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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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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)*

— *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*

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.

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.

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.

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.

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.

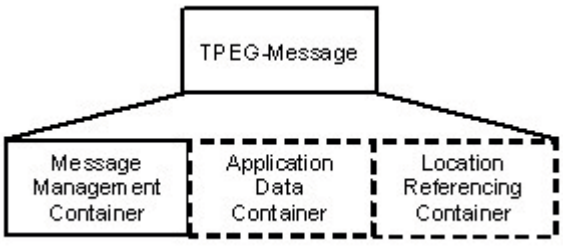

Figure 1 — Composition of TPEG messages

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.

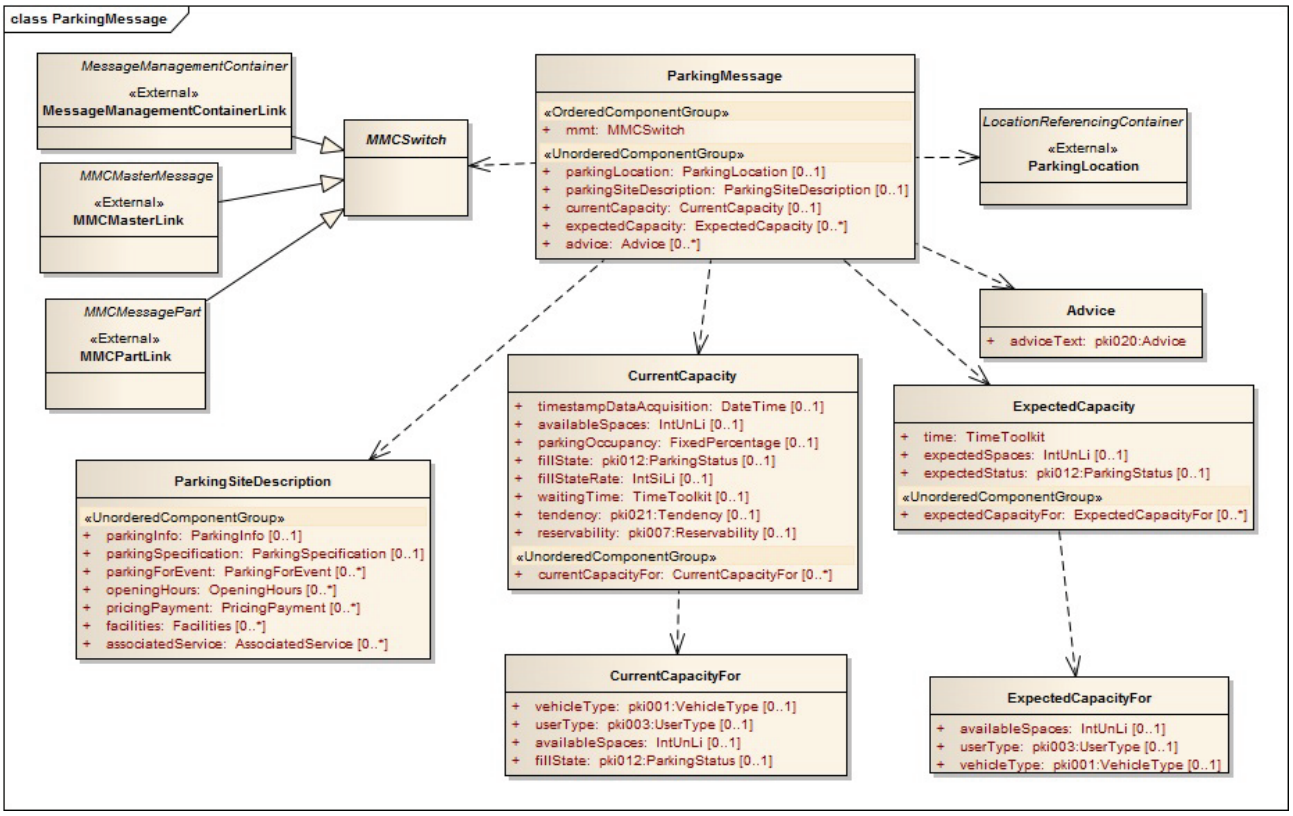

Figure 2 — Structure of the Parking Message

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

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.

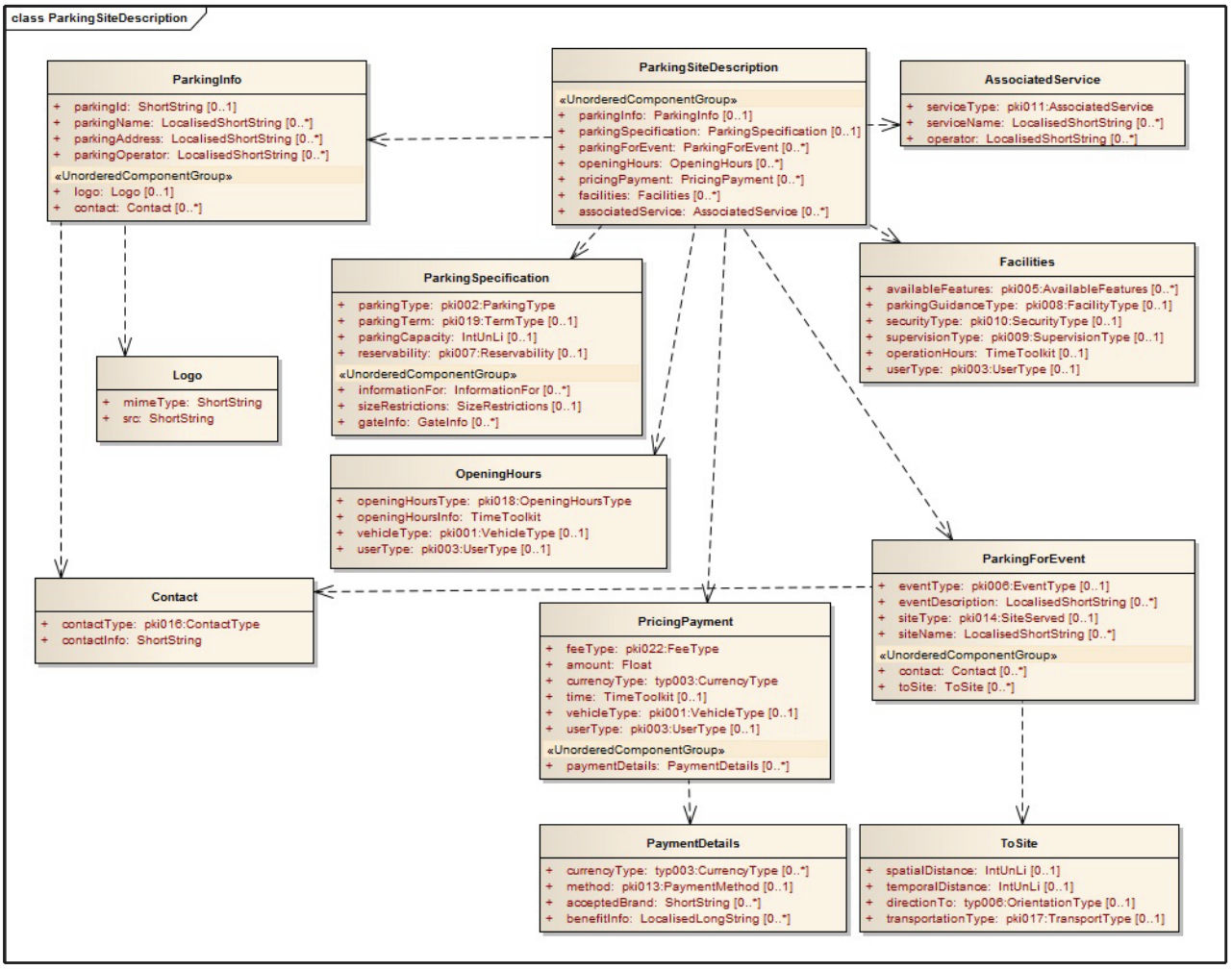

Figure 3 — Structure of Parking Site Description

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.

