Toll Message Specifications

Version 1.0.1

Developed by MTC's 511 Program

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1 Overview

1.1 Purpose

Different agencies in the United States are providing toll collection infrastructure and management across many freeways, bridges, and tunnels. Each toll agency may have a different model for collecting tolls, managing tolls, and providing up-to-date toll information to commuters. The purpose of this document is to establish a message format specification that can be adopted by these toll agencies to publish current toll information for commuters and 3rd party data consumers. By having a mutually accepted message format, different toll agencies can publish their toll information data in a mutually accepted format. This streamlines the aggregation, distribution, and consumption of toll information by other interested parties. A most common use case for this information is to provide the details for tolls on a traffic map where users can see different toll signs along the roadway on the map.

1.2 Scope

This document is intended for Toll Agencies that are interested in publishing their toll data in a format that is mutually accepted by toll agencies and Metropolitan Transportation Commission (MTC). Any third party data consumers interested in utilizing the toll information would be able to access the information via APIs provided by the MTC.

The message specification in this document deals only with the commuter-facing toll information. The complete end-to-end messaging protocol for all aspects of toll collection and management is out of scope for this specification document.

1.3 Design Approach

Since toll information being collected/published via this message format is commuter-centric, its specification is modeled to capture the information in same way that commuters come across it on the road.

At the top level, the information is grouped under toll signs. The toll sign represents an actual toll sign on the road. At this level, the toll agency shall provide the location of the toll sign and any particular additional information being provided by the toll sign. This additional information can be information on the toll sign itself or any additional information related to the toll sign that toll agency may want to publish (such as lane details).

A toll sign provides information about different destinations and their associated tolls. Similarly, the message format accommodates information on multiple toll destinations under each toll sign. Each destination provides the name of the destination and any other additional detail as needed.

The toll price for a given destination may change over time. Sometimes the toll price change is known in advance based on some pre-defined weekly schedule. In other cases, it can be changed on the fly. The message format accommodates both of these scenarios by providing flexibility to publish information on multiple toll prices for a given destination. Each toll price can have associated schedule information, vehicle types for which the toll applies, different modes of payments, and so on. By providing (or

skipping) different details associated with toll price, different toll pricing information can be provided for each destination without requiring multiple toll messages.

In situations where the toll price change cannot be published in advance, a new price can be provided for the same toll sign and toll destination by publishing an updated toll message.

All the information in the message can be categorized under two areas:

- Static Data – This is configuration data such as toll sign and toll destination information that is mostly static in nature. Such information doesn't change frequently or it never changes.
- Dynamic Data – This is usually the information that changes frequently such as toll prices or toll lanes being closed in response to some situation. The dynamic data can also cover real-time data such as travel time information for a specific toll destination.

Based on the nature of changes to the toll information, the toll agencies may choose one of the following modes of publishing the data. These are just examples to show how different situations can be handled. During implementation, toll agencies can use any combination of these scenarios as they see fit.

1. Toll agencies may choose to publish their information one time only (if there are no future changes to their toll information) as static data. Data consumers will constantly poll the toll agency end-point to get the new toll message file/stream; however, they may not find any changes in subsequent polls.
2. Toll agencies may choose to update their configuration data and publish their toll information on regular intervals. The data consumers will constantly poll the toll agency end-point to get the new toll message file/stream.
3. Toll agencies may choose to publish their information at regular intervals as two separate files/streams. One file/stream contains configuration information that does not change frequently while the other file/stream contains the dynamic data covering the latest changes on top of configuration data. The data consumers will pull the configuration file once and then constantly poll the dynamic data file to look for additional changes. This approach will reduce the size of the toll message being polled on regular intervals.
4. Toll agencies may choose to publish their information via publish/subscribe channels in which configuration data may be retrieved on request while dynamic data is pushed out to subscribers whenever there is a change. This requires that toll agencies keep the configuration data and dynamic data changes up to date so that new subscribers get the latest up-to-date information when subscribing. This approach doesn't require any information polling but does need a publish/subscribe platform.

The toll message specification only provides a format in which the toll information should be published and does not dictate any particular implementation approach such as polling, publish/subscribe, etc.

Although it is advisable for toll agencies to provide as much information as possible, it is ultimately up to each toll agency to decide what information and how much detail about their toll programs they would like to share using these specifications.

As the specification evolves and is updated, newer versions of this specification document will be published and the specification version number will be updated accordingly.

Following sections will provide details on the toll message specifications and details on different elements covered by the specification.

2 Toll Message Specification

The toll message specifications are laid out in a hierarchical fashion. This approach makes it possible to see how different sections and pieces of information are interdependent without creating additional cross-references based on different IDs. The diagram in Figure 1 illustrates the main sections of the specifications and the hierarchical dependency between them. In summary:

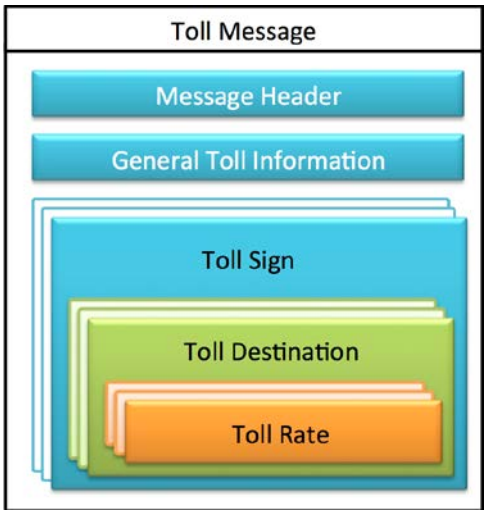


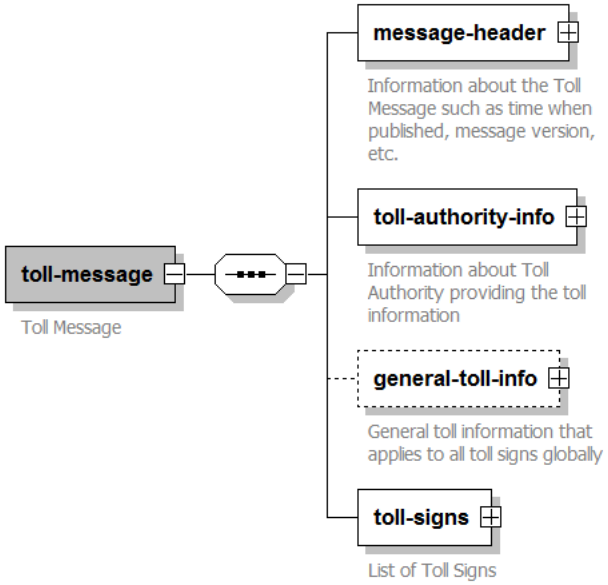
Figure 1. Hierarchical Toll Message Specification

