Public transport information via TPEG - CEN Standard review

Contents

1 Introduction

This report is the second deliverable from a small study to review the draft CEN standard for the provision of Public Transport Information using TPEG.

TPEG is a protocol that has been developed to enable the broadcast of Traffic and Travel information by DAB (Digital Audio Broadcast) radio broadcasts. The development of the standard has been sponsored by the European Broadcasting Union (EBU) and the BBC has been a major contributor to the development of the standard.

The objectives and activities for the study as a whole were:

- to review the Specification for consistency and clarity, and against understood UK needs;
- to review it against ITSO/CEN approaches;
- to detail problems and inconsistencies; and
- to present a review report of the specification, to enable the DTLR to make a UK response (to CEN via BSI) by 18 April 2002.

The specific objectives for this second deliverable are to consider the implications for the Transport Direct programme and to consider the implications for the UK as a whole.

Following this introduction, the rest of the report is structured around 5 principle sections which address the following topics:

(a) A short overview of TPEG, highlighting distinctive features when compared with other Public Transport Information applications.
(b) A review of the TPEG specification with respect to handling various types of Public Transport Information.
(c) The relationship between the TPEG standard and other standards.
(d) TPEG as a service and potential issues with the delivery of the service.
(e) Conclusions.

Annex A lists useful descriptive and technical reference documents on TPEG and the standard.

2 TPEG Overview

2.1 About TPEG

TPEG is an important part in the strategy of the European Broadcasting Union (EBU) for the reasons that it facilitates language independent traffic and travel information to be broadcast to consumer Digital Audio Broadcast (DAB) radio receivers.

DAB is proposed to be the next step in radio broadcasting from current FM radio services. In recent years the RDS data channel was added to FM radio channels enabling: radio station names to be displayed, car radio receivers to be automatically retuned as the vehicle moves out of range of the transmitter, and other basic functions. The RDS-TMC data protocols were developed as part of the EU DRIVE programme to enable the spare capacity in the RDS data channel to be used for the broadcast of substantial volumes of traffic and travel information. When compared to normal travel information bulletins broadcast as part of the radio programme content, the aim of RDS-TMC was to provide more relevant information to drivers, through filtering in the radio receiver and in a more timely manner, by not having to wait for the travel information bulletins.

TPEG will essentially be the DAB equivalent of RDS-TMC. However since DAB can broadcast higher data rates, TPEG has been designed to be more flexible than RDS-TMC.

The purpose of the TPEG suite of standards is to define data communication protocols for the broadcast of traffic and travel information primarily by the DAB radio data channels. The TPEG standards therefore cover the data formats and protocols required for sending the traffic and travel information to the broadcaster and the protocols required for broadcasting this to the end users (general public) by DAB radio.

Forthcoming XML work based on the TPEG applications is seen as an excellent tool for broadcasters to extend the range of the delivery platforms for their information.

2.2 Distinctive Features of TPEG

The concept of "broadcasting" traffic and travel information over limited communications bandwidth primarily to DAB radio receivers, means that the TPEG standards have some characteristics that are distinct from other standards that are being used in the public transport information field. These distinct characteristics are summarised below:

- The standard is specifically designed for communicating with end users via radio broadcasters, or other information broadcasters;
- Public transport information is only one type of information that is covered. TPEG has been primarily designed for the broadcast of road traffic information, weather information, etc., as a high proportion of radio receivers capable of decoding TPEG will be installed in cars;
- The flow of data is mono-directional, with no selectivity of what is sent (any selections are made after the data has been received by the end user equipment);
- Due to the limited communications bandwidths available for radio broadcast, the message structures are designed to efficiently handle messages that describe "events", or exceptions to normal operation. They are not designed to be efficient at broadcasting bulk data such as Public transport service timetables;

- TPEG uses a sophisticated location referencing system. This uses longitude/latitude coordinates (based on the WGS84 standard), text descriptions and includes relationships between locations, to support multimodal interchanges;
- The TPEG messages include information on when and where the messages should be broadcast (for example a message could be broadcast to TPEG users only in Leeds for a period of 30 minutes); and
- TPEG is coded wherever possible to be language independent, enabling messages to be interpreted in any language selectable by the user.

3 Content of the TPEG Public Transport Information Standard

3.1 Introduction

This section of the report describes the findings of the review that were specific to the TPEG standard and its handling of public transport information. The review for this section of the report specifically addresses TPEG in the context of the application for which it is intended, which is the broadcast of public transport information to the general public.

