PD CEN/TS 15531-5:2016



BSI Standards Publication

# Public transport — Service interface for real-time information relating to public transport operations

Part 5: Functional service interfaces
situation exchange: Situation Exchange

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## National foreword

This Published Document is the UK implementation of CEN/TS 15531-5:2016. It supersedes DD CEN/TS 15531-5:2011 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/278, Intelligent transport systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

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SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

# CEN/TS 15531-5

May 2016

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English Version

# Public transport - Service interface for real-time information relating to public transport operations - Part 5: Functional service interfaces situation exchange: Situation Exchange

Transport public - Interface de service pour les informations en temps réel relatives aux opérations de transport public - Partie 5: Service d'interface fonctionnelle - Échange de l'état de l'exploitation et de son contexte

Öffentlicher Verkehr - Diensteschnittstelle für den Echtzeitaustausch von Betriebsinformationen des ÖPNV (SIRI) - Teil 5: Funktionelle Serviceschnittstelle: Situativer Austausch

This Technical Specification (CEN/TS) was approved by CEN on 25 February 2016 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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## European foreword

This document (CEN/TS 15531-5:2016) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TS 15531-5:2011.

The 15531 series consists of the following parts, under the general title *Public transport - Service interface for real-time information relating to public transport operations*

— Part 1: Context and framework

— Part 2: Communications

— Part 3: Functional service interfaces

— Part 4: Functional service interfaces: Facility Monitoring

— Part 5: Functional service interfaces - Situation exchange

The following corrections and modifications have been in this new version of CEN/TS 15531-5:

— Correct spec to include projection attributes for affectedStopPlaceComponent

— Document FacilityRef as part of request

— Document Access Mode as part of request

— Document Scope as part of request

— Document RoadFilter and Accessibility need filter as part of request

— Correct Documentation of AffectedRoads as part of Delivery

— Correct Documentation of capability Matrix

— Correct Documentation of Reason codes

— Added Annex D to Doc on GTFS real-time mapping

— StopMonitoringDelivery upgrade to DatexII

All changes are available in the file ReadMe.txt which is accompanying the XSD-schema, available from http://www.siri.org.uk.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta,



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# Introduction

Public transport services rely increasingly on information systems to ensure reliable, efficient operation and widely accessible, accurate passenger 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, connecting diverse systems; 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, with a well-defined, version interface, individual functional modules can be replaced or evolved, without unexpected breakages of obscurely dependent function.

The SIRI framework is a European Technical Specification that provides a specification for a number of functional interfaces that allow public transport data of specific types to be exchanged readily using structured interfaces.

This further Technical Specification specifies an additional SIRI functional service to exchange incident and event information about disruptions to public transport between servers containing real-time public transport vehicle or journey time data. These include the control centres of transport operators as well as information systems that deliver passenger travel information services.

This document describes the SIRI Situation Exchange service, one of a modular set of services for the exchange of Real-time information. The Situation Exchange service (SIRI-SX) is concerned with the exchange of planned events and unplanned incident data among systems, including incident capture, real-time management and dissemination systems. It is an additional functional service based on the European Technical Specification known as “SIRI” – Service Interface for Real-time Information. 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.

The specification for the base SIRI framework on which SIRI-SX is built is presented in three parts:

a) context and framework, including background, scope and role, normative references, terms and definitions, symbols and abbreviations, business context and use cases (SIRI Part 1: EN 15531-1);

b) the mechanisms to be adopted for data exchange communications links (SIRI Part 2: EN 15531-2);

c) data structures for a series of individual application interface modules (SIRI Part 3: EN 15531-3):

   1) Production Timetable (SIRI-PT);

   2) Estimated Timetable (SIRI-ET);

   3) Stop Timetable (SIRI-ST);

   4) Stop Monitoring (SIRI-SM);

   5) Vehicle Monitoring (SIRI-VM);

   6) Connection Timetable (SIRI-CT);

   7) Connection Monitoring (SIRI-CM);

   8) General Message (SIRI-GM).



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Additional documents are used for additional functional services, to date these are:

— **Facilities Management (SIRI-FM)** service is used to exchange information on the current status of facilities such as lifts, escalators or ticketing machines. It provides a short description of the facility itself, expresses any change to its operational status and specifically the accessibility status for the disabled or those with special needs people. It provides all the current relevant information relating to all facilities fulfilling a set of selection criteria (Part 4: CEN/TS 15531-4).

— **Situation Exchange (SIRI-SX):** this document. The SIRI Situation and Incident Exchange service is used to exchange information messages between identified participants in a standardised structured format suitable for travel information services. It enables messages to be sent and to be revoked (Part 5: CEN/TS 15531-5, this document).

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. The SIRI-SX service is included in version 1.3 of the schema onwards.



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# 1 Scope

The SIRI Situation Exchange service (SIRI-SX) allows the efficient exchange of data about Situations caused by planned and unplanned incidents and events and is intended to support the use cases identified in Annex C. Situations are actual or potential perturbations to normal operation of a transport network. The SIRI-SX service uses the common SIRI communication framework and services which are described in EN 15531-1 and EN 15531-2 and not repeated in this document.

The Situation Exchange service has a rich Situation model, allowing a structured description of all aspects of multimodal travel Situations, including cause, scope, effect and rules for distribution to an audience. The structured values enabling computer based distribution through a wide variety of channels, and the presentation of data in different formats for different device and different audiences. The Situation Exchange Service allows the exchange of incident and event information between, amongst others:

— Control centres;

— Operations Staff;

— Public Information systems;

— Alert systems and personalised alert systems;

— UTMC systems;

— Journey planners;

— AVMS (Automatic Vehicle Management Systems).

SIRI-SX uses a network model based on the CEN Transmodel conceptual model for Public Transport networks, schedules and operations, along with the CEN Identification of Fixed Objects in Public Transport (IFOPT) model for describing physical transport interchanges.

The Situation Exchange service is envisaged as a 'back office' capture and exchange service that will feed other public facing travel information dissemination systems in particular those using the TPEG format. Transport Protocol Expert Group (TPEG) is a European Broadcasting Union fostered standard for broadcasting travel data over Digital Assisted Broadcasting (DAB) radio and other channels. TPEG is maintained by the Traveller Information Services Association (TISA). To this end, the SIRI-SX situation classification model has been harmonized as far as possible with that of TPEG and DATEX2 so that full interoperability can be achieved. Uses of structured elements from TPEG, for which translations already exist in most European languages, also facilitates human readability in different national languages. Maintaining and improving a harmonization with TPEG will be a continuing objective. In addition to the TPEG exchangeable content, SIRI-SX messages contain additional structured information which allows them to be processed in additional ways.

Situation and computer systems and applications are typically *distributed*, that is information will be captured on one system and exchanged with others for dissemination and further processing. This means that a message design is needed that allows the management of the identity of distributed messages over time and across different systems, so that subsequent updates to a Situation can be reconciled by different systems over a network, and obsolete messages can be retired automatically. The SIRI-SX SITUATION model is designed to support the distributed management of Situations.



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## 2 Normative references

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

EN 15531-1:2015, *Public transport — Service interface for real-time information relating to public transport operations — Part 1: Context and framework*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15531-1:2015 and the following apply.

NOTE In accordance with Transmodel conventions, capital letters are used to indicate conceptual model entities from Transmodel, for example VEHICLE JOURNEY, STOP PLACE, etc., and also those from IFOPT and SIRI. Later in this document, the names of classes and attributes expressing these entities in the UML diagrams and the XML schema are shown in Upper Camel Case, e.g. ***VehicleJourney***. Not all conceptual entities are expressed as classes and not all concrete classes and attributes relate directly to a conceptual entity.

**3.1**
**Access Space – IFOPT & NeTEx**
passenger area within a STOP PLACE such as a concourse or booking hall, immigration hall or security area that is accessible by pedestrians, but without a direct access to vehicles

Note 1 to entry: Direct access to a VEHICLE is always from a QUAY and/or BOARDING POSITION. An ACCESS SPACE may be a Room, Hall, Concourse, Corridor, or bounded open space within a STOP PLACE.

**3.2**
**Accessibility – IFOPT**
possibility of a user with a specific USER NEED, such as a disability or encumbrance, to access either fixed or moving Public Transport facilities

**3.3**
**Accessibility Assessment – IFOPT & NeTEx**
ACCESSIBILITY characteristics of an entity used by PASSENGERs such as a STOP PLACE, or a STOP PLACE COMPONENT

Note 1 to entry: Described by ACCESSIBILITY LIMITATIONs, and/or a set of SUITABILITies.

**3.4**
**Accessibility Limitation – IFOPT & NeTEx**
categorisation of the mobility characteristics of a STOP PLACE COMPONENT such as a STOP PATH LINK or ACCESS SPACE to indicate its ACCESSIBILITY by mobility constrained users, for example those needing wheelchair access, step-free access or wanting to avoid confined spaces such as lifts

Note 1 to entry: A small number of well-defined categories are used that are chosen to allow the consistent capture of data and the efficient computation of ROUTEs for different classes of user.

**3.5**
**Affects Scope – SIRI-SX**
scope of a SITUATION ELEMENT or consequence of a SITUATION ELEMENT in terms of the specific entities such as OPERATORs, NETWORKs, LINEs, SCHEDULED STOP POINTs, STOP PLACEs, PLACEs, etc that are affected

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**3.6**
**Base Situation Element – SIRI-SX**
original record of a particular SITUATION

Note 1 to entry: This may subsequently be followed by UPDATE SITUATION ELEMENTs that record further changes.

**3.7**
**Boarding Position – IFOPT & NeTEx**
location within a QUAY from which passengers may directly board, or onto which passengers may directly alight from, a PT vehicle

**3.8**
**Connection Link – Transmodel**
physical (spatial) possibility for a passenger to change from one public transport vehicle to another to continue a trip

Note 1 to entry: Different transfer times may be necessary to cover interchange over a given connection link, depending on the kind of passenger.

Note 2 to entry: IN NeTEx the name is revised to be CONNECTION.

**3.9**
**Consequence – Trident**
outcome of a SITUATION

**3.10**
**Control Action – Transmodel**
action resulting from a decision taken by the controller causing an amendment of the operation planned in the PRODUCTION PLAN

Note 1 to entry: For SIRI-SX, CONTROL ACTIONs may often give rise to a SITUATION, but are entirely distinct concepts.

**3.11**
**Direction – Transmodel & NeTEx**
classification for the general orientation of ROUTEs

Note 1 to entry: In IFOPT the DIRECTION may be an important aspect of a PATH LINK that may only be traversed one way.

**3.12**
**Easement – SIRI-SX**
temporary permission to use a ticket purchased for use of a transport service on a different travel product because the original service has been disrupted

EXAMPLE To use a bus instead of the metro.

**3.13**
**Interchange – Transmodel & NeTEx**
scheduled possibility for transfer of passengers between two SERVICE JOURNEYs at the same or different STOP POINTs



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**3.14**
**Level – IFOPT & NeTEx**
identified storey (ground, first, basement, mezzanine, etc.) within an interchange building on which STOP PLACE COMPONENTs reside

Note 1 to entry: A STOP PATH LINK may connect components on different levels.

**3.15**
**Local Service – IFOPT & NeTEx**
named service relating to the use of the STOP PLACE or transport services at a particular location, for example porterage, assistance for disabled users, booking offices, etc

Note 1 to entry: The service may have a VALIDITY CONDITION associated with it. A LOCAL SERVICE is treated as a form of non-material EQUIPMENT.

**3.16**
**Location – Transmodel**
position of a POINT with reference to a given LOCATING SYSTEM (e.g. coordinates)

**3.17**
**Operator – Transmodel & NeTEx**
organisation in charge of the operation of some or all transport services within a particular area

**3.18**
**Passenger Accessibility Assessment – IFOPT**
categorisation of the ACCESSIBILITY characteristics of a PASSENGER to indicate their requirements for ACCESSIBILITY

Note 1 to entry: For example that are unable to navigate stairs, or lifts, or have visual or Auditory impairments. PASSENGER ACCESSIBILITY TYPE corresponds to one or more ACCESSIBILITY LIMITATIONs, allowing the computation of paths for passengers with constrained mobility. For example, Wheelchair, No Lifts, No Stairs.

