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**Javni prevoz - Vmesnik za informiranje v realnem ļ asu za potrebe delovanja javnega prevoza - 1. del: Okvir in skladnost**

Public transport - Service interface for real-time information relating to public transport operations - Part 1: Context and framework

Öffentlicher Verkehr - Dienstleitungsschnittstelle für zeitnahe Informationen zum Betrieb des öffentlichen Verkehrs - Teil 1: Rahmen und Gerüst



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TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

# CEN/TS 15531-1

July 2007

ICS 35.240.60

English Version

# Public transport - Service interface for real-time information relating to public transport operations - Part 1: Context and framework

Öffentlicher Verkehr - Dienstleitungsschnittstelle für zeitnahe Informationen zum Betrieb des öffentlichen Verkehrs - Teil 1: Rahmen und Gerüst

This Technical Specification (CEN/TS) was approved by CEN on 23 October 2006 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.



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# Foreword

This document (CEN/TS 15531-1:2007) has been prepared by Technical Committee CEN/TC 278 “Road transport and traffic telematics”, the secretariat of which is held by NEN.

This presents Part 1 of the European Technical Specification known as “SIRI”. SIRI provides a framework for specifying communications and data exchange protocols for organisations wishing to exchange Real-time Information (RTI) relating to public transport operations.

SIRI is presented in three parts:

- Context and framework, including background, scope and role, normative references, terms and definitions, symbols and abbreviations, business context and use cases (Part 1).
- The mechanisms to be adopted for data exchange communications links (Part 2).
- Data structures for a series of individual application interface modules (Part 3).

The XML schema can be downloaded from http://www.siri.org.uk/, along with available guidance on its use, example XML files, and case studies of national and local deployments.



It is recognised that SIRI is not complete as it stands, and there will be a substantial amount of work required to continue to develop SIRI over the coming years. It is therefore intended that a SIRI Management Group should continue to exist, at European level, based on the composition of SG7.



According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this CEN Technical Specification: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

# Introduction

Public transport services rely increasingly on information systems to ensure reliable, efficient operation and widely accessible, accurate passenger information. These systems are used for a range of specific purposes: setting schedules and timetables; managing vehicle fleets; issuing tickets and receipts; providing real-time information on service running, and so on.

This Technical Specification specifies a Service Interface for Real-time Information (SIRI) about Public Transport. It is intended to be used to exchange information between servers containing real-time public transport vehicle or journey time data. These include the control centres of transport operators and information systems that utilise real-time vehicle information, for example, to deliver services such as travel information.

Well-defined, open interfaces have a crucial role in improving the economic and technical viability of Public Transport Information Systems of all kinds. Using standardised interfaces, systems can be implemented as discrete pluggable modules that can be chosen from a wide variety of suppliers in a competitive market, rather than as monolithic proprietary systems from a single supplier. Interfaces also allow the systematic automated testing of each functional module, vital for managing the complexity of increasing large and dynamic systems. Furthermore, individual functional modules can be replaced or evolved, without unexpected breakages of obscurely dependent function.



This Technical Specification will improve a number of features of public transport information and service management:



- Interoperability – the Technical Specification will facilitate interoperability between information processing systems of the transport operators by: (i) introducing common architectures for message exchange; (ii) introducing a modular set of compatible information services for real-time vehicle information; (ii) using common data models and schemas for the messages exchanged for each service; and (iv) introducing a consistent approach to data management.

- Improved operations management – the Technical Specification will assist in better vehicle management by (i) allowing the precise tracking of both local and roaming vehicles; (ii) providing data that can be used to improve performance, such as the measurement of schedule adherence; and (iii) allowing the distribution of schedule updates and other messages in real-time.

- Delivery of real-time information to end-users – the Technical Specification will assist the economic provision of improved data by; (i) enabling the gathering and exchange of real-time data between VAMS systems; (ii) providing standardised, well defined interfaces that can be used to deliver data to a wide variety of distribution channels.

Technical advantages include the following:

- Reusing a common communication layer for all the various technical services enables cost-effective implementations, and makes the Technical Specification readily extensible in future.