- Each toll message has information about one toll program within a given toll agency;
- The toll program can have one or more toll signs;
- Each toll sign may have information about one or more toll destinations. In addition, different toll signs at different locations may have different toll destination information; and
- Each toll destination may be associated with one or more pieces of toll rate information based on vehicle types, tolling methods, payment types, times of day, and day of week. Alternatively, toll destination may have no associated toll rate information based on specific toll exemption situations such as “Open to All” or “All Lanes Closed.”

The following sections provide a breakdown of the toll message specifications and explain the different elements of it. The toll message specification is provided as an XML Schema, and the following sections outline and define the different XML Schema parts.

2.1 Toll Message

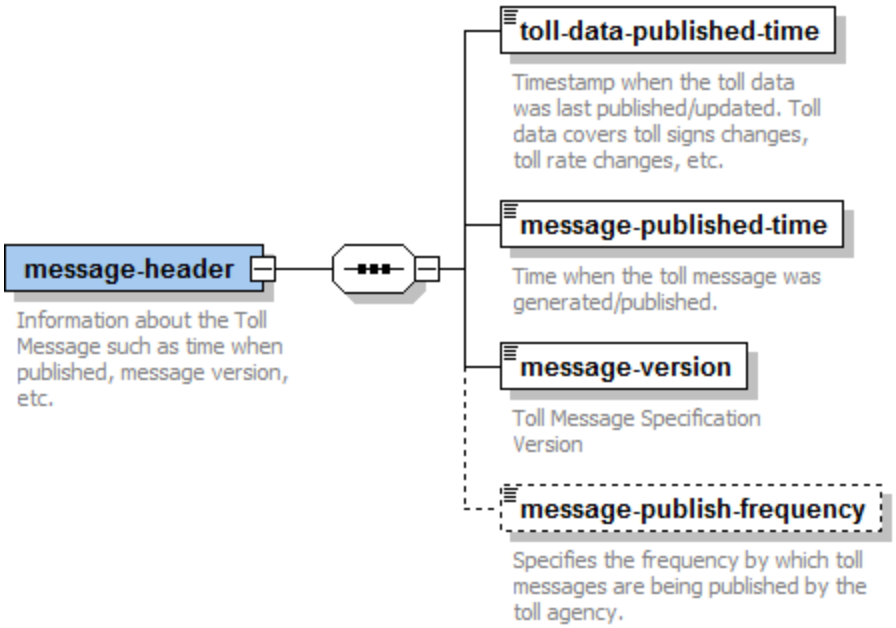
The toll-message element is the top level XML message element.



Occur	Schema Element	Description
1..1	message-header	Required: YES | Occurrence: ONCE Information about the message such as message version, timestamp, etc.
1..1	toll-authority-info	Required: YES | Occurrence: ONCE Information about toll authority such as authority name, program name, etc.
0..1	general-toll-info	Required: NO | Occurrence: ONCE General information about toll such as general toll exemptions, toll restrictions, toll currency, etc. The information in this section is applied globally against all toll signs, toll destinations and toll rates in the message.
1..1	toll-signs	Required: YES | Occurrence: ONCE List of toll signs associated with the toll authority and toll program.

2.2 Message Header

The message-header element is child element of toll-message, and it provides details about the message itself.

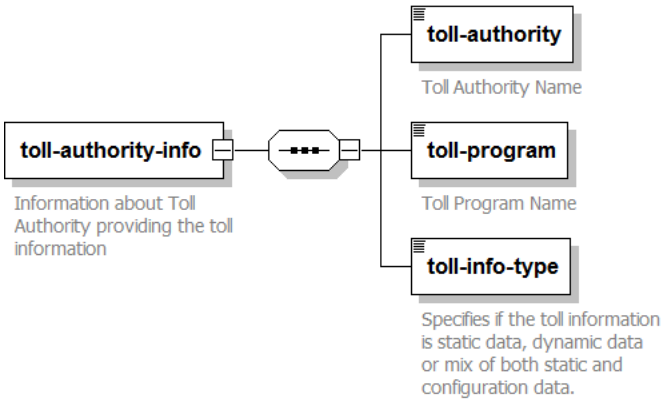


Occur	Schema Element	Description
1..1	toll-data-published-time	Required: YES | Occurrence: ONCE Provides the timestamp in *xs:dateTime* format indicating when the toll information (e.g., pricing) was last updated. This timestamp is different from the message creation timestamp, and it only indicates when the toll information was last modified. For format details, please refer to *xs:dateTime* in XML schema reference section.
1..1	message-version	Required: YES | Occurrence: ONCE Provides the toll message specification version.
1..1	message-published-time	Required: YES | Occurrence: ONCE Provides the timestamp in *xs:dateTime* format. This timestamp represents when the Toll Message was generated. The purpose of this timestamp is to show the freshness of the message. The toll information

Occur	Schema Element	Description
		may not change for a long time (with no change to toll-data-published-time) but a re-published Toll Message will have an updated timestamp. This can be used as a means to ensure the toll authority is publishing the data at regular intervals. For format details, please refer to *xs:dateTime* in XML schema reference section.
`1..1`	`message-publish-frequency`	Required: NO | Occurrence: ONCE Defines the frequency by which new toll messages are published by Toll agency. The message publish frequency is specified in seconds and signifies the time between two consecutive toll message. This field can be used by toll agencies to specify how frequently their toll messages are being published. This information is useful for end-users to know general frequency by which they should request information while trying to keep the information staleness to minimum.