The relationships between the TPEG standard and other standards are reported on in subsequent sections.

3.2 Review Results

The data structure used by TPEG is based around the concept of using one message to describe an "event" in real time. A simplified specific example of coding a railway departure board message for a service departing from London Victoria station is as follows:

- Message location relates to London Victoria Mainline Railway Station
- The 11:31 am South Central service to Horsham is delayed due to signal problem
- Estimated departure time 11:40
- Calling at: Clapham Junction, Balham, Mitcham Junction, Hackbridge, Carshalton, Sutton (Surrey), Cheam, Ewell East, Epsom, Ashtead, Leatherhead, Boxhill & Westhumble, Dorking, Holmwood, Ockley, Warnham, Horsham
- Message validity 18/4/02, 11:30 to 11:45

From the above example it can be seen that Railway station departure boards can readily be described using one message per service. The message control parts of the message enable messages to be subsequently updated as well as setting priorities and validity periods.

In the above example the message has been structured in the form of a "Station View". TPEG is flexible on how messages are structured and how they are interpreted by the receiving application. Section 8.2 of the Standard gives examples of other Views such as: Incident Report; Route View and Service View.

TPEG public transport information is designed to be multimodal, including water, road, rail, air and numerous specific types of these. The review process highlighted several additional types of Bus, as well as Commuter Coaches and River Bus. Details of these and the other review comments can be found in Annex B. Additional types of public transport service can be added relatively easily within the coding scheme.

The wide range of data element types and the flexibility in message structuring make TPEG capable of dealing with a fairly comprehensive set of public transport information data categories, which are summarised in the table below:

public transport information data category	*Addressed by TPEG*
Public transport stops and interchanges	Yes
Location referencing and hierarchies	Yes

Timetable data	Yes
Fares and Ticketing	Limited
Real Time quantitative service operations information (e.g. location of buses, estimated arrival times at bus stops)	Yes
Event and disruption information	Yes

The Capabilities of TPEG to handle each of the above data categories is discussed in more detail below.

3.2.1 Public transport stops and interchanges and location referencing

TPEG includes a sophisticated location referencing scheme allowing nodes (points), links (lines), and areas to be identified, geo-located, described and related to each other.

The location referencing has been designed to allow actual bus stops and station platforms to be coded along with clusters of these in the form of bus and railway stations, etc. Similarly these can all be interrelated to identify complex multimodal interchanges, such as London Victoria and Heathrow Airport.

The coordinate system used by TPEG is the WGS84 spheroid. This has been chosen as it is currently the most commonly used standard that is applicable world wide.

With TPEG locations, the location coordinates are used as part of the location reference identifier. In other words the identical coordinates must be used in all messages to identify the same location/entity.

The review concluded that the TPEG specification could adequately identify, locate and interrelate public transport stops and interchanges. The generation of TPEG location references is not however considered to be a trivial task, and it is strongly recommended that WGS84 format coordinates are stored in the master databases for location references (e.g. NaPTAN).

3.2.2 Event and disruption information

In the UK public transport industry at the moment, most event and disruption information that is available is generally recorded and exchanged using "free format text" descriptions. TPEG provides a specification for replacing free text messages, with language independently coded and structured messages.

The review did not find any significant issues with the event information, other than recommending the addition of further event descriptors, e.g. road works.

3.2.3 Timetable data

The TPEG standard includes the ability to encode entire timetables, however since TPEG is designed for the encoding event and exception information, the data structures are not particularly efficient at handling bulk data.

The review concluded that most of the data elements required for timetables were already included within the standard. However further data types were needed to describe the frequencies of services more precisely. These included:

- Splitting weekdays into Monday to Friday and Monday to Sunday;
- Addressing services with a monthly periodicity. E.g. the service runs on the second Friday of the calendar month;
- Holiday needs to be qualified to mean statutory public holiday (e.g. New years day) as distinct from a longer more general holiday season or period
- A school days, type needs to be included to cover services that only run during school term time.

3.2.4 Real Time quantitative service operations information (e.g. location of buses, estimated arrival times at bus stops)

The TPEG Standard includes comprehensive capabilities for coding information that is typically displayed on rail platform departure screen, concourse display panels and bus stops. The review found no deficiencies in the ability of the TPEG standard to handle real time and time tabled information for display to travellers at the point of departure/arrival of the service, or through other media such as broadcast radio, the internet, etc.