**3.19**
**Place – Transmodel & NeTEx**
geographic location of any type which may be specified as the origin or destination of a trip

Note 1 to entry: A PLACE may be of dimension 0 (a POINT), 1 (a road section) or 2 (a ZONE).

Note 2 to entry: In IFOPT a PLACE may be of dimension 3 and be further associated with a LEVEL.

**3.20**
**Planned event – SIRI-SX**
cause of a SITUATION that is known about in advance

Note 1 to entry: It will have a known start and likely end time.

Note 2 to entry: In SIRI-SX this is recorded as an attribute of a general purpose incident description.

**3.21**
**Projection – Transmodel & NeTEx**
An oriented correspondence - of the shape of an ENTITY on a source layer, - onto an entity in a target layer: e.g. POINT, LINK, LINK SEQUENCE, COMPLEX FEATURE, - within a defined TYPE OF PROJECTION

Note 1 to entry: A general purpose mechanism used in SIRI-SX to indicate the geographical scope of a SITUATION.

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**3.22**
**Publishing Action – SIRI-SX**
part of SITUATION ELEMENT content that contains guidance as to how the SITUATION should be disseminated

**3.23**
**Quay – IFOPT & NeTEx**
place where passengers have access to PT vehicles, such as a platform, stance, or quayside

Note 1 to entry: A QUAY may serve one or more VEHICLE STOPPING PLACEs and be associated with one or more STOP POINTs.

Note 2 to entry: A QUAY is a recursive structure that may contain other sub QUAYs. A child QUAY must be physically contained within its parent QUAY.

**3.24**
**Reason – TPEG**
classification of a SITUATION ELEMENT as being of a particular type

Note 1 to entry: The nature of the REASON is likely to have implications for the duration and consequence of the SITUATION.

**3.25**
**Route – Transmodel & NeTEx**
ordered list of located POINTs defining one single path through the road (or rail) NETWORK

Note 1 to entry: A ROUTE may pass through the same POINT more than once.

Note 1 to entry: Each JOURNEY PATTERN may be associated with a particular ROUTE.

**3.26**
**Situation – Trident**
disruption to the planned operation of services

**3.27**
**Situation Element – Trident**
record of SITUATION STATE at particular time or over a particular period

Note 1 to entry: A SITUATION is represented by one or more SITUATION ELEMENTs.

Note 2 to entry: A SIRI SITUATION ELEMENT corresponds to a DATEX2 'Situation Record'.

**3.28**
**Situation Identifier – SIRI-SX**
unique identifier of a SITUATION ELEMENT made up of several parts, the Country code, Participant Code, Situation Number and Version number



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**3.29**
**Scheduled Stop Point – IFOPT & NeTEx**
POINT in a VEHICLE JOURNEY where passengers can board or alight from vehicles

Note 1 to entry: SCHEDULED STOP POINT refines the primary Transmodel sense of a STOP POINT, which is that of the logical stop point within a scheduled VEHICLE JOURNEY, rather than a physical point in the infrastructure where boarding and alighting, may take place, for which the terms for specific STOP PLACE COMPONENTS such as QUAY or BOARDING POSITION are used. Although the same identifiers are often used for both SCHEDULED STOP POINT and STOP PLACE COMPONENT, a practice which provides significant benefits for data management, they nonetheless represent distinct concepts. A STOP POINT ASSIGNMENT is used to associate a SCHEDULED STOP POINT with a STOP PLACE COMPONENT.

**3.30**
**Stop Place – IFOPT & NeTEx**
place comprising one or more locations where vehicles may stop and where passengers may board or leave vehicles or prepare their trip

Note 1 to entry: A STOP PLACE will usually have one or more well-known names.

**3.31**
**Stop Point – Transmodel**
POINT where passengers can board or alight from vehicles

**3.32**
**Suitability – IFOPT & NeTEx**
whether a particular facility such as a STOP PLACE COMPONENT or VEHICLE can be used by a passenger with a particular USER NEED

**3.33**
**Transport Mode – Transmodel & NeTEx**
characterisation of the operation according to the means of transport (e.g. bus, tram, metro, train, ferry, ship)

**3.34**
**Traffic Element – Datex2**
type of Datex2 Situation Record (i.e. Situation Element) used to describe a road SITUATION

**3.35**
**Update Situation Element– SIRI-SX**
record of a change to a particular SITUATION, originally established by a BASE SITUATION ELEMENT

**3.36**
**Unplanned Incident – SIRI-SX**
cause of a SITUATION that is not known about in advance

**3.37**
**User Need – IFOPT & NeTEx**
ACCESSIBILITY requirement of a PASSENGER

Note 1 to entry: For example, that they are unable to navigate stairs, or lifts, or have visual or auditory impairments.

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**3.38**
**Validity Condition – Transmodel & NeTEx**
condition used in order to characterise a given VERSION of a VERSION FRAME

Note 1 to entry: A VALIDITY CONDITION consists of a parameter (e.g. date, triggering event, etc.) and its type of application (e.g. for, from, until, etc.).

**3.39**
**Vehicle Journey – Transmodel & NeTEx**
planned movement of a public transport vehicle on a DAY TYPE from the start point to the end point of a JOURNEY PATTERN on a specified ROUTE

# 4 Symbols and abbreviations

The common symbols and abbreviations used in the SIRI document set are presented in EN 15531-1. In addition the following terms are used:

- DATEX2 Data Exchange Version 2
- EBU European Broadcasting Union
- ICS Incident Capture System
- QoS Quality of Service
- TISA Traveller Information Services Association
- TPEG-PTI Transport Protocol Experts Group Public Transport Information
- SIRI-SX SIRI Situation Exchange
- SIRI-FM SIRI Facilities Management

# 5 Situations as Software Entities

## 5.1 General

In a travel information system, 'Situations' are data objects describing an incident, typically an unplanned event such as a disruption, but also planned events that affect public transport or its use, such as engineering works, or major public events that will affect use of transport. They will be captured and recorded on one system and then be transmitted to other systems to convey information about the current status to travellers and to transport operator staff. Those other systems will need to transform the data to suit different delivery channel requirements. At any time, further developments may occur that need to be represented by updates to the original SITUATION (or as further related SITUATIONs), and a distributed SITUATION model shall allow for the propagation and reconciliation of these changes across systems.

To support distributed processing of SITUATION a number of basic principles need to be followed:

— use of a rich **structured Situation** representation that can be emitted in standards compliant renderings such as the TISA Transport Protocol Experts Group (TPEG) specification;

— assignment of a persistent **Identity** to SITUATIONs within a global namespace; so they may pass into and out of different systems and still be matched with previous instantiations;

— use of **write-only updates** suitable for store and forward processing in a distributed environment;

— use of a **lifecycle model** with well-defined edit-version-release states;



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— use of well-defined data reference systems. SIRI-SX uses a conceptual model for the scope of the application domain – Public Transport SITUATIONs – based on open standards (CEN Transmodel), allowing the sharing of references with other Transmodel based systems and services.

We elaborate on these below.

## 5.2 Structured Situations

A Situation object needs to be both machine readable and human readable (see Figure 1). To be machine readable requires a set of structured elements with precise meaning as to the nature and scope of the Situation, in particular as to its temporal and network scope (indicated by a location model) and its categorization that can be interpreted by agents such as station displays, journey planners and alert engines. To be human readable, the Situation shall be renderable on different devices in different formats as a textual and graphic representation that a human can understand. The text may be generated automatically from the structured elements, be explicitly encoded, or both.

The Situation shall also include identity and cross- referencing information that can be used to track its progress across different systems.

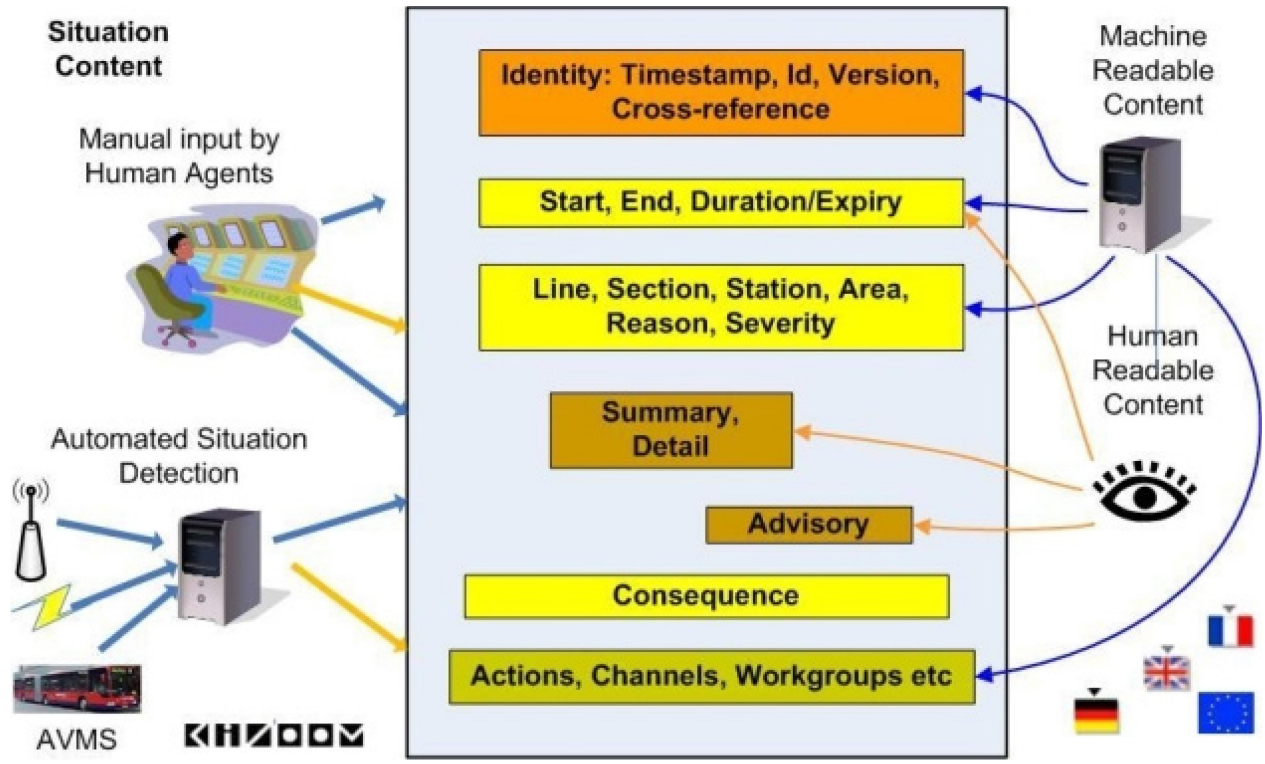



**Figure 1 — Situation Structure elements**

The actual structured Situation model needs to have components to describe its import, including:

— **Identity**: elements to identify and manage the SITUATION and its components;

— **Cross-reference**: elements to relate the SITUATION to other SITUATIONs to which it is related;

— **Audit**: elements to identify the source of the SITUATION;

— **Situation body**: elements – a set of structured details characterizing the nature and processing of the SITUATION, including its current status, **scope** of effect, **classification**, human readable **description**, consequence and suggested **distribution**.

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## 5.3 Distributed Situation processing

### 5.3.1 Identity and Write-Only Updates

A distributed SITUATION data model represents SITUATIONs as information objects that may be distributed over many different systems, typically being created on one system and then displayed and sometimes augmented by others. Distributed systems raise considerations of identity and concurrency of data objects.

