



PubTrans Real-time Output Interface User Guide

Document identity: UM-PT/I/ROI/3
Revision: C
Date: 2013-09-19

Title
PubTrans Real-time Output Interface - User Guide

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2(91)

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Document identity
UM-PT/I/ROI/3

Date
2013-09-19

Revision
C

PubTrans Real-time Output Interface User Guide

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Revision History

Revision	Date	Update	Updated by
A	2006-09-29	.	Ulf Bjersing
B	2007-03-29	Added chapters Setting up subscriptions and Subscription Messages Overview.	Martin Elvheim
C	2013-09-19	Corrected ROI 3.0 database, minor update of Date and Time. Typos and layout fixes.	-

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1 Introduction

This user guide contains information that supplements the interface specification [IS-PT/I/ROI/3]. The document contains the following parts:

Chapter 1 Introduction contains a short introduction of how ROI relates to client applications.

Chapter 2 Production Data gives a general understanding of the data model used in ROI.

Chapter 3 Interpreting State explains in more detail the state model for arrivals and departures, and how the state model can be utilised in client applications.

Chapter 4 Presenting Deviations and chapter 5 Presentation Rules provide recommendations for passenger information systems utilising ROI data.

Chapter 6 Use Cases presents a number of specific use case and applications examples.

Chapter 7 contains basic concepts for understanding how date and time are handled in PubTrans.

Appendix 1 describes the table layout of the RDA database for ROI 3.

1.1 ROI in brief

1.1.1 ROI Concepts

The Real-time Output Interface (ROI) version 3 introduced with PubTrans 5.0 provides a powerful mechanism to provide data to almost any type of information system that need real-time status of the public transport operation. Examples of applications that can benefit using ROI are:

- Real-time passenger display systems.
- Systems providing deviation- and real-time passenger information over the Internet and in mobile devices.
- Operations monitoring and control systems.
- Vehicle systems where deviation- and real-time information can be used both for onboard passenger information and automatic control of operations; connection protection, interchange interval optimisation etc.

ROI is the PubTrans interface for distributing the most recent production plan, deviation messages and real-time updates which occur as an effect of control actions, vehicle monitoring, forecasts and connection protection.

ROI contains data that makes it possible to control any type of passenger information without manual interference in the client system. ROI is designed so that data can be consumed as a fully automatic process. The rich state model in ROI makes it possible for client applications to always be able to present optimal passenger information.

In order to utilise the advantages with ROI, it is essential that the user understands the data model and distribution mechanisms in ROI. ROI is described in detail in [IS-PT/I/ROI/3]. In addition, Hogia Public Transport Systems AB offers consultancy in this field.

1.1.2 Subscriptions

ROI is a subscription based interface, which means that a client application defines what data to receive. The subscription model supports both selection of type of data and scope of data. The latter means for instance to limit the subscription to certain stops and lines.

1.1.3 Real-time Output manager

It is the PubTrans subsystem Real-time Output Manager (ROM) that handles ROI subscriptions and pushes data to the subscribing applications. When a subscription starts, ROM will first provide the latest known planning of operations, i.e. the current production plan. As soon as an object in the production plan is distributed to the client, ROM starts to send real-time updates for this object. This means that the start-up time for a subscription is short, because ROM does not need to distribute a complete production plan before sending real-time updates.

1.2 Client Application Handling in Brief

To fully utilise the capacity of ROI, regardless of using the XML-stream directly or using a database, the designer of the client application must fully understand the data model in ROI.

Here are some high level guidelines:

- ROI-data does not need validation in client systems. PubTrans guarantees that data is already validated from a syntactical and structural point of view.
- It is recommended that client systems are designed to accept and handle data received through ROI. The reason is to ensure that all information system behave identical and show identical information to users (passengers and staff). It is not recommended that client systems impose limitations or special rules that contradict the data- and state model in ROI.
- A client application must be able to handle received ROI-data fast enough. A subscription with a large scope can result in thousands of messages per minute. Required capacity for processing ROI data shall therefore be considered carefully. Network bandwidth shall also be considered.
- Due to the very different needs of information and capabilities in presentation systems, the handling of all presentation logic regarding for instance relative importance of information, repetition rate, exposure time and similar must be handled in the presentation system. It is recommended that the parameters for controlling this behaviour in the presentation system are flexible and configurable.

1.2.1 Stream or database?

The XML-stream can be consumed directly by an application or be stored in a database from which the application retrieves data. Request driven applications will presumably benefit from accessing a database, while event driven applications can use the XML-stream directly. Storing data in a database is also necessary to keep a record of real-time events.

A suggested database layout that could be used by a client system is presented in a later chapter. The client system updates this database according to data provided through the ROI XML-stream.

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1.2.2 XML—Stream Interface

Data exchange is using XML-streams, which in essence are endless XML-files written in real-time over a TCP-connection. This is an efficient way of providing data compared to for instance. XML-streams are described in [IS-PT/I/ROI/3]

1.2.3 ROI Database Adapter (RDA)

In some situations client applications are better of working with an externally maintained database than using the XML streams directly or working with a built-in database. A PubTrans adapter is available for this purpose. It is called ROI Database Adapter (RDA) and stores real-time data received through ROI to a persistent storage accessible to client applications.

2 Production Data

This chapter describes the Production Plan in PubTrans and specifically the main objects it contain and the state model associated with these objects. A general understanding of these concepts is necessary to understand the dynamics of disruption and real-time functionality in PubTrans and to understand the data in ROI.

2.1 Introduction

A *production plan* is a specific version of the intended operation for a specific operation day. It represents the latest valid plan, frozen at a point in time defined by the user, according to local requirements.

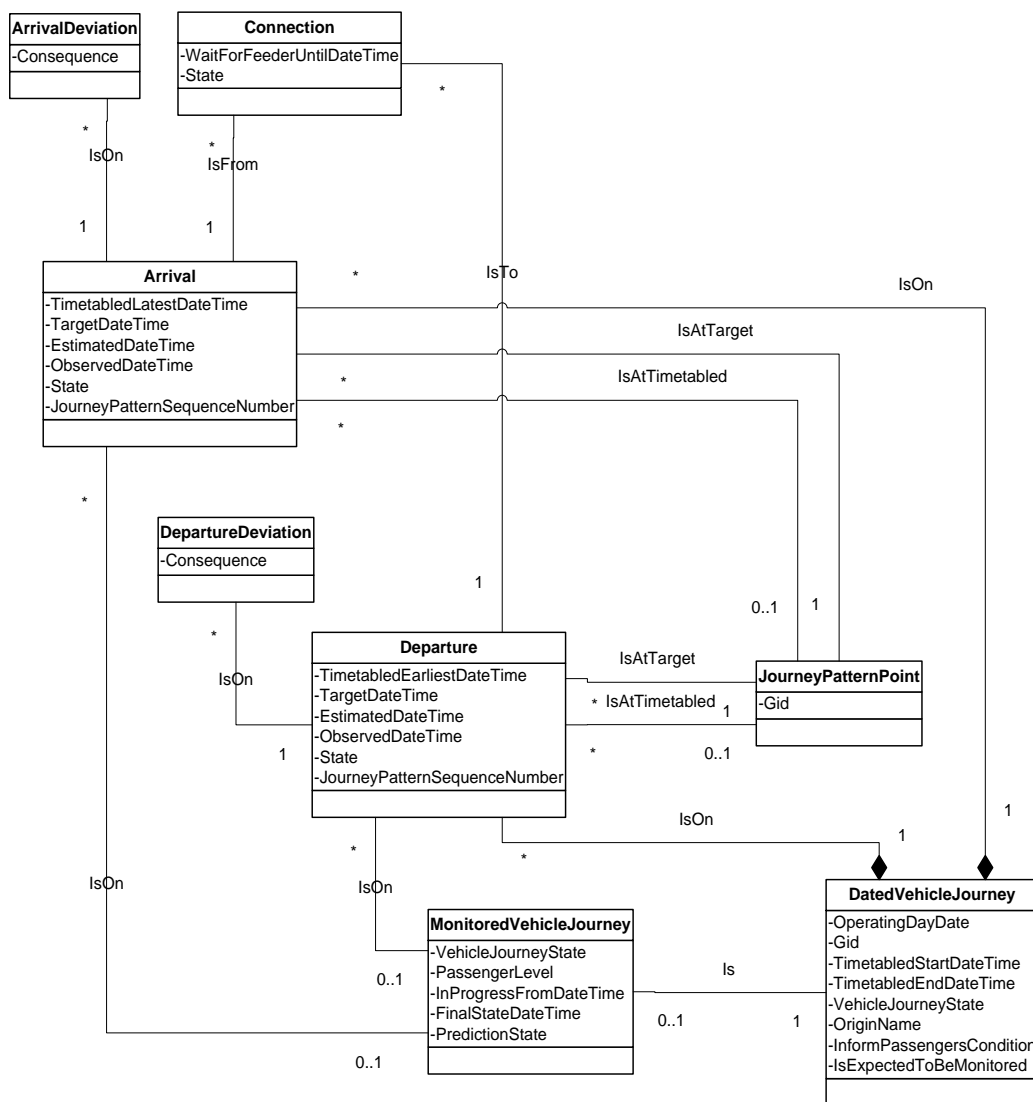


Fig. 1. Object model for the production plan

The initial production plan forms the basis for the daily operation. Control actions are applied during the operation day on the production plan according to certain rules and principles. The current production plan mirrors these changes and is the basis for applying real time reports from vehicles.

The most important content in the production plan are:

- Dated Vehicle Journeys.
- Dated Blocks, defining the sequence of Dated Vehicle Journeys to be operated by each vehicle.
- Dated Arrivals and Dated Departures, describing the arrival/departure of Dated Vehicle Journeys at individual stops.
- Dated Connections, describing the matching pairs of a Dated Arrival on one Dated Vehicle Journey with a Dated Departure of another Dated Vehicle Journey where interchange shall be monitored.
- Deviation Cases with reference to Deviation Messages, scope and status of approval.
- Deviations applied to Dated Calls or Dated Vehicle Journeys as data changes and/or state changes.

These objects are described in detail in the following sections.

2.2 Vehicle Journeys

2.2.1 Dated Vehicle Journey

A *dated vehicle journey* is a vehicle journey that shall be operated on a specific operating day. The dated vehicle journey can be either long term planned, i.e. a *normal dated vehicle journey*, or short term planned, i.e. an *extra dated vehicle journey*. In PubTrans, a normal vehicle journey is an object that is provided through DII, while an extra dated vehicle journey is created as a control action submitted through RII.

2.2.2 Monitored Vehicle Journey

A *monitored vehicle journey* describes a journey recognised as being in process, at the time of the vehicle monitoring. In PubTrans, a monitored vehicle journey will be related to a *dated vehicle journey*. This means that monitoring and states will be based on the dated vehicle journey present in the latest valid plan.

In PubTrans, a monitored vehicle journey is always associated with a physical vehicle that can be monitored through a vehicle detection system of any kind.

PubTrans creates a monitored vehicle journey when the first progress report referencing a particular dated vehicle journey is received through VSI from an external vehicle detection system. From that point, the state of the monitored vehicle journey is continuously updated according to subsequent progress reports submitted via VSI (see state diagram below). A dated vehicle journey can only have one monitored instance.

As long as the monitored vehicle journey is not completed, there is always some uncertainty regarding the quality of detection of vehicle movement. In order for a consumer system to detect this, state machines include states for un-normal operation.

To start progress monitoring in PubTrans, it is strongly advisable that the vehicle monitoring system sends its first progress report when the vehicle is ready to board at the initial terminus, which means before the actual departure. This is information that can be used by display systems at terminals and by the operations control to get information that the vehicle is at the first stop ready to board and depart.

If PubTrans receives a progress report regarding a dated vehicle journey that is not yet assigned, PubTrans makes an implicit assignment and starts to monitor the vehicle journey.

2.2.3 States

The figure below shows the combined states of a dated vehicle journey (white) and a monitored vehicle journey (grey).

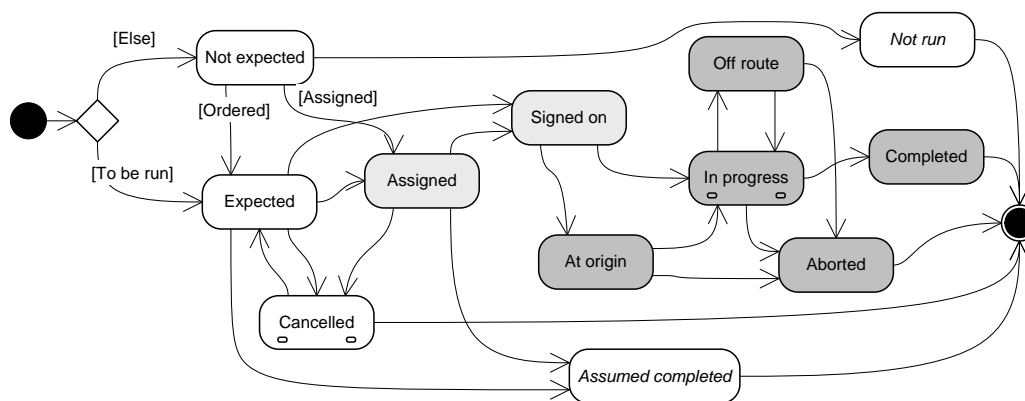


Fig. 2. Vehicle journey states

Initially, a dated vehicle journey can be either **not expected** or **expected**. This has to do with if the vehicle journey originally was scheduled to run or to be ordered. A vehicle journey that was scheduled to be ordered is not expected to run until explicitly ordered. Usually, a dated vehicle journey that is not expected shall not be presented or be presented with the conditions to order it.

The **assigned** state tells the client system that now there is a vehicle assigned to run the dated vehicle journey. Assignments can be made in advance by the operations control to allocate a specific vehicle to work certain dated vehicle journeys.

A dated vehicle can also be **cancelled**, and the cancellation can optionally be revoked.

PubTrans sets states based on progress reporting through VSI and RII. Initially, the assignment of a vehicle journey can be confirmed by the driver, which is indicated by the state **signed on**. As soon as the first progress report is received in VSI, PubTrans starts vehicle journey monitoring by creating a monitored vehicle journey. If the report indicated an arrival at the first stop the initial state will be **at origin**. If the report indicated a departure from the first or later stop or if it indicated an arrival at a later stop the state is set to **in progress**.

If the vehicle system detects that a vehicle is not following the expected route, it can change the state to **off route**.

If the vehicle finally reaches its destination, the vehicle journey receives the state **completed**, else it is **aborted**. Once in progress, a cancellation or sign off will be regarded as the monitored vehicle journey has been aborted. If an aborted dated vehicle journey is resumed again, PubTrans will create a new instance of a monitored vehicle journey.

2.2.3.1 Implicit states

If an expected vehicle journey is not cancelled and never becomes in progress, it should at some point in time be considered as **assumed completed**. If a not expected dated vehicle journey is never run, it should at some point in time be considered as **not run**. This could for instance be the time when the deadline for ordering expires.

2.2.3.2 In progress sub states

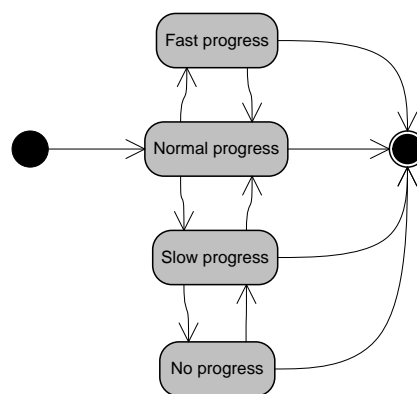


Fig. 3. Sub states of the *in progress* state for a monitored vehicle journey.

The **in progress** state has several sub states, telling the current state of progress. If, for instance the vehicle has been stuck in congestion, this could be indicated by **slow progress** or **no progress**. This state can be used to update passenger expectations further along the route.

2.3 Arrivals and Departures

An arrival and departure at a point in journey pattern on a dated vehicle journey has four different types of data associated with them:

- The timetabled data, representing the initial planned schedule.
- The target data, representing the most recent plan available for passenger information purposes. This is initially equal to the timetable data, but can be updated in real-time as a consequence of re-planning, optimisation or forecasts.
- The estimated data, representing the most recent best guess, based on forecasts made by PubTrans or an external system.
- The observed data, representing the actual performance as recorded by a vehicle monitoring system.

Dated arrivals and departures have a state model consisting of super states for the dated vehicle journey and different sub states for the call. A client application must inspect these states and update passenger information accordingly.

2.3.1 Arrival

An arrival describes the part of a call up to that a vehicle have arrived to a stop point (or passed it). A *dated arrival* contains the original and last valid plan for an arrival. In addition, a *monitored arrival* contains supplementary data based on vehicle monitoring such as observed arrival.

2.3.1.1 Timetabled Arrival

The timetabled latest arrival time and the timetabled point in a journey pattern describe when and where the arrival was initially scheduled.

Sometimes the initial point in journey pattern cannot be decided in the planning phase. In this case, the stop point could be an imaginary stop point, and the physical stop point is assigned in real time.

2.3.1.2 Target Arrival

The targeted latest arrival time and the journey pattern point intended for the arrival are initially equal to the timetable data, but can be updated in real-time as a consequence of short term re-planning, optimisation or forecasts.

The targeted journey pattern point is the most recent plan to what stop point a vehicle will arrive at.

2.3.1.3 Estimated Arrival

The estimated arrival time is the mean time as forecasted by PubTrans (or external system). This time is the most recent best guess.

2.3.1.4 Observed Arrival

The observed arrival time is the actual arrival time as recorded by a vehicle monitoring system. PubTrans will not set this time unless a progress report with an explicit time is received.

2.3.1.5 States

The figure below shows the combined states of a dated arrival (white) and a monitored arrival (grey).

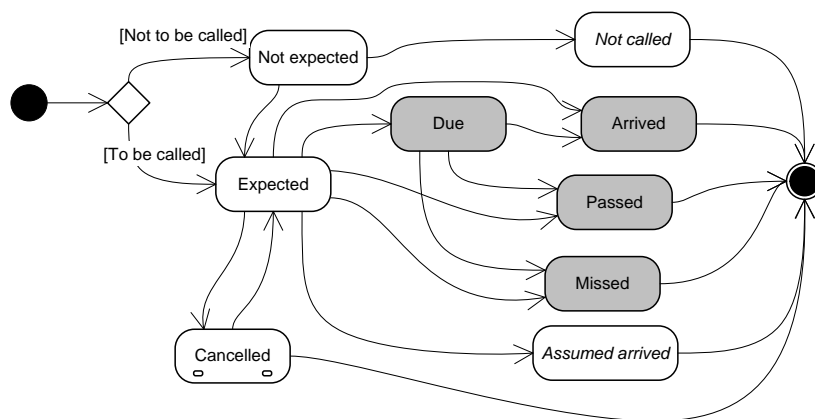


Fig. 4. Arrival states

Initially, an arrival can be either **not expected** or **expected**. This has to do with if the specific arrival originally was scheduled to be called at or to be ordered. If a dated vehicle journey is not expected, then all arrivals are also not expected. On the other hand, if a vehicle journey is scheduled to be expected, there may still be individual arrivals that shall be ordered and therefore have the state not expected. An arrival that was scheduled to be ordered is not expected to be called until explicitly ordered. Usually, an arrival that is not expected shall be presented with the conditions to order it or not be presented at all.

