TECHNICAL SPECIFICATION

ISO/TS 21219-16

First edition
2016-09-01

Intelligent transport systems — Traffic and travel information via transport protocol exports group, generation 2 (TPEG2) —

Part 16: Fuel price information and availability (TPEG2-FPI)

Systèmes intelligents de transport — Informations sur le trafic et le tourisme via le groupe expert du protocole de transport, génération 2 (TPEG2) —

Partie 16: Disponibilité et informations sur le prix du carburant (TPEG2-FPI)

Reference number
ISO/TS 21219-16:2016(E)

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

ISO/TS 21219 consists of the following parts, under the general title *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2):*

— Part 1: *Introduction, numbering and versions* [Technical Specification]

— Part 2: *UML modelling rules* [Technical Specification]

— Part 3: *UML to binary conversion rules* [Technical Specification]

— Part 4: *UML to XML conversion rules* [Technical Specification]

— Part 5: *Service framework* [Technical Specification]

— Part 6: *Message management container* [Technical Specification]

— Part 9: *Service and network information* [Technical Specification]

— Part 10: *Conditional access information* [Technical Specification]

— Part 14: *Parking information* [Technical Specification]

— Part 15: *Traffic event compact* [Technical Specification]

— Part 16: *Fuel price information and availability application* [Technical Specification]

— Part 18: *Traffic flow and prediction application* [Technical Specification]

— Part 19: *Weather information* [Technical Specification]

— The following Parts are planned:

— Part 7: *Location referencing container* [Technical Specification]

— Part 11: *Universal location reference* [Technical Specification]

— Part 21: *Geographic location referencing* [Technical Specification]

— Part 22: *OpenLR location referencing* [Technical Specification]

— Part 23: *Road and multimodal routes application* [Technical Specification]

— Part 24: *Light encryption* [Technical Specification]

— Part 25: *Electromobility information* [Technical Specification]

Introduction

History

TPEG technology was originally proposed by the European Broadcasting Union (EBU) Broadcast Management Committee, who established the B/TPEG project group in the autumn of 1997 with a brief to develop, as soon as possible, a new protocol for broadcasting traffic and travel-related information in the multimedia environment. TPEG technology, its applications and service features were 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. Originally, a byte-oriented data stream format, which may be carried on almost any digital bearer with an appropriate adaptation layer, was developed. Hierarchically structured TPEG messages from service providers to end-users were designed to transfer information from the service provider database to an end-user's equipment.

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

Subsequently, in March 1999, CEN TC 278, in conjunction with ISO/TC 204, established a group comprising members of the former EBU B/TPEG and this committee continued development work. Further parts were developed to make the initial set of four parts, enabling the implementation of a consistent service. Part 3 (TPEG-SNI, ISO/TS 18234-3) described the Service and Network Information Application, used by all service implementations to ensure appropriate referencing from one service source to another.

Part 1 (TPEG-INV, ISO/TS 18234-1) completed the series by describing the other parts and their relationship; it also contained the application IDs used within the other parts. Additionally, Part 5, the Public Transport Information Application (TPEG-PTI, ISO/TS 18234-5), was developed. The so-called TPEG-LOC location referencing method, which enabled both map-based TPEG-decoders and non-map-based ones to deliver either map-based location referencing or human readable text information, was issued as ISO/TS 18234-6 to be used in association with the other applications parts of the ISO/TS 18234 series to provide location referencing.

The ISO/TS 18234 series has become known as TPEG Generation 1.

TPEG Generation 2

When the Traveller Information Services Association (TISA), derived from former Forums, was inaugurated in December 2007, TPEG development was taken over by TISA and continued in the TPEG Applications Working Group.

It was about this time that the (then) new Unified Modeling Language (UML) was seen as having major advantages for the development of new TPEG Applications in communities who would not necessarily have binary physical format skills required to extend the original TPEG TS work. It was also realised that the XML format for TPEG described within the ISO/TS 24530 series (now superseded) had a greater significance than previously foreseen; especially in the content-generation segment and that keeping two physical formats in synchronism, in different standards series, would be rather difficult.

As a result, TISA set about the development of a new TPEG structure that would be UML-based; this has subsequently become known as TPEG Generation 2.

TPEG2 is embodied in the ISO/TS 21219 series and it comprises many parts that cover introduction, rules, toolkit and application components. TPEG2 is built around UML modelling and has a core of rules that contain the modelling strategy covered in ISO/TS 21219-2, ISO/TS 21219-3, ISO/TS 21219-4 and the conversion to two current physical formats: binary and XML; others could be added in the future. TISA uses an automated tool to convert from the agreed UML model XMI file directly into an MS Word document file, to minimise drafting errors, that forms the annex for each physical format.

TPEG2 has a three container conceptual structure: Message Management (ISO/TS 21219-6), Application (many Parts) and Location Referencing (ISO/TS 21219-7). This structure has flexible capability and can accommodate many differing use cases that have been proposed within the TTI sector and wider for hierarchical message content.

TPEG2 also has many location referencing options as required by the service provider community, any of which may be delivered by vectoring data included in the Location Referencing Container.

The following classification provides a helpful grouping of the different TPEG2 parts according to their intended purpose.

— Toolkit parts: TPEG2-INV (ISO/TS 21219-1), TPEG2-UML (ISO/TS 21219-2), TPEG2-UBCR (ISO/TS 21219-3), TPEG2-UXCR (ISO/TS 21219-4), TPEG2-SFW (ISO/TS 21219-5), TPEG2-MMC (ISO/TS 21219-6), TPEG2-LRC (ISO/TS 21219-7);

— Special applications: TPEG2-SNI (ISO/TS 21219-9), TPEG2-CAI (ISO/TS 21219-10);

— Location referencing: TPEG2-ULR (ISO/TS 21219-11), TPEG2-GLR (ISO/TS 21219-21), TPEG2-OLR (ISO/TS 21219-22);

— Applications: TPEG2-PKI (ISO/TS 21219-14), TPEG2-TEC (ISO/TS 21219-15), TPEG2-FPI (ISO/TS 21219-16), TPEG2-TFP (ISO/TS 21219-18), TPEG2-WEA (ISO/TS 21219-19), TPEG2-RMR (ISO/TS 21219-23).

TPEG2 has been developed to be broadly (but not totally) backward compatible with TPEG1 to assist in transitions from earlier implementations, whilst not hindering the TPEG2 innovative approach and being able to support many new features, such as dealing with applications having both long-term, unchanging content and highly dynamic content, such as Parking Information.

This Technical Specification is based on the TISA specification technical/editorial version reference:

SP12009/2.0/002

Intelligent transport systems — Traffic and travel information via transport protocol exports group, generation 2 (TPEG2) —

Part 16:
Fuel price information and availability (TPEG2-FPI)

1 Scope

This Technical Specification specifies the TPEG application: Fuel price information and availability (FPI). The FPI application has been specifically designed to support information of fuel stations, their location, fuel types offered and fuel pricing and availability information.

The standardized delivery, via TPEG technology, of fuel price information has the following benefits to end users of a TPEG service:

a) cost savings to driver, through improved ease of access to price information;

b) improved ease of access to price information that may lead to significant cost savings for fleet operators;

c) environmental benefits from drivers not having to drive around to find the cheapest fuel prices;

d) safety improvements for highways authorities, as drivers are less likely to run out of fuel if they are well informed of local availability and prices;

e) as availability of new fuels become more common and more vehicles use them (e.g. biofuels, hydrogen, etc.), drivers will be better informed about availability of fuelling stations.

The TPEG application Fuel price information and availability, as add-on service component next to, for example, traffic information, is laid out to support large numbers of fuel stations and fuel prices with only modest bandwidth requirements.

When the objective is to inform electric vehicles on the location of charging stations and the availability of charging points, the TPEG application TPEG2-EMI (Electro Mobility Information) shall be chosen. TPEG2-FPI contains rudimentary support for electric charging stations. However, a TISA investigation revealed that a simple extension/differentiation of TPEG2-FPI would not be sufficient to address the evolving market needs of the electric vehicle market. Hence, a separate TPEG application was created to serve the information needs of Electric Vehicles and their operators: TPEG2-EMI.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 17572-2, *Intelligent transport systems (ITS) — Location referencing for geographic databases — Part 2: Pre-coded location references (pre-coded profile)*

ISO/TS 18234-11, *Intelligent transport systems — Traffic and Travel Information (TTI) via transport protocol experts group, generation 1 (TPEG1) binary data format — Part 11: Location Referencing Container (TPEG1-LRC)*

ISO/TS 21219-1, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol expert group, generation 2 (TPEG2) — Part 1: Introduction, numbering and versions (TPEG2-INV)*

ISO/TS 21219-2, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol expert group, generation 2 (TPEG2) — Part 2: UML modelling rules*

ISO/TS 21219-3, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol expert group, generation 2 (TPEG2) — Part 3: UML to binary conversion rules*

ISO/TS 21219-4, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol expert group, generation 2 (TPEG2) — Part 4: UML to XML conversion rules*

ISO/TS 21219-5, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol expert group, generation 2 (TPEG2) — Part 5: Service framework (TPEG2-SFW)*

ISO/TS 21219-6, *Intelligent transport systems — Traffic and travel information via transport protocol expert group, generation 2 (TPEG2) — Part 6: Message management container (TPEG2-MMC)*

ISO/TS 21219-7, *Intelligent transport systems — Traffic and travel information via transport protocol expert group, generation 2 (TPEG2) — Part 7: Location referencing container (TPEG2-LRC)*

ISO/TS 21219-9, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 9: Service and network information (TPEG2-SNI)*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
fuel station
facility which sells fuel and lubricants for motor vehicles

Note 1 to entry: The most common fuels sold are petrol (gasoline in U.S. and Canada) or diesel fuel. Alternate names in use for such a facility are gas station, fuelling station, filling station, service station, petrol station, garage, gasbar, petrol pump or petrol bunk.

4 Abbreviated terms

ACID	Application and Content Identifier
ADC	Application Data Container
CEN	Comité Européen de Normalisation
EBU	European Broadcasting Union
LRC	Location Reference Container
FPI	Fuel price information and availability
MMC	Message Management Container
POI	Point of Interest

SFW	TPEG Service Framework: Modelling and Conversion Rules
SNI	Service and Network Information
TFP	Traffic Flow and Prediction
TISA	Traveller Information Services Association
TMC	Traffic Message Channel
TPEG	Transport Protocol Expert Group
TTI	Traffic and Traveller Information
UML	Unified Modeling Language

5 Application specific constraints

5.1 Application identification

The word “application” is used in this Technical Specification to describe specific subsets of the TPEG structure. An application defines a limited vocabulary for certain type of messages, for example, parking information or road traffic information. Each TPEG application is assigned a unique number called the Application IDentification (AID). An AID is defined whenever a new application is developed and these are all listed in ISO/TS 21219-1.

The application identification number is used within the TPEG2-SNI application ISO/TS 21219-9 to indicate how to process TPEG content and facilitates the routing of information to the appropriate application decoder.

5.2 Version number signalling

Version numbering is used to track the separate versions of an application through its development and deployment. The differences between these versions may have an impact on client devices.

The version numbering principle is defined in ISO/TS 21219-1.

Table 1 shows the current version numbers for signalling FPI within the SNI application ISO/TS 21219-9.

Table 1 — Current version numbers for signalling of FPI

Major version number	2
Minor version number	0

5.3 Ordered Components

TPEG2-FPI requires a fixed order of TPEG components. The order for the FPI message component is shown in Figure 1; the first component shall be the *Message Management Container* (MMC). This shall be the only component if the message is a cancellation message. Otherwise, the MMC component shall be followed by one or more *Application Data Container* component(s) which includes the application-specific information.

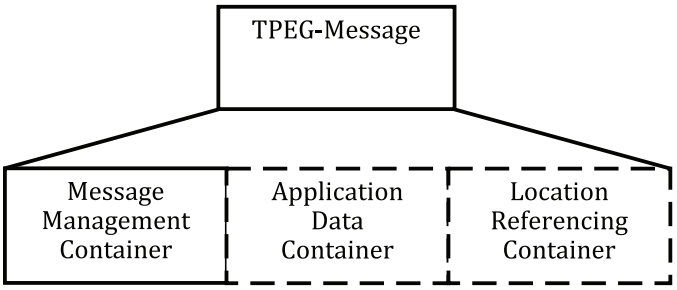

Figure 1 — Composition of TPEG messages

NB: The FPI design centres around the large commonality of information elements, notably for fuel types, (pricing structure: currency, resolution of price information; delivery units) and the relatively slow refresh rate of this information and the expected large volume of FPI information. To give an example of the expected volume, in the USA, approximately 200 000 fuel stations are in operation and, for example, in a radius of 50 km around New York City, one can find approximately 5 000 fuel stations. Consideration of these aspects has guided the design of FPI.