A particular case in point arises when the same Situation may reach a particular dissemination system via different ROUTEs; in which case the consumer needs to be able to establish that the data refers to the same event and not two different instances of a similar event. The same Situation may also return to the originating system and need to be recognized as a known Situation and not a new instance.

In order for updates to be propagated and reconciled in a distributed processing environment, a unique persistent identity shall be maintained across these systems for the Situation and its updates, and there shall be a means of identifying the most recent content. This makes it possible for different systems to recognize repeated references to the same Situation.

A unique identifier allows the tracking and reconciliation of updates to a given SITUATION that has been recognized as a specific single event and is being managed as such. A more complicated question of recognition of similarity and identity reconciliation arises from the fact that a real world disruption may give rise to a number of separate Situation Objects on different systems, with different unique identifiers. These may be subsequently recognized as related and consolidated Cross-referencing mechanisms are needed to allow this to be represented in the data. Both human and computer aided processes may be used to undertake the recognition and consolidation.

A distributed processing model also raises questions of currency – how does a consumer system determine which is the latest information about a SITUATION? What should a dissemination system do if the communication link is lost? How can one distinguish between absence of information and absence of information service? Typically both metadata and built-in mechanisms such as heartbeats are needed to address this need. Synchronisation to a universal clock is also necessary.

Figure 2 illustrates the store and forward processing typical of Situation handling whereby SITUATIONs and updates reach downstream systems via number of different ROUTEs with different intermediate steps. Each system holds its own representation of a SITUATION model and *it is only the SITUATION element* (i.e. an account of changes to the SITUATION), *and not the SITUATION itself which is exchanged.*



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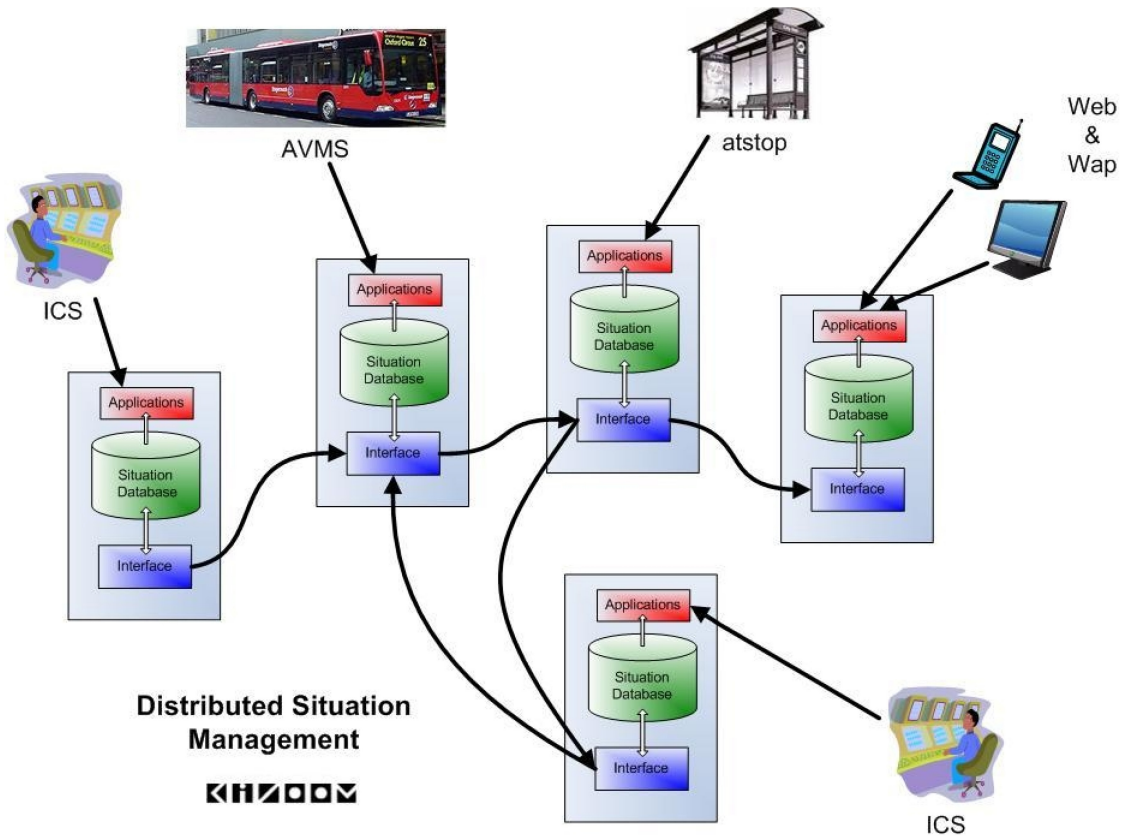



**Figure 2 — Distributed Message Management**

### 5.3.2 Currency and the Situation Life Cycle

SITUATIONs typically undergo a life cycle that will take them from initial capture as a new live SITUATION, through additional verification and dissemination stages, followed possibly by one or more updates, and finally closure. However, as soon as a representation of a SITUATION exists in more the one incident management system (perhaps even on the same computer), each of which might wish to make further updates to the Situation content, issues of coordination arise. How do changes get propagated and reconciled?

Furthermore, there is often also a need to maintain an exact audit trail of the information flow in incident management systems, recording when each update was entered into the system, along with data about where it came from. This can be used both to improve operational processes, and to monitor adherence to operating procedures and performance targets.

Another consideration is that the communication links are potential points of failure, so the system shall allow for efficient resynchronisation after loss of connection, as well as allowing consumer systems to make suitable judgements as to the continued currency of SITUATIONs during a prolonged interruption.

Together these considerations lead to the need for a “write-only” content model which uses a formal edit-version-release process to progress an initial SITUATION and its updates through a managed lifecycle.

This lifecycle occurs at two levels: a “macro” level progression of the overall SITUATION, and a “micro” level of the individual updates to the SITUATION.



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### 5.3.3 Representational model for Situation Elements

Figure 3 shows a fundamental UML class model for representing distributed SITUATION elements as a conceptual model. A Situation comprises one or more Situation Element instances. In effect there are two types of Situation Element object; the original **base** Situation Element, then one or more **update** Situation Element updates.

Both types of element undergo an edit-version-release process to control their use; this is marked by a versioning time: for an element in draft the time is empty. Once populated, the Situation element is considered fixed.

In SIRI-SX, as in TPEG and other incident management systems, we model the relationship between base and updates by allocating a unique **SITUATION number** that is common to both base and update entities, and use a **version number** to distinguish each further update. Numbers are unique within participant – each of whom has a unique identifier within country. This means that we can group a base SITUATION element and its updates simply by their common identifier parts, and can exchange an update independently of the base SITUATION and without explicitly referencing all previously known updates.

To indicate a relationship with a completely separate SITUATION element of a different Situation, an element may also contain one or more ***RelatedSituation*** references that link the Situation element with other Situation elements; in this case the association is explicit.

Note that the model in principle allows updates for the same SITUATION to be created on more than one system if desired. This can give rise to branches in the update chain. It is up to a given consumer system to serialise and reconcile all the updates it has available in order to arrive at a consolidated view of a given Situation (see discussion of branching below).

The model allows for different types of **SITUATION body** to be used to for **public transport** and for **road** related SITUATIONs (which typically have different properties). SIRI-SX is primarily concerned with PT SITUATIONs that affect the PT network and services described by the other SIRI services, but to support interoperability with Datex2 can also embed a Datex2 Traffic Element.



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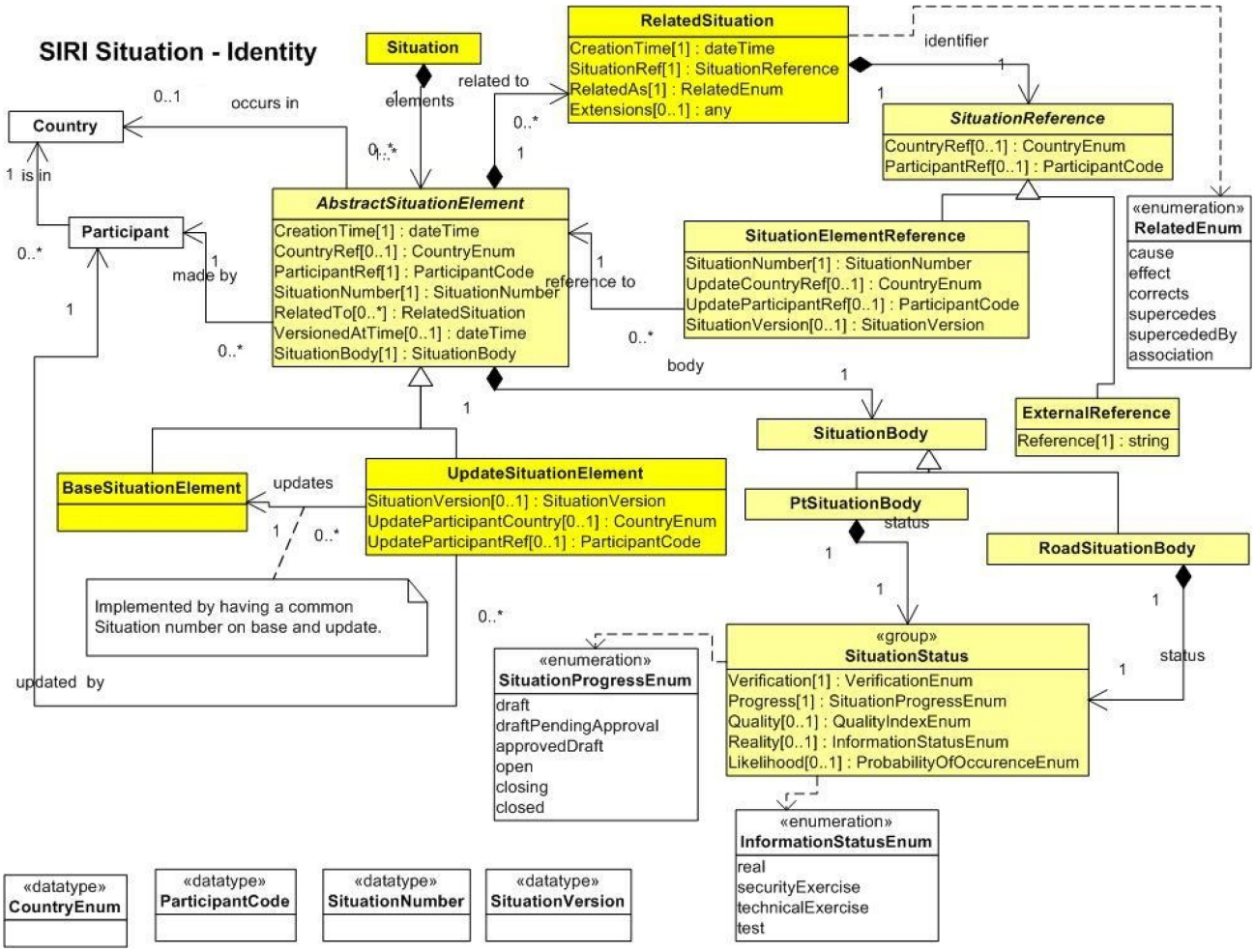



**Figure 3 — UML Diagram of Situation Identity Elements**

### 5.3.4 Update chains – Causal chains

A Situation may thus be represented as a successive chain of situation elements, possibly created on different systems. Figure 4 shows some object instances for situation headers that illustrate this. The base element *Sit00987* and update versions *Sit00987-01* and *Sit00987-02* are created by Participant system *TfL01*. The last update, *Sit00987-03* was created on a separate system by participant *LUL2,* and so has a separate ***UpdateParticipantRef***.