The TPEG Standard does not include any capabilities to carry raw data on actual vehicle locations, as this information is typically processed by the central computer system before being broadcast to the public in the form of an estimated arrival/departure time.

3.2.5 Fares and Ticketing

The TPEG Standard includes only limited information on Fares and Ticketing. More specifically the information is limited to ticket restrictions and booking status. The examples of the way this information is envisaged as being used are to indicate that a flight is full, or that only full fare tickets are valid on the rail service.

Two specific issues were identified as part of the review. The first was that booking status did not differentiate between whether booking in advance is mandatory, optional or not available. The second was that a ticketing restriction of "not via" would be useful.

This whole area of fares and ticketing in the standard is relatively week. As such it is a potential area for further development, should there be a need for it.

4 The TPEG Relationship with Other Standards and Initiatives

4.1 Introduction

This section of the report assesses the TPEG standard in the context of other related CEN standards, and also UK specific standards and initiatives.

The word "standard" is used to encompass formal, informal and de-facto standards.

4.2 The Problem with Standards

In an ideal world all standards would fit together perfectly like a jigsaw puzzle. They would use the same terminology, the same data elements and structures and be fully interoperable with each other. In practice this does not happen, with even in the best cases only groups of specifications for a specific application/service being interoperable, for example the sets of specifications for DAB and TPEG.

Some specific practical issues with standards that need to be remembered when comparing standards are:

- Having a standard doesn't guarantee it will be used;
- There can be more than one standard for the same thing (VHS vs BETAMAX), with the market left to fight it out;
- Standards are sometimes quoted/implemented in spirit rather than to the letter. The ISO OSI 7 layer communications model is a good example;
- The formally released standard is often out of date compared to what is being used;
- When the drafting of a new standard is started, it often uses other standards as references, developing something "better" and incompatible with the reference standards;
- Although a standard may contain all the principle data elements needed for the basic application, the constraints of the way an application is implemented, or the constraints of the communications network may mean that the standard is unusable and consequently another standard is developed.

4.3 The TPEG Standard's Relationship with Other CEN TC278 Standards

CEN TC278 is responsible for the development of European standards in the Transport Telematics field. Much of this work is being undertaken jointly or coordinated with other standards committees and bodies e.g. ISO TC204.

The work within CEN TC278 is sub-divided between a number of Working Groups (WGs). The WGs of relevance to public transport information are as follows:

Working Group	*Responsibilities*	*Standards*
3	Public Transport	Transmodel
4	Traffic and Traveller Information	RDS-TMC, TPEG
7	Geographic Databases	Location Referencing
8	Databases	DATEX

The TPEG standards are being developed within CEN TC278 working group 4 (WG4). WG4 is mandated with the development of communications standards for Traffic and Traveller information, including RDS-TMC, which is in many respects the predecessor to TPEG.

RDS-TMC is a communications standard that was developed to enable traffic and traveller information to be broadcast on FM radio using the spare data capacity in the RDS data channel, which is normally used to send the radio station name and other information to enable car radios to switch station as the vehicles moves from one transmitter region to another.

RDS-TMC services are now available in the UK, with the data being transmitted by commercial radio stations and currently a very limited number of In-vehicle navigation systems being able to decode and use the data (e.g. the Toyota Avensis).

RDS-TMC is designed to enable traffic and traveller "event" and "exception" information to be broadcast to users. The RDS-TMC messages only contain "codes", which can be interpreted through databases in the users' receiving equipment, to convert them to text in the users own language, and to obtain the coordinates or descriptions of the location of the events.

The "codes" for describing the events were developed in conjunction with WG8 which is responsible for DATEX. The DATEX Data Dictionary is one of the most significant standards to have emerged from TC278. The DATEX Data Dictionary in concept defines phrases, which can be put together to create messages describing traffic and travel events (e.g. accident due to oil spill on southbound carriageway, one lane open, ambulance in attendance.). This data dictionary has subsequently been fed into the DTLR UTMC programme and Highways Agency TIH project.

The location referencing for RDS-TMC was developed in conjunction with WG7, who were responsible for developing the Geographic Data File (GDF) standards and location referencing standards for transport telematics. As far as RDS TMC is concerned, only a location code is broadcast over the radio. This code must then be decoded within the receiving device in order to convert it into for example an icon on a map, or into a human readable description of the location, etc.

