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Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams —

Part 4: Road Traffic Message (RTM) application

Informations sur le trafic et le tourisme (TTI) — Messages TTI via les flux de données du groupe d'experts du protocole de transport (TPEG) —

Partie 4: Application de message de trafic sur route (RTM)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 18234-4 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

ISO/TS 18234 consists of the following parts, under the general title *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams:*

— *Part 1: Introduction, numbering and versions*

— *Part 2: Syntax, Semantics and Framing Structure (SSF)*

— *Part 3: Service and Network Information (SNI) application*

— *Part 4: Road Traffic Message (RTM) application*

— *Part 5: Public Transport Information (PTI) application*

— *Part 6: Location referencing applications*

Introduction

TPEG technology uses a byte-oriented stream format, which may be carried on almost any digital bearer with an appropriate adaptation layer. TPEG-messages are delivered from service providers to end-users, and are used to transfer application data from the database of a service provider to a user’s equipment.

This document describes the Road Traffic Message application in detail.

It should be remembered that the TPEG-RTM has been derived from earlier work that resulted in the RDS-TMC standards (EN ISO 14819-2). Upon analysis, RDS-TMC can be seen to drift into other application areas, where it covers a few public transport, parking and weather messages. TPEG-RTM is just one of several applications required to provide a fully comprehensive traffic and travel information service, for example a service is likely to need public transport information, parking information and weather information – these are or will be the subject of other TPEG-application specifications.

Nevertheless, TPEG-RTM, where reasonable, has included the ability to convey similar content to RDS-TMC, in order to offer considerable backwards compatibility and the prospect of automatically generating RDS-TMC messages from TPEG-RTM messages.

The Broadcast Management Committee of the European Broadcast Union (EBU) established the B/TPEG project group in autumn 1997 with the mandate to develop, as soon as possible, a new protocol for broadcasting traffic and travel-related information in the multimedia environment. The TPEG technology, its applications and service features are designed to enable travel-related messages to be coded, decoded, filtered and understood by humans (visually and/or audibly in the user’s language) and by agent systems.

One year later in December 1998, the B/TPEG group produced its first public specifications. Two documents were released. Part 2 (TPEG-SSF, CEN ISO/TS 18234-2) described the Syntax, Semantics and Framing structure, which will be used for all TPEG applications. Part 4 (TPEG-RTM, CEN ISO/TS 18234-4) described the *first* application, for Road Traffic Messages.

CEN/TC 278/WG 4, in conjunction with ISO/TC 204/WG 10, established a project group comprising the members of B/TPEG and they have continued the work concurrently since March 1999. Since then two further parts have been developed to make the initial complete set of four parts, enabling the implementation of a consistent service. Part 3 (TPEG-SNI, CEN ISO/TS 18234-3)) describes the Service and Network Information Application, which is likely to be used by all service implementations to ensure appropriate referencing from one service source to another. Part 1 (TPEG-INV, CEN ISO/TS 18234-1) completed the work, by describing the other parts and their relationships; it also contains the application IDs used within the other parts.

In April 2000, the B/TPEG group released revised Parts 1 to 4, all four parts having been reviewed and updated in the light of initial implementation results. Thus a consistent suite of specifications, ready for wide scale implementation, was submitted to the CEN/ISO commenting process.

In November 2001, after extensive response to the comments received and from many internally suggested improvements, all four parts were completed for the next stage: the Parallel Formal Vote in CEN and ISO. But a major step forward has been to develop the so-called TPEG-Loc location referencing method, which enables both map-based TPEG-decoders and non map-based ones to deliver either map-based location referencing or human readable information. Part 6 (TPEG-Loc, CEN ISO/TS 18234-6) is now a separate specification and is used in association with the other parts of CEN ISO/TS 18234 to provide comprehensive location referencing. Additionally Part 5, the Public Transport Information Application (TPEG-PTI, CEN ISO/TS 18234-5), has been developed and been through the commenting process.

This Technical Specification, CEN ISO/TS 18234-4, provides a full specification provides a full specification for the Road Traffic Message application.