Consequently, the design of the application data container is such that it can contain information for multiple fuel stations at once. The top-level Location Referencing Container of an FPI message shall contain a "Geographic Coverage Area" to indicate the geographic region of interest of the message's content, for receiver geographic filtering purposes. The individual locations of fuel stations are contained in specialized versions of the Application Data Container, as geographic "markers" within this Geographic Coverage Location (see Clause 6 for details). This concept is similar as in TFP, where congested sections of a road are indicated with linear markers with respect to a top-level linear location.

5.4 Extension

The requirement of a fixed component order does not affect the extension of FPI. Future application extensions may insert new components or may replace existing components by new ones without losing backward compatibility. That means, an FPI decoder shall be able to detect and skip unknown components.

5.5 TPEG Service Component Frame

FPI makes use of the "Service Component Frame with dataCRC and messageCount" according to ISO/TS 21219-5.

6 FPI Structure

6.1 General

In this clause, the main structure of FPI and capabilities are defined.

The FPI design centres around the large commonality of information elements, notably for fuel types, pricing structure (currency, resolution of price information; delivery units), the relatively slow refresh rate of this information and the expected large volume of FPI information.

6.2 FPI Structuring concepts

6.2.1 Design

In FPI, for purposes of transmission efficiency, common elements of fuel information are factored out using standard Relational Database theory concepts (the so-called normal forms). Prominently, this is applied for fuel type and pricing structure information ("fuelingDefinitions" in this Technical

Specification). Furthermore, all information is transmitted as tables of information, each under control of a MMC component for validity and update management.

These concepts are described in the following subclauses.

6.2.2 Factoring out definitions

In general, an approach to factor out definitions is more efficient under the following conditions:

a) information is of a composite nature;

b) parts of the information are not the same worldwide (otherwise, a TPEG table would suffice) or more than 255 options exists or are likely to exist (the cardinality of a TPEG table is limited to 255 entries);

c) the amount of duplication in the transmission otherwise needed would significantly affect transmission efficiency.

For FPI, this applies to the fuel names, type and pricing and to fuel brands. Typically, for these data elements, a large number of combinations exist worldwide. Moreover, over time, new types or names may come into existence. Nonetheless, for an individual service provider, only a few combinations are of interest.

Under these conditions, it is advantageous to transmit a separate table with fuel type and pricing structure definitions. Information for a particular fuel station can refer to this item then with a **reference** (the Table Key and Fuel Type Key) rather than duplicating the complete definition every time a fuel station needs to list a price for a particular fuel type with a specific pricing structure.

Table 2 shows a sample from a table for a US-based service provider (e.g. for California). Here, the local fuel names such as “Unleaded”, “Premium” or even “H_2” are used. Delivery units are (US) Gallons for liquid fuels or kg for Hydrogen, and prices are given in US Dollars with a two decimal digit accuracy [e.g. $ 1,34 per (US) Gallon].

Table 2 — Sample table with fueling definitions for the USA

Table Key	(AreaID_Key=01, fuelingDefinitionsID_Key=01)			
Currency unit	US Dollar			
Fuel Type Key	**Fuel name**	**Fuel type**	**Delivery unit**	**Price Resolution**
0	“Unleaded”	Unleaded petrol	Gallon	2 digits
1	“Premium”	high octane unleaded petrol	Gallon	2 digits
2	“Diesel”	Diesel	Gallon	2 digits
3	“H_2“	Hydrogen	kg	2 digits
4	CNG	CNG	gge	2 digits

In Table 2, a line item represents one fuelingDefinition. The field fuel type and delivery unit can be each represented through a standard TPEG table construct as less than 254 variations are expected. The fuel name is obviously represented with a short string and the price resolution with a tiny unsigned integer.

Table 3 shows a sample from a table for a Dutch-based service provider. Here, local names such as “euro-95” and “super-98” are used. Delivery units are now in litres and prices are in Euro, with a price display resolution of 3 digits (e.g. € 1,349 per litre).

Table 3 — Table with fuelling definitions for the Netherlands

Table Key	(AreaID_Key=31, fuelingDefinitionsID_Key=1)			
Currency unit	Euro			
Fuel Type Key	**Fuel name**	**Fuel type**	**Delivery unit**	**Price Resolution**
0	"Euro-95"	Unleaded petrol	Litre	3 digits
1	"Super-98"	high octane unleaded petrol	Litre	3 digits
2	"Diesel"	Diesel	Litre	3 digits

Thus, for every fuel station carrying unleaded, only the *Item Key* of the line item needs to be transmitted to indicate the fuel type meant, rather than the complete definition with the four fields (fuel name, fuel type, delivery unit, pricing resolution). With several thousand fuel prices to be transmitted in dense urban regions, such a mechanism leads to a significant reduction in bandwidth need for a specific repetition rate. This mechanism is used both for fuel type and pricing structure, as for (local) fuel brands. Many fuel stations may have these information items in common.

6.2.3 Transmission of tables of information

A service provider, transmitting fuel price information and availability, needs to be able to provide a TPEG client with a large volume of data at a relatively low transmission bandwidth. This makes it challenging to apply the typical TPEG concept that a single TPEG message equates with a single content item, in this case, a fuel station. The total volume of data per fuel station may easily exceed a hundred bytes. However, clients without any pre-existing information (e.g. transit users) still must be able to have useable data in a short amount of time (~10 min to ~20 min). Some form of transmission at high repetition rates for minimum content, augmented with low repetition rate for additional detailed content is required.

Clustering of (partial) content. The design direction taken for FPI is to allow service providers to arrange their transmissions flexibly, depending on the volume of data to be transmitted and the available bandwidth. That is, the unit of control (a TPEG message) is separated from the unit of content (Fuel Station). Instead, a TPEG message can contain partial content for a cluster of stations (e.g. station locations, or fuelling information) or complete content for a single fuel station.

A large bandwidth service provider with fewer fuel stations to transmit information for may provide the following lay-out of TPEG FPI messages (all messages include the standard MMC component and, for receiver geographic filtering, a LocationReferencingContainer indicating the geographic coverage area).

— **TPEG FPI message, variant A**: Fuel definitions (FPI Component: fuelingDefinitions)

— **TPEG FPI message, variant B:** Station Information for a cluster of 1 station (FPI components: StationFuelingInfoCluster, StationExtraInfoCluster, StationSiteInfoCluster and StationMapLocationCluster).

Both message variants are transmitted at a high repetition rate.

Conversely, a small bandwidth service provider (with more fuel stations to transmit information for) can capitalize on the fact that most of the fuel station information is rather static, (location, site information, etc.).

Thus, a small bandwidth service provider may utilize the following lay-out of TPEG FPI messages.

High repetition rate messages (with standard inclusion of the MMC component and, for receiver geographic filtering, a LocationReferencingContainer indicating the geographic coverage area).

— **TPEG FPI message, variant 1**: Fuel definitions (FPI Component: fuelingDefinitions)

— **TPEG FPI message, variant 2:** Station Information for a cluster of N1 stations
(FPI components: StationFuelingInfoCluster)

— **TPEG FPI message, variant 3:** Station Information for a cluster of N2 stations
(FPI components: StationPOILocationCluster)

Low repetition rate messages (with standard inclusion of the MMC component and, for receiver geographic filtering, a LocationReferencingContainer indicating the geographic coverage area).

— **TPEG FPI message, variant 4**: Station Information for a cluster of N stations
(FPI components: StationSiteInfoCluster)

— **TPEG FPI message, variant 5**: Station Information for a cluster of M1 < N stations
(FPI components: StationNavLocationCluster)

— **TPEG FPI message, variant 6**: Station Information for a cluster of M2 < N stations
(FPI components: StationExtraInfoCluster)

In this case, a low bandwidth service provider can tailor the repetition rate and content of message variants to its local situation and demands. Transit users, without any pre-existing information, are quickly served with the high repetition messages containing the basic location and fuel price information. Commuter users may build up over time the complete fuel station database, including detailed site and location information.

Receivers will link the content tables together based on the unique identification of a fuel station, i.e. the triplet (areaID_Key, stationID_Key) and the fuel definition table (areaID_Key,fuelingDefinitionsID_Key).

NOTE This relational database technology is well known. For utmost clarity, in this Technical Specification, the identifiers used as table keys have been given the suffix "_Key".

6.2.4 MMC usage and FPI message combinations

FPI can make use of both monolithic and multi-part message management for transmission of the fuel station and fuelling definition tables (see ISO/TS 21219-6). The unit of content update shall always be an individual message in case of monolithic message management, or a message part in case of a multi-part message.

In case of a choice (for example, in a TPEG profile) for monolithic message management, then each FPI table (represented by the top-level applicationInformation components) may be transmitted in a separate message or, alternatively, several applicationInformation components may be transmitted together in a single message. The choice largely depends on the desirable repetition rates for these components. Components with an equal repetition rate can advantageously be combined in a single message.

With monolithic message management, each message shall have a unique message ID to distinguish it from other messages. If at least one information element changes for any of the contained fuel stations, then the versionID of the message shall be increased.

In case of a choice for multi-part message management, then the respective information parts for a cluster of Fuel Stations can be transmitted as partial messages. A single "MMCMasterMessage" in that case can indicate the respective partial messages together comprising of the total information. The minimal information, i.e. StationFuelingInfoCluster and one of the LocationInfoClusters shall be signalled as mandatory, since together they comprise of the minimal information which can be presented to the user. The other applicationInformation components (e.g. StationExtraInfoCluster,

StationSiteInfoCluster) may be signalled as optional to indicate that the overall message contents may be presented to the user, even if this partial message has not yet been received.

With multi-part message management, providers are recommended to have the various message parts contain information for the same cluster of stations (i.e. the same set of stationID_Key's). If at least one information element changes for any of the contained fuel stations, then the versionID of the affected partial message shall increase.

For both forms of message management, it is recommended to send the FuelingDefinitions in a separate, long lasting, FPI message. Its content is independent of any fuel station in particular and rather encodes the regional or national fuel and fuel pricing conventions.

Summarizing, the minimal applicationInformation components needed to provide a basic FPI service are the following:

a) FuelingDefinitions;

b) StationFuelingInfoCluster;

c) one of the Station(…)Location(…)Cluster options.

The additional applicationInformation components providing more detailed and/or special information for selected fuel stations are the following:

a) StationExtraInfoCluster;

b) StationSiteInfoCluster.

The FPI service provider can utilize both monolithic and multi-part message management. With multi-part messagemanagement, the provider should ensure that the repetition rate of the "MMCMasterMessage" is at least as frequent as the mandatory message parts to provide for fastest display of FPI information in a TPEG client after start-up.