TPEG is essentially a development of RDS TMC, designed to make it more flexible and manageable in the light of greater bandwidth being available via DAB. The main developments from the RDS-TMC approach are:

- TPEG locations are not coded and no longer require a database in the receiving equipment to decode them.
- Free text can be included in messages e.g. location names and other names.
- The TPEG event codes/descriptions are different to those in DATEX. In principle the TPEG event codes are word based compared with the phrase based approach of DATEX/RDS-TMC. The TPEG team state that they are comparing the TPEG coding with the DATEX coding with the aim of validating that DATEX messages can be converted into TPEG messages.

It should be noted that like TPEG, the main focus of the DATEX and RDS-TMC developments has been driver information, particularly for handling event based information on the road network e.g. road works, accidents, adverse weather.

The other CEN TC278 standard of relevance to TPEG is Transmodel which has been developed under WG3. This is the most comprehensive CEN TC278 standard related to public transport. However Transmodel does not cover Real-Time information and event information in any detail. Consequently there is relatively little overlap with the TPEG standards. See the Curtis+Cartwright report for DTLR dated 10 December 2001 for further details on Transmodel.

4.4 NaPTAN

The DTLR draft proposals for the National Public Transport Access Nodes (NaPTAN) Database were reviewed to determine whether it would contain all the appropriate information that would be required to support information systems using TPEG or similar approaches. At the same time the TPEG location referencing methodology was reviewed to check its appropriateness for handling public transport locations, including the clustering of stops/bays/platforms and multimodal interchanges.

Three principle issues were identified for consideration as part of the NaPTAN standard development, and these were fed back into the NaPTAN consultation process. The comments raised and how they were incorporated into the finalised version of NaPTAN are summarised below:

- Will location clustering information be included within NaPTAN? While TransXChange will handle this for exchanging service descriptions, it would however be very useful for information systems such as TPEG, if NaPTAN holds the definitive source of clustering and interchange related information. More specifically NaPTAN should include clustering information that will enable bus stops, bus stations and railway platforms to be clustered together to form bus stop pairs, bus stations and railway stations respectively. Similarly interchange information is required between nearby facilities (e.g. Victoria has a railway station, bus station, metro station, coach station and numerous on street bus/coach stops all within walking distance of each other). The finalised version of NaPTAN makes provision for clustering information to be held in NaPTAN but only in respect of "identifiable entities" such as bus stations, ferry terminals or railway stations with multiple entrances. There is no technical reason why the clustering arrangements proposed for such entities could not be applied to the much smaller clusters of bus stop pairs, etc. However the current judgement is that this is not necessary for NaPTAN, instead it is information that is expected to be held (where needed) in local database and journey planning systems.
- With regard to pairs of bus stops (one on either side of the road), it is necessary to be able to differentiate which is for which direction of travel. This is necessary both for bus service providers registering their services and the provision of information to the public using TPEG. When a bus service provider is creating the service registration it is important that they register the service as passing the stop on the correct side of the road for the direction of travel. This may not necessarily be obvious, from a text description e.g. "opposite Boots", if the person creating the registration doesn't know where Boots is. The same problem exists in providing Real-time Countdown style passenger information using TPEG, as the user will generally only be interested in one direction of travel.). The finalised version of NaPTAN makes provision for the direction of a stop to be included using an 8 point compass code, e.g. North West
- TPEG uses WGS84 longitude/latitude coordinates, both as the coordinate system and as the location ID code. The WGS84 standard is applicable world wide, enabling our EU neighbours to interpret the data and for "international systems/products" to use a common coordinate system. It would therefore be useful if NAPTAN could hold WGS84

coordinates, both to provide a definitive TPEG location ID code and to provide an internationally accepted universal grid reference, assisting information systems such as TPEG/DAB. NAPTAN could also include support for multiple local grids, enabling support for the Irish Grid as well as the British National Grid. In addition it would be sensible for NaPTAN to hold the definitive TPEG Location Container contents for each entry. The finalised version of NaPTAN adopted the view that data collection locally and uploaded to NaPTAN should be in relevant local grid coordinates (OSGR or Irish as relevant). However it would be possible at the national level to apply the relevant conversion to these grid references in order to hold WGS84 transformation data in addition to the source grid references.

