

TPEG - an introduction to the growing family of standards and specifications for Traffic and Travel Information services

Bev Marks (European Broadcasting Union specialist)

Wednesday, 10 June 2009 - 16:00

Location: Room 601, Skempton (Civil Eng) Bldg, Imperial College London

Abstract

In this seminar talk, with PowerPoint slides, Bev Marks - the European Broadcasting Union specialist - will describe the origins of TPEG and the published international standards, together with many new TPEG Applications and their reasons for development. TPEG stands for Transport Protocol Expert Group - a slight parody of JPEG and MPEG - but with no less a serious intention of developing Traffic and Travel Information applications, and even more applications so far not approached for the end-user traveller. TPEG satisfies a key requirement for simultaneous delivery from a single service provision activity to the latest broadcast and internet delivery channels. The TPEG Toolkit provides a language independent solution for TTI service providers by describing a "words" table based hierarchical message construct that allows easy translation and extensions.

Bev Marks will describe the latest status within the Traveller Information Services Association (TISA) which has recently agreed with CEN ISO to be the "excellence centre" for ongoing TPEG specifications maintenance and developments. Currently a number of TISA-Specifications are undergoing TISA Membership review prior to delivery for international standardisation - potentially doubling the size of the current TPEG Standards family!

TPEG – an introduction: standards and specifications for TTI services

2009-June

Bev MARKS, Holly Blue Associates

TPEG Expert, EBU Technical and TISA Steering Board Member

www.ebu.ch

www.tisa.org

Summary

2

- Introduction: TPEG started back in 1997; What is TPEG technology for? Content and Delivery segments; TPEG Open standards; “toolkit”; Where does TPEG fit?
 - TPEG Applications and Messages
 - TPEG-Loc Container
 - TPEG-RTM Container and Tables
 - The TPEG Forum, RTIG and then TISA
 - TPEG Spec.s and Standards; TPEG2; XRC; Profiles
 - TPEG in Use: UK; World
- *with short question opportunity between sections..*

TPEG started way back in 1997

3

- By autumn 1997 – some leading edge EBU Members realised that the Traffic and Travel Information (TTI) service-data technology known as RDS-TMC would not satisfy an increased demand for multi-modal travel information and it would not last for ever!
- RDS-TMC is a single delivery channel (FM Radio/RDS) constrained (and therefore compressed) data solution
- A replacement system must be much more future proof
- Nevertheless RDS-TMC services supporting vehicle based (on-board) Navi-systems are now expanding across Europe!

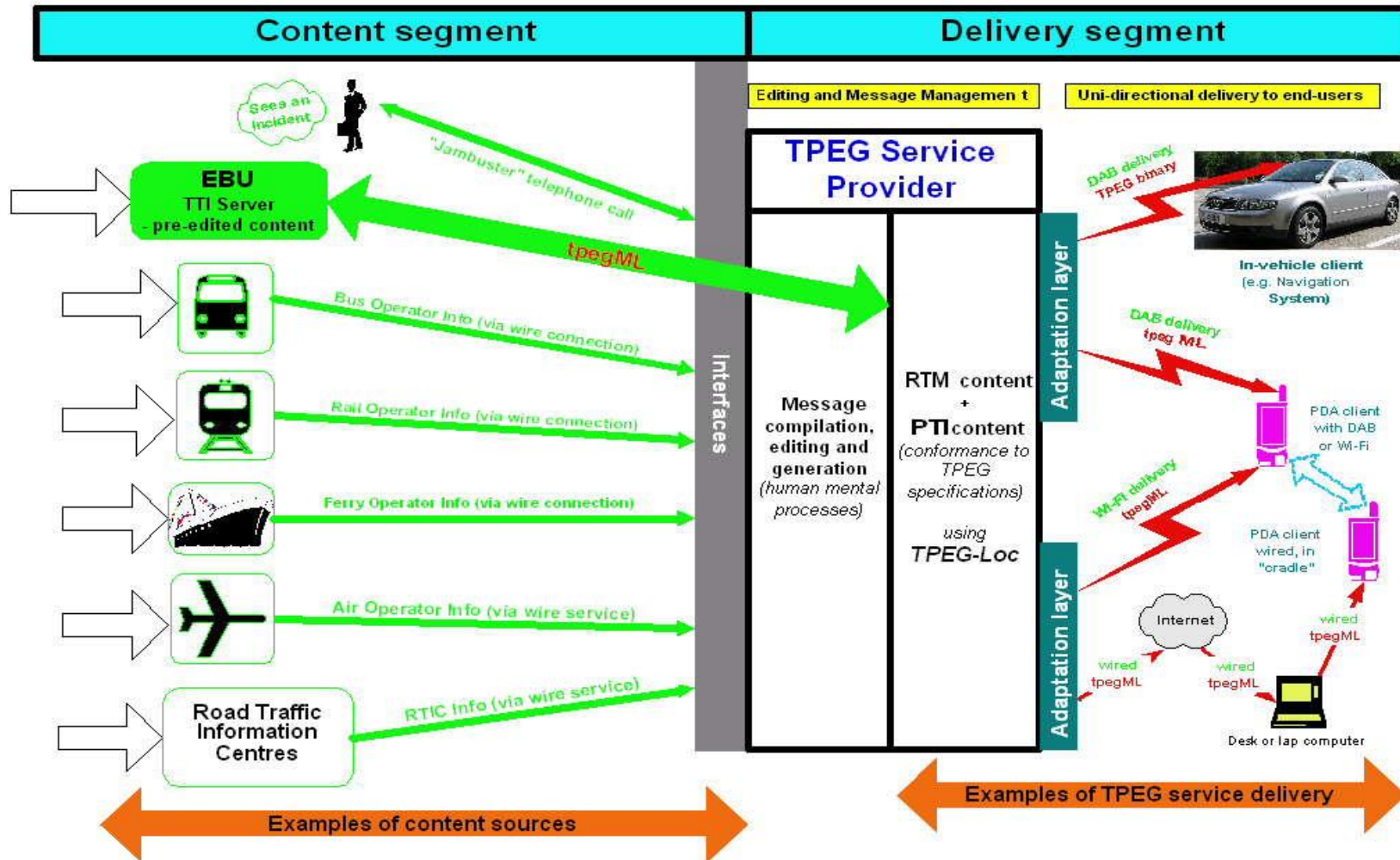
What is TPEG technology for ?

4

- End-user focussed TTI services ...
- Language-independent structured messages...
- Multimodal TTI - with various applications (RTM, PTI etc)
- A toolkit for other Application developers... (PKI, CTT, WEA)
- From the segments of the TTI domain, TPEG technology was originally focussed on the Delivery (Service Provision) segment
- But we gradually began to see an important use for TPEG technology in the Content Collection segment

Content and Delivery segments

5



TPEG technology: standardised

6

- TPEG technology allows delivery on different platforms
 - ▣ Digital Radio (DAB/DMB), Internet, Digital TV (DVB)
- Applications were originally developed for Digital Radio
 - ▣ BINARY STANDARD (**CEN/ISO TS 18234-Series**)
Adopted: 2004-08-27
- Applications developed for message generation (& Internet delivery) using XML
 - ▣ tpegML STANDARD (**CEN/ISO TS 24530-Series**)
Adopted: 2005-02-04

TPEG Open Standards – Initial Series

7

TS Part - topic	CEN / ISO TS 18234- Series BINARY	Mapping	CEN / ISO TS 24530- Series XML
Introduction, Numbering and Versions	Part 1		--
Syntax, Semantics and Framing Structure	Part 2		--
Service and Network Information application	Part 3		--
Road Traffic Message application	Part 4	<mapped>	Part 3
Public Transport Information application	Part 5	<mapped>	Part 4
Location Referencing for applications	Part 6	<mapped>	Part 2
Introduction, common data types & tpegML	--		Part 1