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.

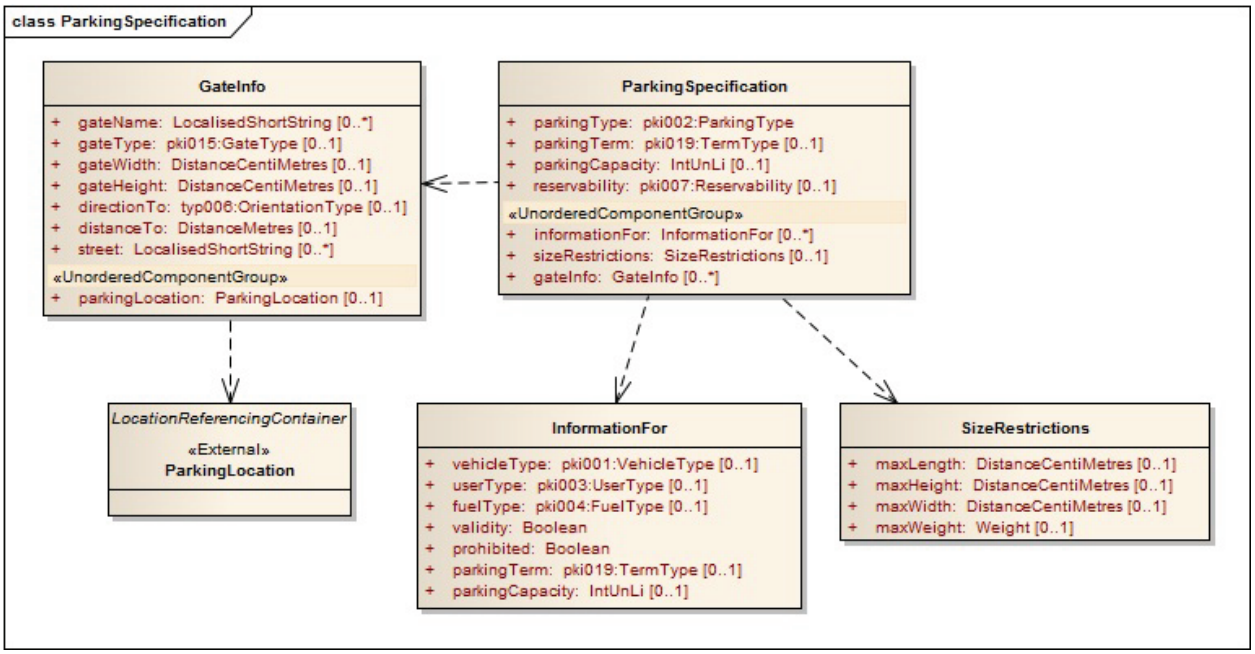

Figure 4 — Structure of Parking Specification

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.

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.

Table 10 *(continued)*

Name	Type	Multiplicity	Description
street	LocalizedShortString	0..*	The language specific names of a street next to the gate. Only one street shall be named, although it can be named in various languages.
Unordered Components			
parkingLocation	ParkingLocation	0..1	n/a

6.15 ParkingForEvent

Parking sites sometimes offer places for visitors of major events or famous places, or are at times even especially set up for a specific event. The type and name of the event can be indicated within this component. Additional details about the event would be expected to be delivered via other TPEG applications. A separate component shall be used for each event, as shown in Table 11.

Table 11 — ParkingForEvent

Name	Type	Multiplicity	Description
eventType	pki006:EventType	0..1	Allows indication of what kind of event the parking is for.
eventDescription	LocalizedShortString	0..*	A language-specific name or description can be included to further specify the related event.
siteType	pki014:SiteServed	0..1	The type of the site for which this parking facility serves can be given.
siteName	LocalizedShortString	0..*	A language-specific name or description can be included to further specify the related site.
Unordered Components			
contact	Contact	0..*	n/a
toSite	ToSite	0..*	n/a

6.16 ToSite

This component provides information on how the related site can be reached, as shown in Table 12.

Table 12 — ToSite

Name	Type	Multiplicity	Description
spatialDistance	IntUnLi	0..1	The distance in metres to reach the related facility.
travel time	IntUnLi	0..1	Duration in minutes it takes to the related facility using the indicated transportation.
directionTo	typ006:OrientationType	0..1	The direction to the related facility.
transportationType	pki017:TransportType	0..1	The means of transportation for which the information in this component is valid.

6.17 OpeningHours

Times that the parking facility is open with respect to vehicle and user type, as shown in Table 13.

Table 13 — OpeningHours

Name	Type	Multiplicity	Description
openingHoursType	pki018:OpeningHoursType	1	Defines how the openingHours attribute has to be interpreted.
openingHoursInfo	TimeToolkit	1	The actual timespan encoded using the TimeToolkit container.
vehicleType	pki001:VehicleType	0..1	The vehicle type for which the information within this component is valid.
userType	pki003:UserType	0..1	The information in this component is relevant for these users.

6.18 PricingPayment

The PricingPayment component describes the costs for parking at this parking location, as well as further payment details, as shown in Table 14.

Table 14 — PricingPayment

Name	Type	Multiplicity	Description
feeType	pki022:FeeType	1	Defines what sort of fee is described within this component.
amount	Float	1	The actual amount of the fee, expressed in the currency specified in the currencyType attribute.
currencyType	typ003:CurrencyType	1	The currency in which the amount of the fee is given.
Time	TimeToolkit	0..1	Time period for which this pricing information applies.
vehicleType	pki001:VehicleType	0..1	Limits the information to a vehicle type.
userType	pki003:UserType	0..1	Limits the information to a user type.
Unordered Components			
paymentDetails	PaymentDetails	0..*	n/a

6.19 PaymentDetails

The component PaymentDetails provides additional details on currencies, methods of payment and benefit information, as shown in Table 15.

Table 15 — PaymentDetails

Name	Type	Multiplicity	Description
currencyType	typ003:CurrencyType	0..*	Payment is accepted in these currencies.
method	pki013:PaymentMethod	0..1	How the fee can be paid.
acceptedBrand	ShortString	0..*	Brands, products and company names that are accepted for the specified method of payment.
benefitInfo	LocalizedLongString	0..*	Language specific announcement of a special benefit.

6.20 Facilities

The component Facilities indicates facilities and features, such as guided parking, which are available at the parking site and their operating hours, as well as the user type, as shown in Table 16.

Several facilities can be encoded in the attributes of one Facilities component at the same time, if they, for example, have identical hours of operation.

Table 16 — Facilities

Name	Type	Multiplicity	Description
availableFeatures	pki005:AvailableFeatures	0..*	Features that are present at the parking facility can be listed here.
parkingGuidanceType	pki008:FacilityType	0..1	The information is related to the parking guidance specified here.
securityType	pki010:SecurityType	0..1	The information concerns this security type.
supervisionType	pki009:SupervisionType	0..1	The information is related to this supervision type.
operationHours	TimeToolkit	0..1	This attribute is used to indicate the operation time for the information provided in the other attributes of this component.
userType	pki003:UserType	0..1	The facility is relevant for this user type.