The location referencing system used by TPEG is quite sophisticated enabling relationships between places to be handles, as well as point, line and area locations to be described. The review concluded that the location referencing used by TPEG, was more than adequate for the provision of public transport information using TPEG messages. However much care will still need to be taken in generating the location references for TPEG messages, due to the traps and pitfalls associated with coordinate conversion, stop clustering and multimodal interchanges.

4.5 TransXChange

TransXChange is being developed to meet the UK needs for a data exchange format for public transport timetables and service registrations.

The capabilities of TPEG were reviewed relative to TransXChange for handling public transport timetables. No significant issues were found, other than to note that the TPEG message structures are not optimised for the efficient delivery of bulk data such as timetables. TPEG does not include the necessary data field for exchanging service registration details, but this is not relevant for public information broadcast anyway.

In conclusion TPEG should not be considered as a substitute for TransXChange, but rather it can be considered as a suitable method of broadcasting limited volumes of timetable information to the public.

4.6 TRIDENT

TRIDENT responds to the transport policy need of enabling seamless travel across different modes of transport (bus/tram/metro/rail and road). The project is developing common specifications for sharing and exchanging data between transport and multimodal infrastructure operators, public authorities and service providers through a message-based and object-oriented approach.

Objectives:

- Produce and test draft model and specifications based on a message-based (using DATEX) and object-oriented (using XML) approach throughout Europe
- Obtain CEN approval for both final validated specifications
- Hold TRIDENT Forum workshops organised on user needs and object oriented technologies
- Formulate recommendations to overcome non-technical issues

Duration and Funding:

- 33 months, starting January 2000, co-funded through EU 5th Framework IST Programme

Consortium:

- Prime Contractor: ERTICO
- Partners: Vlaamse Gemeenschap, RATP, METL-CETE Méditerranée
- Others: B+S Ingenieur AG, De Lijn, ATAC, Metro, Mizar mediaservices, MVA, La Poste Suisse, STA, TRITEL

The specifications will be implemented, tested and validated in four sites: Flanders (De Lijn, MVG, Tritel), Paris (RATP), Rome (ATAC, Mizar, STA) and West Yorkshire (Metro and MVA).

The TRIDENT project is developing specifications for multimodal transport data exchange, which is similar to the scope of TPEG particularly when it is developed into an XML version. Essentially this means that the TRIDENT specifications could be regarded as competing with the TPEG standards and TransXChange. As already highlighted, this is not inconsistent with the processes of international standardisation and market competition in standards. It is however an issue if it is considered important that there is only one standard/specification in use for the UK.

4.7 RTIG

The Real Time Information Group is aiming to develop common standards related to the broad application of providing real time passenger information at bus stops.

The Real Time Information Group, National RTPI Strategy document version 1.00c does not currently mention TPEG. Informal discussions with John Mason of the RTIG indicated that they recognise that TPEG could become an important standard, but in what way is not clear as yet.

Much of the focus of the RTIG work has been on standardising the communications interfaces at the radio interface with the on-bus equipment. TPEG is also not particularly relevant to this interface.

TPEG is however directly relevant to the delivery of information to the public for 2 reasons

> (a) Since the BBC plan to implement TPEG, there is an immediate opportunity to deliver real time public transport information to every DAB radio receiver in the UK.
>
> (b) TPEG messages could be adopted as the standard for all communications with bus stop, platform, concourse and other public transport information displays, the BBC DAB radio broadcasts could then be used to update them, or alternatively private communications networks could be used as is currently the case.

With further development TPEG could also be suitable for communicating between the central computers operating real time information systems, facilitating interoperability between neighbouring systems without the need to be interoperable at the vehicle equipment level.

5 Practical TPEG Issues

The success of TPEG as a medium for the broadcast of traffic and travel information in the UK has yet to be proven. This is dependent on a number of factors including:

(a) The availability of information for broadcast, which given that this is available for RDS-TMC services, this should not be a major problem;

(b) The go ahead of DAB radio broadcasts in the UK by the BBC or other broadcasters;

(c) The availability and take-up of DAB radio receivers by the public;

(d) The availability and take-up of equipment capable of decoding and using TPEG messages, and in particular the public transport information content; and,

(e) Competition from other information sources, e.g. the Internet and mobile phone.

In the reviewers opinion it is the last two of these factors in particular that are the most critical. Firstly the competing internet, mobile phone and other products could well be far easier and more convenient to use by the public and more cost effective from a commercial perspective.