Just before arrival the arrival may optionally get the state **due**, which means that the vehicle is just about to arrive or pass. The timing of when a vehicle is due is up to the vehicle monitoring system to decide. This is an optional state that requires that the automatic vehicle location system is capable of provide such information.

An arrival can finally be **not called**, **arrived**, **passed** or **missed**. The not called-state and the missed-state will be set for all arrivals where an arrived- or passed-state is missing when PubTrans receives a progress report further down the route. A missed-state means that a call was expected and that a vehicle implicitly is arrived or passed, but there was no observation recorded. A not-called-state is set when the no call was recorded and the stop was not expected to be called.

2.3.1.6 Implicit states

If an expected dated arrival is not cancelled and not is monitored, it will at some point in time be considered as **assumed arrived**. If a not expected dated arrival is never called, it will at some point in time be considered **not called**. This could for instance be the time when the deadline for ordering expires.

2.3.1.7 Cancelled sub states

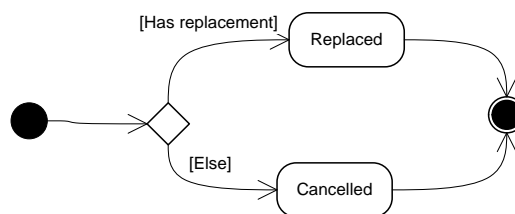


Fig. 5. Cancelled sub states for arrival

A cancelled arrival can **replaced**, which means that alighting is cancelled and replaced by an arrival of another vehicle journey, or **cancelled**, which means that the possibility to alight at the stop is not possible or not permitted.

2.3.2 Departure

A *departure* contains the last valid plan for a departure. In addition, a departure contains supplementary data based on vehicle monitoring.

2.3.2.1 Timetabled Departure

The timetabled earliest departure time and the timetabled point in a journey pattern describe when and where the departure was initially scheduled.

Through the departure object it is also possible to find the relevant destination texts that shall be presented.

2.3.2.2 Target Departure

The targeted earliest departure time and the journey pattern point intended for the departure are initially equal to the timetable data, but can be updated in real-time as a consequence of short term re-planning, optimisation or forecasts.

The targeted journey pattern point is the most recent plan to what stop point a vehicle will depart from.

2.3.2.3 Estimated Departure

The estimated departure time is the mean time as forecasted by PubTrans (or external system). This time is the most recent best guess.

2.3.2.4 Observed Departure

The observed departure time is the actual departure time as recorded by a vehicle monitoring system. PubTrans will not set this time unless there is a progress report received with an explicit time.

2.3.2.5 States

The figure below shows the combined states of a dated departure (white) and a monitored departure (grey).

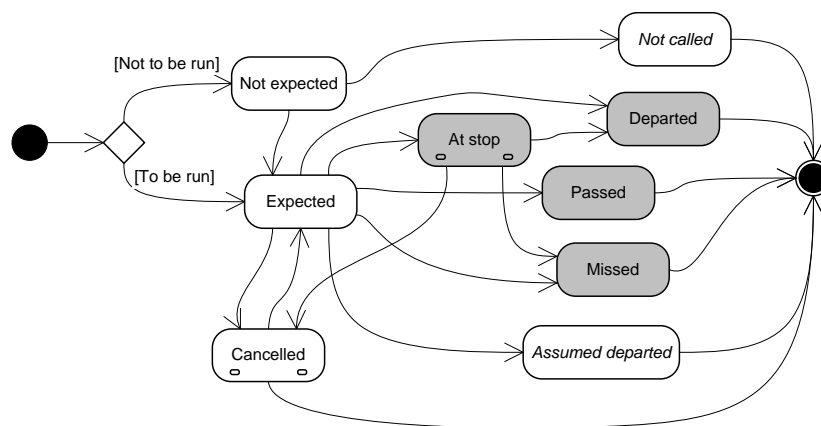


Fig. 6. Departure states

Initially, a dated departure can be either **not expected** or **expected**. This has to do with if the specific departure originally was scheduled to be called at or to be ordered. If a dated vehicle journey is not expected, then all departures are also not expected. On the other hand, if a vehicle journey is scheduled to be expected, there may still be individual departures that shall be ordered and therefore have the state not expected.

When a vehicle has arrived the dated departure receives the state **at stop**. When the vehicle leaves the stop it receives the state **departed**. If the vehicle passes without stopping, the departure will be flagged as **passed**.

The **not called** state and **missed**-state will be set for all departures where a departed or passed-state is missing if PubTrans receives a progress report further down the route. A missed-state means that a call was expected but there was no observation recorded. All the final states can be used for clear-down of a departure board.

2.3.2.6 Implicit states

If an expected dated arrival is not cancelled and not is monitored, it will at some point in time be considered as **assumed departed**. A departure that was scheduled to be ordered is not expected to be called until explicitly ordered. Usually, a dated departure that is not expected shall be presented with the conditions to order it or not be presented at all. If a not expected departure is never called, it will at some point in time be considered **not called**.

2.3.2.7 Cancelled sub-state

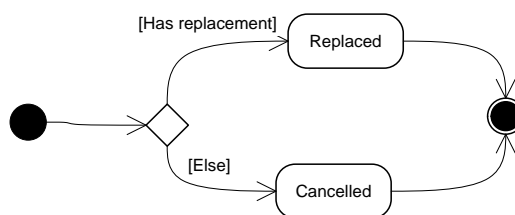


Fig. 7. Cancelled sub states for departure

A cancelled departure can be **replaced**, which means that boarding is cancelled and replaced by a departure of another vehicle journey, or **cancelled**, which means that the possibility to board at the stop is not possible or not permitted.

2.4 Connections

2.4.1 Connection

A *connection* is the intended meeting of two vehicles to exchange passenger. The arriving vehicle is called a *feeder*, and the departing vehicle is called a *fetcher*. A connection is always one-way. If the vehicles shall exchange passengers in both directions, this is expressed as two connections.

A *dated connection* is a connection between a dated arrival and a dated departure. A dated connection specifies the time the fetcher maximum should wait. This value can be updated in real time through control actions.

2.4.2 States

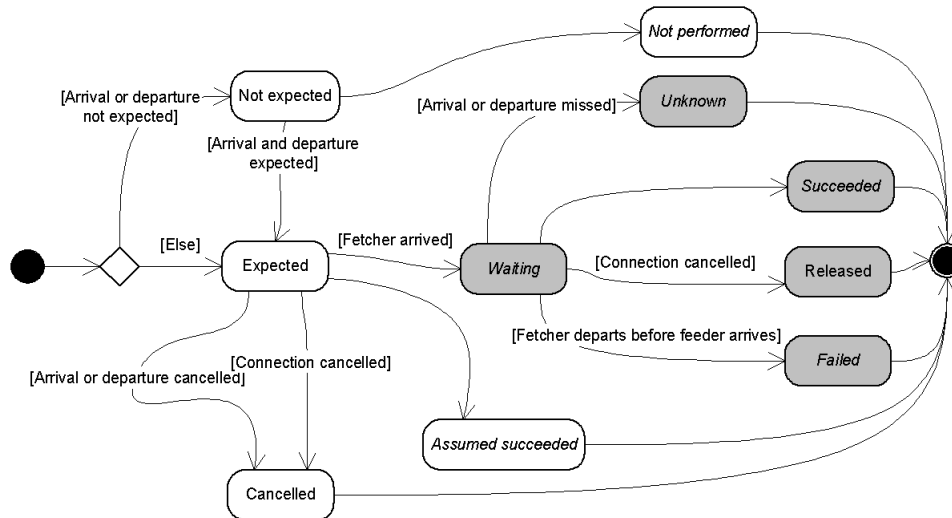


Fig. 8. Dated and monitored connection states

States are maintained for dated connections and monitored connections. States for dated connections are affected by short term operation control, i.e. control actions. States for monitored connections are also affected by vehicle monitoring and forecasts.

If the feeder arrival or fetcher departure is not expected, then the connection itself has the initial state **not expected**, otherwise it is initially **expected**.

A connection can be **cancelled** for several reasons; as a consequence that the feeder arrival is cancelled, or as the fetcher departure is cancelled, or the connection itself is cancelled.

An **expected** connection has the implicit state **waiting** as soon as the fetcher's arrival at the stop has been detected and its planned earliest departure time has passed.

A monitored connection can also for some reason be **released** before the feeder arrives. This is accomplished with a Connection Cancellation control action.

2.4.2.1 Implicit Final States

Final states for connections are not set by the Connection Protection Manager (CPM). This has to do with that it is difficult to know when a final state can be set during an operation day. Instead these can be deducted when analysing connections afterward:

If a dated connection was never monitored: if it has state **not expected**, its final state shall be interpreted as **not performed**; otherwise, if the state is not **cancelled**, it shall be interpreted as **assumed succeeded**.

The **failed** state can be deducted as when the fetcher has departed before the feeder's arrival (possibly with consideration to a minimal interchange time).

The **unknown** state can be deducted as when either the arrival or the departure has the state **missed**. In this case, it is not possible to conclude whether the connection succeeded or failed.

If a monitored connection not has a state **failed**, **released** or **unknown**, the final state shall be interpreted as **succeeded**.

2.5 Dated Blocks

A *dated block* defines a sequence of dated vehicle journeys that should be operated by one logical vehicle on a particular day.

2.5.1 State model

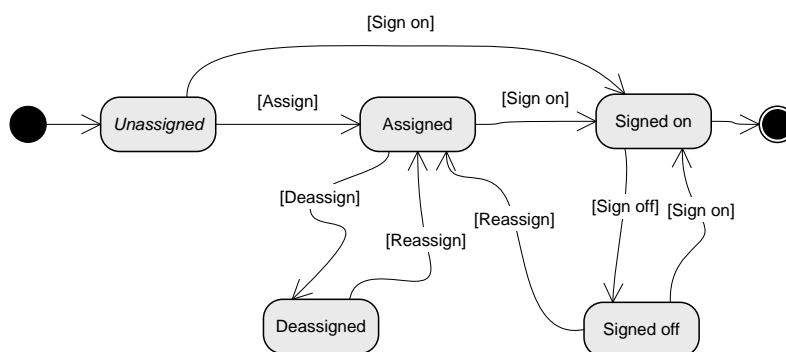


Fig. 9. Dated block state model

When a vehicle is allocated to work on a dated block it becomes **assigned**. When a vehicle is deassigned from the dated block, it then becomes **deassigned**. A vehicle can be reassigned to a dated block, which then becomes **assigned** again.

A vehicle sign-on is the confirmation from the driver that the assignment is accepted. The state of the dated block becomes **signed on**. When the driver signs off or when the driver signs on to another block, the dated block becomes **signed off**. Also in this state, a vehicle can be reassigned to a dated block, which then becomes **assigned** again.

2.5.1.1 Implicit states

A dated block is to be considered as **unassigned** until an assignment or sign-on is made.

2.6 Deviation Case

A *deviation case* is the container for all information that concerns a specific deviation. The first part of this chapter describes the different aspects of a deviation case.

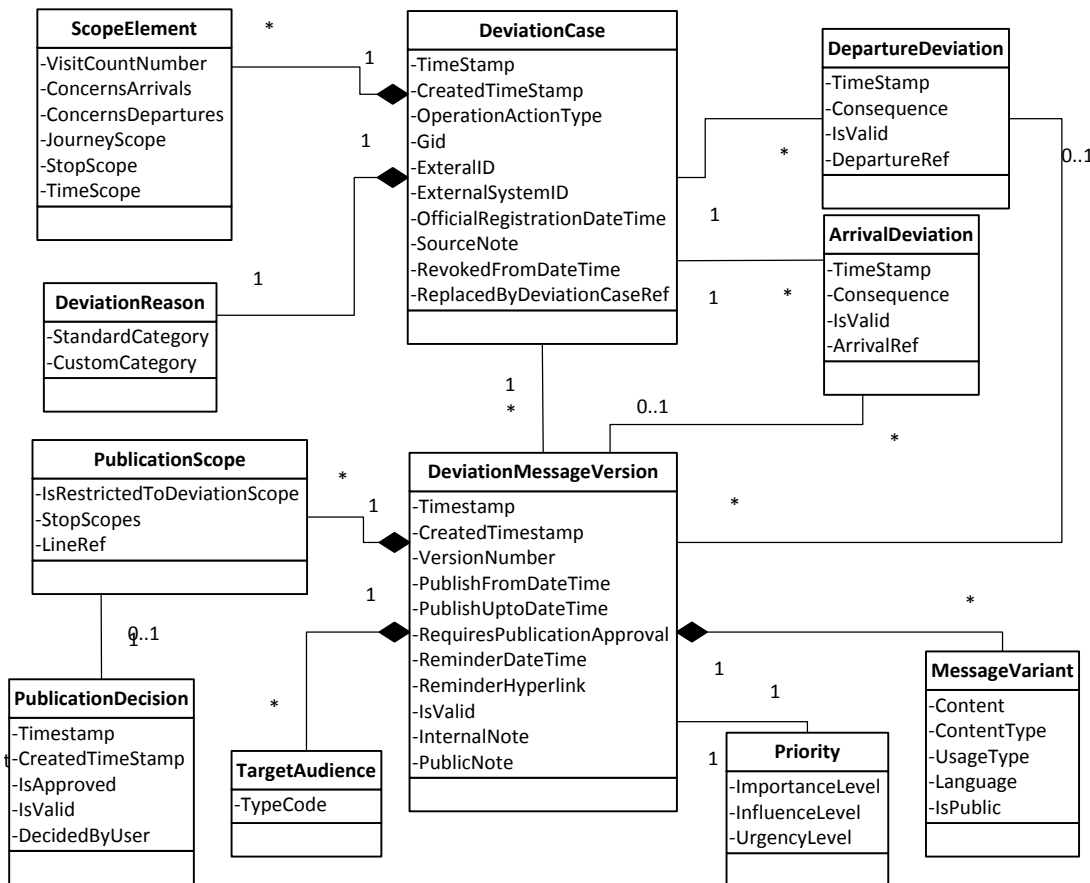


Fig. 10. Logical structure for a deviation case

The deviation case includes:

- The *identity* of the case, which also is exposed to both submitting systems and consuming systems.
- Administrative data about who has created the case and when the case has been created.
- The *reason* behind the deviation case.
- An optional *deviation message* with variants to suit different media.
- The *target audience* that shall have the message, e.g. passengers, drivers etc.
- The *priority* of the deviation message.

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- The *scope* to publish the deviation message in.
- An *operation action*, which can be either a *control action* that describe a short term temporary change in the operation, or an *information action* that is information only.
- The *scope* for the control action, i.e. what part of the operation it applies to.

These items are described in detail in the following sections. Deviation Message is described in section 2.7.

2.6.1 Master- and Sub Cases

Deviation cases can be grouped, which can help to manage cases that relates to each other. The purpose of the grouping is entirely up to the user.

In ROI the grouping is exposed to other applications. This means that all applications using ROI also will see what deviation cases that are grouped together.

2.6.2 Reason for Deviation

Behind a deviation there is a reason, and it is generally a good idea to provide this reason, because it sometimes helps both staff and passengers to understand the consequences, and act accordingly. Examples of reasons for a deviation are vehicle breakdown, shortage of vehicles, no driver, accident, driving the wrong way, assault, strike, traffic congestion, weather conditions.

2.6.3 Scope

A *scope* defines a part of the operation, i.e. a set of arrivals and departures. The set can be expressed in many ways, which not is presented here. Details are found in the RII XML-schemas.

2.6.3.1 Types of Scope

A deviation case has two different types of scope:

- The *operation actions scope*, which is the scope that applies for control actions and information actions. This scope defines what part of the operation that is directly affected. Each control action has its special type of operation action scope.
- The *publication scope*, which is the scope for deviation messages. This scope defines what passengers that are affected by the deviation, i.e. to where the deviation message shall be distributed or announced. This is a general expression containing one or several lines. For each line, it is possible to limit the scope to certain stop points.

2.6.3.2 Scope Categories

In many cases, information about a deviation is intended for persons needing information about departures only or arrivals only. A scope is therefore divided into two main categories:

- Departures.
- Arrivals.

By pointing out the arrivals and departures as separate entities, information can be addressed specifically to boarding or alighting passengers.

2.6.4 Closing a Deviation Case

To close a deviation case means to shorten its validity to 'now'. This has the effect that the end validity of the deviation messages in the case is passed, and that the deviation messages should not be presented any longer. Some types of control actions are also affected by closing a deviation case.

When a deviation has expired, it is sometimes not sufficient to just remove the deviation message, but the passengers must be informed that the operation is normal again. Using PubTrans, this can be made in two different ways:

- By updating the existing deviation case with a new deviation message, and a new validity. This method takes effect immediately.
- By ending the original case and creating a new deviation case with the new information. In this method, the user selects the time to finish the existing case and when the new case is valid from (usually the same time).

In both cases, the effect is that the original information is replaced from the start time of the new validity.

2.7 Deviation Message

2.7.1 Target Audience

A target audience classifies a deviation message in terms of what roles the receivers have in the public transport system.

- **Customer:** a person who is interested in information about public transportation but is not a passenger.
- **Passenger:** a person that is using the public transport system in any way, e.g. intending to travel in a near future, walking to the stop, waiting at a station, riding with a train, etc.
- **Onboard staff:** persons working onboard a public transport vehicle involved in passenger information, e.g. a bus driver, a ticket collector, a deck officer, etc.

2.7.2 Priority

The priority of a deviation message is made up of three components:

- Importance
- Influence
- Urgency

The purpose of this three dimensional classification, is to make it possible to let different client information systems take decisions about if, how, when and through what channels and media a deviation message shall be distributed.

In order to have a conformant interpretation of the three dimensions, it is recommended that the definition and use of the dimensions are consistent across all users of a PubTrans system.

2.7.2.1 Importance

This is how important a deviation message is in relation to other deviation messages. Importance is a relative entity that can support each presentation system to do the optimal within its limits. The importance gives a presentation system a hint of what message to present first or repeated more often or highlight or whatever method it takes to draw attention to the information.

2.7.2.2 Influence

This is a hint about how many persons that is influenced by a deviation. In a deviation message, the user can define a publication scope that tells what lines etc. a message shall be published on, but this does not tell how many people (customers, passengers) that are influenced. A deviation on a local bus line does not influence many people, while a deviation on a central metro line does.

With the level of influence it is possible to classify a deviation message in a number of generic levels of how many people that is influenced by a deviation. The level of influence can be used by presentation systems to select if a message shall be presented or not on specific media. For instance, messages that influence many people usually are presented in media for mass communication.

2.7.2.3 Urgency

This is a hint of how fast information about a deviation shall reach the receivers. The level of urgency defines the priority for distribution of information. When the level of urgency is high, this may imply that the information shall be distributed using fast ways to reach the receivers, e.g. SMS to mobile phones, speaker calls at stations etc.

