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Traffic Light Priority Trigger Position File Format

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Status of this document

This document is Published.

If there are any comments or feedback arising from the review or use of this document, please contact us at secretariat@rtig.org.uk

Document Control

Version	Changes	Author	Date
1.0	Original version	Tim Rivett	March 2021
1.1	MovementToken changed to allow unlimited characters SourceInternalTrafficSignalRef limit removed SourceMovementRef limit removed and description updated	Tim Rivett	August 2022

1 Introduction

1.1 About this document

1.1.1 This document has been produced for the Real Time Information Group (RTIG). It provides RTIG members with a standardised approach to the transfer of data about locations to trigger requests for traffic light priority (TLP).

1.2 Background and context

1.2.1 In recent years, there has been renewed interest in the digital provision of priority to public transport at signalised junctions.

1.2.2 Existing work from RTIG: specifically, the documents T008 andT031, provide the specification and methodology for the transmission of data from public service vehicles, such as buses and trams, to traffic signals. These provide technical frameworks to provide priority for public transport vehicles at signalised junctions in an interoperable manner.

1.2.3 Both the standards within these documents rely on messages being sent to traffic signal systems at predefined locations, or trigger locations; but neither standard *defines* the structure through which trigger location data can be shared.

1.2.4 This document sets out to address this gap through the definition of a standard format for the sharing of trigger location data.

1.3 Scope

1.3.1 This report has no statutory or other legal basis and is purely to provide advice to suppliers, authorities and bus operators who supply or use real time information systems.

1.3.2 The transfer of data to and from real time systems and vehicle and traffic management systems are within scope of this report.

1.4 Acknowledgements

1.4.1 RTIG is grateful to the members of its Working Group for contributing to the construction and validation of this document - in particular: Trapeze Group UK, BR Hallworth, SYPTE, TfL, Ticketer, Vix Technology and Hampshire County Council.

2 Providing Bus Priority at Traffic Signals

2.1 In support of transport policy, it is frequently desirable to give buses preferential access to green time at traffic signals. This can improve running time and reliability – both of which are potentially significant drivers of passenger satisfaction, and can thereby, contribute to achieving modal shift.

2.2 Whilst signal priority is not the only way of achieving bus priority, other approaches tend to involve significant infrastructure work – bus lanes, gated intersections, or even bus-only roadways. These can be very effective but they are expensive and time consuming to implement, require sufficient real estate to be available; and involve substantial disruption during works. So although signal priority cannot provide as much benefit, it is much simpler and cheaper to implement.

2.3 There are two ways of achieving signal priority. The original approach generally adopted was for a system local to the traffic signals to be triggered by the approach of a bus. Either a device on the roadside (or in the road) detects a bus and directs the signal controller to grant priority; or a device in the bus communicates its presence to a roadside receiver. An existing RTIG protocol (RTIGT008) provides a specification for this solution: where the trigger is generated actively by the bus.

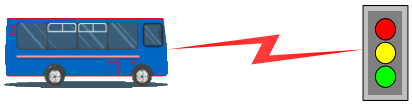

Figure 1 RTIG T008 Bus to traffic signal priority request

2.4 However, this approach is not always desirable. It requires work on the traffic signal controllers directly, which may be expensive (particularly if many junctions are affected); and also, often requires buses to be specially equipped in order to activate the trigger.

2.5 In many areas, particularly town and city centres, traffic signals are already connected in to a central “urban traffic control” (UTC) computer which facilitates flow on an area-wide basis. A local priority request would either have to override the UTC control - potentially disrupting flows across a wide area; or wait for the signal controller to pass the request to the UTC system for granting or rejecting.

2.6 An alternative way of achieving priority is possible where there is both a centralised UTC and a centralised vehicle tracking system. This involves negotiation for priority on a centre-to-centre basis. An existing RTIG protocol (RTIGT031) provides a specification for this solution.

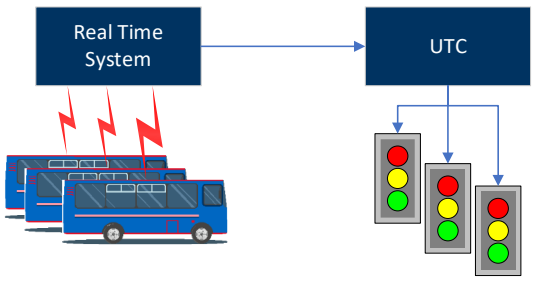

Figure 2 RTIG T031 Bus to UTC priority request

2.7 Both approaches require the bus or real time central system to know at which location they should request priority from the UTC.

2.8 Since the introduction of RTIGT008 and RTIGT031, real time and ticket machine suppliers and UTC operators have developed various approaches to providing the necessary information on locations to trigger priority requests. This has resulted in different formats being used by different TLP schemes.

2.9 The structure presented in this document sets out to standardise the format for the transfer of the necessary locations and related data.

3 Managing Bus Priority

3.1 Trigger Locations and Movements

3.1.1 For a bus to be able to obtain priority at a junction controlled by a traffic signal, it needs to tell the traffic light control system that it is approaching and in which direction, or movement, it will be leaving the junction.

3.1.2 Informing UTC or other such systems that a bus is approaching a junction and allowing sufficient time to make changes to signal timings (for example, how long a green or red light shows), will typically require the bus to provide information on its location three times:

- 'registration' at some distance indicates that a vehicle is approaching;
- 'request' indicates the need for immediate priority; and
- 'clear' indicates that the vehicle has cleared the junction.

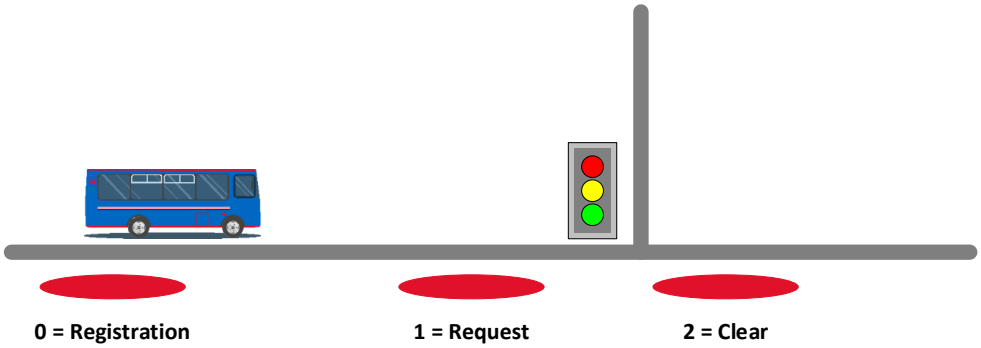

Figure 3 Trigger locations

3.1.3 The need for a bus to provide information on the direction or movement it is going to take at the junction is to enable any filters to be set. Where there are different possible exit directions from a junction, movements can be allocated to specific bus routes to help determine which triggers should be being sent by a vehicle as it approaches the junction.

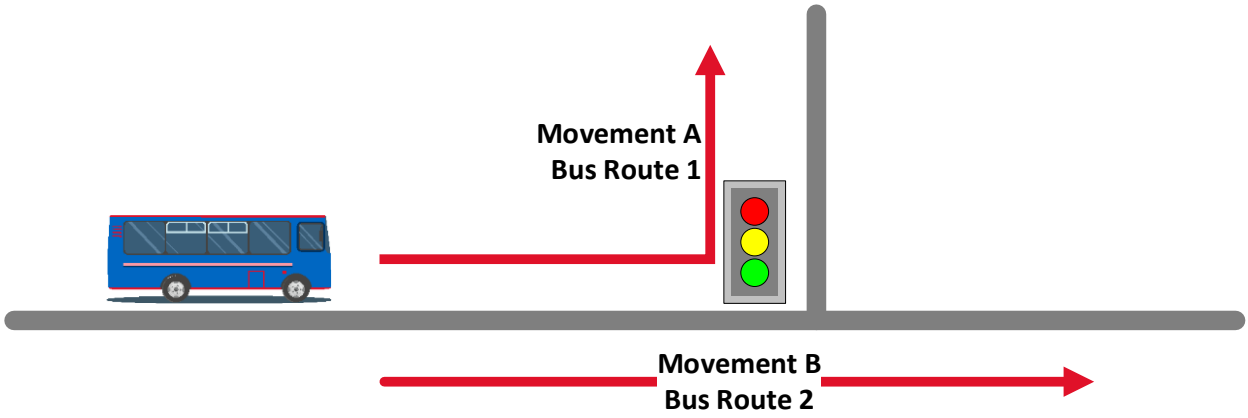

Figure 4 Vehicle movements at a junction

3.1.4 As well as direction and location, buses can provide additional information such as lateness - to assist in greater control of priority decisions and so as not to adversely disadvantage other vehicles or movements at the junction.

3.2 The Trigger Management Challenge

3.2.1 In the simple scenario where a single operator runs services in a single UTC area, the management of trigger files is simple. The UTC supplies a file to the operator which includes the locations of the trigger points - with the allocation of each trigger to an individual service. The operator then loads the file onto their buses and TLP works.

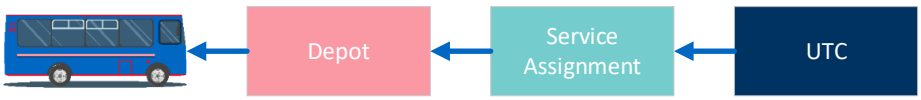

Figure 5 Simple trigger file management process

3.2.2 When a service route changes, the trigger file is updated, and a new file is provided to the operator who then replaces the file on their vehicles. Updates to locations of trigger positions are handled in a similar manner.

3.2.3 In a more complex, more realistic environment, a bus operator will operate services from a single depot in more than one UTC area and/or there will be multiple bus operators providing services in a single UTC area.

3.2.4 For example, an operator may serve from one depot A in Region 1 consisting of three towns A, B & C; and from another depot B in Region 2 containing C,D & E. Each town has its own UTC.

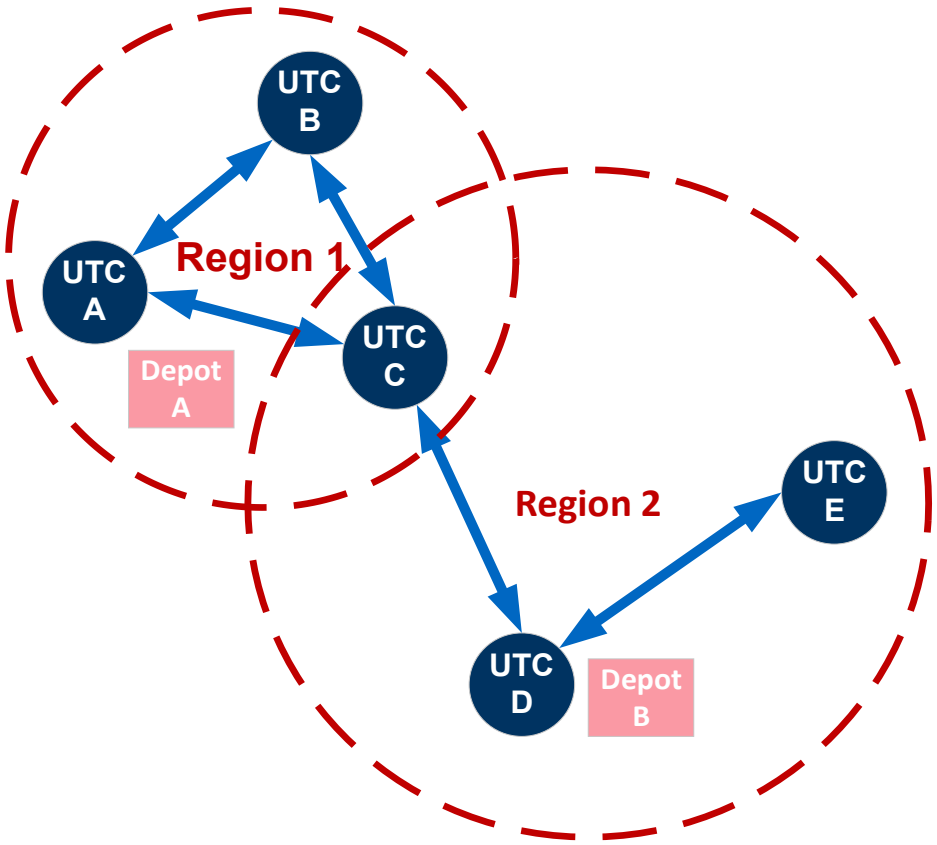

Figure 6 Scenario of multiple depots, UTCs and operational areas.