During the development of the TPEG technology a number of versions have been documented and various trials implemented using various versions of the specifications. At the time of the publication of this Technical Specification, all parts are fully inter-workable and no specific dependencies exist. This Technical Specification has the technical version number TPEG-RTM_3.0/003.

Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams —

Part 4: Road Traffic Message (RTM) application

1 Scope

This document establishes the method of delivering Road Traffic Messages within a TPEG service. The TPEG-RTM application is designed to allow the efficient and language independent delivery of road information directly from service provider to end-users. The information provided relates to event and some status information on the road network and on associated infrastructure affecting a road journey. For example, limited information about abnormal operation of links in the network may be included, such as ferries, lifting-bridges, etc.

The term “application” is used in TPEG specifications to describe specific applications, such as in this case the Road Traffic Message application, which comprises three information containers: the Message Management Container, the Application Event Container and the TPEG-Location Container. The first two Containers are fully described herein and the TPEG-Location Container is described in CEN ISO/TS 18234-6.

Each TPEG application (e.g. TPEG-RTM) is assigned a unique number that is called the application identification (AID). An AID is defined whenever a new application is developed. The AID is used within the TPEG-Service and Network Information Application (CEN ISO/TS 18234-3) to indicate how to process TPEG content and allows routing of data to an appropriate application decoder.

AID = 0001 is assigned to the TPEG-Road Traffic Message application, described in this specification.

A hierarchical methodology has been developed to allow the creation of messages from a set of TPEG-RTM tables, which are essentially word oriented and cover most needs. Many of the TTI descriptive words, in the TPEG-RTM tables, were obtained from the DATEX dictionary (ENV 13106), which embodies European TTI knowledge of the last ten years or more, including a deconstruct of the phrase oriented RDS-TMC events list (EN ISO 14819-2). These TPEG-RTM tables (essentially word oriented data object dictionaries) comprise a wide ranging ability to describe a TTI event and some status information, introducing new precision in a number of areas such as “vehicle types”, “positional information on the carriageway” and “diversion routing advice”.

NOTE Explicit backwards compatibility with the RDS-TMC events list (EN ISO 14819-2) could not be achieved since some “update classes”, such as “29 Reference to Audio Broadcasts” and “30 Service Messages”, fall outside the TPEG-RTM remit.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 7498-1, *Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model*

ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO/TS 18234-1, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 1: Introduction, Numbering and Versions*

ISO/TS 18234-2, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 2: Syntax, Semantics and Framing Structure (SSF)*

ISO/TS 18234-3, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 3: Service and Network Information (SNI) Application*

ISO/TS 18234-6, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 6: Location Referencing application*

3 Terms and definitions

For the purposes of this Technical Specification, the following terms and definitions apply.

NOTE Definitions in this specification are in some cases derived from definitions found in the DATEX Data Dictionary (ENV 13106). TPEG-RTM is completely focussed on delivering messages to end-users, so for this key operational reason some definitions have a different meaning from that found in the DATEX Data Dictionary. These differences are highlighted in this section.

3.1
cross reference information (CRI)
pointer to one or more messages in the same, or another TPEG service

3.2
event description (EVE)
part of a message describing the event, unplanned or planned occurrence affecting the road or transport network, (for example the transport network in the case of a ferry carrying vehicles between parts of the road network) or status information, including qualifiers and quantifiers

NOTE This definition varies from the DATEX Data Dictionary definition (ENV 13106).

3.3
locations
see CEN ISO/TS 18234-6 for full details of the location referencing container explanations

3.4
location referencing
method for referencing locations to facilitate the exchange of location related information between different systems

3.5
message
collection of coherent information sent through an information channel. Describes an event or a collection of related events, or status information and including message management information. The latter is contained in the message header

3.6
message expiry time (MET)
date and time in accordance with EN ISO 8601 when the message should be deleted from all TPEG-decoders (used for message management purposes)

3.7
message generation time (MGT)
date and time stamp in accordance with EN ISO 8601 originated at the actual time and point of message generation (used for message management purposes)

3.8
message identifier (MID)
unique identifier for a sequence of versions of one message relating to a particular event of a particular service component

3.9
position
defines where an event has taken place in relation to the road: driving lane 1, hard shoulder, central reservation, etc. The driving lanes are numbered according to the usual local practice, i.e. driving lane 1 is the lane nearest to the hard shoulder. In countries which drive on the left, driving lanes are hence numbered from left-to-right, and in countries driving on the right, from right-to-left

3.10
severity factor (SEV)
Amount of disruption to traffic likely to be caused by a particular event

NOTE This definition varies from the DATEX Data Dictionary definition (ENV 13106).