6.21 AssociatedService

The component AssociatedService, as shown in Table 17, carries the description of associated services which are available at the parking site and usually have a name. Simple services that usually do not have a name may be indicated in the availableFeatures attribute in the Facilities component.

Table 17 — AssociatedService

Name	Type	Multiplicity	Description
serviceType	pki011:AssociatedService	1	The type of the associated service.
serviceName	LocalizedShortString	0..*	Description of the service in specified languages.
operator	LocalizedShortString	0..*	Language specific strings representing the name and/or company of the operator.

6.22 CurrentCapacity

The CurrentCapacity element describes the current parking situation by means of the exact number of available spaces, tendencies and qualitative descriptions, as shown in Table 18.

This component indicates the overall number of parking spaces available at the time of message generation. Contained components may specify the number and type of spaces the capacity refers to.

Table 18 — CurrentCapacity

Name	Type	Multiplicity	Description
timestampDataAcquisition	DateTime	0..1	The date and time when data has been measured or acquired.
availableSpaces	IntUnLi	0..1	The number of all available spaces. This is a quantitative measure.
parkingOccupancy	FixedPercentage	0..1	Number of occupied spaces in relation to the capacity specified in ParkingSpecification (0 % to 100 %).
fillState	pki012:ParkingStatus	0..1	Describes the overall status of the site with respect to parking occupancy.

Table 18 *(continued)*

Name	Type	Multiplicity	Description
fillStateRate	IntSiLi	0..1	The difference (cars per hour) between the rate of vehicles entering the facility and the rate of vehicles exiting the facility. Negative numbers indicate that cars are leaving the site.
waitingTime	TimeToolkit	0..1	Estimated time a user will have to wait in case currently no free parking places are available within this site.
tendency	pki021:Tendency	0..1	The currently observed filling tendency.
reservability	pki007:Reservability	0..1	n/a
Unordered Components			
currentCapacityFor	CurrentCapacityFor	0..*	n/a

6.23 CurrentCapacityFor

The component CurrentCapacityFor provides information on the current parking situation for a vehicle or user type to be defined, as shown in Table 19. If the availableSpaces attribute is left out, the component simply indicates that "There are spaces of this type" and does not specify how many.

Table 19 — CurrentCapacityFor

Name	Type	Multiplicity	Description
vehicleType	pki001:VehicleType	0..1	The type of vehicles for which the capacity value in this component applies.
userType	pki003:UserType	0..1	The type of users for which the capacity value in this component applies.
availableSpaces	IntUnLi	0..1	Describes in more detail for which users or vehicles spaces are available. If the availableSpaces attribute is omitted, it indicates that there are places of the specified type available. The summary of available spaces in all CurrentCapacityFor components may be larger than the total number of available spaces, because of overlapping set definitions.
fillState	pki012:ParkingStatus	0..1	Describes the overall status of the parking facility for the group of users and vehicle types specified. This is a more qualitative measure than the absolute number of available spaces attribute.

6.24 ExpectedCapacity

The component ExpectedCapacity provides forecasts concerning the parking situation which may be encoded for multiple timepoints in the future, as shown in Table 20.

Table 20 — ExpectedCapacity

Name	Type	Multiplicity	Description
time	TimeToolkit	1	Specifies the timepoint for which the prognosis is made.
expectedSpaces	IntUnLi	0..1	Number of available places to be expected. This is an estimated number only.
expectedStatus	pki012:ParkingStatus	0..1	Rough qualitative estimation.
Unordered Components			
expectedCapacityFor	ExpectedCapacityFor	0..*	n/a

6.25 ExpectedCapacityFor

The ExpectedCapacityFor element allows specification of the expected available spaces with respect to user type and vehicle type, as shown in Table 21.

Table 21 — ExpectedCapacityFor

Name	Type	Multiplicity	Description
availableSpaces	IntUnLi	0..1	Number of available places to be expected. This is an estimated number only.
userType	pki003:UserType	0..1	The type of user for which the capacity value in this component applies.
vehicleType	pki001:VehicleType	0..1	The type of vehicles for which the capacity value in this component applies.

6.26 Advice

The component Advice provides helpful information concerning the parking situation which is given through instances of this component, as shown in Table 22.

Table 22 — Advice

Name	Type	Multiplicity	Description
adviceText	pki020:Advice	1	Advice concerning the parking from table pki020.

7 PKI Tables

7.1 pki001:VehicleType

The VehicleType table lists various types of vehicles that might be addresses, as shown in Table 23.

Table 23 — VehicleType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation.	
1	all cars		
2	light goods vehicle	<7,5 tonne	
3	heavy goods vehicle	>7,5 tonne	In UK: officially known as Large Goods Vehicle (LGV)
4	pedal cycle		i.e. cycle rack at public transport station

Table 23 *(continued)*

Code	TISA English 'Word'	Comment	Example
5	vehicle with trailer		
6	high-sided vehicle		
7	minibus	Usually four to eight seats.	
8	taxi	Usually four seats maximum	
9	motorcycle		i.e. specially marked zones for motorcycles
10	small car		
11	large car		
12	camper car		
13	car with trailer		
14	car with caravan		
15	light goods vehicle with trailer		
16	heavy goods vehicle with trailer		
17	motorcycle with sidecar		
18	moped		
19	passenger car		
20	trucks		
21	bus		
255	undefined vehicle type		

7.2 pki002:ParkingType

The ParkingType table lists different types of how a parking site is build, as shown in Table 24.

Table 24 — ParkingType

Code	TISA English 'Word'	Comment	Example
000	unknown	Service provider does not know at time of message generation	
001	special		
002	open space		
003	multi-storey		
004	underground		
005	covered		
006	nested		
007	field		
008	road side		
009	drop-off with valet		
010	drop-off mechanical		
011	highway		
012	park and ride		
013	car pool		
014	campground		
015	parking zone		

Table 24 *(continued)*

Code	TISA English 'Word'	Comment	Example
016	downtown		
017	temporary		
018	kiss and ride		
255	undecodable parking type		

7.3 pki003:UserType

The UserType table permits specification of certain characterized groups of people, as shown in Table 25.

Table 25 — UserType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation.	
1	all users	(logical plural)	
2	shoppers	(logical plural)	
3	hotel guests	(logical plural)	
4	subscribers	(logical plural)	
5	reservation holders	(logical plural)	
6	season ticket holders	(logical plural)	
7	registered disabled users	(logical plural)	
8	pregnant women	(logical plural)	
9	wheelchair users	(logical plural)	
10	elderly users	(logical plural)	
11	families	(logical plural)	
12	men	(logical plural)	
13	women	(logical plural)	
14	pensioners	(logical plural)	
15	students	(logical plural)	
16	staff		
17	employees	(logical plural)	
18	customers	(logical plural)	
19	visitors	(logical plural)	
20	members	(logical plural)	
21	short-term parking user		
22	long-term parking user		
23	Overnight parking user		
24	sport event away supporters	(logical plural)	
25	sport event home supporters	(logical plural)	
255	undecodable user type		

7.4 pki004:FuelType

The FuelType table lists all sorts of fuels, as shown in Table 26.

