Traffic and Travel Information broadcasting
– protocols for the 21st century

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The broadcasting of traffic and travel information is likely to continue for some years via existing delivery means such as RDS-TMC, teletext, and spoken radio and TV broadcasts. However, several new delivery technologies – such as DAB, DVB, GSM and the Internet – are being developed to extend and enhance the provision of such information to drivers and travellers throughout Europe.

While recognizing the benefits and value of RDS-TMC, the EBU's recently-established TPEG activity is firmly aimed at the upcoming multimedia broadcasting environment. In this article, the authors give some background to the provision of TTI services in Europe, and explain the new protocols that are being developed within the framework of TPEG.

1. Introduction

Spoken audio announcements which give Traffic and Travel Information (TTI) have long been an important element of EBU Members' radio broadcasts. In recent years, EBU Members have provided supplementary information on their TV broadcasts, both in vision and as teletext, and most recently via the Internet.

Worsening traffic congestion (and higher expectations from our audiences) generates even greater demands for accurate and timely information. Broadcasters cannot respond simply by increasing the number of on-air announcements, in their traditional delivery modes. This would be unacceptable to the public, many of whom already express concern that such announcements are intrusive, repetitive and irritating – unless, of course, the information is relevant to them.

The transmission of TTI, via data broadcast modes, potentially solves this problem because the TTI data can be transmitted inaudibly and, furthermore, it can be filtered at the receiver to ensure that the end-users only obtain data which is relevant to their journeys. This article concentrates on TTI data broadcasting, but mentions other TTI delivery methods, where appropriate, and where they may possibly become competitive services.

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2. Principles of TTI

Over recent years, many organizations have worked on the development of TTI data broadcasting technology, not least the EBU through the *Broadcast for Motorists* activity, the EPISODE Project and, most recently, the EBU Strategy Group on TTI. A synthezis of principles which should apply to all broadcast TTI services has been derived from their work and is shown in *Panel 1* on the next page.

3. Multiple delivery methods

The emergence of multiple delivery methods for TTI services (DAB, DVB-T, GSM, RDS-TMC, UMTS, etc.), and the consequent uncertainty in the market, has perhaps caused confusion amongst broadcasters and manufacturers alike. In particular, some broadcasters are concerned that the introduction of RDS-TMC services (which are carried by existing analogue FM transmitters) might damage the prospects for their emerging DAB implementations and services. Conversely, other broadcasters are worried that RDS-TMC services will be made redundant by DAB [1][2]. Similarly, consumer electronics manufacturers like to see gentle progression – with full backwards compatibility – from one delivery method to another. They also like to sell products supported by new delivery mechanisms and they appear to be attracted to GSM technology, perhaps because chipset development has matured very rapidly, and relatively low investments in software to deliver TTI services can be foreseen.

4. Potential commercial telematic service delivery

Future TTI services will have to be developed on the assumption that communication with people on the move will definitely take place within the new competitive multimedia service environment, where broadcast technology will be just one delivery mechanism and another will be mobile telephone technology (see *Fig. 1*).

In this particular context, we can note the following trend: in the past, traffic information receivers were essentially car radios for which there was a significant after-market, supported by more than 50 different consumer electronics manufacturers, mainly from Europe and the Far East, supplying a wide range of products.

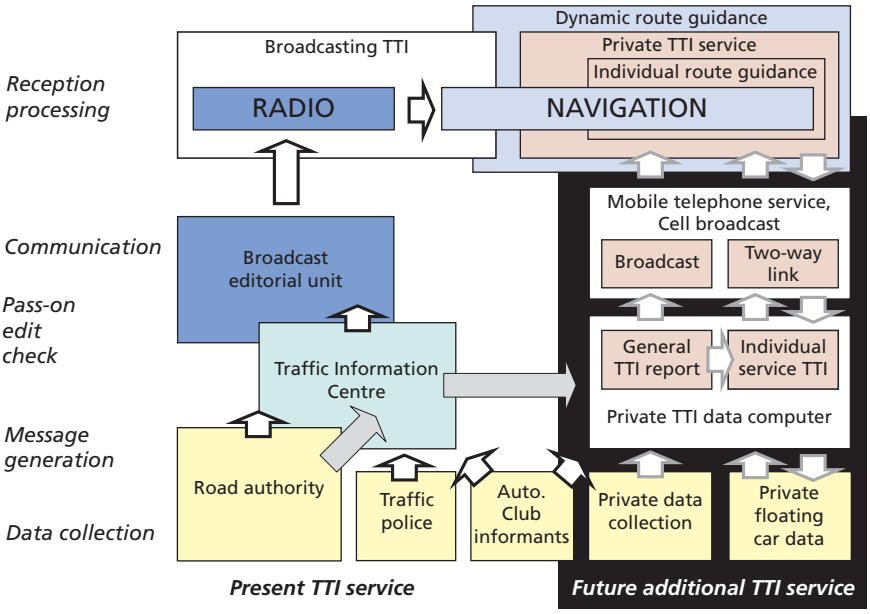

Figure 1
The competitive TTI environment: new information sources, new delivery mechanisms and enhanced services.