3.2.5 Each UTC manages its own traffic lights and defines the locations for triggering priority. This necessitates the combining of multiple trigger files into a single file for loading onto buses in the respective depots.

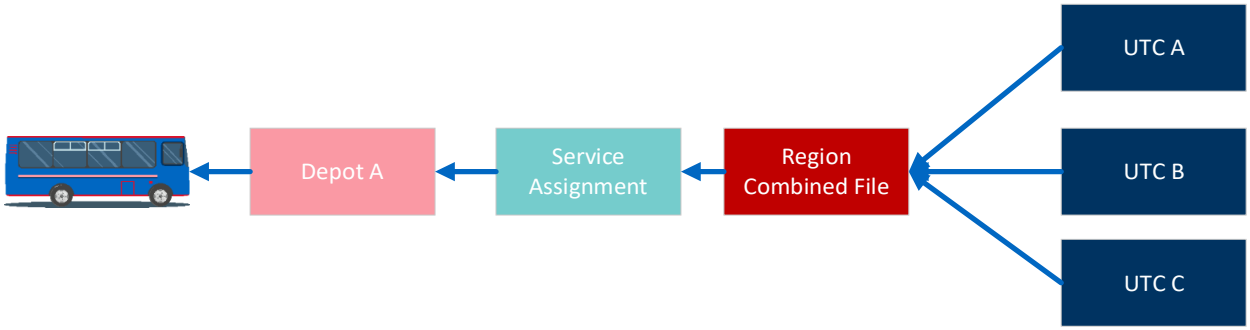

Figure 7 Process of combining trigger files

3.2.6 In a metropolitan area with large and complex multiple UTCs in operation, there are likely to be thousands of triggers that need to be managed for a depot. Each type of ticket machine has different disk storage capacity and processing power/ speed built into its specification. This, therefore, places inherent constraints on the number of triggers that can be loaded onto the bus to which it is fitted. When the bus enters a trigger location, the machine will need to check if there is a position update and the more trigger locations that need to be searched - the greater the processing power required, or time taken to complete the search. This all adds pressure onto the machine's operational capacity at the same time as it is required to carry out other time sensitive functions such as providing AVL; and its prime function of issuing tickets to passengers.

3.2.7 Therefore, to mitigate the inherent constraints of ticket machine capability, the number of triggers loaded onto a bus needs to be carefully managed - to ensure it can continue to fulfil *all* its operational requirements satisfactorily. This can normally be achieved by limiting the UTC trigger files by region and/or depot area. However, in some cases this may need to be done at service level, though this significantly increases the complexity of the process.

3.2.8 Where neighbouring authorities are sending individual trigger files to the same bus operators, care needs to be taken to ensure that trigger files are appended to the ticket machine and not overwriting existing triggers. To take control of this process, and where cross boundary bus movements are significant, authorities could look to issue trigger files from a single shared resource which can merge and send a single trigger file update to all operators. Sending a single merged file at set date periods can also help reduce the number of uploads each bus operator and their ETM supplier has to process. For example, to manage this process, seven authorities in Yorkshire use a central resource for collecting the various trigger files, merging them and issuing them to operators. This resource is also responsible for monitoring the priority requests coming back from the buses after new trigger files have been issued.

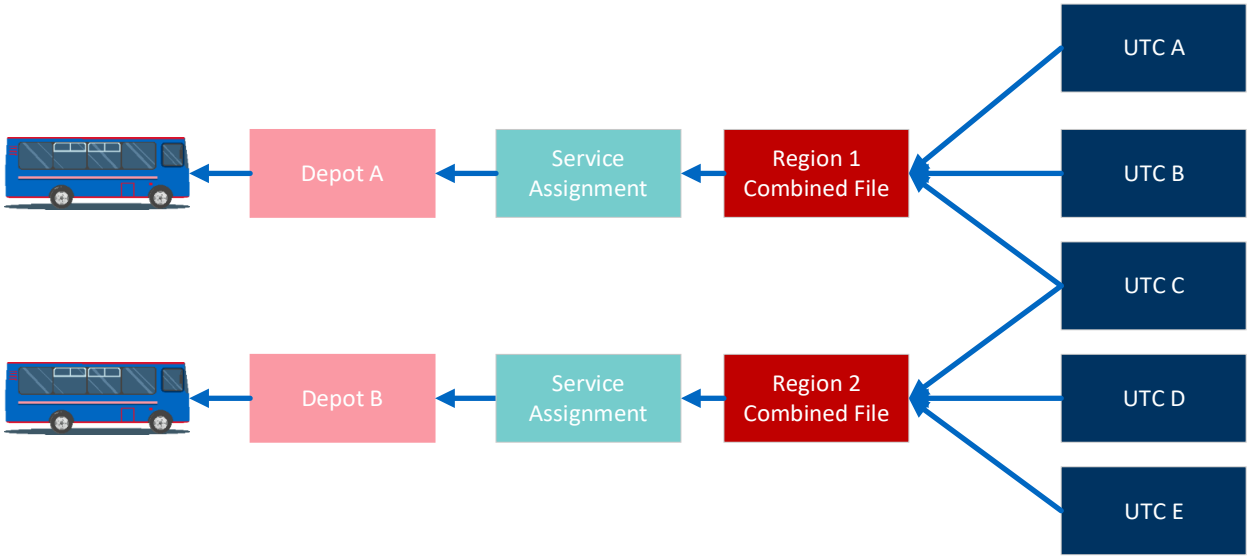

Figure 8 Process of combining trigger files for multiple depots

3.2.9 The assignment of triggers to services can be done by each UTC separately but to ensure consistency in route data, it is best achieved after the combining of the trigger files. If done beforehand, each UTC has to be up to date with all necessary route data from the bus operator - increasing the potential for out-of-date data.

3.2.10 Each of these scenarios requires a more proactive and complex management process to be implemented by the UTCs and bus operators.

3.2.11 In a metropolitan area with large and complex multiple UTCs in operation, and with thousands of triggers needing to be managed, processes need to be put in place to coordinate changes between UTCs and operators. This will ensure that optimum performance of the system is maintained in the longer term.

3.2.12 Service assignment presents common issues:

- it is difficult to target high priority buses such as Park & Rides;
- it is difficult to assign triggers to specific traffic signal movements; and
- trigger performance decays over time.

3.3 Multiple Ticket Machine Suppliers

3.3.1 This standard will serve to reduce the complexity of managing the data transfers - as there will be a single standard for the trigger data.

3.3.2 The process of providing the file to different ticket machine suppliers will continue to be dependent on supplier preference. Similarly, the steps and time taken to load files onto individual ticket machines on-bus will vary.

3.3.3 Sometimes the service assignment to triggers can be managed through a single process for all ticket machines. For some, however, the service assignment has to be carried out in the ticket machine supplier's software.

3.3.4 Agreeing the necessary processes with each ETM supplier early in the project is key to ensuring long term success.

3.3.5 Once the data file needed on-bus is produced, it needs to be sent to each vehicle. This will necessitate some form of confirmation: both of success and of the version of data that a ticket machine has loaded. This assists audit with the later identification of any problems, such as reducing numbers of triggers being fired for a junction.

3.4 Multiple UTCs

3.4.1 Where there is more than one UTC providing bus priority, the data from each will be unique within an individual UTC data set but not, necessarily unique across multiple UTCs.

3.4.2 Such an example is where traffic signal IDs are not unique between UTC systems. Where a UTC is being configured from new, it would be possible to agree with neighbouring authorities - a traffic signal ID range for each UTC to use to avoid clashes; but this presumes that nothing already exists in an area and this is an increasingly rare scenario. The signal ID is used by buses and real time systems to decide how to route priority requests to the relevant authority. Duplicates can result in priority being given to a phantom bus in the wrong authority.

3.4.3 In this situation, as part of the process of combining trigger files, it is not as simple as being able to concatenate two files together – rather some form of management tool is required to de-duplicate the data.

3.5 Latency

3.5.1 Traffic signal control is a time sensitive process with decisions on changes to signal phasing needing to be made quickly when new data is received.

3.5.2 Typically, once a priority message is received by a UTC, the processing and transmission delay for it to be received by a traffic controller is 1 to 2 seconds.

3.5.3 The change to a junction's signal timing will require a few seconds extension or a recall - to enable a bus to pass through a junction in as unimpeded a way as possible.

3.5.4 Every delay, even small - in the transmission of data from the ticket machine or other on-bus device making the decision that it has reached a trigger point - to the receipt of the data by a UTC, is significant as it may mean the difference between being able to change a signal and having to throw the request away as it has become stale.

3.5.5 It is therefore, important to be able to measure, review and manage the latency of messages using the inbuilt message timestamps.

3.6 Trigger Monitoring

3.6.1 There is a myriad of reasons why the number of triggers being sent by buses to a UTC might reduce over time. Even the most rudimentary monitoring is likely to pick up a loss of all, or a significant number of triggers being sent to a UTC - normally due to the failure of one or more parts of the overall system such as a communications link.

3.6.2 However, without regular *detailed* monitoring it is possible to miss a slow reduction in the number of trigger requests being sent to a UTC. It is therefore, important to put appropriate monitoring processes in place: to ensure the overall system of bus priority continues to work efficiently and thereby provide priority as expected.

3.6.3 The number of priority requests being received should be reviewed after every new trigger file issued. Using ‘permanent’ (all buses request regardless of lateness) triggers is recommended to help reduce the variables when comparing data. ‘Late only’ triggers can hide a wide range of issues, whereas permanent triggers allow live visual spot checks to be made to gauge the system’s health. If priority is to be provided for late buses only, the UTC priority system can assess the lateness level and decide to grant priority - rather than the decision being made by the bus or real time system.

3.6.4 Common reasons for low numbers of priority request data are:

- latest trigger files not on buses;
- not all buses receiving files quickly;
- ineffective UTC region trigger file management;
- triggers not correctly serviced and/or assigned;
- faulty bus equipment;
- buses not logged on to the correct or indeed, any service;
- data feeds dropping; and
- delays in processing of triggers in each system component can build to produce significant latency.

3.6.5 The monitoring systems need to be intelligent enough to understand that the number of requests could differ significantly between weekends and weekdays; and peak and off-peak times. This will ensure that the number of false alarms remains low and so that when alerts are received, operational staff review and address them.

4 Special Use Cases

4.1 Trigger Location Close to Bus Stop

4.1.1 It is good practice to locate trigger locations away from bus stops to ensure that any boarding and/or alighting activity does not delay the vehicle. Indeed, they should be far enough away from the bus stop to avoid triggering a request if a bus has to stop short; or just after a stop - if it is occupied by another vehicle.