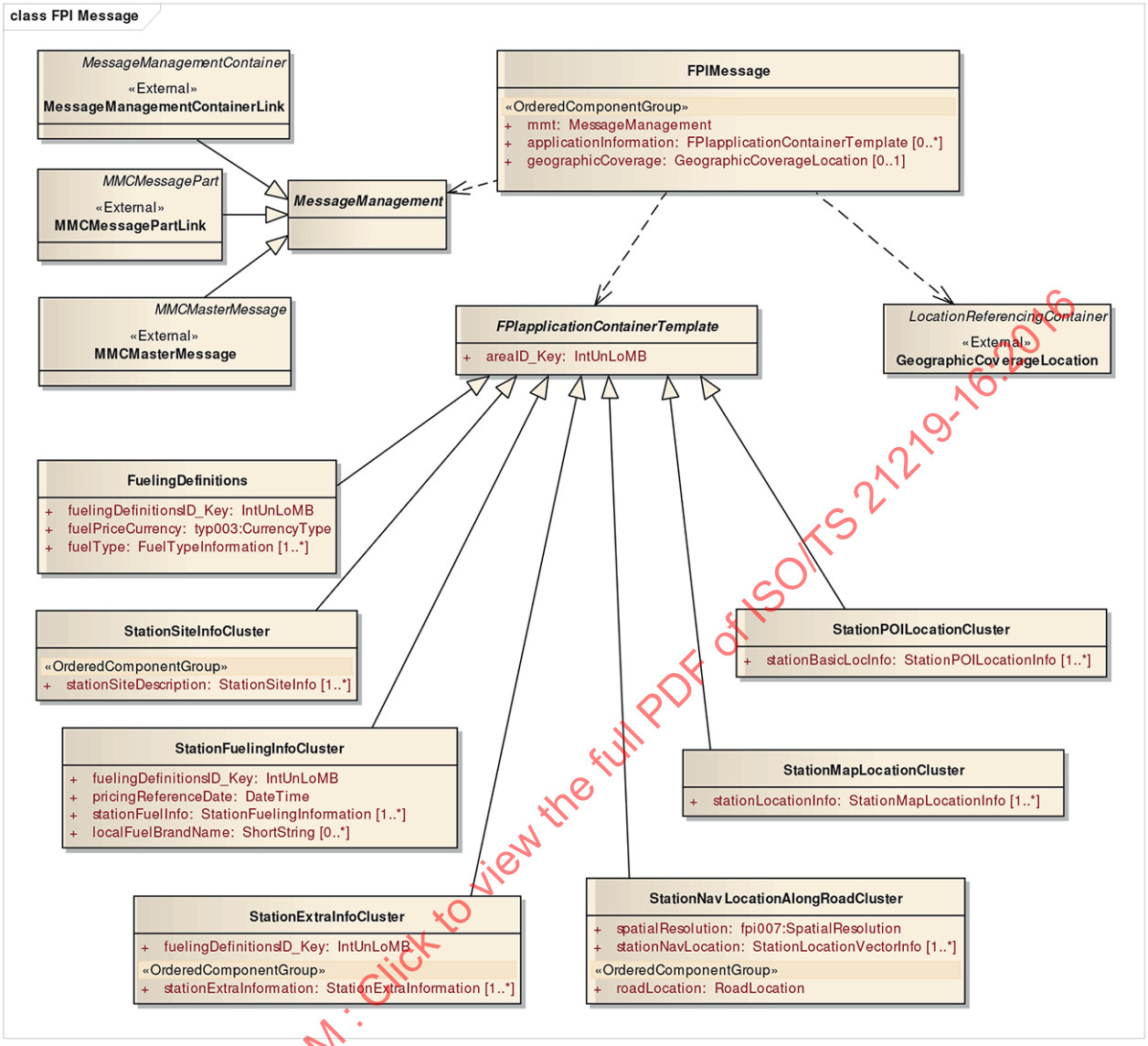

Figure 2 — Main structure of a FPI message

6.3 FPI Message structure

6.3.1 General

The structure of the top-level overall FPI message is illustrated in Figure 2. For transmission efficiency, a FPI message is designed to contain information for a cluster of fuel stations at once. In addition, the fuelingDefinitions is a separate component which can be included together with a cluster of fuel stations, or can be separately transmitted (as explained in the previous clause).

The six types of information which can be transmitted inside an FPI message are the following:

a) FuelingDefinitions (Fuel type, name and pricing structure information);

b) primary information for a cluster of fuel station (typically the fuel brand, fuel types and pricing);

c) additional information for a cluster of fuel station (typically availability issues, promotional offers);

d) detailed site information for a cluster of fuel stations (typically contact information, opening hours, etc.);

e) location information for a cluster of fuel stations;

f) geographic coverage (i.e. scope) of the contents of this FPI message in a top-level location referencing container. In FPI, this geographic Coverage location reference shall be an area-type location reference.

Typically, fuelingDefinitions should be transmitted in a separate FPI message with a long expiry time. This type of information is near-constant for a given service; only when a new fuel type enters the market is a change required. Other FPI messages can refer to this "dynamic table" fuelingDefinition via a cross reference by the TableID which is the pair (AreaID_Key, fuelingDefinitionsID_Key). For example, a service in the Netherlands would refer to the definitions in Table 2 by *AreaID_Key=31, FuelingDefinitionsID_Key=1*.

For bandwidth reasons, only a subset of fuel station information should be rapidly transmitted. This subset contains the minimal information for a TPEG client to present useful information to its users. The so-called "primary information" (see 6.3.3), includes the FuelingInformation (the fuel brand, fuel prices and date of pricing collection) and a minimal location information.

Some stations may have imposed delivery restrictions, are running promotional offers or, (temporarily) are sold out for some main fuel types. Such information can be carried as "additional information" (see 6.3.3). Finally, on a slower pace, the above information can be augmented by detailed site information for a fuel station, giving contact information, detailed address and location references, opening hours and other information. Such information can be provided as "detailed site information" (see 6.3.5).

Hence, the minimal information needed for a TPEG client to present useful information to its user is the following:

a) StationFuelingInfoCluster, containing the fuelling information for a number of stations;

b) FuelingDefinitions, relevant to the StationFuelingInfoCluster;

c) minimal location information, e.g. StationPOILocationCluster.

The other two top level application container components, StationExtraInfoCluster and StationSiteInfoCluster, provide additional information which is helpful and provides more detail (when set in relation to the StationFuelingInfoCluster).

Thus, a service provider is in the position to transmit the first two components (*StationFuelingInfoCluster* and *FuelingDefinitions*) at a frequent repetition rate to suit first-time clients, and transit clients, and provide the other two components (*StationExtraInfoCluster* and *StationSiteInfoCluster*) at a slow rate for local clients with large persistent storage which are then able to provide more detailed information.

6.3.2 FuelingDefinitions

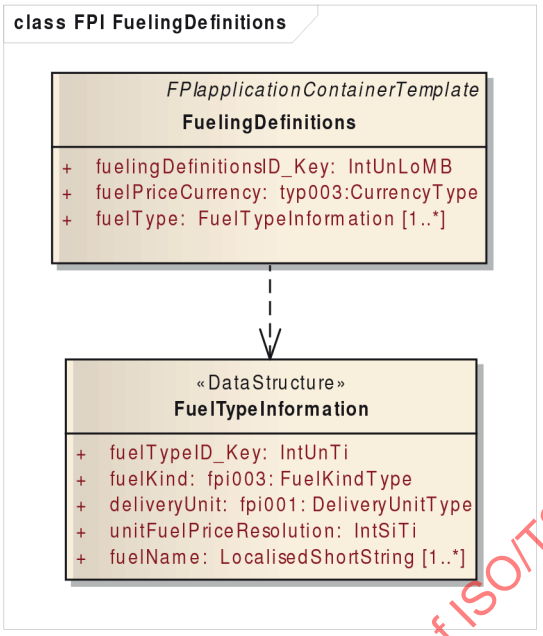

Figure 3 — Structure of FuelingDefinitions

The main structure to transmit fuel type definitions is illustrated in Figure 3. As detailed in 6.2, this structure is designed for transmission of a dynamic table with composite fields. The two table identification parameters are areaID and fuelingDefinitionsID. Together, these parameters uniquely identify a particular set of fuel types and pricing structure information.

The main component FPIFuelingDefinitions contains the two table identification parameters, the currency in which the fuel prices are given, and a list of fuel types. The fuelTypeID_Key is used as the reference to which other components may refer to one of the listed fuel types. The data structure FuelTypeInformation encodes a single fuel type.

A fuel type is characterised by a (local) fuel name, a global fuel kind, the delivery unit for the given fuel type and the currency type of the fuel price. Lastly, the item unitFuelPriceResolution is given. This item shall indicate the resolution of pricing as given by fuel stations on their displays.

Fuel prices to be displayed to a user must be built up from the following two separately transmitted items:

— the unitFuelPriceResolution as transmitted with the fuel types;

— the unitFuelPricePoints which is transmitted separately for each station and each fuel type.

With these items, a fuel price for display to the user is reconstructed as follows:

$$\text{Fuel price} = \text{unitFuelPricePoints} \times 10^{\text{unitFuelPriceResolution}}$$

Thus, a fuel price of 2,34 $/Gallon is transmitted with unitFuelPricePoints = 234 and unitFuelPriceResolution = –2 (i.e. 234×10^{-2} indicating a displayed price of 2,34). Similarly, a fuel price of € 1,234/Litre is transmitted with unitFuelPricePoints = 1234 and unitFuelPriceResolution = –3 (i.e. $1\,234 \times 10^{-3}$ indicating a displayed price of 1,234).

6.3.3 StationFuelingInformation

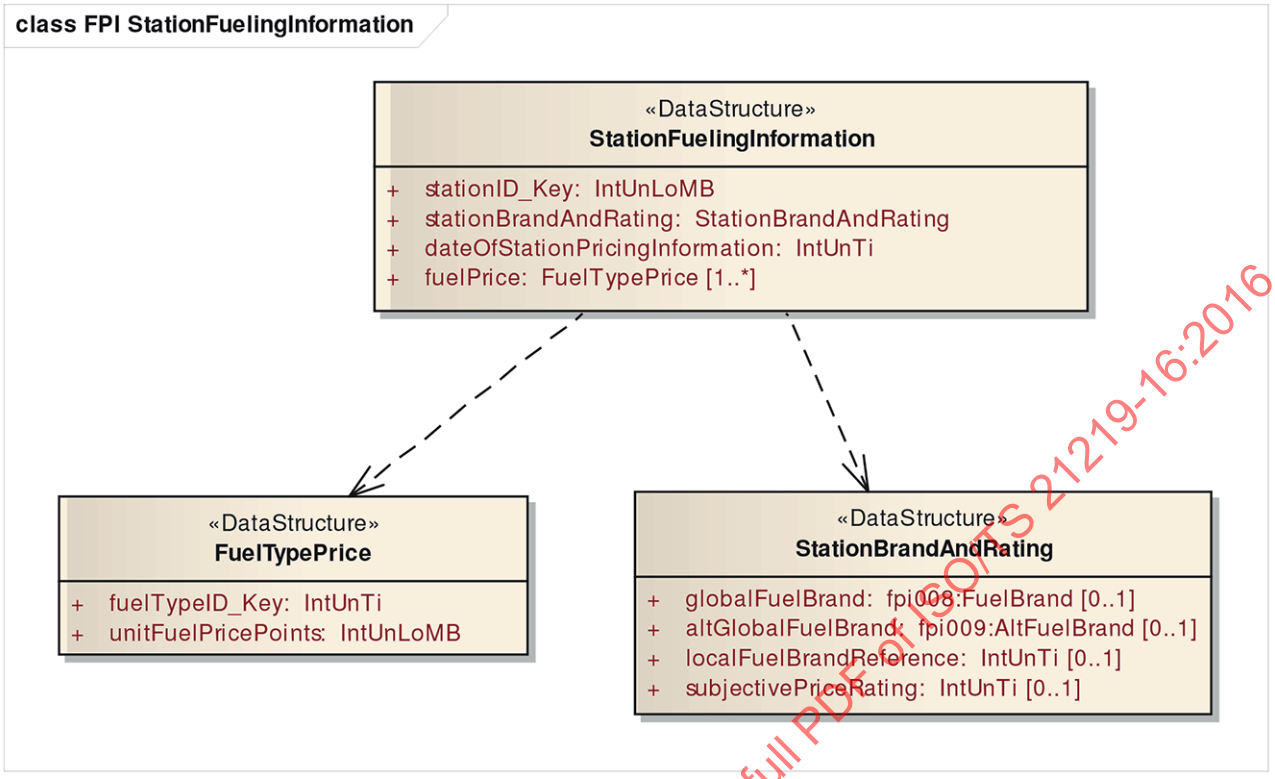

Figure 4 — Structure of StationFuelingInformation

The main structure to transmit the primary fuel information and location for a fuel station is illustrated in Figure 4. The primary information consists of four parts as follows:

a) a stationID in order to have a unique reference for this station which is independent of the messageID;

b) the fuel brand of the station (e.g. Shell, BP, Exxon);

c) the fuel prices for the fuel types which this station carries;

d) the date of the last received fuel pricing information for this station.

The stationID allows a receiver to link together the primary information transmitted in the StationFuelingInformation and other information transmitted in, e.g. the StationExtraInformation component. The combination (areaID_Key, stationID_Key) uniquely identifies a given fuel station in the context of the service's Application and Content Identifier (ACID).

The fuel brand is preferably transmitted as an entry from the TPEG table fpi008:FuelBrand or fpi009:AltFuelBrand. However, when a local or new fuel brand is not present in this table, instead, a reference to a localFuelBrand can be provided. The optional list of localFuelBrandNames is contained in the overlying cluster component (StationFuelingInfoCluster). The provided reference to the localFuelBrand indicates the index (0, ...) in this list of localFuelBrandNames.

The fuel prices are transmitted with a data structure FuelTypePrice. The fuel type is indicated with a reference (fuelTypeID_Key) to a fuelType as contained in the FuelingDefinitions. This reference provides the fuelTypeID_Key of the fuel type contained in the FuelingDefinitions component. The overlying Cluster component (StationFuelingInfoCluster) contains the FuelingDefinitionsID_Key indicating the FuelingDefinitions table to refer to. The actual price is sent as unitFuelPricePoints, which combined with the unitFuelPriceResolution given in fuelType allows the receiver to construct displayed price elements as explained in 6.3.1.