Since RDS [3] has been on the market, car manufacturers have tended, more and more, to integrate the car radio in conjunction with multi-functional displays in the dashboard, and these will be increasingly used along with other telematics functionality. Additionally, they bulk-buy OEM equipment that meets their own interface requirements, which somewhat opposes any standardization of these interfaces.

Recently, the German mobile telephone provider, Mannesmann, developed – through its subsidiary, Mannesmann-Autocom – the GATS protocol (now being standardized by CEN TC 278 WG 4 [4]). It also acquired VDO, a large company that manufactures in-vehicle instrumentation. It then acquired Philips Car Systems, one of the major car radio manufacturers which is also an important supplier of telematic terminals and navigational systems. All this indicates that the after-market for these products may gradually shrink and that a number of different telematic systems, as accepted by the market, will co-exist through telematics equipment that is supplied with the car to the end-user.

Studies on the use of GSM, for the provision of two-way communication between information centres and computers installed in vehicles, started in the European Commissions' DRIVE 1 (1989-1991) project called SOCRATES (System of Cellular Radio for Traffic Efficiency and Safety).

GSM includes the possibility for data communication using the SMS (Short Message Services) channel that can be used for traffic message services, point-to-point and point-to-multipoint (cell broadcast) services, route guidance, and emergency calls. GSM also provides a full data connection functionality that permits implementation of pre- and on-trip travel planning, and also dynamic route guidance in a navigational system. The widely-spread GSM technology is thus, in addition to traditional broadcasting, very suitable for the provision of a large variety of data services of interest to mobile users.

Integration of internet and GSM technologies has been studied extensively in the EC-funded PROMISE project. The aim of this project was the development of a traffic and travel information service – using the Wireless Application Protocol (WAP) and employing a new type of PDA end-user terminal (e.g. the Nokia 9000/9110 Communicator) which is the first GSM integrated data telephone of this type and which is likely to be followed soon by similar units made by almost all the major telephone manufacturers. In the summer of 1999, in the Paris metropolitan area, the SFR mobile GSM telephone network will start a trial which offers information services built around TTI and which will include information about other services such as banking, weather and TV.

Finally, the Universal Mobile Telecommunication System (UMTS) will represent the third generation of wireless mobile voice and data communication. This will probably attain a user data-rate of 2 Mbit/s. The wide availability of GSM makes it a good starting platform for the introduction of UMTS services. The ETSI standardization work provides for a phased approach of evolutional enhancements to GSM technology, with the view to ensuring a long lifetime for GSM products using earlier versions of the standards [5][6].

5. RDS-TMC

In recent times, the profile of data service provision has increased, due to the European Commission support for the development of technology to achieve pan-European TTI data services with language independence. The development of RDS-TMC has been the result. Although a simple acronym for Radio Data System – Traffic Message Channel, in most peoples minds this

Figure 2
An inexpensive portable RDS-TMC receiver – the GNS Tricsy.
(Source: GNS)

Figure 3
A typical single-tuner RDS-TMC car radio – the Blaupunkt Viking TMC 148, using a "smart card" location database but with limited performance and display abilities.
(Source: Bosch)

Figure 4
An in-vehicle navigational system – the VDO Car Communications CARIN 520 system, using a CD-ROM location database but with a single-tuner RDS-TMC RC 579 car radio.
(Source: VDO)

Figure 5
An integrated car system – the Volvo RTI navigation system, using a two-tuner approach which separates the RDS-TMC facility from normal radio listening.
(Source: Volvo)

Figure 6
The BMW in-car system – which uses a Becker double tuner, combined with a VDO CARIN navigation unit.

really covers much more, because the data and information-gathering infrastructure is generally included within the same terminology [2].

Throughout Europe, there are now many RDS-TMC implementations – and quite a few are part-funded by various EC sources. The largest of these are intended to give coverage over the strategically important Trans European Road Network – with its complex interfaces between cultures, countries, languages and road conventions. In relative terms, only a small proportion of the expenditure has gone towards the broadcast sector aspects of TTI, specifically for RDS-TMC message generation and transmission systems.

