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BSI Standards Publication

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

Part 14: Parking information application (TPEG2-PKI)

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National foreword

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Part 14: Parking information application (TPEG2-PKI)

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Contents

Page

Foreword ..... **v**
Introduction ..... **vii**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Abbreviated terms **2**
5 Application specific constraints **2**
5.1 Application identification 2
5.2 Version number signalling 3
5.3 Ordered components 3
5.4 Extensions 3
5.5 TPEG Service Component Frame 3
6 PKI Message components **3**
6.1 ParkingMessage 3
6.2 MMCSwitch 5
6.3 MessageManagementContainerLink 5
6.4 MMCMasterLink 5
6.5 MMCPartLink 5
6.6 ParkingLocation 5
6.7 ParkingSiteDescription 5
6.8 ParkingInfo 6
6.9 Logo 7
6.10 Contact 7
6.11 ParkingSpecification 7
6.12 InformationFor 8
6.13 SizeRestrictions 9
6.14 GateInfo 9
6.15 ParkingForEvent 10
6.16 ToSite 10
6.17 OpeningHours 10
6.18 PricingPayment 11
6.19 PaymentDetails 11
6.20 Facilities 11
6.21 AssociatedService 12
6.22 CurrentCapacity 12
6.23 CurrentCapacityFor 13
6.24 ExpectedCapacity 13
6.25 ExpectedCapacityFor 14
6.26 Advice 14
7 PKI Tables **14**
7.1 pki001:VehicleType 14
7.2 pki002:ParkingType 15
7.3 pki003:UserType 16
7.4 pki004:FuelType 16
7.5 pki005:AvailableFeatures 17
7.6 pki006:EventType 17
7.7 pki007: Reservability 18
7.8 pki008:FacilityType 18
7.9 pki009:SupervisionType 18
7.10 pki010:SecurityType 19
7.11 pki011:AssociatedService 19
7.12 pki012:ParkingStatus 20

Documents
Document Sharing Hub

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Full document details: PD ISO/TS 21219-14:2016

7.13 pki013:PaymentMethod ... 20
7.14 pki014:SiteServed ... 21
7.15 pki015:GateType ... 21
7.16 pki016:ContactType ... 21
7.17 pki017:TransportType ... 22
7.18 pki018:OpeningHoursType ... 22
7.19 pki019:TermType ... 22
7.20 pki020:Advice ... 23
7.21 pki021:Tendency ... 23
7.22 pki022:FeeType ... 23

Annex A (normative) **TPEG PKI, TPEG-Binary Representation** ... **25**

Annex B (normative) **TPEG PKI, tpegML Representation** ... **37**

Bibliography ... **50**

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Full document details: PD ISO/TS 21219-14:2016

Foreword

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

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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

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 (TPEG2-INV)*

— *Part 2: UML modelling rules*

— *Part 3: UML to binary conversion rules*

— *Part 4: UML to XML conversion rules*

— *Part 5: Service framework (TPEG2-SFW)*

— *Part 6: Message management container (TPEG2-MMC)*

— *Part 9: Service and network information (TPEG2-SNI)*

— *Part 10: Conditional access information (TPEG2-CAI)*

— *Part 14: Parking information (TPEG2-PKI)*

— *Part 15: Traffic event compact (TPEG2-TEC)*

— *Part 18: Traffic flow and prediction application (TPEG2-TFP)*

— *Part 19: Weather information (TPEG2-WEA)*

The following parts are under preparation:

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

— *Part 23: Roads and multi-modal routes application (TPEG2-RMR)*

— *Part 24: Light encryption (TPEG2-LTE)*

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— *Part 25: Electromobility charging infrastructure (TPEG2-EMI)*

The following parts are planned:

— *Part 7: Location referencing container*

— *Part 21: Geographic location referencing*

— *Part 22: OpenLR location referencing*

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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, 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 Modelling 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 realized 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 minimize drafting errors, that forms the Annex for each physical format.

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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), TPEG2-LTE (ISO/TS 21219-24);

— 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: 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-EMI (ISO/TS 21219-25).

TPEG2 has been developed to be broadly (but not entirely) backward compatible with TPEG1 to assist in transitions from earlier implementations, while 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:

SP13009/1.1/001.

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

Part 14: Parking information application (TPEG2-PKI)

1 Scope

This part of ISO/TS 21219 specifies the TPEG Parking Information application which has been designed to deliver parking information to a variety of receivers using a number of different channels, foremost of course are digital broadcasting and Internet technologies. Parking information may be presented to the user in many different ways, including text, voice, or graphics.