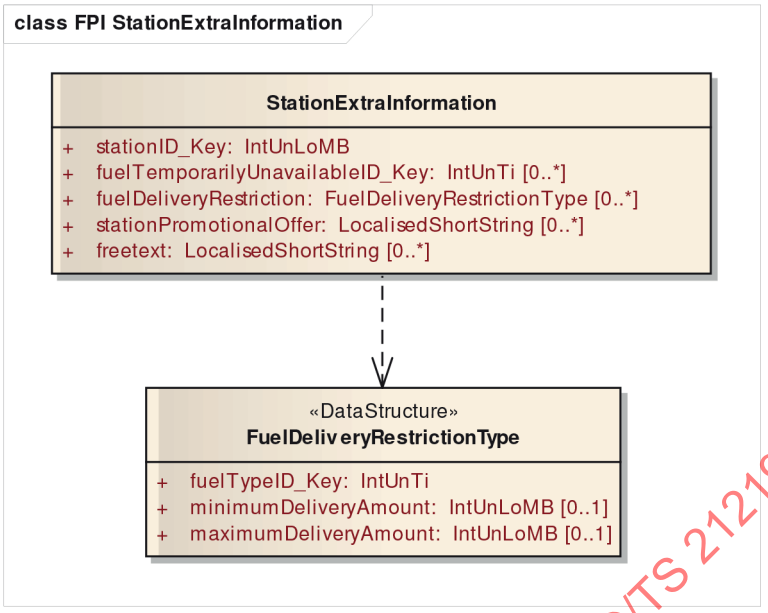

Figure 5 — Structure of Station Extra Information

6.3.4 Station Extra Information

The main structure to transmit the additional information for a fuel station is illustrated in Figure 5. Transmission of additional information is expected to be relevant only for a small subset of all the fuel stations. In particular, transmission of additional information makes sense when a fuel station has run out of stock of a particular fuel, when it needs to impose delivery restrictions for a particular fuel or when it has a promotional offer or other information to convey to a driver.

The stationID allows a receiver to link together the primary information transmitted in the StationFuelingInformation, and other information transmitted in other components, such as the StationSiteInformation component.

To indicate the types of fuel temporarily out of stock, a reference to a fuel type can be transmitted using the fuelTemporarilyUnavailableID_Key. The identification of the fuel type table, as contained in the StationExtraInfoCluster (areaID_Key, fuelingDefinitions_Key), makes this an unambiguous reference to a fuel type.

Delivery restrictions on certain fuel types can be transmitted with one or more FuelDeliveryRestrictionType data structures. These include a reference to a fuel type and an optional minimum or maximum delivery amount (in the delivery units of the fuel type).

Finally, one or more promotional offers (in relevant languages of interest) or general information can be transmitted as free text.

6.3.5 Station Site Information

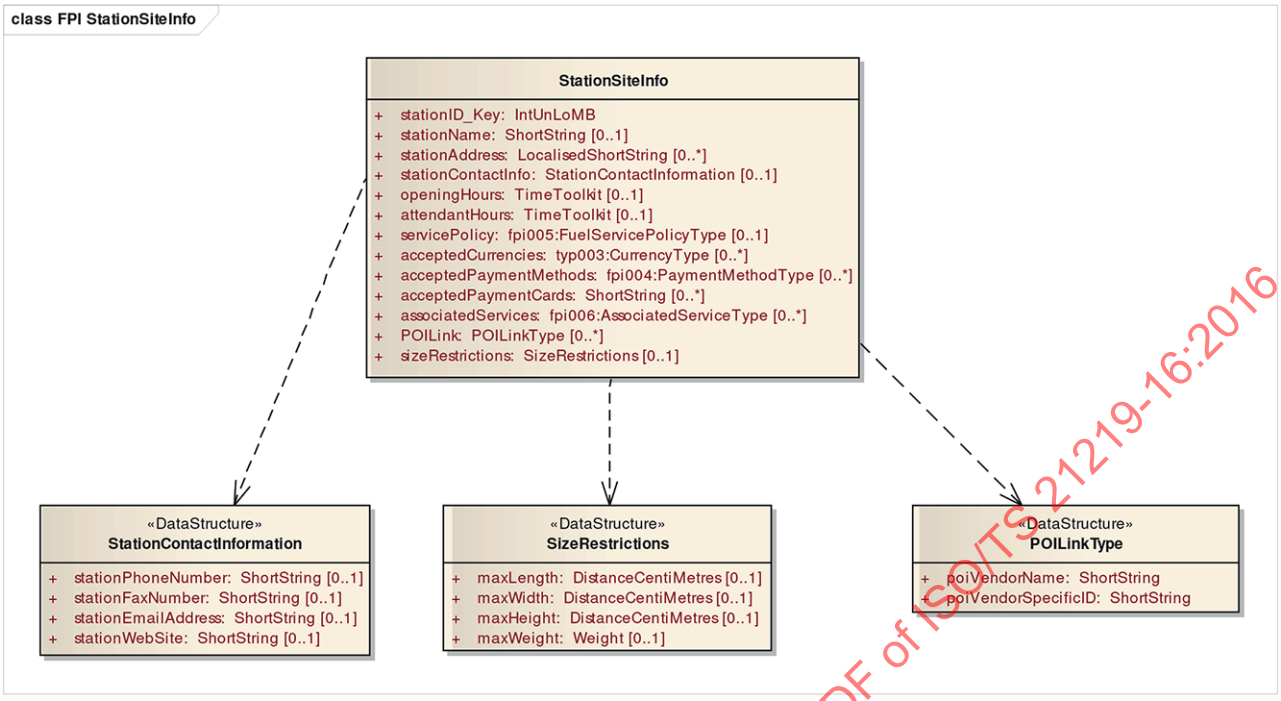

Figure 6 — Structure of Station Site Information

The main structure to transmit the detailed site information for a fuel station is illustrated in Figure 6. The detailed site information allows a service provider to include many details about the site of the facility as well as contact information as follows:

a) the station name and station street address;

b) contact information for the facility;

c) the opening hours of the station and the times when an attendant is present;

d) the fuel service policy: whether customers are allowed to pump fuel themselves or whether an attendant will do so;

e) the accepted currencies, payment methods, and (names of) accepted payment cards;

f) associated services that the facility offers in addition to fuelling (e.g. public restrooms, mini-market, etc.);

g) a reference to a Point of Interest (POI) vendor specific identifier;

h) any vehicle restrictions with respect to the usage of the facility.

NOTE Most of the information elements are optional, hence, service providers can choose to transmit only those elements which are relevant for the facility and the provider's customers.

6.3.6 Station Location Information

Three variants for providing location information for fuel stations are as follows:

a) minimal POI-like location information, with minimally a WGS-84 coordinate pair;

b) information on entry/exit locations to/from the fuel station along a road (such that clusters of fuel station can reuse the same Road Location location reference);

c) detailed map location references for the facility location itself, and entry/exit locations.

The overall structure of the location information variants is shown Figure 7.

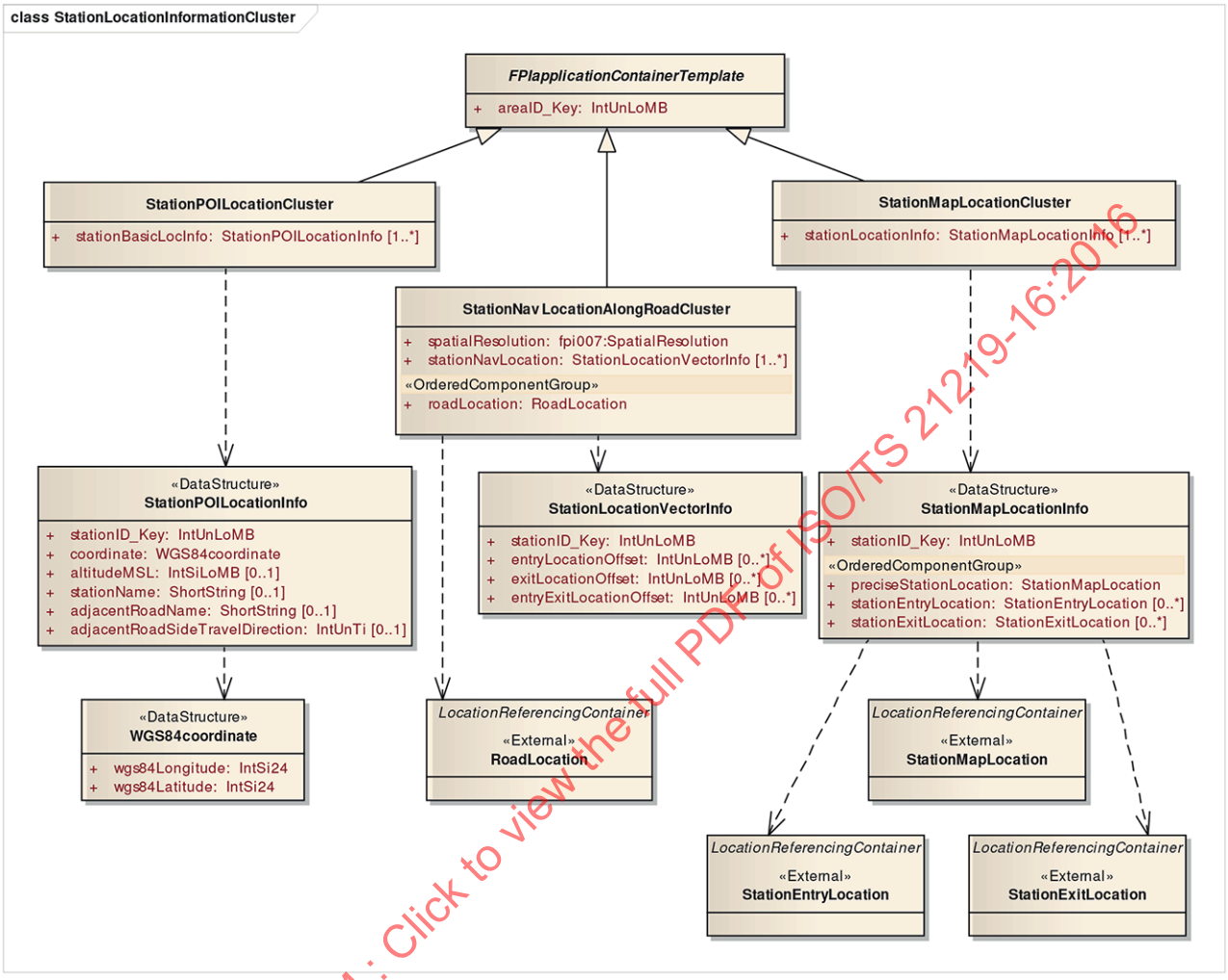

Figure 7 — Structure of station location information

StationPOILocationCluster — For the first variant of fuel station location information, the component StationPOILocationCluster, allows an efficient transmission of minimal facility location for small bandwidth service providers. The efficient data structure coding allows for the transmission of a minimal geographic location for a fuel station. It offers a means to achieve adequate repetition rates in small bandwidth environments.

StationNavLocationAlongRoadCluster — The second variant, using the component StationNavLocationAlongRoadCluster, allows for the efficient transmission of station's entry, exit or combined entry/exit locations, notably when multiple stations are located along a road. This concept is similar to TFP.

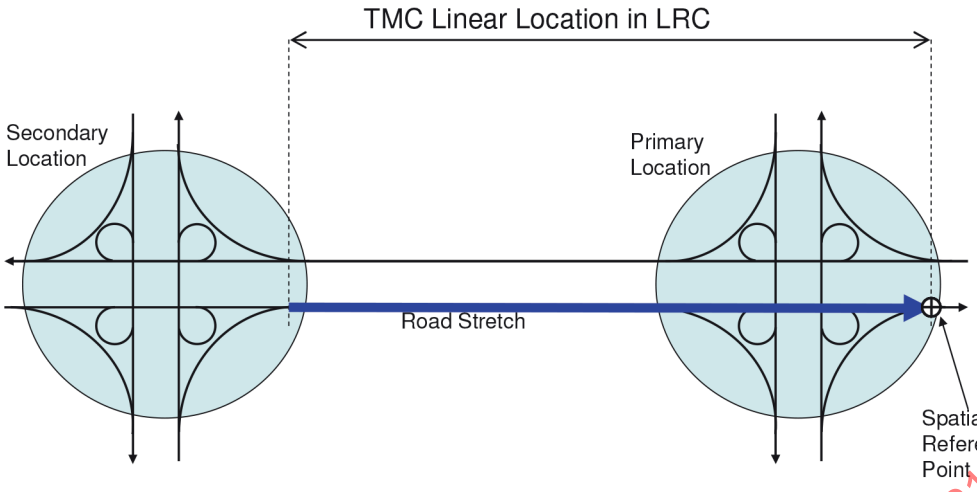

Figure 8 — Definition of spatial reference point for TMC locations included in RoadLocation LRC (in StationNavLocationAlongRoadCluster)

The RoadLocation component contains all information describing the linear location along which a number of fuel stations are located. Only linear locations shall be used to define the road stretch along which the respective fuel stations are located (no area or point locations).