Panel 1
Synthesis of TTI principles for broadcasters

- Basic TTI data services (i.e. information about events such as accidents, congestion, or roadworks) should be available free of charge to the public, whilst recognizing that there will be many opportunities for paid-for value-added services, such as information about local hotels, restaurants and other services;
- TTI data broadcasts should have widespread geographic coverage, rather than being confined to densely-populated areas (EBU Members have an obligation to provide near-universal coverage);
- International roaming is an essential requirement for TTI services: the ultimate goal should be Europe-wide TTI services;
- All TTI services should conform to European standards and should use open non-proprietary systems (to ensure that competitive end-user products become available);
- TTI services should be language-independent;
- TTI services should be able to provide for the requirements of multi-modal travel, to facilitate change-over from individual to public transport;
- It is especially desirable that certain receiver types could perform fully without a (firmware) location database *before* accessing a broadcast TTI service (e.g. a web browser decoder or a personal digital assistant with plug-in radio receiver/decoder card);
- Source information for basic TTI services should be provided free of charge to broadcasters.

It is clear that RDS-TMC will help broadcasters to offer the maximum amount of road traffic message information to the end-user, but the cost is that a long transition period will be needed. Initially, few RDS-TMC receivers will be in use, but gradually as they become more widely available (see *Figs. 2-6* on the previous page), the broadcaster and the end-user will be able to take advantage of TTI that is delivered as data, thus achieving many of the principles noted in *Panel 1*, in a more effective way.

Broadcasters, via their information and news-gathering systems, are well placed to be RDS-TMC service providers and to be able to offer a particularly rich service with factual and anecdotal information. The factual information is most appropriate for the RDS-TMC service, while the linked anecdotal information can most effectively be used in other ways (e.g. within spoken "infotainment" programmes).

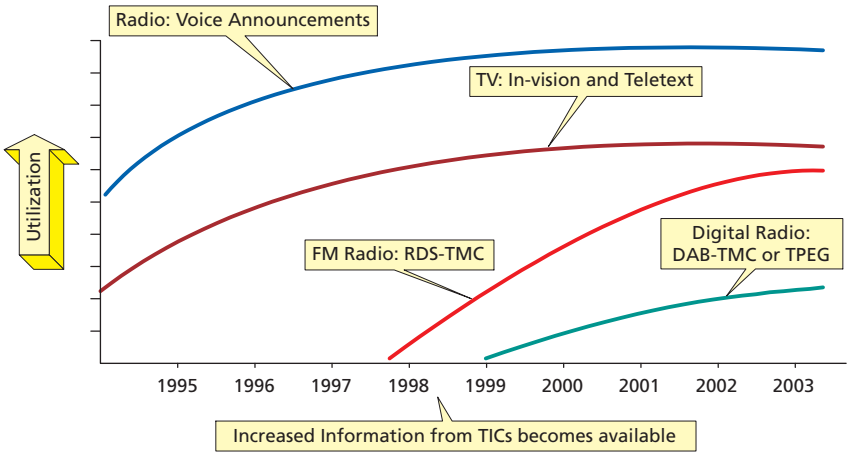

Figure 7
Multi-layered TTI broadcasting approach – what will succeed and when?

The most critical issues that arise from this multi-layered approach are access to information, timeliness and on-air consistency (see *Fig. 7*). Therefore it is vital that public service broadcasters, who provide free-to-air services for the benefit of the

public across many media delivery methods, retain free access to TTI source information. The public broadcasters are willing to deploy considerable effort to ensure that, within their full service offerings, there is on-air consistency for the benefit of the whole community.

The EC-funded and EBU-led EPISODE Project (1996-1998) conducted a detailed survey of these issues and informed all parties concerned about the integration of RDS-TMC into live broadcast systems. There was a need for commonly-agreed broadcast systems and methodologies: the European standards for (i) RDS-TMC (the transmission protocol, the event list in the relevant European languages and the data format for location coding), and (ii) the DATEX Data Dictionary (for message exchanges between the traffic information centres and the service providers) are now being implemented widely [7]. Once in place, this will lead to economic equipment supply, speedier installations and, therefore, more efficient and quicker European expansion of TTI services. The EPISODE project used many fora to inform the broadcast sector about these issues and this culminated, at the EBU 1998 EuroTravel Conference, in a number of Resolutions that were adopted, being highly relevant to the implementation issues of RDS-TMC. These are shown in *Panel 2*.

Panel 2
EBU EuroTravel '98 Resolutions

RDS-TMC In-vehicle receivers:

- Must provide *all* the European languages or easily understood icons;
- Must be designed for easy and safe use by the driver;
- Must have dual front-end tuners, to allow RDS-TMC functionality as well as radio listening;
- Should become normal integrated equipment in *all* vehicles.

Location coding:

- Location-code tables should be held and maintained by a publicly-funded organization;
- Regular updates should be easily available to the end-user;
- This data should be freely available for service providers both nationally and internationally.

TTI services:

- Since there are many sources of TTI data (e.g. automatic sensors, driver reports, etc.) it is necessary that editorial control is with the service provider;
- This will ensure coherent, high quality messages;
- Since TTI services are a high priority for the public, it is important for broadcasters to use all possible means of delivery.