2.3 Toll Authority Information

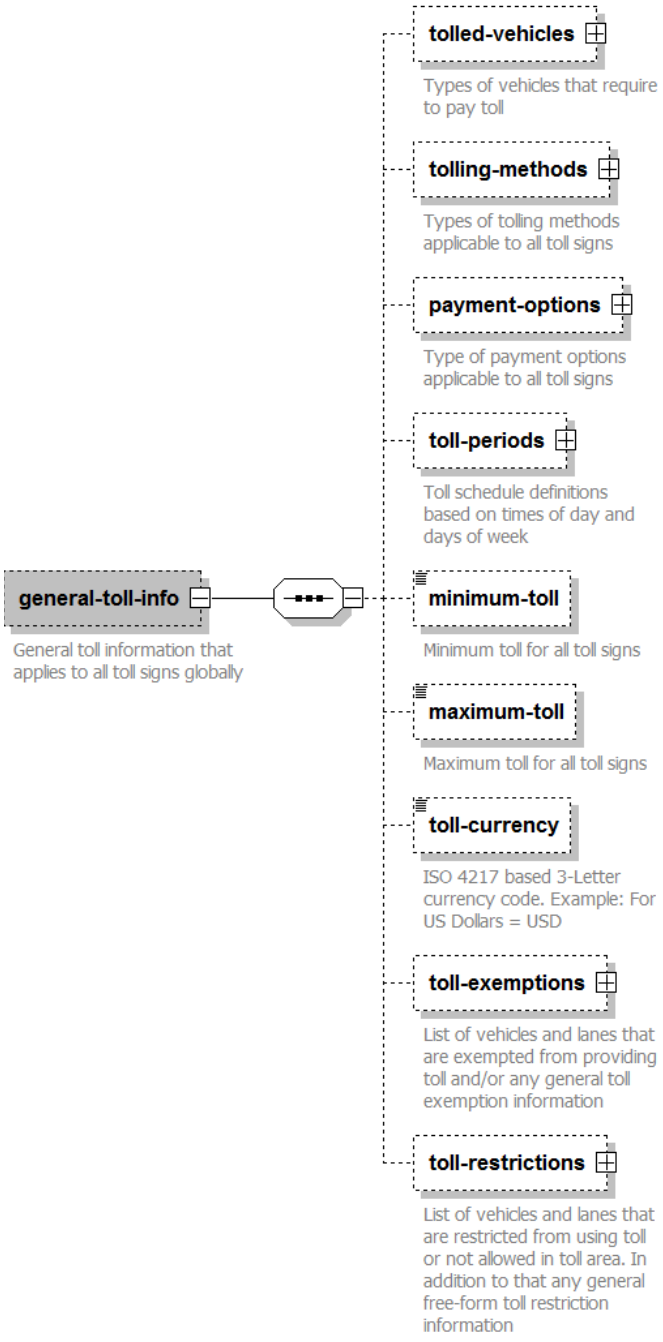
The toll-authority-info element is a child element of toll-message and provides details about the toll authority publishing the toll message.



Occur	Schema Element	Description
1..1	toll-authority	Required: YES | Occurrence: ONCE Name of the toll authority
1..1	toll-program	Required: YES | Occurrence: ONCE Name of toll program
1..1	toll-info-type	Required: YES | Occurrence: ONCE Defines the type of toll information provided in the message. This determines whether the information in this message is new or updated static (configuration) data. For toll facilities that do not have real-time updates to their toll rates, the facility data is considered *static*. If a toll facility changes toll rates daily, or even more frequently, the facility can provide only the updated information in the subsequent messages. The information type in these subsequent messages is classified as *dynamic*. The facilities can also provide a single update with both static (configuration) data and real-time (dynamic) updates combined in one message. The toll information type for these messages is classified as *mixed*. The configuration data is static information and must be provided. This information is required to initiate a Toll Facility information/record in the system. Additional updates to pricing can be provided in reference to this configuration information. For messages with configuration data, this field should be set as “static”. For messages containing only dynamic/real-time changes, the “dynamic” toll message info type should be used. If the message contains both static data and dynamic data, this field should be set as “mixed.” Possible values: • static • dynamic • mixed

2.4 General Toll Information

The general-toll-info element is a child element of toll-message and provides rules that apply globally to all toll signs in the message.



Occur	Schema Element	Description
0..1	toll-exemptions	Required: NO | Occurrence: ONCE