4.1.2 In the event that it is not possible to avoid setting a location trigger close to a bus stop, then a solution has been developed by Transport for London (TfL) involving the use of door sensors and door open/closed events.

4.1.3 The data elements for this approach are contained within DoorEvent - an optional part of a Point:

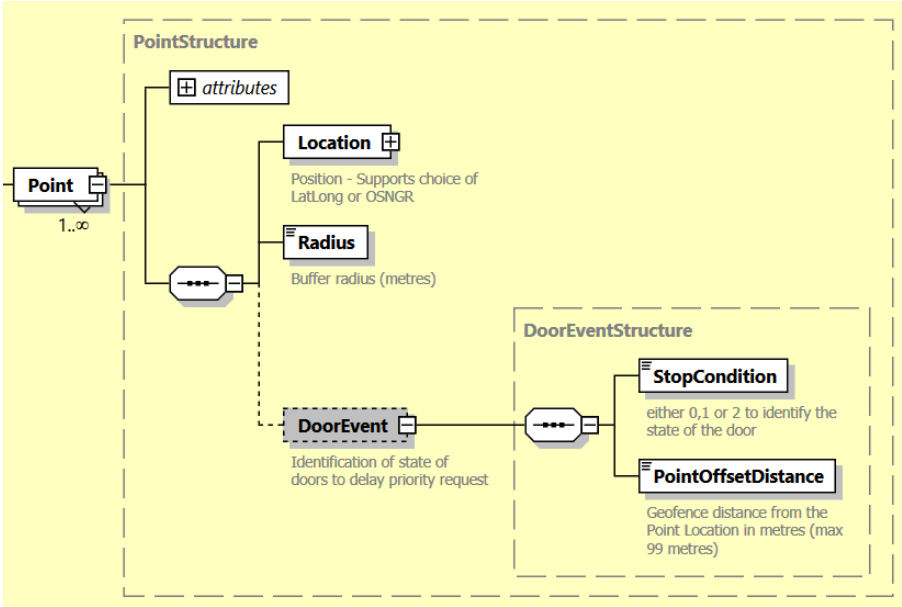

Figure 9 DoorEvent element diagram

4.1.4 Three StopConditions have been defined which determine the Trigger Point specific behaviour, although only two are widely used by TfL in London.

4.1.5 The logic used to trigger an event for each StopCondition can be altered by the bus location service provider. The trigger position file format provides the facility to choose between three different behaviours as configured by the bus location service provider. The trigger behaviour described below reflects the that implemented by TfL in London at the time of writing.

StopCondition 0

4.1.6 When the StopCondition is set to 0, a bus will send the Trigger Point event when it reaches the Trigger Point location in the centre of figure 10 i.e. door open/close events are irrelevant.

4.1.7 This is the traditional triggering mechanism, and it is typically used in London where there are no bus stops located between the Trigger Point and the stop line.

4.1.8 In this case, both the Trigger Point Radius and PointOffsetDistance are set to the same value.

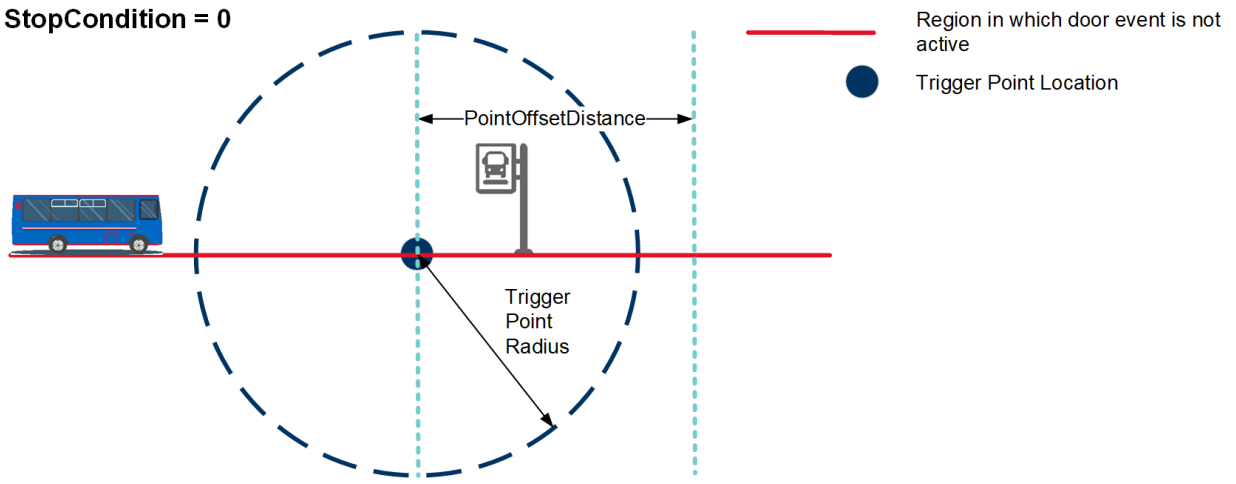

Figure 10 StopCondition = 0 description

StopCondition 1

4.1.9 StopCondition 1 is not used in London and was added for specific use cases where the bus door's opening event is required instead of the door closing event.

4.1.10 Two suggested use cases are: firstly, to provide the central UTC system with confirmation that a bus has stopped and opened its doors; and

secondly, in conjunction with a second trigger point in the same location with StopCondition 2, the central UTC system can be used to measure the dwell time of each bus.

For example, the first Trigger Point using StopCondition 1 will create an event when the bus has stopped and opened its doors - whereas the second Trigger Point using StopCondition 2, will create an event when the doors close (see section *StopCondition 2*) - thereby providing the dwell time using the time stamp between the two trigger events.

4.1.11 As the bus travels from left to right in Figure *11*, it crosses the Trigger Point Radius and when it does, the door open/close event logic is started. This is shown by the green line in the figure. Note: the door logic is based on the door opening for this StopCondition.

4.1.12 If the vehicle enters the Trigger Point Radius and opens its doors before reaching PointOffsetDistance, a trigger event is sent when the door is opened. No other circumstances cause a trigger to be sent in TfL's implementation, although this behaviour could be altered by the bus location service provider - to also trigger an event when the bus passes the PointOffsetDistance i.e. it doesn't stop within the Trigger Point Radius at all.

4.1.13 When this functionality is implemented, the PointOffsetDistance is always less than the Trigger Point Radius but this is not mandatory.

In the case where the PointOffsetDistance is greater than the Trigger Point Radius, triggers can be sent beyond the Trigger Point Radius for a distance of up to (PointOffsetDistance - Trigger Point Radius) metres. However, it is important to ensure that PointOffsetDistance is always less than the Trigger Point Radius to avoid any unwanted behaviour.

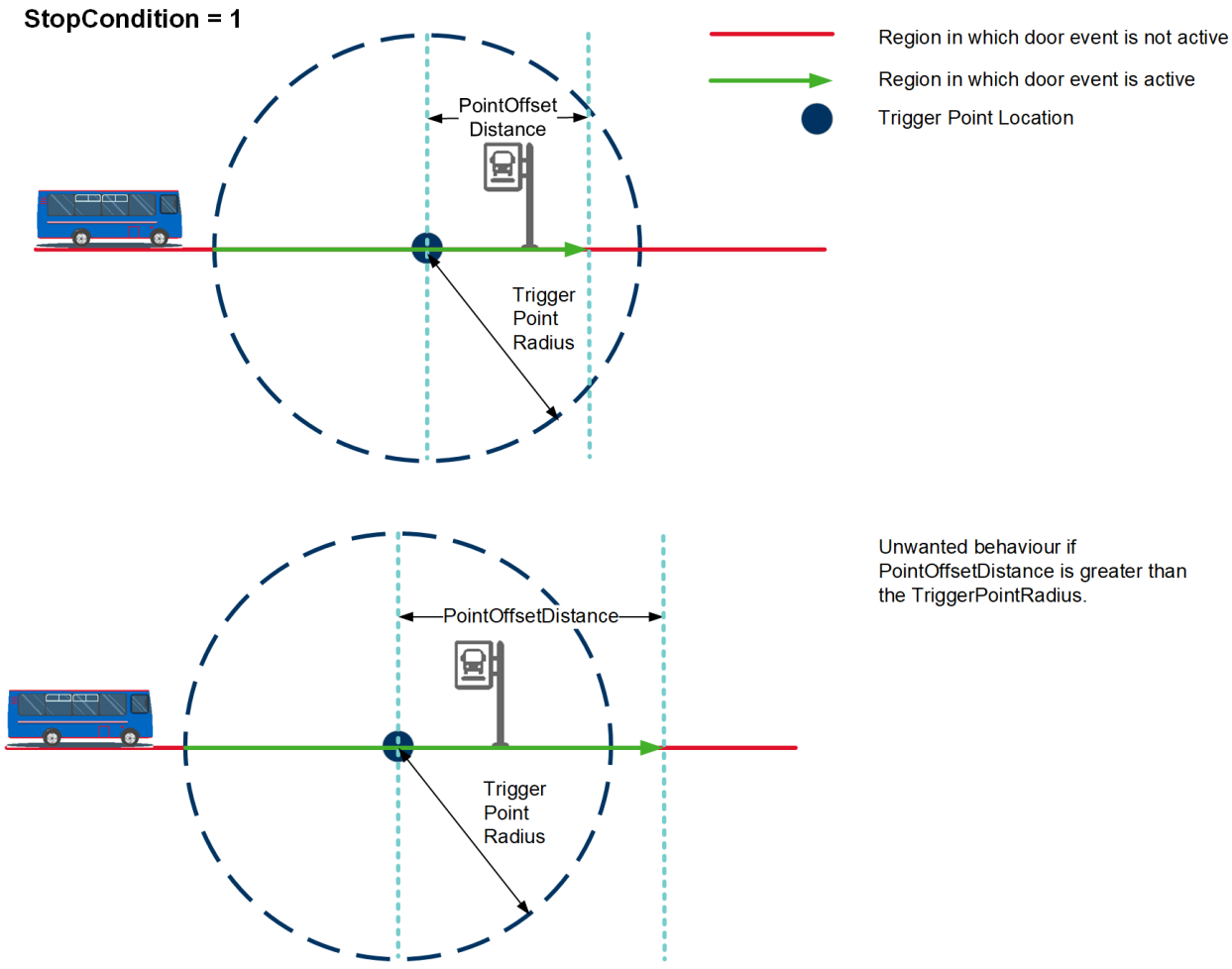

Figure 11 StopCondition = 1 description

StopCondition 2

4.1.14 This is used widely by TfL in London: where the Trigger Point is located at or near the bus stop and where it is large enough to allow multiple buses to stop within it.

4.1.15 Similarly to StopCondition 1, as the bus travels from left to right as shown in Figure 12: it crosses the Trigger Point Radius and when it does, the door open/close event logic is started. This is shown by the green line in the figure. Note: the door logic for this StopCondition is based on the doors closing.

4.1.16 If the bus has entered the Trigger Point Radius, stopped, opened its doors and not yet reached PointOffsetDistance, then a trigger event is sent when the doors are closed and the bus moves 2 metres from its location.

If the bus has not stopped or has done so outside the Trigger Point Radius, then it will travel through the trigger zone until it reaches the PointOffsetDistance - at which point a trigger event will be sent.