Awareness:

- Individual product and service advertising will not create a mass public awareness of the benefits of RDS-TMC;
- When RDS-TMC services are implemented, it is vital that national advertising campaigns are created to inform the public. In order to facilitate this critical step, both ECMT and National support will be necessary;
- In addition, it is vital that all car manufacturers are encouraged to offer RDS-TMC receivers as normal equipment in *all* vehicles.

TTI future:

- It is recognized that multi-modal TTI services require higher capacity than RDS-TMC can provide;
- Therefore, in the future, developments of enhanced TTI services will need to be supplemented by higher data-rate carriers;
- The development of TPEG will facilitate many applications to the advantage of users.

Information Society:

- The EC 5th Framework programme offers opportunities for many new developments, and European commitment to Information Society Technology. All partners should work together to explore this initiative for the benefit of all travellers in Europe.

The lack of RDS-TMC receivers that support language options remained an issue of major concern during the EPISODE project period. Despite developing considerable awareness, no signi-ficant improvement was observed; however there are now indications that new companies are interested in joining those who were originally involved in the RDS-TMC technology development, in order to design and sell innovative RDS-TMC products to the market. Nevertheless it will take at least another two to three years before large volume sales are seen.

6. Why the new TPEG protocols are needed

The EBU recognizes all these developments and, in order to prepare for the use of data transmission systems that have a significantly higher data transmission capacity than RDS, it now seeks to develop a bearer-independent TTI delivery technology which builds on the infrastructures now being built for RDS-TMC implementation. However, this new technology will enable greatly-extended TTI services to be implemented that are not technically feasible within RDS-TMC, given the fact that this system has to operate within the data capacity constraints imposed by RDS. The technology envisaged is one for a near-universal protocol. This is important, both from an end-user's viewpoint and from a service provider's need to deliver services via one or more delivery technologies as the multimedia age develops and which will in most cases include RDS-TMC.

As a result, in 1997 the EBU established the B/TPEG Project Group, with wide sectorial interests, including broadcasters, consumer electronics manufacturers, digital mapping companies, service providers and transmission operators. Reminiscent of other technologies which seek bearer independence and universal applicability, the name "Transport Protocol Experts Group" (TPEG) was derived. The Vision of this Project Group is: *"to develop a new protocol for Traffic and Travel Information, for use in the multi-media broadcasting environment. This will include applications, service and transport features which will enable travel-related messages to be coded, decoded, filtered and understood both by humans (visually and/or audibly) and by agent systems."*

The TPEG specifications comprise a number of parts which define mechanisms that permit service providers to operate services using one or more delivery technologies (e.g. DAB, internet, etc.) with <u>one</u> message-generation process. Furthermore, they will allow a range of receiver types to be used *simultaneously*, ranging from sophisticated agent receivers that serve navigation systems, through to simple receivers (e.g. perhaps a PDA with plug-in radio receiver / decoder card) that are only able to decode top-level information.

The highest priority for the Project Group was to develop the first (end-user oriented) application for road traffic messages, together with the core protocol, network and services layers. The Road Traffic Messages application [8] is modelled on experience gained from RDS-TMC and uses a deconstruct of the DATEX Data Dictionary to ensure that much of the prior knowledge regarding such TTI services is reflected in this application [7][9].

The TPEG specifications are being designed to allow an existing service provider (e.g. RDS-TMC) to migrate towards the multimedia age by employing the TPEG specifications to achieve the deliv-

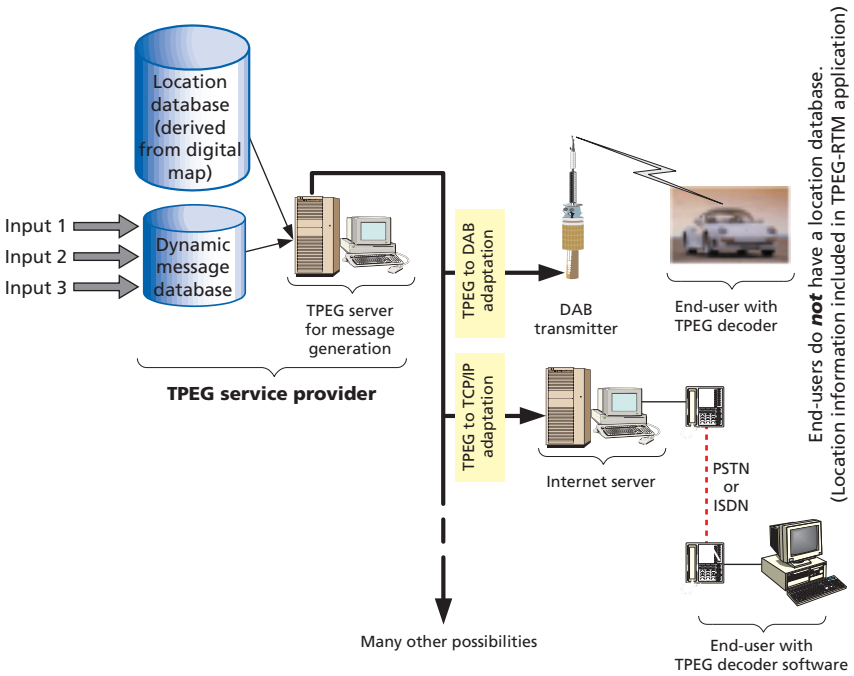

Figure 8
The TPEG protocol allows a service provider to deliver services simultaneously to a variety of end-user situations.