Secondly producing products that can decode the public transport TPEG data and present only information that is of interest to the user to them, is not straight forward, and may not make any commercial sense when compared with internet, mobile phone products, especially for use outside of a car. Despite many techniques for filtering and decoding RDS-TMC traffic messages being tested, it is only when RDS-TMC is combined with an In-vehicle navigation system that the filtering can be done with any ease and confidence. As a result there are very few vehicles in the UK fitted with equipment capable of decoding it (i.e. just the Toyota Avensis at the time of writing). While it is reasonable to expect the number of vehicles fitted with equipment capable of decoding RDS-TMC and TPEG traffic messages to increase, this could be a slow process and does not guarantee that equipment will include the ability to select and display public transport information.

6 Conclusions

6.1 The TPEG Standard

TPEG is a protocol that has been developed to enable the language independent broadcast of Traffic and Travel information by DAB (Digital Audio Broadcast) radio. The development of the standard has been sponsored by the European Broadcasting Union (EBU) and the BBC has been a major contributor to the development of the standard.

The review concluded that TPEG is capable of dealing with a comprehensive set of multimodal public transport information data categories, which include:

- Public transport stops and interchanges
- Location referencing and hierarchies
- Timetable data
- Real Time quantitative service operations information (e.g. location of buses, estimated arrival times at bus stops)
- Event and disruption information

Due to the limited communications bandwidths available for radio broadcast, the TPEG message structures are designed to efficiently handle messages that describe "events", or exceptions to normal operation. They are not designed to be efficient at broadcasting bulk data such as Public transport service timetables.

The review process did not find any major issues with the TPEG Standard. A number of editorial and technical comments were made on the standard, the details of which are included in Annex B. The technical comments will need to be incorporated into the standard in order to address some of the finer details of UK bus operations.

The TPEG Standard includes only limited information on Fares and Ticketing. More specifically the information is limited to ticket restrictions and booking status. This is therefore a potential area for further development, however it is not regarded as being essential, or a priority action.

6.2 The Implications for the UK Scene and Transport Direct

The review concluded that TPEG and DAB are powerful technologies for the broadcast of traffic and travel information to the public by radio. It is therefore recommended that Transport Direct generally supports the implementation of TPEG. Some of the main ways in which a member of the public could receive public transport information using TPEG are via:

- An in car navigation unit which as well as providing traffic information, could provide station departure board information, or even multimodal journey planning; and,
- Bus stop display information, where the data sent to the stop has been encoded using TPEG and broadcast to the sign using either a private or public radio network.

The current competition for DAB radio broadcast of public transport information includes the internet and mobile phone technologies. The availability and interactive nature of these technologies may provide a more attractive option for users and service providers for the provision of public transport information.

6.2.1 TPEG Relationship with other Standards

The review concluded that the TPEG Standard was complementary with other public transport information standards that are of relevance to the UK.

The review of the TPEG Standard prompted a number of comments on the proposals for NaPTAN. These were fed into the NaPTAN consultation process and incorporated into the final version of the NaPTAN standard as follows:

- Clustering and interchange information is now included within NaPTAN as this is needed by TPEG and other public transport information applications.
- With regard to pairs of bus stops (one on either side of the road), it is necessary to be able to differentiate which is for which direction of travel. The final version of NaPTAN includes a field for an 8 point compass direction.
- TPEG uses WGS84 coordinates, both as the coordinate system and as the location ID code. It was recommended for NaPTAN to hold the definitive TPEG Location Container contents for each entry. Data transfer to the National database will still include only local coordinates. However it would be possible for the local coordinates to be converted to WGS84 Longitude/Latitude at a National level.

The TRIDENT project is developing specifications for multimodal transport data exchange, which is similar to the scope of TPEG particularly when TPEG is developed into an XML version. Essentially this means that the TRIDENT specifications could be regarded as competing with the TPEG standards and potentially TransXChange. This is not inconsistent with the processes of international standardisation and market competition in standards.

6.2.2 Areas for further work

The Real Time Information Group (RTIG) is aiming to develop common standards related to the broad application of providing real time passenger information at bus stops. It is recommended that the RTIG reviews the potential for TPEG and TRIDENT and that these are included in the National RTPI Strategy.

The review concluded that TPEG has two potential main areas of relevance to the RTIG, which are:

> (a) Since the BBC plan to implement TPEG, there is an immediate opportunity to deliver real time public transport information to every DAB radio receiver in the UK.
>
> (b) TPEG messages could be adopted as the standard for all communications with bus stop, platform, concourse and other public transport information displays, the BBC DAB radio broadcasts could then be used to update them, or alternatively private communications networks could be used as is currently the case.