# 1 Scope

## 1.1 Interfaces Specified by this Technical Specification

### 1.1.1 Business Context

Real-time information may be exchanged between a number of different organisations, or between different systems belonging to the same organisation. Key interfaces include the following:

- Between public transport vehicle control centres – generally, for fleet and network management.
- Between a control centre and an information provision system – generally, to provide operational information for presentation to the public.
- Between information provision systems – generally, sharing information to ensure that publicly available information is complete and comprehensive.

Annex B describes the business context for SIRI in more detail.

SIRI is intended for wide scale, distributed deployment by a wide variety of installations. In such circumstances it is often not practical to upgrade all the systems at the same time. SIRI therefore includes a formal versioning system that allows for the concurrent operation of different levels at the same time and a disciplined upgrade process.

In this general framework, SIRI defines a specific set of concrete functional services. The services separate the communication protocols from the message content ('functional services'). This allows the same functional content to be exchanged using different transport mechanisms, and different patterns of exchange. Figure 1 below shows this diagrammatically.



### 1.1.2 SIRI Communications



SIRI provides a coherent sent of functional services for exchanging data for different aspects of PT operation. A common data model, based on TransModel 5.1, is used across all services.

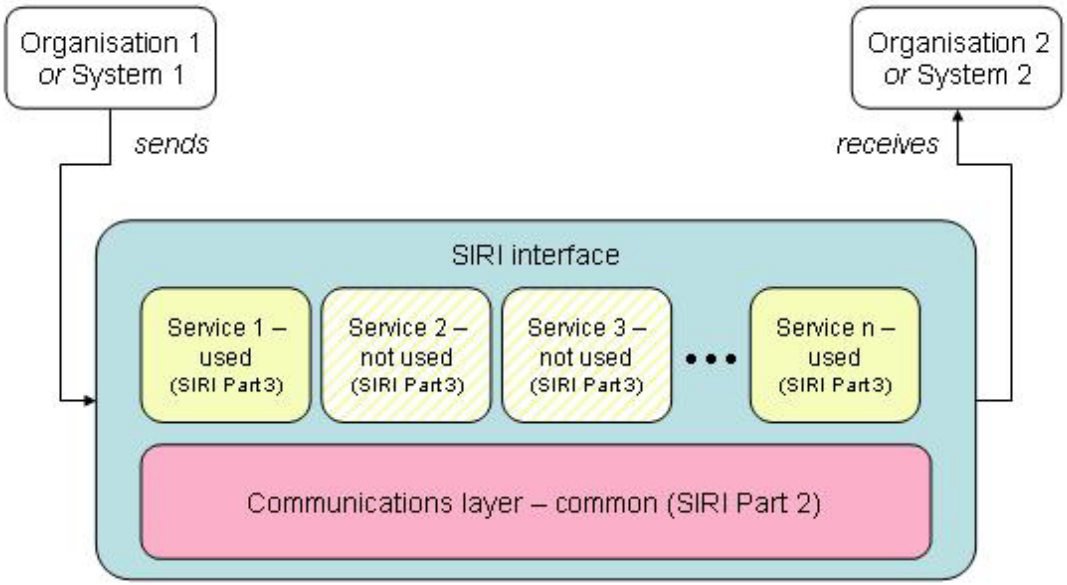


**Figure 1 — Structure of SIRI: a set of optional service interface specifications using a common communications layer**

A communication layer defines common procedures for the requesting and exchanging of data. Within SIRI, the same general communication protocols are used for all the different concrete functional interfaces, and specify a common infrastructure for message referencing, error handling, reset behaviour and so forth. The communications layer is defined in Part 2 of the SIRI document set.

To allow the most efficient use to be made of bandwidth and processing capacity, the SIRI communications architecture supports several different patterns of interaction. SIRI supports both request/response and publish/subscribe protocols between servers, allowing applications both to pull or to push data.

The SIRI publish/subscribe pattern of interaction follows the paradigm described in the W3C candidate standard 'Publish-Subscribe Notification for Web Services (WS-PubSub)'. SIRI uses the same separation of concerns, and a similar terminology for Publish/Subscribe concepts as is used in WS-PubSub.

For the delivery of data in response to both requests and subscriptions, SIRI supports two common patterns of message exchange as realised in existent national systems:

- One-step 'direct' delivery: allowing the simple rapid delivery of data
- Two-step 'fetched' delivery: allowing a more optimised use of limited resources.