Table 26 — FuelType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	all		
2	95 octane petrol		
3	98 octane petrol		
4	diesel		
5	LPG		
6	unleaded petrol		
7	leaded petrol		
8	hydrogen		
9	electric		
10	alcohol		
255	undecodable fuel type		

7.5 pki005:AvailableFeatures

The AvailableFeatures table lists features that might be available, as shown in Table 27.

Table 27 — AvailableFeatures

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	none		
2	wheelchair accessible		
3	internet hotspots		
4	electricity available		
5	toilet		
6	public telephone		
7	shower facility		
8	vending machine		
9	information point		
255	undecodable feature		

7.6 pki006:EventType

The EventType table lists different events for which parking might be provided, as shown in Table 28.

Table 28 — EventType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	open-air concert		
2	concert		
3	sound and light show		
4	art event		

Table 28 *(continued)*

Code	TISA English 'Word'	Comment	Example
5	flower event		
6	beer festival		
7	food festival		
8	wine festival		
9	theatrical event		
10	firework display		
11	sport and game		
12	street festival	e.g. Karneval in Cologne	e.g. Karneval in Cologne
13	film festival		
14	exhibition		
15	parade		
255	undecodable event type		

7.7 pki007: Reservability

The Reservability table gives information about the reservability at a parking site, as shown in Table 29.

Table 29 — Reservability

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	partly reservable		
2	reservable		
3	not reservable		
4	reservation required		
255	undecodable reservation status		

7.8 pki008:FacilityType

The FacilityType table lists facilities that may be available at a parking site, as shown in Table 30.

Table 30 — FacilityType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	mechanical parking		
2	valet parking		
3	automatic space guidance		
4	staff guides to space		
5	vehicle lift		
255	undecodable facility type		

7.9 pki009:SupervisionType

The SupervisionType table permits specification of whether and how a site is supervised, as shown in Table 32.

Table 31 — SupervisionType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	none		
2	remote		
3	on site		
4	control centre on site		
5	control centre off site		
6	patrol		
255	undecodable supervision type		

7.10 pki010:SecurityType

The SecurityType table lists security measures that may be associated with a parking site, as shown in Table 32.

Table 32 — SecurityType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	none		
2	security staff		
3	cctv		
4	dog		
255	undecodable security type		

7.11 pki011:AssociatedService

The AssociatedService table lists services that may be associated with a parking site, as shown in Table 33.

Table 33 — AssociatedService

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	fuel station		
2	restaurant		
3	overnight accommodation		
4	vehicle maintenance facility		
5	shop		
6	kiosk		
7	pharmacy		
8	cafe		

Table 33 *(continued)*

Code	TISA English 'Word'	Comment	Example
9	car wash		
10	repair shop		
255	undecodable service		

7.12 pki012:ParkingStatus

The ParkingStatus table describes the overall situation of a parking site, as shown in Table 34.

Table 34 — ParkingStatus

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	full		
2	busy		
3	vacant		
4	closed		
5	no parking allowed		
6	special conditions apply	Only spaces for special users or vehicle types available	
255	undecodable parking status		

7.13 pki013:PaymentMethod

The PaymentMethod table permits specification of the methods that may be used for payment, as shown in Table 35.

Table 35 — PaymentMethod

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	cash		
2	credit card		
3	electronic settlement		
4	ticket		
5	token		
6	direct cash transfer		
7	RFID		
8	pre-pay card		
9	mobile phone		
10	smartcard		
255	undecodable payment method		

7.14 pki014:SiteServed

The SiteServed table lists relevant categories of associated sites that may be served by a parking site, as shown in Table 36.

Table 36 — SiteServed

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	airport terminal		
2	ferry terminal		
3	vehicle-on-rail terminal	For loading vehicles on trains	
4	coach station	For long distance travel	
5	cable car station		
6	shopping centre		
7	public transport station		e.g. suburban train, underground, tram or bus
8	market		
9	religious centre		
10	convention centre		
11	exhibition centre		
12	ski lift		
13	cinema		
255	undecodable site		

7.15 pki015:GateType

The GateType table defines of which sort a gate is, as shown in Table 37.

Table 37 — GateType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	vehicle entrance		
2	vehicle exit		
3	vehicle rental return		
4	vehicle exit and entrance	common simplification	
5	pedestrian entrance	common simplification	
255	undecodable gate type		

7.16 pki016:ContactType

The ContactType table lists various methods to contact someone, as shown in Table 38.

Table 38 — ContactType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	telephone		
2	fax		
3	e-mail		
4	Internet address		
5	priory telephone	To on-site staff	
6	telephone main office	To off-site staff	
255	undecodable contact type		

7.17 pki017:TransportType

The TransportType table lists various modes of transport, as shown in Table 39.

Table 39 — TransportType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	pedestrian		
2	underground rail		
3	train		
4	bus		
5	ferry		
6	tram		
7	shuttle		
255	undecodable transport type		

7.18 pki018:OpeningHoursType

The OpeningHoursType table defines the types of a given time value, as shown in Table 40.

Table 40 — OpeningHoursType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	entry hours		
2	exit hours		
3	maximum stay time		
255	undecodable opening hours type		

7.19 pki019:TermType

The TermType table defines for which desired parking duration a parking site may be best suited, as shown in Table 41.

Table 41 — TermType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	short term		
2	long term		
3	overnight		
4	medium term		
255	undecodable term type		

7.20 pki020:Advice

The Advice table permits specification of encoded advice for users, as shown in Table 42.

Table 42 — Advice

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	shuttle service is available		
2	use public transportation		
3	use park and ride		
4	admission ticket is also valid for public transport		
5	no public transport available		
6	extra parking capacity available		
255	undecodable advice		

7.21 pki021:Tendency

The Tendency table permits specification indicating the tendency of the fill state, as shown in Table 43.

Table 43 — Tendency

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	filling quickly		
2	filling		
3	filling slowly		
4	unchanging		
5	emptying slowly		
6	emptying		
7	emptying quickly		
255	undecodable tendency		

7.22 pki022:FeeType

The FeeType table lists values that describe the nature of a charge fee, as shown in Table 44.

Table 44 — FeeType

Code	TISA English 'Word'	Comment	Example
0	unknown	Service provider does not know at time of message generation	
1	minimum		
2	maximum		
3	additional		
4	season ticket		
5	temporary price		
6	night price		
7	day price		
8	month price		
9	year price		
10	first hour price		
11	free parking		
12	flat		
255	undecodable fee type		

Annex A
(normative)

TPEG PKI, TPEG-Binary Representation

A.1 General

This Annex provides the TPEG binary representation derived via application of the UML to binary conversion rules specified in TPEG2-UBCR, ISO/TS 21219-3.

A.2 Message components

A.2.1 List of Generic Component Ids

Table A.1 provides the list of generic component Ids.