4.1.17 If the bus stops and opens/closes its doors less than 2m from the PointOffsetDistance, then the trigger is sent 2m from the geographical location at which the door close event was sent (even though this will be slightly after PointOffsetDistance).

4.1.18 When implemented, the PointOffsetDistance is always less than the Trigger Point Radius but this is not mandatory.

In the case where PointOffsetDistance is greater than the Trigger Point Radius, trigger events can be sent beyond the Trigger Point Radius for a distance of up to (PointOffsetDistance - Trigger Point Radius) metres. It is important to ensure PointOffsetDistance is always less than the Trigger Point Radius to avoid any unwanted behaviour.

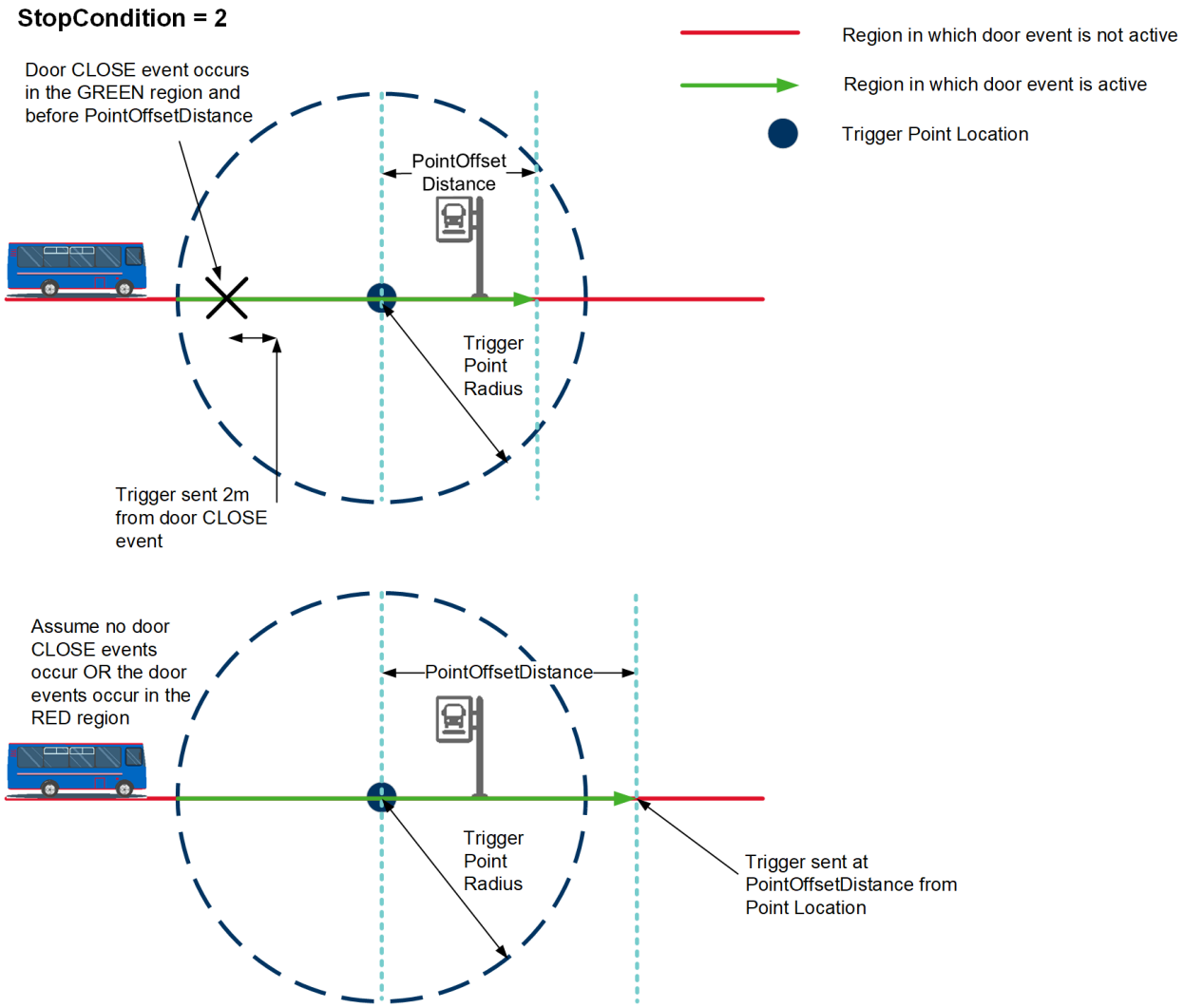

Figure 12 StopCondition = 2 description

5 Structure of the Trigger Position File

5.1 Structure Re-use

5.1.1 The XSD is designed to allow as much re-use of elements within the same XML file as possible: to reduce size and encourage re-use. It does not, however, provide for re-use of elements *between* XML files.

5.1.2 Where structures exist in other standards, it is important that where appropriate, these have been referenced and re-used. For this XSD, the LocationStructure is re-used from the NaPTAN 2.5 schema file: 'NaPT_location-v2-5.xsd'

5.1.3 The data types: NationalOperatorCodeType, ServiceCodeType and VehicleModesEnumeration match those used in TransXChange to ease re-use of existing data.

5.2 Schema Commenting

5.2.1 The schema is commented throughout, these are included in the detailed schema description in section 6 of this document.

5.2.2 The commenting within the schema is designed to be sufficient to negate the need for a person with general knowledge of the principle of bus priority, bus timetables and real time information systems to refer to this document.

5.3 Primacy of XSD file

5.3.1 Whilst every effort has been made to ensure that this document and the XSD schema are consistent, in the event of a discrepancy between this documentation and the XSD schema file, the XSD schema file has primacy.

6 Schema Description

element **RTIGJunctions**

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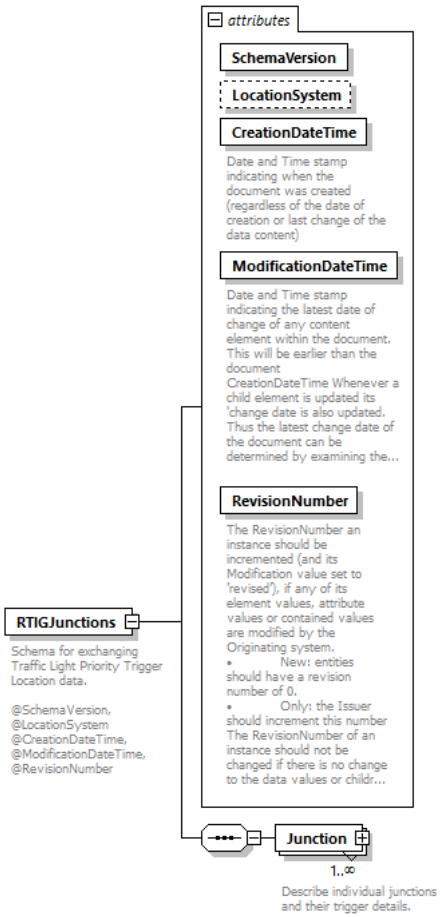
<tr><td>diagram</td><td> 
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Date and Time stamp indicating when the document was created (regardless of the date of creation or last change of the data content)</td></tr>
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annotation	documentation Schema for exchanging Traffic Light Priority Trigger Location data. @SchemaVersion, @LocationSystem @CreationDateTime, @ModificationDateTime, @RevisionNumber			

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attribute **RTIGJunctions/@LocationSystem**

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facets	Kind Value Annotation enumeration WGS84 documentation All coordinate will be in World Geodetic System 84 (WGS 84) format. http://www.wgs84.com/ enumeration Grid documentation All coordinates will be in a grid based system.

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attribute **RTIGJunctions/@ModificationDateTime**

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attribute **RTIGJunctions/@RevisionNumber**

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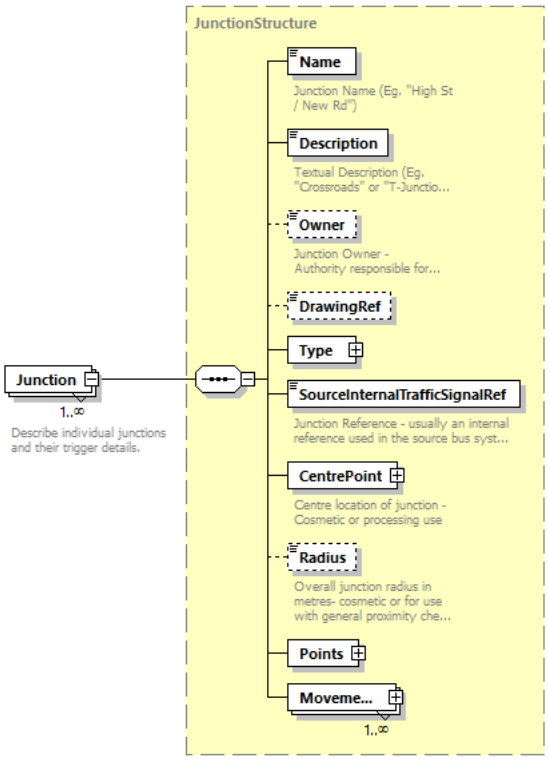
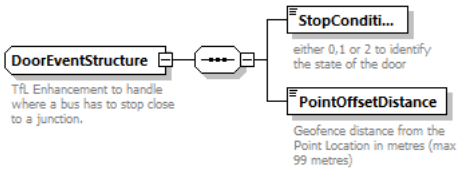
properties	use required
annotation	documentation The RevisionNumber an instance should be incremented (and its Modification value set to 'revised'), if any of its element values, attribute values or contained values are modified by the Originating system. • New: entities should have a revision number of 0.

	• Only: the Issuer should increment this number The RevisionNumber of an instance should not be changed if there is no change to the data values or children of an element.

element **RTIGJunctions/Junction**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**JunctionStructure**
properties	minOcc 1 maxOcc unbounded content complex
children	**Name Description Owner DrawingRef Type SourceInternalTrafficSignalRef CentrePoint Radius Points Movements**
annotation	documentation Describe individual junctions and their trigger details.

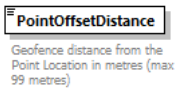
complexType **DoorEventStructure**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
children	**StopCondition** **PointOffsetDistance**
used by	element **PointStructure/DoorEvent**
annotation	documentation TfL Enhancement to handle where a bus has to stop close to a junction.