### 1.1.3 SIRI Functional Services

SIRI provides specific protocols for the following functional services, defined in Part 3 of the SIRI document set:



- Production Timetable [PT] Service: To send daily information on the operational timetable and associated vehicle running information.
- Estimated Timetable [ET] Service: To send real-time information on timetable, including changes based on the production service and on actual running conditions.



- Stop Timetable [ST] Service: To provide a stop-centric view of timetabled vehicle arrivals and departures at a designated stop.
- Stop Monitoring [SM] Service: To send real-time arrival & departure information relating to a specific stop.
- Vehicle Monitoring [VM] Service: To send real-time information on the movement and predicted movement of vehicles.
- Connection Timetable [CT] Service: To send an operational timetable for a service feeding an interchange, in order to inform departing services of the possible need to wait for connecting passengers.
- Connection Monitoring [CM] Service: To send real-time information on the running of a service inbound to an interchange, in order to advise departing services of the need to wait for connecting passengers. This can also be used to send real-time information to assist passengers in planning their onward journey following a connection.
- General Message [GM] Service: To exchange informative messages between participants.

## 1.2 Use of the SIRI standard

As a framework standard, it is not necessary for individual systems or specifications to implement the whole of the SIRI standard. Specifically it is intended that individual national bodies may adopt consistent subsets of the standard. However, it should be possible to describe (for those elements of systems, interfaces and specifications which fall within the scope of SIRI):

- The aspects of SIRI that they have adopted.

- The aspects of SIRI that they have chosen not to adopt.

In other words, there is no global statement of which elements are mandatory and which optional (except for key fields which are clearly always mandatory).

SIRI is a modular and expandable standard, and the modules included in this version are only a subset of what might potentially be included. Specifically, the current issue of the SIRI specification excludes the following:

- Interfaces between central systems and individual end-devices – on-bus systems, on-street signs, consumer devices etc.

- Interfaces with traffic management systems.

- Control action functions, e.g. instructions to a vehicle to change its running.

- Data relating to events and situations – in SIRI this is passed via the *GeneralMessage* service.

- Functionality of systems – SIRI only specifies the interfaces between servers.

The potential for SIRI to be expended to encompass additional services, including some of those cited here, is being actively investigated at present.

Guidance on the implementation and use of SIRI is not part of the specification. It is a matter for individual users and national groupings to provide advice and guidance on how SIRI may be used in support of local practices.



Note also that the SIRI communications layer does not specify the bearer technologies to be used. It has been specifically developed to be 'technology independent' in this regard, so that local implementations can select the most cost-effective services for their projects.



Of course different technologies have different characteristics, and this may have an impact on the way that SIRI is used in practice. For example, the latency (time delay imposed by the communications network) of a service such as public GPRS is much higher than that on a dedicated, broadband fixed link using DSL. Therefore, systems based on GPRS will need to use a much higher value for some or all of the hysteresis parameters.

## 1.3 Limitations on SIRI and Possible Future Developments

The developers of this technical specification recognise that there is continual development in the business practice of the public transport industry, and that SIRI must continue to evolve to fulfil its needs. Specifically, there is scope for additional elements to be included in two places:

- Communications (SIRI Part 2). New mechanisms of data communication are constantly becoming available, in particular for areas such as information security and data discovery. SIRI is intended to be in line with prevailing information systems industry practice and Part 2 aims to retain flexibility in use of communications technologies.

- Applications (SIRI Part 3). This technical specification is based on a specific set of interfaces, representing a subset of practical needs among participant countries. However, new models of business cooperation may arise which necessitate additional application interface specifications. Part 3 is not intended to be a complete set of interfaces and additional modules might be required in future.

- Architectural detail. This technical specification is based on a very high-level decomposition of public transport operations, and implements only the most common interfaces. This may not fulfil all the needs of an implementer; for example, Scandinavia and the UK both have a relatively high degree of organisational disaggregation, and as a result may need standardisation on what would be 'internal' interfaces elsewhere in Europe.

CEN welcomes input from users of this Technical Specification as to where SIRI needs extension or refinement.