Table A.1 — List of Generic Component Ids

Name	Id
ParkingMessage	0
MessageManagementContainerLink	1
MMCMasterLink	2
MMCPartLink	3
ParkingLocation	4
ParkingSiteDescription	5
CurrentCapacity	6
CurrentCapacityFor	7
ExpectedCapacity	8
ExpectedCapacityFor	9
InformationFor	10
SizeRestrictions	11
ParkingInfo	12
ParkingSpecification	13
Logo	14
Contact	16
OpeningHours	17
GateInfo	18
PricingPayment	19
PaymentDetails	20
Facilities	21
ToSite	23
Advice	24
AssociatedService	25
ParkingForEvent	26

A.2.2 ParkingMessage

<ParkingMessage(0)>:=	
<IntUnTi>(0),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
ordered {	
<MMCSwitch>(mmt),	: Includes one of the Message Management Container types.
}	
unordered {	
n * <ParkingLocation>(parkingLocation)[0..1],	: As defined in external TPEG2-Location Referencing specification.
n * <ParkingSiteDescription>(parkingSiteDescription)[0..1],	
n * <CurrentCapacity>(currentCapacity)[0..1],	
n * <ExpectedCapacity>(expectedCapacity),	
n * <Advice>(advice)	
};	

A.2.3 MMCSwitch

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

A.2.4 MessageManagementContainerLink

<MessageManagementContainerLink(1)<MMCSwitch()>>:=	
External <MessageManagementContainer(1)>;	: see MessageManagementContainer specification

A.2.5 MMCMasterLink

<MMCMasterLink(2)<MMCSwitch()>>:=	
External <MMCMasterMessage(2)>;	: see MMCMasterMessage specification

A.2.6 MMCPartLink

<MMCPartLink(3)<MMCSwitch()>>:=	
External <MMCMessagePart(3)>;	: see MMCMessagePart specification

A.2.7 ParkingLocation

<ParkingLocation(4)>:=	
External <LocationReferencingContainer(4)>;	: see LocationReferencingContainer specification

A.2.8 ParkingSiteDescription

<ParkingSiteDescription(5)>:=	
<IntUnTi>(5),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
unordered {	
n * <ParkingInfo>(parkingInfo)[0..1],	
n * <ParkingSpecification>(parkingSpecification)[0..1],	
n * <ParkingForEvent>(parkingForEvent),	
n * <OpeningHours>(openingHours),	
n * <PricingPayment>(pricingPayment),	
n * <Facilities>(facilities),	
n * <AssociatedService>(associatedService)	
};	

A.2.9 ParkingInfo

<ParkingInfo(12)>:=	
<IntUnTi>(12),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
<ShortString>(parkingId),	: 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.
if (bit 1 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(parkingName),	: Name of the parking in various languages.
}	
if (bit 2 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(parkingAddress),	: Address of the parking in language specific formats. e.g. for German: Frauensteige 2, D-89075 Ulm
}	
if (bit 3 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(parkingOperator),	: Language specific strings representing the name and/or company of the operator.
}	

unordered {	
n * <Logo>(logo)[0..1],	
n * <Contact>(contact)	
};	

A.2.10 Logo

<Logo(14)>:=	
<IntUnTi>(14),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<ShortString>(mimeType),	: The mime type of the image at the provided source.
<ShortString>(src);	: URI where the logo can be retrieved.

A.2.11 Contact

<Contact(16)>:=	
<IntUnTi>(16),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<pki016:ContactType>(contactType),	: Indicates the type of the information in the contactInfo attribute.
<ShortString>(contactInfo);	: The actual contact information of the type indicated in the contactType attribute.

A.2.12 ParkingSpecification

<ParkingSpecification(13)>:=	
<IntUnTi>(13),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<pki002:ParkingType>(parkingType),	: Indicates the over all type for the parking.
BitArray(selector),	
if (bit 0 of selector is set)	
<pki019:TermType>(parkingTerm),	: 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.
if (bit 1 of selector is set)	
<IntUnLi>(parkingCapacity),	: Total number of max available spaces.
if (bit 2 of selector is set)	
<pki007:Reservability>(reservability),	: Indicates whether it is possible to reserve places.
unordered {	
n * <InformationFor>(informationFor),	

n * <SizeRestrictions>(sizeRestrictions)[0..1],	
n * <GateInfo>(gateInfo)	
};	

A.2.13 InformationFor

<InformationFor(10)>:=	
<IntUnTi>(10),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
<pki001:VehicleType>(vehicleType),	: This attribute indicates the vehicle type the information in the component is valid for.
if (bit 1 of selector is set)	
<pki003:UserType>(userType),	: This attribute indicates the user type the information in the component is valid for.
if (bit 2 of selector is set)	
<pki004:FuelType>(fuelType),	: This attribute indicates the fuel type a vehicle must use for the information in this component to be valid.
if (bit 3 of selector is set)	
<Boolean>(validity),	: If set to true, the following attribute “Prohibited” contains valid information. If set to false, the following attribute shall be ignored.
if (bit 4 of selector is set)	
<Boolean>(prohibited),	: 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.
if (bit 5 of selector is set)	
<pki019:TermType>(parkingTerm),	: Holds information about the term the parking is available for the indicated group.
if (bit 6 of selector is set)	
<IntUnLi>(parkingCapacity);	: Number of spaces available for the indicated group.

A.2.14 SizeRestrictions

<SizeRestrictions(11)>:=	
<IntUnTi>(11),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
<DistanceCentiMetres>(maxLength),	: The maximum length in centimetres.
if (bit 1 of selector is set)	
<DistanceCentiMetres>(maxHeight),	: The maximum height in centimetres.
if (bit 2 of selector is set)	

<DistanceCentiMetres>(maxWidth),	: The maximum width in centimetres.
if (bit 3 of selector is set)	
<Weight>(maxWeight);	: The maximum weight in kilogrammes.

A.2.15 GateInfo

<GateInfo(18)>:=	
<IntUnTi>(18),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(gateName),	: Language-specific names for the gate to be presented to the user.
}	
if (bit 1 of selector is set)	
<pki015:GateType>(gateType),	: Specifies the type of the gate.
if (bit 2 of selector is set)	
<DistanceCentiMetres>(gateWidth),	: The minimum width of the gate in centrimetres.
if (bit 3 of selector is set)	
<DistanceCentiMetres>(gateHeight),	: The minimum height of the gate in centimetres.
if (bit 4 of selector is set)	
<typ006:OrientationType>(direction-To),	: Direction to the street listed in the street attribute. For example, the next street from the gate is in direction “north”.
if (bit 5 of selector is set)	
<DistanceMetres>(distanceTo),	: The distance to the street listed in the street attribute. For example, the next street from the gate is 1 500 metres away in the above-mentioned direction.
if (bit 6 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(street),	: The language-specific names of a street next to the gate. Only one street shall be named, although it can be named in various languages.
}	
unordered {	
n * <ParkingLocation>(parkingLoca-tion)[0..1]	
};	

A.2.16 ParkingForEvent

<ParkingForEvent(26)>:=	
<IntUnTi>(26),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component

<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
<pki006:EventType>(eventType),	: Allows indication of what kind of event the parking is for.
if (bit 1 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(eventDescription),	: A language-specific name or description can be included to further specify the related event.
}	
if (bit 2 of selector is set)	
<pki014:SiteServed>(siteType),	: The type of the site for which this parking is for can be given.
if (bit 3 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(siteName),	: A language-specific name or description can be included to further specify the related site.
}	
unordered {	
n * <Contact>(contact),	
n * <ToSite>(toSite)	
};	

A.2.17 ToSite

<ToSite(23)>:=	
<IntUnTi>(23),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
<IntUnLi>(spatialDistance),	: The distance in metres to reach the related facility.
if (bit 1 of selector is set)	
<IntUnLi>(temporalDistance),	: Time, in minutes, it takes to the related facility using the indicated transportation.
if (bit 2 of selector is set)	
<typ006:OrientationType>(directionTo),	: The direction to the related facility.
if (bit 3 of selector is set)	
<pki017:TransportType>(transportationType);	: The means of transportation for which the information in this component is valid.