ery of *several* services, yet only undertake a single message generation process, and be able to offer services for significantly different end-user situations, as shown in *Fig. 8.* One key objective is to free the end-user from the need to initially have a location database on a smart card or CD-ROM – *before* using a service.

The first draft specifications were completed at the end of 1998. The BBC, in the UK, implemented these immediately (in early 1999) as a pilot service, with test transmissions on their national DAB multiplex and on the Internet. This will allow engineering evaluations of the Road Traffic Message application to be undertaken in the UK *and* world-wide via the Internet, for the benefit of professional developers.

The TPEG Project Group is actively co-operating with other organizations, such as WorldDAB, the DVB Forum, the RDS Forum, the TMC Forum and the DARC (DAta Radio Channel) Forum, in order to evaluate the experience gained by these fora with TPEG implementations and then, where necessary, to develop suitable Adaptation Layers (see *Fig. 9*) in conjunction with them. With its sound knowledge of their market interests, other TPEG applications are already planned by the B/TPEG Project Group; in particular, applications needed by the multi-modal urban traveller of the future, such as Public Transport Information, and Status and Travel-time Information.

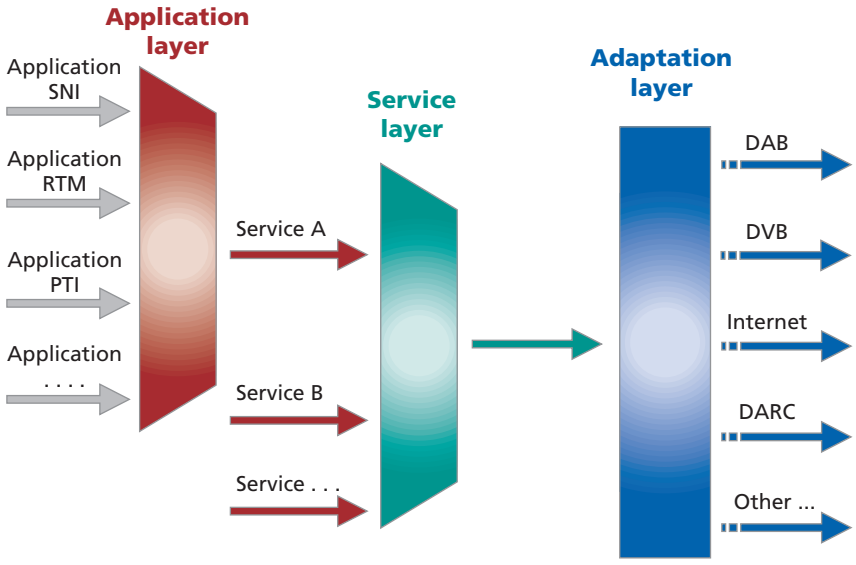

Figure 9
The TPEG protocol allows applications (e.g. TPEG-RTM and TPEG-PTI) and services to be multiplexed onto several potential bearers (e.g. DAB, DVB-T, DARC or the Internet) via suitable adaptations.

It is the EBU's intention that it will continue to fully support the TPEG specifications work, which is likely to be ongoing during 1999/2000. The first draft specifications, completed at the end of 1998, were submitted to an internal peer review over the first quarter of 1999, with the intention to then submit them to CEN TC 278 WG 4 (concerned with the development of standards for telematics in the road traffic and transport sector) for formalizing as a European pre-standard. Meanwhile, the B/TPEG Project Group has formally been accepted by CEN as their Project Group 4.7, thereby allowing a single more efficient development path.

Continued dialogue with all the value- chain participants is seen as a key requirement to ensuring that TPEG-based products are successfully brought to the market.

7. DAB-TMC: Why not?

An increased emphasis on public transport information may be anticipated, so the significance of the TTI content will move more towards multi-modal journeys, combining private and public transport. As urban congestion is still expected to increase, so too will the need for

better pre-trip planning become more important, particularly in the case of multi-modal journeys.