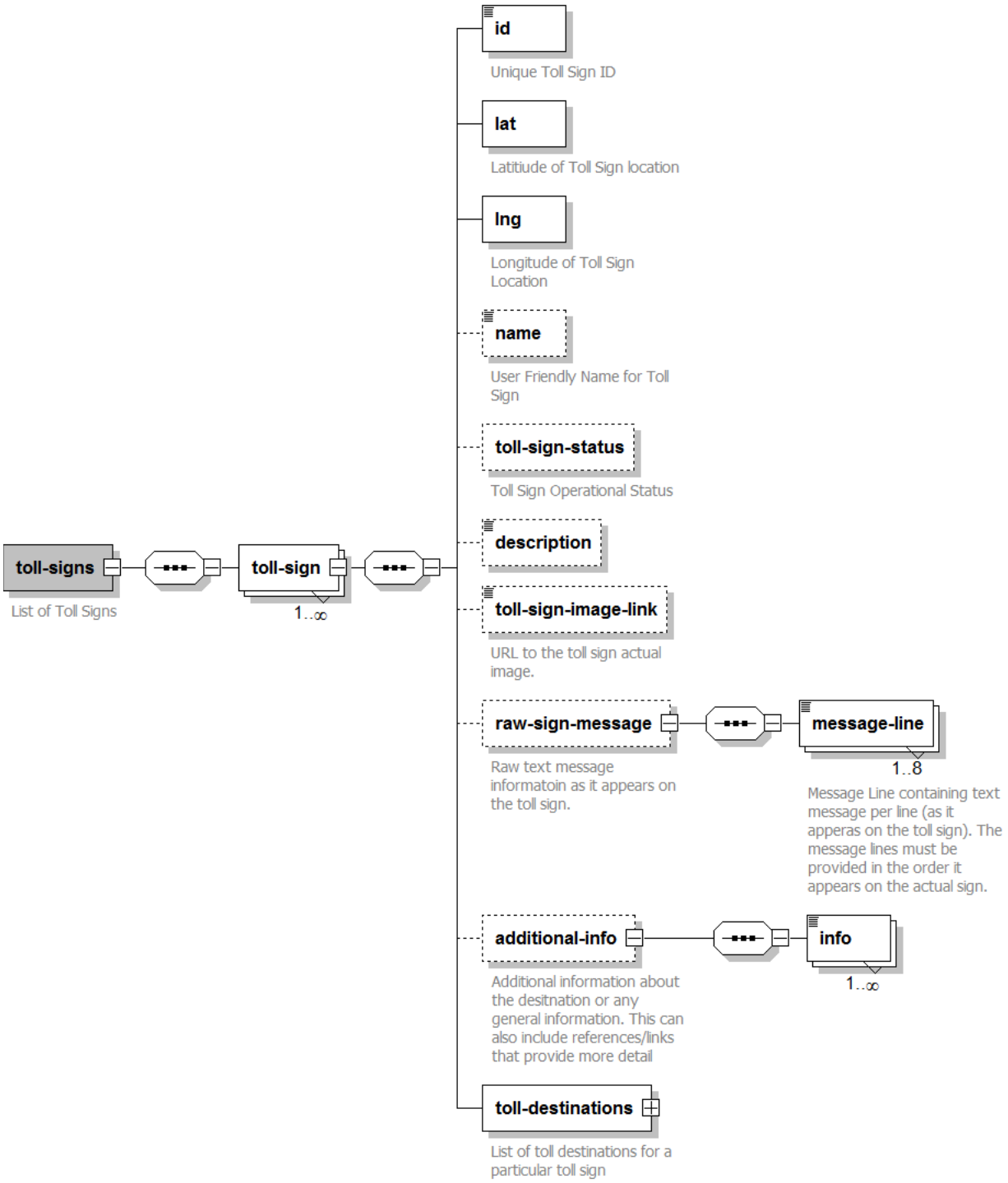
Occur	Schema Element	Description
		The toll-exemptions element allows the toll authority to specify the vehicle types and lanes or contains general information about the toll where it is exempted. This list can be omitted if there are no exemptions. When the list is included, there must be at least one toll exemption provided. The toll exemptions specified under toll-rate take precedence over toll restrictions provided under the general-toll-info element. For more details and possible values, please refer to Toll Exemptions under Section 2.8
0..1	toll-restrictions	Required: NO | Occurrence: ONCE The toll-restrictions element allows the toll authority to specify the vehicle types that are restricted from toll lanes, toll lanes that are restricted from any particular type of toll traffic and any other general toll restriction information. This list can be omitted if there are no restrictions. When the list is included, there must be at least one toll restriction provided. The toll restrictions specified under toll-rate take precedence over toll restrictions provided under the general-toll-info element. For more details and possible values, please refer to Toll Restrictions under Section 2.8
0..1	tolled-vehicles	Required: NO | Occurrence: ONCE The vehicle types for which the toll is applicable. The tolled-vehicles element indicates the vehicle types that will be charged a toll. The tolled vehicles specified under the general-toll-info element are applied to all toll rates. The tolled vehicles specified under toll-rate take precedence over tolled vehicles provided under the general-toll-info element.

Occur	Schema Element	Description
		When this element is included in the message, the element must have at least one vehicle type specified under it. For more details and possible values, please refer to Tolled Vehicles under Section 2.8
0..1	tolling-methods	Required: NO | Occurrence: ONCE This element provides the list of tolling methods for this toll message. A tolling method is a means by which the toll is collected. Example of tolling methods are “FasTrak,” “Pay by Plate,” and “Toll Booth.” The tolling methods provided in this element are considered to be the only tolling methods applicable for this toll message. When this element is included in the message, the element must have at least one tolling methods specified under it. The tolling methods specified under toll-rate take precedence over tolling methods provided under the general-toll-info element. For more details and possible values, please refer to Tolling Methods under Section 2.8
0..1	payment-options	Required: NO | Occurrence: ONCE This element provides the list of payment options that are applicable for this toll message. A payment option represents a mode of payment. Examples of payment options are “invoice,” “cash”, “credit cards”, etc. The payment-options provided in this element are considered to be the only payment options applicable for this toll message. The payment options specified under toll-rate take precedence over payment options provided under the general-toll-info element. For more details and possible values, please refer to Payment Options under Section 2.8
0..1	toll-periods	Required: NO | Occurrence: ONCE

Occur	Schema Element	Description
		This element provides the list of toll periods. A toll period is defined by a combination of times of the day and day(s) of the week. The purpose of the toll periods element is to pre-define different schedules for different tolls. This is particularly useful where the toll information changes during different times of day and/or different days of the week. By specifying toll period information with toll rates, the need for sending multiple update messages when toll rates change during the day (when the toll rate information for those toll periods is known in advance) is eliminated. All the toll period definitions must be specified under the *general-toll-information* element. The toll-rates section simply makes reference to the unique ID assigned to each toll period.
`0..1`	`minimum-toll`	Required: NO | Occurrence: ONCE Optional element to specify a minimum toll rate that applies across all tolls.
`0..1`	`maximum-toll`	Required: NO | Occurrence: ONCE Optional element to specify a maximum toll rate that applies across all tolls.
`0..1`	`toll-currency`	Required: NO | Occurrence: ONCE This element specifies the toll currency type. The value is specified in ISO 4217 based on a three-Letter currency code. If not specified, it is assumed to be USD (US Dollars).

2.5 Toll Signs

The toll-signs element is a child element of toll-message and provides a collection of toll signs that are part of the toll program. Each element in this collection is a type of toll-sign. The toll-signs collection must have at least one toll-sign element.