With further development TPEG has the potential to be suitable for communicating between the central computers operating real time information systems, facilitating interoperability between neighbouring systems without the need to be interoperable at the vehicle equipment level.

Annex A - References

Transport Protocol Experts Group (TPEG) TPEG specifications - Part 5: Public Transport Information Application TPEG-PTI_2.2/001 - N1292 Draft CEN/ISO CD 18234-5 (TTI via TPEG)

What is TPEG? January 2001 - EBU - B/TPEG Output PG 01/013 2001 January 16 Digital Radio, Multimedia And Intelligent Transportation Systems - T.Livock and P.A.O.Gardiner, British Broadcasting Corporation, UK

Proposed National Public Transport Access Nodes (NaPTAN) Database - DTLR

Transmodel V5.0 - prEN12896 - CEN

DETR Traffic Area Network TransXChange Project Schema Documentation Overview

Review of Transmodel - Curtis+Cartwright report for DTLR dated 10 December 2001

Transport Direct Standards Review : Final Report, Standards Catalogue and Future Developments - Curtis+Cartwright report for DTLR dated 11 December 2001

Annex B - Comments on the Draft Standard

Date 02 April 2002	N1292
From: UK	Draft CEN/ISO CD 18234-5 (TTI via TPEG)

Clauses		**Comments from U.K**
1	E	The two bullet point lists are included to highlight how public transport information can be presented in terms of TPEG-PTI views. The order of these bullet points is not consistent and should be rearranged to allow the reader to match the first set to the TPEG-PTI views.
5.4.2 to 5.4.7	T	Where the definition varies from the DATEX Data Dictionary definition the standard should state whether this is a data formatting issue and is therefore translatable, or whether the definition is substantially different and is therefore non translatable.
5.4.2 to 5.4.7	E	The DATEX Data Dictionary is reference 8, not 7.
5.5	E	This section should be entitled "Public Transport Event Container" to ensure consistency with figure 1.
5.5	E	PTI event container elements "BS", "TR" and "TTPI" have been included within section 6.2.2 and should be referred to within section 5.5.
5.5.8 to 5.5.10, 8.2.3	T	These three fields would not in all cases uniquely identify a UK bus service, as it is possible for a Transport Operator Subsidiary to operate two or more services with the same publicly known Transport Service Name in neighbouring areas. An additional information container should be added "Transport Service Registration Code".

6.1.3 and 6.2.1	T	As the version number of a message starts at 0, the message would need to go through more that 255 versions before a new message is required (not 254 as stated)
6.2.1	E	Both the UNV and MET elements should be included within this section.
6.2.2	E	The scheduled/predicted times (STO & STA) elements should be included in the list of the PTI container elements.
6.2.2	E	The list of elements has been arranged in a different order to that set out in section 5.5. Again, for consistency these lists could be presented in the same order to aid the reader.
6.2.2	E	The route description element is included as "RD" but in section 5.5.13 is included as "RDP". These elements should be referred to consistently ad "RDP" as they apply to points within routes.
6.2.2	E	PTI container elements "DT", "CR" and "TTT" are included in section 5.5 and should therefore also be referred to in this section.
8.1.1	E	The third example should show the year element indented rather than the day (i.e. as per the text).
8.1.2	E	The element "MSG" is incorrect and should be replaced with "MGT".
8.1.2	E	The list of elements suggests that all the elements are MMC elements. From section 5 however, it is clear that this is not the case. Two sub-headings should be added to the list of elements. These are "TPEG (LOC) elements" above "LOCATION ELEMENTS"; and "PTI Event Container elements:" above "EVENT DESCRIPTIVE ELEMENTS".
8.1.2	E	The cross reference elements should be placed directly under the "Effect and Reliability" elements as they are also part of the MMC elements.
8.1.3.7 8.1.3.11	E	The TPEG (LOC) and PTI Event Container elements need to be separated from the MMC elements.
8.1.4	E	This section should be entitled "PTI Event Container Elements".
8.1.4.1	E	The "TO, Transport Operator" element should be included within this section.
8.1.4.2 and pti table 05	T	Additional types of bus services should be included either as transport_modes or bus_types. These are: • Hail and ride services. These services are characterised by a mixture of formal bus stops, and having sections of the route where the bus will stop anywhere on request where it is safe to do so. • Demand Responsive services. These services combine fixed and flexible routing. It may in some cases be mandatory that a seat is booked in advance. It may also be possible for a passenger to request a deviation once on the bus (e.g. Wiltshire Wigglybus) • Mobility buses. These services are specifically targeted at people with mobility difficulties (e.g. wheel chair users). There are numerous variations on the operating arrangements for these services which need to be recognised in providing information about them as follows: • Services may be available for anyone to use, or they may have specific eligibility requirements (e.g. must be registered disabled) • The services may operate a regular fixed route (e.g. once a week.), or may