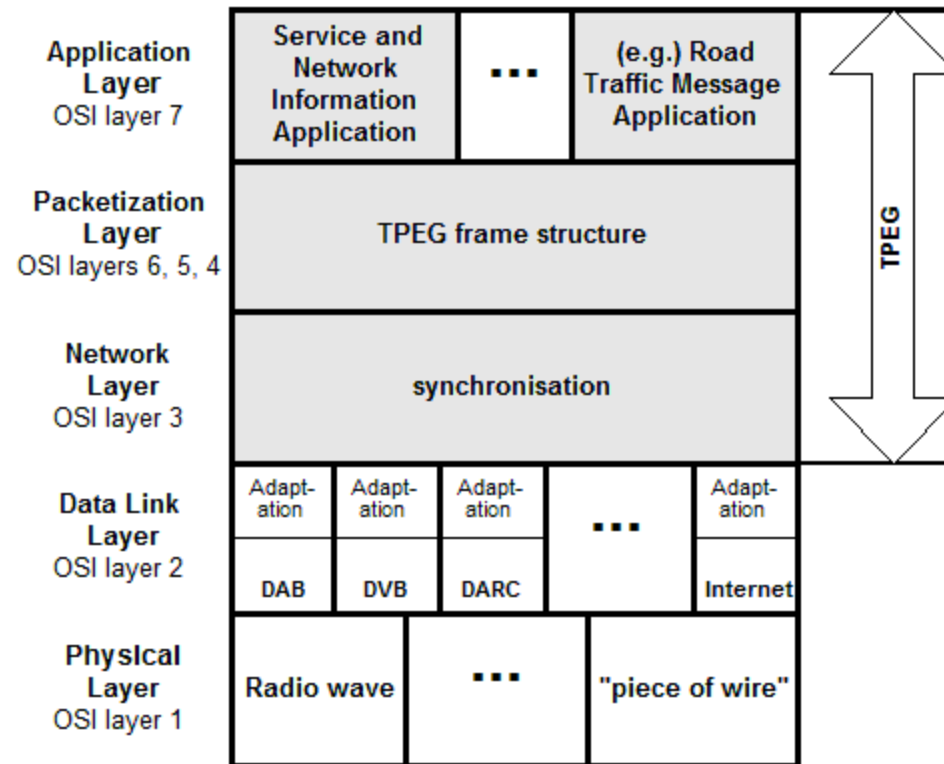
TPEG “toolkit”- a universal solution..

- ✓ Language independence through Tables concept
- ✓ Service provision for map-based and text-based systems
- ✓ Client filtering by location co-ordinates and by message content text
- ✓ Support for all transport networks (multi-modal and inter-modal)
- ✓ Extensible and expandable
 - “toolkit” support for new TPEG Applications ...
- ✓ Agnostic about bearers
- ✓ Every location or area on earth covered with WGS 84 co-ords

Where does Binary TPEG fit? (1)

9

□ ISO OSI Protocol Stack:

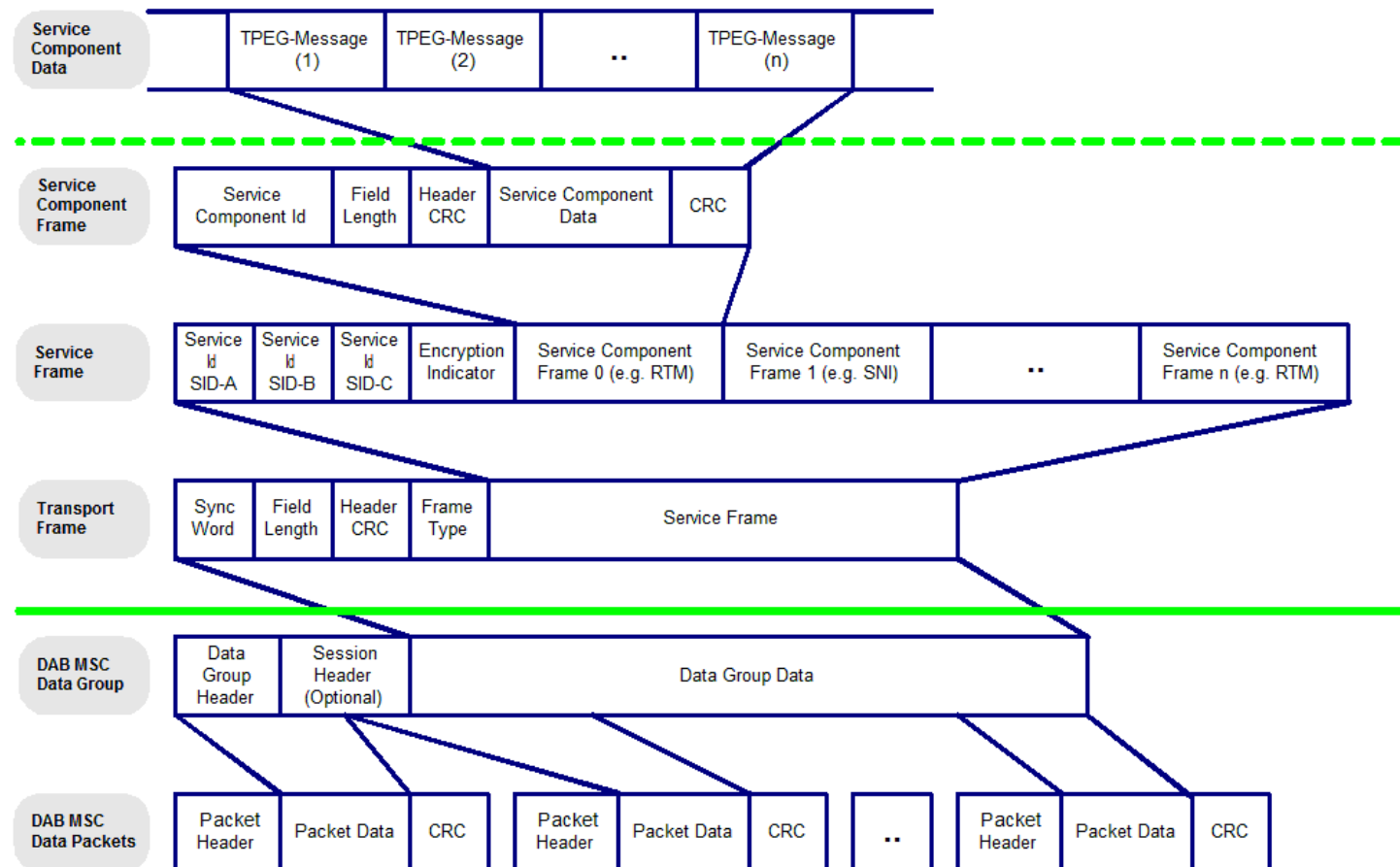


Next slide shows the Frame structure..

Where does Binary TPEG fit? (2)

10

□ TPEG Frame structure:



Structure allows
For mixing of
Services in a
data stream..!

QUESTIONS ?

Next Section will cover: TPEG Applications and Messages..