**Additional Information about the relation between SIRI and Transmodel** has been produced by a Transmodel compliance study. It can be found at www.siri.org.uk:

- A table describing the exact mapping of each SIRI element to the corresponding Transmodel object.
- An extract of the Transmodel objects underlying SIRI Services.
- A UML Schema definition.

## 2 Normative references

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

EN 12896, *Road transport and traffic telematics - Public transport - Reference data model*

CEN/TS 13149-6, *Public transport - Road vehicle scheduling and control systems - Part 6: CAN message content*

ISO 8601, *Data elements and interchange formats – Information interchange – Representation of dates and times*



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



## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1 Transport Related Terms

This section includes terms for both PT entities and properties of PT entities used in SIRI. For each term, it is indicated whether the term derives from TransModel (EN 12896 version 5.0) or whether the term is specific to SIRI.

**3.1.1**
**BEARING – SAE J1939/71 (CEN/TS 13149-6)**
the heading of the vehicle in degrees expressed as a floating point number: compliant to SAE J1939/71 (Compatible with CEN/TS 13149-6)

**3.1.2**
**BLOCK – TransModel**
the work of a vehicle from the time it leaves a PARKING POINT after parking until its next return to park at a PARKING POINT. Any subsequent departure from a PARKING POINT after parking marks the start of a new BLOCK. The period of a BLOCK has to be covered by DUTIES.

**3.1.3**
**CALL ACTIVITY – SIRI**
the activity a passenger may undertake when a Vehicle calls at a stop; Boarding, Alighting, or Pass Through

**3.1.4**
**CALL – SIRI**
a visit by a VEHICLE to a specific STOP POINT as it follows the JOURNEY PATTERN of its VEHICLE JOURNEY to achieve a set of planned and estimated PASSING TIMEs. A VEHICLE may make more than one Call to the same stop in the course of a JOURNEY: different calls may typically be distinguished by a Visit Number count. The Call may have real time data associated with it.

A SIRI Call may be regarded as a useful optimisation of a more normalised set of structures that are articulated separately in TransModel. Call combines the TransModel elements of POINT IN JOURNEY PATTERN in with ESTIMATED PASSING TIME, OBSERVED PASSING TIME, & TARGET PASSING TIME, along with real time elements and other stop properties pertaining to the visit. Note that SIRI segregates all elements pertaining to arrival from those pertaining to departure, again facilitating the validation and implementation of actual systems.

**3.1.5**
**CHANGE OF JOURNEY PATTERN – TransModel**
a CONTROL ACTION consisting in assigning a new JOURNEY PATTERN (and the ROUTE supporting it) to a DATED VEHICLE JOURNEY

**3.1.6**
**CLEARDOWN – SIRI**
the act of removing a Stop Visit from a DISPLAY once a vehicle has arrived at a stop. For improved latency, 'Direct Cleardown' may often be done by direct wireless communication between the approaching vehicle and the stop display equipment, as well as by the regular back-end communication between the Stop Monitoring producer server and the Stop Monitoring Consumer entity of the client system driving the stop display.



A separate Cleardown identifier may be associated with each Stop Visit for this purpose, which can be used to reconcile the previous Stop Visit with the arriving vehicle; typically this will be a short numeric code designed to be efficient for communication over a radio channel of restricted capacity.





**3.1.7**
**CONNECTION ACTIVITY – SIRI**



a change to the planned arrival to, or departure from, a connection link for a vehicle journey that is material to passengers intending to make a planned interchange. Events may include a delayed arrival of the feeder, a decision to prolong the wait by the distributor vehicle, a change of the distributor departure point, or cancellation of either of the feeder or distributor journeys.

**3.1.8**
**CONNECTION PROTECTION – SIRI**
the coordination of inbound feeder and outbound distributor journeys at an interchange so as to maximise the chances of passengers achieving their journeys. Involves the exchange of information between feeder and distributor to inform dispatchers and passengers of the current situation, and the delaying of distributor vehicles so as to honour GUARANTEED CONNECTIONS.

**3.1.9**
**CONNECTION LINK – TransModel**
the physical (spatial) possibility for a passenger to change from one public transport vehicle to another to continue a trip. Different transfer times may be necessary to cover interchange over a given connection link, depending on the kind of passenger.