Today, traffic congestion has become a serious problem in urban areas. Some traffic congestion is attributed to drivers searching for parking spaces. Therefore, timely provision of parking information could help ease traffic congestion. Furthermore, parking information would be valuable for the visitor, particularly when it could be used to signal where a temporary parking facility is established for a special occasion.

2 Normative references

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

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

ISO/TS 21219-3, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts 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 experts group, generation 2 (TPEG2) — Part 4: UML to XML conversion rules*

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

3 Terms and definitions

3.1
Message Management Container
concept applied to the grouping of all message elements including Message Management Information of a TPEG-Message together in one place

Note 1 to entry: See TPEG2 MMC documents (ISO/TS 21219-6) for full details of the Message Management Container explanations.

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3.2
Location Referencing
means to provide information that allows a system to accurately identify a location

Note 1 to entry: The content of a location reference allows the location to be presented in a graphical or textual manner to the end-user (e.g. coloured network graphs), as well as to be used for navigational systems purposes.

3.3
Location Referencing Container
concept applied to the grouping of all the Location Referencing elements, of a TPEG-Message, together in one place

Note 1 to entry: See TPEG2 LRC documents (ISO/TS 21219-7) for full details of the Location Referencing container explanations.

4 Abbreviated terms

ACID	Application and Content Identifier
AID	Application Identification
CA	Conditional Access
CAI	Conditional Access Information
CEN	Comité Européen de Normalization
CRC	Cyclic redundancy check
EBU	European Broadcasting Union
ECM	Entitlement Control Message
EMM	Entitlement Management Message
MMC	Message Management Container
n/a	not available
SFW	TPEG Service Framework: Modelling and Conversion Rules
TISA	Traveller Information Services Association

5 Application specific constraints

5.1 Application identification

The word “application” is used in this part of ISO/TS 21219 to describe specific subsets of the TPEG structure. An application defines a limited vocabulary for a 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 TPEG-SNI application ISO/TS 21219-9 to indicate how to process TPEG content and facilitates the routing of information to the appropriate application decoder.

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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 can 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 PKI within the SNI application.

Table 1 — Current version numbers for signalling of PKI

major version number	1
minor version number	1

5.3 Ordered components

TPEG-PKI does not generally require a fixed order of TPEG components, except where explicitly modelled. The order for the PKI message components is shown in Figure 1; the first component shall be the *Message Management Container.* This shall be the only component if the message is a cancellation message. Otherwise, the MMC component shall be followed by the one or more *Application Data Container* component(s) which includes the application-specific information.

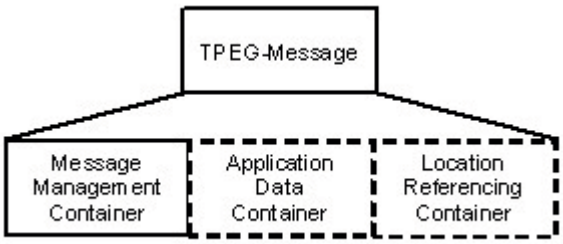

Figure 1 — Composition of TPEG messages

5.4 Extensions

Future application extensions may insert new components or may replace existing components by new ones without losing backward compatibility. That means that a PKI decoder shall be able to detect and skip unknown components.

5.5 TPEG Service Component Frame

PKI makes use of the "Service Component Frame with dataCRC and messageCount and priority" according to ISO/TS 21219-6 as follows.

"ServCompFramePrioritisedCountedProtected"

6 PKI Message components

6.1 ParkingMessage

A parking message shall hold one of the MessageManagement components and optionally can have one ParkingLocation, one ParkingSiteDescription and multiple Advice components, as well as one CurrentCapacity and multiple ExpectedCapacity components, as illustrated in Figure 2 and Table 2.