A.2.18 OpeningHours

<OpeningHours(17)>:=	
<IntUnTi>(17),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component

<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<pki018:OpeningHoursType>(opening-HoursType),	: Defines how the openingHours attribute has to be interpreted.
<TimeToolkit>(openingHoursInfo),	: The actual timespan encoded using the TimeToolkit container.
BitArray(selector),	
if (bit 0 of selector is set)	
<pki001:VehicleType>(vehicleType),	: The vehicle type for which the information within this component is valid.
if (bit 1 of selector is set)	
<pki003:UserType>(userType);	: The information in this component is relevant for these users.

A.2.19 PricingPayment

<PricingPayment(19)>:=	
<IntUnTi>(19),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<pki022:FeeType>(feeType),	: Defines what sort of fee is described within this component.
<Float>(amount),	: The actual amount of the fee, expressed in the currency specified in the currencyType attribute.
<typ003:CurrencyType>(currency-Type),	: The currency in which the amount of the fee is given.
BitArray(selector),	
if (bit 0 of selector is set)	
<TimeToolkit>(time),	: Time period for which this pricing information applies.
if (bit 1 of selector is set)	
<pki001:VehicleType>(vehicleType),	: Limits the information to a vehicle type.
if (bit 2 of selector is set)	
<pki003:UserType>(userType),	: Limits the information to a user type.
unordered {	
n * <PaymentDetails>(paymentDetails)	
};	

A.2.20 PaymentDetails

<PaymentDetails(20)>:=	
<IntUnTi>(20),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
{	
<IntUnLoMB>(n),	

n * <typ003:CurrencyType>(currency-Type),	: Payment is accepted in these currencies.
}	
if (bit 1 of selector is set)	
<pki013:PaymentMethod>(method),	: The methods of payment that can be used for payment of a fee.
if (bit 2 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <ShortString>(acceptedBrand),	: Brands, products and company names that are accepted for the specified method of payment.
}	
if (bit 3 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedLongString>(benefitInfo)	: Language-specific announcement of a special benefit.
};	

A.2.21 Facilities

<Facilities(21)>:=	
<IntUnTi>(21),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <pki005:AvailableFeatures>(available-Features),	: Features that are present at the parking facility can be listed here.
}	
if (bit 1 of selector is set)	
<pki008:FacilityType>(parkingGuidance-Type),	: The information is related to the parking guidance specified here.
if (bit 2 of selector is set)	
<pki010:SecurityType>(securityType),	: The information concerns this security type.
if (bit 3 of selector is set)	
<pki009:SupervisionType>(supervision-Type),	: The information is related to this supervision type.
if (bit 4 of selector is set)	
<TimeToolkit>(operationHours),	: This attribute is used to indicate the operation time for the information provided in the other attributes of this component.
if (bit 5 of selector is set)	
<pki003:UserType>(userType);	: The facility is relevant for this user type.

A.2.22 AssociatedService

<AssociatedService(25)>:=	
<IntUnTi>(25),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<pki011:AssociatedService>(serviceType),	: The type of the associated service.
BitArray(selector),	
if (bit 0 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(serviceName),	: Description of the service in relevant languages.
}	
if (bit 1 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(operator)	: Language-specific strings representing the name and/or the company of the operator.
};	

A.2.23 CurrentCapacity

<CurrentCapacity(6)>:=	
<IntUnTi>(6),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
<DateTime>(timestampDataAcquisition),	: The date and time when data has been measured or acquired.
if (bit 1 of selector is set)	
<IntUnLi>(availableSpaces),	: The number of all available spaces. This is a quantitative measure.
if (bit 2 of selector is set)	
<FixedPercentage>(parkingOccupancy),	: Number of occupied spaces in relation to the capacity specified in ParkingSpecification (0 % to 100 %).
if (bit 3 of selector is set)	
<pki012:ParkingStatus>(fillState),	: Describes the overall status of the site with respect to parking occupancy.
if (bit 4 of selector is set)	
<IntSiLi>(fillStateRate),	: The difference (cars per hour) between the rate of vehicles entering the facility and the rate of vehicles exiting the facility. Negative numbers indicate that cars are leaving the site.
if (bit 5 of selector is set)	

<TimeToolkit>(waitingTime),	: Estimated time a user will have to wait in case currently no free parking places are available within this site
if (bit 6 of selector is set)	
<pki021:Tendency>(tendency),	: The currently observed tendency. This is no prognosis.
if (bit 7 of selector is set)	
<pki007:Reservability>(reservability),	
unordered {	
n * <CurrentCapacityFor>(currentCapacityFor)	
};	

A.2.24 CurrentCapacityFor

<CurrentCapacityFor(7)>:=	
<IntUnTi>(7),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
<pki001:VehicleType>(vehicleType),	: The type of vehicles for which the capacity value in this component applies.
if (bit 1 of selector is set)	
<pki003:UserType>(userType),	: The type of users for which the capacity value in this component applies.
if (bit 2 of selector is set)	
<IntUnLi>(availableSpaces),	: Describes in more detail for which users or vehicles spaces are available. If the availableSpaces attribute is omitted, it indicates that there are places of the specified type available. The summary of available spaces in all CurrentCapacityFor components may be larger than the total number of available spaces, because of overlapping set definitions.
if (bit 3 of selector is set)	
<pki012:ParkingStatus>(fillState);	: Describes the overall status of the parking facility for the group of users and vehicle types specified. This is a more qualitative measure than the absolute number of available spaces attribute.

A.2.25 ExpectedCapacity

<ExpectedCapacity(8)>:=	
<IntUnTi>(8),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<TimeToolkit>(time),	: Specifies the timepoint for which the prognosis is made.
BitArray(selector),	

if (bit 0 of selector is set)	
<IntUnLi>(expectedSpaces),	: Number of available places to be expected. This is an estimated number only.
if (bit 1 of selector is set)	
<pki012:ParkingStatus>(expectedStatus),	: Rough qualitative estimation.
unordered {	
n * <ExpectedCapacityFor>(expectedCapacityFor)	
};	

A.2.26 ExpectedCapacityFor

<ExpectedCapacityFor(9)>:=	
<IntUnTi>(9),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
<IntUnLi>(availableSpaces),	: Number of available places to be expected. This is an estimated number only.
if (bit 1 of selector is set)	
<pki003:UserType>(userType),	: The type of user for which the capacity value in this component applies.
if (bit 2 of selector is set)	
<pki001:VehicleType>(vehicleType);	: The type of vehicles for which the capacity value in this component applies.

A.2.27 Advice

<Advice(24)>:=	
<IntUnTi>(24),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<pki020:Advice>(adviceText);	: Advice concerning the parking from table pki020.

Annex B
(normative)

TPEG PKI, tpegML Representation

B.1 General

This Annex provides the xml representation derived via application of the UML to xml conversion rules specified in TPEG2-UXCR ISO/TS 21219-4.