3.11
start time (STA)
date and time in accordance with EN ISO 8601 at which an event, or status information, began or is scheduled to begin (used for presentation to the end-user)

NOTE This definition varies from the DATEX Data Dictionary definition (ENV 13106).

3.12
status
characteristic of an element of the transport system for which at all times a value can be established. Status relates to an information stream. Values can be normal or deviating from normal

3.13
stop time (STO)
date and time in accordance with EN ISO 8601 at which an event, or status information, ended or is scheduled to end (used for presentation to the end-user)

NOTE This definition varies from the DATEX Data Dictionary definition (ENV 13106).

3.14
time schedule information (TSI)
gives information about the time schedule for repetitive events within the start and stop time

3.15
unverified information (UNV)
indicates that a message includes information from an unverified source

3.16
version number (VER)
serial number to distinguish successive messages having a particular message identifier. Version numbers are used incrementally, allowing the progress of an event to be tracked from first notification (VER = 0), through updates, to eventual cancellation (VER = 255)

NOTE This definition varies from the DATEX Data Dictionary definition (ENV 13106).

4 Symbols and abbreviations

For the purposes of this Technical Specification, the following abbreviations apply.

4.1
AID
Application Identification

4.2
BPN
Broadcast, Production and Networks (an EBU document publishing number system)

4.3
B/TPEG
Broadcast/TPEG (the EBU project group name for the specification drafting group)

4.4
CEN
Comité Européen de Normalisation

4.5
CRI
Cross Reference Information (see 3.1)

4.6
DAB
Digital Audio Broadcasting

4.7
DVB
Digital Video Broadcasting

4.8
EBU
European Broadcasting Union

4.9
ETSI
European Telecommunications Standards Institute

4.10
EVE
Event Description (see 3.2)

4.11
ILOC
Intersection location

4.12
INV
Introduction, Numbering and Versions (see CEN ISO/TS 18234-1)

4.13
IPR
Intellectual Property Right(s)

4.14
ISO
International Organization for Standardization

4.15
MET
Message Expiry Time (see 3.6)

4.16
MGT
Message Generation Time (see 3.7)

4.17
MID
Message Identifier (see 3.8)

4.18
OSI
Open Systems Interconnection

4.19
PTI
Public Transport Information (see CEN ISO/TS 18234-5)

4.20
RDS-TMC
Radio Data System – Traffic Message Channel

4.21
RFU
Reserved for future use (not necessarily abbreviated)

4.22
RTM
Road Traffic Message application (this specification)

4.23
SEV
Severity Factor (see 3.10)

4.24
SNI
Service and Network Information application (see CEN ISO/TS 18234-3)

4.25
SSF
Syntax, Symantics and Framing Structure (see CEN ISO/TS 18234-2)

4.26
STA
Start Time (See 3.11)

4.27
STO
Stop Time (see 3.13)

4.28
TPEG
Transport Protocol Experts Group

4.29
TSI
Time Schedule Information (see 3.14)

4.30
TTI
Traffic and Travel Information

4.31
UAV
Unassigned value

4.32
UNV
Unverified Information (see 3.15)

4.33
UTC
Coordinated Universal Time

4.34
VER
Version Number (see 3.16)

5 RTM application overview

5.1 Introduction

The TPEG-Road Traffic Message application allows for a wide range of TPEG-decoder types and presentation possibilities to be supported. It may support simultaneously a wide range of TPEG-decoder types, from sophisticated agent TPEG-decoders serving navigation systems, through to simple TPEG-decoders only able to decode ‘top-level’ information. Some of the possibilities include digital map-based TPEG-decoders, GPS TPEG-decoders without digital map, and in-vehicle, fixed or portable TPEG-decoders without either GPS or digital map. Road traffic messages may be presented to the user in many different ways, including by text, by synthesized speech, graphically, or in route calculation.