TPEG Applications (1)

12

- TPEG Applications are separated for design reasons into different specifications (e.g. Road traffic content differs very much from Public Transport info with timetables etc.)
- Terminology for both: **Binary** and **XML** versions:
 - ▣ Road Traffic Messages: TPEG-RTM tpeg-rtmML
 - ▣ Public Transport Information: TPEG-PTI tpeg-ptiML
 - ▣ Location Referencing: TPEG-LOC tpeg-locML
 - ▣ Parking Information: TPEG-PKI
 - ▣ Traffic Event Compact: TPEG-TEC
- There are already many more abbreviations used in TPEG technology..!

TPEG Applications (4)

- All TPEG Applications have been (endlessly!) analysed to create a simple structure – that embodies user requirements for comprehension and filtering aspects
- Thus a Hierarchical Structure is used to carry TTI content
- More-and-more detail, or less detail, can be used...
- Very simple messages can be constructed or very rich content can be delivered
- Language independent... through translatable Tables
- All TPEG Applications use an associated Location Referencing method

TPEG Messages: a stream

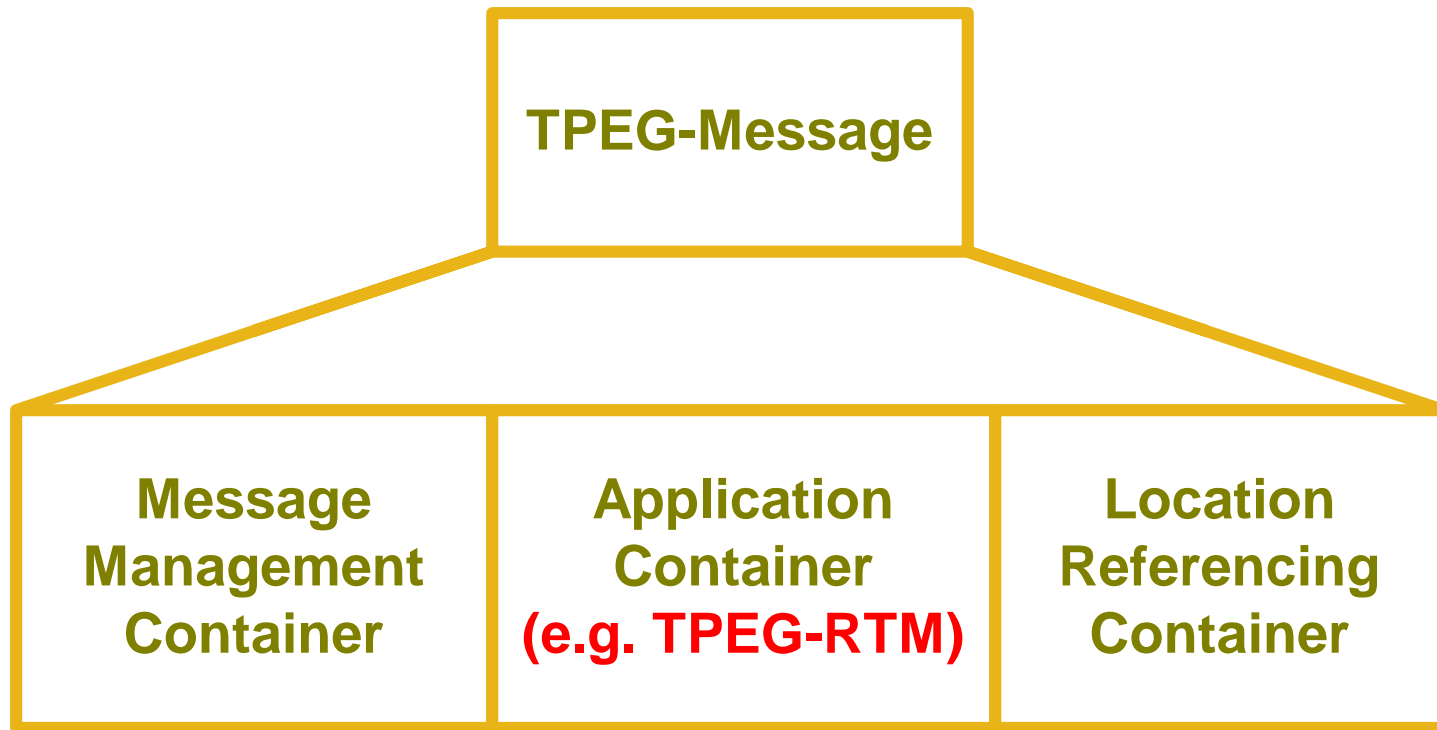
14



TPEG-Messages were originally designed to be delivered in data streams delivered via DAB, but can also be delivered as files on the Internet

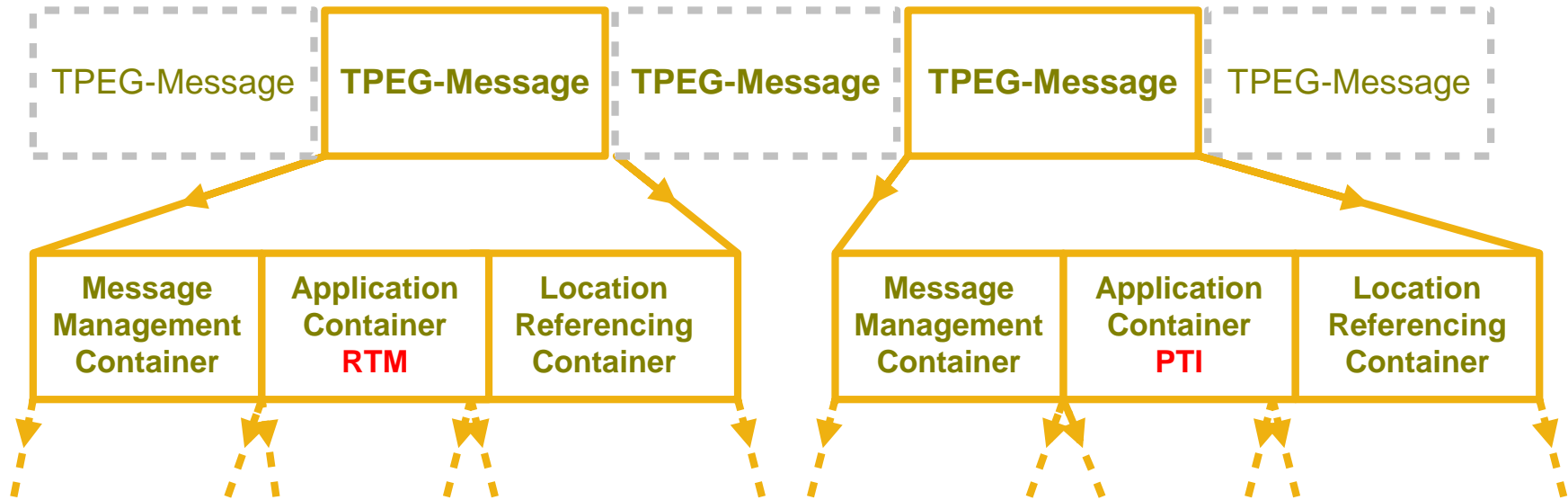
TPEG Messages: generic structure

15



TPEG Messages: a mixed stream

16



A TPEG Message - Binary Physical format

17

- Just a single message – but it does not reveal any functionality, unless you know a lot about the ISO TS18234-Series !

```
2D3C 0100 869B 3E40 C817 3E40 BD55 3E4A
0297 0303 9000 611E 0000 5D03 0108 FFF8
B34B 0057 163D 0205 0703 4138 3202 0C18
0A49 6E76 6572 6761 7272 7902 0A19 0848
6967 686C 616E 6401 08FF F92A 8C00 577C
6F02 0507 0341 3832 020F 180D 4472 756D
6E61 6472 6F63 6869 7402 0A19 0848 6967
686C 616E 6403 0103 8100 0A01 0001 0104
0401 0101 0285 0003 0201 02
```