B.2 Message Components

B.2.1 ParkingMessage

```
<xs:element name="ParkingMessage" type="ParkingMessage"/>
<xs:complexType name="ParkingMessage">
 <xs:complexContent>
 <xs:extension base="tsf:ApplicationRootMessageML">
 <xs:sequence>
 <xs:element name="mmt" type="MMCSwitch"/>
 <xs:choice maxOccurs="unbounded">
 <xs:element name="parkingLocation" type="lrc:LocationReferencingContainer"
minOccurs="0"/>
 <xs:element name="parkingSiteDescription" type="ParkingSiteDescription" minOccurs="0"/>
 <xs:element name="currentCapacity" type="CurrentCapacity" minOccurs="0"/>
 <xs:element name="expectedCapacity" type="ExpectedCapacity" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="advice" type="Advice" minOccurs="0" maxOccurs="unbounded"/>
 </xs:choice>
 </xs:sequence>
 </xs:extension>
 </xs:complexContent>
</xs:complexType>
```

B.2.2 MMCSwitch

```
<xs:complexType name="MMCSwitch">
 <xs:sequence>
 <xs:choice minOccurs="1" maxOccurs="1">
 <xs:element name="optionMessageManagementContainerLink"
type="mmc:MessageManagementContainer" minOccurs="1" maxOccurs="1"/>
 <xs:element name="optionMMCMasterLink" type="mmc:MMCMasterMessage" minOccurs="1"
maxOccurs="1"/>
 <xs:element name="optionMMCPartLink" type="mmc:MMCMessagePart" minOccurs="1"
maxOccurs="1"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.3 ParkingSiteDescription

```
<xs:complexType name="ParkingSiteDescription">
 <xs:sequence>
 <xs:choice maxOccurs="unbounded">
 <xs:element name="parkingInfo" type="ParkingInfo" minOccurs="0"/>
 <xs:element name="parkingSpecification" type="ParkingSpecification" minOccurs="0"/>
 <xs:element name="parkingForEvent" type="ParkingForEvent" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="openingHours" type="OpeningHours" minOccurs="0" maxOccurs="unbounded"/>
 <xs:element name="pricingPayment" type="PricingPayment" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="facilities" type="Facilities" minOccurs="0" maxOccurs="unbounded"/>
```

```
 <xs:element name="associatedService" type="AssociatedService" minOccurs="0"
maxOccurs="unbounded"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.4 ParkingInfo

```
<xs:complexType name="ParkingInfo">
 <xs:sequence>
 <xs:element name="parkingId" type="tdt:ShortString" minOccurs="0"/>
 <xs:element name="parkingName" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="parkingAddress" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="parkingOperator" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:choice maxOccurs="unbounded">
 <xs:element name="logo" type="Logo" minOccurs="0"/>
 <xs:element name="contact" type="Contact" minOccurs="0" maxOccurs="unbounded"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.5 Logo

```
<xs:complexType name="Logo">
 <xs:sequence>
 <xs:element name="mimeType" type="tdt:ShortString"/>
 <xs:element name="src" type="tdt:ShortString"/>
 </xs:sequence>
</xs:complexType>
```

B.2.6 Contact

```
<xs:complexType name="Contact">
 <xs:sequence>
 <xs:element name="contactType" type="pki016_ContactType"/>
 <xs:element name="contactInfo" type="tdt:ShortString"/>
 </xs:sequence>
</xs:complexType>
```

B.2.7 ParkingSpecification

```
<xs:complexType name="ParkingSpecification">
 <xs:sequence>
 <xs:element name="parkingType" type="pki002_ParkingType"/>
 <xs:element name="parkingTerm" type="pki019_TermType" minOccurs="0"/>
 <xs:element name="parkingCapacity" type="tdt:IntUnLi" minOccurs="0"/>
 <xs:element name="reservability" type="pki007_Reservability" minOccurs="0"/>
 <xs:choice maxOccurs="unbounded">
 <xs:element name="informationFor" type="InformationFor" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="sizeRestrictions" type="SizeRestrictions" minOccurs="0"/>
 <xs:element name="gateInfo" type="GateInfo" minOccurs="0" maxOccurs="unbounded"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.8 InformationFor

```
<xs:complexType name="InformationFor">
 <xs:sequence>
 <xs:element name="vehicleType" type="pki001_VehicleType" minOccurs="0"/>
 <xs:element name="userType" type="pki003_UserType" minOccurs="0"/>
 <xs:element name="fuelType" type="pki004_FuelType" minOccurs="0"/>
 <xs:element name="validity" type="tdt:Boolean"/>
 <xs:element name="prohibited" type="tdt:Boolean"/>
 <xs:element name="parkingTerm" type="pki019_TermType" minOccurs="0"/>
 <xs:element name="parkingCapacity" type="tdt:IntUnLi" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.2.9 SizeRestrictions

```
<xs:complexType name="SizeRestrictions">
 <xs:sequence>
 <xs:element name="maxLength" type="tdt:DistanceCentiMetres" minOccurs="0"/>
 <xs:element name="maxHeight" type="tdt:DistanceCentiMetres" minOccurs="0"/>
 <xs:element name="maxWidth" type="tdt:DistanceCentiMetres" minOccurs="0"/>
 <xs:element name="maxWeight" type="tdt:Weight" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.2.10 GateInfo

```
<xs:complexType name="GateInfo">
 <xs:sequence>
 <xs:element name="gateName" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="gateType" type="pki015_GateType" minOccurs="0"/>
 <xs:element name="gateWidth" type="tdt:DistanceCentiMetres" minOccurs="0"/>
 <xs:element name="gateHeight" type="tdt:DistanceCentiMetres" minOccurs="0"/>
 <xs:element name="directionTo" type="tdt:typ006_OrientationType" minOccurs="0"/>
 <xs:element name="distanceTo" type="tdt:DistanceMetres" minOccurs="0"/>
 <xs:element name="street" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:choice maxOccurs="unbounded">
 <xs:element name="parkingLocation" type="lrc:LocationReferencingContainer"
minOccurs="0"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.11 ParkingForEvent

```
<xs:complexType name="ParkingForEvent">
 <xs:sequence>
 <xs:element name="eventType" type="pki006_EventType" minOccurs="0"/>
 <xs:element name="eventDescription" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="siteType" type="pki014_SiteServed" minOccurs="0"/>
 <xs:element name="siteName" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:choice maxOccurs="unbounded">
 <xs:element name="contact" type="Contact" minOccurs="0" maxOccurs="unbounded"/>
 <xs:element name="toSite" type="ToSite" minOccurs="0" maxOccurs="unbounded"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.12 ToSite

```
<xs:complexType name="ToSite">
 <xs:sequence>
 <xs:element name="spatialDistance" type="tdt:IntUnLi" minOccurs="0"/>
 <xs:element name="temporalDistance" type="tdt:IntUnLi" minOccurs="0"/>
 <xs:element name="directionTo" type="tdt:typ006_OrientationType" minOccurs="0"/>
 <xs:element name="transportationType" type="pki017_TransportType" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.2.13 OpeningHours

```
<xs:complexType name="OpeningHours">
 <xs:sequence>
 <xs:element name="openingHoursType" type="pki018_OpeningHoursType"/>
 <xs:element name="openingHoursInfo" type="tdt:TimeToolkit"/>
 <xs:element name="vehicleType" type="pki001_VehicleType" minOccurs="0"/>
 <xs:element name="userType" type="pki003_UserType" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.2.14 PricingPayment

```
<xs:complexType name="PricingPayment">
 <xs:sequence>
 <xs:element name="feeType" type="pki022_FeeType"/>
 <xs:element name="amount" type="tdt:Float"/>
 <xs:element name="currencyType" type="tdt:typ003_CurrencyType"/>
 <xs:element name="time" type="tdt:TimeToolkit" minOccurs="0"/>
 <xs:element name="vehicleType" type="pki001_VehicleType" minOccurs="0"/>
 <xs:element name="userType" type="pki003_UserType" minOccurs="0"/>
 <xs:choice maxOccurs="unbounded">
 <xs:element name="paymentDetails" type="PaymentDetails" minOccurs="0"
maxOccurs="unbounded"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.15 PaymentDetails