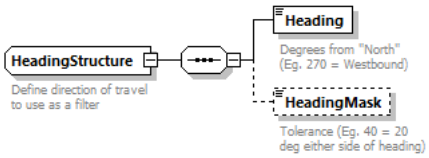
element **DoorEventStructure/StopCondition**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	restriction of **xsd:nonNegativeInteger**
properties	content simple
facets	Kind Value Annotation enumeration 0 documentation Door Condition 0 enumeration 1 documentation Door Condition 1 enumeration 2 documentation Door Condition 2
annotation	documentation either 0,1 or 2 to identify the state of the door

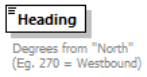
element **DoorEventStructure/PointOffsetDistance**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	restriction of **xsd:nonNegativeInteger**
properties	content simple
facets	Kind Value Annotation minInclusive 0 maxInclusive 99
annotation	documentation Geofence distance from the Point Location in metres (max 99 metres)

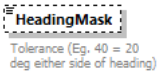
complexType **HeadingStructure**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
children	**Heading** **HeadingMask**
used by	element **MovementPointStructure/Direction**
annotation	documentation Define direction of travel to use as a filter

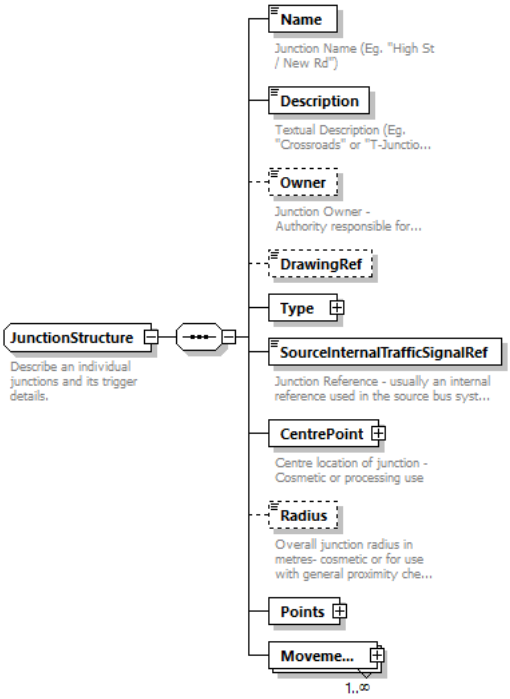
element **HeadingStructure/Heading**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**AbsoluteBearingType**
properties	content simple
facets	Kind Value Annotation maxExclusive 360
annotation	documentation Degrees from "North" (Eg. 270 = Westbound)

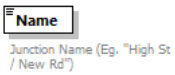
element **HeadingStructure/HeadingMask**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	restriction of **xsd:nonNegativeInteger**
properties	minOcc 0 maxOcc 1 content simple
facets	Kind Value Annotation minInclusive 0 maxInclusive 180
annotation	documentation Tolerance (Eg. 40 = 20 deg either side of heading)

complexType **JunctionStructure**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
children	**Name Description Owner DrawingRef Type SourceInternalTrafficSignalRef CentrePoint Radius Points Movements**
used by	element **RTIGJunctions/Junction**
annotation	documentation Describe an individual junctions and its trigger details.

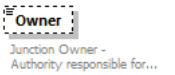
element **JunctionStructure/Name**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	content simple
annotation	documentation Junction Name (Eg. "High St / New Rd")

element **JunctionStructure/Description**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	content simple
annotation	documentation Textual Description (Eg. "Crossroads" or "T-Junction")

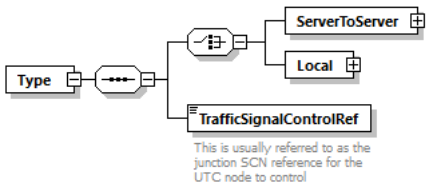
element **JunctionStructure/Owner**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation Junction Owner - Authority responsible for junction

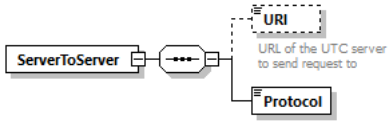
element **JunctionStructure/DrawingRef**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	minOcc 0 maxOcc 1 content simple

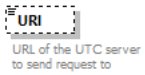
element **JunctionStructure/Type**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
properties	content complex
children	**ServerToServer Local TrafficSignalControlRef**

element **JunctionStructure/Type/ServerToServer**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
properties	content complex
children	**URI Protocol**

element **JunctionStructure/Type/ServerToServer/URI**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:anyURI**
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation URL of the UTC server to send request to

element **JunctionStructure/Type/ServerToServer/Protocol**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	restriction of **xsd:string**
properties	content simple
facets	Kind Value Annotation enumeration SCOOT enumeration RTIGT031

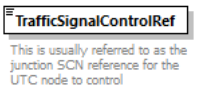
element **JunctionStructure/Type/Local**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
properties	content complex
children	**Protocol**

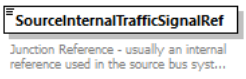
element **JunctionStructure/Type/Local/Protocol**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	restriction of **xsd:string**
properties	content simple
facets	Kind Value Annotation enumeration RTIGT08

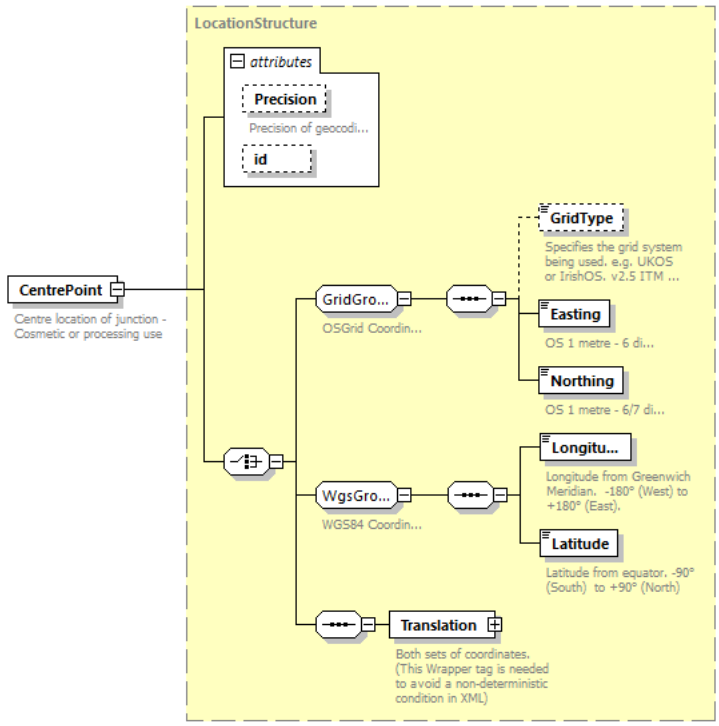
element **JunctionStructure/Type/TrafficSignalControlRef**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	content simple
annotation	documentation This is usually referred to as the junction SCN reference for the UTC node to control

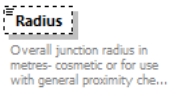
element **JunctionStructure/SourceInternalTrafficSignalRef**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	restriction of **xsd:nonNegativeInteger**
properties	content simple
annotation	documentation Junction Reference - usually an internal reference used in the source bus system

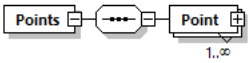
element **JunctionStructure/CentrePoint**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**LocationStructure**
properties	content complex
children	**GridType Easting Northing Longitude Latitude Translation**
attributes	Name: Precision — Type: **PrecisionEnumeration** — Use: optional — Default: 1km — Fixed: — Annotation: documentation: Precision of geocoding Name: id — Type: **LocationIdType** — Use: optional
annotation	documentation Centre location of junction - Cosmetic or processing use

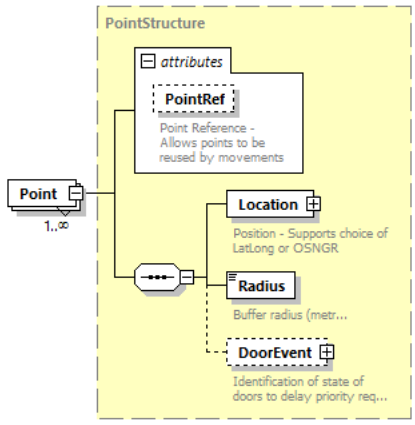
element **JunctionStructure/Radius**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:nonNegativeInteger**
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation Overall junction radius in metres- cosmetic or for use with general proximity checks

element **JunctionStructure/Points**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
properties	content complex
children	**Point**

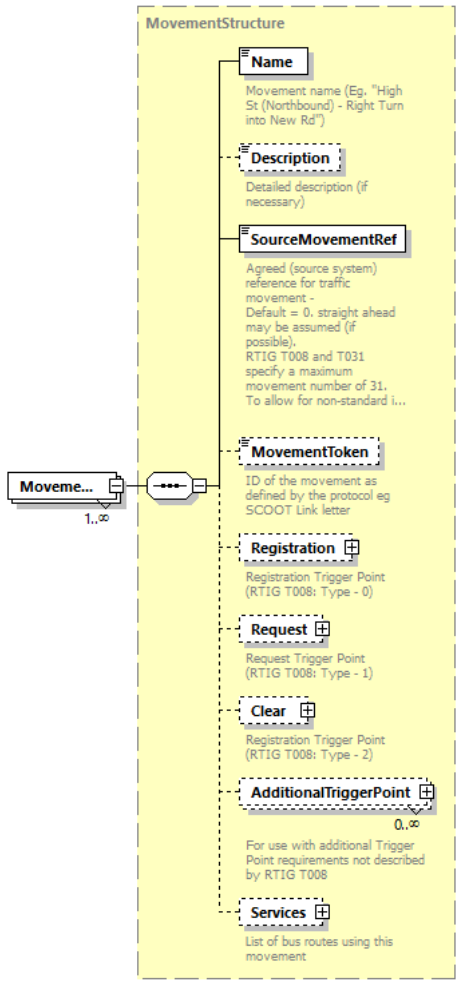
element **JunctionStructure/Points/Point**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**PointStructure**
properties	minOcc 1 maxOcc unbounded content complex
children	**Location** **Radius** **DoorEvent**

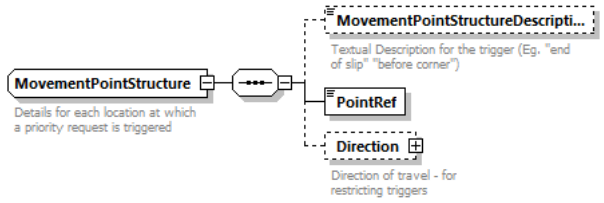
attributes

Name	Type	Use	Default	Fixed	Annotation
PointRef	**xsd:string**				documentation Point Reference - Allows points to be reused by movements

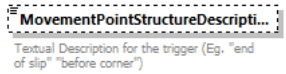
element **JunctionStructure/Movements**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**MovementStructure**
properties	minOcc 1 maxOcc unbounded content complex
children	**Name Description SourceMovementRef MovementToken Registration Request Clear AdditionalTriggerPoint Services**

complexType **MovementPointStructure**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
children	**MovementPointStructureDescription PointRef Direction**
used by	elements **MovementStructure/AdditionalTriggerPoint MovementStructure/Clear MovementStructure/Registration MovementStructure/Request**
annotation	documentation Details for each location at which a priority request is triggered

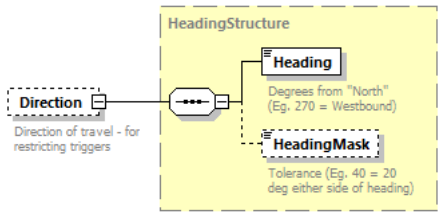
element **MovementPointStructure/MovementPointStructureDescription**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation Textual Description for the trigger (Eg. "end of slip" "before corner")

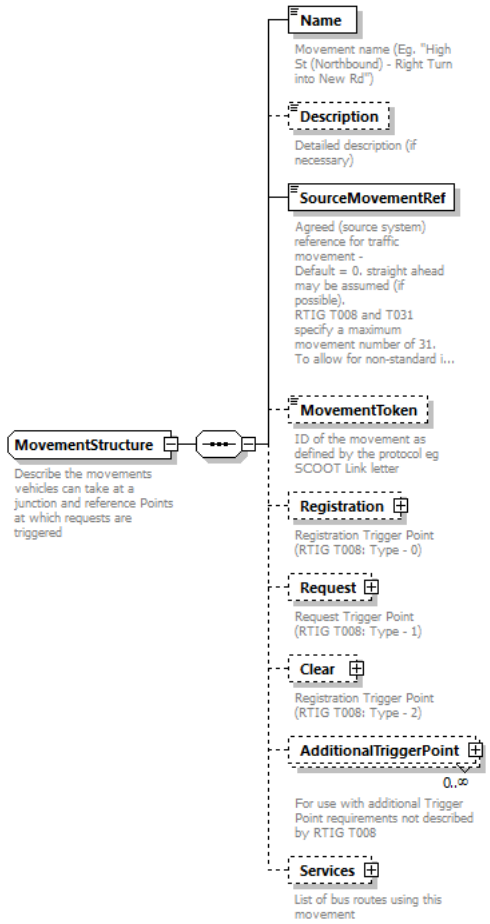
element **MovementPointStructure/PointRef**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	content simple