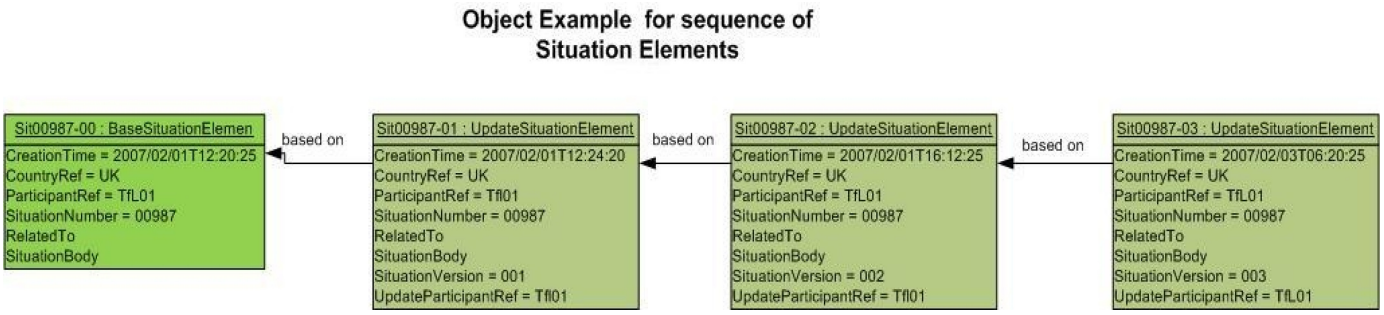



**Figure 4 — Situation Instance example**



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Each Situation Element instance will have a SITUATION body associated with it (not shown). Any values specified for an attribute on an update element, e.g. a change of temporal or NETWORK scope, supersede any previous values as the current values for the SITUATION.

In effect, SIRI-SX exchanges the detailed history of updates to a SITUATION. In practice, the producer and consumer systems may create additional views of the SITUATION representing a current consolidated view of the SITUATION as an aggregation of the separate updates.

### 5.3.5 Cross-referencing Situations – Causal chains

SITUATION elements can include explicit references to other SITUATIONs that explain them. This allows SITUATION threads to be merged or split into a chain of cause and effect. Adding or removing a cross reference between two different SITUATION element chains should follow the same edit-version-release model for other changes; i.e. to add a link between two SITUATIONs requires an new SITUATION update element being added to the SITUATION that wishes to establish the reference. This allows links to be propagated to other systems.

Figure 5 shows this: an update *Sit00456-02* to SITUATION *Sit00456* adds as one of its properties a Related to reference that associates it with *Sit00987-02* and by implication Sit00987 overall. This can be used to find earlier and later updates to *Sit00987* as well.

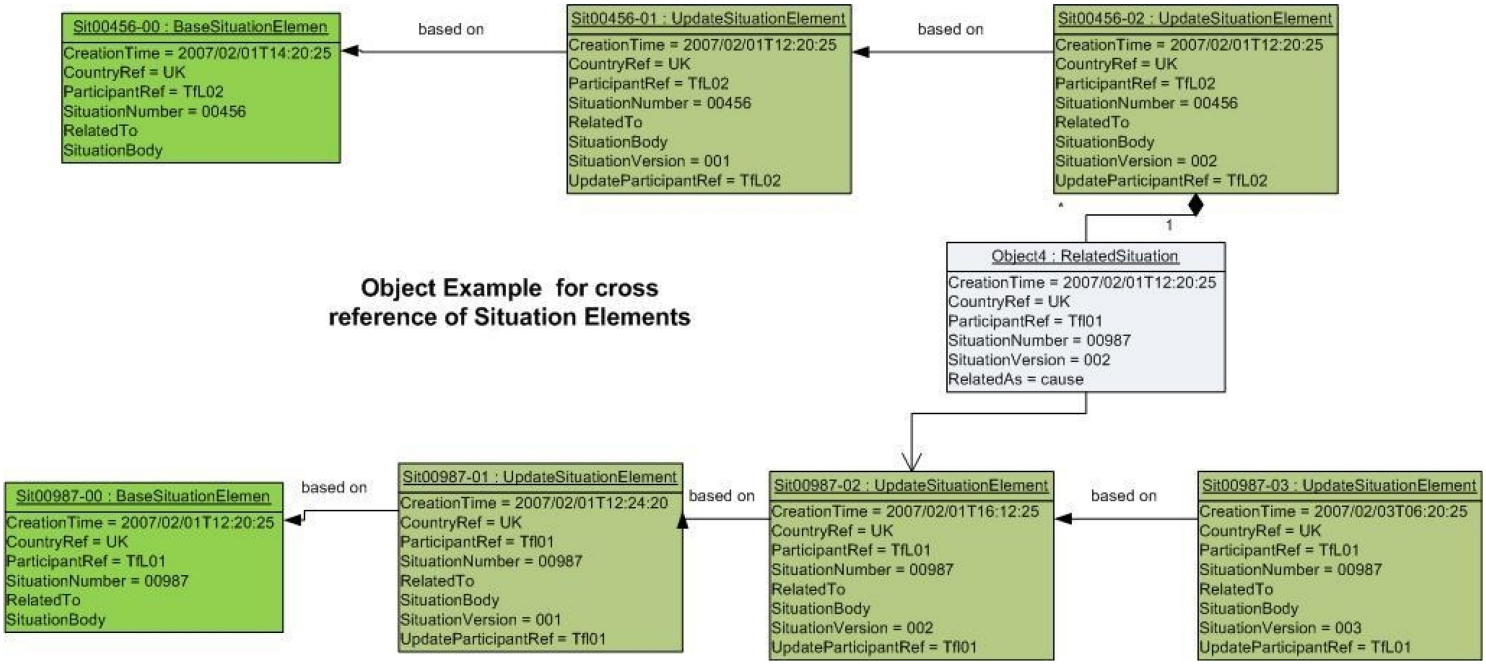



**Figure 5 — Instance example – Situation cross-reference chains**

### 5.3.6 Branching and distributed updates

#### 5.3.6.1 General

Normally a SITUATION and its updates will be originated on a given computer and distributed to others. It is possible that alternative updates will be created on two different machines, giving rise to a branch in the chain of situation elements (Figure 6). In this case, if and when elements of the alternative branch are returned to the original machine (or indeed any downstream machine) it will be up to it to reconcile the two branches, either by discarding the obsolete branch, or by creating a new situation element that merges the data in to a revised update. This may be done either by a simple automated policy of using the most recent timestamp, or may be done by manual reconciliation, by an OPERATOR who chooses



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one or other element as more current. If there is new information unknown to the original machine then a new update will be created reconciling the branch.

It is possible as an implementation policy to constrain the creation of updates such that an update can only be created on the system on which it originated, thus avoiding branching (except by the creation of completely separate instances).

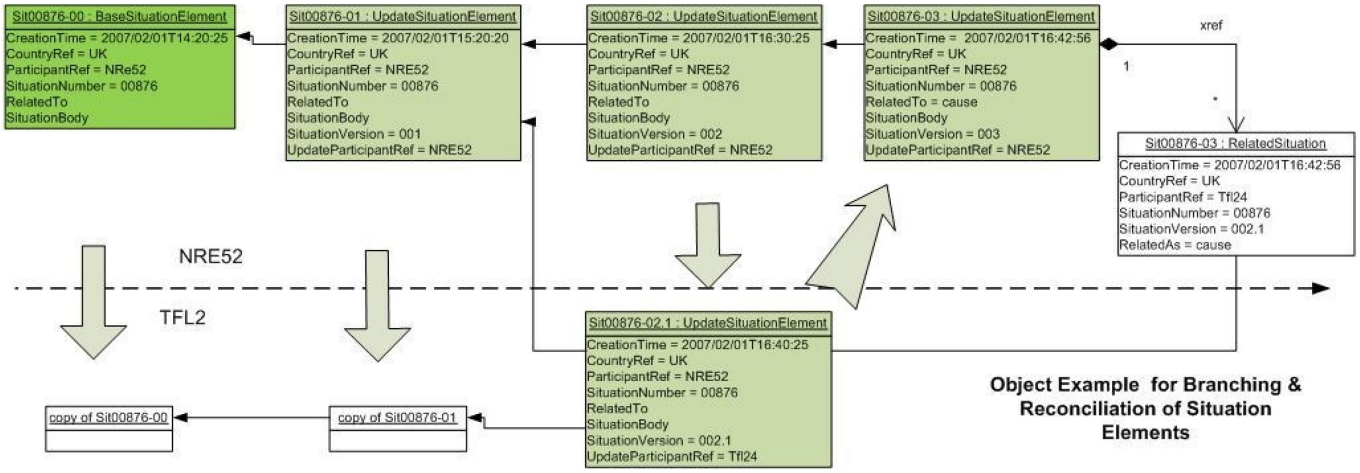



**Figure 6 — Instance Example – Situation branching**

### 5.3.6.2 Situation Element Life Cycle: Editable and Versioned States

Each Situation element starts out as an editable draft on an originating system: once capture is complete it is versioned, freezing content fields from further change, and then may be released to other systems.

Once released to other systems, if a SITUATION ends before its specified end time a further update situation element may need to be distributed to rescind it.

Note that this mechanism is distinct from the version number (which may also be used to version drafts) Within a database it would be possible to save a succession of draft versions with an incrementing number, before finally saving a version with the status set to versioned.

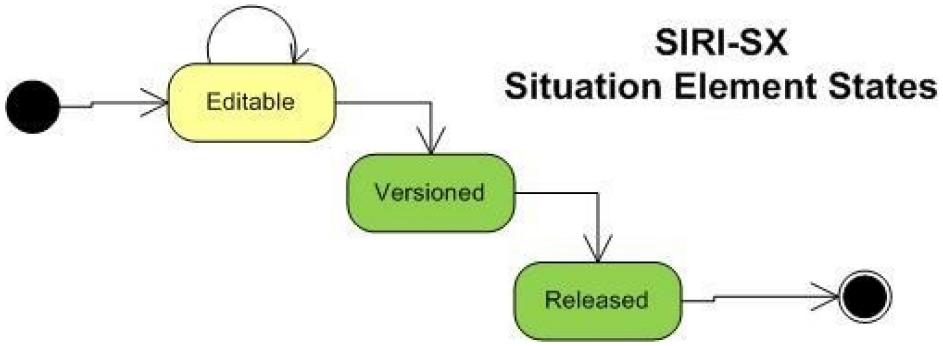



**Figure 7 — Edit release cycle of an individual Situation Element**

### 5.3.6.3 Situation Life Cycle: Situation Progress States

The overall state of a SITUATION progresses through a number of states (Figure 8). In a *Draft* state, the initial content of the SITUATION is being captured or verified. Once capture is completed, the draft may optionally be submitted to a second authority to review or approve, in which case it will pass through *PendingApproval* and *ApprovedDraft* States. Once in an *ApprovedDraft* state, the SITUATION is available

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to be picked up and published, at which point it becomes *Open*, that is, in effect or about to come into effect, during which time further SITUATION updates may be created. Eventually the SITUATION will be *Closed*, that is, ready to remove from the distribution system. Closure may be immediate, or be done via an intermediate *Closing* state that indicates the SITUATION is resolved but a notice should be retained for a while in order that passengers see an "all clear" notice.

A given Situation element may record the current **progress state** of the SITUATION at the time it is versioned. To record a new state for the SITUATION, a new SITUATION update element is needed. Thus a *Closed* SITUATION may be reopened by the addition of a further update.

Note that the lifecycle states shown in Figure 8 do not necessarily correspond to a simple attribute value in the situation elements. In the SIRI-SX model, the overall status of the SITUATION is encoded by a combination of an explicit enumerated **progress state** value in the SITUATION body, and the temporal scope. Thus a SITUATION that has passed its termination time is automatically deemed to be *Closed*.