A TPEG Message - XML Physical format

18

```
<mpeg_message>
  <originator country="UK" originator_name="BBC Travel"/>
  <summary xml:lang="en">A82 Highland - Fallen tree northbound between Invergarry and Drumnadrochit is partially blocking
the road.</summary>
  <road_traffic_message message_id="11580" version_number="1" message_generation_time="2003-02-05T07:34:16+0"
start_time="2003-02-05T07:29:25+0" severity_factor="&rtm31_3;">
    <location_container language="&loc41_30;">
      <location_coordinates location_type="&loc1_3;">
        <WGS84 latitude="57.073253632" longitude="-4.783896446"/>
        <descriptor descriptor_type="&loc3_7;" descriptor="A82"/>
        <descriptor descriptor_type="&loc3_24;" descriptor="Invergarry"/>
        <descriptor descriptor_type="&loc3_25;" descriptor="Highland"/>
        <WGS84 latitude="57.334888458" longitude="-4.478613377"/>
        <descriptor descriptor_type="&loc3_7;" descriptor="A82"/>
        <descriptor descriptor_type="&loc3_24;" descriptor="Drumnadrochit"/>
        <descriptor descriptor_type="&loc3_25;" descriptor="Highland"/>
        <direction_type direction_type="&loc2_3;">
      </location_coordinates>
    </location_container>
    <obstructions number_of="1">
      <position position="&rtm10_1;">
      <object number_of="1">
        <object_problem object_problem="&rtm12_2;">
      </object>
    </obstructions>
    <network_conditions>
      <restriction restriction="&rtm49_2;">
    </network_conditions>
  </road_traffic_message>
</mpeg_message>
```

□ Part of the same message - in XML it reveals functionality, without knowing a lot about the ISO TS24530-Series !

“raw/unrendered” tpegML

QUESTIONS ?

But not too many after the last two slides, please!

Next Section will cover: TPEG-LOC..

TPEG-LOC: Requirements

20

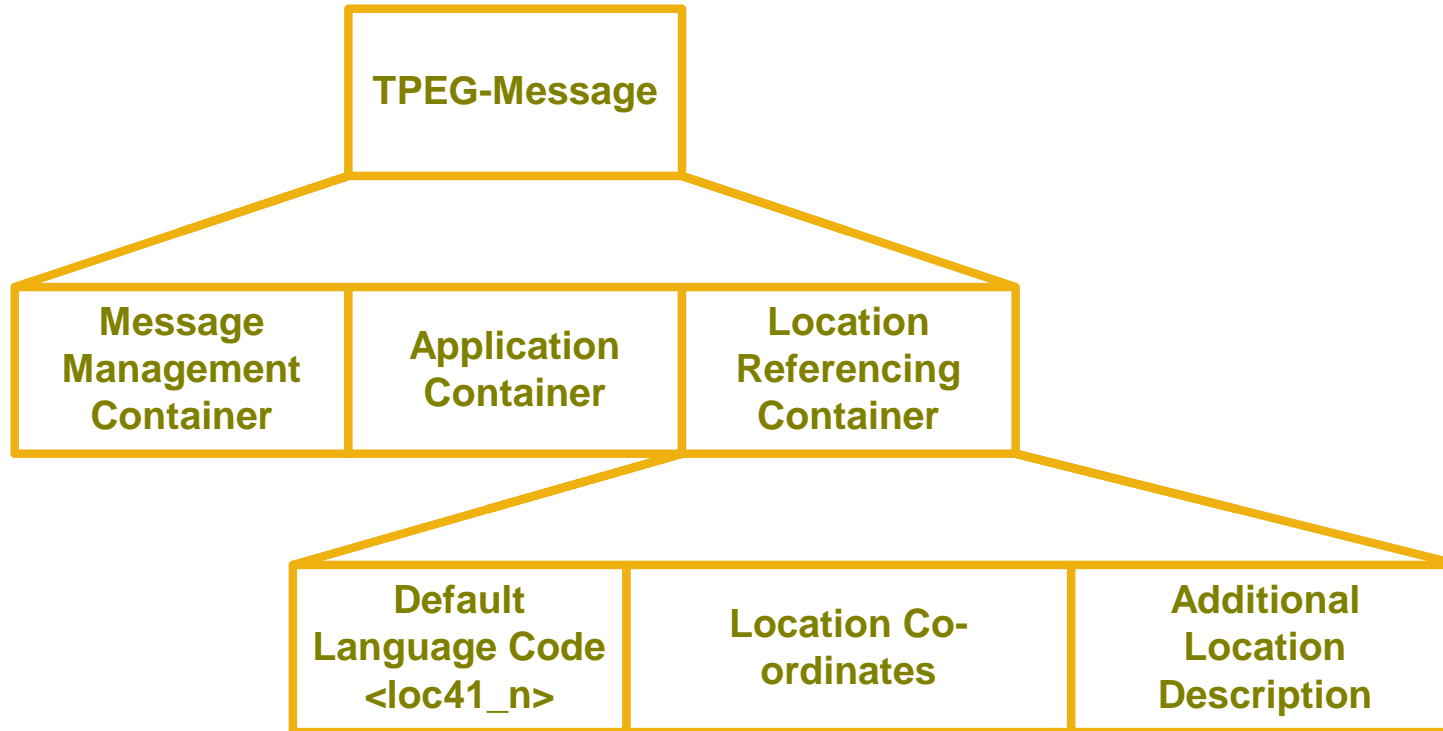
- TPEG-LOC designed for the whole end-user community:
 - ▣ With Human readable and Machine readable needs

- TPEG-LOC designed for many different client types
 - ▣ Digital Radios, Navi-systems, PDAs, Computers, etc.

- TPEG-LOC designed for many different applications
 - ▣ Road Traffic Messages, Public Transport Information, Parking Information, Congestion and Travel-Time
 - and more: not yet developed

TPEG-LOC: Container structure (1)