In SIRI, a Feeder service may arrive at one STOP POINT in the CONNECTION LINK, and the Distributor may leave from the same or a different stop in the CONNECTION LINK.

The interchange duration, i.e. transfer time is the time needed to go from stop point to stop point across a CONNECTION LINK. In SIRI, it does not include time needed to board or alight. Several different types of interchange duration may be specified.

**3.1.10**
**CONNECTION MONITORING – SIRI**
the monitoring of the real-time arrivals and departures at an interchange for changes against the planned schedule

**3.1.11**
**CONTROL ACTION – TransModel**
an action resulting from a decision taken by the controller causing an amendment of the operation planned in the PRODUCTION PLAN

**3.1.12**
**CONTROL CENTRE – SIRI**
a Control Centre is an ORGANISATIONAL UNIT that manages a network or networks of vehicles and their attendant real-time systems, and corresponding specifically to a SIRI Service Participant. Each Control Centre has a uniquely identifier, (the Control Centre Code), which provides a scope (i.e. unique namespace) for all non-global data references, such as stop identifiers, vehicle identifiers, etc. Within a Control centre, references must be unique. VEHICLES and JOURNEYS within the span of control of a given Control Centre are Local; VEHICLES and JOURNEYS within the span of control of an external Control Centre are Foreign.

**3.1.13**
**COUPLED JOURNEY – TransModel**
a complete journey operated by a coupled train, composed of two or more VEHICLE JOURNEYs remaining coupled together all along a JOURNEY PATTERN. A COUPLED JOURNEY may be viewed as a single VEHICLE JOURNEY.

**3.1.14**
**COURSE OF JOURNEY– TransModel**
a part of a BLOCK, composed of consecutive VEHICLE JOURNEYs defined for the same DAY TYPE, all operated on the *same* LINE. Also sometimes termed a Run.



**3.1.15**
**DATA SYSTEM – TransModel**
the origin of operational data referring to one single responsibility. References to a data system are useful in an interoperated computer system.

For SIRI, this entails in particular specific systems for assigning unique identifiers to relevant entities such as STOP POINTS or JOURNEYS, about which messages are to be exchanged, and which can be matched to the locally known entities identified by the respective internal operating data. The DATA SYSTEM must be mutually agreed between CLIENT and SERVER. A DATA SYSTEM has both a data model to describe the entities and their relationships, and a Namespace to describe the unambiguous set of identifier values.

**3.1.16**
**DATED VEHICLE JOURNEY – TransModel**
a particular journey of a vehicle on a particular OPERATING DAY, including all modifications decided by the control staff

**3.1.17**
**DELAYED – SIRI**
a categorisation of a VEHICLE JOURNEY for presentation as being late and subject to significant uncertainty caused either by a Disturbance to the transport network or a problem with the VEHICLE itself

**3.1.18**
**DESTINATION DISPLAY – TransModel (with clarification)**
an advertised destination of a specific JOURNEY PATTERN, usually displayed on a headsign or at other on-board locations.

In SIRI, different values for DESTINATION DISPLAY may be used in the dated timetable, the real-time table, or on individual calls to support stop centric and vehicle centric presentations of information to the customer. If not specified on an individual Call element, the DESTINATION DISPLAY will be inherited from the most recent

previous Call element. If there are no values on previous calls, it will be inherited from the DATED VEHICLE JOURNEY destination displays.

**3.1.19**
**DIRECTION – TransModel**
a classification for the general orientation of ROUTEs

**3.1.20**
**DISTRIBUTOR – SIRI**
the role of the outgoing VEHICLE from a TARGETED INTERCHANGE, which picks up passengers from a CONNECTION LINK who have transferred from a Feeder Service. Sometimes also called a Fetcher.

**3.1.21**
**DISTRIBUTOR DEPARTURE – SIRI**
the departure of an outgoing distributor VEHICLE JOURNEY from a CONNECTION LINK

**3.1.22**
**EARLY – SIRI**
a categorisation used in data presentations to indicate that the vehicle has been classified as Early against some criteria. The status of Early will be derived from the real-time progress data. This term should be contrasted with SCHEDULE DEVIATION which specifies the deviation from schedule in seconds.