The **Spatial Reference Point** of this RoadLocation is defined as the **end of the Roadlocation** (in driving direction). Based on this Reference Point, offsets are used to describe dedicated points on the road stretch, i.e. the respective entry and exit locations of the fuel stations.

If TMC location referencing (ISO 17572-2) is used in the RoadLocation, the Spatial Reference Point shall be always the Primary Location. A TMC Primary Location defines only an intersection and is, thus, not very precise. Therefore, the following convention shall be applied in FPI for TMC locations:

— the Spatial Reference Point for TMC locations is the position on the road stretch where the last entry or exit in driving direction joins the road stretch (see also Figure 8).

StationMapLocationCluster — Finally, the third variant, uses the component StationMapLocationCluster, allows for the full detailed transmission of richer location information for a single fuel station or a cluster of fuel stations. This method of transmission is suitable primarily for large bandwidth service providers.

7 FPI Message components

7.1 FPIMessage

The overall FPI message container is presented in Table 4.

Table 4 — FPI message

Name	Type	Multiplicity	Description
Ordered components			
mmt	MessageManagement	1	This component is specified in the MMC specification. It contains all and only information related to message management. The sender side, especially the instance generating the transmission data, has to ensure that the message management information allows unambiguous interpretation over time and in appropriate scenarios with disturbed reception specific to the transmission channel.
applicationInformation	FPIapplicationContainerTemplate	0..*	Application information for a cluster of fuel stations. This can contain either fuelling definitions, basic information, additional availability and restrictions, more detailed site and facility or location information.
geographicCoverage	GeographicCoverageLocation	0..1	Geographic coverage of the stations for which information is included in this message. FPI shall only use area locations to indicate the geographicCoverage of the FPI message: no point locations, nor linear locations may be used.

7.2 FPIapplicationContainerTemplate

The FPIapplicationContainerTemplate component presented in Table 5 is an abstract component for all application cluster components.

Table 5 — FPIapplicationContainerTemplate

Name	Type	Multiplicity	Description
areaID_Key	IntUnLoMB	1	The areaID_Key provides a level of granularity for fuelingdefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingdefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).

7.3 FuelingDefinitions

The FuelingDefinition component to transmit fuel type, name, price and delivery unit definitions is presented in Table 6. This component may be sent in a separate message with a later expiry time, instead of repeated for every fuel station. The fuelingDefinitionsID_Key tag defines the proper definitions to use.

In the context of a given service ACID, the combination of areaID_Key and fuelDefinitonsID_Key shall define a unique set of fuel definitions.

One FuelingDefinitions table shall be contained in each FuelingDefinitions component, transmitted in a single FPI message.

Table 6 — FuelingDefinitions

Name	Type	Multiplicity	Description
areaID_Key	IntUnLoMB	1	The areaID_Key provides a level of granularity for fuelingdefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingdefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
fuelingDefinitionsID_Key	IntUnLoMB	1	ID of set of fuelingDefinitions given here. This ID will be referenced to by FuelingInformation. The combination (AreaID_Key, fuelingDefinitionsID_Key) shall be unique per ACID (Application and Content Identifier) for a given TPEG service.
fuelPriceCurrency	typ003:CurrencyType	1	Currency of pricing for all offered fuel types.
fuelType	FuelTypeInformation	1..*	List of Fuel Types, delivery units and pricing resolution information as part of this fuelingDefinitions.

7.4 MessageManagement

The MessageManagement component is an abstract generalization for the message management containers as specified in the MMC specification.

7.5 StationExtraInfoCluster

The StationExtraInfoCluster component presented in Table 7 contains additional information for a cluster of fuel stations.

Table 7 — StationExtraInfoCluster

Name	Type	Multiplicity	Description
areaID_Key	IntUnLoMB	1	The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
fuelingDefinitionsID_Key	IntUnLoMB	1	Reference to FuelingDefinitions table to use (in context of provided AreaID_Key). A reference to a fuel type in the fuelingDefinitions table is used in context of delivery restrictions and temporary unavailability.
Ordered components			
stationExtraInformation	StationExtraInformation	1..*	Component containing extra information for a particular fuel station

7.6 StationExtraInformation

The StationExtraInformation component presented in Table 8 contains additional information for a fuel station, which may be relevant only for a few stations (e.g. in case of promotional offers or delivery restrictions).

Table 8 — StationExtraInformation

Name	Type	Multiplicity	Description
stationID_Key	IntUnLoMB	1	The stationID_Key, together with areaID_Key, uniquely identifies a particular station in the context of a service ACID (Application and Content IDentifier).
fuelTemporarilyUnavailableID_Key	IntUnTi	0..*	Reference to fuel type which is temporarily out of stock. This reference provides the fuelTypeID_Key of the fuel type in the fuel type table in fuelDefinitions component with (AreaID_Key, fuelingDefinitionsID_Key) as given in the StationExtraInfoCluster component.
fuelDeliveryRestriction	FuelDeliveryRestrictionType	0..*	Optional indication whether delivery restrictions are placed on a particular fuel type.
stationPromotionalOffer	LocalisedShortString	0..*	Field to transmit any station promotional offers in languages of interest.
freetext	LocalisedShortString	0..*	Field to transmit any station additional information (other than promotional offers) in languages of interest.

7.7 StationFuelingInfoCluster

The StationFuelingInfoCluster component presented in Table 9 contains the primary information for a fuel station: Fuel types, Fuel Brand name(s) and primary station information. On basis of the FuelingDefinitions, this fuel information, and basic location information, a receiver can already present useful information to an end user.

Table 9 — StationFuelingInfoCluster

Name	Type	Multiplicity	Description
areaID_Key	IntUnLoMB	1	The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
fuelingDefinitionsID_Key	IntUnLoMB	1	Reference to correct FuelingDefinitions to use (in context of AreaID_Key unique).
pricingReferenceDate	DateTime	1	Reference date for pricing information in stationFuelingInformation data structures.
stationFuelInfo	StationFuelingInformation	1..*	Fueling information for a particular fuel station.
localFuelBrandName	ShortString	0..*	Name of a local Fuel Brand, not occurring in table fpi008: FuelBrand nor in table fpi009: AltfFuelBrand.

7.8 StationMapLocationCluster

The StationMapLocationCluster component presented in Table 10 contains map-related location referencing information for a cluster of stations, located at different roads.

Table 10 — StationMapLocationCluster

Name	Type	Multiplicity	Description
areaID_Key	IntUnLoMB	1	The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
stationLocationInfo	StationMapLocationInfo	1..*	Container component holding precise location information for a list of stations.

7.9 StationNavLocationAlongRoadCluster

The StationNavLocationAlongRoadCluster component presented in Table 11 contains entry/exit road location referencing information for a cluster of stations, located along the same main road.

This information is especially suited for navigating towards/from fuel stations.

Table 11 — StationNavLocationAlongRoadCluster

Name	Type	Multiplicity	Description
areaID_Key	IntUnLoMB	1	The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
spatialResolution	fpi007:SpatialResolution	1	Resolution of the spatial offset used in this structure in steps of 5 m, 10 m, 25 m, 50 m and 100 m. This spatial resolution value shall be used for all spatial offsets in the StationLocationVector.
stationNavLocation	StationLocationVectorInfo	1..*	Navigable entry/exit locations of a fuel station along a road, as specified relative to a section of that road.
Ordered components			
roadLocation	RoadLocation	1	The road along which a number of fuel stations are situated. The locations of individual fuel stations are given as offsets with respect to the start of this RoadLocation.

7.10 StationPOILocationCluster

The StationNavLocationAlongRoadCluster component presented in Table 12 contains basic POI location referencing information for a cluster of fuel stations.

Table 12 — StationPOILocationCluster

Name	Type	Multiplicity	Description
areaID_Key	IntUnLoMB	1	The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
stationBasicLocInfo	StationPOILocationInfo	1..*	A list of station id's with basic location information.

7.11 StationSiteInfo

The StationSiteInfo component presented in Table 13 contains detailed site information for a fuel station, including full address, opening hours and accepted payment methods.

Table 13 — StationSiteInfo

Name	Type	Multiplicity	Description
stationID_Key	IntUnLoMB	1	The stationID_Key, together with areaID_Key, uniquely identifies a particular station in the context of a service ACID (Application and Content IDentifier).
stationName	ShortString	0..1	Name of individual station. Applicable if well known, or when no brand name is associated with the station.
stationAddress	LocalisedShortString	0..*	Street address of the fuel station in the relevant local language(s).
stationContactInfo	StationContactInformation	0..1	Contact information for the fuel station.
openingHours	TimeToolkit	0..1	Opening hours of the facility.
attendantHours	TimeToolkit	0..1	Hours when a human attendant is available for cash payments and help for motorists.
servicePolicy	fpi005:FuelServicePolicyType	0..1	The station's fuel pumping policy: self-serve, full-serve or a combination.
acceptedCurrencies	typ003:CurrencyType	0..*	Accepted currencies for payment, if not only the displayed currency for the fuel price is accepted.
acceptedPaymentMethods	fpi004:PaymentMethodType	0..*	Accepted methods for payment.
acceptedPaymentCards	ShortString	0..*	When payment methods such as debit or credit cards are indicated, the names of accepted payment cards (bank or credit cards) can be specified here. E.g. "American Express", "Visa", "Maestro", "DKV", etc.
associatedServices	fpi006:AssociatedServiceType	0..*	Lists available services which the stations offer in conjunction with the fuelling service (e.g. mini market).
POILink	POILinkType	0..*	Reference to a POI of a third party POI supplier.
sizeRestrictions	SizeRestrictions	0..1	Applicable size restrictions on vehicles that are allowed to use this facility.

7.12 StationSiteInfoCluster

The StationSiteInfoCluster component presented in Table 14 contains site information for a cluster of fuel stations.

Table 14 — StationSiteInfoCluster

Name	Type	Multiplicity	Description
areaID_Key	IntUnLoMB	1	The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
Ordered Components			
stationSiteDescription	StationSiteInfo	1..*	Detailed site information for a particular fuel station.

7.13 GeographicCoverageLocation

Geographic Coverage location reference defined by the Location Referencing Container from the TPEG-LRC toolkit [ISO/TS 18234-11 (for TPEG1) and ISO/TS 21219-7 (for TPEG2)]. This shall be an area location that indicates the region of relevance for the content of the FPI message.

7.14 MessageManagementContainerLink

MessageManagementContainer as defined in the TPEG-MMC toolkit (ISO/TS 21219-6).

7.15 MMCMasterMessageLink

MMCMasterMessage as defined in the TPEG-MMC toolkit (ISO/TS 21219-6).

7.16 MMCMessagePartLink

MMCMessagePart as defined in the TPEG-MMC toolkit (ISO/TS 21219-6).

7.17 StationEntryLocation

The StationEntryLocation component is used to encode a station entrance road/ramp as a Location Reference Container from the TPEG-LRC toolkit [ISO/TS 18234-11 (for TPEG1) and ISO/TS 21219-7 (for TPEG2)].

7.18 StationMapLocation

The StationMapLocation component is used to encode a station facility location as a Location Reference Container from the TPEG-LRC toolkit [ISO/TS 18234-11 (for TPEG1) and ISO/TS 21219-7 (for TPEG2)].

7.19 RoadLocation

The RoadLocation component is used to encode road location as Location Reference Container from the TPEG-LRC toolkit [ISO/TS 18234-11 (for TPEG1) and ISO/TS 21219-7 (for TPEG2)].

7.20 StationExitLocation

The StationExitLocation component is used to encode a station exit road/ramp as a Location Reference Container from the TPEG-LRC toolkit [ISO/TS 18234-11 (for TPEG1) and ISO/TS 21219-7 (for TPEG2)].

8 FPI Datatypes

8.1 FuelDeliveryRestrictionType

The FuelDeliveryRestrictionType presented in Table 15 contains the data structure to specify applicable minimum and/or maximum delivery amounts for a specific fuel type.

Table 15 — FuelDeliveryRestrictionType

Name	Type	Multiplicity	Description
fuelTypeID_Key	IntUnTi	1	Reference to a fuel type as specified in the appropriate FuelingDefinitions component (with given AreaID_Key, fuelingDefinitionsID_Key).
minimumDeliveryAmount	IntUnLoMB	0..1	Minimum delivery amount of Fuel Type in number of delivery units.
maximumDeliveryAmount	IntUnLoMB	0..1	Maximum delivery amount of Fuel Type in number of delivery units.

8.2 FuelTypeInformation

The FuelTypeInformation presented in Table 16 contains the specification of the name and type of the fuel, including pricing resolution and delivery units.