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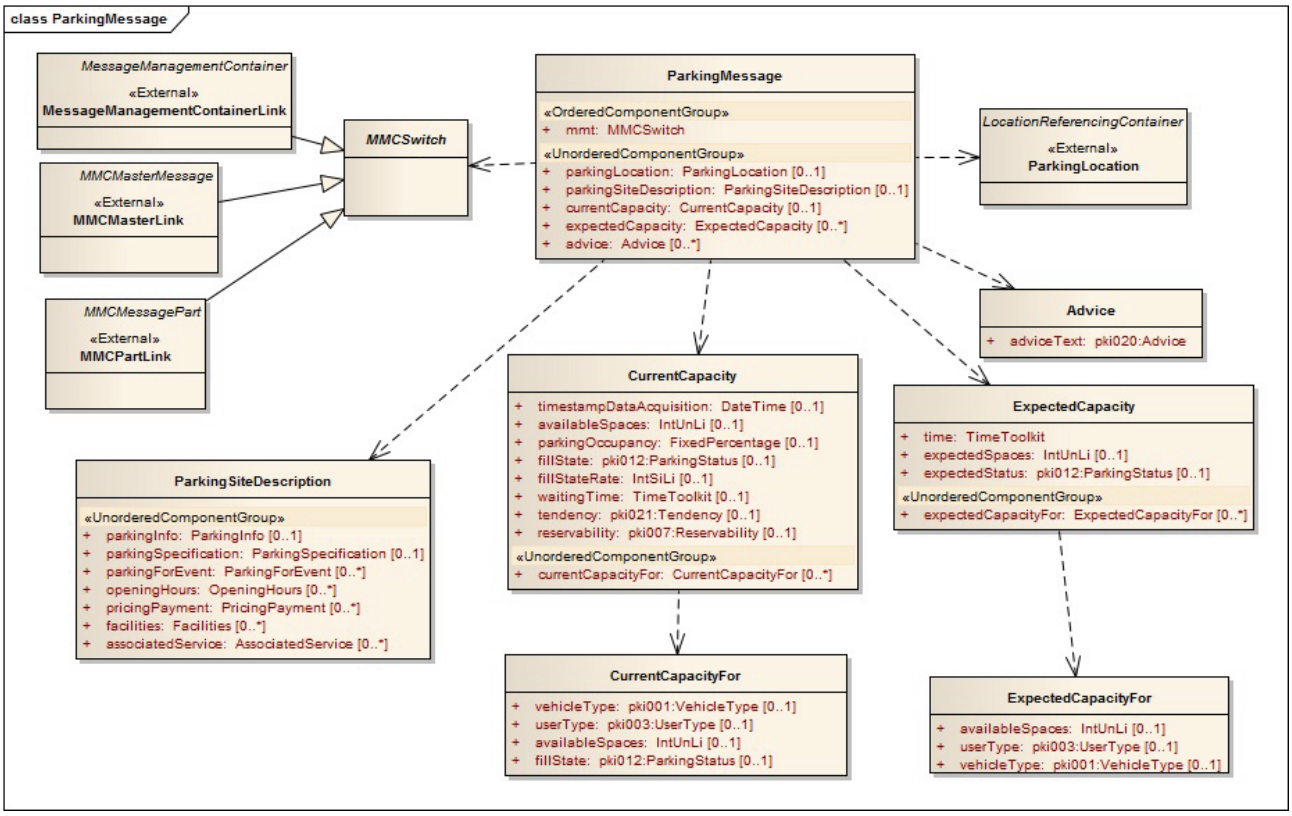

Figure 2 — Structure of the Parking Message

Methods of the TPEG Message Management Container ISO/TS 21219-6 may be used to transmit static data independently to dynamic data.

NOTE 1 The components have been grouped to easily allow such dynamic updates.

For example, the name and the location of a parking site do not change frequently and thus, these data can be transmitted less frequently than, say, the number of available spaces. It is important nonetheless, that the basic information required to display a sensible message to the user should be sent in suitable intervals to allow receivers just switched on to decode and display data within reasonable time.

Clients should decode messages with the same version number (and PartID in case of partial messages) only once.

Table 2 — Parking message

Name	Type	Multiplicity	Description
Ordered Components			
mmt	MMCSwitch	1	Includes one of the Message Management Container types.
Unordered Components			
parkingLocation	ParkingLocation	0..1	As defined in external TPEG2-Location Referencing specification.
parkingSiteDescription	ParkingSiteDescription	0..1	n/a
currentCapacity	CurrentCapacity	0..1	n/a
expectedCapacity	ExpectedCapacity	0..*	n/a
advice	Advice	0..*	n/a

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6.2 MMCSwitch

The MMCSwitch is an abstract container that allows the use of the different Message Management options.

6.3 MessageManagementContainerLink

The MessageManagementContainerLink serves as a link to the message management container.