**3.1.23**
**ESTIMATED PASSING TIME – TransModel**
time data, calculated from the latest available input, about when a public transport vehicle will pass a particular POINT IN JOURNEY PATTERN on a specified MONITORED VEHICLE JOURNEY. These are mainly used to inform passengers about expected times of arrival and/or departure, but may also be used for monitoring and re-planning. See also OBSERVED (ACTUAL) PASSING TIME, TARGET (AIMED) PASSING TIME and TIMETABLED PASSING TIME.



**3.1.24**
**EVENT – TransModel**



an EVENT may be raised in response to the disturbance and over the lifetime of the EVENT one of more CONTROLLER ACTIONS and messages may then be associated with it.

In SIRI, the EVENT is generally avoided in favour of more specific terms for entities

**3.1.25**
**FEEDER – SIRI (Informal TransModel term)**
the role of the incoming VEHICLE to and VEHICLE JOURNEY at a TARGETED INTERCHANGE, which feeds passengers to an arrival STOP POINT having a CONNECTION LINK to a departure STOP POINT from where they will board a Distributor Service. A VEHICLE may perform both feeder and distributor roles at the same time, that is, both set down passengers to transfer to other services, and board passengers from other services.

**3.1.26**
**FEEDER ARRIVAL – SIRI**
the arrival of an incoming feeder VEHICLE JOURNEY to a CONNECTION LINK

**3.1.27**
**FOREIGN VEHICLE – SIRI (Informal TransModel Term)**
a given ORGANISATIONAL UNIT, i.e. SIRI Control Centre system, manages its own set of Local VEHICLES and VEHICLE JOURNEYS, for which it is responsible for provisioning and updating the data. It may also need to manage data for Foreign VEHICLES and VEHICLE JOURNEYS, whose data is originated by a different Control Centre. A Foreign Vehicle is thus a local VEHICLE from one Control Centre that is Roaming into the area managed by another Control Centre.

**3.1.28**
**HEADWAY INTERVAL – SIRI**
for Frequency based services, the interval between vehicles may be TIMETABLED, AIMED, ESTIMATED or ACTUAL

**3.1.29**
**HEADWAY SERVICE – SIRI**
a frequent service whose time of departure is normally shown to the public as 'every n minutes' rather than a fixed time

**3.1.30**
**INCIDENT –TransModel term**
an unforeseen EVENT influencing the operation of the network

In SIRI, progression of an Incident is represented by a Situation.

**3.1.31**
**IN CONGESTION – SIRI**
the status of a vehicle stuck in a traffic jam causing its journey to be delayed and subject to non-deterministic factors; any predictions are likely to be inaccurate

**3.1.32**
**IN PANIC – SIRI**
the status of a vehicle with an active Panic Alarm indicating a security or other incident that is likely to delay the journey according to non-deterministic factors; any predictions are likely to be inaccurate



**3.1.33**
**JOURNEY CANCELLATION – TransModel**
a CONTROL ACTION consisting in deleting a DATED VEHICLE JOURNEY from the latest valid plan



**3.1.34**
**JOURNEY CREATION – TransModel**
a CONTROL ACTION consisting in adding a completely new DATED VEHICLE JOURNEY to the latest valid plan

**3.1.35**
**JOURNEY MEETING – TransModel**
a time constraint for one or several SERVICE JOURNEYs fixing interchanges between them and/or an external event (e.g. arrival or departure of a feeder line, opening time of the theatre, etc.)

**3.1.36**
**JOURNEY PATTERN – TransModel**
an ordered list of STOP POINTs and TIMING POINTs on a single ROUTE, describing the pattern of working for public transport vehicles. A JOURNEY PATTERN may pass through the same POINT more than once. The first point of a JOURNEY PATTERN is the origin. The last point is the destination. Every VEHICLE JOURNEY has a JOURNEY PATTERN associated with it.

In SIRI, JOURNEY PATTERNs are not explicitly exposed in the interface: the LINE and Route DIRECTION elements that appear on VEHICLE JOURNEYS are assumed to be derived from the associated journey pattern.

**3.1.37**
**LATE – SIRI**
a categorisation in presentations indicating that the vehicle has been classified as Late i.e., that a VEHICLE is running behind schedule in excess of some specified criteria. The status of Late will be derived from the real-time progress data.