Each road traffic message will need to include at least some of the following elements to satisfy the user requirements for information upon which decisions may be based:

— To whom is the information targeted,

— The geographical location to which the information relates,

— The position on the roadway, or adjacent area affected,

— The event being described,

— How severe is the effect of the described message on the journey,

— Whether the information has been verified,

— The time period for which the message remains valid,

— The consequence the message has on expected journey time in the form of delay information,

— Advice on alternative routes,

— Alternative travel options using other modes of transport by cross-references to other applications,

— Further associated information.

Different road users will have disparate needs and interests in various road traffic messages. Different road users may have disparate needs and interests in various road traffic messages. Some may be useful to many users while others may be relevant to only a few users, for example drivers of heavy goods vehicles. Structure in the coding of messages provides for each to be suitably client-filtered. Filtering can be based on many elements, including phrases, attributes, location, times, and the severity of the message on the journey. No additional coding structure is needed.

NOTE Part of each TPEG-message is a location reference. TPEG technology uses one location referencing system across all applications, known as TPEG-Loc (CEN ISO TS 18234-6). This has the potential of enabling messages from different TPEG streams to be linked by their common location. Each message will be about a particular location. The location may be quite specific, a single point on the road network, a road segment between two given points, or it may be a more general area, often with more vague boundaries. The way in which the location is coded is important as it allows information to be filtered by TPEG-decoders and integrated with route planning and navigation systems.

The descriptive phrase and attribute part of the message about an incident allows a user to make a judgement about the likely progress of a journey, and may either directly or indirectly provide advice allowing travel plans to be revised. To allow appropriate decisions to be made, various data about the incident may be required. If for example, an accident occurs, in general the effect the incident causes will change over time. Immediately following an accident, there will be some disruption to traffic flow, the disruption will increase as traffic builds up behind the incident, then begin to lessen as the accident is cleared, and eventually traffic flow will return to normal.

Each incident has a unique reference number (MID), and the changing progress of an incident is tracked by including a VER with each message. The service provider will allocate a new MID and VER = 0 for a new message, subsequent updates to the same event are indicated by allocation of the next higher VER. A MID and version number 255 has the effect of cancelling all earlier versions of the same message.

There are a few particular things to note about MID and VER.

The first is that VER do NOT “wrap around” from version 255 to version 0. In the unlikely event that more than 254 updates to a specific incident is required, service providers must generate a ‘new’ message, using a new MID (and VER = 0), and cancel the earlier message using Version number = 255. A road traffic message uses two mandatory elements: MID and VER=255, which, used in combination, cancels earlier sent messages with the same message ID.

The shortest non-cancellation message contains MID, VER, LOC and EVE; it should be noted that once a location reference is used, one or more corresponding event descriptions must be included.

The second thing to note is that a message identification number, once used, and then cancelled, must not be re-used until as long a time-period as possible has elapsed. Ideally, a service provider should use all 65 535 possible message identification numbers before re-using a previously used MID.

This use of message identification numbers and version numbers will ensure that TPEG-decoders can unambiguously identify the latest versions of each road traffic message, even if messages are received by the TPEG-decoder ‘out of sequence’, when for example an earlier version of a message arrives after a subsequent version, which updates the information that was originally transmitted.

Message identifier and version are the two elements that are mandatory for every message. They are used for message management purposes in the user’s TPEG-decoder, and are not intended for direct display to the user.

All other elements of a message are optional, used when appropriate. These include elements relating to time, the specific or general location to which the message relates, and which particular driving lanes or carriageway are affected. The service provider is also able to make a judgement on the severity of the effect the incident may have upon journey times, and whether an authoritative reporter has verified the information. As a result of a particular message, a user may wish to access more information, perhaps a suggested diversion route, or even to study alternative modes of transport. An easy means of accessing additional information, for example public transport timetables, within a different TPEG application is provided with the cross-referencing information.

