistics companies.

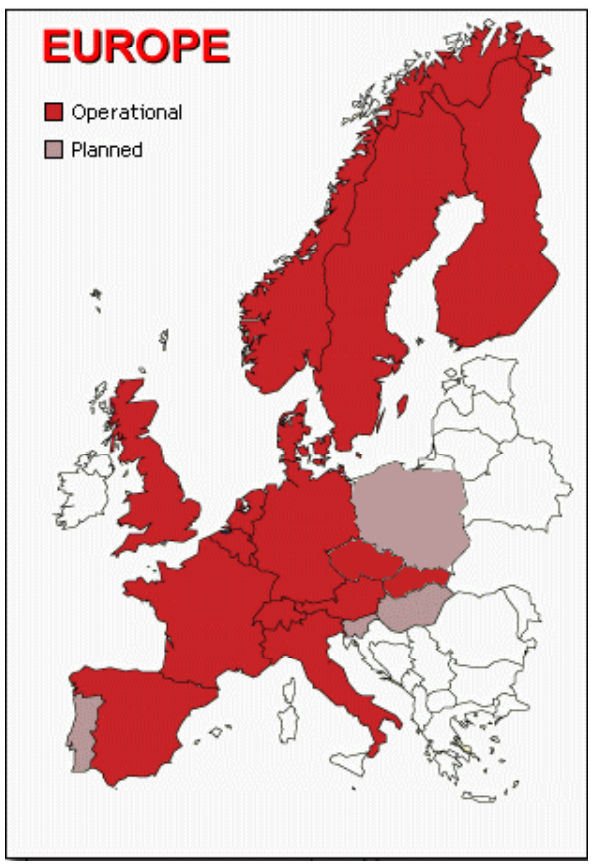

Fig. 2. The present state of RDS-TMC in Europe
Source: TMC Forum

4. The history of works under the TMC system

The TMC development includes activities in projects DRIVE (Dedicated Road Infrastructure for Vehicle Safety in Europe 1989-91), DRIVE II (1992-94). Therefore the works were continued if frames of 4FP (Fourth Framework Programme 1994-98) – the projects: EPISODE (European Pre-Operational Implementation Survey On Further Development And Evaluation Of RDS-TMC (Broadcast sector)), FORCE 1 (Enhanced Field Projects for Large Scale Introduction and Validation of RDS/TMC Services in Europe) and successively 2 and 3, ECORTIS (European RDS-TMC Implementation Support). Additionally in Euro-regional projects: VIKING, CENTRICO, CORVETTE, SERTI, ARTS.

5. Creating the national RDS-TMC system

Establishing a national RDS-TMC system must be supported by the agreement of all players in the information chain which creating the TMC service: ministerial bodies, civil/public services, public road authorities, public broadcasters, road users, industry. The agreement on type of messages to be provided as public service is also needed.

Each of these actors is responsible for the piece of the puzzle forming a functioning service TMC:
- ministerial bodies - inter alia: The Ministry of Interior and Administration, Ministry of Infrastructure - responsible for legislation adaptation, supervision of the information incoming to the system by the public services, coordinating the activities of public road authorities, supervision over the establishment of a national location tables LCL (Location Code List);
- public road authorities - inter alia: General Directorate for National Roads and Motorways, Regional Road Centres - transfer the most important information for traffic flow about road incidents, and other obstacles in the vulnerable points of the national road network, supervision of the road network equipment systems like motion detectors, systems measuring atmospheric conditions;
- civil/public services - Police, Fire Brigade, Border Guard – responsible for traffic safety - deliver the most important road information, mainly about accidents and other handicaps.

- public broadcasters – Polish Radio S.A. as the service provider - collecting information from the above mentioned sources and transmission via radio messages about the traffic condition and other related information. In addition, create the technical capacity to proper digital broadcasting messages TMC and the effective use of inbuilt features RDS transmission: TA and TP function;
- road users – inter alia: motor clubs, taxi drivers - motor clubs members' and ordinary drivers support providing information on the traffic conditions. This requires the creation of so-called "confidence drivers" as a certified sources of information.
- industry - hardware and software manufacturers - constantly improvement and introduction of new attractive products on the market based on the needs of drivers and passengers, promote the development activities of products and services.

The process, which consists both in legal form and as well as from technical field, and can be presented in the following steps:

The preparation of necessary standards which mean to translate it into Polish. For the RDS-TMC system these standards are: EN ISO 14819 - Traffic and Travel Information (TTI) – TTI Messages via traffic message coding - Part 1: Coding protocol for Radio Data System - Traffic Message Channel (RDS-TMC) using ALERT-C; Part 2: Event and information codes for Radio Data System - Traffic Message Channel (RDS-TMC) and Part 3: Location referencing for ALERT-C.

The preparation of national location tables LCL (location code list) - in these tables must find a digital record of all national roads, to determine in accurate way the location of the incident. The process of creating the arrays are divided into:

- collection of localization points (in a natural way the point of location is, for example, crossroads)
- writing location points to location tables;
- correct determination of location points by the names of roads.