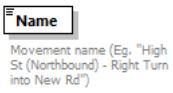
element **MovementPointStructure/Direction**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**HeadingStructure**
properties	minOcc 0 maxOcc 1 content complex
children	**Heading** **HeadingMask**
annotation	documentation Direction of travel - for restricting triggers

complexType **MovementStructure**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
children	**Name Description SourceMovementRef MovementToken Registration Request Clear AdditionalTriggerPoint Services**
used by	element **JunctionStructure/Movements**
annotation	documentation Describe the movements vehicles can take at a junction and reference Points at which requests are triggered

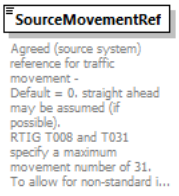
element **MovementStructure/Name**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	content simple
annotation	documentation Movement name (Eg. "High St (Northbound) - Right Turn into New Rd")

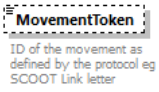
element **MovementStructure/Description**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation Detailed description (if necessary)

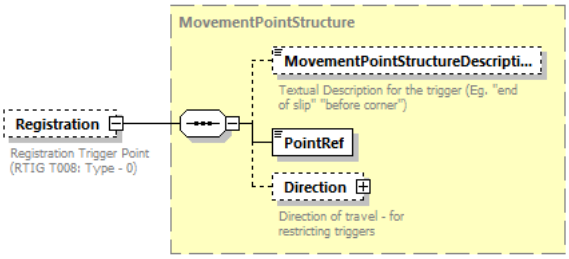
element **MovementStructure/SourceMovementRef**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	restriction of **xsd:nonNegativeInteger**
properties	content simple
annotation	documentation Movement Reference - usually an internal reference used in the source bus system. Default = 0. straight ahead may be assumed (if possible). RTIG T008 and T031 specify a maximum movement number of 31. To allow for implementations that are not required to comply with T008 or T031 there is no restriction to the maximum number.

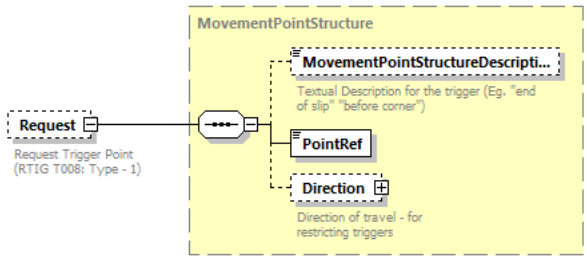
element **MovementStructure/MovementToken**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	restriction of **xsd:string**
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation ID of the movement as defined by the protocol eg SCOOT Link letter RTIG T008 and T031 specify a maximum movement number of 31. To allow for implementations that are not required to comply with T008 or T031 there is no restriction to the maximum number

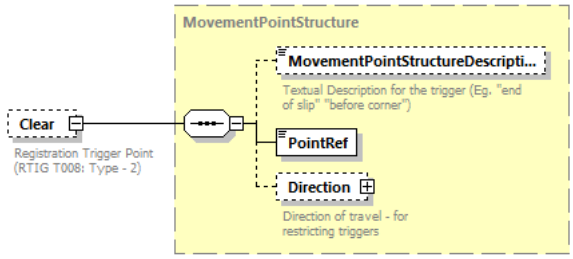
element **MovementStructure/Registration**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**MovementPointStructure**
properties	minOcc 0 maxOcc 1 content complex
children	**MovementPointStructureDescription PointRef Direction**
annotation	documentation Registration Trigger Point (RTIG T008: Type - 0)

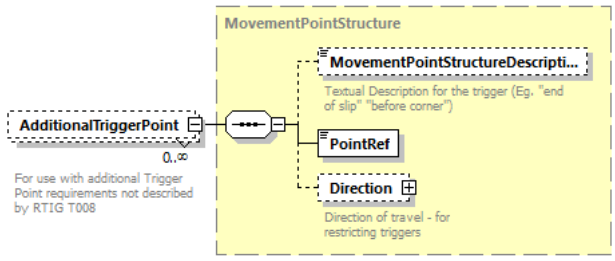
element **MovementStructure/Request**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**MovementPointStructure**
properties	minOcc 0 maxOcc 1 content complex
children	**MovementPointStructureDescription PointRef Direction**
annotation	documentation Request Trigger Point (RTIG T008: Type - 1)

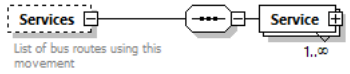
element **MovementStructure/Clear**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**MovementPointStructure**
properties	minOcc 0 maxOcc 1 content complex
children	**MovementPointStructureDescription PointRef Direction**
annotation	documentation Registration Trigger Point (RTIG T008: Type - 2)

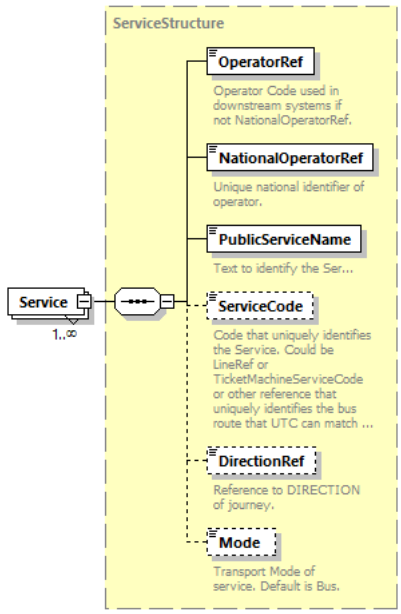
element **MovementStructure/AdditionalTriggerPoint**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**MovementPointStructure**
properties	minOcc 0 maxOcc unbounded content complex
children	**MovementPointStructureDescription** **PointRef** **Direction**
annotation	documentation For use with additional Trigger Point requirements not described by RTIG T008

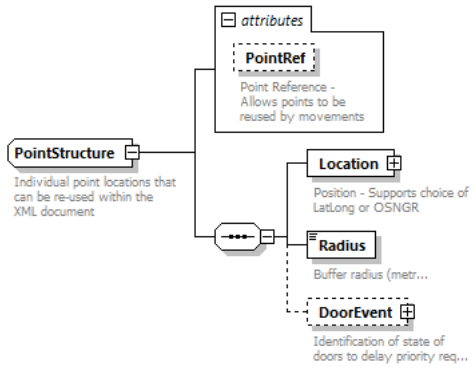
element **MovementStructure/Services**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
properties	minOcc 0 maxOcc 1 content complex
children	**Service**
annotation	documentation List of bus routes using this movement

element **MovementStructure/Services/Service**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**ServiceStructure**
properties	minOcc 1 maxOcc unbounded content complex
children	**OperatorRef NationalOperatorRef PublicServiceName ServiceCode DirectionRef Mode**

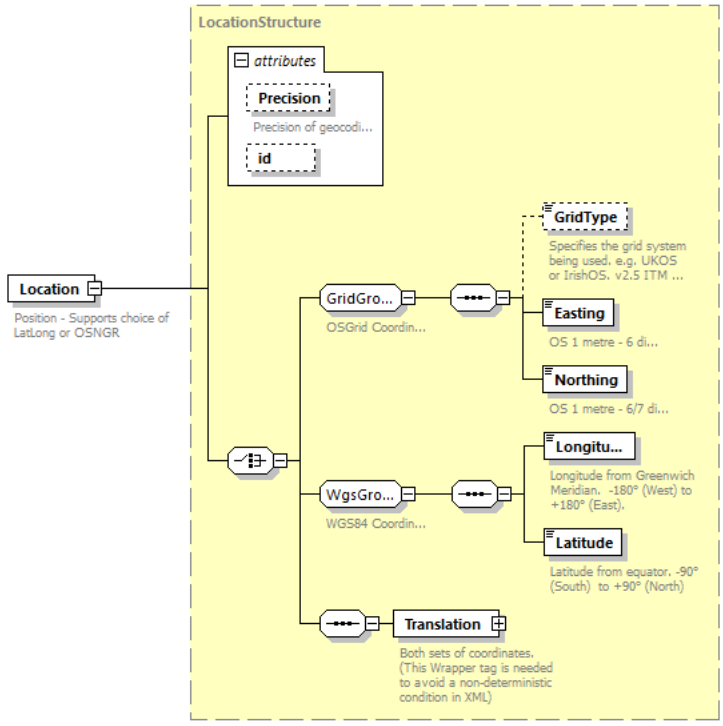
complexType **PointStructure**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
children	**Location Radius DoorEvent**
used by	element **JunctionStructure/Points/Point**
attributes	Name: PointRef; Type: **xsd:string**; Use: ; Default: ; Fixed: ; Annotation documentation: Point Reference - Allows points to be reused by movements
annotation	documentation Individual point locations that can be re-used within the XML document

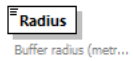
attribute **PointStructure/@PointRef**

type	**xsd:string**
annotation	documentation Point Reference - Allows points to be reused by movements

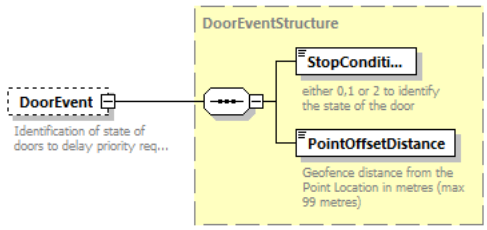
element **PointStructure/Location**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**LocationStructure**
properties	content complex
children	**GridType Easting Northing Longitude Latitude Translation**
attributes	Name / Type / Use / Default / Fixed / Annotation Precision / **PrecisionEnumeration** / optional / 1km / / documentation: Precision of geocoding id / **LocationIdType** / optional
annotation	documentation Position - Supports choice of LatLong or OSNGR

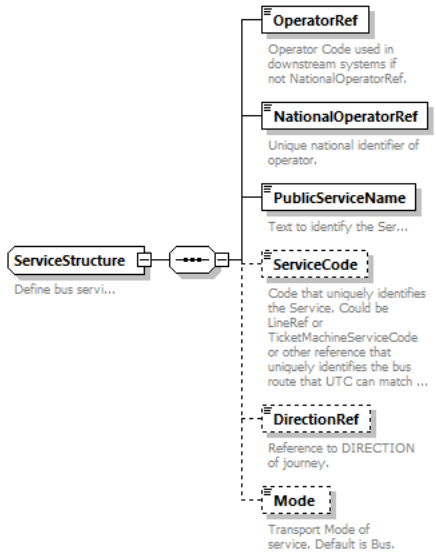
element **PointStructure/Radius**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:nonNegativeInteger**
properties	content simple
annotation	documentation Buffer radius (metres)

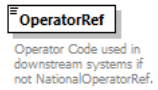
element **PointStructure/DoorEvent**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**DoorEventStructure**
properties	minOcc 0 maxOcc 1 content complex
children	**StopCondition** **PointOffsetDistance**
annotation	documentation Identification of state of doors to delay priority request

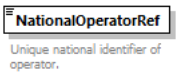
complexType **ServiceStructure**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
children	**OperatorRef** **NationalOperatorRef** **PublicServiceName** **ServiceCode** **DirectionRef** **Mode**
used by	element **MovementStructure/Services/Service**
annotation	documentation Define bus services

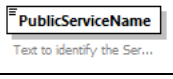
element **ServiceStructure/OperatorRef**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	content simple
annotation	documentation Operator Code used in downstream systems if not NationalOperatorRef.