5.2 TPEG-message concept

TPEG applications follow an overall concept, which is indicated by the diagrams in this section to give a quick and easily understood human concept, before a more technical description is given.

TPEG event messages may be seen as being built from three different parts, or containers, each with its own clear task: a message management container, an application event container (in this application, the RTM Container) and a location Ccontainer, a shown in Figure 1. (Location referencing details are described in TPEG-Loc (CEN ISO/TS 18234-6).

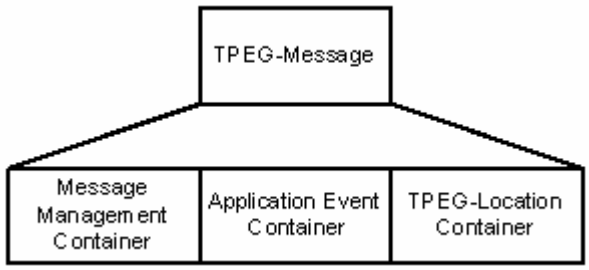

Figure 1 — The three containers

The message management container handles all the elements that allow message tracking, quick identification, validity and other "administrative" tasks. The elements in the application event container are used to describe, with the end-user in mind, the reason for the message, what has happened, and what an end-user may wish to know. The location container describes the location, route or an area for which the event message is applicable.

Regardless of delivery method, it is assumed that a TPEG-decoder will "see" a number of TPEG-messages, one after the other, where they may be messages defined by one or more applications. Figure 2 shows this concept where two applications: TPEG-PTI (CEN ISO/TS 18234-5) and TPEG-RTM messages are streamed together.

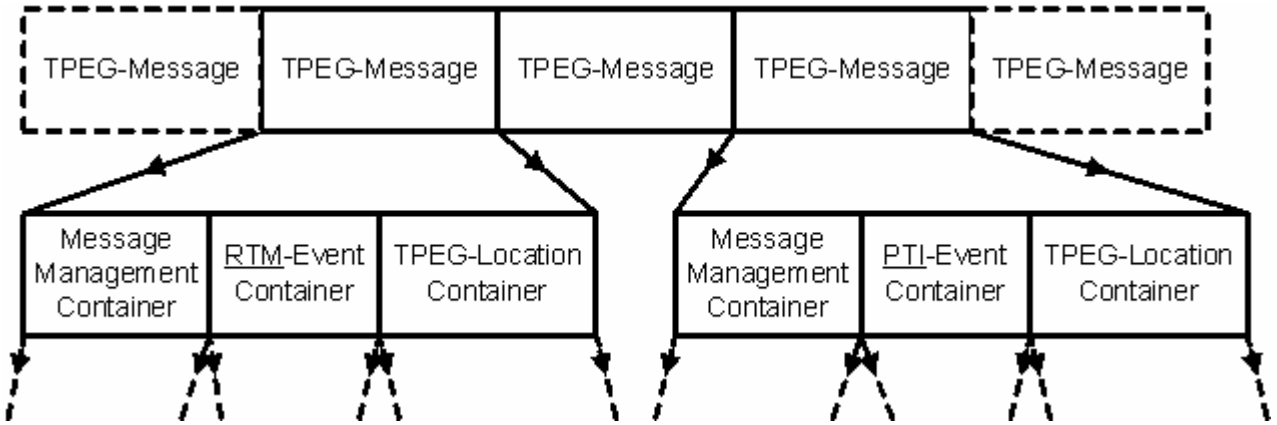

Figure 2 — TPEG-messages showing message management, event and location containers

Where a TPEG-message is one carrying traffic and travel information, Figure 2 also shows that it comprises three "containers": one for the message management, one for event content (e.g. "Accident – Buses running slowly, etc.) and one for the location content (both machine readable and human understandable data).

5.3 TPEG-messages delivering additional information

TPEG-messages may also contain vital information for the full use of a service. For example, a special form of message which is only a message management container (without any associated location container) may be inserted to cancel an existing message (see 5.4.1). This concept is illustrated, in Figure 3.