2.7.3 Message Variants

Despite the general principle in PubTrans of not providing device specific formatting of information, it is not possible for a one-size-fits-all format either. An example is when information shall be provided as both text and audio. Although there exists ways to synthesise speech from text, this is not always available, so instead text and audio have to be provided in parallel. Another example is that some media is forgivable for verbose information, while other requires that the information is very compact. To deal with this, it is possible to provide optional message variants of the content that shall be presented.

To each deviation message, any number of message variants can be appended. The message variants to provide in each case are up to the providing system to decide. However, in order to provide presentation systems in a consistent way, it is recommended that a PubTrans user define a standard set of message variants that all providers of deviation reports shall support.

The message variants have three main properties:

- Some content.
- A content type that tells the consumer how to interpret the content. Example: 'text/plain' or 'urn/mp3', the last one describing that the content is a hyperlink to an mp3 audio file.
- A usage type that tells the consumer of recommended usage of the content, i.e. if it is adapted to media with some limitation, for instance short texts adapted for displays with limited number of characters. Example: 'audio/short', 'text/long'.

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RII defines a number of predefined message variants, and it is possible to add customised message variants if the predefined variants are not sufficient.

2.7.4 Message Approval

PubTrans distinguishes between submitting a deviation report and the approval of publication of the deviation message in the report. The idea is that it shall be easy for many involved persons to provide information that something has happened but only possible for authorised persons to approve publication of information about it.

When a user submits a deviation message where the user have publication rights for the lines as defined in the deviation case publication scope, the publication can be approved in the same report.

A user can also submit a deviation message with a scope that includes lines for which the user does not have publication rights. In this case, the deviation message will only be flagged as approved for the lines the user has publication rights for. For the other lines, the deviation message will be flagged as not approved for publishing. Such messages shall not be presented to the selected target audience.

A user with special rights can bypass the publication approval mechanism by submitting a deviation message that is marked as not needing publication approval. In that case the deviation message should be published in the selected publication scope regardless of any publication decision.

3 Interpreting states

This chapter explains in more detail the state model for arrivals and departures, and how it can be utilised in client applications using data received through Real-time Output Interface (ROI). The state model is described in detail in [IS-PT/I/ROI/3].

Real-time information means to have the latest available status of the operation. ROI has a rich state model, which makes it possible for a client application to act on a number of different events. It is therefore essential that an implementer of a client application understands the state model. Missing aspects of the state model means that a client application might not be consistent with the state of the transport system as reported to PubTrans.

ROI is stateful, which means that each combination of state needs to be examined in order to know the actual state of an arrival and a departure. Client applications usually need to store the last known state for each vehicle journey, arrival, departure and connection.

3.1 State Attributes

The table below lists the attributes that are part of the state model in ROI. Later in this chapter, it is explained how the combination of these states shall be interpreted.

Object	Attribute	Comment
Dated Vehicle Journey	State	The state of the vehicle journey until it becomes monitored.
Monitored Vehicle Journey	State	The state of the vehicle journey from the point it becomes monitored. This state has precedence over the dated vehicle journey state.
	Prediction state	State of quality of vehicle monitoring/forecast.
Arrival	Type	Used to find out if the arrival shall be presented to passengers or not.
	State	The state of the specific arrival. This state can be overridden by the vehicle journey state.
	Observed datetime	Undefined until an actual arrival has been observed.
Departure	Type	Used to find out if the arrival shall be presented to passengers or not.
	State	The state of the specific departure. This state can be overridden by the vehicle journey state.
	Observed datetime	Undefined until an actual departure has been observed.

Object	Attribute	Comment
Connection	State	The state of the specific connection.
	Wait for Feeder until date/time	Initially is a value based on the planned connection and then can be changed by a control action.

Other attributes to consider:

- The attribute Passenger Level in object Monitored Vehicle Journey: gives a hint if the vehicle is crowded or not.
- The attribute State in object Vehicle Journey Assignment is an additional state which tells if a resource has been allocated and if a driver has confirmed this assignment.

3.1.1 Implicit States

3.1.1.1 Time out handling

Situations when reports are missing from the real time systems should be handled by the passenger information system. There should be a time-out value for clear down of departures that are long overdue according to their target departure time. The time-out value should be configurable and relate to the target departure time.

3.2 Static States

Static states are states set by the scheduling process and are the initial states. These states might be overridden by a dynamic state, e.g. by a control action or by monitoring actual vehicle progress.

Object: Attribute	States	Recommended passenger information
Arrival: Type	No stop No alighting	Do not present these arrivals to passengers.
	Stop if alighting requested Always stop	Present as normal arrivals. Stop if alighting requested means that the vehicle journey will stop only if passengers requesting it, e.g. by pressing a STOP-button.
	Flexible alighting up to here	This indicate that passengers can alight anywhere on the stretch after the previous point in the journey pattern up to and including this point. This can be treated as a Stop if alighting requested, if information about flexible stop is of no interest.

Object: Attribute	States	Recommended passenger information
Departure: Type	No stop No boarding	Do not present these departures to passengers.
	Stop if boarding requested Always stop	Present as normal departures. Stop if boarding requested means that the vehicle journey will stop only if there are passengers requesting it, e.g. by waving their hand to the driver. See also section 4.3.5
	Flexible boarding from here	This indicate that passengers can board anywhere on the stretch from this point and up to the next point in the journey pattern. This can be treated as a Stop if boarding requested, if information about flexible stop is of no interest.

3.3 Prediction State

The prediction state tells the external system to what extent target times are reliable. Possible values are **normal**, **unreliable** and **lost contact**. **Unreliable** is an indication of low prediction quality. The general rule is that target times should not be used when the prediction state is **unreliable**. More details are presented in the following sections. **Lost contact** is an indication that the AVL-system has lost radio contact with the monitored vehicle.

3.4 Departure State

A system that presents departure information must consider the vehicle journey state, the prediction state, and the departure state. Some systems may also take the arrival state **due** in consideration.

This table below contains a list of the most common state combinations and their interpretation from the perspective of passenger information for departing passengers.

Vehicle Journey State	Prediction State	Arrival State	Departure State	Recommended passenger information
Any	Any	Any	Not expected	Do not show departure at all. Some systems might instead indicate that this departure is available only if ordered.
Any	Any	Any	Cancelled	Show the departure as cancelled.
Any	Any	Any	Replaced	Show that departure is cancelled but will be replaced by another departure (possibly from another stop point).
Not expected	Any	Any	Any	Do not show departure at all, unless there is information for how the passengers can order it and the time limit for late ordering has not been passed.

Vehicle Journey State	Prediction State	Arrival State	Departure State	Recommended passenger information
Cancelled Aborted	Any	Any	Any except: Not expected Departed Passed Missed	Show departure as cancelled.
Expected Assigned Signed-On	Any	Any	Expected	Normally show target time for departure. A symbol or text indicating that the vehicle journey is not yet in progress could be added depending on presentation system configuration. If the presentation system only shows vehicles that are in progress, do not show the departure.
At origin	Any	Any	Expected	Normally show target time for departure. A symbol or text indicating that the vehicle journey is at origin, but not yet in progress could be added depending on presentation system configuration. If the presentation system only shows vehicles that are in progress, do not show the departure.
Normal progress Fast progress	Unreliable	Any except Due.	Expected	Present the current vehicle journey position, i.e. "has left station X Z minutes ago" or "currently at station Y". Systems that cannot present texts of that size should use a symbol or text indicating that the vehicle journey prediction is unreliable.
Slow progress	Unreliable	Any except Due.	Expected	Present the current vehicle journey position, i.e. "has left station X Z minutes ago" or "currently at station Y" and information that "traffic moves slowly". Systems that cannot present texts of that size should use a symbol or text indicating that the vehicle journey prediction is unreliable.
No progress	Unreliable	Any except Due.	Expected	Present the current vehicle journey position, i.e. "has left station X Z minutes ago" or "currently at station Y" and information that there is a "stop in traffic". Systems that cannot present texts of that size should use a symbol or text indicating that the vehicle journey prediction is unreliable.

Vehicle Journey State	Prediction State	Arrival State	Departure State	Recommended passenger information
Normal progress Slow progress Fast progress No progress	Normal	Any except Due.	Expected	Show target time for departure.
	Lost contact	Any except Due.	Expected	Show target time for departure and a symbol or text indicating that the vehicle journey prediction is no longer updated.
	Any	Due	Expected	Show target time for departure and/or info that vehicle is due.
	Any	Any	At stop Boarding Boarding closed	Show target time for departure and/or info that vehicle is at stop/boarding/boarding closed.
	Any	Any	Departed Passed	Do not show departure or show as departed/passed.
	Any	Any	Missed	Do not show departure.
	Any	Any	Assumed departed	Do not show departure.

3.5 Arrival State

A system that presents arrival information must consider the vehicle journey state, the prediction state, and the arrival state. In some cases the departure state must also be considered consideration.

The table below contains a list of the most common state combinations and their interpretation from the perspective of passenger information for departing passengers.

Vehicle Journey State	Prediction State	Arrival State	Departure State	Recommended passenger information
Any	Any	Not expected	Any	Do not show arrival at all. Some systems might instead indicate that this arrival is available only if ordered.
Any	Any	Cancelled	Any	Show the arrival as cancelled.
Not expected	Any	Any	Any	Do not show arrival at all, unless there is information for how the passengers can order it and the time limit for late ordering has not been passed.

Vehicle Journey State	Prediction State	Arrival State	Departure State	Recommended passenger information
Cancelled Aborted	Any	Any except Not expected Arrived Passed Missed	Any	Show arrival as cancelled.
Expected Assigned Signed-on	Any	Expected	Any	Show target time for arrival, no information or adjusted information depending on presentation system configuration. A symbol or text indicating that the vehicle journey is not yet in progress could be added depending on presentation system configuration.
At origin	Any	Expected	Any	Show target time for arrival, no information or adjusted information depending on presentation system configuration. A symbol or text indicating that the vehicle journey is at origin could be added depending on presentation system configuration.
Normal progress Fast progress	Unreliable	Expected	Any	Present the current vehicle journey position, i.e. "has left station X Z minutes ago" or "currently at station Y". Systems that cannot present texts of that size should use a symbol or text indicating that the vehicle journey prediction is unreliable.
Slow progress	Unreliable	Expected	Any	Present the current vehicle journey position, i.e. "has left station X Z minutes ago" or "currently at station Y" and information that "traffic moves slowly". Systems that cannot present texts of that size should use a symbol or text indicating that the vehicle journey prediction is unreliable.
No progress	Unreliable	Expected	Any	Present the current vehicle journey position, i.e. "has left station X Z minutes ago" or "currently at station Y" and information that there is a "stop in traffic". Systems that cannot present texts of that size should use a symbol or text indicating that the vehicle journey prediction is unreliable.

Vehicle Journey State	Prediction State	Arrival State	Departure State	Recommended passenger information
Normal progress	Normal	Expected	Any	Show target time for arrival.
	Lost contact	Expected	Any	Show target time for arrival and a symbol or text indicating that the vehicle journey prediction is no longer updated.
Fast progress	Any	Due	Any	Show that vehicle is due to arrive.
No progress		Arrived	Any but Departed	Show that vehicle has arrived.
	Any	Arrived	Departed	Do not show arrival.
	Any	Passed	Any	Do not show arrival.
	Any	Missed	Any	Do not show arrival.
	Any	Assumed arrived	Any	Do not show arrival.

4 Presenting Deviations

In addition to the state model, a client system must also handle deviations. PubTrans provides the following deviations in ROI:

- Vehicle Journey Deviations
- Arrival Deviations
- Departure Deviations

It is recommended that a presentation system have a configurable action list that map to the respective type of deviation. An action could be to show an additional symbol or showing a certain text. The text shown shall often be constructed by using ROI data filled in a text template.

Vehicle Journey Deviations hold information that apply to all arrivals and departures and should therefore be considered in addition to the Arrival and Departure Deviations that apply for a specific stop.

4.1 Using Consequences

In each deviation message PubTrans provides a so called *consequence code*. This code indicates the type of information that will be relevant to present. The table below shows some examples of how to interpret consequence codes.

Consequence Code	Applies to	Recommended passenger information
CANCELLED	Arrival Deviation	Present that this arrival is cancelled and supplement with text from Deviation Message Public Note. This information should be presented for all Departures on the same Vehicle Journey that precedes the affected Arrival. Presentation systems can thus provide extra information telling a passenger that plans to board at a stop before the affected stop; that he or she will not be able to alight at the affected stop.
CANCELLED	Departure Deviation	Present that this departure is cancelled supplement with text from Deviation Message Public Note. This information should be presented for all Arrivals on the same Vehicle Journey that succeeds the affected Departure. Presentation systems can thus provide extra information telling a person that is waiting for a passenger at a later stop that a certain vehicle journey did not pick up passengers at the affected stop.
CANCELLED	Vehicle Journey Deviation	Present all departures and arrivals on the vehicle journey as cancelled, supplement with text from Deviation Message Public Note.

Consequence Code	Applies to	Recommended passenger information
CHANGEOFFPLATFORM	Arrival Deviation Departure Deviation	Redirect passengers from this stop point to the new target stop point (Departure Target Journey Pattern Point Ref) and supplement with text from Deviation Message Public Note.
CHANGEOFVEHICLE	Arrival Deviation	Inform arriving passengers that they must leave the current vehicle and board a replacing vehicle at the platform indicated by Departure Target Journey Pattern Point Ref.
LOWCAPACITY	Vehicle Journey Deviation	Supplement the information for all departures on this vehicle journey that the vehicle used has a lower capacity than expected or use text from the Deviation Message Public Note.
HIGHCAPACITY	Vehicle Journey Deviation	Supplement the information for all departures on this vehicle journey that the vehicle used has a higher capacity than expected or use text from the Deviation Message Public Note.
NOWHEELCHAIR	Vehicle Journey Deviation	Supplement the information for all departures on this vehicle journey that wheelchair access is not possible.
NOLOWFLOOR	Vehicle Journey Deviation	Supplement the information for all departures on this vehicle journey that low floor access is not possible.
INFORMATION	Vehicle Journey Deviation	Present the information in the Deviation Message Public Note on all arrivals and departures on this vehicle journey.
INFORMATION	Arrival Deviation Departure Deviation	Present the information in the Deviation Message Public Note on this arrival/ departure.
ORDEREDJOURNEY	Vehicle Journey Deviation	Inform passengers that this service journey (which must be ordered in advance) has been ordered.
EXTRAJOURNEY	Vehicle Journey Deviation	Inform passengers that this is an additional service journey not included in the printed timetable

4.1.1 Handle Multiple Deviations Valid at the Same Time

There could be multiple Deviations valid at the same time for the same object. For instance, an arrival can have more than one valid deviation and thus several consequences. The presentation system must be able to present all these deviations, e.g. by switching between the different messages according to their relative importance.

4.1.2 Publication Decision

It is NOT necessary to verify publication decisions for information provided through Arrival, Departure or Vehicle Journey Deviations. These deviations are only distributed if they should be published.

4.2 Priority

The priority in ROI is made up of three dimensions:

- Importance, which is relative to other deviation messages.
- Influence, which is a hint of how many persons that are affected.
- Urgency, which is how fast deviation messages shall reach receivers.

The example below uses a three level scale for each dimension.

Dimension	Level	Usage
Importance	Low	General messages with content that does not affect passenger travel, at least not within the next few days, e.g. information about fare changes, planned schedule changes, general alerts and warnings etc.
	Medium	Messages affecting passenger behaviour.
	High	Special alerts and warnings that needs immediate attention.
Influence	Local	Messages that affects less than a few percent of all passengers. These messages are only presented at local points, not in general media as internet.
	District	Messages that affects a significant amount of passengers, and requires distribution on general media, as internet. These messages can also be broadcasted within the transport system.
	Regional	Messages that shall be broadcasted through all media, also external media as local radio stations.
Urgency	Low	Distribute only through standard media, do not use costly media (as SMS). This implies some delay before information reaches some users, e.g. messages in buses, which has to be downloaded in the garage.
	Medium	Distribute on additional selected media, e.g. instant distribution to vehicles, SMS to priority customers etc.
	High	Distribute using all available media regardless of cost. This level must be used with consideration of capacity of certain media.

4.3 Special Cases

4.3.1 Warning for Passing Trains

This information will not be supplied as Arrival or Departure Deviations. The information is instead supplied in the form of Network Deviations with Status **attention**. It is not necessary to investigate any publication decisions before publishing this information since the deviation message version will be flagged as not requiring a publication decision.

A Network Deviation with Status **attention** that has a Network Object Ref of type Stop Point Ref and high importance, should replace all other information on a display located at the platform during the validity

period of the Network Deviation. As an alternative to inspecting the priority level, it is also acceptable to inspect if the Public Note attribute in the Deviation Message element matches a configured text.

This means that the information "Warning for passing trains" will be presented as the only information during a train passage.

4.3.2 Cancellations

Note that an arrival at a stop can be cancelled without necessarily cancelling the departure and vice versa. Cancelling an arrival means that alighting will not be possible. Cancelling a departure means that boarding is not possible. In both these cases a monitored vehicle may be recorded as arriving and departing, or passing.

For lines with short intervals, cancellations of individual vehicle journeys might simply be indicated by not showing them at all. This behaviour should be handled in the presentation system.

A presentation system shall consider alternate strategies for mass cancellations such as when a Stop Area is closed for a short period of time. The information is supplied in the form of a Network Deviation with State **closed**.

4.3.3 Cancelled Arrivals at Stops after This Departure

Some presentation systems need to provide extra information telling a passenger that he or she will not be able to alight at a later stop.

PubTrans will expose information about cancelled arrivals following the subscribed departure in the form of Arrival Deviations with consequence="CANCELLED".

PubTrans will provide this information even if the affected stop is not subscribed, because it concerns passengers at the subscribed stop.

4.3.4 Cancelled Departures at Stops before This Arrival

Some presentation systems need to provide extra information to cater for persons waiting for arriving passengers. It could be of interest to know that a passenger will not be able to board at a previous stop. The waiting person will then be able to conclude that the person he/she is waiting for probably will not arrive as expected.

ROI will expose cancelled departures preceding the subscribed arrival in the form of Departure Deviations with consequence="CANCELLED".

PubTrans will provide this information even if the affected stop is not subscribed, because it concern passengers at the subscribed stop.

4.3.5 Journey Ordering

In some cases, the passengers are requested to order a departure in advance. Here some examples:

- Vehicle journey on demand, the vehicle journey is only operated on request.
- Flexible routes, the vehicle journey is operating according to a schedule, but calls at some stops only if requested.

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For instance, passengers can request a call by phone or pressing a button at the stop. There is usually a time constraint involved, e.g. that the ordering shall be made X minutes in advance.

Note that PubTrans state model supports that ordering can be required for a vehicle journey as whole or individual calls on a vehicle journey.

In ROI, vehicle journeys or calls on-demand will have the initial state **not expected**. If they are ordered, this can be reported using a control action in RII, and the state will change to **expected**. Once expected the state never reverts back to not expected, the only alternative is to cancel it.