Providing a model for road, covering all possible routes, of course will be never possible to achieve within an acceptable time for two reasons. First, the more detailed model the greater costs are needed to its creation. Second, the traffic possible to occur on local roads to a small extent will create the need for the type of information provided by the TMC. On the other side will be very difficult obtaining information about the situation on the roads with low congestion.

Creating the location tables is an ongoing process, because the efficiency of navigation in a directly way translates to the number of defined location points, and that ensure a more efficient location of events and the possibility of avoiding them. The methodical works on the development of tables is also necessary to upgrade resulting from the fact of, whether in the city or between places, create new roads, bridges, renaming streets.

Another step is a certification of location lists made by the TMC Forum. For the public tables can be free of charge certification, for commercial applications exist a set rate. Of course, before approval the tables must be verified by using dedicated tools, in terms of consistency.

Preparing arrays of events. The actual list of events is full of possible information to provide. The problem arises when the events, that have occurred, has to be described before the information will broadcast to the receivers. The same information can be described a combination of different codes (which are assigned to events), which may in the system, during the interpretation of codes, lead to ambiguities and problems in the operation of the system.

For example traffic situation composed by [7]:

- RWR = resurfacing work
- SAT = single alternate line traffic
- LS3 = slow traffic

TMC messages can contain information related to one or two elements of situation but no more:

- RWR + LS3 can be broadcast through message "Resurfacing work. Slow traffic";
- RWR + SAT can be broadcast through message "Resurfacing work. Single alternate line traffic"
- LS3 + SAT can not be broadcast in one only message.

Thus it is necessary to define priorities in order to decide automatically the elements that will be included in the message broadcast through RDS-TMC. The highest priority in such cases should be assigned to report, which from a traffic management perspective is the most important for the driver.

Planning a broadcasting network for RDS-TMC - appointing an operator, which range of transmitters cover the whole country, preferably national broadcaster (public broadcaster), in areas where the signal is too weak, cooperation with local broadcasters.

The launch of pilot project - most often around a large city, where the data traffic centre will be created. Who will be the supervisor of the network, what statutes

will have locations tables (open access for free or maybe restricted), what information will be transmitted, whether the service will be dedicated for certain services, offering TMC information associated with a wide range of strategic and tactical localization bases? About these and many other question the answer should be known much earlier, at best on the same beginning of planning. The clear and transparency system of responsibility for maintenance and overseeing could guarantee the high reliability and correct work of TMC service.

Creation sources of information about traffic condition – some source of such information already existed: police, sensors on roads (like cameras), information from the GDDKiA, etc. The specific source of information is a network of "confidence drivers" including taxi driver, the members of motor clubs, etc.

The creation of Traffic Information Centre. Depending on the subsequent development of TMC, data centres should be able to exchange data with neighbouring centres. Centres located in vicinity of border meet the additional role, namely the exchange of information with neighbouring centres from abroad in order to provide the driver passing border the full road situation on his route. Additional benefits of the collected information in data centre is the ability to use it in related systems, where a prime example is an Internet map of a city with a real time updating of incidents places with a description of duration time of obstacle (see Figure below).

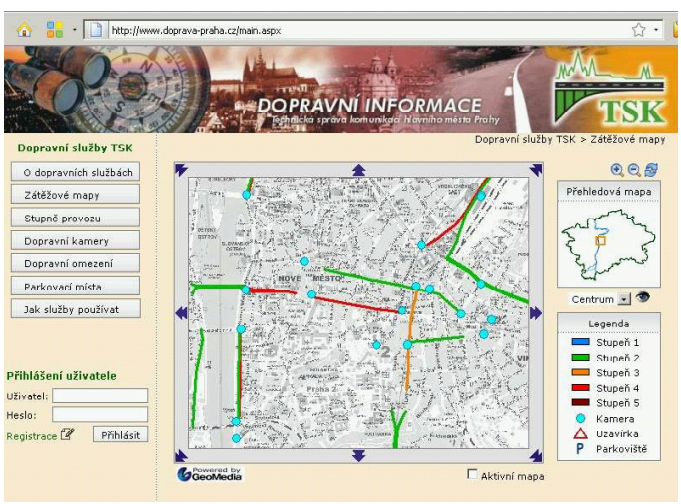

Fig. 3. Internet service for Prague
Source: http://www.doprava-praha.cz

6. Conclusions

Free public service TMC promotes overall mobility through easily accessible navigation devices. Thus the service may be serve a broad audience. It links directly with the traffic safety and makes the traffic flow more fluidity. One of the most unsatisfying feature of public service is limited accessibility without the cities and some selected regions. Of course the one of the main goal of system develop is achieve as high signal coverage as possible with the final value 100% of the national territory. The real time guidance increase exploitation of transport capacity without any improvement in road infrastructure.

Paid services are intended for more sophisticated information collection or extended coverage.

It is a great possibility to exploitation this service in the area of commercial and private transport like traffic management, travel information, logistic but only when the road data will be utilize optimally. Furthermore the TMC could be a basis for many ITS applications in the field of safety applications, digital maps, and generally to improving RTTI.

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