Thus a more diverse market for TTI will emerge. Examples will include:

- ⇨ one-to-one information, where the service provider offers high value personal information, e.g. via a GSM network;
- ⇨ high data-rate information to update a navigation system to certain subscribers;
- ⇨ Internet-delivered TTI services, especially oriented to pre-trip planning, with the possibility of download information.

However, the large majority of road users can only be reached *economically* through a wide range of on-air TTI broadcast services, delivering real-time information to a whole range of receiver types – from portable radios and car receivers to home radio receivers and fixed terminals, operating via various delivery technologies.

RDS-TMC is not able to fully provide multi-modal information and relies on proprietary location databases at the receiving terminal, which tends to create some barriers to a pan-European service. Nevertheless, since RDS is fully implemented on the public broadcasters' national FM networks, RDS-TMC represents – at least for the present – the most economic solution for offering a TTI data service to end-users who, of course, will need a new RDS-TMC receiver equipped with the special location databases that these receivers require. This has the drawback that it is not easy to maintain the updating of these location-code databases from the end-users' viewpoint.

In many debates about the future of broadcasting, arguments about the choice of delivery technologies threaten to overwhelm the much more important issue of content provision. This also seems to be true in the case of RDS-TMC and DAB. In practice, the collection of TTI data and its subsequent processing is far more complicated and expensive than the final part of distributing it to the public. In essence, there is no direct conflict between the provision of TTI data services on RDS-TMC and on DAB.

Abbreviations

CEN	*Comité Européen de Normalisation*
EC	European Commission
EU	European Union
DAB	Digital Audio Broadcasting
DVB	Digital Video Broadcasting
DVB-T	DVB - Terrestrial
ETSI	European Telecommunication Standards Institute
FM	Frequency modulation
GSM	Global system for mobile communications
OEM	Original equipment manufacturer
PDA	Personal digital assistant
RDS	Radio Data System
RDS-TMC	RDS - Traffic Message Channel
TIC	Traffic information centre
TPEG	Transport Protocol Experts Group
TPEG-PTI	TPEG - Public Transport Information
TPEG-RTM	TPEG - Road Traffic Message
TPEG-SNI	TPEG - Service and Network Information
TTI	Traffic and travel information
UMTS	Universal mobile telecommunicaton system

The infrastructure required by service providers for the handling of RDS-TMC data will also meet the needs of future services, such as TPEG on DAB. This can be seen in *Fig. 10* which shows the basic elements of an existing RDS-TMC "system". It is essentially the same as that shown in *Fig. 8*.

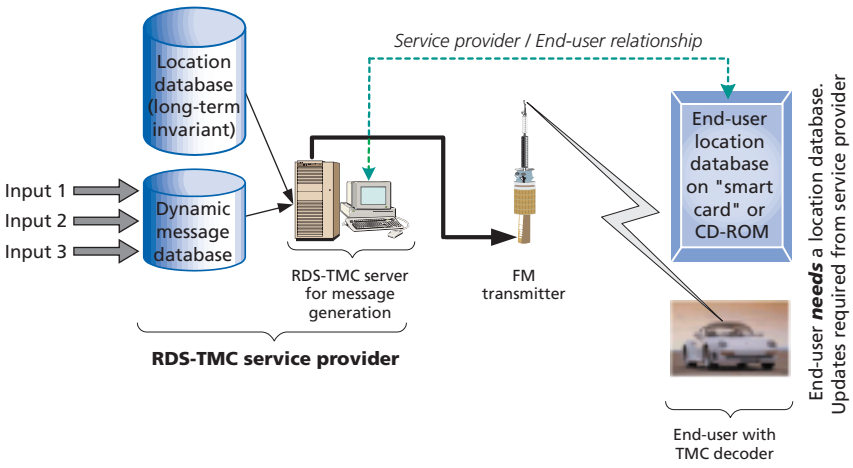

Figure 10
An RDS-TMC "system" has many common features for the service provider who wishes to deploy TPEG services.

TPEG-RTM has focused on Road Traffic Messages derived from DATEX and RDS-TMC. It is clear that further service requirements – such as Public Transport Information, and Status and Travel-time Information – still need to be developed within the TPEG suite. There is also a strong European political desire for these services.

DAB services are only beginning to be deployed throughout Europe but now, in most cases, their coverage is still focused on city populations and it will be many years (at least five to ten) before all of the Trans European Road Network is covered. Thus TPEG-RTM has a time window for validation, for consensus building with industry and for standardization, before market maturity is achieved. Therefore it does not threaten RDS-TMC.

Some consumer electronics manufacturers who are instrumental in RDS-TMC development are now lobbying very forcibly to use this time window for RDS-TMC services to be carried in DAB transmissions. This is in conflict with the vision of the public broadcasters within the EBU that had previously recommended "*that DAB TTI services should be implemented as soon as possible using TPEG protocols rather than the protocols developed for RDS-TMC*".