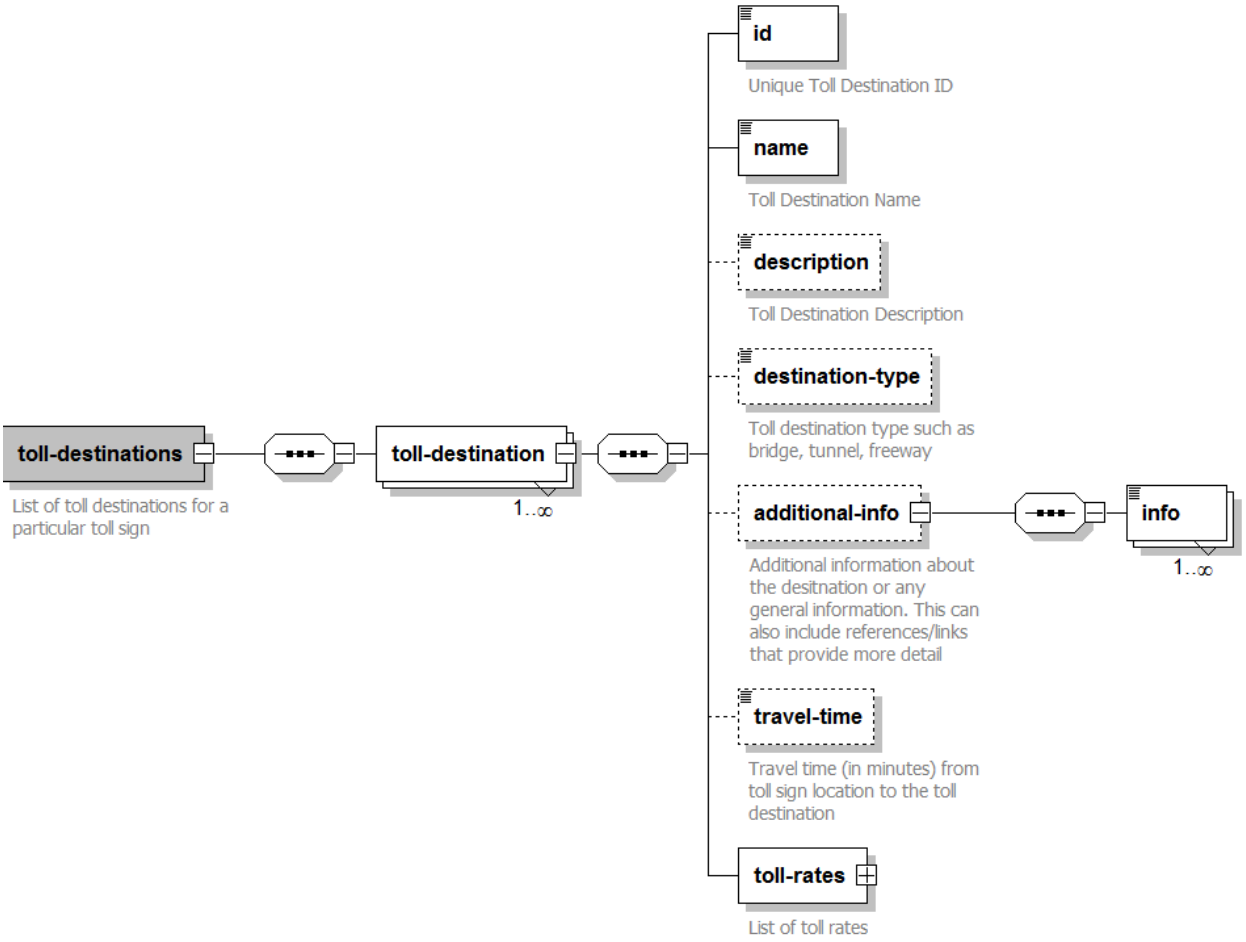
Occur	Schema Element	Description
1..1	id	Required: YES | Occurrence: ONCE Unique ID for the toll sign. The ID must be unique across the complete toll message. The ID is required when referring to a

Occur	Schema Element	Description
		specific toll sign in subsequent update messages since update messages do not include configuration information and provide only the information that has been updated since the last update or configuration message.
1..1	lat	Required: YES | Occurrence: ONCE Latitude of toll sign location specified in decimal degrees.
1..1	lng	Required: YES | Occurrence: ONCE Longitude of toll sign location specified in decimal degrees.
0..1	name	Required: NO | Occurrence: ONCE User friendly name for the toll sign.
0..1	toll-sign-status	Required: NO | Occurrence: ONCE The sign status represents whether the toll sign is currently operational (live) or not.
0..1	description	Required: NO | Occurrence: ONCE Toll sign description. This is optional.
0..1	toll-sign-image-link	Required: NO | Occurrence: ONCE URL to actual toll sign.
0..1	raw-sign-message	Required: NO | Occurrence: ONCE This represents the information on the toll sign in raw text form. The information is provided in line-by-line format as free-form text in each line.
0..1	additional-info	Required: NO | Occurrence: ONCE Additional message on the sign. This is a free form text which represents additional sign information as it appears on the actual sign.

Occur	Schema Element	Description
		The additional information can be used to represent the footer information specified on toll signs (such as HOV information)
1..1	toll-destinations	Required: YES | Occurrence: ONCE List of toll destinations associated with this toll sign.

2.6 Toll Destinations

The toll-destinations element is a child element of toll-sign and provides a collection of toll destinations that are part of the toll sign. Each element in this collection is a type of toll-destination. The toll-destination collection must have at least one toll-destination element.