4.3.6 Journey Creation

If a journey is created as a reinforcement of a cancelled or partially cancelled vehicle journey, the call state of the reinforced vehicle journey will be set to **replaced** on the reinforced journeys cancelled calls in those instances when the created journey calls within the same stop area.

5 Presentation Rules

This chapter contains recommendations for how to present PubTrans data in user applications and in passenger information systems in particular.

5.1 Destination Display Texts

Usually display designs and communication media have limitations to consider when presenting information. These limitations apply to character size, length of text and typographical limitations such as available fonts, colours and display resolution.

PubTrans is designed to take these limitations into consideration. For destination display presentation, PubTrans can provide a number of text elements that can be combined to a presented line and destination text.

The following sections show in what order destination elements could be evaluated in order to find the optimal name to display. First combination of elements that fits into the size of the display should be used. The evaluation should use the actual lengths of the destination fields for the display type used. The actual length a destination fields for a display unit with even spaced fonts is number of characters, while the length for pixel-based display units is based on individual character width and spacing.

5.1.1 Concepts

A destination text is displayed when showing departures, an origin when showing arrivals. PubTrans provides text elements for both departures and arrivals. For departures PubTrans also support a symbol element.

For departures, it is possible to define a set of text elements for each departure, i.e. change the destination along a route. This is practical for instance when sub-destinations are passed along the route and not relevant any longer, or for circular lines that needs to change its destination at several points.

5.1.2 Origins

PubTrans support the following text elements for origins.

- Origin Name: <= 50 characters.
- Origin Short Name: <= 16 characters.

5.1.3 Destinations

PubTrans provides the following destination elements:

- Line Designation: <= 8 characters
- Primary Destination: <= 50 characters.
- Primary Destination Short Name: <= 16 characters.
- Secondary Destination Name: <= 50 characters.
- Secondary Destination Short Name: <= 16 characters.

These can for instance be combined in the following ways:

- Primary Destination Name & SecondaryDestinationName: <= 101 characters.
- PrimaryDestinationName & SecondaryDestinationShortName: <= 67 characters.
- PrimaryDestinationShortName & SecondaryDestinationShortName: <= 33 characters.
- PrimaryDestinationName: <= 50 characters.
- PrimaryDestinationShortName: <= 16 characters.

Note that for combined elements a space is required between the elements, which are the reason that there is one more character in the maximum lengths. Also note that it is *Line Designation* that is used for presentation purposes, never the *Line Number*.

5.2 Sort Order of Departures and Arrivals

The sort order of departures and arrivals may be selected for each application purpose. However, note the following:

- Sorting by line should use *Line Number* or *Line GID*. Sorting by *Line GID* also distinguishes on Transport Authority, which means that information may be grouped per Transport Authority.
- Sorting by direction of line should use *Direction of Line GID*. This is similar to sorting by *Line GID*, which means that information may be grouped per Transport Authority
- Sorting by time should use the displayed time, i.e. the rounded time compensated for time zone and daylight saving time and delays. This sort order corresponds to the actual order they will arrive or depart at a stop point.

5.3 Change of Stop Point

A call may be moved from the scheduled stop point to another one, usually within the same stop area.

In ROI, the last known expected stop point for arrivals and departures is defined by the *Target Journey Pattern Point Ref* element. The originally scheduled stop point is defined by the *Timetabled Journey Pattern Point Ref*.

An update providing a value for *Target Journey Pattern Point Ref* indicates a change of stop point. The presentation system should consider re-directing passengers from the timetabled stop point to the new target stop point.

5.4 Displaying Times

There is in principal two ways of present arrival- and departure times:

- As an absolute time, e.g. 12:34.
- As a relative time, e.g. about 9 minutes, also known as a count-down time.

5.4.1 Which Time to Use?

PubTrans provides a number of different times for client applications to use. The matrix below describes these times.

	Planned	Target	Estimated	Observed
	Defined in the scheduling process. Undefined vehicle journey timing is not based on a schedule.	Initially equal to schedule but later changed as an effect of control actions and forecast.	Initially undefined but if given either an external forecast or forecast from PubTrans	Recorded times provided from vehicle monitoring, initially undefined.
Arrival	Latest accepted arrival time.	Last known decided or forecasted latest arrival time.	Last known forecasted average arrival time.	Actual arrival time.
Departure	Earliest permitted departure time.	Last known decided or forecasted earliest departure	Last known forecasted average departure time	Actual departure time

Normally, the target time shall be used for presentation purpose, for instance calculation of minutes to departure in a count down presentation.

- The target departure time represents an optimistic departure time suitable for departure boards.
- The target arrival time represents a pessimistic forecast of arrival. For some application it could be more appropriate to use the estimated departure time, which represents an average departure time.

Due to special considerations, it can sometimes be appropriate to present the estimated arrival- and departure time in place of the target times when estimated times are available. This behaviour should be configurable on a per line basis or per transport mode basis in the presentation system.

5.4.2 Rounding Times

In both DOI and ROI, times can be provided with a resolution in seconds. This is usually too precise to be useful in passenger information. Such times need to be rounded before they are presented.

The general rule is that arrival times are always rounded up, and departure times are rounded down. This also applies to count-down systems.

Most information systems have a presentation resolution of 1 minute. Therefore, arrival- and departure times need to be rounded as follows:

- Arrival times shall be rounded up to whole minute (or what other resolution unit used).
- Departure times shall be rounded down to whole minute (or what other resolution unit used).

When rounding relative times, first calculate the time difference between the target time and the current time in full resolution, and apply the rounding described above to that difference.

This rounding ensures that promises to the passengers are kept, ensuring that an earliest departure never can get a value later than the original un-rounded value, and that a latest arrival never can get a value earlier than the original un-rounded value.

5.4.3 Displayed times

It is the displaying system's responsibility to format the output according to the recommendations below.

The recommended way to present absolute departure times are:

- Departure times should be displayed 00:00 – 23:59.
- Arrival times should be displayed 00:01 – 24:00. An arrival time is never presented as 00:00.

When relative times are to be presented, it is recommended that countdown is used only when it is less than an hour to the arrival or departure. This means that count-down can be presented with integers counting down from 59 to 0. The last minute before arrival/departure might require special consideration. If the system has a time resolution enough, a ½ minute can be displayed. It is also recommended to have a special indication when the vehicle is due, or will pass through without stopping.

5.4.4 Compensating Time

Two types of time compensation must be made in order to present the right departure and arrival times in a local context:

- Adjusting for time zone.
- Adjusting for daylight saving time.

PubTrans delivers ROI data for Journeys with timing information that should be understood in the context of a clock displaying local time according to the local time zone. The clock must be compensated for the daylight that applied at noon on the DatedOnDayDate for the concerned vehicle journey.

5.4.5 Daylight Saving Time

To handle daylight saving time correctly, a displaying system must keep track of its time change when changing to and from daylight saving time.

In this section the following definition of daylight saving time change is used:

- When the clock changes from 01:59 to 03:00, it is a change of +01:00, because the 'new' displayed time is one hour ahead the 'old' one.
- When the clock changes from 02:59 to 02:00, it is a change of -01:00, because the 'new' displayed time is one hour behind the 'old' one.

The displaying system must also keep track of days that are daylight saving days and not. Daylight saving days are the days from (and including) the day when daylight saving time begins up to (but not including) the day when it changes back to normal. This information is used to determine if a call is worked according to daylight saving time or normal time. If the operating day is a daylight saving day, the call is operated according to daylight saving time, else not.

The table below shows the time difference between the current time and a dated call.

	Call is operated according to daylight saving time	Call is not operated according to daylight saving time
Current time is daylight saving time	Time difference is 0.	Time compensation is 1.
Current time is not daylight saving time	Time difference is -1.	Time compensation is 0.

It is required that this simple calculation is built into a displaying system and applied for all calculations from PubTrans time to presented time. It is important that this calculation always is applied, and not just the hours when changing to or from daylight saving time. The main reason is that it is not known the maximum duration of a vehicle journey, and therefore not possible to limit the compensation to a specific time interval.

The calculation should be made with the full date and time values in order to correctly calculate and sort departure and arrivals.

The consequences of the compensation table described above are that departure- and arrival times always are presented in the context of the current clock, also if the departure- or arrival time is later than the time-shift. This is demonstrated in the following table:

	Dated yesterday		Dated today	
Current time	Scheduled time	Displayed time	Scheduled time	Displayed time
Change from normal time to daylight saving time				
01:59 NT	01:59	01:59	02:59	01:59
01:59 NT	02:01	02:01	03:01	02:01
03:01 ST	02:01	03:01	03:01	03:01
Change from daylight saving time to normal time				
02:59 ST	02:59	02:59	01:59	02:59
02:59 ST	03:01	03:01	02:01	03:01
02:00 NT	03:01	02:01	02:01	02:01

The first three examples show the change from normal time (NT) to daylight saving time (ST). Just before the daylight saving time changes from normal to summer (i.e. up to 01:59), all subsequent times will be displayed with times 2:00, 2:01, etc, although such times never will exist, because the clock will change from 01:59 to 03:00. When the clock changes to 03:00 all times will be displayed in ST context.

The three last examples show the change from daylight saving time back to normal time. Here all times are displayed in ST-context up to 02:59. When the clock changes to 02:00 all times will be displayed in NT-context.

6 Use Cases

This chapter presents a number of use case and applications examples.

6.1 Deviation messages on a web page

In this example, the purpose of the application is to present a selection of deviation messages based on a user selection.

6.1.1 Selecting which deviation messages to present

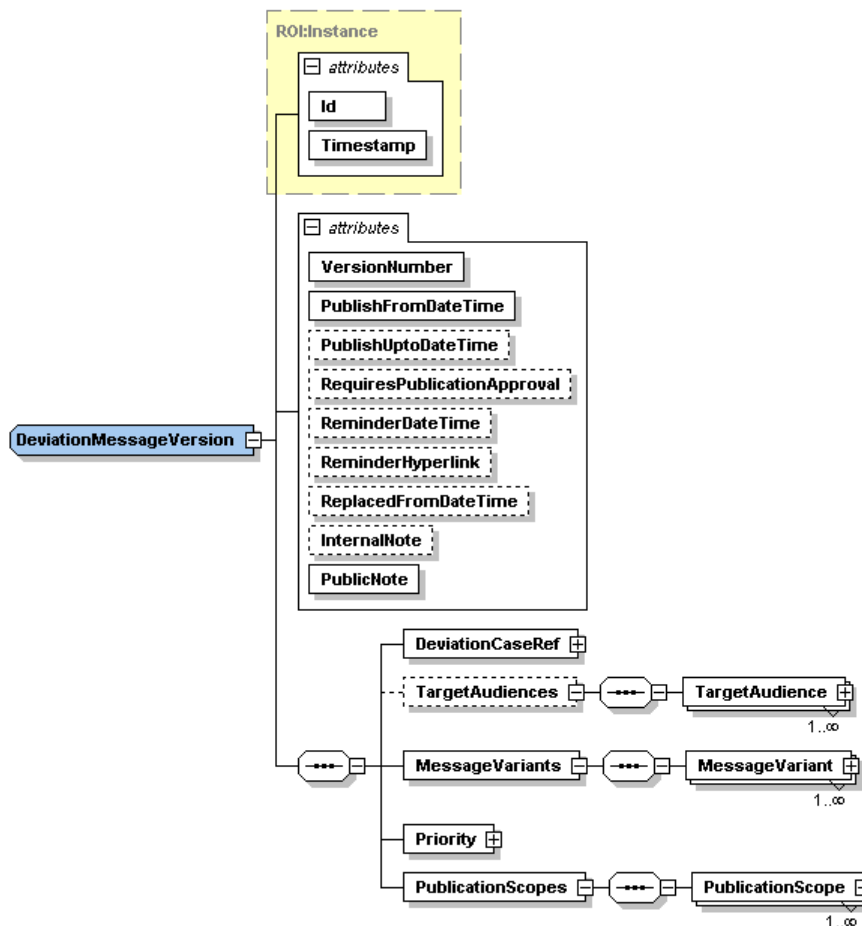


Fig. 11. Figure 1 Deviation Message Version

Through ROI you can subscribe on Deviation Messages. You can filter received Deviation Messages using the Publication Scope. A Deviation Message has one or many Publication Scopes. The set of Publication Scopes indicates the intended Public Transport context for the Deviation Message.

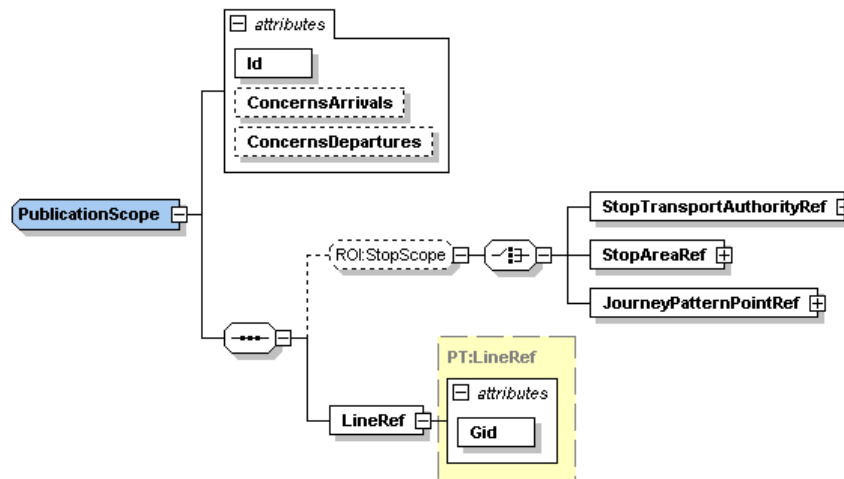


Fig. 12. Figure 2 Publication Scope

6.1.2 Assembling published deviation information concerning a certain Line:

Starting with the simple case; you want to get all relevant information concerning a certain line. However, it is important to avoid publishing information that has not yet been approved for publication. Suggested message texts can be provided from many sources, but it is only authorized staff that can decide that a certain message should be published on a certain line.

Suggested workflow:

- Select all Deviation Message Versions that includes a Publication Scope having a Line Ref that fits the selected line.
- Check that the individual Deviation Message Versions are valid. There is a special "IsValid" attribute for this purpose that can be inspected.
- Check if the Deviation Message Version needs publication approval or not. There is a "RequiresPublicationApproval" attribute for this purpose that can be inspected. If publication approval is required then check that there is a valid affirmative Publication Decision on the Line Ref of interest for the Deviation Message Version in question.
- Check that you are within the DeviationMessageVersion.PublishFromDateTime to DeviationMessageVersion.PublishUptoDateTime timeframe¹.
- Check that the Deviation Message Version has a Passenger or Customer target audience.
- If you are about to present the information on a special media, such as in an SMS message or on the first page of a website, also check that the appropriate Message Variant of interest has its is-Public attribute set to true before publishing it in that channel.

¹ Applications where outdated deviation messages are to be presented should not filter on the PublishUptoDateTime.

6.1.3 Assembling published deviation information concerning a certain Stop Area:

Finding what to present when a stop is the selection criteria is somewhat more complex. To solve this task we must first understand which lines that passes the Stop Area in question.

It is suggested that a cross-reference table is assembled from data in DOI, or that a query like the one below is used.

```
SELECT DISTINCT Line.Gid FROM Line
INNER JOIN DirectionOfLine
ON Line.Id = DirectionOfLine.IsOnLineId
INNER JOIN NamedJourneyPattern
ON NamedJourneyPattern.IsOnDirectionOfLineId = DirectionOfLine.Id
INNER JOIN PointInJourneyPattern
ON PointInJourneyPattern.IsInJourneyPatternId = NamedJourneyPattern.IsJourneyPatternId
INNER JOIN StopPointValidity
ON StopPointValidity.IsJourneyPatternPointGid =
PointInJourneyPattern.IsJourneyPatternPointGid
WHERE
StopPointValidity.IsIncludedInStopAreaGid = @WantedStopAreaGid
AND
StopPointValidity.ExistsFromDate <= @WantedDate
AND
( StopPointValidity.ExistsUptoDate > @WantedDate
  OR
StopPointValidity.ExistsUptoDate IS NULL )
AND
NamedJourneyPattern.ExistsFromDate <= @WantedDate
AND
( NamedJourneyPattern.ExistsUptoDate > @WantedDate
  OR
NamedJourneyPattern.ExistsUptoDate IS NULL )
```

This query finds the Lines whose Journey Patterns contain a reference to a Stop Point in the Stop Area in question.

Suggested workflow:

- Select all Deviation Message Versions that includes a Publication Scope having a Line Ref that fits the set of Lines from the query above.
- Filter out those Deviation Message Versions where the Publication Scope has a Stop Scope element, and where the Stop Scope does not cover the wanted Stop Area. To be covered, either there is no Stop Scope element at all, or there is a Stop Area Ref that refers to the same Stop as the wanted Stop Area, or there is a Stop Transport Authority Ref that the wanted Stop Area is defined by, or there is a Journey Pattern Point Ref that is a Stop Point under the wanted Stop Area.
- Check that the individual Deviation Message Versions are valid. There is a special "IsValid" attribute for this purpose that can be inspected.
- Check if the Deviation Message Version needs publication approval or not. There is a "RequiresPublicationApproval" attribute for this purpose that can be inspected. If publication approval is required then check that there is a valid affirmative Publication Decision on the Line Ref of interest for the Deviation Message Version in question.

- Check that you are within the DeviationMessageVersion.PublishFromDateTime to DeviationMessageVersion.PublishUptoDate² timeframe.
- Check that the Deviation Message Version has a Passenger or Customer target audience.
- If you are about to present the information on a special media, such as in an SMS message or on the first page of a website, also check that the appropriate Message Variant of interest has its is-Public attribute set to true before publishing it in that channel.

6.1.4 Assembling deviation information concerning control actions:

Optionally you could also present that control actions apply to the Line or Stop of interest, even when there is no deviation message appended to the control action. In this case the Deviation Scope is used to find which control actions that apply to the Line or Stop in question.

6.1.4.1 Selecting Deviation Cases for a certain Line

Below is a table that describes which control action deviation cases that apply to the Line of interest:

Scope Element combination	No Journey Scope	Journey Transport Authority Ref	Line Ref	Direction Of Line Ref	Vehicle Journey Ref
No Stop Scope	Always include	Include if the Line of interest is defined by the referred Journey Transport Authority	Include if the referred Line is the Line of interest.	Include if the referred Direction Of Line is on the Line Of interest.	Include if the referred Vehicle Journey is worked on the Line of interest.

² Applications where outdated deviation messages are to be presented should not filter on the PublishUptoDate²Time.