Table 16 — FuelTypeInformation

Name	Type	Multiplicity	Description
fuelTypeID_Key	IntUnTi	1	ID of fuel type defined in this data structure with the remainder of the attributes in the FuelTypeInformation data structure. The combination (AreaID_Key, fuelingDefinitionsID_Key, fuelTypeID_Key) shall be unique.
fuelKind	fpi003:FuelKindType	1	The type of fuel, e.g. unleaded, petrol or LPG.
deliveryUnit	fpi001:DeliveryUnitType	1	The delivery unit of the fuel, also the unit for which unit prices are given.
unitFuelPriceResolution	IntSiTi	1	The display resolution of the unit price. Fuel Price is transmitted as unitFuelPricePoints × ($10^{unitFuelPriceResolution}$). For example, a price of 1,34 $/Gallon is transmitted as follows: unitFuelPricePoints = 134; unitFuelPriceResolution = –2; deliveryUnit = 2.
fuelName	LocalisedShortString	1..*	Local name of the fuel, e.g. “Premium”, or “Euro-95”. Name can be language-dependent, e.g. “Bleifrei 95” or “Sans Plomb 95”.

8.3 FuelTypePrice

The FuelTypePrice presented in Table 17 contains the pricing information for a specific type of fuel, in both pricing resolution, currency and delivery units as specified in the applicable FuelTypeInformation data structure.

Table 17 — FuelTypePrice

Name	Type	Multiplicity	Description
fuelTypeID_Key	IntUnTi	1	ID of the fuelType, as contained in the fuelTypeInformation table in the FuelingDefinitions component. The price for a fuelType is given here.
unitFuelPricePoints	IntUnLoMB	1	Unit price of fuel type per delivery unit. Specified in points. Actual price is obtained by combining this with the unitFuelPriceResolution specified in the FuelType inside the FPIFuelingDefinitions component. Price = unitFuelPricePoints × ($10^{\text{unitFuelPriceResolution}}$).

8.4 StationContactInformation

The StationContactInformation presented in Table 18 contains the general contact information (phone, fax, email, website) for the fuel station.

Table 18 — StationContactInformation

Name	Type	Multiplicity	Description
stationPhoneNumber	ShortString	0..1	Telephone number of fuel station, both numeric or alpha-numeric (e.g. 01-800-FUEL)
stationFaxNumber	ShortString	0..1	Fax number of fuel station, both numeric or alpha-numeric (e.g. 01-800-FUEL)
stationEmailAddress	ShortString	0..1	Email address of fuel station, e.g. info@fuelstation.com
stationWebSite	ShortString	0..1	URL address of fuel station, e.g. www.fuelstation.com

8.5 POILinkType

The POILinkType presented in Table 19 contains the cross reference to a POI vendor specific POI identifier. This is a cross-reference to IDs outside the TPEG realm, e.g. a reference to a Navteq/TeleAtlas POI ID as contained in a Navteq/TeleAtlas map database.

Table 19 — POILinkType

Name	Type	Multiplicity	Description
poiVendorName	ShortString	1	The POI vendor for which the vendor specific POI identifier is given.
poiVendorSpecificID	ShortString	1	Vendor specific POI ID as sequence of alphanumeric characters.

8.6 SizeRestrictions

The SizeRestrictions presented in Table 20 contains the applicable size restrictions on vehicles allowed to enter the facility premises.

Table 20 — SizeRestrictions

Name	Type	Multiplicity	Description
maxLength	DistanceCentiMetres	0..1	Maximum length of vehicle permitted to enter the facility.
maxWidth	DistanceCentiMetres	0..1	Maximum width of vehicle permitted to enter the facility.
maxHeight	DistanceCentiMetres	0..1	Maximum height of vehicle permitted to enter the facility.
maxWeight	Weight	0..1	Maximum weight of vehicle permitted to enter the facility.

8.7 StationBrandAndRating

The StationBrandAndRating presented in Table 21 contains the specification of the fuel brand which a fuel station may carry, and the subjective price rating for this station.

If the intended fuel brand is a global brand, occurring in either table fpi008: FuelBrand or table fpi009: AltFuelBrand, then a single index is given to the FuelBrand as appearing in either table.

If the intended fuel brand is a (local or new) brand, not occurring in above tables, then optionally the globalFuelBrand could set to fpi008 value "001: local brand", and the optional attribute localFuelBrandReference is set to the index of (dynamic) table localFuelBrand in component StationFuelingInfoCluster, where this local name is specified.

Table 21 — StationBrandAndRating

Name	Type	Multiplicity	Description
globalFuelBrand	fpi008:FuelBrand	0..1	Reference to a global fuel brand in the table fpi008: FuelBrand.
altGlobalFuelBrand	fpi009:AltFuelBrand	0..1	Reference to a global fuel brand in the table fpi009: AltFuelBrand.
localFuelBrandReference	IntUnTi	0..1	Optional reference to a local fuel brand name. This reference is an index into the localFuelBrandName list (index=0, ...) in component StationFuelInfoCluster
subjectivePriceRating	IntUnTi	0..1	Subjective Price Rating of Station. Content providers can indicate with the subjective price rating whether on average this station is relatively expensive (lower value) or relatively inexpensive (higher value). A higher value indicates that this station offers less expensive prices compared to other fuel stations in the region. A value of 0 indicates that this is one of the most expensive fuel stations in the region. A subjective price rating can be indicated as a number of stars, where more stars indicate more competitive pricing. Recommend is to limit the maximum value for least expensive station to value of 10 or less.

8.8 StationFuelingInformation

The StationFuelingInformation presented in Table 22 contains the information for a fuel station specifying the fuel types, pricing, as well as fuel brand, and the subjective price rating of this station.

Table 22 — StationFuelingInformation

Name	Type	Multiplicity	Description
stationID_Key	IntUnLoMB	1	The stationID_Key, together with areaID_Key, uniquely identifies a particular station in the context of a service ACID (Application and Content IDentifier).
stationBrandAndRating	StationBrandAndRating	1	The rating and branding information for the fuel station: — the fuel brand which this station carries; — the subjective price rating for this station.
dateOfStationPricingInformation	IntUnTi	1	Date of pricing information. This is specified as the number of days prior to referencePricingDate as given in the StationFuelingInformation component. 0 = Same date as referencePricingDate. 1 = Day before date of referencePricingDate. 2 = Two days before date of referencePricingDate. ...
fuelPrice	FuelTypePrice	1..*	List of fuel prices per fuel type.

8.9 StationMapLocationInfo

The StationMapLocationInfo presented in Table 23 contains the map-related location reference information for the location of the facility itself and, optionally, entrance and exit roads to this facility.

Table 23 — StationMapLocationInfo

Name	Type	Multiplicity	Description
stationID_Key	IntUnLoMB	1	The stationID_Key, together with areaID_Key, uniquely identifies a particular station in the context of a service ACID (Application and Content IDentifier).
Ordered components			
preciseStationLocation	StationMapLocation	1	Map-based location reference of facility location itself.
stationEntryLocation	StationEntryLocation	0..*	Map-based location reference to one or more entrance roads to the facility.
stationExitLocation	StationExitLocation	0..*	Map-based location reference to one or more exit roads from the facility location

8.10 StationLocationVectorInfo

The StationLocationVectorInfo presented in Table 24 contains the location for an individual station along the given RoadLocation, specified as offset from the start of this RoadLocation.

Table 24 — StationLocationVectorInfo

Name	Type	Multiplicity	Description
stationID_Key	IntUnLoMB	1	The stationID_Key, together with areaID_Key, uniquely identifies a particular station in the context of a service ACID (Application and Content IDentifier).
entryLocationOffset	IntUnLoMB	0..*	Offset on an entrance road/ramp to the fuel station from the RoadLocation. Offset is specified relative to the start of the RoadLocation in units given by the spatialResolution in the cluster component.
exitLocationOffset	IntUnLoMB	0..*	Offset on an exit road/ramp from of the fuel station to the RoadLocation. Offset is specified relative to the start of the RoadLocation in units given by the spatialResolution in the cluster component.
entryExitLocationOffset	IntUnLoMB	0..*	Offset to a combined entry/exit road/ramp from of the fuel station to the RoadLocation. Offset is specified relative to the start of the RoadLocation in units given by the spatialResolution in the cluster component.

8.11 StationPOILocationInfo

The StationPOILocationInfo presented in Table 25 contains the data structure to provide a minimal POI-style location reference (WGS84 coordinate) for a fuel station.

Table 25 — StationPOILocationInfo

Name	Type	Multiplicity	Description
stationID_Key	IntUnLoMB	1	The stationID_Key, together with areaID_Key, uniquely identifies a particular station in the context of a service ACID (Application and Content IDentifier).
coordinate	WGS84coordinate	1	(centriod) WGS84 coordinate of the POI.
altitudeMSL	IntSiLoMB	0..1	Elevation of location in metres above/below Mean Sea Level (MSL).
stationName	ShortString	0..1	Name of the fuel station itself.
adjacentRoadName	ShortString	0..1	Name of the road adjacent to the location of the fuel station.
adjacentRoadSideTravelDirection	IntUnTi	0..1	The approximate direction of travel for the side of road at which the primary entry location for the fuel station is located. Expressed in units of 360°/256°.

8.12 WGS84coordinate

The WGS84coordinate presented in Table 26 contains the data structure to specify a WGS-84 coordinate pair to single-digit metre resolution.

Table 26 — WGS84coordinate

Name	Type	Multiplicity	Description
wgs84Longitude	IntSi24	1	Longitude in standard 24 bit encoding which stores coordinates in order of magnitude of 10 micro degrees resolution (five decimals). Longitude (unit degrees) is encoded as follows: WGS84longitude = int {[sign(longitude)] × 0,5 + [longitude × (2^{24})/360]}.
wgs84Latitude	IntSi24	1	WGS84 latitude in standard 24 bit encoding which stores coordinates in order of magnitude of 10 micro degrees resolution (five decimals). Latitude (unit degrees) is encoded as follows: WGS84latitude = int {[sign(latitude)] × 0,5 + [latitude × (2^{24})/360]}.

9 FPI Tables

9.1 Introduction of FPI Tables

This clause defines the applicable tables for the FPI application.

NOTE In this version of the specification, table number fpi002 is not yet defined. This table number is reserved for future enhancements.

9.2 fpi001:DeliveryUnitType

Table 27 enumerates the applicable types of delivery units for various fuel types.

Table 27 — DeliveryUnitType

Code	Reference-English "word"	Comment	Example
000	Unknown		
001	Litre	Unit: Litre	
002	Imperial Gallon	Unit: Imperial Gallon	
003	US Gallon	Unit: US Gallon	
004	m^3	Cubic metres: Unit m^3	
005	KWh	Kilowatt hour: Unit KWh	
006	Kg	Kilogramme: Unit Kg	
007	gge	Gas gallon equivalent: Unit for Compressed Natural Gas (CNG) used in the USA	
255	undefined		

9.3 fpi003:FuelKindType

Table 28 enumerates a list of fuel types, for machine understandable selection of fuel types. Due to differences in method for determining Octane level in North America and rest of the world, octane grades are specified with relative levels. Definition indicates with (R + M)/2 or RON Octane number belongs to which grades.

Table 28 — FuelKindType

Code	Reference-English "word"	Comment	Example
000	unknown		
001	unleaded petrol	Unleaded petrol with 87 Octane (R + M)/2 in North America and 95 Octane in rest of world.	
002	midgrade octane unleaded petrol	Unleaded petrol with 89 Octane (R + M)/2 in North America and 98 Octane in rest of world.	
003	high octane unleaded petrol	Unleaded petrol with over 89 Octane (R + M)/2 in North America and over 98 Octane in rest of world.	
005	leaded petrol	Leaded petrol with at least 87 Octane (R + M)/2 in North America and at least 95 Octane in rest of world.	
006	high octane leaded petrol	Leaded petrol with over 89 Octane (R + M)/2 in North America and over 98 Octane in rest of world.	
007	petrol with lead substitute		
008	biopetrol	Unleaded petrol with ethanol supplement.	
009	diesel		
010	biodiesel		
011	LPG	Liquefied Petroleum Gas.	
012	CNG	Compressed Natural Gas	
013	ethanol		
014	hydrogen		
015	electric		
255	undefined		

9.4 fpi004:PaymentMethodType

Table 29 enumerates the applicable methods of payment accepted at this facility.

Table 29 — PaymentMethodType

Code	Reference-English "word"	Comment	Example
000	unknown		
001	cash		
002	credit card		
003	bank card	Also "debit cards" would fall into this category.	
004	tank card		
006	ATM		
007	RFID		
008	pre-pay card		
009	mobile phone		

Table 29 *(continued)*

Code	Reference-English "word"	Comment	Example
010	smartcard		
011	customer loyalty card	In UK, also known as "agency card", in North America as "reward card" or "club card".	
255	undefined		

9.5 fpi005:FuelServicePolicyType

Table 30 enumerates the applicable types of fuelling service policy offered by the fuel station.