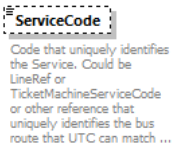
element **ServiceStructure/NationalOperatorRef**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**NationalOperatorCodeType**
properties	content simple
annotation	documentation Unique national identifier of operator.

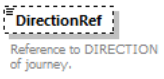
element **ServiceStructure/PublicServiceName**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	content simple
annotation	documentation Text to identify the Service.

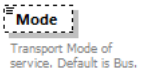
element **ServiceStructure/ServiceCode**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**ServiceCodeType**
properties	minOcc 0 maxOcc 1 content simple
annotation	documentation Code that uniquely identifies the Service. Could be LineRef or TicketMachineServiceCode or other reference that uniquely identifies the bus route that UTC can match requests to

element **ServiceStructure/DirectionRef**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**DirectionRefEnumeration**
properties	minOcc 0 maxOcc 1 content simple
facets	Kind / Value / Annotation enumeration inbound enumeration outbound enumeration inboundAndOutbound enumeration circular enumeration clockwise enumeration antiClockwise
annotation	documentation Reference to DIRECTION of journey.

element **ServiceStructure/Mode**

diagram	
namespace	http://www.rtig.org.uk/schema/rtigt042
type	**VehicleModesEnumeration**
properties	minOcc 0 maxOcc 1 content simple default bus
facets	Kind / Value / Annotation enumeration air enumeration bus enumeration trolleyBus enumeration coach enumeration ferry enumeration funicular enumeration metro enumeration rail enumeration tram enumeration underground
annotation	documentation Transport Mode of service. Default is Bus.

simpleType **DirectionRefEnumeration**

namespace	http://www.rtig.org.uk/schema/rtigt042
type	restriction of **xsd:NMTOKEN**
properties	base xsd:NMTOKEN
used by	element **ServiceStructure/DirectionRef**
facets	Kind / Value / Annotation enumeration inbound enumeration outbound enumeration inboundAndOutbound enumeration circular enumeration clockwise enumeration antiClockwise
annotation	documentation Reference to DIRECTION of journey.

simpleType **NationalOperatorCodeType**

namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:NMTOKEN**
properties	base xsd:NMTOKEN
used by	element **ServiceStructure/NationalOperatorRef**
annotation	documentation Identifying code for the operator, conforming to a national scheme.

simpleType **ServiceCodeType**

namespace	http://www.rtig.org.uk/schema/rtigt042
type	**xsd:string**
properties	base xsd:string
used by	element **ServiceStructure/ServiceCode**
annotation	documentation Identifying code for a particular service.

simpleType **VehicleModesEnumeration**

namespace	http://www.rtig.org.uk/schema/rtigt042
type	restriction of **xsd:NMTOKEN**
properties	base xsd:NMTOKEN
used by	element **ServiceStructure/Mode**
facets	Kind / Value / Annotation enumeration air enumeration bus enumeration trolleyBus enumeration coach enumeration ferry enumeration funicular enumeration metro enumeration rail enumeration tram enumeration underground
annotation	documentation Modes of transport applicable to timetabled public transport.

7 Schema

```
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xml="http://www.w3.org/XML/1998/namespace" xmlns="http://www.rtig.org.uk/schema/rtigt042"
xmlns:napt="http://www.naptan.org.uk/" targetNamespace="http://www.rtig.org.uk/schema/rtigt042"
elementFormDefault="qualified" attributeFormDefault="unqualified" version="1.1" id="rtigt042">
	<xsd:annotation>
		<xsd:appinfo>
			<Metadata xmlns="http://www.govtalk.gov.uk/CM/gms-xs">
				<Audience>Urban Traffic control and Bus System
developers</Audience>
				<Contributor>Revised for version 1.1 RTIG Ltd, by  Tim Rivett.
mailto:secretariat@rtig.org.uk</Contributor>
				<Coverage>United Kingdom</Coverage>
				<Creator>Originally created by Trapeze Group UK.</Creator>
				<Date>
					<Created>2021-02-11</Created>
				</Date>
				<Date><Modified>2022-08-05</Modified>
					v1.1
					MovementToken changed to allow 2 characters to match
RTIGT031
					SourceInternalTrafficSignalRef limit removed
					SourceMovementRef limit removed and description
updated
				</Date>
				<Description>
					<p>The Traffic Light Priority Trigger File is a system for
exchanging data on the locations buses can request priority from traffic light management systems.</p>
				</Description>
				<Format>
					<MediaType>text/xml</MediaType>
					<Syntax>http://www.w3.org/2001/XMLSchema</Syntax>
					<Description>XML schema, W3C Recommendation
2001</Description>
				</Format>
				<Language>[ISO 639-2/B] ENG</Language>
				<Publisher>Real Time Information Group Ltd</Publisher>
				<Rights>Unclassified
		<Copyright>RTIG Ltd Copyright 2022</Copyright>
				</Rights>
				<Source>
					<ul>
						<li>Originally developed by Trapeze Group
UK.</li>
						<li>Revised as version 1.1, 2022 by Tim Rivett,
RTIG following feedback from Trapeze</li>
					</ul>
				</Source>
				<Status>Version 1.1</Status>
				<Subject>
```

```
                                        <Category>Transport, Public transport, Bus services,
Coach services</Category>
                                    </Subject>
                                    <Title>Traffic Light Priority Trigger Schema, an XML format for
exchanging trigger locations.</Title>
                                    <Type>Standard</Type>
                                </Metadata>
            </xsd:appinfo>
            <xsd:documentation>Traffic Light Priority Trigger File   HEADER
DOCUMENTATION</xsd:documentation>
        </xsd:annotation>
        <xsd:include schemaLocation="NaPT_location-v2-5.xsd">
            <xsd:annotation>
                <xsd:documentation>Includes common types for National Public Transport
XML schemas</xsd:documentation>
            </xsd:annotation>
        </xsd:include>
        <xsd:element name="RTIGJunctions">
            <xsd:annotation>
                <xsd:documentation>Schema for exchanging Traffic Light Priority Trigger
Location data.

@SchemaVersion,
@LocationSystem
@CreationDateTime,
@ModificationDateTime,
@RevisionNumber
</xsd:documentation>
            </xsd:annotation>
            <xsd:complexType>
                <xsd:annotation>
                    <xsd:documentation>Grouping for document change
metadata.</xsd:documentation>
                </xsd:annotation>
                <xsd:sequence>
                    <xsd:element name="Junction" type="JunctionStructure"
maxOccurs="unbounded">
                        <xsd:annotation>
                            <xsd:documentation>Describe individual
junctions and their trigger details.</xsd:documentation>
                        </xsd:annotation>
                    </xsd:element>
                </xsd:sequence>
                <xsd:attribute name="SchemaVersion" type="xsd:NMTOKEN"
use="required" fixed="0.5"/>
                <xsd:attribute name="LocationSystem" type="LocationSystemEnumeration"
use="optional" default="Grid"/>
                <xsd:attribute name="CreationDateTime" type="xsd:dateTime"
use="required">
                    <xsd:annotation>
```