Scope Element combination	No Journey Scope	Journey Transport Authority Ref	Line Ref	Direction Of Line Ref	Vehicle Journey Ref
Stop Transport Authority Ref	Include if any stop in any of the valid Journey Patterns on the Line of interest is defined by the referred Stop Transport Authority	Include if the Line of interest is defined by the referred Journey Transport Authority and any stop in any of the valid Journey Patterns on the Line of interest is defined by the referred Stop Transport Authority	Include if the referred Line is the Line of interest and any stop in any of the valid Journey Patterns on the Line of interest is defined by the referred Stop Transport Authority	Include if the referred Direction Of Line is on the Line of interest and any stop in any of the valid Journey Patterns on the Line of interest is defined by the referred Stop Transport Authority	Include if the referred Vehicle Journey is worked on the Line of interest and any stop in the Journey Pattern of the referred Vehicle Journey is defined by the referred Stop Transport Authority.
Stop Area Ref	Include if any stop in any of the valid Journey Patterns on the Line of interest is included in the referred Stop Area.	Include if the Line of interest is defined by the referred Journey Transport Authority and any stop in any of the valid Journey Patterns on the Line of interest is included in the referred Stop Area.	Include if the referred Line is the Line of interest and any stop in any of the valid Journey Patterns on the Line of interest is included in the referred Stop Area.	Include if the referred Direction Of Line is on the Line of interest and any stop in any of the valid Journey Patterns on the Line of interest is included in the referred Stop Area.	Include if the referred Vehicle Journey is worked on the Line of interest and any stop in the Journey Pattern of the referred Vehicle Journey is included in the referred Stop Area.

Scope Element combination	No Journey Scope	Journey Transport Authority Ref	Line Ref	Direction Of Line Ref	Vehicle Journey Ref
Stop Point Ref	Include if any stop in any of the valid Journey Patterns on the Line of interest is the referred Stop Point.	Include if the Line of interest is defined by the referred Journey Transport Authority and any stop in any of the valid Journey Patterns on the Line of interest is the referred Stop Point.	Include if the referred Line is the Line of interest and any stop in any of the valid Journey Patterns on the Line of interest is the referred Stop Point.	Include if the referred Direction Of Line is on the Line of interest and any stop in any of the valid Journey Patterns on the Line of interest is the referred Stop Point.	Include if the referred Vehicle Journey is worked on the Line of interest and any stop in the Journey Pattern of the referred Vehicle Journey is the referred Stop Point.

Relevant Deviation Cases for a certain Line.

6.1.4.2 Selecting Deviation Cases for a certain Stop

First construct a set of Lines (called Line Set below) that are relevant for the Stop in question. See details in the query in 6.1.3 above. Having that Line Set it is possible to use the table below and decide which control action deviation cases that apply to the Stop.

Scope Element combination	No Journey Scope	Journey Transport Authority Ref	Line Ref	Direction Of Line Ref	Vehicle Journey Ref
No Stop Scope	Always include	Include if any of the Lines in the Line Set is defined by the referred Journey Transport Authority	Include if any of the Lines in the Line Set is the referred Line.	Include if the referred Direction Of Line is on any of the Lines in the Line Set.	Include if the referred Vehicle Journey is worked on any of the Lines in the Line Set.

Scope Element combination	No Journey Scope	Journey Transport Authority Ref	Line Ref	Direction Of Line Ref	Vehicle Journey Ref
Stop Transport Authority Ref	Include if the Stop Area of interest is defined by the referred Stop Transport Authority.	Include if any of the Lines in the Line Set is defined by the referred Journey Transport Authority and the Stop Area of interest is defined by the referred Stop Transport Authority.	Include if any of the Lines in the Line Set is the referred Line and the Stop Area of interest is defined by the referred Stop Transport Authority.	Include if the referred Direction Of Line is on any of the Lines in the Line Set and the Stop Area of interest is defined by the referred Stop Transport Authority.	Include if the referred Vehicle Journey is worked on any of the Lines in the Line Set and the Stop Area of interest is defined by the referred Stop Transport Authority.
Stop Area Ref	Include if the Stop Area of interest is the referred Stop Area.	Include if any of the Lines in the Line Set is defined by the referred Journey Transport Authority and the Stop Area of interest is the referred Stop Area.	Include if any of the Lines in the Line Set is the referred Line and the Stop Area of interest is the referred Stop Area.	Include if the referred Direction Of Line is on any of the Lines in the Line Set and the Stop Area of interest is the referred Stop Area.	Include if the referred Vehicle Journey calls at the referred Stop Point, and this Stop Point is included in the Stop Area of interest.

Scope Element combination	No Journey Scope	Journey Transport Authority Ref	Line Ref	Direction Of Line Ref	Vehicle Journey Ref
Stop Point Ref	Include if the referred Stop Point is included in the Stop Area of interest.	Include if any of the Lines in the Line Set is defined by the referred Journey Transport Authority and the referred Stop Point is included in the Stop Area of interest.	Include if any of the Lines in the Line Set is the referred Line and the referred Stop Point is included in the Stop Area of interest.	Include if the referred Direction Of Line is on any of the Lines in the Line Set and the referred Stop Point is included in the Stop Area of interest.	Include if the referred Vehicle Journey is calls the referred Stop Point and the referred Stop Point is included in the Stop Area of interest.

6.2 Accident at a stop

This use case is an example of the interaction between messages coming to PubTrans through RII and what the resulting ROI messages from PubTrans will look like.

There has been an accident at Stop 9784 "Stortorget" which means that no vehicles can stop there. This stop caters for two different lines, line 1 and 3.

6.2.1 Reporting a Control Action

First, a control action is performed in an external operation control system. The event is the reported to PubTrans using the control action Change of Stop Point Status in RII. There are no texts describing recommended alternatives included at this stage since the most important thing is to make a fast registration and show passengers what has happened.

```
<DeviationCaseAddRequest MessageId="435432">
  <DeviationReason StandardCategory="ACCIDENT"/>
  <ControlAction RegistrationDateTime="2005-12-17T09:30:47.0+01:00">
    <ChangeOfStopPointStatus Status="CLOSED">
      <StopAreaRef Gid="9021001009784000"/>
      <TimeScope FromDateTime="2005-12-17T09:30:00+01:00"
        UptoDateTime="2005-12-17T10:30:00+01:00"/>
    </ChangeOfStopPointStatus>
  </ControlAction>
  <ReportedByUser OrganisationalUnitCode="ARRCENT"
    OrganisationCode="ARRIVA" Name="PKN"/>
</DeviationCaseAddRequest>
```

6.2.2 Presenting the consequences of a Control Action

6.2.2.1 To passengers at a stop

For passengers at stop, a monitor will show general information relating to all stop points at this stop area. There could be a general text saying that the stop is closed. The information is based on that the subscribing monitor receives a deviation case create event on ROI:

```
<DeviationCaseCreateEvent MessageId="3221234">
  <DeviationCase   Timestamp="2005-12-17T09:30:48+01:00"
                  Gid="9076001000074263"
                  CreatedDateTime="2005-12-17T09:30:47+01:00"
                  OperationActionType="STOPPOINTCLOSED"
                  Id="1000021474836478">
    <ScopeElements>
      <ScopeElement Id="2147483647">
        <StopAreaRef Gid="9021001009784000"/>
        <TimeScope   FromDateTime="2005-12-17T09:30:00+01:00"
                    UptoDateTime="2005-12-17T10:30:00+01:00"/>
      </ScopeElement>
    </ScopeElements>
    <DeviationReason StandardCategory="ACCIDENT"/>
    <ReportedByUser  OrganisationalUnitCode="ARRIVA"
                    OrganisationCode="ARRIVA" Name="PKN">
      <OrganisationalUnitRef Id="1000002147483647"/>
    </ReportedByUser>
  </DeviationCase>
</DeviationCaseCreateEvent>
```

6.2.2.2 Passengers at stop waiting to board

Displays showing departure information for departures on line 1 and 3 at the stop are updated. There will be a message showing that the departure is cancelled. The subscribing display system receives one message per affected service journey at that stop through ROI.

```
<DepartureUpdateEvent MessageId="3735096">
  <Departure   Timestamp="2005-12-17T09:30:48+01:00"
              TargetDateTime="2005-12-17T09:43:00+01:00"
              Id="100002147482315"
              State="CANCELLED"/>
</DepartureUpdateEvent>
```

6.2.2.3 Persons at stop waiting for passenger to arrive

Displays showing arrival information for departures on line 1 and 3 at the stop are updated. There will be a message showing that the arrival is cancelled. The information is based on that the subscribing display system receives one message per affected service journey at that stop through ROI.

```
<ArrivalUpdateEvent MessageId="3735098">
  <Arrival   Timestamp="2005-12-17T09:30:48+01:00"
            TargetDateTime="2005-12-17T09:43:00+01:00"
            Id="100002147482314"
            State="CANCELLED"/>
</ArrivalUpdateEvent>
```



```
<ArrivalDeviationEvent MessageId="3735099">
  <ArrivalDeviation Timestamp="2005-12-17T09:30:48.0+01:00"
    Consequence="CANCELLED"
    Id="1000002147498561">
    <ArrivalRef Id="1000002147483662"/>
    <DeviationCaseRef Gid="9076001000074263" Id="1000021474836478"/>
  </ArrivalDeviation>
</ArrivalDeviationEvent>
```

6.2.2.4 Passengers waiting to board at other stops

Displays showing departure information for departures on line 1 and 3 at stops before stop 9784 appends the text "Stannar ej vid Stortorget" to the departure information for affected service journeys. The information is based on that the subscribing display receives an arrival deviation event message showing that there is an arrival deviation at stop 9784 through ROI. There is one message per affected service journey.

There will only be messages for service journeys that both pass this stop and stop 9784. If the same subscription covers several stops, there will still only be one such message per service journey.

```
<ArrivalDeviationEvent MessageId="3221235">
  <ArrivalDeviation Timestamp="2005-12-17T09:30:48.0+01:00"
    Consequence="CANCELLED"
    Id="1000002147498561">
    <ArrivalRef Id="1000002147483662"/>
    <CallRef JourneyPatternSequenceNumber="3">
      <DatedVehicleJourneyRef OperatingDayDate="2005-12-17"
        Gid="9015001000300123" Id="2147483647"/>
      <JourneyPatternPointRef Gid="9025001009784002"/>
    </CallRef>
    <DeviationCaseRef Gid="9076001000074263" Id="1000021474836478"/>
  </ArrivalDeviation>
</ArrivalDeviationEvent>
```

6.2.2.5 Passengers Onboard Buses Are Informed

Displays onboard buses running affected service journeys on line 1 and 3 that have not yet passed stop 9784 displays the text "Stannar ej vid Stortorget".

The information is based on that the subscribing system receives an arrival deviation event message showing that there is an arrival deviation at stop 9784 through ROI. There is one message per affected service journey.

6.2.2.6 Traffic informers responsible for line 1 and/or 3

The traffic informers will be notified in OCS that there is a deviation that is of potential interest.

6.2.3 A Deviation Message is reported

The traffic informers might add additional recommendations in a deviation message. This message is delivered to PubTrans through RII.

```
<DeviationMessageUpdateRequest MessageId="433285">
  <DeviationMessageVersionRef VersionNumber="1">
    <CaseRef>
      <DeviationCaseRef Gid="9076001000074263"/>
    </CaseRef>
  </DeviationMessageVersionRef>
  <DeviationMessage PublicNote="Olyckshändelse"
    InternalNote="Person påkörd"
    PublishFromDate="2005-12-17T09:32:00+01:00">
    <PublicationScopes>
      <PublicationScope>
        <LineRef Gid="9011001000100000"/>
        <PublicationDecision IsApproved="Y">
          <DecidedByUser OrganisationCode="CONNEX"
            OrganisationalUnitCode="CONN_01"
            Name="DF"/>
        </PublicationDecision>
      </PublicationScope>
      <PublicationScope>
        <LineRef Gid="9011001000300000"/>
      </PublicationScope>
    </PublicationScopes>
    <TargetAudience>
      <Passenger/>
    </TargetAudience>
    <Priority UrgencyLevel="2" ImportanceLevel="2"
      InfluenceLevel="2"/>
    <MessageVariants>
      <Header UsageType="HEADER" ContentType="text/plain"
        Content="Olyckshändelse vid Stortorget"/>
      <Summary UsageType="SUMMARY"
        ContentType="text/plain"
        Content="Stortorget trafikeras inte för närvarande på grund
          av olyckshändelse. Linje 1 och 3 kör förbi."/>
      <Details UsageType="DETAILS" ContentType="text/plain"
        Content="Stortorget trafikeras inte för närvarande på grund av
          olyckshändelse. Linje 1 och 3 kör förbi. Använd hållplats Brotorget
          istället."/>
    </MessageVariants>
  </DeviationMessage>
  <ReportedByUser OrganisationCode="CONNEX"
    OrganisationalUnitCode="CONN_01"
    Name="DF"/>
</DeviationMessageUpdateRequest>
```

6.2.4 Presentation of a Deviation Message

The following will be sent through ROI. There will also resulting Arrival and Departure Deviations that references the DeviationMessage Id on line 1.

```
<DeviationMessageVersionEvent MessageId="3221256">
  <DeviationMessageVersion VersionNumber="1"
    Timestamp="2005-12-17T09:32:00+01:00"
    PublicNote="Olyckshändelse"
    InternalNote="Person påkörd"
    PublishFromDateTime="2005-12-17T09:32:00+01:00"
    Id="2147483647">
    <DeviationCaseRef Gid="9076001000074263" Id="1000002147483947"/>
    <TargetAudiences>
      <TargetAudience Id="1" TypeCode="PASSENG"/>
    </TargetAudiences>
    <MessageVariants>
      <MessageVariant Id="336364646"
        UsageType="HEADER"
        ContentType="text/plain"
        Content="Olyckshändelse vid Stortorget"/>
      <MessageVariant Id="336364647"
        UsageType="SUMMARY"
        ContentType="text/plain"
        Content="Stortorget trafikeras inte för närvarande
        på grund av olyckshändelse. Linje 1 och 3 kör
        förbi."/>
      <MessageVariant Id="336364648"
        UsageType="DETAILS"
        ContentType="text/plain"
        Content="Stortorget trafikeras inte för närvarande
        på grund av olyckshändelse. Linje 1 och 3 kör förbi.
        Använd hållplats Brotorget istället."/>
    </MessageVariants>
    <Priority UrgencyLevel="2" ImportanceLevel="2" InfluenceLevel="2"/>
    <PublicationScopes>
      <PublicationScope Id="1000500001123">
        <LineRef Gid="9011001000100000"/>
      </PublicationScope>
      <PublicationScope Id="1000500001124">
        <LineRef Gid="9011001000300000"/>
      </PublicationScope>
    </PublicationScopes>
  </DeviationMessageVersion>
</DeviationMessageVersionEvent>
<PublicationDecisionEvent MessageId="3221257">
  <PublicationDecision Timestamp="2005-12-17T09:32:00+01:00"
    IsApproved="Y" Id="2147483647">
    <PublicationScopeRef Id="1000500001123"/>
    <DecidedByUser
      OrganisationCode="CONNEX"
      OrganisationalUnitCode="CONN_01"
      Name="DF">
      <OrganisationalUnitRef Id="232332147483647"/>
    </DecidedByUser>
  </PublicationDecision>
</PublicationDecisionEvent>
```

6.3 Handling Real Time data

This section describes how to handle connection protection.

6.3.1 Subscribing to real-time data

Using ROI it is possible to subscribe to events concerning a certain line at a certain stop. This is similar to what you would have done in VDV 453.

Where you normally send the message VDV453:Requesting DPI Data DISSubscription

```
<SubscriptionRequest Sender="MOBILE" TimeStamp="2005-10-01T04:00:00">
  <DISSubscription SubscriptionID="1" ValidUntilTimeStamp="2005-10-02T00:03:59">
    <DISID>51234</DISID>
    <LineID>12</LineID>
    <PreviewTime>30</PreviewTime>
    <MaxNumOfTrips>100<MaxNumOfTrips>
    <Hysteresis>120</Hysteresis>
  </DISSubscription>
</SubscriptionRequest>
```

In ROI you should instead send:

```
<SubscriptionRequest StartUtcDateTime="2005-10-01T04:00:00+01:00" MessageId="21">
  <VehicleJourneyEventSelection LookAheadDuration="PT30M">
    <ScopeElements>
      <ScopeElement ConcernsDepartures="N">
        <LineRef Gid="9011001001200000"/>
        <JourneyPatternPointRef Gid="9025001000051234"/>
      </ScopeElement>
    </ScopeElements>
  </VehicleJourneyEventSelection>
</SubscriptionRequest>
```

- The ROI attribute LookAheadDuration="PT30M" serves the same purpose as the VDV 453 element <PreviewTime>30 </PreviewTime>
- The ROI attribute LineRef.Gid="9011001001200000" serves the same purpose as the VDV 453 element <LineID>12</LineID>, the value 12 is embedded in the Gid.
- The ROI attribute JourneyPatternPointRef.Gid="9025001000051234" serves a similar purpose as the VDV 453 element <DISID>51234</DISID>, the value 51234 is embedded in the Gid.
- The attribute ConcernsDepartures="N" means that all departure information will be filtered away, and that only arrival related events and prognoses will be provided. This is relevant since it is the arrival of the trains that is of interest, not when they depart.

The hysteresis will be based on a system wide SL decision. Typically a hysteresis of 30 seconds or one minute could be expected.

6.3.2 Receiving real time data

Having set up a subscription as mentioned above, messages will be transferred from PubTrans as events takes place. The two messages of interest are the *Arrival Create Event* and the *Arrival Update Event*

6.3.2.1 Arrival Create Event

For each connection protection where both the feeder and the fetcher are planned to work a certain date, this message will be sent when the preview time/look ahead duration goes in to scope. This message will only be sent once per arriving train to a certain station.

```
<ArrivalCreateEvent MessageId="2234">
  <Arrival
    Id="1234332147483647"
    Timestamp="2005-09-30T09:10:24+01:00"
    TargetDateTime="2005-10-01T09:42:00+01:00"
    EstimatedDateTime="2005-10-01T09:42:00+01:00"
    TimetabledLatestDateTime="2005-10-01T09:42:00+01:00"
    State="EXPECTED"
    JourneyPatternSequenceNumber="16">
    <DatedVehicleJourneyRef OperatingDayDate="2005-10-01" Gid="9015001001200045"
      Id="1234331234567890"/>
    <DirectionOfLineRef Gid="9012001001210000"/>
    <MonitoredVehicleJourneyRef Id="1236771278347324"/>
    <TargetJourneyPatternPointRef Gid="9025001000051234"/>
  </Arrival>
</ArrivalCreateEvent>
```

The following attributes are of interest:

- **Arrival.Id**, this is the unique identifier used in subsequent reports relating to the same arrival.
- **Arrival.TimetabledLatestDateTime** this is the planned arrival time for the train.
- **Arrival.EstimatedDateTime** this is the estimated arrival time. This attribute will only be provided if there is a prognosis available.
- **Arrival.State**. This attribute will contain information showing the state of the arrival. E.g. "CANCELLED".
- **Arrival.DatedVehicleJourneyRef.Id** This attribute contains the value of the ServiceJourney.Number for the train in question.
- **Arrival.TargetJourneyPatternPointRef.Gid** This attribute contains the point where the train will dock.
- **Arrival.TimetabledJourneyPatternPointRef.Gid** This attribute contains the point where the train was planned to dock. Only provided if there has been a change of platform.