DAB transmissions will offer city and metropolitan area coverage relatively soon. Therefore it is also recommended that the TPEG applications – Public Transport Information, and Status and Travel-time Information – are developed soon with high priority. These will then give broadcasters the ability to provide significantly enhanced multi-modal TTI services, which "leverage" the digital broadcast services.

Since "DAB-TMC" services would only inherit the limitations of RDS-TMC, they can no longer – in the light of the enhanced TTI services that DAB-TPEG will offer – be recommended for implementation.

8. Demonstrating and evaluating TPEG

Under the 5th Framework of the European Union's new programme for technology research and development, launched in March 1999, there are a number of action lines that may usefully be employed for further evaluation and demonstration of the upcoming TPEG specifications. The opportunity to participate is just another occasion to reach even more consensus at

a European scale for the objectives of the TPEG project pursued in the EBU. Examples from this new EU work programme that could relate to TPEG evaluation and verification are:

- ⇨ improving the accessibility, relevance and quality of public services;
- ⇨ encouraging a spirit of "design-for-all";
- ⇨ integration and convergence across the information-processing, communications and media sectors.

Specifically in the area of Transport & Tourism, the open TPEG-protocol applications offer attractive new possibilities because they are bearer-independent and will offer single multi-modal TTI message generation to multiple existing bearers, also facilitating cross border use.

TPEG applications could thus usefully be demonstrated and evaluated in this particular context, and within a new project consortium formed to undertake these tasks under EBU leadership. Such work will also show how the existing TTI broadcast infrastructures may be adapted to support a language-independent TPEG-RTM appli-cation which can then serve the widest range of end-user products wherever the end-user may be, and which would aid and speed up the standardization process – feeding back results to CEN, by developing a "service chain toolkit".

Such a new project will also contribute to the creation of immediate market opportunities for enhanced pan-European TTI services and products from the extensible, emergent TPEG-protocol capability.

9. Conclusions

European public broadcasters see Traffic and Travel Information broadcasting as a significant part of their complete portfolio of programme and information services; they recognize that TTI services are expected from them – as part of their public-service remit – and they wish, most emphatically, to continue in this role. Thus we can expect the continuation of TTI broadcasting via existing delivery mechanisms, such as spoken radio services, TV, teletext, the Internet and RDS-TMC. Additionally, many broadcasters – especially those collaborating within the EBU – are already developing new services and using new delivery technologies to provide accurate and timely information about multi-modal events, such as road accidents, roadworks, and bus and train operations. New ways of conveying such significantly-enhanced services are just around the corner, e.g. the Internet, DAB and DVB. All of these will fit directly into the broadcasters' remit and, with certainty, TTI data broadcasting will play an increasingly significant role, giving Europe better, more widespread, and easily accessible TTI services. These services should remain available free of charge to the public.

Given the strong political drive for the development of TTI, delivered to a very large number of users in Europe through RDS-TMC, the infrastructure to support this is gathering pace and will become very widespread in the next few years.

It is also recognized that there will be many additional opportunities for paid-for value-added services, such as information about local hotels, restaurants or status-oriented urban traffic information services. Already the potential impact of the GSM network has been realized and various commercial service providers are beginning to offer their services. However, some will be relatively expensive (being call-charge based) and their widespread market penetration is not necessarily guaranteed.

The EBU's relatively new TPEG activity has already clearly identified the benefits and value of RDS-TMC, together with its limitations. TPEG is firmly aimed at the upcoming multimedia broadcasting environment. Progress in the TPEG development has been very fast. There is already a clearly identified need to start, as soon as possible, a European TPEG Project with the aim of gaining and exchanging initial operational experience that is much needed to support the upcoming process of TPEG standardization.

Long-term forecasts in the consumer market environment are notoriously difficult to make, but certainly TTI is here to stay (see *Fig. 11*). Europe will not solve its road traffic problems in a decade, so TTI will still be a significant factor, especially to promote better safety. A gradual upgrading to Public Transport Information may be anticipated, so emphasis on the TTI content will move more towards multi-modal journeys. As urban congestion is still expected to increase, so too will the need for better pre-trip planning become increasingly more important, to learn how best to undertake a multi-modal journey. Furthermore, rural journeys – with increased car ownership – will require more TTI to assist the users. Thus a more diverse market for TTI will emerge.