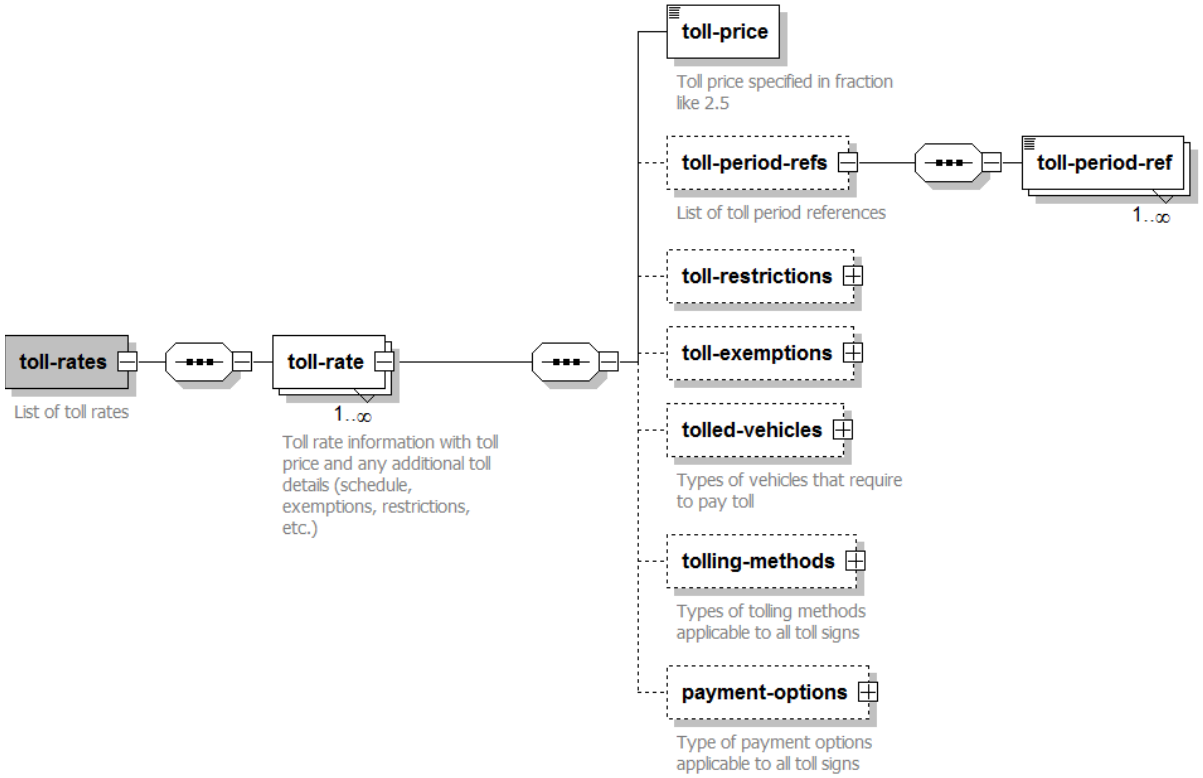


Occur	Schema Element	Description
1..1	id	Required: YES | Occurrence: ONCE Unique ID for the toll destination. The ID must be unique across the complete toll message. The ID is used to refer to a specific toll destination when update messages are provided since update messages do not include configuration information and provide only the information that has been updated since last update or configuration message.
1..1	name	Required: YES | Occurrence: ONCE Name of the destination. It provides a user-friendly name for the destination.
0..1	description	Required: NO | Occurrence: ONCE Any additional details about the toll destination. This information is optional.
0..1	destination-type	Required: NO | Occurrence: ONCE The type of destination. This specifies what kind of toll destination is being provided. Possible values are: • Tunnel • Bridge • Freeway
0..1	additional-info	Required: NO | Occurrence: ONCE The additional sign message related to this specific destination. This is free-form text providing any additional information as it appears on the toll sign.
0..1	travel-time	Required: NO | Occurrence: ONCE The travel time from the current location of the toll sign to the destination location. This information is optional.

Occur	Schema Element	Description
1..1	toll-rates	Required: YES | Occurrence: ONCE This is a list of different tolls applicable to this toll destination.

2.7 Toll Rates

The toll-rates element is a child element of toll-destination and provides a collection of toll rates that are associated with the toll destination. Each element in this collection is a type of toll-rate. The toll-rates collection must have at least one toll-rate element.



Occur	Schema Element	Description
1..1	toll-price	Required: YES | Occurrence: ONCE The toll price for this current sign for the specified destination. The price is specified in a decimal format without currency information or a symbol, such as “2.00”, “1.35”.

Occur	Schema Element	Description
		When there is no toll is applicable, the toll price can be specified as "0".
0..1	toll-period-refs	Required: NO | Occurrence: ONCE The toll periods refs (references) for which this toll is active. If there is no toll-period is provided, it is assumed to be 24/7 schedule (24 hours a day, 7 days a week). When this element is included in the message, the element must have at-least one toll period reference ID. All definitions for toll periods must reside under the general-toll-info element. This element only refers to the toll period IDs defined in toll-periods under general-toll-info element and doesn't allow definition of new or ad-hoc toll periods here.
0..1	toll-restrictions	Required: NO | Occurrence: ONCE The toll-restrictions element allows the toll authority to specify the vehicle types that are restricted from toll lanes, toll lanes that are restricted from any particular type of toll traffic, and any other general toll restriction information. This list can be omitted if there are no restrictions. When the list is included, there must be at least one toll restriction provided. The toll restrictions specified under the toll-rate element take precedence over toll restrictions provided under the general-toll-info element. For more details and possible values, please refer to Toll Restrictions under Section 2.8
0..1	toll-exemptions	Required: NO | Occurrence: ONCE The toll-exemptions element allows the toll authority to specify the vehicle types, lanes, and other general information about vehicles that are allowed in the toll area but exempted from providing toll.

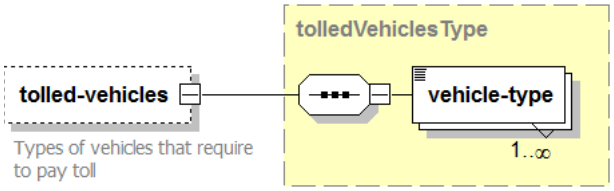
Occur	Schema Element	Description
		This list can be omitted if there are no exemptions. When the list is included, there must be at least one toll exemption provided. The toll exemptions specified under the toll-rate element take precedence over toll restrictions provided under the general-toll-info element. For more details and possible values, please refer to Toll Exemptions under Section 2.8
0..1	tolled-vehicles	Required: NO | Occurrence: ONCE The vehicle types for which this toll is applicable. If the toll applies to all vehicles types or the vehicle types specified in the general toll information, then this element should not be provided. The tolled vehicles specified under the toll-rate element take precedence over tolled vehicles provided under general-toll-info element. When this element is included in the message, the element must have at least one vehicle type specified under it. For more details and possible values, please refer to Tolled Vehicles under Section 2.8
0..1	tolling-methods	Required: NO | Occurrence: ONCE This element provides the list of tolling methods for this toll message. A tolling method is a means by which the toll is collected. Examples of tolling methods are “FasTrak,” “Pay by Plate,” and “Toll Booth.” The tolling methods provided in this element are considered to be the only tolling methods applicable for this toll rate. The tolling methods specified under the toll-rate element take precedence over tolling methods provided under the general-toll-info element. When this element is included in the message, the element must have at least one tolling method specified under it.