6.4 MMCMasterLink

The MMCMasterLink serves as a link to the message management container.

6.5 MMCPartLink

The MMCPartLink serves as a link to the message management container.

6.6 ParkingLocation

The ParkingLocation serves as a link to the LocationReferenceContainer.

6.7 ParkingSiteDescription

The ParkingSiteDescription component is a wrapper for largely static information about a parking facility. The information is grouped in the ParkingName, ParkingSpecification, OpeningHours, PricingPayment, Facilities, ParkingForEvent and AssociatedService components; see Figure 3 and Table 3.

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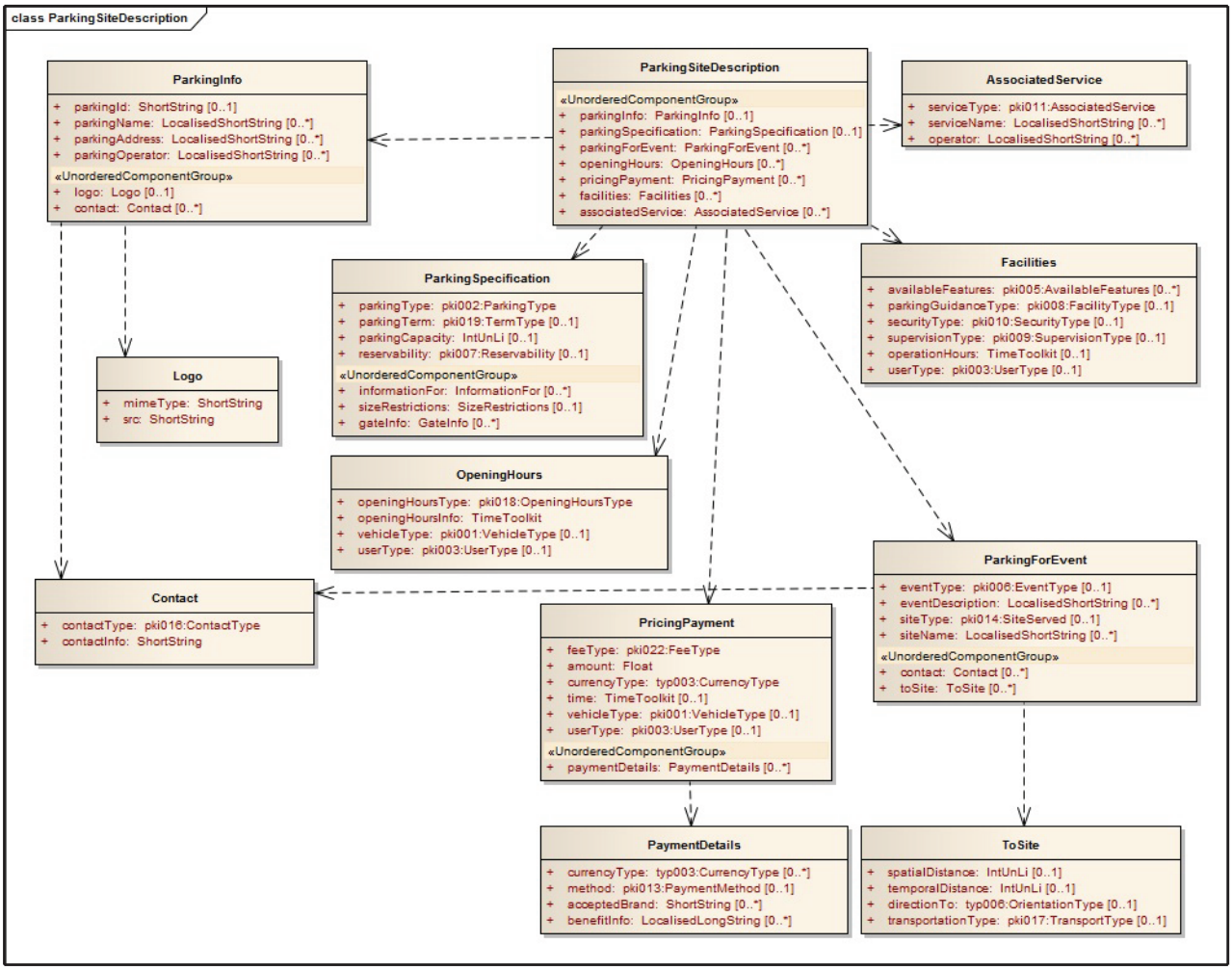