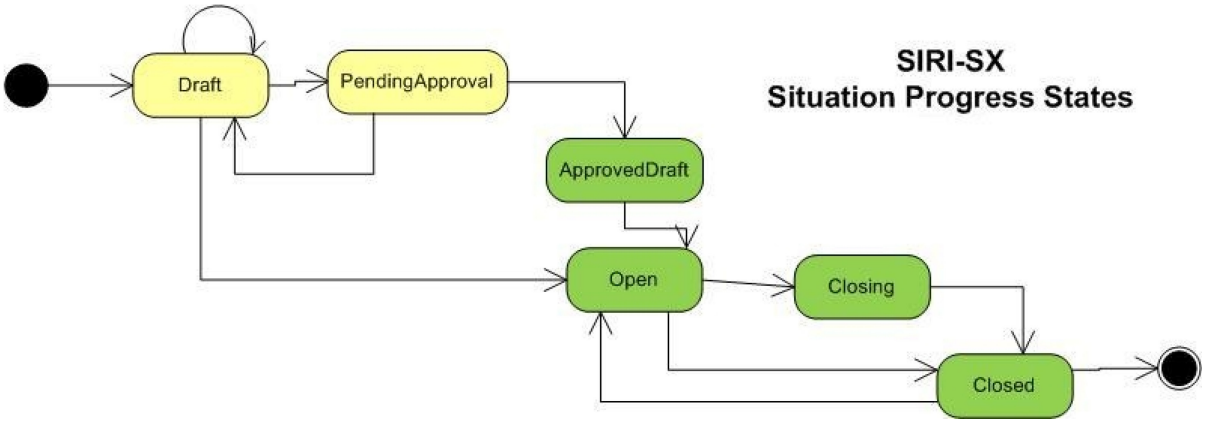



**Figure 8 — Overall Life cycle Progress States of a Situation**

### 5.3.7 Archiving

Once closed, situation elements may be maintained in a database indefinitely as documents of record. The content includes source and timestamp data suitable for audit purposes.

## 5.4 Summary of Situation Management

### 5.4.1 General

Together the above requirements dictate a particular approach to modelling SITUATIONs as software entities in SIRI-SX (and corresponding to the approach to managing message identity used in TPEG and DATEX2). The model is fundamental to using SIRI-SX messages and can be summarized as follows:

### 5.4.2 Situation Identity

1) Every SITUATION has a unique **identifier**, which is unique within all SITUATION management systems participating in the exchange of SITUATIONs.

2) A **Situation number** is allocated for the **base** situation element which creates the SITUATION; this is unique within the issuing system, as identified by its SIRI ***Participant*** identifier.

3) SITUATIONs may have SITUATION **update elements**, which reflect further change to the SITUATION. Updates are also processed through clearly defined states, being first edited, then versioned and released.



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4) For an update element the **Situation number** shall be qualified by a **version number**. The version numbers issued are monotonically increasing. The version numbers of updates issued by systems other than the one which created the base situation element are qualified by the system identifier of that other system and shall be unique within that other system.

5) Participant codes should be unique within a given country.

Thus situation elements in effect have a compound identifier:

The full logical identifier of a Base Situation element comprises:

(***CountryCode*** +) ***ParticipantCode*** + ***SituationNumber***.

The full logical identifier of an Update Situation element comprises the above with a version number added, and if the system creating the update is different from the original system, also a participant code.

(***CountryCode*** +) ***ParticipantCode*** + ***SituationNumber*** +
((***VersionCountryCode*** +) ***VersionParticipantCode*** +) ***VersionNumber.***

Not all of the identifier parts necessarily need to be cited in all contexts in order to identify a given situation element. For example if the country code or participant code is common to all SITUATIONs it does not need to be cited explicitly. In implementations, the Country code may often be derived for example, to be the same as the OPERATOR, etc.

### 5.4.3 Situation Life Cycle

1) An edit-version-release cycle is used for situation elements. Content may only be changed when still in draft state. Once versioned, *the contents of a given version of a SITUATION or update are never changed*. If a change is needed after release, a further update is created with modified contents.

2) Every situation element has a workflow progress status which may have at least the following states: *draft*, (i.e. in edit): *versioned, open, closed*. Some other intermediate states, for example *pendingApproval*, *approvedDraft* and *closing* may also be useful. Note that the progress status reflects the status at the time the situation element is versioned. The overall status of a SITUATION cannot necessarily be determined just from the progress status value as if for example it has a validity set by a time window, the SITUATION will no longer be open, even if there has been no explicit update

### 5.4.4 Situation Update Content

1) An update need only contain those additional content values for the situation element which have changed since previous ones. All other values will be assumed to be as in the original base situation element together with previous cumulative updates. A consumer system may create a consolidated view of the current status of a SITUATION by successively applying intervening update situation elements. Depending on the application, the consumer may wish to present the full history or just a consolidated view.

2) Updates may be created on more than one system, version numbers being additionally identified by the participant reference of the system that is creating the update. It is up to the consumer system to reconcile different branches. All updates contain a creation time which can be used to assess which is the most recent.

3) A situation element will have a number of content values describing its currency including a validity period and a publication date. These can be used by consumer systems to judge the staleness of a SITUATION.

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### 5.4.5 Example of identifier allocation

Table 1 shows and example of Situation Identifier values issued for base situation element *tfl0001:00023* and three subsequent update elements. The first two updates on the same system (*Tfl001*), the last on a different system (*rail04*).

Note that the actual choice of identifier values and numbering systems is an implementation choice. Version numbers of a given incident should preferably be monotonically increasing within each Participant system, e.g. *0001, 0002* as this provides a cross check against failures in synchronising system clocks. For update situation elements created on a different system the version number may either introduce a sub digit e.g. *0002.1, 0002.1.1,* etc, or simply increment the previous number e.g. 003, 004, etc.

**Table 1 — Situation Numbering Example**

| | **Situation Number** | | **Version identifier** | | **Timestamp** |
|---|---|---|---|---|---|
| | **Creator ParticipantRef** | **SituationId** | **Update ParticipantRef** | **Update Version** | |
| Initial base situation element on system TfL001 | Tfl001 | 00023 | (Tfl001) | 0000 | 2007–02–23T12:20:13Z |
| Update situation element 1 on system TfL001 | Tfl001 | 00023 | (Tfl001) | 0001 | 2007–02–23T12:40:23Z |
| Update situation element 2 on system TfL001 | Tfl001 | 00023 | (Tfl001) | 0002 | 2007–02–23T16:30:57Z |
| Update situation element 3 on System Rail 04 | Tfl001 | 00023 | Rail04 | 0002.1 | 2007–02–23T16:30:57Z |

### 5.4.6 Date time stamps as identifiers

All situation elements and updates are also time stamped. Assuming all participant systems use synchronised time, this provides an additional alternative way to identify and sequence updates.

## 5.5 Interoperability of Situation management systems

### 5.5.1 General

In a complex transport network, systems will wish to integrate both public and private transport data, and will need to exchange data with many different systems in many different formats. SIRI-SX attempts to use a general SITUATION model that will allow the round-trip exchange of SITUATIONs with the other main SITUATION models, notably Datex2 and TPEG.

Some types of road SITUATION affect certain PT networks that make use of the road network, such as bus and coach. Although certain generic aspects of SITUATIONs, such as identifiers, temporal validity, severity, etc are common to both Road and PT SITUATION models, there are very significant differences in the detailed models needed to describe Road SITUATIONs from those needed to describe PT SITUATIONs, and in particular each requires quite distinct representations for key aspects such as nature of SITUATION, network and location scope, advice, etc. It would indeed be very undesirable for SIRI-SX to introduce its own separate model for road SITUATIONs. Instead SIRI-SX attempts to achieve interoperability with Datex2 and TPEG by establishing an explicit correspondence between the SITUATION models (See Annex). This allows the exchange of messages between different systems to



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describe SITUATIONs with content that is sufficiently uniform to achieve a useful level of computation and to support cross modal inferences.

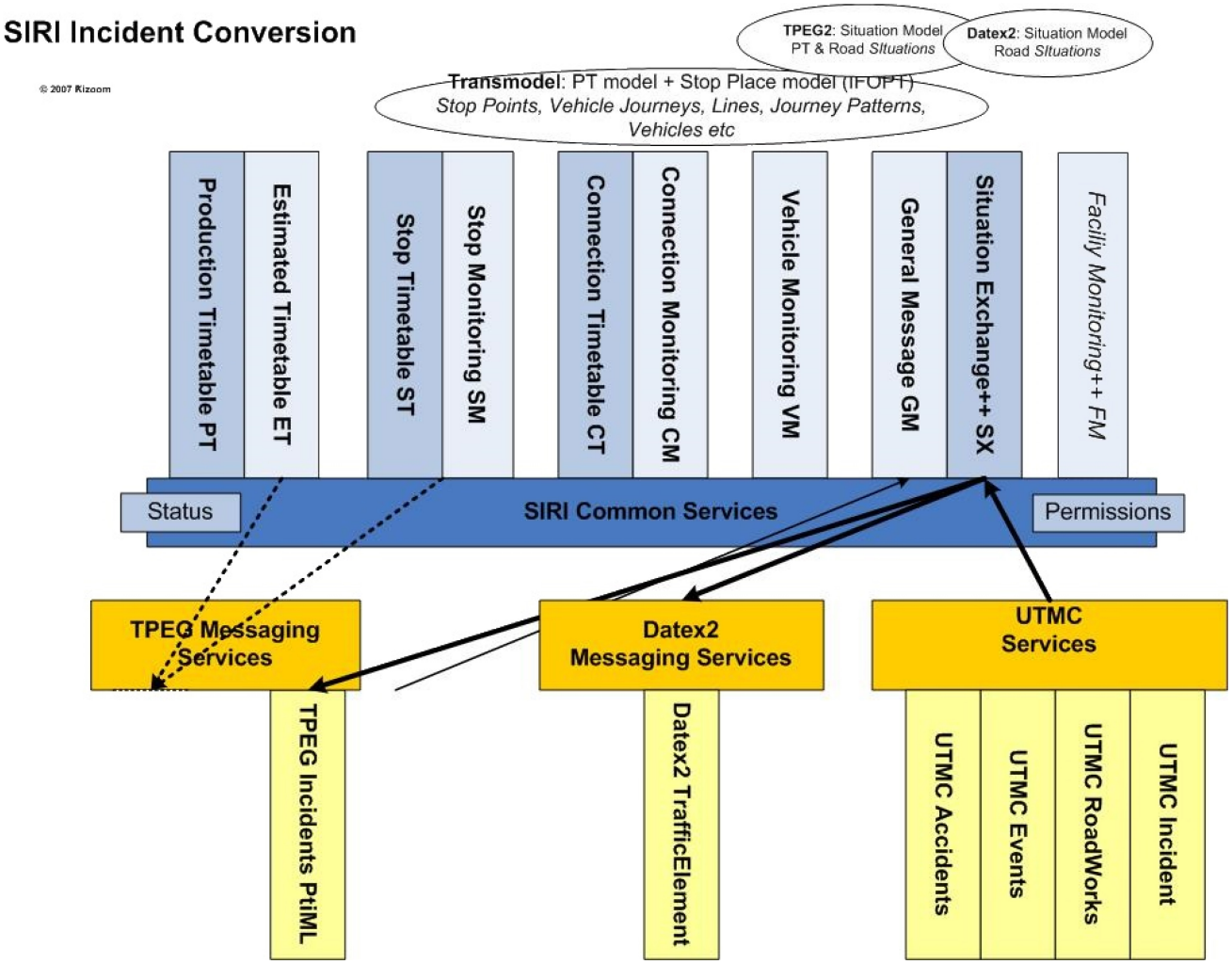



**Figure 9 — Interoperability of message services**

In principle the adoption of interoperable models should make it possible to use SIRI to DATEX2 SITUATION records and vice versa. It should also facilitate the creation of adaptors to transform SITUATION content. For example, one might want certain types of datex2 road network SITUATION to create an equivalent SITUATION that affects certain ROUTEs of the bus network.