		be a door to door service more like a shared taxi. • The services may need to be booked in advance. • Guided bus. High quality service with fast guideway sections. • School_bus type should indicate whether it is a service that is only for school children, or available for general use.
9.2	E	This section should be entitled "PTI Event Container Descriptions".
pti table 03	T	Commuter coaches, e.g. Green Line
pti table 07	T	River Bus, e.g. London River Services
Pti table 17	T	The following should be added as they are all events relevant to bus delays: • Route diversion • Road works • Road Closure • Special Event e.g. demonstration, parade
Pti table 22	T	Should be updated to include the differentiation between "must be booked in advance" and "booking is optional"
Pti table 23	T	Should include a "Not via option" e.g. not via London
Pti table 26	T	Consideration should be given to the adequacy of being able to handle services with a monthly periodicity. E.g. the service runs on the second Friday of the calendar month.
Pti table 31	T	Weekdays should be replaced by two entries, Monday to Friday, and Monday to Saturday
Pti table 31	T	Holiday should be qualified to mean statutory public holiday (e.g. New years day) as distinct from a longer more general holiday season or period
Pti table 31	T	A school days, type should be included to cover services that only run during school term time.
11 (last paragraph)	E	Should read "As described in Section *5.2*, the *TPEG* Message Containerand shown in *Figure 2*."
11.1.2	E	The last paragraph should refer to figure 11 *not* 17.
11.1.2.2	E	Example of a road in Stuttgart, Network Layer = Loc08/01.
11.2.1-11.2.3	E	The references indented on the right-hand side of the page are incorrect. They refer to section 9 but should refer to sub-sections within section 11. Section 9.2.2 should read section 11.1.1 Section 9.2.3 should read section 11.1.2 Section 9.2.3.1 should read section 11.1.2.1 Section 9.2.3.2 should read section 11.1.2.2

		Section 9.2.3.3 should read section 11.1.2.3
11.2.4	E	First line should read: "As described in Section 5.3 (and shown in Figure 1: Downloading.".
11.2.4	E	Second paragraph should refer to section 11.1.2.1 *not* 9.1.2.1.
11.4	E	First line should read: "As described in Section 5.3 (and shown in Figure 1: Downloading.".
11.4	E	Second paragraph should refer to section 11.1.2.1 *not* 9.1.2.1.
11.6	E	Third paragraph should read: "An intersection is represented by the use of "location co-ordinates" according to Figure 7 in Section 11.1.1.4. A section of(see figure 6 in Section 11.1.1.3)."
11.6.2.7 & 11.6.3.3.	E	The examples using A4 Great Western Road show the resultant road descriptors road and name parts separated by a comma not a semicolon as described in section 11.6.2.5.

T=Technical

E = Editorial

Additional Spelling/Grammatical Errors

Clauses		**Comments from U.K**
1	E	Fourth paragraph should read: ""the end-user" focus of TPEG is seen as useful to.".
8.2.2	E	First paragraph should read: "This type of message representation is possibly of most use when the major focus lies on services to and from a fixed point."
pti table 02	E	Eurostart should be Eurostar, motorrail should be motorail?
pti table 03	E	Natonal should be National
pti table 08	E	Manhatten should be Manhattan
11	E	Last paragraph: Readble should be readable
11.1	E	Bold text: doted should be dotted
11.1.2.1	E	First paragraph: *are* tree index should be *area* tree index
11.1.2.1	E	Final paragraph: everey should be every
11.12.2	E	Final paragraph: eleements should be elements
11.4	E	Second paragraph should read "The Area Tree Downloading Container has the coding structure".
Annex A2	E	Should read: "It makes little sense.not *to* be used"
Annex A3	E	Should read: ", even if *their* train is unaffected each time"

Italicised words indicate the words changed.