6.3.2.2 Arrival Update Event

Each time the prognosis changes more than the hysteresis value after the Arrival Create Event was sent, an Arrival Update Event will be sent.

```
<ArrivalUpdateEvent MessageId="2278">
  <Arrival
    Id="1234332147483647"
    Timestamp="2005-10-01T09:40:14+01:00"
    TargetDateTime="2005-10-01T09:43:00+01:00"
    EstimatedDateTime="2005-10-01T09:42:30+01:00"
    State="EXPECTED"/>
</ArrivalUpdateEvent>
```

The following attributes are of interest:

- **Arrival.Id**, this is the unique identifier that connects this message with the previously sent Create Arrival Event.
- **Arrival.EstimatedDateTime** this is the current estimated arrival time.

An Arrival Update Event will be sent when the train arrives to the station in question.

```
<ArrivalUpdateEvent MessageId="2286">  
<Arrival  
  Id="1234332147483647"  
  Timestamp="2005-10-01T09:42:36+01:00"  
  TargetDateTime="2005-10-01T09:43:00+01:00"  
  ObservedDateTime="2005-10-01T09:42:35+01:00"  
  State="ARRIVED"/>  
</ArrivalUpdateEvent>
```

The following attributes are of interest:

- **Arrival.Id**, this is the unique identifier that connects this message with the previously sent Create Arrival Event.
- **Arrival.ObservedDateTime** this is the actual arrival time.

6.4 Setting up subscriptions

External systems can subscribe to real-time data from PubTrans. There are a number of messages that are used to administrate the process of subscribing to PubTrans ROI data. The different messages have different time scales and are used in different stages of the process.

First there is the Subscription Request and the Subscription Termination Request. These two messages should be used only once each under the life-time of an attached system. The Subscription Request is used to set up the initial subscription the first time a certain system is attached to PubTrans, while the Subscription Termination Request is used to permanently detach a certain system from PubTrans.

Then there is the Subscription Update Request that can be used to modify the subscription.

Finally there is the Subscription Resume Request that is used to restart the subscription after a system has been disconnected from PubTrans and connected again.

The messages are respectively described in more detail below. There are also additional information to be found in IS-PT/I/ROI/3 in the chapters Client Options for Subscription, Distributing Data and Recovery.

6.4.1 The Subscription Request

The subscription is initially set up using the Subscription Request. The request should contain the appropriate scope selections depending on the requirements of the subscribing system. There are a number of possible selections including: Vehicle Journey Event Selections, Deviation Case Event Selection, Assignment Event Selections and Network Deviation Event Selection. A number of different combinations are possible to cover different requirements.

Please observe that the Subscription Request should only be used once by an external system. If changes of the scopes and selections are needed then the subscription should be altered using the Subscription Update Request, instead of terminating the subscription and starting a new subscription.

Observe that a new subscription will not be fully functional until the transition phase is completed. See below.

6.4.2 The Subscription Resume Request

The Subscription Resume Request is used to restart a subscription when a system reconnects to PubTrans after being disconnected.

PubTrans will keep track of the subscription in such a way that no information is lost even if a system loses contact with PubTrans for a period of time. There are however exceptions to this. If a system is disconnected for more than a day, there could potentially be a data-loss since PubTrans holds old real-time data for subscription purposes only a restricted period of time. If there is a data loss situation a Subscription Error Report is sent to the subscriber, where after data distribution is resumed from a point as far back in time as possible.

Some types of systems want to reinstate real-time data about ongoing events as fast as possible after a disconnection, and don't want information about old events. These systems can supply an appropriate value in the StartUTCDateTime attribute of the Subscription Resume Request. This informs PubTrans not to distribute older data thus getting the distribution of new data in synch faster.

The opposite is also possible to a certain extent. If a system has lost data due to some internal failures, it can request resending of previously sent data by providing a value for the SynchronisedUptoUTCDateTime that is earlier than what PubTrans expects.

If no SynchronisedUptoUTCDateTime is set, the synchronisation process will start from the latest saved (=confirmed) synchronised time. If a SynchronisedUptoUTCDateTime is set, the synchronisation process will, if possible, start from the given time. If it is not possible to synchronise from this point, a Subscription Error Report is sent and the synchronisation process starts from the first possible time within the Active Interval³.

The StartUTCDateTime can be used to limit the data volume after resuming. Only valid data equal to or later than the given StartUTCDateTime will be distributed to the subscribing system. If the StartUTCDateTime is not set, the Subscription resumes from the StartUTCDateTime saved by PubTrans.

The Subscription resumes Production Plan data based on the SynchronisedUptoUTCDateTime. The Production Plan will be recovered from this point in time, with the StartUTCDateTime as an earliest point in time. The Deviation Case Events resume based on the StartUTCDateTime instead. All cases still valid from the StartUTCDateTime will be recovered.

Please note that the evaluation of what is "valid data" is always performed on the Vehicle Journey level. PubTrans will not use the individual times of Arrivals and Departures when evaluating StartUTCDateTime or SynchronisedUptoUTCDateTime values. All relevant Arrivals and Departures will thus be distributed

³ The Active Interval is the interval of operating day dates that PubTrans holds Production Plan data.

along with the Vehicle Journey regardless if the individual Arrival or Departure falls outside of the time frame.

6.4.3 The Subscription Update Request

Using the Subscription Update Request gives a smooth transfer from old to new subscription settings. The Subscription Update Request is used to add, change or remove Scopes and/or Selections to a previously set up subscription.

The effect of the transition phase applies to an updated subscription. See below.

The external system should send a Subscription Resume Request to re-start the subscription after updating the subscription.

6.4.4 The Subscription Termination Request

The Subscription Termination Request is generally only used to end a subscription. An ended subscription cannot be re-instated and is permanently lost. This is particularly important to remember if the effects of the transition phase are crucial.

6.4.5 The Transition Phase

PubTrans maintains a daily production plan for a limited period of days in a rolling window. New or added subscriptions are invoked as Dated Vehicle Journeys are added or removed from this rolling window.

A new or changed subscription will not be fully functional at once. It could take one or a few days depending on configuration. During the Transition Phase, which is until all old and previously prepared data is not distributed and/or invalid, the subscriber will not receive data within the new or added selection or scope but within the previous scope. Distribution of data that is covered by both the previous and new scope is not affected at all.

Deviation Cases and their related messages are not affected by the transition phase effects. They are effective from the point of confirmation of the new and/or updated scope.

6.4.6 Disconnecting from PubTrans

Disconnecting from PubTrans will not end a subscription; however the subscription will enter a non-connected state. Disconnecting from PubTrans should preferably be done by sending an end tag of the ROI:ToPubTrans xml-stream. In this case PubTrans disconnects the external system gracefully.

If an external system is unintentionally disconnected for some reason, PubTrans will eventually timeout and the subscription will enter the non-connected state.

The external system should send a Subscription Resume Request (See above) to re-start the subscription after a reconnection.

6.4.7 Setting up the subscription the first time

A client system should send a Subscription Request to set up a subscription. Different types of client applications need different types of subscription configurations. Below are some examples.

6.4.7.1 Display system providing information to passengers waiting to board at a stop

Such a system should primarily subscribe on Vehicle Journey Events with a relevant set of Scope Elements. It could reduce the number of received events by excluding the arrival events. This is accomplished by setting *ConcernsArrivals* = 'N' for each scope element.

If deviation texts are to be presented on the displays then *ExpandDeviationMessageData* = 'Y' should be set in the Vehicle Journey Event Selection element. This means that the different deviation events will include the *DeviationMessage.PublicNote* attribute.

The subscription should also include the Network Deviation Event Selection element with *ExpandDeviationMessageData* = 'Y' set if there is a need to warn for passing trains on the displays.

```
<SubscriptionRequest StartUtcDateTime="2005-10-01T04:00:00+01:00" MessageId="420">
  <VehicleJourneyEventSelection
    ExpandDeviationMessageData="Y"
    LookAheadDuration="PT30M" >
    <ScopeElements>
      <ScopeElement ConcernsArrivals="N">
        <LineRef Gid="9011001001100000"/>
        <JourneyPatternPointRef Gid="9025001000051234"/>
      </ScopeElement>
      <ScopeElement ConcernsArrivals="N">
        <LineRef Gid="9011001001200000"/>
        <JourneyPatternPointRef Gid="9025001000051234"/>
      </ScopeElement>
    </ScopeElements>
  </VehicleJourneyEventSelection>
  <NetworkDeviationEventSelection ExpandDeviationMessageData="Y"/>
</SubscriptionRequest>
```

6.4.7.2 Display system providing information to persons waiting for arriving passengers at a stop

Such a system should use the same type of configuration as described in 6.4.7.1 Display system providing information to passengers waiting to board at a stop above, with the exception that *ConcernsDepartures* = 'N' should be set instead of *ConcernsArrivals* = 'N'.

6.4.7.3 Web application providing information to customers that want an overview of previous, current and expected deviations

Such a system need only subscribe to Deviation Case Events.

```
<SubscriptionRequest StartUtcDateTime="2005-10-01T04:00:00+01:00" MessageId="421">
  <DeviationCaseEventSelection IncludeSourceControlAction="Y">
    <ScopeElements><ScopeElement></ScopeElement></ScopeElements>
    <PublicationScopeElements>
      <PublicationScopeElement></PublicationScopeElement>
    </PublicationScopeElements>
  </DeviationCaseEventSelection>
</SubscriptionRequest>
```

6.4.8 Modifying an existing subscription

If the client system wants to modify an existing subscription at a later time it should send a Subscription Update Request. Observe that the complete subscription configuration including those parts of the previous configuration that are to be retained should be included in the Subscription Update Request.

```
<SubscriptionUpdateRequest MessageId="543">
  <VehicleJourneyEventSelection
    ExpandDeviationMessageData="Y"
    LookAheadDuration="PT30M" >
    <ScopeElements>
      <ScopeElement ConcernsArrivals="N">
        <LineRef Gid="9011001001100000"/>
        <JourneyPatternPointRef Gid="9025001000051234"/>
      </ScopeElement>
    </ScopeElements>
  </VehicleJourneyEventSelection>
  <NetworkDeviationEventSelection ExpandDeviationMessageData="Y"/>
</SubscriptionUpdateRequest>
```

6.4.9 Resuming a subscription

The client should send a Subscription Resume Request to resume a subscription after the connection has been broken.

```
<SubscriptionResumeRequest MessageId="7496"/>
```

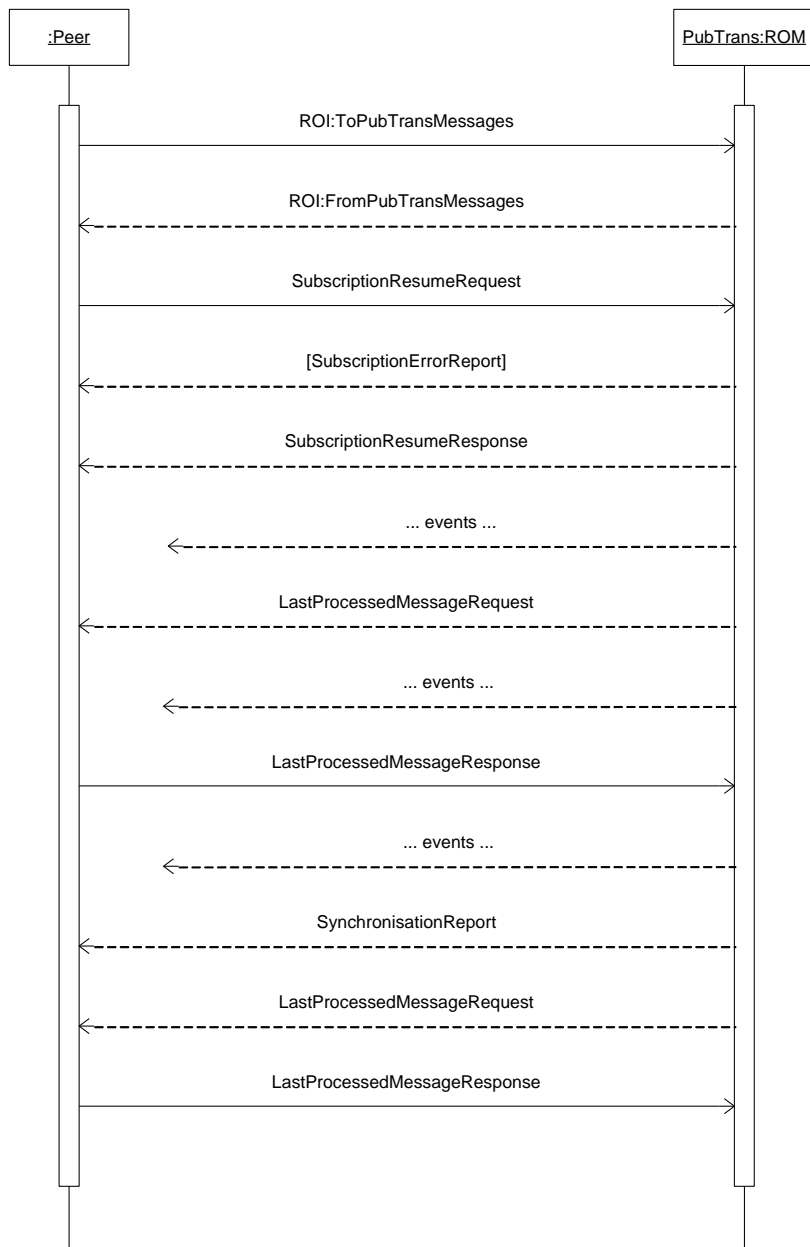
6.4.10 Subscription Resume Request Example

This example shows a typical communication situation between an external system and PubTrans. The communication starts with the external system sending a Subscription Resume Request to restart an already set up subscription. PubTrans will send a Subscription Error Report if a SynchronisedUptoUTCDateTime was supplied in the Subscription Resume Request that is outside the Active Interval.

PubTrans will then respond with a Subscription Resume Response.

Following the response, subscription events are sent. Last Processed Message Requests will be sent regularly to keep the synchronisation and communication alive. The external system should respond to these requests with a Last Processed Message Response.

PubTrans will also send Synchronisation Reports at some interval. This report informs the external system how far the subscription has recovered.



6.5 Subscription Messages Overview

This is an overview of the Subscription messages that can be sent to PubTrans and their expected responses and possible errors. Note that Subscription Request should only be sent once to setup a subscription and that the Subscription Termination Request should only be used to permanently end a subscription. Use Subscription Resume Request and Subscription Update Request for normal resuming and updating communication with PubTrans.

Input to PT:ROI following connection & start tag.	Expected results and response from PT.	Possible responses	Possible errors:
Subscription Request (w/o StartUTCDateTime)	PT starts subscription using now time as a limiter.	Subscription Response, Subscription Error Response	Subscription already active. Expanded data or Look-Ahead out of bounds.
Subscription Request (w. StartUTCDateTime)	PT starts subscription with supplied StartUTCDateTime as a limiter.	Subscription Response, Subscription Error Response	StartUTCDateTime too early. Subscription already active. Expanded data or Look-Ahead out of bounds.
Subscription Resume Request (w/o any time attributes)	PT resumes subscription from its previously saved point in time.	Subscription Resume Response Subscription Error Report Subscription Error Response	No valid subscription. SynchronisedUptoUTCDateTime no longer in active interval.
Subscription Resume Request (w. SynchronisedUptoUTCDateTime)	PT resumes subscription from the given time.	Subscription Resume Response Subscription Error Report Subscription Error Response	No valid subscription. SynchronisedUptoUTCDateTime no longer in active interval.
Subscription Resume Request (w. SynchronisedUptoUTCDateTime, StartUTCDateTime)	PT resumes subscription from the given time with StartUTCDateTime as a limiter.	Subscription Resume Response Subscription Error Report Subscription Error Response	No valid subscription. SynchronisedUptoUTCDateTime no longer in active interval.

Input to PT:ROI following connection & start tag.	Expected results and response from PT.	Possible responses	Possible errors:
Subscription Resume Request (w. Start-UTCDateTime)	PT resumes subscription from the previously saved time with Start-UTCDateTime as a limiter.	Subscription Resume Response Subscription Error Report Subscription Error Response	No valid subscription. SynchronisedUptoUTCDateTime no longer in active interval.
Subscription Update Request (no Subscription Resume Request or Subscription Request before this message)	PT alters the subscription with the new data. (No data is sent)	Subscription Update Response Subscription Error Response	Expanded data or Look-Ahead out of bounds. No valid subscription.
Subscription Update Request (Subscription Resume Request or Subscription Request sent previously in the same session.)	PT alters the subscription and resumes from the previously saved time. PT recovers Deviation Case Events if applicable.	Subscription Update Response Subscription Error Response	Expanded data or Look-Ahead out of bounds. No valid subscription.
Subscription Termination Request	PT terminates the given subscription.	Subscription Termination Response Subscription Error Response	No subscription available to terminate. No such subscription to terminate (Wrong SubscriptionId set).

7 Date and Time

This chapter contains explanation of basic concepts for how temporal data is used in PubTrans. This chapter contains knowledge essential for understanding how date and time are handled in PubTrans and is an important basic knowledge to understand other PubTrans concepts.

7.1 General

7.1.1 Time Zones

A PubTrans system is configured to operate in a default local time zone, which typically is the time zone of the country in which a PubTrans system is installed.

Timetable data is always stored as local times.

Real-time processing of data requires that data is given in a format that can be converted to UTC. Internally, all events are time stamped in UTC. This is primarily to avoid problems with changes of daylight saving time. Using UTC makes all timestamps increasing, which simplifies the data processing and the interpretation of data.

On XML-input, time can be expressed in any time zone according to the definition of the *xs:datetime* data type. For timetable data these values are converted and stored in the default local time zone. For real-time data these values are converted and stored in UTC.

On output, PubTrans provide data enough to make conversion of both local times and UTC-times to any other time zone.

7.1.2 Comparing Date and Times

When comparing date and time values, a date should always be treated as 0:00 that day. This has consequences for comparing end dates of period, because the end date will never be included in the period. A comparison should therefore always use the following expression to determine if a value is within a period or time band: *Start date/time ≤ value < end date/time*.

7.1.3 Dates

Dates are absolute values defining a calendar day or an operating day. A date is expressed according to the XML data type *xs:date*.

7.1.3.1 Calendar Day

This is a day that starts 0:00 and ends 24:00. Two calendar days cannot overlap in time.

7.1.3.2 Operating Day

This is a day that starts 0:00 the given date. All scheduled objects (vehicle journeys, blocks etc.) belong to an operating day. Their absolute timing is calculated as the start of the operating day + the relative time. Operations belonging to different operating days may overlap.

7.1.4 Times

Times are absolute within a calendar day. The absolute date/time is calculated as the date 0:00 + the time. Time is expressed according to the XML data type *xs:time*.

7.1.5 Duration

Duration is any period of time between two absolute date/times. Duration can have any length, e.g. more than 24 hours. Duration is expressed according to the XML data type *xs:duration*.

The data type duration does not exist as a type in SQL Server. Instead, it can be implemented as an integer counting seconds or as a *datetime*, where the duration is counted from day zero.