21

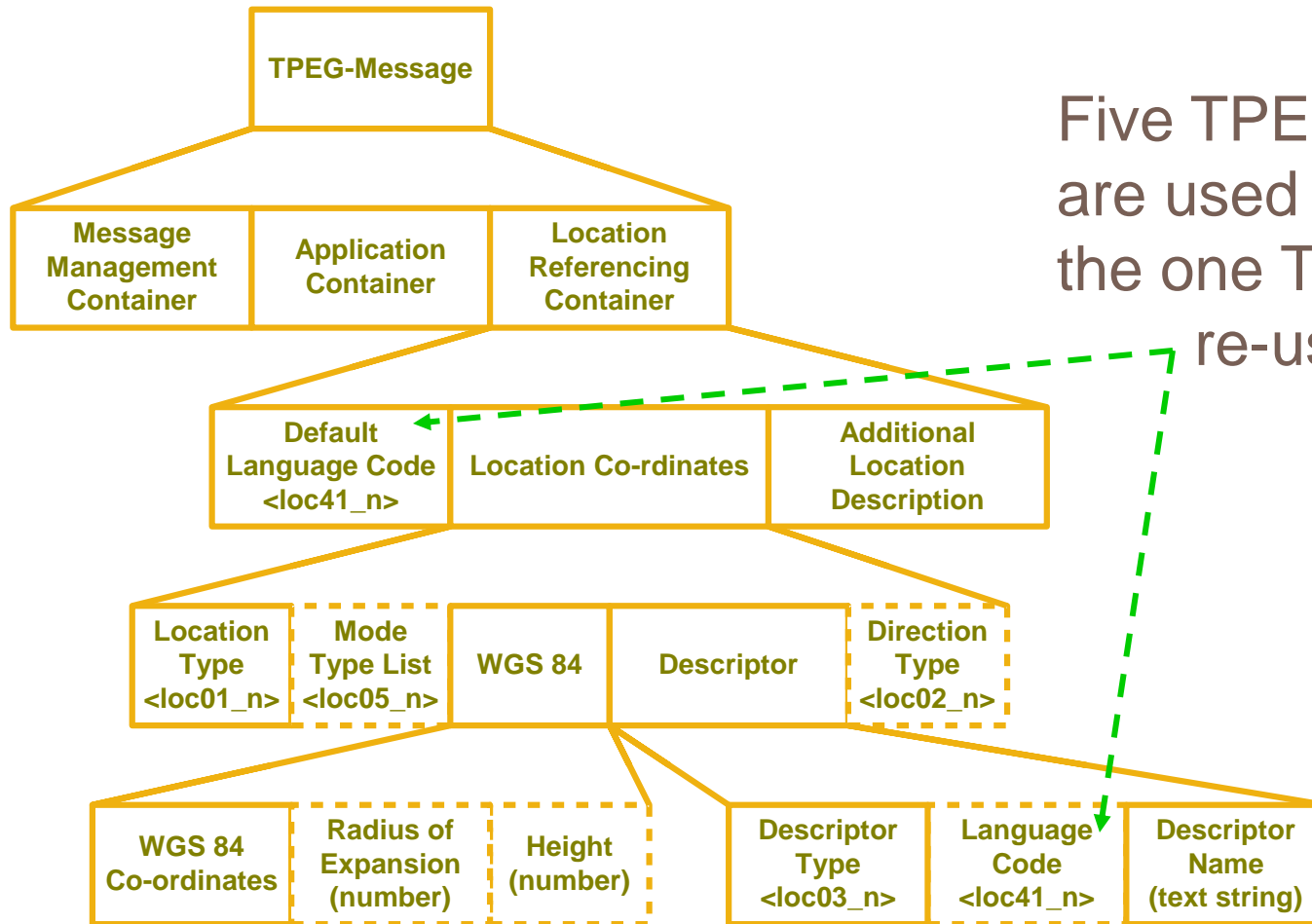


Here we see the first of many TPEG-Tables in use: **<loc41_n>**

Not guaranteed (some links now broken), but look at: <http://www.bbc.co.uk/travelnews/xml/> for TPEG Tables and “test translations”

DO NOT COPY for any development work – master Tables are now held by TISA!

TPEG-LOC: Container structure (2)



Five TPEG-Tables are used and note the one Table is re-used

TPEG-LOC: Location types <loc01_n>

23

- **Large Area** (ie radius > 5km) e.g. for fog reports
- **Nodal Area** (ie radius < 5km) e.g. for a rail terminal
- **Directional Segment** e.g. for a traffic queue
- **Intersection Point** e.g. for a slip road closure
- **Framed Point** e.g. for a rural location between two villages
- **Non-linked Point** e.g. point not on a road network
- **Connected Points** e.g. several non-linked points at an airport complex

Remember these are designed for human end-users, who often do not have a conceptualised map in their head..

TPEG-LOC: Features (1)

24

- TPEG-LOC is scalable for Service Providers to implement what they want:
 - e.g. In the case of the early BBC Travel News implementation, it used only WGS 84 co-ordinates..
- TPEG-LOC provides the opportunity to link to internet mapping resources..



BBC Travel News

Road Traffic Messages for the UK

25 messages on: 2003-07-14 at: 10:00:1+1 (+1=BST/+0=GMT)

 **Please note this is an experimental service only!**

Latest traffic news at the top

 90267 (1); Severity: **very severe**
Start on: 2003-07-14 at: 09:34:50+1 (+1=BST/+0=GMT)

- Location Type: route, westbound:

Text Descriptor	WGS84 co-ordinates
road number: M4;	Latitude: 51.4529
Junction with: A34;	Longitude: -1.31053
town name: Newbury	Click here for a map
junction name: 13	
county name: Berkshire	Latitude: 51.4534
road number: M4;	Longitude: -1.48208
Junction with: A338;	Click here for a map
town name: Hungerford	
junction name: 14	
county name: Berkshire	
- Restriction: closed:

TPEG-LOC: Features (2)

25

- TPEG-LOC produces human comprehensible information and/or Icons, with filtering, in relation with Digital Maps
- TPEG-LOC is language independent and designed specifically to cope with multiple language locations, where dual language street signs are found
- TPEG generally, and TPEG-LOC therefore, provide for much client-product differentiation – fuelling the market for many product types

QUESTIONS ?

Next Section will cover: TPEG-RTM Application...

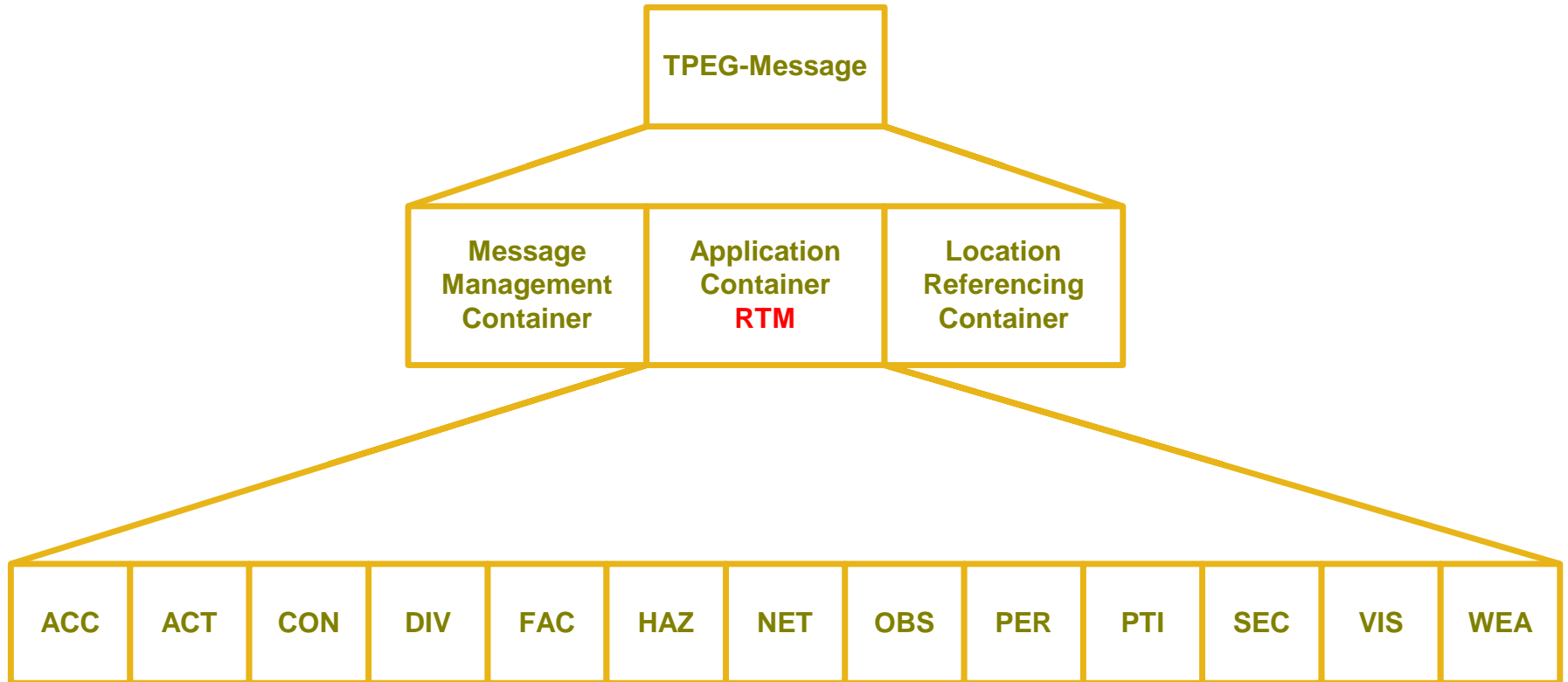
TPEG-RTM: Requirements

27

- Derived from RDS-TMC, so should map it well
- Needs to provide richer content possibilities than RDS-TMC
- Table based to allow easy language independence
- Suitable for streaming via DAB, but essentially designed to be a bearer independent design
- Extensible for future developments - especially Table additions