Figure 3 — Structure of Parking Site Description

Table 3 — ParkingSiteDescription

Name	Type	Multiplicity	Description
Unordered Components			
parkingInfo	ParkingInfo	0..1	n/a
parkingSpecification	ParkingSpecification	0..1	n/a
parkingForEvent	ParkingForEvent	0..*	n/a
openingHours	OpeningHours	0..*	n/a
pricingPayment	PricingPayment	0..*	n/a
facilities	Facilities	0..*	n/a
associatedService	AssociatedService	0..*	n/a

6.8 ParkingInfo

The ParkingInfo component contains address and contact information about a parking facility to be displayed to the user. This includes name, address, operator, logo and the contact details for the parking facility, as shown in Table 4.

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Table 4 — ParkingInfo

Name	Type	Multiplicity	Description
parkingId	ShortString	0..1	This attribute may hold a parking site specific ID string, allowing linking this site to other referencing schemes. It shall not contain language specific descriptions and should preferably not be presented to the user as a description.
parkingName	LocalizedShortString	0..*	Name of the parking in various languages.
parkingAddress	LocalizedShortString	0..*	Address of the parking in language specific formats. e.g. for German: Frauensteige 2, D-89075 Ulm
parkingOperator	LocalizedShortString	0..*	Language-specific strings representing the name and/or company of the operator.
Unordered Components			
Logo	Logo	0..1	n/a
contact	Contact	0..*	n/a

6.9 Logo

The logo component provides a URI and a mimeType for a company or parking site logo type. It does not contain the image data itself, as shown in Table 5.

Table 5 — Logo

Name	Type	Multiplicity	Description
mimeType	ShortString	1	The mime type of the image at the provided source.
Src	ShortString	1	URI where the logo can be retrieved.

6.10 Contact

This component provides contact information, as shown in Table 6.

Table 6 — Contact

Name	Type	Multiplicity	Description
contactType	pki016:ContactType	1	Indicates the type of the information in the contactInfo attribute.
contactInfo	ShortString	1	The actual contact information of the type indicated in the contactType attribute.

6.11 ParkingSpecification

The ParkingSpecification component (see Figure 4 and Table 7) contains detailed and largely static information about a parking facility describing properties of the parking site. This includes the type of parking and the maximum capacity among other information.

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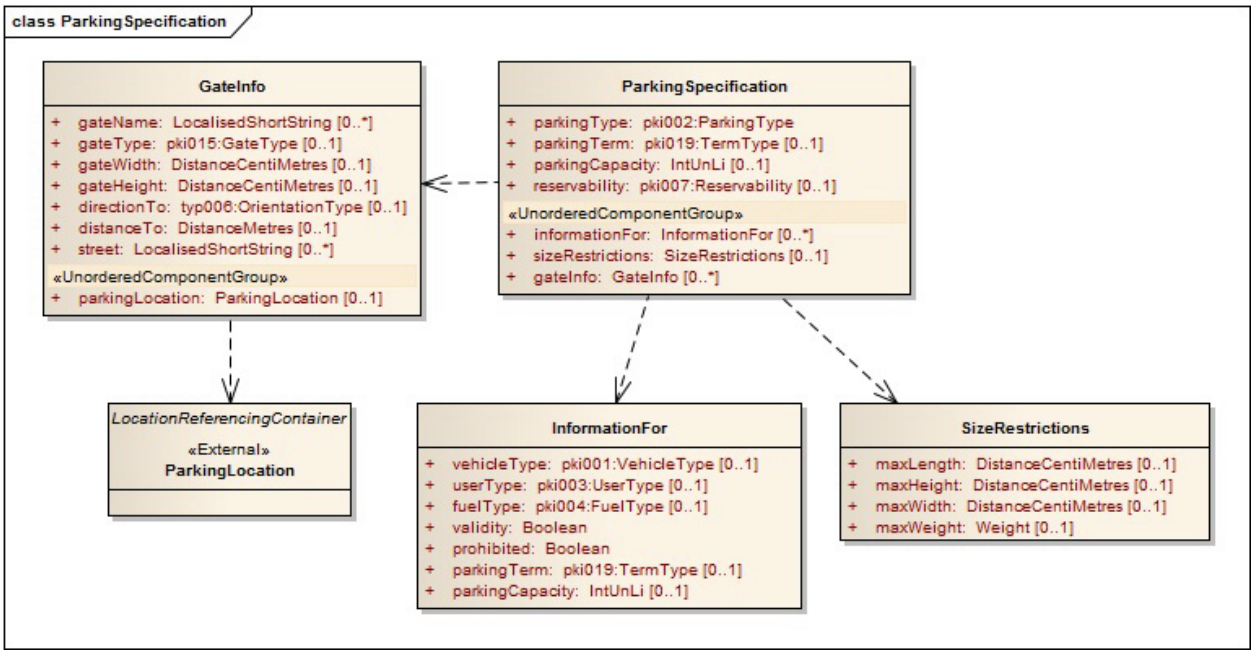