<xsd:documentation>Date and Time stamp indicating when the document was created (regardless of the date of creation or last change of the data content)</xsd:documentation>
</xsd:annotation>
</xsd:attribute>
<xsd:attribute name="ModificationDateTime" type="xsd:dateTime" use="required">
<xsd:annotation>
<xsd:documentation>Date and Time stamp indicating the latest date of change of any content element within the document. This will be earlier than the document CreationDateTime Whenever a child element is updated its 'change date is also updated. Thus the latest change date of the document can be determined by examining the top level elements.
</xsd:documentation>
</xsd:annotation>
</xsd:attribute>
<xsd:attribute name="RevisionNumber" type="xsd:nonNegativeInteger" use="required">
<xsd:annotation>
<xsd:documentation>The RevisionNumber an instance should be incremented (and its Modification value set to ’revised’), if any of its element values, attribute values or contained values are modified by the Originating system.
• New: entities should have a revision number of 0.
• Only: the Issuer should increment this number
The RevisionNumber of an instance should not be changed if there is no change to the data values or children of an element.
</xsd:documentation>
</xsd:annotation>
</xsd:attribute>
</xsd:complexType>
</xsd:element>
<xsd:complexType name="JunctionStructure">
<xsd:annotation>
<xsd:documentation>Describe an individual junctions and its trigger details.</xsd:documentation>
</xsd:annotation>
<xsd:sequence>
<xsd:element name="Name" type="xsd:string">
<xsd:annotation>
<xsd:documentation>Junction Name (Eg. "High St / New Rd")</xsd:documentation>
</xsd:annotation>
</xsd:element>
<xsd:element name="Description" type="xsd:string">
<xsd:annotation>
<xsd:documentation>Textual Description (Eg. "Crossroads" or "T-Junction")</xsd:documentation>
</xsd:annotation>
</xsd:element>
<xsd:element name="Owner" type="xsd:string" minOccurs="0">

```
                                        <xsd:annotation>
                                                <xsd:documentation>Junction Owner - Authority
responsible for junction</xsd:documentation>
                                        </xsd:annotation>
                                </xsd:element>
                                <xsd:element name="DrawingRef" type="xsd:string" minOccurs="0"/>
                                <xsd:element name="Type">
                                        <xsd:complexType>
                                                <xsd:sequence>
                                                        <xsd:choice>
                                                                <xsd:annotation>
                                                                        <xsd:documentation>
</xsd:documentation>
                                                                </xsd:annotation>
                                                                <xsd:element
name="ServerToServer">
                                                                        <xsd:complexType>
                                                                                <xsd:sequence>

        <xsd:element name="URI" type="xsd:anyURI" minOccurs="0">

        <xsd:annotation>

                <xsd:documentation>URL of the UTC server to send request to</xsd:documentation>

        </xsd:annotation>

        </xsd:element>

        <xsd:element name="Protocol">

        <xsd:simpleType>

                <xsd:restriction base="xsd:string">

                        <xsd:enumeration value="SCOOT"/>

                        <xsd:enumeration value="RTIGT031"/>

                </xsd:restriction>

        </xsd:simpleType>

        </xsd:element>
                                                                                </xsd:sequence>
                                                                        </xsd:complexType>
                                                                </xsd:element>
                                                                <xsd:element name="Local">
                                                                        <xsd:complexType>
                                                                                <xsd:sequence>
```

```
        <xsd:element name="Protocol" minOccurs="1">
        <xsd:simpleType>
                <xsd:restriction base="xsd:string">
                        <xsd:enumeration value="RTIGT08"/>
                </xsd:restriction>
        </xsd:simpleType>
        </xsd:element>
                                                                        </xsd:sequence>
                                                                </xsd:complexType>
                                                        </xsd:element>
                                                </xsd:choice>
                                                <xsd:element name="TrafficSignalControlRef"
type="xsd:string">
                                                        <xsd:annotation>
                                                                <xsd:documentation>This is
usually referred to as the junction SCN reference for the UTC node to control</xsd:documentation>
                                                        </xsd:annotation>
                                                </xsd:element>
                                        </xsd:sequence>
                                </xsd:complexType>
                        </xsd:element>
                        <xsd:element name="SourceInternalTrafficSignalRef">
                                <xsd:annotation>
                                        <xsd:documentation>Junction Reference - usually an
internal reference used in the source bus system</xsd:documentation>
                                </xsd:annotation>
                                <xsd:simpleType>

                                </xsd:simpleType>
                        </xsd:element>
                        <xsd:element name="CentrePoint" type="LocationStructure"
minOccurs="1">
                                <xsd:annotation>
                                        <xsd:documentation>Centre location of junction -
Cosmetic or processing use</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="Radius" type="xsd:nonNegativeInteger"
minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Overall junction radius in metres-
cosmetic or for use with general proximity checks</xsd:documentation>
                                </xsd:annotation>
```

```
                        </xsd:element>
                        <xsd:element name="Points">
                                <xsd:complexType>
                                        <xsd:sequence>
                                                <xsd:element name="Point"
type="PointStructure" maxOccurs="unbounded"/>
                                        </xsd:sequence>
                                </xsd:complexType>
                        </xsd:element>
                        <xsd:element name="Movements" type="MovementStructure"
maxOccurs="unbounded"/>
                </xsd:sequence>
        </xsd:complexType>
        <xsd:complexType name="PointStructure">
                <xsd:annotation>
                        <xsd:documentation>Individual point locations that can be re-used within the
XML document</xsd:documentation>
                </xsd:annotation>
                <xsd:sequence>
                        <xsd:element name="Location" type="LocationStructure">
                                <xsd:annotation>
                                        <xsd:documentation>Position - Supports choice of
LatLong or OSNGR</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="Radius" type="xsd:nonNegativeInteger">
                                <xsd:annotation>
                                        <xsd:documentation>Buffer radius
(metres)</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="DoorEvent" type="DoorEventStructure"
minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Identification of state of doors to
delay priority request</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                </xsd:sequence>
                <xsd:attribute name="PointRef" type="xsd:string">
                        <xsd:annotation>
                                <xsd:documentation>Point Reference - Allows points to be reused
by movements</xsd:documentation>
                        </xsd:annotation>
                </xsd:attribute>
        </xsd:complexType>
        <xsd:complexType name="MovementStructure">
                <xsd:annotation>
                        <xsd:documentation>Describe the movements vehicles can take at a
junction and reference Points at which requests are triggered</xsd:documentation>
```

```
                </xsd:annotation>
                <xsd:sequence>
                        <xsd:element name="Name" type="xsd:string">
                                <xsd:annotation>
                                        <xsd:documentation>Movement name (Eg. "High St
(Northbound) - Right Turn into New Rd")</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="Description" type="xsd:string" minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Detailed description (if
necessary)</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="SourceMovementRef">
                                <xsd:annotation>
                                        <xsd:documentation>
Movement Reference - usually an internal reference used in the source bus system.
Default = 0. straight ahead may be assumed (if possible).
RTIG T008 and T031 specify a maximum movement number of 31.
To allow for implementations that are not required to comply with T008 or T031 there is no restriction to
the maximum number.</xsd:documentation>
                                </xsd:annotation>
                                <xsd:simpleType>
                                        <xsd:restriction base="xsd:nonNegativeInteger"/>


                                </xsd:simpleType>
                        </xsd:element>
                        <xsd:element name="MovementToken" minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>
ID of the movement as defined by the protocol eg SCOOT Link letter
RTIG T008 and T031 specify a maximum movement number of 31.
To allow for implementations that are not required to comply with T008 or T031 there is no restriction to
the maximum number </xsd:documentation>
                                </xsd:annotation>
                                <xsd:simpleType>
                                        <xsd:restriction base="xsd:string">
                                                <xsd:maxLength value="2"/>
                                        </xsd:restriction>
                                </xsd:simpleType>
                        </xsd:element>
                        <xsd:element name="Registration" type="MovementPointStructure"
minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Registration Trigger Point (RTIG
T008: Type - 0) </xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
```

```
                        <xsd:element name="Request" type="MovementPointStructure"
minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Request Trigger Point (RTIG T008:
Type - 1)</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="Clear" type="MovementPointStructure"
minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Registration Trigger Point (RTIG
T008: Type - 2)</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="AdditionalTriggerPoint"
type="MovementPointStructure" minOccurs="0" maxOccurs="unbounded">
                                <xsd:annotation>
                                        <xsd:documentation>For use with additional Trigger
Point requirements not described by RTIG T008</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="Services" minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>List of bus routes using this
movement</xsd:documentation>
                                </xsd:annotation>
                                <xsd:complexType>
                                        <xsd:sequence>
                                                <xsd:element name="Service"
type="ServiceStructure" maxOccurs="unbounded"/>
                                        </xsd:sequence>
                                </xsd:complexType>
                        </xsd:element>
                </xsd:sequence>
        </xsd:complexType>
        <xsd:complexType name="DoorEventStructure">
                <xsd:annotation>
                        <xsd:documentation>TfL Enhancement to handle where a bus has to stop
close to a junction.</xsd:documentation>
                </xsd:annotation>
                <xsd:sequence>
                        <xsd:element name="StopCondition">
                                <xsd:annotation>
                                        <xsd:documentation>either 0,1 or 2 to identify the state
of the door</xsd:documentation>
                                </xsd:annotation>
                                <xsd:simpleType>
                                        <xsd:restriction base="xsd:nonNegativeInteger">
                                                <xsd:enumeration value="0">
                                                        <xsd:annotation>
```

```
                                                <xsd:documentation>Door
Condition 0</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:enumeration>
                                        <xsd:enumeration value="1">
                                                <xsd:annotation>
                                                <xsd:documentation>Door
Condition 1</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:enumeration>
                                        <xsd:enumeration value="2">
                                                <xsd:annotation>
                                                <xsd:documentation>Door
Condition 2</xsd:documentation>
                                                </xsd:annotation>
                                        </xsd:enumeration>
                                </xsd:restriction>
                        </xsd:simpleType>
                </xsd:element>
                <xsd:element name="PointOffsetDistance" minOccurs="1">
                        <xsd:annotation>
                                <xsd:documentation>Geofence distance from the Point
Location in metres (max 99 metres)</xsd:documentation>
                        </xsd:annotation>
                        <xsd:simpleType>
                                <xsd:restriction base="xsd:nonNegativeInteger">
                                        <xsd:minInclusive value="0"/>
                                        <xsd:maxInclusive value="99"/>
                                </xsd:restriction>
                        </xsd:simpleType>
                </xsd:element>
        </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="ServiceStructure">
        <xsd:annotation>
                <xsd:documentation>Define bus services</xsd:documentation>
        </xsd:annotation>
        <xsd:sequence>
                <xsd:element name="OperatorRef" type="xsd:string">
                        <xsd:annotation>
                                <xsd:documentation>Operator Code used in downstream
systems if not NationalOperatorRef.</xsd:documentation>
                        </xsd:annotation>
                </xsd:element>
                <xsd:element name="NationalOperatorRef"
type="NationalOperatorCodeType">
                        <xsd:annotation>
                                <xsd:documentation>Unique national identifier of
operator.</xsd:documentation>
                        </xsd:annotation>
```

```
                        </xsd:element>
                        <xsd:element name="PublicServiceName" type="xsd:string">
                                <xsd:annotation>
                                        <xsd:documentation>Text to identify the
Service.</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="ServiceCode" type="ServiceCodeType"
minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Code that uniquely identifies the
Service. Could be LineRef or TicketMachineServiceCode or other reference that uniquely identifies the
bus route that UTC can match requests to</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="DirectionRef" type="DirectionRefEnumeration"
minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Reference to DIRECTION of
journey.</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="Mode" type="VehicleModesEnumeration"
default="bus" minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Transport Mode of service. Default
is Bus.</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                </xsd:sequence>
        </xsd:complexType>
        <xsd:complexType name="MovementPointStructure">
                <xsd:annotation>
                        <xsd:documentation>Details for each location at which a priority request is
triggered</xsd:documentation>
                </xsd:annotation>
                <xsd:sequence>
                        <xsd:element name="MovementPointStructureDescription" type="xsd:string"
minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Textual Description for the trigger
(Eg. "end of slip" "before corner")</xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="PointRef" type="xsd:string"/>
                        <xsd:element name="Direction" type="HeadingStructure" minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Direction of travel - for restricting
triggers</xsd:documentation>
                                </xsd:annotation>
```

```
                        </xsd:element>
                </xsd:sequence>
        </xsd:complexType>
        <xsd:complexType name="HeadingStructure">
                <xsd:annotation>
                        <xsd:documentation>Define direction of travel to use as a
filter</xsd:documentation>
                </xsd:annotation>
                <xsd:sequence>
                        <xsd:element name="Heading" type="AbsoluteBearingType">
                                <xsd:annotation>
                                        <xsd:documentation>Degrees from "North" (Eg. 270 =
Westbound) </xsd:documentation>
                                </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="HeadingMask" minOccurs="0">
                                <xsd:annotation>
                                        <xsd:documentation>Tolerance (Eg. 40 = 20 deg either
side of heading)</xsd:documentation>
                                </xsd:annotation>
                                <xsd:simpleType>
                                        <xsd:restriction base="xsd:nonNegativeInteger">
                                                <xsd:minInclusive value="0"/>
                                                <xsd:maxInclusive value="180"/>
                                        </xsd:restriction>
                                </xsd:simpleType>
                        </xsd:element>
                </xsd:sequence>
        </xsd:complexType>
        <!--=====Structures to align with TransXChange
================================================================================-->
        <xsd:simpleType name="NationalOperatorCodeType">
                <xsd:annotation>
                        <xsd:documentation>Identifying code for the operator, conforming to a
national scheme.</xsd:documentation>
                </xsd:annotation>
                <xsd:restriction base="xsd:NMTOKEN"/>
        </xsd:simpleType>
        <xsd:simpleType name="ServiceCodeType">
                <xsd:annotation>
                        <xsd:documentation>Identifying code for a particular
service.</xsd:documentation>
                </xsd:annotation>
                <xsd:restriction base="xsd:string"/>
        </xsd:simpleType>
        <xsd:simpleType name="VehicleModesEnumeration">
                <xsd:annotation>
                        <xsd:documentation>Modes of transport applicable to timetabled public
transport.</xsd:documentation>
                </xsd:annotation>
```

```
                <xsd:restriction base="xsd:NMTOKEN">
                        <xsd:enumeration value="air"/>
                        <xsd:enumeration value="bus"/>
                        <xsd:enumeration value="trolleyBus"/>
                        <xsd:enumeration value="coach"/>
                        <xsd:enumeration value="ferry"/>
                        <xsd:enumeration value="funicular"/>
                        <xsd:enumeration value="metro"/>
                        <xsd:enumeration value="rail"/>
                        <xsd:enumeration value="tram"/>
                        <xsd:enumeration value="underground"/>
                </xsd:restriction>
        </xsd:simpleType>
        <xsd:simpleType name="DirectionRefEnumeration">
                <xsd:annotation>
                        <xsd:documentation>Reference to DIRECTION of
journey.</xsd:documentation>
                </xsd:annotation>
                <xsd:restriction base="xsd:NMTOKEN">
                        <xsd:enumeration value="inbound"/>
                        <xsd:enumeration value="outbound"/>
                        <xsd:enumeration value="inboundAndOutbound"/>
                        <xsd:enumeration value="circular"/>
                        <xsd:enumeration value="clockwise"/>
                        <xsd:enumeration value="antiClockwise"/>
                </xsd:restriction>
        </xsd:simpleType>
</xsd:schema>
```