Occur	Schema Element	Description
		For more details and possible values, please refer to Tolling Methods under Section 2.8
0..1	payment-options	Required: NO | Occurrence: ONCE This element provides the list of payment options that are applicable for this toll message. A payment option represents a mode of payment. Examples of payment options are “invoice,” “cash,” “credit cards,” etc. The payment options specified under the toll-rate element take precedence over payment options provided under the general-toll-info element. When this element is included in the message, the element must have at least one payment option specified under it. For more details and possible values, please refer to Payment Options under Section 2.8

2.8 Common Toll Message Elements

2.8.1 Tolled Vehicles

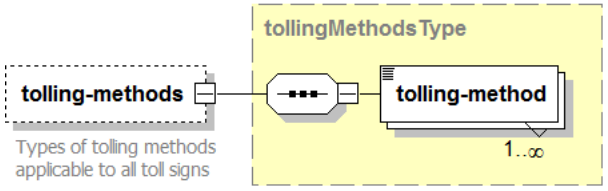
The tolled-vehicles element is a collection of vehicle-type where vehicle-type represents one of the pre-defined vehicle types. The purpose of providing vehicle types is to allow the toll rates to be further classified based on this element (if and when needed). For instance, if single occupancy vehicles have a higher toll rate than others, or HOV3+ have no toll, the tolled vehicle type can be used to specify these details along with toll rate.



For list of possible values for vehicle-type please see Section2.8.7, Vehicle Type.

2.8.2 Tolling Methods

The tolling-methods element represents a collection of pre-defined tolling methods. Each tolling-method is a method by which a toll can be applied and collected. The purpose of providing tolling methods is to allow the toll rates to be further classified based on multiple tolling methods (if and when needed). For instance, if a transponder-based toll has a lower toll rate than other modes of tolling, the tolling method can be specified along with toll rate.

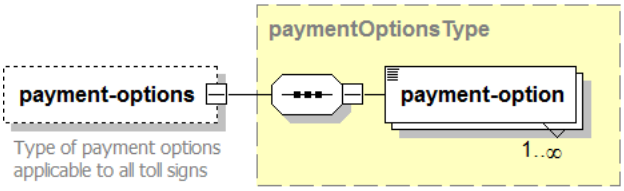


Following list provides the tolling methods currently defined by this specification.

ID	Tolling Method
CASH	Cash
PAYBYPLATE	Pay by (License) Plate
FASTRAK	FasTrak
TOLLBOOTH	Toll Booth

2.8.3 Payment Options

The payment-options element is a collection of pre-defined modes of payments. This option allows the toll authority to specify the mode by which a user can pay the toll. The purpose of providing the payment option is to allow the toll rates to be further classified based on payment option (if and when needed). For instance, if cash-based toll pricing is different than debit, credit, or auto-withdrawal, it can be specified along with toll rate.



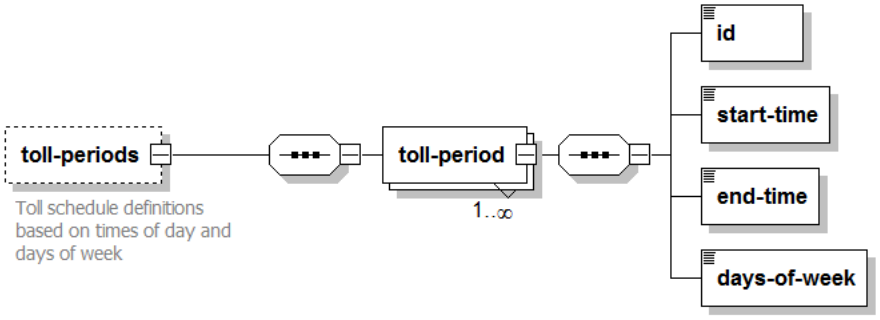
Following list provides the payment options currently defined by this specification.

ID	Payment Options
CASH	Cash
CC	Credit Card
FASTRAK	FasTrak
INVOICE	Invoice
PREPAID	Pre-Paid

2.8.4 Toll Periods

The toll-periods element is a collection of toll-period that specifies different schedules based on day of the week and time of day. Each toll period consists of one or more days of week (Monday to Sunday). There is start time of day and end time of day that applies to each day of the week specified in the schedule.

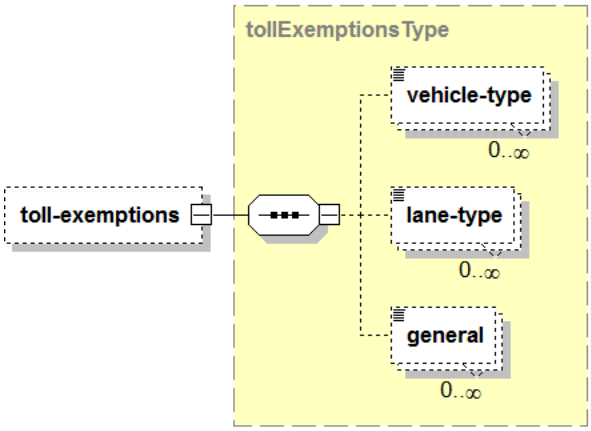
The toll-period element is useful when a toll varies by day of week or time of day. For instance, if there is a different toll rate on weekends than on weekdays or if there is a different toll during morning rush hour (8am to 10am), a toll period can be specified with a toll rate to restrict the toll rate to that toll period.