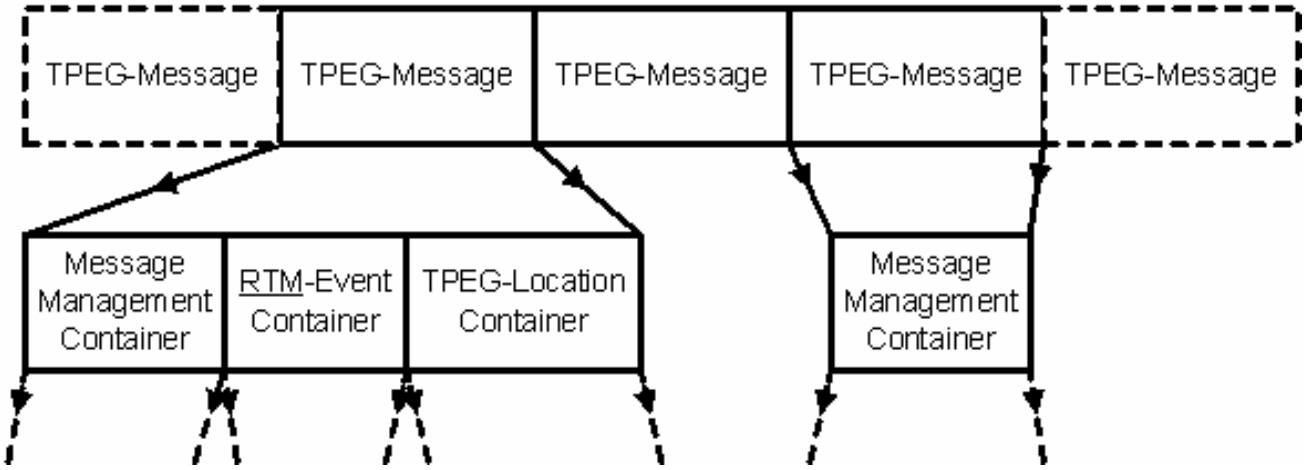

Figure 3 — Delivering additional non-message information

5.4 Elements of a TPEG road traffic message

Most elements of a road traffic message are optional, sent only if specifically required. Thus a TPEG-message container may include various elements according to the following descriptions. Figure 4 shows a TPEG-RTM message, which has three containers.

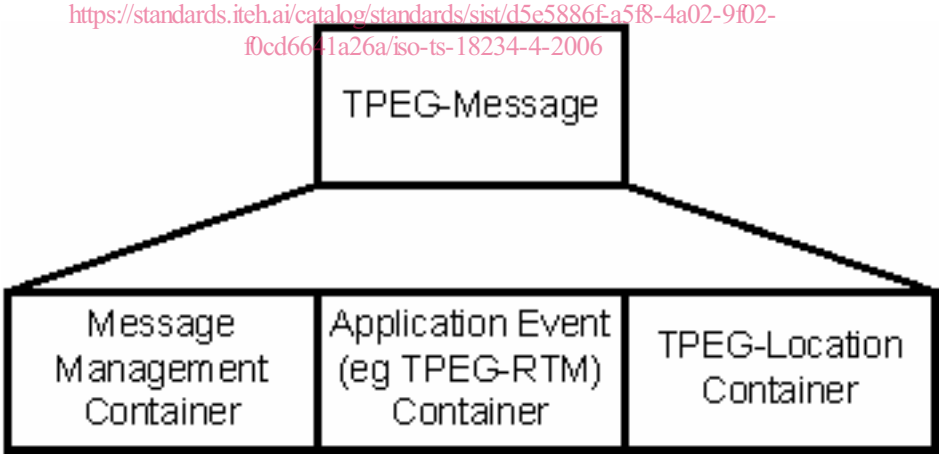

Figure 4 — TPEG-RTM message normally has three containers

5.4.1 Cancellation message

A special case, used to cancel an earlier message, only comprises the two mandatory elements, message identifier and version number = 255. Note it does not have an associated location container. This is shown in Figure 5.