Figure 4 — Structure of Parking Specification

Table 7 — ParkingSpecification

Name	Type	Multiplicity	Description
parkingType	pki002:ParkingType	1	Indicates the overall type for the parking facility.
parkingTerm	pki019:TermType	0..1	Classifies the site with respect to the maximum allowed parking time or pricing schema. For example, short-term parking sites are usually very expensive for long term use. For the rare case that a parking site offers places for several term types, the parking site should be represented as one separate "virtual" parking site for each term type.
parkingCapacity	IntUnLi	0..1	Total number of parking spaces in the parking facility.
reservability	pki007:Reservability	0..1	Indicates whether it is possible to reserve places.
Unordered Components			
informationFor	InformationFor	0..*	n/a
sizeRestrictions	SizeRestrictions	0..1	n/a
gateInfo	GateInfo	0..*	n/a

6.12 InformationFor

The InformationFor component contains more detailed information for specific vehicle types, user groups or fuel types, as shown in Table 8. This component allows targeted information to be delivered to particular groups, such as disabled drivers for example, with regard to the parking duration, the number of reserved spaces, the maximum number of available spaces and other specific information. The component can further signal who may or may not use the particular site. The number of reserved spaces can e.g. be encoded as a component with userType "reservation holders".

The numbers contained within this component are a subset of the numbers indicated in the attributes of the ParkingSpecification component. The sum of the numbers may be larger than the total number of available spaces, because there may be overlapping groups. For example, all of the spaces available for a certain user group, may be also available for a special vehicle type.

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Table 8 — InformationFor

Name	Type	Multiplicity	Description
vehicleType	pki001:VehicleType	0..1	This attribute indicates the vehicle type the information in the component is valid for.
userType	pki003:UserType	0..1	This attribute indicates the user type the information in the component is valid for.
fuelType	pki004:FuelType	0..1	This attribute indicates the fuel type a vehicle must use for the information in this component to be valid.
Validity	Boolean	1	If set to true, the following attribute "Prohibited" contains valid information. If set to false, the following attribute shall be ignored.
Prohibited	Boolean	1	If set to true, the usage of this site is prohibited for groups indicated by the above attributes. If set to false, the use is explicitly allowed.
parkingTerm	pki019:TermType	0..1	Holds information about the term the parking is available for the indicated group.
parkingCapacity	IntUnLi	0..1	Number of spaces available for the indicated group.

6.13 SizeRestrictions

The SizeRestrictions component defines physical limits concerning the maximum size of a vehicle that can use the parking site, as shown in Table 9.

Table 9 — SizeRestrictions

Name	Type	Multiplicity	Description
maxLength	DistanceCentimetres	0..1	The maximum length in centimetres.
maxHeight	DistanceCentimetres	0..1	The maximum height in centimetres.
maxWidth	DistanceCentimetres	0..1	The maximum width in centimetres.
maxWeight	Weight	0..1	The maximum weight in kilogrammes.

6.14 GateInfo

GateInfo provides details for individual gates. It can hold a ParkingLocation to accurately identify the location of the specific gate, as shown in Table 10.

Table 10 — GateInfo

Name	Type	Multiplicity	Description
gateName	LocalizedShortString	0..*	Language specific names for the gate to be presented to the user.
gateType	pki015:GateType	0..1	Specifies the type of the gate.
gateWidth	DistanceCentimetres	0..1	The minimum width of the gate, specified in centimetres.
gateHeight	DistanceCentimetres	0..1	The minimum height of the gate, specified in centimetres.
directionTo	typ006:OrientationType	0..1	Direction to the street listed in the street attribute. For example, the next street from the gate is in direction "north".
distanceTo	DistanceMetres	0..1	The distance to the street listed in the street attribute. For example, the next street from the gate is 1 500 m away in the above mentioned direction.

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