### 5.5.2 Datex2 Interoperability

To support interoperability with Datex2, SIRI-SX includes the following mechanisms:

1. A formal correspondence between most generic SIRI-SX and Datex2 Situation elements (see Annex B), allowing a uniform approach to managing both road and PT SITUATIONs. The SIRI-SX schema has equivalent elements (and in some cases reuses actual Datex2 elements), so that the creation of adaptors to exchange SITUATIONs is simplified, and it is possible to establish uniform business rules for processing SITUATIONs.

2. Allowing the reuse of a Datex2 ***TrafficElement*** to describe a road SITUATION that can be exchanged as a SIRI SITUATION, or linked with a PT SITUATION in a causal chain.

3. Allowing the annotation of SIRI-SX PT SITUATIONs with Datex2 Locations.

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### 5.5.3 TPEG Interoperability

To support interoperability with TPEG, SIRI-SX includes the following mechanisms:

1. A correspondence can be seen between a subset of generic SIRI-SX and TPEG message elements, allowing a uniform approach to managing both TPEG PTI messages and PT SITUATIONs, and making the construction of adaptors straightforward.

2. TPEG reason codes are used to categorize SIRI-SX messages. See 7.8.5.7.8.

### 5.5.4 Communications Bandwidth

As with other SIRI functional services, the SIRI-SX service is intended primarily for server to server communication over broadband IP between back end control systems and distribution hubs. It uses a XML structure that is relatively verbose and includes both a rich structured content and textual descriptions. It is not optimised for over the air communication with vehicles using communication over constrained bandwidth, although it compresses well. It should however be straightforward to make a one-way transform of SIRI-SX messages (or a subset of their content) into a more concise format suitable for such transmission if required.

# 6 The Situation Model

## 6.1 General

SIRI-SX includes a structured model of SITUATIONs. A SITUATION describes a disruption to services, using data elements whose identifiers relate directly to the entities of other information services. SITUATIONs can thus be directly linked to SCHEDULED STOP POINTs, LINEs, VEHICLE JOURNEYs, pathways: as the cause of disruption or as the result of service problems. This tagging makes it possible to process SITUATIONs automatically, for example to support journey planners or alert services.

The SIRI-SX SITUATION model is described with UML class diagrams in this section.

— Summary of SITUATION Model.

— SITUATION Body.

— SITUATION Body Details.

— SITUATION Reason (TPEG).

— SITUATION Consequence.

— SITUATION Affects Scope.

  — Overview of Affects Scope.

  — Affects Scope for Scheduled Services.

  — Affects Scope for STOP PLACE.

  — Common Accessibility Elements.

— Publishing Actions.

— Data Types.



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There are separate descriptions of the PT SITUATION body and the Road SITUATION Body.

The UML class diagrams in this document follow presentation conventions intended to make clear the mapping of elements to a concrete XML schema. See Annex A for a full discussion. The attributes used to implement associates are shown explicitly. In most cases, each UML Class is implemented as an explicit XML element of the same name. In some cases the XML schema simplifies, in particular a << group >> stereotype is used to indicate that a class is implemented as a reusable XML group embedded within another element, rather than as a first-class element.

## 6.2 Representing a PT Situation in SIRI-SX

### 6.2.1 Summary of PT Situation model

Figure 10 introduces the SIRI-SX SITUATION model for Public Transport SITUATIONs as a UML diagram. The SITUATION model has four main concepts: ***PtSituationBody***, ***AffectsScope***, ***Consequence*** and ***Actions***.

— The ***PtSituationBody*** brings together the information about a Public Transport SITUATION and is made up of a number of structured parts, including the temporal scope; a systematic classification (based on TPEG); and set of text descriptions.

— The ***AffectsScope*** element specifies the scope of the SITUATION – the location model in TPEG terms. This can be stated in terms of the network, and/or particular LINEs, stations or VEHICLE JOURNEYs or points in line with a Transmodel representation.

— A ***Consequences*** element describes the effect of the SITUATION on services.

— A ***PublishingActions*** element suggests processing options for the SITUATION for use by downstream systems, for example whether it should appear on the web or not. This allows the SITUATION provider to tag the SITUATION with information guiding the business rules for different workflow steps in the subsequent use of the SITUATION.

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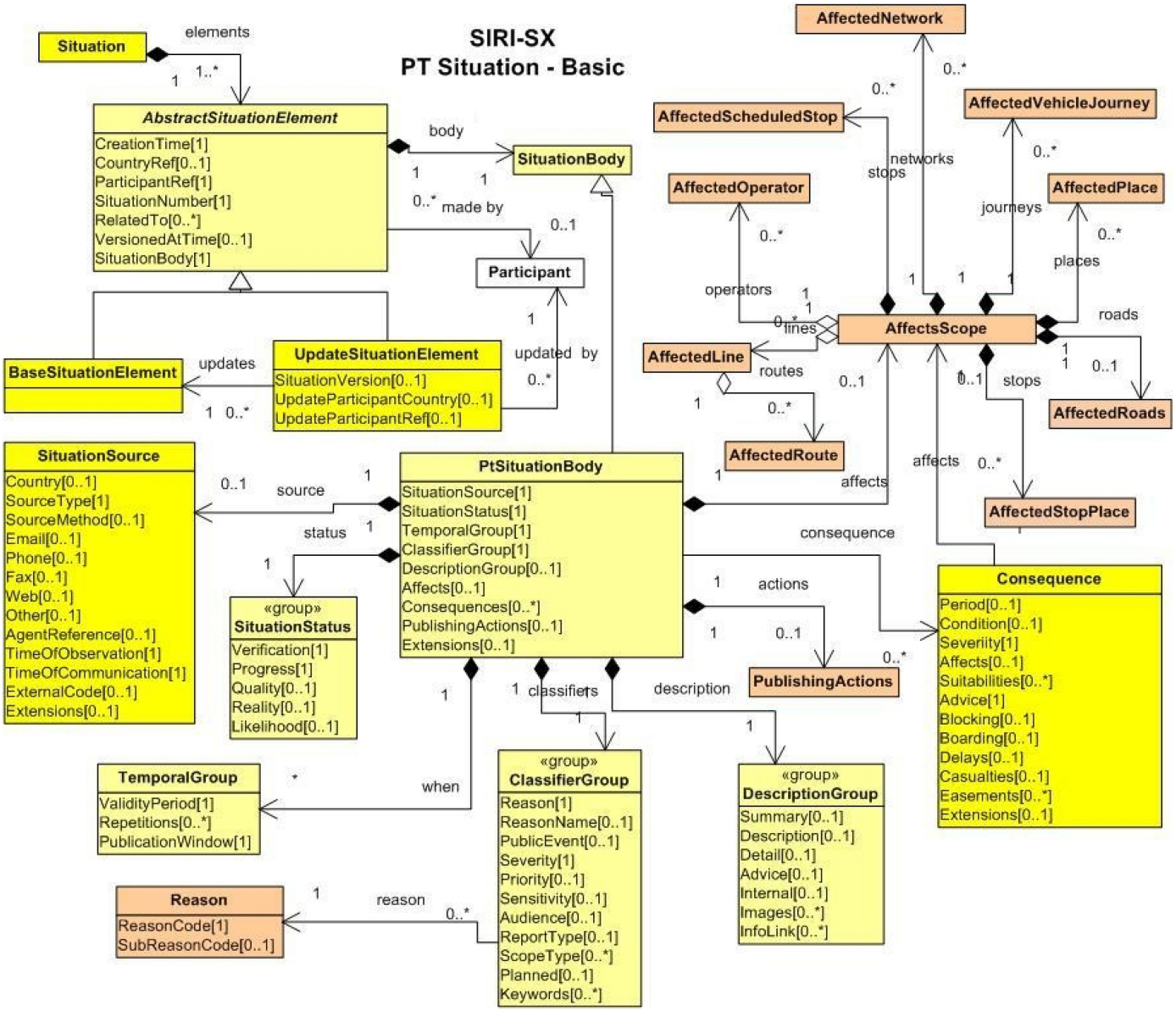



**Figure 10 — UML Diagram of Overview of SIRI-SX Model for PT Situations**

### 6.2.2 PT Situation Element Body

Figure 11 elaborates Figure 10 to add in basic information about the properties of a PT SITUATION.

— The ***PtSituationBody*** groups the descriptive properties of SITUATIONs that are common to both Base SITUATIONs and updates.

— ***SituationStatus*** describes the current status of the SITUATION, including ***Verification***, ***Progress.*** ***Reality*** and ***QualityIndex.***

— ***SituationSource*** describes the information source from which the SITUATION was obtained.

— A Group of Temporal elements describes the Temporal scope of the SITUATION, including ***ValidityPeriod***, (when the SITUATION occurs) ***Repetitions*** (if it recurs at a regular periodicity) and ***PublicationWindow.*** (If the period for informing customers is different from the validity period).



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— A Group of Classifier elements describes the Classification of the SITUATION by ***Reason***, ***Severity***, ***Priority***, ***Audience***.

— A Group of Descriptor elements provides a set of textual descriptions of the SITUATION. This can contain different components, for example ***Summary***, ***Description***, ***Details***, ***Advice***, ***Internal*** as well as ***Image*** and ***InfoLinks.***

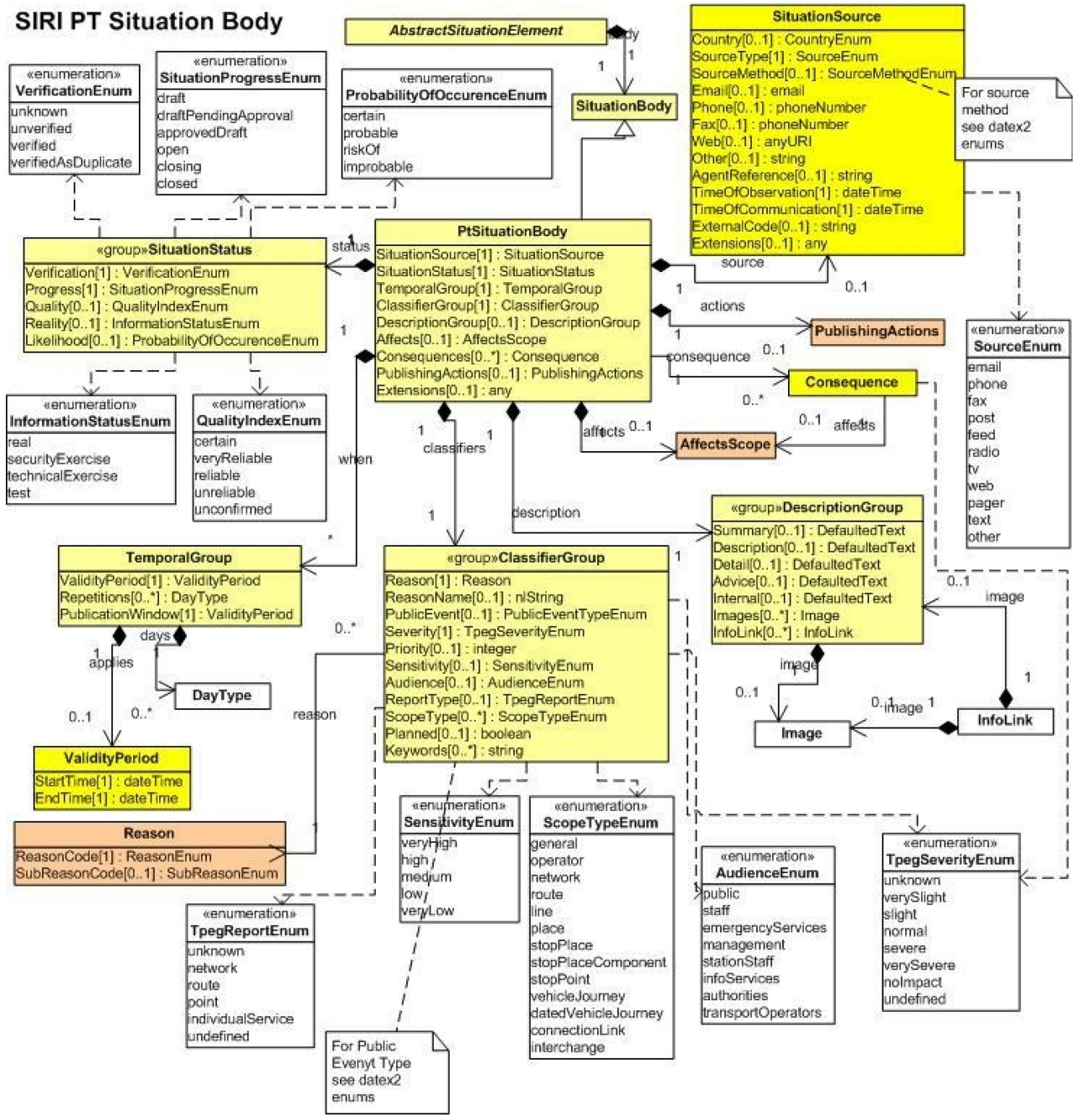



**Figure 11 — UML Diagram of PT Situation Body Summary**

### 6.2.3 PT Situation Body Details

Figure 12 elaborates Figure 11 with further details about the types and allowed values for them. These are also described in tabular form later in 7.8.5 below.