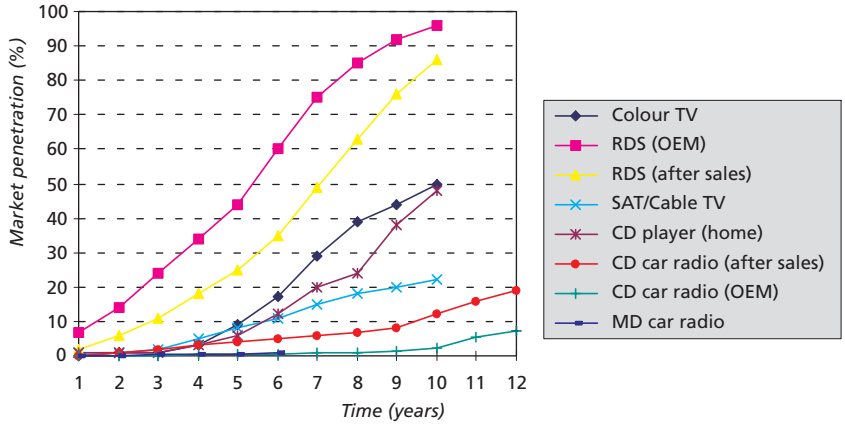

Figure 11
Market penetration over time for various new technologies.
(Source: Bosch)

However, the large majority of road users can only be *economically* reached through a wide range of on-air TTI *broadcast* services, delivering real-time information to a whole range of receiver types, from "walkman radios" and car receivers, to home receivers – operating via various delivery technologies.

The well-developed infrastructures of the public service broadcasters should have no difficulty in supporting such an important European objective.

Bibliography

[1] **RDS-TMC: What is it all about?**
EBU Publication, November 1998.

[2] ENV 12313-1: **Traffic and Traveller Information – Part 1: Coding Protocol for RDS-TMC using ALERT-C**
CEN, July 1998.

[3] EN 50067: **Specification of the radio data system (RDS) for VHF/FM sound broadcasting in the frequency range from 87.5 to 108.0 MHz**
ETSI, April 1998.

[4] ERTICO Newsletter No. 3/1999.

Relevant web sites

http://www.alert-tmc.com
http://www.bbc.co.uk/rd/projects/tpeg
http://www.dvb.org
http://www.ebu.ch
http://www.ebu.ch/bmc/bmc_btpeg.htm
http://www.ertico.com
http://www.etsi.fr
http://www.gatsforum.com
http://www.nokia.com
http://www.rds.org.uk/episode
http://www.worlddab.org

Dietmar Kopitz *studied Telecommunications at the Technical University of Berlin (Germany) and first worked for Sender Freies Berlin, in the field of computer-controlled production equipment. In 1971 he joined the EBU. Since then he has, among many other things, co-ordinated all RDS development work within the EBU, participating in writing specifications, the elaboration of the implementation guidelines and the European and US standardization processes. He was a founder of the RDS Forum and presently is its Chief Executive Officer. In the field of RDS-TMC, he led the European Commission's EPISODE Project.*

For many years, Mr Kopitz has co-ordinated all the technical questions relating to broadcast traffic and travel information services that involve the Radio Committee of the EBU. In this function, he has established very good links between the EBU and many international organizations such as the EC, the ECMT and ERTICO, as well as with the industry concerned.

Because TPEG technology is being developed through the EBU, Dietmar Kopitz leads the B/TPEG Project Office, and also co-ordinates the EBU's new TTI Strategy Task Force. Presently, he is preparing a new EC project which, within a consortium formed by broadcasters and industry partners, aims at testing and validating the TPEG technology on a number of different bearers such as DAB, DVB-T and the Internet.

Bev Marks *trained at the BBC and qualified as a broadcast and communications engineer in 1968. He pursued a varied career with the BBC, in both radio and television engineering, and now works as a freelance broadcast engineer, specializing in DAB, RDS and TTI matters.*

Over the last three years, Mr Marks worked as a broadcast systems expert – in the field of Traffic and Travel Information – for the EPISODE Project, which was funded by the EC and undertaken by the EBU as a support measure for finalizing RDS-TMC developments. During that time, he specialized in the broadcast issues of RDS-TMC standardization, and represented the sector in CEN TC 278 WG 4.

For a number of years, Bev Marks has also brought his expert knowledge to the RDS Forum and the WorldDAB Forum. In this capacity, he has been (and still is) involved in a wide range of inter-related TTI and standardization issues, particularly in assisting co-ordination between these different broadcast systems. He is presently deployed by the EBU in a secretariat role for the B/TPEG Project Group, which is actively developing new TTI protocols in collaboration with CEN TC 278 WG 4.

[5] D. Kopitz and B. Marks: **RDS: The Radio Data System**
Artech House Publishers, 1998, ISBN 0-89006-744-9.

[6] J. Walker (Editor): **Advances in Mobile Information Systems**
Artech House Publishers, 1999, ISBN 0-89006-951-4.

[7] prENV 00278091: **Road Transport and Traffic Telematics, DATEX Traffic and Travel Data Dictionary, Version 3.1a**
CEN, March 1999.

[8] TPEG Specification – Part 4: **Road Traffic Message Application, Version 1.1**.

[9] TPEG Specification – Part 2: **Syntax, Semantics and Framing Structure, Version 1.1**.