Table 30 — FuelServicePolicyType

Code	Reference-English "word"	Comment	Example
000	unknown		
001	self service only		
002	full service only		
003	self service and full service		
004	unattended service station	Completely automated (self service) fuel station, never attended by a human operator	
255	undefined		

9.6 fpi006:AssociatedServiceType

Table 31 enumerates a list of applicable associated services as commonly offered by a fuel station.

Table 31 — AssociatedServiceType

Code	Reference-English "word"	Comment	Example
000	unknown		
001	public restrooms		
002	mini-market		
003	car wash		
004	restaurant		
005	hotel		
006	vehicle repair shop		
007	internet hotspot		
255	undefined		

9.7 fpi007:SpatialResolution

Table 32 enumerates the applicable resolutions in metre for the specified spatial offset from the start of the RoadLocation.

Table 32 — SpatialResolution

Code	Reference-English "word"	Comment	Example
000	5-metre-resolution	Resolution of related offset is in 5 m steps as absolute offsets to the spatial reference point, offset = value × 5	
001	10-metre-resolution	Resolution of related offset is in 10 m steps as absolute offsets to the spatial reference point, offset = value × 10	
002	25-metre-resolution	Resolution of related offset is in 25 m steps as absolute offsets to the spatial reference point, offset = value × 25	
003	50-metre-resolution	Resolution of related offset is in 50 m steps as absolute offsets to the spatial reference point, offset = value × 50	
004	100-metre-resolution	Resolution of related offset is in 100 m steps as absolute offsets to the spatial reference point, offset = value × 100	

9.8 fpi008:FuelBrand

Table 33 enumerates a list of well-known fuel brands. For these brands, logos may be provided to client devices.

Table 33 — FuelBrand

Code	Reference-English "word"	Comment; illustrative occurrence of countries where brand is normally found	Example
000	unknown	Name not known	
001	local brand	Local fuel brand, name to be specified separately	
002	76	USA	
003	7-eleven	USA	
004	Agip	Italy	
005	Agrola	Switzerland	
006	Aldi	France	
007	amiGo	The Netherlands	
008	Amoco	USA	
009	ANWB	The Netherlands	
010	Aral	Germany, Luxemburg	
011	Arco	USA	
012	Argos	The Netherlands	
013	Armorine	France	
014	AS 24	France	
015	Asda	UK	
016	Atac	France	
017	Auchan	France	

Table 33 *(continued)*

Code	Reference-English "word"	Comment; illustrative occurrence of countries where brand is normally found	Example
018	Avia	Independent distributor of fuels, Europe	
019	BP	UK, Europe	
020	BrandOil	The Netherlands	
021	Butler	UK	
022	BWOC	UK	
023	Caltex	Caltex is a petroleum brand name of the Chevron Corporation, and is used in the Asia-Pacific region, the Middle-East and southern Africa	
024	Campus	France	
025	Carlton	UK	
026	Carrefour	France	
027	Casey's	USA	
028	Casino	France	
029	Cenex	USA	
030	Champion	France	
031	Chevron		
032	Circle K	USA	
033	Citgo	USA	
034	Clark	USA	
035	Co-op	France	
036	Coccinelle	France	
037	Colruyt	France	
038	Conoco	USA	
039	Comod	France	
040	Copec	Chili	
041	Cora	France	
042	Costco	USA	
043	Cumberland Farms	USA	
044	DCA	France	
045	Dyneff	France	
046	E Z Mart	USA	
047	Ecomarche	France	
048	ED	France	
049	Elan	France	
050	Emo	Emo oil, Ireland	
051	Elf	France	
052	Elf Jaune	France	
053	Esso	Europe	
054	Esso Express	France	
055	Exxon	Global brand	
056	Fina	Europe, USA	

Table 33 *(continued)*

Code	Reference-English "word"	Comment; illustrative occurrence of countries where brand is normally found	Example
057	Firezone	The Netherlands	
058	Franprix	France	
059	G20	France	
060	Galp	Portugal	
061	Gas America		
062	Geant	France	
063	Getty	USA, brand marketed by Lukoil	
064	Gleaner	UK	
065	Gulf	UK, Europe	
066	Gull	Western Australia and New Zealand	
067	Hess	USA	
068	Holiday	USA	
069	Husky	Canada	
070	Hydro	Sweden	
071	Hyper U	France	
072	IDS	France	
073	Intermarche	France	
074	Jet	UK, Europe	
075	Kai	France	
076	Kangaroo	USA	
077	Kroger	USA	
078	Kum & Go	USA	
079	Kwik Fill	USA	
080	Kwik Trip	USA	
081	Leader Price	France	
082	LeClerc	France	
083	Libreco	France	
084	Lidl	France	
085	Lotos	Poland	
086	Loves	USA	
087	Lukoil	USA, Europe	
088	Mapco	USA	
089	Marathon	USA	
090	Marche U	France	
091	Martens	France	
092	Match	France	
093	Maxi Coop	France	
094	MaxiMarche	France	
095	Maxol	Ireland, UK	
096	Mobil	Europe	
097	Mobile	USA	
098	Mohawk	Canada	

Table 33 *(continued)*

Code	Reference-English "word"	Comment; illustrative occurrence of countries where brand is normally found	Example
099	MOL	Hungary	
100	Monoprix	France	
101	Morrisons	UK	
102	Murco	UK	
103	Murphy USA	USA	
104	Mutant	France	
105	National	UK	
106	Ners	France	
107	Nervol	France	
108	Netto	France	
109	Oil France	France	
110	OMV	Austria, Germany, Eastern Europe	
111	Pace	UK	
112	Pemex	Mexico	
113	Petro-Canada	Canada	
114	Petrodis	France	
115	Phillips 66	USA	
116	Pilot	USA, fuel and truck stops	
117	Power	UK	
118	Primagaz	France	
119	Proteus	UK	
120	Proxi	France	
121	Q8	Europe	
122	Quik Trip	USA	
123	Racetrac	USA	
124	Raceway	USA	
125	Regent	UK	
126	Rix	UK	
127	Rond Point	France	
128	Safeway	USA	
129	Sainsburys	UK	
130	Sam's club	USA	
131	Sasol	South Africa	
132	Scottish Fuels	UK	
133	Shamrock	USA	
134	Sheetz	USA	
135	Shell	Global brand	
136	Shell Express	The Netherlands	
137	Shopi	France	
138	Siligom	France	
139	Sinclair	USA	
140	Somerfield	UK	

Table 33 *(continued)*

Code	Reference-English "word"	Comment; illustrative occurrence of countries where brand is normally found	Example
141	Spar	UK	
142	Speedway	USA	
143	Statoil	Scandinavia	
144	Stationmarche	France	
145	Stewarts	USA	
146	Stripes	USA	
147	Sunoco	USA	
148	Super U	France	
149	Tamoil	The Netherlands	
150	Tango	The Netherlands	
151	Teboil	Finland, subsidiary of Lukoil	
152	Tesco	UK	
153	Tesoro	USA	
154	Texaco	Europe	
155	Thames	UK	
156	Tinq	The Netherlands	
157	TOP	Ireland	
158	Total	France, plus selected countries in Europe, Africa and Asia	
159	Topaz	Ireland	
160	UK	UK	
161	Ultramar	Canada	
162	Uno-X	Scandinavia	
163	Valero	USA	
164	Wawa	USA	
165	WCF	UK	
166	Wilco	USA	
167	Wilson Gas Stops	Atlantic provinces of Canada	
168	YX Energi	Norway and Denmark	
169	Allsup's	USA	
170	Fast Stop	USA	
171	Flying J	USA	
172	Irving	USA	
173	Jackson's Food Stores	USA	
174	Maverik	USA	
175	Petro South	USA	
176	Super America	USA	
177	Travelcenters of America	USA	
178	Turkey Hill	USA	
255	undefined	Name not defined (or unbranded station)	

9.9 fpi009:AltFuelBrand

Table 34 contains an alternative list of well-known fuel brands. For these brands, logos could be provided to client devices. This second alternative list allows 500 global fuel brands to be defined.

Table 34 — AltFuelBrand

Code	Reference-English "word"	Comment	Example
000	unknown		
255	undefined		

Annex A
(normative)

TPEG application, TPEG-Binary Representation

A.1 General

In this annex, the TPEG-Binary representation is specified.

A.2 Message components

A.2.1 List of generic component Ids

Table A.1 lists the generic component Ids.

Table A.1 — List of generic component Ids

Name	Id
FPIMessage	0
MessageManagementContainerLink	1
MMCMasterMessageLink	2
MMCMessagePartLink	3
GeographicCoverageLocation	4
FuelingDefinitions	6
StationFuelingInfoCluster	7
StationExtraInfoCluster	8
StationSiteInfoCluster	9
StationExtraInformation	10
StationSiteInfo	11
StationPOILocationCluster	12
StationMapLocationCluster	13
StationNavLocationAlongRoadCluster	14
StationMapLocation	15
StationEntryLocation	16
StationExitLocation	17
RoadLocation	18

A.2.2 FPIMessage

<FPIMessage(0)>:=	
<IntUnTi>(0),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
ordered {	
<MessageManagement>(mmt),	: This component is specified in the MMC specification. It contains all and only information related to message management. The sender side, especially the instance generating the transmission data, has to ensure that the message management information allows unambiguous interpretation over time and in appropriate scenarios with disturbed reception specific to the transmission channel.
n * <FPIapplicationContainerTemplate>(applicationInformation),	: Application information for a cluster of Fuel Stations. This can contain either fuelling definitions, basic information, or additional availability and restrictions, or more detailed site and facility, or location information.
n * <GeographicCoverageLocation>(geographicCoverage)[0..1]	: Geographic coverage of the stations for which information is included in this message. FPI shall only use area locations to indicate the geographicCoverage of the FPI message : no point locations, nor linear locations may be used.
};	

A.2.3 FPIapplicationContainerTemplate

<FPIapplicationContainerTemplate(x)>:=	
<IntUnTi>(x),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<IntUnLoMB>(areaID_Key);	: The areaID_Key provides a level of granularity for fuelingdefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingdefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).

A.2.4 FuelingDefinitions

<FuelingDefinitions(6)<FPIapplicationContainerTemplate(6)>>:=	
<IntUnTi>(6),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes

<IntUnLoMB>(areaID_Key);	: The areaID_Key provides a level of granularity for fuelingdefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingdefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
<IntUnLoMB>(fuelingDefinitionsID_Key),	: ID of set of fuelingDefinitions given here. This ID will be referenced to by FuelingInformation. The combination (AreaID_Key, fuelingDefinitionsID_Key) shall be unique per ACID (Application and Content Identifier) for a given TPEG service.
<typ003:CurrencyType>(fuelPriceCurrency),	: Currency of pricing for all offered fuel types.
<IntUnLoMB>(n),	
n * <FuelTypeInformation>(fuelType);	: List of Fuel Types, delivery units and pricing resolution information as part of this fuelingDefinitions.

A.2.5 MessageManagement

<MessageManagement(x)>:=	
<IntUnTi>(x),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr);	: number of bytes in attributes

A.2.6 StationExtraInfoCluster

<StationExtraInfoCluster(8)<FPIapplicationContainerTemplate(8)>>:=	
<IntUnTi>(8),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<IntUnLoMB>(areaID_Key);	: The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
<IntUnLoMB>(fuelingDefinitionsID_Key),	: Reference to FuelingDefinitions table to use (in context of provided AreaID_Key). A reference to a fuel type in the fuelingDefinitions table is used in context of delivery restrictions and temporary unavailability.

ordered {	
n * <StationExtraInformation>(stationExtraInformation)	: Component containing extra information for a particular fuel station
};	

A.2.7 StationExtraInformation

<StationExtraInformation(10)>:=	
<IntUnTi>(10),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<IntUnLoMB>(stationID_Key),	: The stationID_Key, together with areaID_Key, uniquely identifies a particular station in the context of a service ACID (Application and Content IDentifier).
BitArray(selector),	
if (bit 0 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <IntUnTi>(fuelTemporarilyUnavailableID_Key),	: Reference to fuel type which is temporarily out of stock. This reference provides the fuelTypeID_Key of the fuel type in the fuel type table in fuelDefinitions component with (AreaID_Key,fuelingDefinitionsID_Key) as given in the StationExtraInfoCluster component.
}	
if (bit 1 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <FuelDeliveryRestrictionType>(fuelDeliveryRestriction),	: Optional indication whether delivery restrictions are placed on a particular fuel type.
}	
if (bit 2 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(stationPromotionalOffer),	: Field to transmit any station promotional offers in languages of interest.
}	
if (bit 3 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(freetext)	: Field to transmit any station additional information (other than promotional offers) in languages of interest.
};	

A.2.8 StationFuelingInfoCluster

<StationFuelingInfoCluster(7)<FPIapplicationContainerTemplate(7)>>:=	
<IntUnTi>(7),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes

<IntUnLoMB>(areaID_Key);	: The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
<IntUnLoMB>(fuelingDefinitionsID_Key),	: Reference to correct FuelingDefinitions to use (in context of AreaID_Key unique).
<DateTime>(pricingReferenceDate),	: Reference date for pricing information in stationFuelingInformation data structures.
<IntUnLoMB>(n),	
n * <StationFuelingInformation>(stationFuelInfo),	: Fuelling information for a particular fuel station.
BitArray(selector),	
if (bit 0 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <ShortString>(localFuelBrandName)	: Name of a local Fuel Brand, not occurring in table fpi008: FuelBrand nor in table fpi009: AltfFuelBrand.
};	

A.2.9 StationMapLocationCluster

<StationMapLocationCluster(13)<FPIapplicationContainerTemplate(13)>>:=	
<IntUnTi>(13),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<IntUnLoMB>(areaID_Key);	: The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
<IntUnLoMB>(n),	
n * <StationMapLocationInfo>(stationLocationInfo);	: Container component holding precise location information for a list of stations.