TPEG-RTM: Container structure

28



Next slide explains...

TPEG-RTM: Details (1)

29

ACC	ACT	CON	DIV	FAC	HAZ	NET	OBS	PER	PTI	SEC	VIS	WEA
Accident	Activities	Road Conditions	Diversion Advice	Facilities Performance	Moving Hazard	Network Conditions	Obstructions	Network Performance	Public Transport Information	Security Alert	Visibility	Weather

Here we see the TPEG-RTM “Top Level” Classes derived from RDS-TMC, and with potential for added richness through TPEG-Tables offering more detail

TPEG-RTM: Classes/Tables (2)

Accident	Activities	Road Conditions	Diversion Advice	Facilities Performance	Moving Hazard	Network Performance	Obstructions	Network Conditions	PTI	Security Alert	Visibility	Weather
rtm01	rtm10	rtm10	rtm01	rtm42	rtm10	rtm34	rtm10	rtm10	rtm40	rtm36	rtm17	rtm31
rtm03	rtm24	rtm31	rtm45	rtm43	rtm23		rtm23	rtm45	rtm41		rtm13	rtm29
rtm10	rtm20	rtm18	rtm10	rtm10	rtm21		rtm21	rtm47			rtm14	rtm30
rtm19	rtm19	rtm39	rtm47	rtm32	rtm22		rtm22	rtm49				
rtm20		rtm15	rtm35	rtm33	rtm03		rtm03	rtm50				
rtm21				rtm37	rtm01		rtm01					
rtm22				rtm38	rtm20		rtm20					
rtm23					rtm19		rtm19					
							rtm12					

TPEG-RTM: Details (3)

A typical TPEG-Table used to give detail to the “Top Level” Class Network Performance is:

If you know RDS-TMC you will recognise this!

TPEG-Table rtm34: network_performace_status			
Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	stationary traffic		
2	queuing traffic		
3	slow traffic		
4	heavy traffic		
5	freely flowing traffic		
6	sheer weight of traffic	<i>Used in scripts</i>	
255	advice	- the table default word -	

TPEG-RTM: 50 Tables...

32

- The **biggest** Table (rtm10: position) has 106 out of 255 possible entries used – to date
 - plenty of room for expansion..
- The **smallest** Table (rtm46: unverified_information) has just 2 out of 255 possible entries used!
- “ghost drivers”* were not forgotten..
(rtm36: security_alert_type)
** a term well know in Germany but only used recently in UK broadcasts some 9 years after its inclusion!*
- These Tables provide “very good mapping” of RDS-TMC (*quote from the IRT*)

QUESTIONS ?

Next Section will cover: TPEG Forum, RTIG and TISA..

The TPEG Forum (1)

- The TPEG Forum was established by the European Broadcasting Union with the following objectives:
 - ▣ To encourage implementation of TPEG in services and products
 - ▣ To facilitate exchange of information about practical implementation of TPEG
 - ▣ To maintain the existing TPEG standards
 - ▣ To develop new applications of TPEG and, where appropriate, to develop new specifications
- The TPEG Forum was built on the 7 years of work on TPEG by the EBU's B/TPEG group and in parallel 3 years of the TPEG Project

The TPEG Forum (2)

Working with others in the Traffic and Travel Information domain:

- CEN and ISO for International Standardisation
- **Road Traffic Information Group** – a joint TMC Forum and TPEG Forum activity – “bringing the development of TTI technology into focus”
- EBU TTI Group – using TPEG in the Content Segment

RTIG – Origins

36

- Established by an ad hoc meeting held at London airport Heathrow Terminal 4 on 2004-06-11, representing:
 - ▣ TMC Forum management
 - ▣ TPEG Forum management
- Mutual recognition that co-operation in the individual technologies and their service potentials is necessary
- Nevertheless keeping both Forums independent, but permitting a consensus building dialogue

Notice how the individual Forums were quite at arms length originally!

RTIG – Aims

37

- RTIG was created to ensure synergy from the development and operation of TMC and TPEG technologies for the best progress and development of future Road Traffic Information (RTI)
- By analysing the fundamental market focussed requirements and their links to TMC and TPEG technologies and services
 - ▣ Open to all TMC and TPEG Forum members
 - ▣ Joint Chairmen of TMC¹ and TPEG² Forums
 - ▣ Supported with Secretariat by ERTICO (with assistance from TPEG Forum Secretariat)

¹ *Danny Woolard, formerly ITIS plc* ² *Bev Marks, EBU*

RTIG – one ‘Focus topic’ as an example..

38

- Loc Ref situation is complex and involves “sticky” IPR issues as well as technology challenges
 - ▣ TPEG Forum offered a solution for RDS-TMC codes in TPEG-Loc
 - ▣ TPEG Forum suggested a solution for including separately standardised AGORA-C Loc Ref in TPEG
 - ▣ TPEG Forum proposed a unified solution, but this was still some way off wider understanding/acceptance
- TPEG Forum accepted the RTIG input ideas and responded with the plan for development of a worldwide solution...
- Delegates needed to better understand the issues of Loc Ref and the GST IP SAF CHAN Project was informed...

RTIG transformed into TISA

39

- TPEG Forum and TMC Forum combine in 2007
 - ▣ new name / new structure / new organization
 - ▣ First General Assembly 2007-11-21 - Berlin at T-Systems
- **Traveller Information Services Association**
 - ▣ market driven / integrated approach / helping transition
 - ▣ fee based (€4200/year)
 - ▣ independent – but still strongly supported by EBU
 - ▣ Sectors covering:
 - Content, Services, Standards, Systems Management (e.g. AIDs SIDs etc)

TISA Positioning

40

- TISA has negotiated with the Standards Organisations to become the worldwide excellence centre for TMC and TPEG
 - ▣ Amended and future TISA Specifications being drafted and submitted to CEN and ISO for European and International standardization
 - ▣ Potentially some TISA Specifications will be handled by ETSI
- International Standards
 - ▣ Provide the Open Standards platform for (worldwide) service/client implementations

Current TISA work on TPEG

41

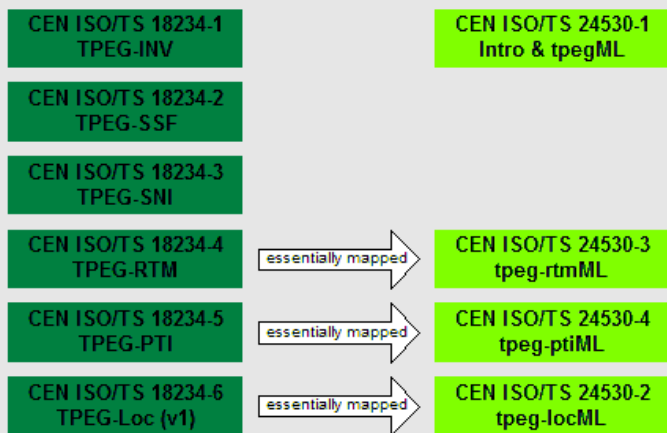
- Carried out in the **TPEG Applications Working Group (TAWG)** and its Task Forces
- Driven by Use Case Proposals (from any member)
 - ▣ Market driven assessment made widely within TISA
 - ▣ Minimum parties to undertake work = 3 or 4
- Current work is shown on the Road Map (next slides)
 - ▣ Each TF is designated W-*nnn* (the potential abbreviation for application in future)

QUESTIONS ?