7.2 Periods of Time

7.2.1 Period

In PubTrans, periods are expressed starting at a *from-date-value* and an *up-to-date-value*. The dates within a period should be interpreted as all dates inclusive the from-value and exclusive the up to-value. The up-to date can be thought of as an "invalid from date". If a periods last date is the 31st of January, this has to be specified with an up-to date 1st of February in PubTrans.

When comparing if a datetime value is within a period of not, a date value shall always be regarded as having a time component of 0:00:00.

7.2.2 Time Band

In PubTrans, periods are expressed starting at a *from-time-value* and duration.

7.3 Timetable Times

7.3.1 General

Timetable times are generally expressed in the range of 00:00:00 to 23:59:59. PubTrans supports a time resolution in seconds for both planned and real-time data.

Many systems only handles one passing time per timing point. PubTrans consequently distinguishes between arrival times and departure times, and they exist for all points passed by a vehicle journey. This means that a vehicle journey also can have an arrival time at the first stop and a departure time from the last stop, and that arrival- and departure times also can be given for non stop points in a journey pattern.

The departure time is always interpreted as the earliest permitted departure time, and the arrival time as the latest acceptable arrival time.

7.3.2 Sequence for Arrivals and Departures

The sequence of arrivals and departures on a vehicle journey and for all vehicle journeys in a block has the following constraints:

1. A departure time must be equal or greater than a previous departure time.

2. An arrival time must be less than or equal to a following arrival time.
3. An arrival time must be equal or greater than a previous departure time.
4. At the same point, an arrival time can be less than, equal or greater than the departure time. See interpretation in the table below.

Rule 1 and 2 applies for all sequences of calls, also for a sequence of vehicle journeys in a block, which means that:

- The first departure time of a following vehicle journey must be equal or greater than the last departure time of a preceding vehicle journey.
- The last arrival time of a previous vehicle journey must be less than or equal to the first arrival time of the following vehicle journey.

Rule 4 implies the following interpretation of arrival- and departure times at the same stop:

Relation between arrival and departure time	Interpretation
Arrival time < Departure time	The call has a planned duration at the stop.
Arrival time = Departure time	The call is exact at this time.
Arrival time > Departure time	The call has an uncertainty time-span, usually due to known variation in regularity.

Note that there is no constraint that an arrival time must be less than or equal to a departure time at the same stop.

7.3.3 Default Arrival and Departure Times

The normal way of defining timing of a vehicle journey is to specify its departure- and arrival time in DII. As minimum, PubTrans require that the vehicle journeys first departure time and last arrival time is provided. In addition, any number of immediate arrival- and departures times can be defined. If an immediate time is not provided, PubTrans will apply default times for omitted arrival- and departure times as follows:

- An omitted arrival time will be set equal to that of the following arrival.
- An omitted departure time will be set equal to that of the previous departure.

Example: If all immediate times are not given, all departure times will be set equal to the first departure time and all arrival times will be set to the last arrival time. This is consequent with the facts provided.

7.3.4 Midnight

PubTrans handles timetable data across midnight seamless. A vehicle journey is always operated as belonging to one operating day, even if the vehicle journey is running over several days. Usually the operating day corresponds to the start day for a vehicle journey, but it is not required. For instance, a Friday night service that start early Saturday morning can still have Friday as operating day.

For timetable data, all arrival and departure times are defined on input as an offset time relative 0:00 the operating day. The offset can be 0 - 3 days, so it is possible to have vehicle journeys with durations up to 4 days.

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For operational data on output, the arrival and departure times are also given in absolute date/time values. This means that data can be viewed both from an operating day point of view and an absolute time point of view. In the latter case, it is possible to access data by an absolute time, regardless of operating day type. A typical example of where this is practical is when timetables for two operating days overlap.

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Approved
Sebastian Andersson

Document identity
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PubTrans Real-time Output Interface - User Guide

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Author
Erik Johannesson

Approved
Sebastian Andersson

Document identity
UM-PT/I/ROI/3

Date
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Appendices

9 RDA Database for ROI 3.0

This appendix describes the output tables from RDA working in ROI 3.0 mode.

9.1 Database Conventions

9.1.1 Naming in general

The names of the tables and columns are self descriptive based on the terminology and naming used in PubTrans, which in turn is based on the European Reference Data Model TRANSMODEL.

9.1.2 Tables

A table represents an entity in the ROI data model.

9.1.3 Columns

A column value represents either a descriptive value or a foreign key.

Each column is associated with a user defined data type, named on the form `typXyz`. A user defined data type defines the SQL Server data type, an optional default value and value constraint. See section 0 for description of the data types used by RDA.

9.1.4 Foreign keys

Foreign keys – or object references using an object-oriented terminology – is always a single column value. This makes joining of tables much easier. However, a join is often supposed to also consider the time aspect, i.e. consider the period of existence/validity of joined objects.

The naming of the columns is self-descriptive, with the name of the type of reference and the referred interface view.

Foreign keys are of three types:

- `TypId`: A unique identity of the row, not only in the table, but also across all tables in all installations of PubTrans databases. This type is a 16-digit number, and is denoted by `typId`. A foreign key with a `typId`-value may be NULL. If not NULL, it is guaranteed to have referential integrity.
- `TypGid`: A global identity, which has the same value for the same object across all installations of PubTrans databases. This type is denoted by `typGid` and the value of this type is normally constructed by concatenating numeric attributes to a 16-digit number. There are also so called "abstract" Gids where the 16-digit number does not contain any special meaning. The `typGid`-value is guaranteed to be unique at a specific point in time, but may also Point to objects that do not exist at a specific point in time.
- `TypLocalId`: A unique identity of the row, but only in scope of one table in a certain installation. This type is an integer, and is denoted by `typLocalId`. A foreign key with a `typLocalId`-value may be NULL. If not NULL, it is guaranteed to have referential integrity.

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Additionally, absolute date and time values are unique per se. There exist two types of values: `typDate` and `typDateTime`.

Please note that no other references than `typId`, `typLocalId` and `typGid` are guaranteed to be unique. Attributes like Line-numbers, Organisation names and so on may not be used as keys, as they are not guaranteed to be unique and may change over time.

9.1.5 Column names

Columns have self-descriptive names. The name ends with the name of the data type (without the data types leading "typ"). The data type is named in a non-implementation specific fashion. Behind this data type name, PubTrans defines how values of the data type should be handled on input. The data types are described in a separate chapter at the end of this document. When column names are referred to in general text in this document they are presented in italics.

9.1.6 Column names – foreign keys

Columns that hold foreign keys have names that start with "Is", "Has", "Uses", "StartsAt" or similar to express that they express a relationship to the referred view. The name of the referred view is also part of the column name. It can be found directly in front of the data type "Id" or "Gid". I.e. the column name `IsManagedByOrganisationalUnitId` is built up of three parts; "IsManagedBy", that express the relationship; "OrganisationalUnit", that is the name of the referred view; and "Id" that denotes that it is the column Id in the referred view that should be matched.

9.1.7 NULL-values

Columns where NULL-values are permitted will be noted as "May be NULL." in the remark of each view definition.

9.1.8 Local time versus UTC

Date/time values can be either in local time or in UTC. All date/times are local times unless the column names includes UTC in the name. To convert a local time to UTC, subtract the `UtcOffsetMinutes` from the local time.

RDA will provide time data in the appropriate local time according to local time zone and daylight savings time.

For data concerning Dated Vehicle Journeys evaluation will be based on daylight savings conditions valid at noon on the operating day date of the associated Dated Vehicle Journey. For other objects evaluation will be based on daylight savings conditions valid at the first time the provided time is passed.

9.1.9 Keeping track of changes

The `CreatedUTCDateTime` reflects the timestamp when the record was created in PubTrans. The `LastModifiedUTCDateTime` columns will contain the same value as `CreatedUTCDateTime` if the object has not been modified.

Observe that RDA does not necessarily deliver records in a strict order based on LastModifiedUTCDate-Time. This implies that future dated vehicle journeys that are available in PubTrans will not be distributed immediately, but will be delayed until they come within the look-ahead time frame.

9.1.10 Indexes

The column *Id* in the tables should be used as primary key. Other indexes may need to be added depending on which queries that are used by client applications. Observe that adding indexes to a write-intensive database such as the RDA-database comes at a performance penalty that can sometimes be detrimental. The impact of added indexes must therefore be checked before finalizing the tuning. It should be considered if it is possible to rewrite the queries so that fewer or less costly indexes can be used.

If customisations of indexes are made, it is strongly recommended that all additions be saved as SQL-scripts so they easily can be applied again if necessary.

9.2 Vehicle Journeys

9.2.1 Dated Vehicle Journey

Dated Vehicle Journey is part of the production plan. It is delivered in advance as a Vehicle Journey Create Event.

Column name	Data type	Remark
Id	typId	Unique.
OperatingDayDate	typDate	
Gid	typGid	
IsOnDirectionOfLineGid	typGid	May be NULL. Only NULL if Dead Run.
VehicleOperatorGid	typGid	May be NULL.
TimetabledStartDateTime	typDateTime	Local time.
TimetabledEndDateTime	typDateTime	Local time.
UTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC.
State	typVehicleJourneyState	May be updated. Not expected, expected or cancelled.
OriginName	typName	May be NULL. May be updated.
OriginShortName	typShortName	May be NULL. May be updated.
InformPassengers— ConditionCode	typInformPassengersConditionCode	May be NULL.

Column name	Data type	Remark
ExpectedToBeMonitoredYesNo	typYesNo	May be NULL.
IsValidYesNo	typYesNo	May be updated, but only from 1 (Yes) to 0 (No).
CreatedUTCDateTime	typDateTime	
LastModifiedUTCDateTime	typDateTime	May be updated.

Note that The VehicleJourneyState as a whole consists of StateCode above combined with VehicleJourney-Assignment.StateCode and MonitoredVehicleJourney.ProgressStateCode.

It is possible to convert times marked as local times into UTC by subtracting UTCOffsetMinutes.

9.2.2 Monitored Vehicle Journey

Monitored Vehicle journey is created when journey progress is first detected. Before this event, information about the vehicle journey is available in Dated Vehicle Journey and Vehicle Journey Assignment.

Column name	Data type	Remark
Id	typId	Unique.
IsDatedVehicleJourneyId	typId	
IsAssignedToVehicleGid	typGid	May be NULL. Provided depending on configuration.
State	typVehicleJourneyState	May be updated. At origin, in progress(slow progress, no progress, normal progress, fast progress) off route, aborted, completed.
PassengerLevel	typPassengerLevel	May be updated. Unknown, empty, seats available, standing passengers, passengers left behind.
InProgressFromDateTime	typDateTime	Local time.
FinalStateDateTime	typDateTime	May be NULL. May be updated from NULL Local time when aborted or completed.
PredictionState	typPredictionState	May be updated. Normal, lost contact, in contact but prediction not reliable.
LastObservedDateTime	typDateTime	May be NULL. Not NULL only when prediction is not reliable. May be updated. Local time.
LastObservedAtJourneyPatternPointGid	typGid	May be NULL. Not NULL only when prediction is not reliable. May be updated.

Column name	Data type	Remark
LastObservation-WasDepartureYesNo	typYesNo	May be NULL. Not NULL only when prediction is not reliable. May be updated.
CreatedUTCDateTime	typDateTime	
LastModifiedUTCDateTime	typDateTime	May be updated.

It is possible to convert times marked as local times into UTC by subtracting UTCOffsetMinutes. The relevant UTCOffsetMinutes value is found in the associated Dated Vehicle Journey record.

The available service level is deductible from Vehicle data in DOI.

9.2.3 Vehicle Journey Deviation

A deviation that concern all arrivals and departures on a vehicle journey is exposed as a vehicle journey deviation instead of individual arrival and departure deviations.

Column name	Data type	Remark
Id	typId	Unique.
IsOnDatedVehicleJourneyId	typId	
HasDeviationMessageVersionId	typId	May be NULL
IsConsequenceOfDeviationCaseGid	typGid	
ConsequenceShortName	typShortName	
IsValidYesNo	typYesNo	May be updated, but only from 1 (Yes) to 0 (No).
LastModifiedUTCDateTime	typDateTime	May be updated.

9.2.4 Arrival

Arrival is part of the production plan. The timetabled data is delivered in advance in the Arrival Create Event. Monitored data is appended as updates are delivered as Arrival Update Events. The Arrival record can be used to provide passenger information even before a vehicle is assigned based on the production plan data.

Column name	Data type	Remark
Id	typId	Unique.
IsOnDatedVehicleJourneyId	typId	
IsOnMonitoredVehicleJourneyId	typId	May be NULL. May be updated from NULL.
JourneyPatternSequenceNumber	typSequenceNumber	Unique in combination with IsOnDatedVehicleJourneyId and IsOnMoni-

Column name	Data type	Remark
		toredVehicleJourneyId.
IsTimetabledAtJourneyPatternPointGid	typGid	
VisitCountNumber	typVisitCount- Number	
IsTargetedAtJourneyPatternPointGid	typGid	May be updated. Defaults to Gid of timeta- bled journey pattern point.
WasObservedAtJourneyPatternPointGid	typGid	May be NULL. May be updated.
TimetabledLatestDateTime	typDateTime	Local time.
TargetDateTime	typDateTime	May be updated. Defaults to timetabled latest arrival date time. Local time.
EstimatedDateTime	typDateTime	May be NULL. May be updated. Local time.
ObservedDateTime	typDateTime	May be NULL. May be updated from NULL. Actual arrival date time. Local time.
State	typArrivalState	May be updated. Not expected, not called, expected, can- celled, due, arrived, passed, missed, re- placed, assumed arrived.
Type	typArrivalType	No stop, no alighting, stop if alighting, al- ways stop, flexible alighting up to here.
IsValidYesNo	typYesNo	May be updated, but only from 1 (Yes) to 0 (No).
LastModifiedUTCDateTime	typDateTime	May be NULL. May be updated.

It is possible to convert times marked as local times into UTC by subtracting UTCOffsetMinutes. The rele-
vant UTCOffsetMinutes value is found in the associated Dated Vehicle Journey record.

9.2.5 Arrival Deviation

Column name	Data type	Remark
Id	typId	Unique.
IsOnArrivalId	typId	
AffectsPreviousDeparturesYesNo	typYesNo	
HasDeviationMessageVersionId	typId	May be NULL
IsConsequenceOfDeviationCaseGid	typGid	
ConsequenceShortName	typShortName	

Column name	Data type	Remark
IsValidYesNo	typYesNo	May be updated, but only from 1 (Yes) to 0 (No).
LastModifiedUTCDateTime	typDateTime	May be updated.

9.2.6 Departure

Departure is part of the production plan. The timetabled data is delivered in advance in the Departure Create Event. Monitored data is appended as updates are delivered as Departure Update Events. The Departure record can be used to provide passenger information even before a vehicle is assigned based on the production plan data.

Column name	Data type	Remark
Id	typId	Unique.
IsOnDatedVehicleJourneyId	typId	
IsOnMonitoredVehicleJourneyId	typId	May be NULL. May be updated.
JourneyPatternSequenceNumber	typSequenceNumber	Unique in combination with IsOnDatedVehicleJourneyId and IsOnMonitoredVehicleJourneyId.
IsTimetabledAtJourneyPatternPointGid	typGid	
VisitCountNumber	typVisitCountNumber	
IsTargetedAtJourneyPatternPointGid	typGid	May be updated. Defaults to Gid of timetabled journey pattern point.
WasObservedAtJourneyPatternPointGid	typGid	May be NULL. May be updated.
HasDestinationDisplayId	TypId	May be NULL. If NULL, then HasDestinationStopAreaGid is provided instead. May be updated.
HasDestinationStopAreaGid	typGid	May be NULL. Only provided when HasDestinationDisplayId is NULL. May be updated.
HasServiceRequirementId	typId	May be NULL.
TimetabledEarliestDateTime	typDateTime	Local time.
TargetDateTime	typDateTime	May be updated. Defaults to timetabled earliest departure date time. Local time.
EstimatedDateTime	typDateTime	May be NULL. May be updated. Local time.

Column name	Data type	Remark
ObservedDateTime	typDateTime	May be NULL. May be updated from NULL. Actual departure date time. Local time.
State	typDepartureState	May be updated. Not expected, not called, expected, cancelled, at stop, boarding, boarding closed, departed, passed, missed, replaced, assumed departed.
Type	typDepartureType	No stop, no boarding, stop if boarding, always stop, flexible boarding from here.
IsValidYesNo	typYesNo	May be updated, but only from 1 (Yes) to 0 (No).
LastModifiedUTCDateTime	typDateTime	May be NULL. May be updated.

It is possible to convert times marked as local times into UTC by subtracting UTCOffsetMinutes. The relevant UTCOffsetMinutes value is found in the associated Dated Vehicle Journey record.

9.2.7 Departure Deviation

Column name	Data type	Remark
Id	typId	Unique.
IsOnDepartureId	typId	
AffectsLaterArrivalsYesNo	typYesNo	
HasDeviationMessageVersionId	typId	May be NULL
IsConsequenceOfDeviationCaseGid	typGid	
ConsequenceShortName	typShortName	
IsValidYesNo	typYesNo	May be updated, but only from 1 (Yes) to 0 (No).
LastModifiedUTCDateTime	typDateTime	May be updated.

Will not be distributed or updated until the synchronisation process has passed the timetabled start time of the underlying Dated Vehicle Journey.

9.2.8 Connection

Column name	Data type	Remark
Id	typId	Unique.
IsFromArrivalId	typId	

Column name	Data type	Remark
IsToDepartureId	typId	
WaitForFeederUntilDateTime	typDateTime	May be updated. Local time.
UTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time.
State	typConnectionState	May be updated. Expected, waiting, released, cancelled, failed.
ContinuingVehicleYesNo	typYesNo	
ExposedToStaffYesNo	typYesNo	
ExposedToPassengersYesNo	typYesNo	
MinChangeDurationSeconds	typDurationSeconds	May be NULL.
MaxReplanDurationSeconds	typDurationSeconds	May be NULL.
AlertControlCentre-AfterDurationSeconds	typDurationSeconds	May be NULL.
IsValidYesNo	typYesNo	May be updated, but only from 1 (Yes) to 0 (No).
CreatedUTCDateTime	typDateTime	
LastModifiedUTCDateTime	TypDateTime	May be updated.

It is possible to convert times marked as local times into UTC by subtracting UTCOffsetMinutes.

9.3 Control Actions and Information Actions

9.3.1 Deviation Case

Column name	Data type	Remark
Id	typId	Unique.
Gid	typGid	
OperationActionCode	typOperation-ActionCode	
ExternalIDName	typName	May be NULL.
ExternalSystemIDName	typName	May be NULL.
IsPartOfMasterDeviationCaseId	typId	May be NULL.