```
<xs:complexType name="PaymentDetails">
 <xs:sequence>
 <xs:element name="currencyType" type="tdt:typ003_CurrencyType" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="method" type="pki013_PaymentMethod" minOccurs="0"/>
 <xs:element name="acceptedBrand" type="tdt:ShortString" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="benefitInfo" type="tdt:LocalisedLongString" minOccurs="0"
maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>
```

B.2.16 Facilities

```
<xs:complexType name="Facilities">
 <xs:sequence>
 <xs:element name="availableFeatures" type="pki005_AvailableFeatures" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="parkingGuidanceType" type="pki008_FacilityType" minOccurs="0"/>
 <xs:element name="securityType" type="pki010_SecurityType" minOccurs="0"/>
 <xs:element name="supervisionType" type="pki009_SupervisionType" minOccurs="0"/>
 <xs:element name="operationHours" type="tdt:TimeToolkit" minOccurs="0"/>
 <xs:element name="userType" type="pki003_UserType" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.2.17 AssociatedService

```
<xs:complexType name="AssociatedService">
 <xs:sequence>
 <xs:element name="serviceType" type="pki011_AssociatedService"/>
 <xs:element name="serviceName" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
 <xs:element name="operator" type="tdt:LocalisedShortString" minOccurs="0"
maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>
```

B.2.18 CurrentCapacity

```
<xs:complexType name="CurrentCapacity">
 <xs:sequence>
 <xs:element name="timestampDataAcquisition" type="tdt:DateTime" minOccurs="0"/>
 <xs:element name="availableSpaces" type="tdt:IntUnLi" minOccurs="0"/>
 <xs:element name="parkingOccupancy" type="tdt:FixedPercentage" minOccurs="0"/>
 <xs:element name="fillState" type="pki012_ParkingStatus" minOccurs="0"/>
 <xs:element name="fillStateRate" type="tdt:IntSiLi" minOccurs="0"/>
 <xs:element name="waitingTime" type="tdt:TimeToolkit" minOccurs="0"/>
 <xs:element name="tendency" type="pki021_Tendency" minOccurs="0"/>
 <xs:element name="reservability" type="pki007_Reservability" minOccurs="0"/>
 <xs:choice maxOccurs="unbounded">
 <xs:element name="currentCapacityFor" type="CurrentCapacityFor" minOccurs="0"
maxOccurs="unbounded"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.19 CurrentCapacityFor

```
<xs:complexType name="CurrentCapacityFor">
 <xs:sequence>
 <xs:element name="vehicleType" type="pki001_VehicleType" minOccurs="0"/>
 <xs:element name="userType" type="pki003_UserType" minOccurs="0"/>
 <xs:element name="availableSpaces" type="tdt:IntUnLi" minOccurs="0"/>
 <xs:element name="fillState" type="pki012_ParkingStatus" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.2.20 ExpectedCapacity

```
<xs:complexType name="ExpectedCapacity">
 <xs:sequence>
 <xs:element name="time" type="tdt:TimeToolkit"/>
 <xs:element name="expectedSpaces" type="tdt:IntUnLi" minOccurs="0"/>
 <xs:element name="expectedStatus" type="pki012_ParkingStatus" minOccurs="0"/>
 <xs:choice maxOccurs="unbounded">
 <xs:element name="expectedCapacityFor" type="ExpectedCapacityFor" minOccurs="0"
maxOccurs="unbounded"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.21 ExpectedCapacityFor

```
<xs:complexType name="ExpectedCapacityFor">
 <xs:sequence>
 <xs:element name="availableSpaces" type="tdt:IntUnLi" minOccurs="0"/>
 <xs:element name="userType" type="pki003_UserType" minOccurs="0"/>
 <xs:element name="vehicleType" type="pki001_VehicleType" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.2.22 Advice

```
<xs:complexType name="Advice">
 <xs:sequence>
 <xs:element name="adviceText" type="pki020_Advice"/>
 </xs:sequence>
</xs:complexType>
```

B.3 Datatypes

B.4 Full PKI Schema Definition

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- This XML schema is generated with tpegUMLconverter V2.1 -->
<xs:schema xmlns="http://www.tisa.org/TPEG/PKI_1_1"
      targetNamespace="http://www.tisa.org/TPEG/PKI_1_1"
      xmlns:xs="http://www.w3.org/2001/XMLSchema"
      xmlns:tsf="http://www.tisa.org/TPEG/SFW_1_1"
      xmlns:tdt="http://www.tisa.org/TPEG/TPEGDataTypes_2_0"
      xmlns:mmc="http://www.tisa.org/TPEG/MMC_1_1"
      xmlns:lrc="http://www.tisa.org/TPEG/LRC_2_1"
      elementFormDefault="qualified"
      attributeFormDefault="qualified">
      <xs:import  namespace="http://www.tisa.org/TPEG/SFW_1_1"  schemaLocation="SFW_1_1.
xsd"/>
      <xs:import  namespace="http://www.tisa.org/TPEG/TPEGDataTypes_2_0"
schemaLocation="TDT_2_0.xsd"/>
      <xs:import  namespace="http://www.tisa.org/TPEG/LRC_2_1"  schemaLocation="LRC_2_1.
xsd"/>
      <xs:import  namespace="http://www.tisa.org/TPEG/MMC_1_1"  schemaLocation="MMC_1_1.
xsd"/>
      <xs:element  name="ParkingMessage"  type="ParkingMessage"/>
      <xs:complexType  name="ParkingMessage">
            <xs:complexContent>
                  <xs:extension  base="tsf:ApplicationRootMessageML">
```

```
                        <xs:sequence>
                              <xs:element  name="mmt"  type="MMCSwitch"/>
                              <xs:choice  maxOccurs="unbounded">
                                    <xs:element  name="parkingLocation"
type="lrc:LocationReferencingContainer"  minOccurs="0"/>
                                    <xs:element  name="parkingSiteDescription"
type="ParkingSiteDescription"  minOccurs="0"/>
                                    <xs:element  name="currentCapacity"
type="CurrentCapacity"  minOccurs="0"/>
                                    <xs:element  name="expectedCapacity"
type="ExpectedCapacity"  minOccurs="0"  maxOccurs="unbounded"/>
                                    <xs:element  name="advice"  type="Advice"
minOccurs="0"  maxOccurs="unbounded"/>
                              </xs:choice>
                        </xs:sequence>
                  </xs:extension>
            </xs:complexContent>
      </xs:complexType>
      <xs:complexType  name="MMCSwitch">
            <xs:sequence>
                  <xs:choice  minOccurs="1"  maxOccurs="1">
                        <xs:element  name="optionMessageManagementContainerLink"
type="mmc:MessageManagementContainer"  minOccurs="1"  maxOccurs="1"/>
                        <xs:element  name="optionMMCMasterLink"
type="mmc:MMCMasterMessage"  minOccurs="1"  maxOccurs="1"/>
                        <xs:element  name="optionMMCPartLink"  type="mmc:MMCMessagePart"
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Bibliography

[1] ISO 639-1, *Codes for the representation of names of languages — Part 1: Alpha-2 code*

[2] ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*

[3] ISO 4217, *Codes for the representation of currencies*

[4] ISO/TS 18234-7, *Intelligent transport systems — Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format — Part 7: Parking information*

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

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