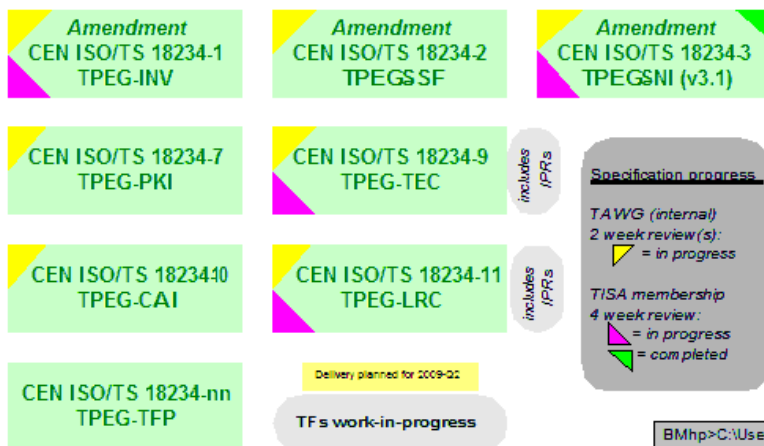
Next Section will cover: TISA Specifications and Standards..
- including Profiles

TPEG Spec.s & Standards - Road Map (1)

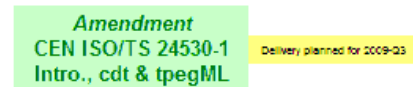
~ Current CEN ISO Published Standards ~



~ Current TISA Binary development work ~



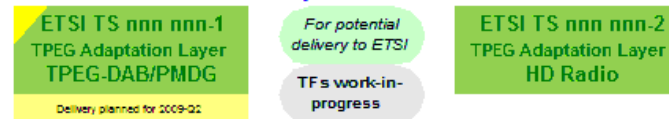
~ Current TISA XML development work ~



~ Current TISA Profile development work ~



~ Current TISA Adaptation Layer Profile development work ~



~ Possible future development work ~



TPEG Generation 2..

44

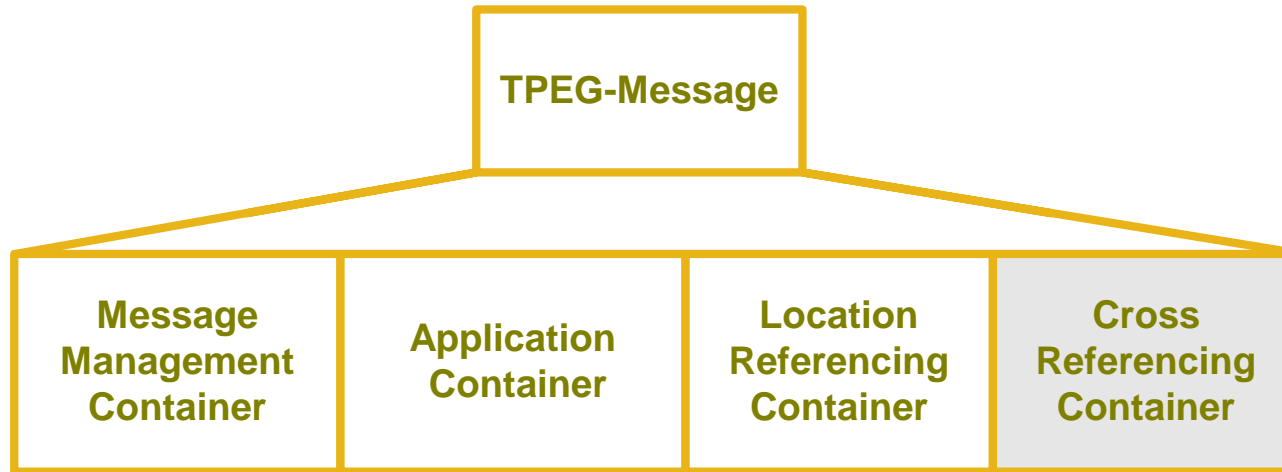
- TPEG2 - UML modelled for each application
 - ▣ Easier for non-technical experts to assist the analysis processes that will define the hierarchical structures
 - ▣ Each application will have a single model from which both Binary and XML physical formats will be derived
 - Other physical formats could also be derived from the same model
- TISA has added huge value by defining specific TPEG conversion rules from UML to Binary and XML
 - ▣ allowing, effectively, automatic Specification generation

TPEG Spec.s & Standards - Road Map (2)



TPEG-XRC – a planned new facility

46



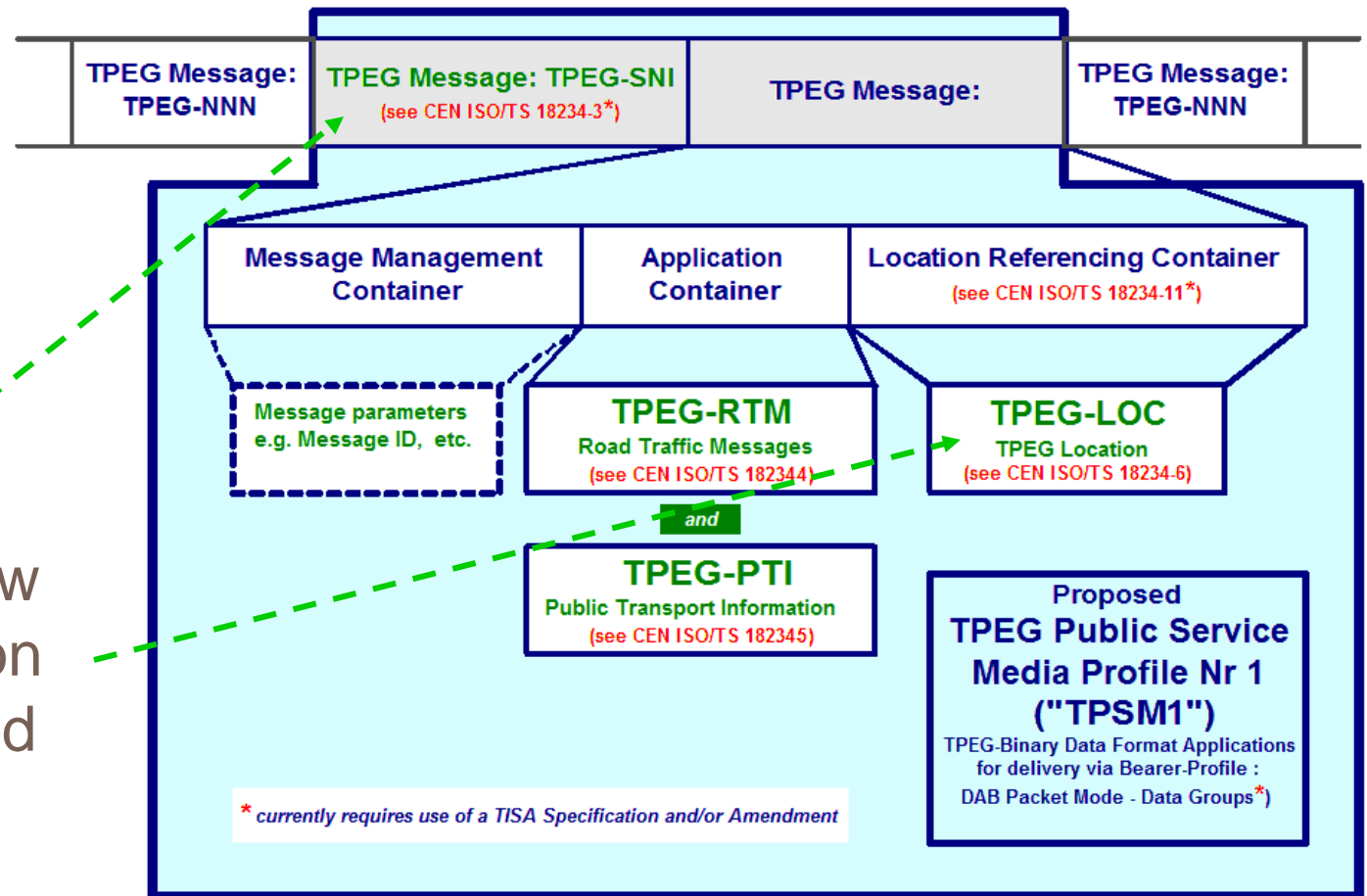
XRC allows messages from same or differing applications to cross reference each other, regardless of MGT