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The diagram introduces the subcomponents of the ***AffectsScope*** element which can be used to specify the scope of a SITUATION as a collection of annotated references to NETWORK and service elements.

***Consequences*****:** Describes specific effects of the SITUATION, including additional ***AffectsScope*** specific to the consequence. May have a separate ***ValidityPeriod***, ***Severity***, ***Advice*** as well as additional structured information such as ***Delay***, ***Casualties***, and specific effects on accessibility – ***Suitability, Boarding*** possibilities, ***Easements.***

Some components, such as ***Reason, AffectsScope, Consequence*** and ***PublishingActions***, are further elaborated in additional diagrams (See Figure 13, Figure 14, Figure 15, Figure 16, Figure 20).



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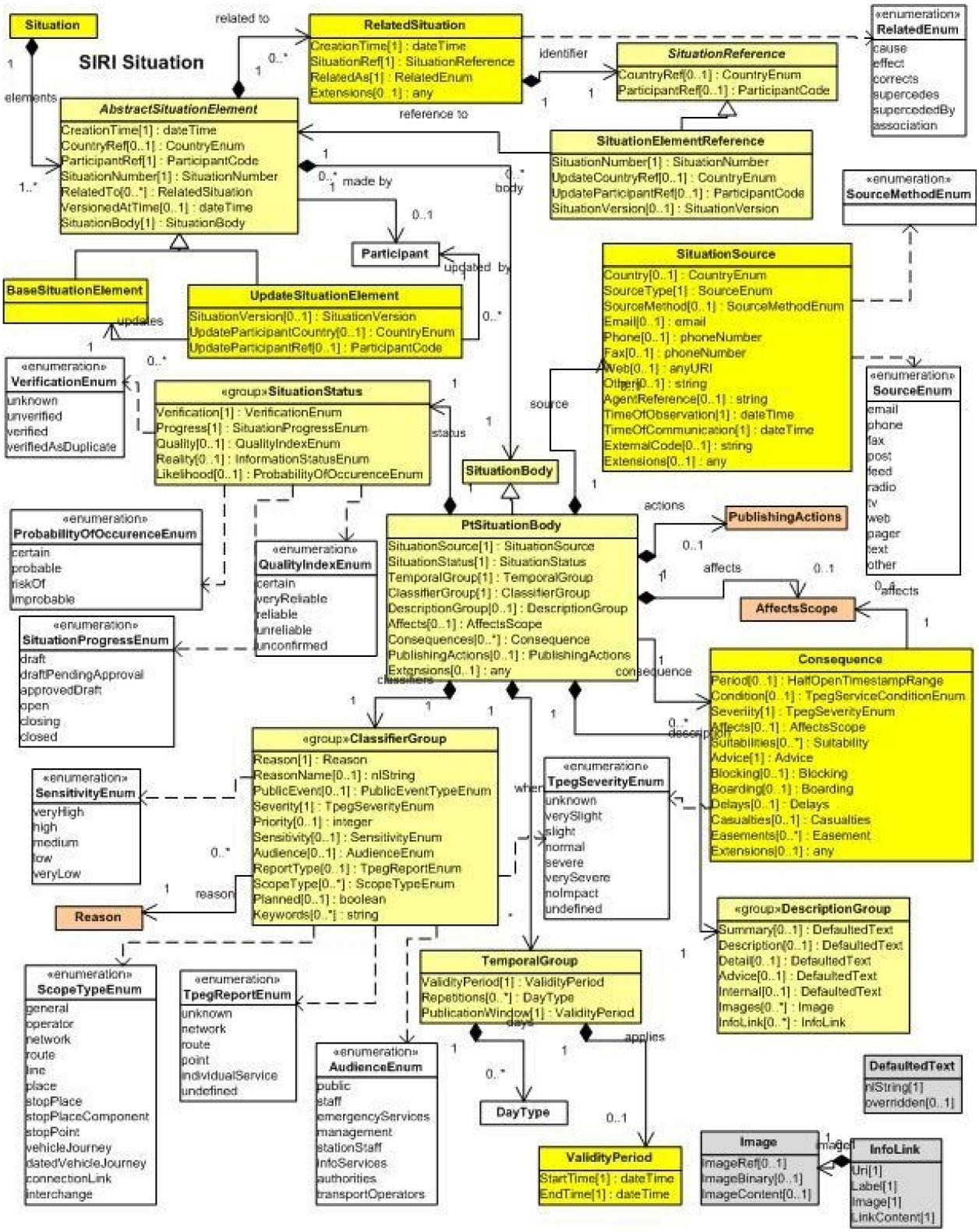



**Figure 12 — UML Diagram of SIRI-SX Situation Body**

### 6.2.4 PT Situation Reason

A SITUATION ***Reason*** is part of the SITUATION classifier content and provides taxonomic information about the cause of the SITUATION. Each SITUATION is assigned a Reason type.

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In the SIRI-SX SITUATION model, for Pt SITUATIONs a two level classification system is used, corresponding to the TPEG PTI ontology. Each main reason type (***PersonnelReason***, ***EquipmentReason***, ***EnvironmentReason*** etc) contains a set of subtypes that explain the reason in more detail; for example for ***EnvironmentReason***, includes *heavySnow, rain, fog, flooding,* etc.

Note that TPEG in fact has two sets of Reason codes; one in TPEG-Loc and one in TPEG–PTI There are some minor differences but not conflicts. SIRI-SX uses a union of both sets.

SIRI-SX makes some additional distinctions to identify a number of additional SITUATION reasons not currently recognized by TPEG – each of these additional reasons is mapped to an existing TPEG category so that an SIRI-SX schema is fully compatible for export to TPEG. For example SIRI-SX distinguishes between 'Fire on Track' and a plain 'Fire'.

Figure 13 summarizes the SIRI-SX Reason codes. The codes are listed in tabular form in 7.8.5.7.8.



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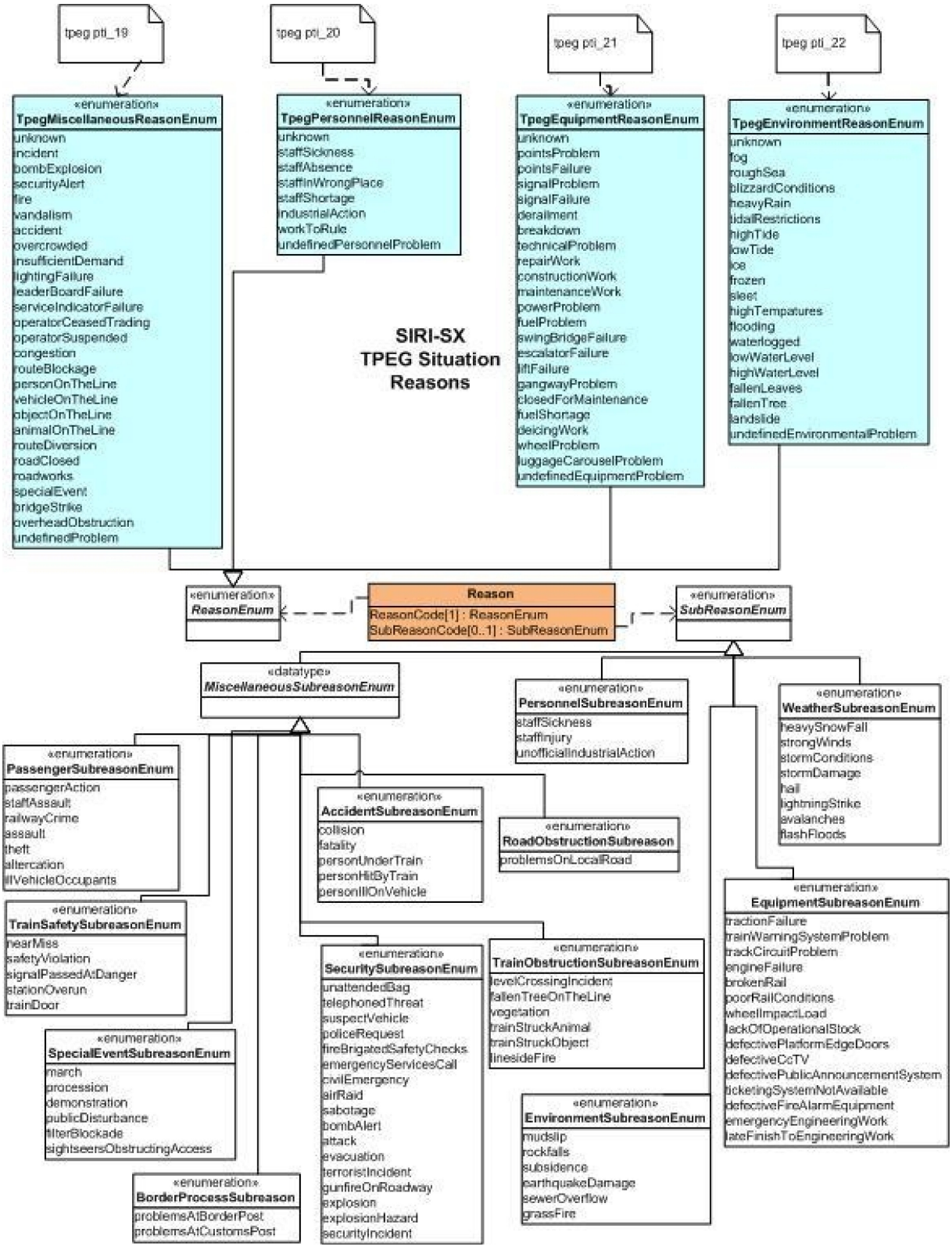



**Figure 13 — UML Diagram of TPEG Situation Reason Values**



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### 6.2.5 Situation Consequence

The SITUATION ***Consequence*** element represents the likely effect or effects of a SITUATION on transport services. A SITUATION may have multiple consequences, each of which may have a different scope.

Figure 14 elaborates just the Consequence part of the previous UML diagrams. See 7.8.5.9 for a tabular representation. ***Consequence*** is made up of an ***AffectsScope*** and other properties:

— ***Suitability:*** describes the consequence for accessibility.

— ***Blocking*** describes whether the ROUTEs and services described in the ***AffectsScope*** element should be blocked, i.e. shown as unavailable in Journey Planner and real-time departure systems.

— ***Boarding*** describes the consequence for alighting and boarding at the Affected Stops

— ***Advice***: Additional guidance to passengers

— ***Casualties***: the number of

— **AffectsScope**: Identifies which parts of the network and which services are affected by the consequence. (See 6.2.6 below)

— **Easements**: Describes fare exceptions allowed because of the disruption.

The ***Consequence*** elements are described in tabular form in 7.8.5.9.