A.2.10 StationNavLocationAlongRoadCluster

<StationNavLocationAlongRoadCluster(14) <FPIapplicationContainerTemplate(14)>>:=	
<IntUnTi>(14),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<IntUnLoMB>(areaID_Key);	: The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
<fpi007:SpatialResolution>(spatialResolution),	: Resolution of the spatial offset used in this structure in steps of 5 m, 10 m, 25 m, 50 m and 100 m. This spatial resolution value shall be used for all spatial offsets in the StationLocationVector.
<IntUnLoMB>(n),	
n * <StationLocationVectorInfo>(stationNavLocation),	: Navigable entry/exit locations of a fuel station along a road, as specified relative to a section of that road.
ordered {	
<RoadLocation>(roadLocation)	: The road along which a number of fuel stations are situated. The locations of individual fuel stations are given as offsets with respect to the start of this RoadLocation.
};	

A.2.11 StationPOILocationCluster

<StationPOILocationCluster(12)<FPIapplicationContainerTemplate(12)>>:=	
<IntUnTi>(12),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<IntUnLoMB>(areaID_Key);	: The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
<IntUnLoMB>(n),	
n * <StationPOILocationInfo>(stationBasicLocInfo);	: A list of station id's with basic location information.

A.2.12 StationSiteInfo

<StationSiteInfo(11)>:=	
<IntUnTi>(11),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<IntUnLoMB>(stationID_Key),	: The stationID_Key, together with areaID_Key, uniquely identifies a particular station in the context of a service ACID (Application and Content IDentifier).
BitArray(selector),	
if (bit 0 of selector is set)	
<ShortString>(stationName),	: Name of individual station. Applicable if well known, or when no brand name is associated with the station.
if (bit 1 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(stationAddress),	: Street address of the fuel station in the relevant local language(s).
}	
if (bit 2 of selector is set)	
<StationContactInformation>(stationContactInfo),	: Contact information for the fuel station.
if (bit 3 of selector is set)	
<TimeToolkit>(openingHours),	: Opening hours of the facility.
if (bit 4 of selector is set)	
<TimeToolkit>(attendantHours),	: Hours when a human attendant is available for cash payments and help for motorists.
if (bit 5 of selector is set)	
<fpi005:FuelServicePolicyType>(servicePolicy),	: The station's fuel pumping policy: self-serve, full-serve or a combination.
if (bit 6 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <typ003:CurrencyType>(acceptedCurrencies),	: Accepted currencies for payment, if not only the displayed currency for the fuel price is accepted.
}	
if (bit 7 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <fpi004:PaymentMethodType>(acceptedPaymentMethods),	: Accepted methods for payment.
}	
if (bit 8 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <ShortString>(acceptedPaymentCards),	: When payment methods such as debit or credit cards are indicated, then here the names of accepted payment cards (bank or credit cards) can be specified here. For example, "American Express", "Visa", "Maestro", "DKV", etc.
}	

if (bit 9 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <fpi006:AssociatedServiceType>(associatedServices),	: Lists available services which the stations offer in conjunction with the fuelling service (e.g. mini market).
}	
if (bit 10 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <POILinkType>(POILink),	: Reference to a POI of a third party POI supplier.
}	
if (bit 11 of selector is set)	
<SizeRestrictions>(sizeRestrictions);	: Applicable size restrictions on vehicles that are allowed to use this facility.

A.2.13 StationSiteInfoCluster

<StationSiteInfoCluster(9)<FPIapplicationContainerTemplate(9)>>:=	
<IntUnTi>(9),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<IntUnLoMB>(areaID_Key);	: The areaID_Key provides a level of granularity for fuelingDefinitions and fuel station identifiers. Per area, locally unique stationID_Keys can be chosen, as only the combination (AreaID_Key, StationID_Key) is to be unique in the context of an ACID (application and content identification). Similarly, the fuelingDefinitionsID_Key is only unique by the combination (areaID_Key, fuelingDefinitionsID_Key).
ordered {	
n * <StationSiteInfo>(stationSiteDescription)	: Detailed site information for a particular fuel station.
};	

A.2.14 GeographicCoverageLocation

<GeographicCoverageLocation(4)>:=	
External <LocationReferencingContainer(4)>;	: see TPEG-LRC specification

A.2.15 MessageManagementContainerLink

<MessageManagementContainerLink(1)<MessageManagement()>>:=	
External <MessageManagementContainer(1)>;	: see TPEG-MMC specification

A.2.16 MMCMasterMessageLink

<MMCMasterMessageLink(2)<MessageManagement()>>:=	
External <MMCMasterMessage(2)>;	: see TPEG-MMC specification

A.2.17 MMCMessagePartLink

<MMCMessagePartLink(3)<MessageManagement()>>:=	
External <MMCMessagePart(3)>;	: see TPEG-MMC specification

A.2.18 StationEntryLocation

<StationEntryLocation(16)>:=	
External <LocationReferencingContainer(16)>;	: see TPEG-LRC specification

A.2.19 StationMapLocation

<StationMapLocation(15)>:=	
External <LocationReferencingContainer(15)>;	: see TPEG-LRC specification

A.2.20 RoadLocation

<RoadLocation(18)>:=	
External <LocationReferencingContainer(18)>;	: see TPEG-LRC specification

A.2.21 StationExitLocation

<StationExitLocation(17)>:=	
External <LocationReferencingContainer(17)>;	: see TPEG-LRC specification

A.3 FPI Datatypes

A.3.1 FuelDeliveryRestrictionType

<FuelDeliveryRestrictionType>:=	
<IntUnTi>(fuelTypeID_Key),	: Reference to a fuel type as specified in the appropriate FuelingDefinitions component (with given AreaID_Key, fuelingDefinitionsID_Key).
BitArray(selector),	
if (bit 0 of selector is set)	
<IntUnLoMB>(minimumDeliveryAmount),	: Minimum delivery amount of Fuel Type in number of delivery units.
if (bit 1 of selector is set)	
<IntUnLoMB>(maximumDeliveryAmount);	: Maximum delivery amount of Fuel Type in number of delivery units.

A.3.2 FuelTypeInformation

<FuelTypeInformation>:=	
<IntUnTi>(fuelTypeID_Key),	: ID of fuel type defined in this data structure with the remainder of the attributes in the FuelTypeInformation data structure. The combination (AreaID_Key,fuelingDefinitionsID_Key, fuelTypeID_Key) shall be unique.
<fpi003:FuelKindType>(fuelKind),	: The type of fuel, e.g. unleaded petrol, or LPG.
<fpi001:DeliveryUnitType>(deliveryUnit),	: The delivery unit of the fuel, also the unit for which unit prices are given.

<IntSiTi>(unitFuelPriceResolution),	: The display resolution of the unit price. Fuel Price is transmitted as unitFuelPricePoints × ($10^{unitFuelPriceResolution}$). For example, a price of 1,34 $/Gallon is transmitted as follows: unitFuelPricePoints = 134; unitFuelPriceResolution = –2; deliveryUnit = 2.
<IntUnLoMB>(n),	
n * <LocalisedShortString>(fuelName);	: Local name of the fuel, e.g. “Premium” or “Euro-95”. Name can be language-dependent, e.g. “Bleifrei 95” or ”Sans Plomb 95”.

A.3.3 FuelTypePrice

<FuelTypePrice>:=	
<IntUnTi>(fuelTypeID_Key),	: ID of the fuelType, as contained in the fuelTypeInformation table in the FuelingDefinitions component. The price of this fuelType is given here.
<IntUnLoMB>(unitFuelPricePoints);	: Unit price of fuel type per delivery unit. Specified in points. Actual price is obtained by combining this with the unitFuelPriceResolution specified in the FuelType inside the FPIFuelingDefinitions component. Price = unitFuelPricePoints × ($10^{unitFuelPriceResolution}$).

A.3.4 StationContactInformation

<StationContactInformation>:=	
BitArray(selector),	
if (bit 0 of selector is set)	
<ShortString>(stationPhoneNumber),	: Telephone number of fuel station, both numeric or alpha-numeric (e.g. 01-800-FUEL)
if (bit 1 of selector is set)	
<ShortString>(stationFaxNumber),	: Fax number of fuel station, both numeric or alpha-numeric (e.g. 01-800-FUEL)
if (bit 2 of selector is set)	
<ShortString>(stationEmailAddress),	: email address of fuel station, e.g. info@fuelstation.com
if (bit 3 of selector is set)	
<ShortString>(stationWebSite);	: URL address of fuel station, e.g. www.fuelstation.com

A.3.5 POILinkType

<POILinkType>:=	
<ShortString>(poiVendorName),	: The POI vendor for which the vendor specific POI identifier is given.
<ShortString>(poiVendorSpecificID);	: Vendor specific POI ID as sequence of alphanumeric characters.

A.3.6 SizeRestrictions

<SizeRestrictions>:=	
BitArray(selector),	
if (bit 0 of selector is set)	
<DistanceCentiMetres>(maxLength),	: Maximum length of vehicle to be permitted to enter the facility.
if (bit 1 of selector is set)	
<DistanceCentiMetres>(maxWidth),	: Maximum width of vehicle to be permitted to enter the facility.

if (bit 2 of selector is set)	
<DistanceCentiMetres>(maxHeight),	: Maximum height of vehicle to be permitted to enter the facility.
if (bit 3 of selector is set)	
<Weight>(maxWeight);	: Maximum weight of vehicle to be permitted to enter the facility.

A.3.7 StationBrandAndRating

<StationBrandAndRating>:=	
BitArray(selector),	
if (bit 0 of selector is set)	
<fpi008:FuelBrand>(globalFuelBrand),	: Reference to a global fuel brand in the table fpi008: FuelBrand.
if (bit 1 of selector is set)	
<fpi009:AltFuelBrand>(altGlobalFuelBrand),	: Reference to a global fuel brand in the table fpi009: AltFuelBrand.
if (bit 2 of selector is set)	
<IntUnTi>(localFuelBrandReference),	: Optional reference to a local fuel brand name. This reference is an index into the localFuelBrandName list (index=0, …) in component StationFuelInfoCluster.
if (bit 3 of selector is set)	
<IntUnTi>(subjectivePriceRating);	: Subjective Price Rating of Station. Content providers can indicate with the subjective price rating whether on average this station is relatively expensive (lower value) or relatively inexpensive (higher value). A higher value indicates that this station offers less expensive prices compared to other fuel stations in the region. A value of 0 indicates that this is one of the most expensive fuel stations in the region. A subjective price rating can be indicated as a number of stars, where more stars indicate more competitive pricing. Recommend is to limit the maximum value for least expensive station to value of 10 or less.

A.3.8 StationFuelingInformation

<StationFuelingInformation>:=	
<IntUnLoMB>(stationID_Key),	: The stationID_Key, together with areaID_Key, uniquely identifies a particular station in the context of a service ACID (Application and Content IDentifier).
<StationBrandAndRating>(stationBrandAndRating),	: The rating and branding information for the fuel station: — the fuel brand which this station carries; — the subjective price rating for this station.
<IntUnTi>(dateOfStationPricingInformation),	: Date of pricing information. This is specified as the number of days prior to referencePricingDate as given in the StationFuelingInformation component: 0 = Same date as referencePricingDate; 1 = Day before date of referencePricingDate; 2 = Two days before date of referencePricingDate. …
<IntUnLoMB>(n),	
n * <FuelTypePrice>(fuelPrice);	: List of fuel prices per fuel type.