Column name	Data type	Remark
DeviationReasonStandardCategoryCode	typDeviationReason-StandardCategoryCode	May be NULL.
DeviationReasonCustomCategoryName	typName	May be NULL.
ReportedByUserName	typName	May be NULL
ReportedByUserOrganisationalUnitId	typId	May be NULL
ReportedByUserOrganisationalUnitCode	typCode	May be NULL
ReportedByUserOrganisationCode	typCode	May be NULL
OfficialRegistrationDateTime	typDateTime	May be NULL. Local time.
OfficialRegistrationUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time. May be NULL. NULL if OfficialRegistrationDateTime is NULL.
SourceNote	typNote	May be NULL. Could contain name and organisation of original information supplier.
RevokedFromDateTime	typDateTime	May be NULL. May be updated from NULL. Local time.
RevokedFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC. May be NULL. NULL if RevokedFromDateTime is NULL.
RevokedByUserName	typName	May be NULL. May be updated from NULL.
RevokedByUserOrganisationalUnitId	typId	May be NULL. May be updated from NULL.
RevokedByUserOrganisationalUnitCode	typCode	May be NULL. May be updated from NULL.
RevokedByUserOrganisationCode	typCode	May be NULL. May be updated from NULL.
LastScopeEndUTCDateTime	typDateTime	May be NULL.
IsReplacedById	typId	May be NULL. NULL if this object is valid, else zero or replacing object's Id. May be updated.
CreatedUTCDateTime	typDateTime	
LastModifiedUTCDateTime	typDateTime	May be updated.

It is possible to convert times marked as local times into UTC by subtracting the related UTCOffsetMinutes.

9.3.2 Deviation Case Scope Element

Column name	Data type	Remark
Id	typId	Unique.
IsForDeviationCaseId	typId	
StopScopeGid	typGid	May be NULL. NULL means include all stops. It is also possible to filter on stops under Transport Authority, Stop Area or single Stop Point/Journey Pattern Point.
JourneyScopeGid	typGid	May be NULL. NULL means include all journeys. It is also possible to filter on journeys under Transport Authority, Line, Direction Of Line or single Journey.
VisitCountNumber	typVisitCountNumber	May be NULL.
ConcernsArrivalsYesNo	typYesNo	.
ConcernsDeparturesYesNo	typYesNo	
FromDateTime	typDateTime	Local time.
FromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time.
UptoDateTime	typDateTime	Local time.
UptoUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time.

It is possible to convert times marked as local times into UTC by subtracting the related UTCOffsetMinutes.

9.3.3 Deviation Message Version

Column name	Data type	Remark
Id	typId	Unique.
IsForDeviationCaseId	typId	
VersionNumber	typVersionNumber	Unique in combination with DeviationCaseId.
PublishFromDateTime	typDateTime	Local time.

Column name	Data type	Remark
PublishFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time.
PublishUptoDateTime	typDateTime	May be NULL. Local time.
PublishUptoUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time. May be NULL. NULL if PublishUptoDateTime is NULL.
PublicationApprovalRequiredYesNo	typYesNo	
PublicNote	typNote	
InternalNote	typNote	May be NULL.
ReminderDateTime	typDateTime	May be NULL. Local time.
ReminderHyperlinkName	typHyperLinkName	May be NULL.
PriorityImportanceLevel	typImportanceLevel	Measurement of how important this information is to those affected.
PriorityInfluenceLevel	typInfluenceLevel	Measurement of how many that are affected by this information.
PriorityUrgencyLevel	typUrgencyLevel	Measurement of how soon this information must reach affected.
ReportedByUserName	typName	May be NULL
ReportedByUserOrganisationalUnitId	typId	May be NULL
ReportedByUserOrganisationalUnitCode	typCode	May be NULL
ReportedByUserOrganisationCode	typCode	May be NULL
IsValidYesNo	TypYesNo	May be updated, but only from 1 (Yes) to 0 (No).
CreatedUTCDateTime	typDateTime	
LastModifiedUTCDateTime	typDateTime	May be updated.

It is possible to convert times marked as local times into UTC by subtracting the related UTCOffsetMinutes.

9.3.4 Selecting valid deviation messages

9.3.5 Most client applications will only pull for messages. This is made by a SELECT-statement that should filter messages as follows:

- Public messages must have a Passenger Target Audience or Customer Target Audience, PublishFromDateTime must be less than or equal to the time of presentation. The time of presentation must also be less than PublishUptoDateTime.
- Messages requested by identified users on an extranet must be approved for publication.

Presentation of deviation messages to non-public users is not restricted to messages that are valid or approved at the time of presentation. This is something application dependent.

9.3.6 Target Audience

Column name	Data type	Remark
Id	typId	Unique.
IsConcernedByDeviationMessageVersionId	typId	
TypeCode	typTargetAudienceTypeCode	PASSENG, CUSTOMER,STAFF. (Passenger, customer, staff on board vehicle.

Message Variant

Column name	Data type	Remark
Id	typId	Unique.
IsPartOfDeviationMessageVersionId	typId	
Content	typContent	Actual text or hyperlink to content
ContentTypeShortName	typShortName	Text/plain, text/html, urn/mp3
UsageTypeShortName	typShortName	
LanguageCode	typLanguageCode	May be NULL.
IsPublicYesNo	typYesNo	Denotes if this message variant is OK to distribute to the public. This is only relevant if there is also a publication approval.

Publication Scope

Column name	Data type	Remark
Id	typId	Unique.
IsForDeviationMessageVersionId	typId	
ConcernsLineGid	typGid	
IsRestrictedToDeviationScopeYesNo	typYesNo	

Note

The Publication Scope is restricted to those stops on the concerned Line that are covered by the union of Stop Scope For Publication Scope records defined for this Publication Scope. If there are no such records, then all stops on the concerned Line are covered.

9.3.7 Stop Scope For Publication Scope

Column name	Data type	Remark
Id	typLocalId	Unique.
IsForPublicationScopeId	typId	
StopScopeGid	typGid	May be NULL. It is possible to filter on stops under Transport Authority, Stop Area or Stop Point/Journey Pattern Point called by journeys on the selected Line. If NULL then all stops are included. It will only be NULL if either ConcernsArrivalsYesNo='N' or ConcernsDeparturesYesNo='N'.
ConcernsArrivalsYesNo	typYesNo	
ConcernsDeparturesYesNo	typYesNo	

Publication Decision

Column name	Data type	Remark
Id	typId	Unique.
IsForPublicationScopeId	typId	
DecidedByUserName	typName	May be NULL
DecidedByUserOrganisationalUnitId	typId	
DecidedByUserOrganisationalUnitCode	typCode	
DecidedByUserOrganisationCode	typCode	
ApprovedYesNo	typYesNo	
IsValidYesNo	typYesNo	May be updated, but only from 1 (Yes) to 0 (No).
CreatedUTCDateTime	typDateTime	
LastModifiedUTCDateTime	typDateTime	May be updated.

Source Control Action

Column name	Data type	Remark
Id	typLocalId	Unique.

Column name	Data type	Remark
IsForDeviationCaseId	typId	
PartCount	typCount	

Note

Source Control Action contains the XML-structure of the original Control Action. Depending on size the actual data will be provided in one or more Source Control Action Parts.

9.3.8 Source Control Action Part

Column name	Data type	Remark
Id	typLocalId	Unique.
IsPartOfSourceControlActionId	typLocalId	
SequenceNumber	typSequenceNumber	Unique in combination with IsPartOfSourceControlActionId.
Content	typContent	

Short Term Changes in Network

These short-term changes are not to be confused with the validity of the Network objects. What is expressed here is simply the state of the objects.

9.3.8.1 Network Deviation

Column name	Data type	Remark
Id	typId	Unique.
TypeCode	typNetwork-DeviationTypeCode	STOPPOIN, STATENTR or BRIDGDEV. (Stop Point, Station Entrance, Bridging Device)
ConcernsGid	typGid	StopPointGid, StationEntrancePointGid or BridgingDeviceGid.
StatusCode	typNetwork-DeviationStatusCode	Limited access, closed, attention.
HasDeviationMessageVersionId	typId	May be NULL.
IsConsequenceOfDeviationCaseGid	typGid	
ValidFromDateTime	typDateTime	May be updated. Local time.
ValidFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time.
InvalidFromDateTime	typDateTime	May be updated. Local time.

Column name	Data type	Remark
InvalidFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time.
LastModifiedUTCDateTime	typDateTime	May be updated.

It is possible to convert times marked as local times into UTC by subtracting the relevant UTCOffsetMinutes.

9.3.8.2 Assignments

9.3.8.3 The states assigned and **signed on** are recorded in separate Assignment instances. The state applies from the time indicated by attribute Valid From Date Time. The attribute Invalid From Date Time marks the time from when the opposite state (*unasigned/signed off*) starts to apply or when the assignment instance was overridden by another assignment instance.

Observe that the attribute Invalid From Date Time is not provided in advance. Instead it is set when this Assignment instance is overridden by another Assignment instance, or the opposite state starts to apply.

- A Vehicle can only be associated with one assignment instance having state signed on and no invalid from date time.
- A Vehicle can be associated with several assignment instances having state assigned and no invalid from date time.
- A Block/Vehicle Journey/Duty/Driver can only be associated with one assignment instance with no invalid from date time.

Vehicle Journey Assignment

Column name	Data type	Remark
Id	TypId	Unique.
IsOfDatedVehicleJourneyId	TypId	May be NULL
IsOfVehicleJourneyGid	typGid	
IsToVehicleGid	TypGid	
OperatingDayDate	typDate	
State	typAssignmentState	Assigned, signed on.
TrainSizeCarCount	typCarCount	May be NULL
ValidFromDateTime	typDateTime	Local time.
ValidFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time.
InvalidFromDateTime	typDateTime	May be NULL. May be updated. Local time.

Column name	Data type	Remark
InvalidFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time. May be NULL. NULL if InvalidFromDateTime is NULL.
CreatedUTCDateTime	typDateTime	
LastModifiedUTCDateTime	typDateTime	May be updated.

Please note that information about which Vehicle that is assigned to a vehicle journey in progress is also available in view Monitored Vehicle Journey. However it is only in this view that assignment data is available before that event.

9.3.8.4 It is possible to convert times marked as local times into UTC by subtracting UTCOffsetMinutes.

Block Assignment

Column name	Data type	Remark
Id	typId	Unique.
IsOfBlockGid	typGid	
IsToVehicleGid	typGid	
OperatingDayDate	typDate	
State	typAssignmentState	Assigned, signed on.
ValidFromDateTime	typDateTime	Local time.
ValidFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time.
InvalidFromDateTime	typDateTime	May be NULL. May be updated. Local time.
InvalidFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time. May be NULL. NULL if InvalidFromDateTime is NULL.
CreatedUTCDateTime	typDateTime	
LastModifiedUTCDateTime	typDateTime	May be updated.

It is possible to convert times marked as local times into UTC by subtracting UTCOffsetMinutes.

Duty Assignment

Column name	Data type	Remark
Id	TypId	Unique.

Column name	Data type	Remark
IsOfDutyGid	TypGid	
IsToEmployeeGid	TypGid	
OperatingDayDate	typDate	
State	typAssignmentState	Assigned, signed on.
ValidFromDateTime	typDateTime	Local time.
ValidFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time.
InvalidFromDateTime	typDateTime	May be NULL. May be updated. Local time.
InvalidFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time. May be NULL. NULL if InvalidFromDateTime is NULL.
CreatedUTCDateTime	typDateTime	
LastModifiedUTCDateTime	typDateTime	May be updated.

It is possible to convert times marked as local times into UTC by subtracting UTCOffsetMinutes.

Driver Assignment

Column name	Data type	Remark
Id	TypId	Unique.
IsOfEmployeeGid	TypGid	
IsToVehicleGid	TypGid	
OperatingDayDate	typDate	
State	typAssignmentState	Assigned, signed on.
ValidFromDateTime	typDateTime	Local time.
ValidFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time.
InvalidFromDateTime	typDateTime	May be NULL. May be updated. Local time.
InvalidFromUTCOffsetMinutes	typOffsetMinutes	The number of minutes that should be subtracted from local time to get UTC time. May be NULL. NULL if InvalidFromDateTime is NULL.
CreatedUTCDateTime	typDateTime	
LastModifiedUTCDateTime	typDateTime	May be updated.

It is possible to convert times marked as local times into UTC by subtracting UTCOffsetMinutes.

Data types

9.3.8.5 Below is a list of the data types used in the views.

Data type	Values	SQL-type	Remark
typArrivalState	0 = Not expected 1 = Not called 2 = Expected 3 = Cancelled 5 = Due 6 = Arrived 10 = Passed 11 = Missed 12= Replaced 13 = Assumed ar- rived	smallint	
typArrivalType	0 = No Stop. 1 = Stop, but no alighting. 2 = Stop for alight- ing if necessary. 3 = Always Stop for alighting. 5 = Flexible Stop – end of alighting stretch.	Smallint	Only types >= 2 should be pre- sented as arrivals to the public.
typAssignmentState	0 =Assigned. 1 = Signed on	smallint	
typCarCount	0-999.	numer- ic(3,0)	
typCode	1-8 uppercase al- phanumeric charac- ters.	Var- char(8)	User defined alphanumeric short identity of an object.

Data type	Values	SQL-type	Remark
typConnectionState	0 = Not expected 1 = Expected 2 = Cancelled 3 = Waiting 4 = Released 5 = Succeeded 6 = Assumed succeeded 7 = Failed. 8 = Unknown	smallint	
typContent	Any text	nvarchar(3600)	
typCount	0-999999999999	numeric(12,0)	
typDate	Any valid date.	Datetime	typDate means to ignore the time part of the date time value.
typDateTime	Any valid absolute time, with both date and time component. A left out time component means 00:00:00 that date.	Datetime	typDateTime means to use both the date and time part as an absolute Point in time.
typDepartureState	0 = Not expected 1 = Not called 2 = Expected 3 = Cancelled 6 = At stop 7 = Boarding 8 = Boarding closed 9 = Departed 10 = Passed 11 = Missed 12 = Replaced 13 = Assumed departed.	Smallint	

Data type	Values	SQL-type	Remark
typDepartureType	0 = No Stop. 1 = Stop, but no boarding. 2 = Stop for boarding if necessary. 3 = Always Stop for boarding. 5 = Flexible Stop – beginning of boarding stretch	smallint	Only types >= 2 should be presented as departures to the public.
typDeviationReasonStandardCategoryCode	ACCIDENT ASSAULT NODRIVER VEHSHORT VEHBREAK WRONGROU WEATHER CONGESTI STRIKE ROADWORK INFRASTR EARLYDEP RESTOREO CHANGEDR OTHER TRAFFICI POLICEDE SAFETY SMOKE MEDICAL HEAVYLOA MAINTENA SERVICEI MARKETIN VANDALIS TECHNICA DELAYS REDUCEDS	var- char(8)	ACCIDENT, ASSAULT, NO DRIVER, VEHICLE SHORTAGE, VEHICLE BREAKDOWN, WRONG ROUTE, WEATHER, CONGESTION, STRIKE, ROAD WORK, INFRASTRUCTURE FAILURE, EARLY DEPARTURE, RESTORE OPERATION, CHANGED ROUTE, OTHER TRAFFIC INCIDENT POLICE DECISION SAFETY SMOKE MEDICAL HEAVYLOAD MAINTENANCE SERVICE INFO MARKETING INFO VANDALISM TECHNICAL FAILURE DELAYS REDUCED SPEED
typDurationSeconds	0-2 000 000 000.	int	
typEmployeeNumber	A 1-5 digit number.	Numer- ic(5, 0)	
typGid	16-digit number.	Numer-	Global id for an object across all

Data type	Values	SQL-type	Remark
		ic(16,0)	PubTrans instances. See separate GID-documentation of how this value is to be created and interpreted.
typHyperLinkName	1-1024 characters	nvar- char(1024)	
typId	16-digit number.	Numer- ic(16,0)	Id for an object is unique among all Pubtrans instances.
typImportanceLevel	1 – 9	smallint	The value 1 represents the highest priority. Measurement of how important this information is to those affected.
typInfluenceLevel	1 – 9	smallint	The value 1 represents the highest priority. Measurement of how many that are affected by this information.
typInformPassengers-ConditionCode	ALWAYS ONLYIF_O ONLYIF_S NEVER	var- char(8)	Describes under which conditions passengers should be informed. Always. Only if the Journey is ordered. Only if the Journey is signed on. Never.
typLanguageCode	According to ISO 639.1	var- char(8)	ISO 639.1 Language Codes. For example sv – orwegi, da – orweg, en – orwegi, nn – nynorsk orwegian and nb – bokmål Norwegian.
typLocalId	A positive number	int	
typName	1-50 characters.	Nvar- char(50)	Full-length name.
typNetworkDeviationStatusCode	LIMITED CLOSED ATTENTIO	var- char(8)	Limited access, closed, attention
typNetworkDeviationTypeCode	STOPPOIN STATENTR BRIDGDEV	var- char(8)	Stop Point, Station Entrance, Bridging Device
typNote	1-255 characters.	Nvar-	

Data type	Values	SQL-type	Remark
		char(255)	
typOffsetMinutes	A time offset in minutes.	Smallint	
typOffsetSeconds	A time offset in seconds.	Int	
typOperationActionCode	INFORMAT J_CREATE J_CANCEL P_J_CANC J_ORDERI C_J_PATT C_J_PROG C_J_TIMI CON_CREA CON_MODI CON_CANC SP_CLOSE SP_ATTEN SP_L_ACC BD_CLOSE BD_ATTEN BD_L_ACC SE_CLOSE SE_ATTEN SE_L_ACC V_W_ASSI V_W_DEAS	var- char(8)	Information Journey Creation Journey Cancellation Partial Journey Cancellation Journey Ordering Change Of Journey Pattern Change Of Journey Progress Change Of Journey Timing Connection Creation Connection Modification Connection Cancellation Stop Point Closed Stop Point Attention Stop Point Limited Access Bridging Device Closed Bridging Device Attention Bridging Device Limited Access Station Entrance Point Closed Station Entrance Point Attention Station Entrance Point Limited Access Vehicle Work Assignment Vehicle Work Deassignment
typPassengerLevel	0 = Empty 1 = Seats available, 3 = Standing pas- sengers 4=Passengers left behind 9 = Unknown	smallint	
typPredictionState	0 = Normal 1=lost contact 2 = In contact but prediction not relia- ble.	smallint	
typSequenceNumber	1 - 999999999998	numer-	

Data type	Values	SQL-type	Remark
		ic(12, 0)	
typShortName	1-16 characters.	nvar- char(16)	Short name.
typTargetAudienceTypeCode	PASSENG CUSTOMER STAFF	var- char(8)	Passenger, customer, staff on board vehicle
typText	Any text.	nvar- char(1000)	
typUrgencyLevel	1 - 9	smallint	The value 1 represents the highest priority. Measurement of how soon this information must reach affected.
typVehicleJourneyState	0 = Not expected 1 = Not run 2 = Expected 3 =Assigned 4 = Cancelled 5 = Signed on 6 = At origin 7 = Fast progress 8 = Normal progress 9 = Slow progress 10 = No progress 11 = Off route 12 = Aborted 13 = Completed 14 = Assumed com- pleted	smallint	
typVersionNumber	1 - 999999	int	
typVisitCountNumber	1 - 999999	int	
typYesNo	0 or 1, interpreted as No or Yes.	bit	