2.8.5 Toll Exemptions

The toll-exemptions element specifies the situations where toll is exempted. It is a list of exemptions for vehicles and lanes or contains general information about the toll where it is exempted. Toll-exemptions are optional and provide general toll exemption information as free-form text. The toll exemptions are categorized as follows:

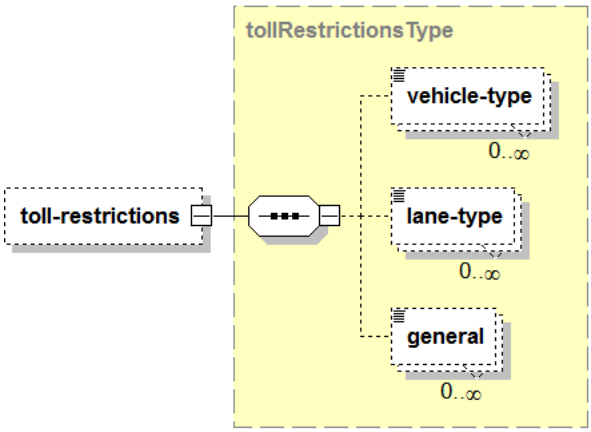
- Vehicle Exemptions: Specifies the types and classes of vehicles that are exempted from providing any toll.
- Lanes Exemptions: Specifies the toll lanes that are exempted from collecting any toll.
- General Exemptions: Specifies any general information about the tolls where tolls are exempted. This is free-form text field.



2.8.6 Toll Restrictions

The toll-restrictions element provides information about vehicle types and lane types that are restricted from toll lanes. The toll restrictions are categorized as follows:

- Vehicle Restrictions
- Lanes Restrictions
- General Restrictions (free-form text field)



2.8.7 Vehicle Type

The vehicle-type element is an enumeration of pre-defined vehicle types and vehicle classes.

The vehicle-type is used to specify the tolled vehicle types (under the tolled-vehicles element) that are exempted from the toll (under the toll-exemptions element) or that are not allowed in toll lanes (under the toll-restrictions element).

The following list provides the vehicle types that are currently defined by this specification.

ID	Vehicle Type
AV	All Vehicles
SOV	SOV : Single Occupancy Vehicles
HOV2	HOV 2+: High Occupancy Vehicles, 2 or more people
HOV2OC	HOV 2 for vehicles that have maximum of 2 seats.
HOV3	HOV 3+: High Occupancy Vehicles, 3 or more people
HOV4	HOV 4+: High Occupancy Vehicles, 4 or more people
HYBCARS	Hybrid Cars
MOTORBIKE	Motor bikes
BUS	Bus/Buses
VANPOOL	Vanpools
LOWEV	Low Emission Vehicles
HIGHEV	High Emission Vehicles
TRAILER	Trailers
AXLE2	2-Axle Vehicles

ID	Vehicle Type
AXLE3	3-Axle Vehicles
AXLE4	4-Axle Vehicles
AXLE5	5-Axle Vehicles
AXLE6	6-Axle Vehicles
MULTIAXLE	Multi-Axle Vehicles
VEHCLASS1	Vehicle Class 1
VEHCLASS2	Vehicle Class 2
VEHCLASS3	Vehicle Class 3
VEHCLASS4	Vehicle Class 4
VEHCLASS5	Vehicle Class 5
VEHCLASS6	Vehicle Class 6
VEHCLASS7	Vehicle Class 7
VEHCLASS8	Vehicle Class 8
VEHCLASS9	Vehicle Class 9
VEHCLASS10	Vehicle Class 10
VEHCLASS11	Vehicle Class 11
VEHCLASS12	Vehicle Class 12
VEHCLASS13	Vehicle Class 13

2.8.8 Lane Types

The following list provides the lane types currently defined in the specifications. These lane types can be used in toll-exemptions and toll-restrictions definitions.

ID	Lane Type
AL	All Lanes
LEFTLANE	Left Lane
LEFTLANE2	Two left lanes
LEFTLANE3	Three left lanes
MIDDLELANE	Middle Lane
MIDDLELANE2	Two middle lanes
MIDDLELANE3	Three middle lanes
RIGHTLANE	Right lane
RIGHTLANE2	Two Right Lanes
RIGHTLANE3	Three Right Lanes
CARPOOLLANE	Carpool lanes

3 XML Schema Reference

3.1 Schema Type - xs:dateTime

The *xs:dateTime* format follows ISO 8601 conventions as specified under W3C ISO Formats (http://www.w3.org/TR/xmlschema-2/#isoformats) and specifically dateTime conventions (http://www.w3.org/TR/xmlschema-2/#dateTime) .

The xs:dateTime can provide date and time information in different formats. However, for sake of simplicity, following are the three forms in which time can be provided for toll data:

- Local: The local time
- UTC: Time provided in UTC format
- Specific Locale: Time provided in UTC format with timezone information added to it.

These times can be represented using following format:

Local	`YYYY-MM-DDThh:mm:ss`
UTC	`YYYY-MM-DDThh:mm:ssZ`
UTC Timezone Offset	`YYYY-MM-DDThh:mm:ss±[hh]:[mm]`

The letters Y, M, D T, h, m, s and Z in the format mentioned above are designators and are defined as follows:

YYYY	4-digit Year
MM	2-digit Month (01 to 12)
DD	2-digit Day of Month (01 to 31)
T	Letter “T”. Delimiter/Separator between Date part and Time part
hh	2-digit zero-padded hour between 00 and 24 (where 24 is only used to denote midnight at the end of a calendar day)
mm	2-digit zero-padded minute between 00 and 59
ss	2-digit zero-padded second between 00 and 59
Z	Letter “Z” – used as UTC Timezone designator. When the letter “Z” is added to the timestamp, it means that time is in UTC format.
±[hh][mm]	Timezone offset from UTC time. For example, `-0500` will represent US Eastern timezone (`-0400` for US Eastern Daylight Time) Other valid forms of providing timezone offset are: • ±[hh]:[mm] • ±[hh]

Sources:

- W3C XML Schema - ISO Formats (http://www.w3.org/TR/xmlschema-2/#isoformats)
- W3C XML Schema – *dateTime* Format specification (http://www.w3.org/TR/xmlschema-2/#dateTime)