One of the key original concepts of TPEG was that it should be extensible.

We have invented a new container that will soon be developed to add new functionality!

TPEG Profiles

47



Notice how SNI is a requisite and how the specific location referencing method is fixed

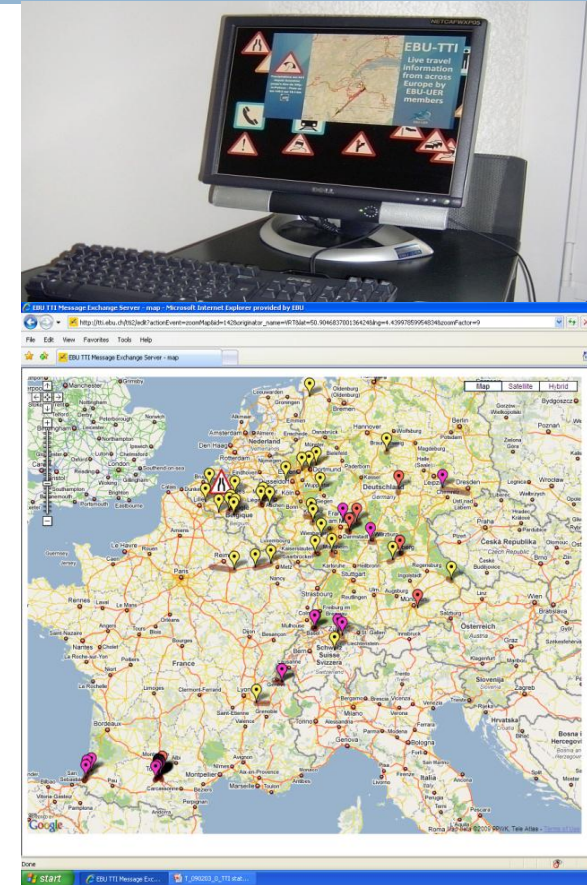
QUESTIONS ?





Next Section will cover: TPEG in use now..

TPEG in use: EBU Message Exchange

49

- EBU TTI Message Exchange System:
 - ▣ Uses tpeg-rtmML at its core
 - ▣ EBU members deliver tpegML content to Server in Geneva and EBU members can access cross-border information, in their own language regardless of input language, already edited for broadcast!
 - To an ftp server to ingest into own message generation system
 - Or via private webpage for instant viewing

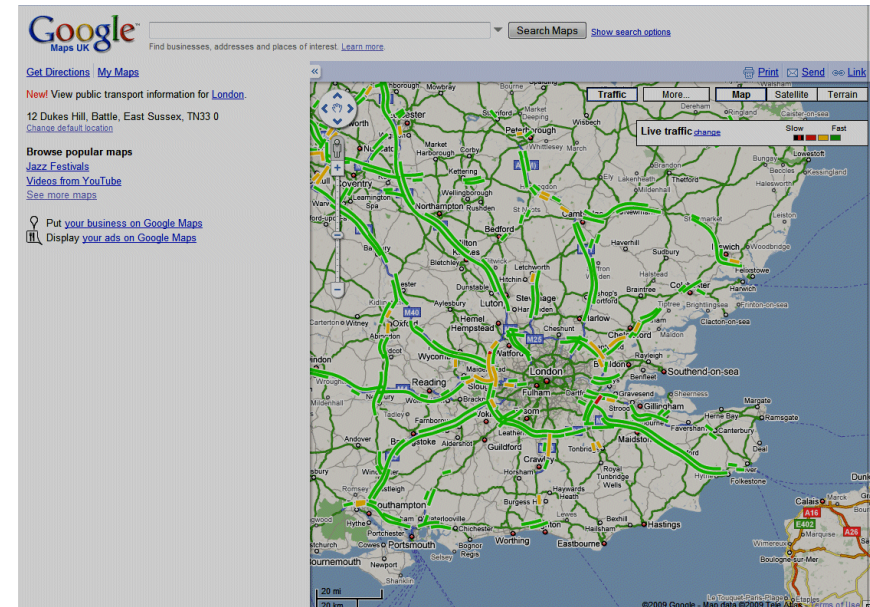


United Kingdom		2009-05-05 10:45:00Z	2009-07-31 11:30:00Z		road: B3022 Sheet Street Junction with: Victoria Street town: Windsor	Display on map
France		2009-06-09 19:26:00Z	2009-06-09 23:59:00Z		road: A64 (La Pyrénéenne) from: Roques region name: South-Western France	Display on map

TPEG in use: UK

50

- BBC have a long standing TPEG-RTM test running on DAB (but probably not current standard usage?)
- Traffic Master & ITIS conducting TPEG Binary tests on DAB
- BBC uses tpeg-rtmML to receive data from content provider, Trafficlink. tpeg-rtmML is used for processing and delivery to public-facing (web, mobile & interactive tv) services
- UK Highways Agency using tpeg-locML to deliver content to Google Maps and TomTom, for GPRS service



TPEG in use: World

51

- **Europe:** EBU Members exchanging tpeg-rtmML content: ORF Austria, BBC, WDR Germany (ARD collective) & others, Radio France, NRK Norway (converted to RDS-TMC format for delivery, also), SRG SSR idée suisse (with Viasuisse) and VRT Belgium
- **Germany:**
 - ▣ BR (Munich area) conducting TPEG Binary tests (e.g. TEC) on DAB ...
- **USA:**
 - ▣ Ibiquity testing TPEG services using HD Radio's Advanced Application Services (e.g.TFP)
- **South Korea:**
 - ▣ KBS delivering TPEG services via DMB (e.g. RTM, SNI, CTT, etc)

THANK YOU FOR YOUR
ATTENTION TO THIS
PRESENTATION...

SOME MORE QUESTIONS ?

marks@ebu.ch or bevm@hollyblue.net