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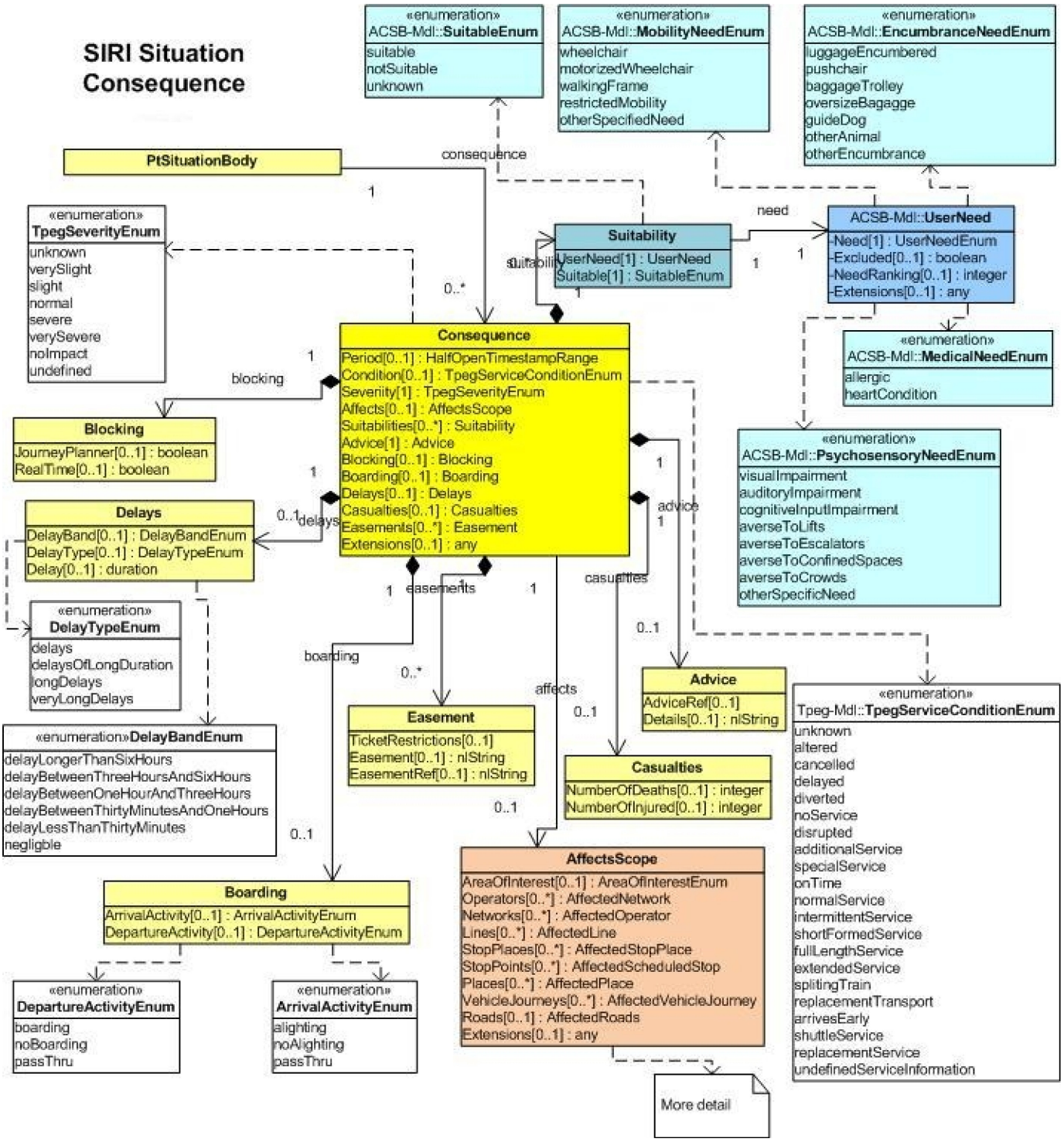



**Figure 14 — UML Diagram of SIRI-SX Situation Consequence**

### 6.2.6 The PT AffectsScope

#### 6.2.6.1 Overview of AffectsScope

The ***AffectsScope*** element describes the scope of a SITUATION or scope of the ***Consequence*** of a PT SITUATION. It allows the use of tagged references to the identifiers of Transmodel entities. The same



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references to data elements can be shared with other SIRI services, allowing the efficient exchange of information.

It can also be used to associate IFOPT STOP PLACE entities with a SITUATION in order to describe the precise scope of a SITUATION within a physical interchange.

Figure 15 introduces the ***AffectsScope*** model. The scope can be specified at different levels – e.g. the whole network, part of network, a station, etc. Annotations such as the name, direction etc that are useful for SITUATION processing and presentation can be included along with the basic entity references.

The scope of effect on the NETWORK and on scheduled services is made using ***AffectedNetwork***, ***AffectedOperator***, ***AffectedLine***, ***AffectedRoute***, ***AffectedVehicleJourney***, ***AffectedScheduledStop***, and ***AffectedCall*** elements, each of which may reference specific Transmodel entities. This is elaborated in Figure 16.

The scope of effect on PLACE and STOP PLACE usage is made using ***AffectedPlace***, ***AffectedStopPlace,*** and ***AffectedStopPlaceComponent***. This is elaborated in Figure 17.

For a discussion of the distinction between a ***ScheduledStopPoint***, a ***StopPlace*** and a ***StopPlaceComponent***, see the IFOPT documentation.



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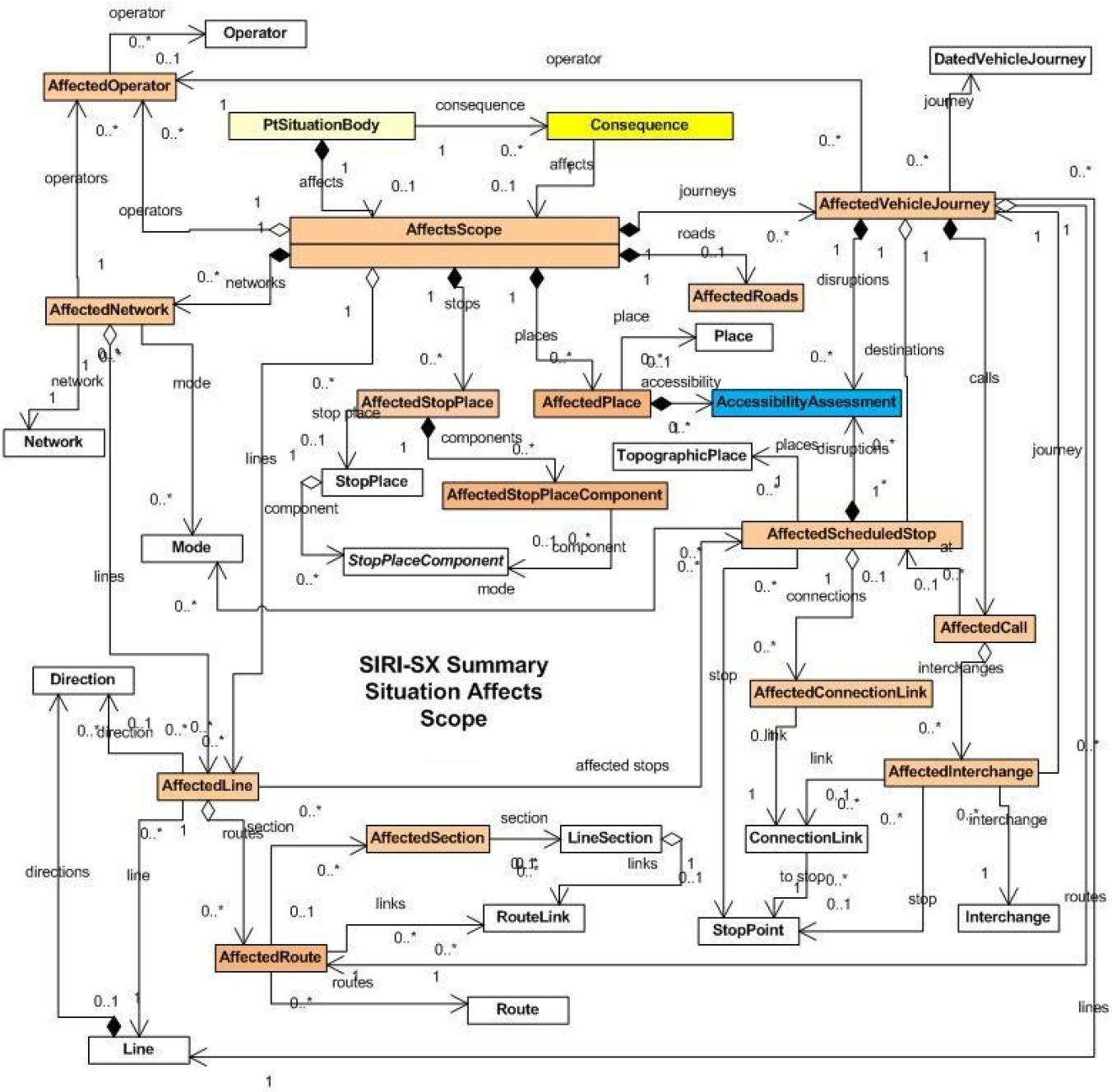



**Figure 15 — UML Diagram of AffectsScope Summary**

### 6.2.6.2 AffectsScope for Scheduled Services

Figure 16 shows that part of the ***AffectsScope*** that pertains to scheduled service elements. The AffectsScope may contain multiple instances of any of the following (some of which provide a context for other child elements):

— ***AffectedNetwork*** describes a NETWORK level scope, such as might apply to weather conditions or a special holiday.

— ***AffectedOperator*** describes an OPERATOR wide scope, such as a strike.



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— ***AffectedLine*** describes a LINE or line section scope for SITUATIONs affecting part of a NETWORK, such as a LINE undergoing delays because of signalling problems. A line section is an arbitrary list of identifiers of ***RouteLink*** instances or other parts of a LINE.

— ***AffectedRoute***, describes a ROUTE or line section scope for SITUATIONs affecting all or part of a ROUTE of a NETWORK (and hence all VEHICLE JOURNEYs that use that ROUTE), such as a section undergoing delays because of road works.

— ***AffectedVehicleJourney*** describes a scope of a specific VEHICLE JOURNEY, such as a delayed or cancelled service. The VEHICLE JOURNEY may be a DATED VEHICLE JOURNEY – i.e. one particular instance on a particular calendar day, or undated, it which case it specifies a particular VEHICLE JOURNEY in the timetable.

— ***AffectedCall*** describes a scope of a CALL at a SCHEDULED STOP POINT within a VEHICLE JOURNEY, such as a cancelled CALL at stop.

— ***AffectedInterchange*** describes a scope of an INTERCHANGE between two VEHICLE JOURNEYs at a SCHEDULED STOP POINT, such as a cancelled connection.

— ***AffectedScheduledStop*** describes a scope of an individual SCHEDULED STOP POINT, such as for a closed station. Note that this is a timetable reference and does not necessarily distinguish between the whole STOP PLACE or a specific QUAY – this can be done using the ***AffectedStopPlace*** elements – see Figure 17.

— ***AffectedConnectionLink*** describes a scope of an individual a CONNECTION LINK between two SCHEDULED STOP POINTs, such as the possibility of transfer between rail and metro at a station.

— ***AccessibilityAssessment*** describes the specific effects on ACCESSIBILITY at a point in the NETWORK or on use of a VEHICLE JOURNEY. See later below.

— ***AffectedFacility*** describes facilities affected, for a VEHICLE JOURNEY, a SCHEDULED STOP POINT or a STOP PLACE, such as a buffet car not being available. (Not shown)

— ***AffectedRoads*** describes those parts of the road NETWORK affected using a Datex2 ***GroupOfLocations***. See Datex2 for further details. The ***AffectedRoads*** can be used to describe a road scope for PT SITUATIONs – for ***RoadSituationBody*** it would typically be specified on a ***TrafficElement*** of.



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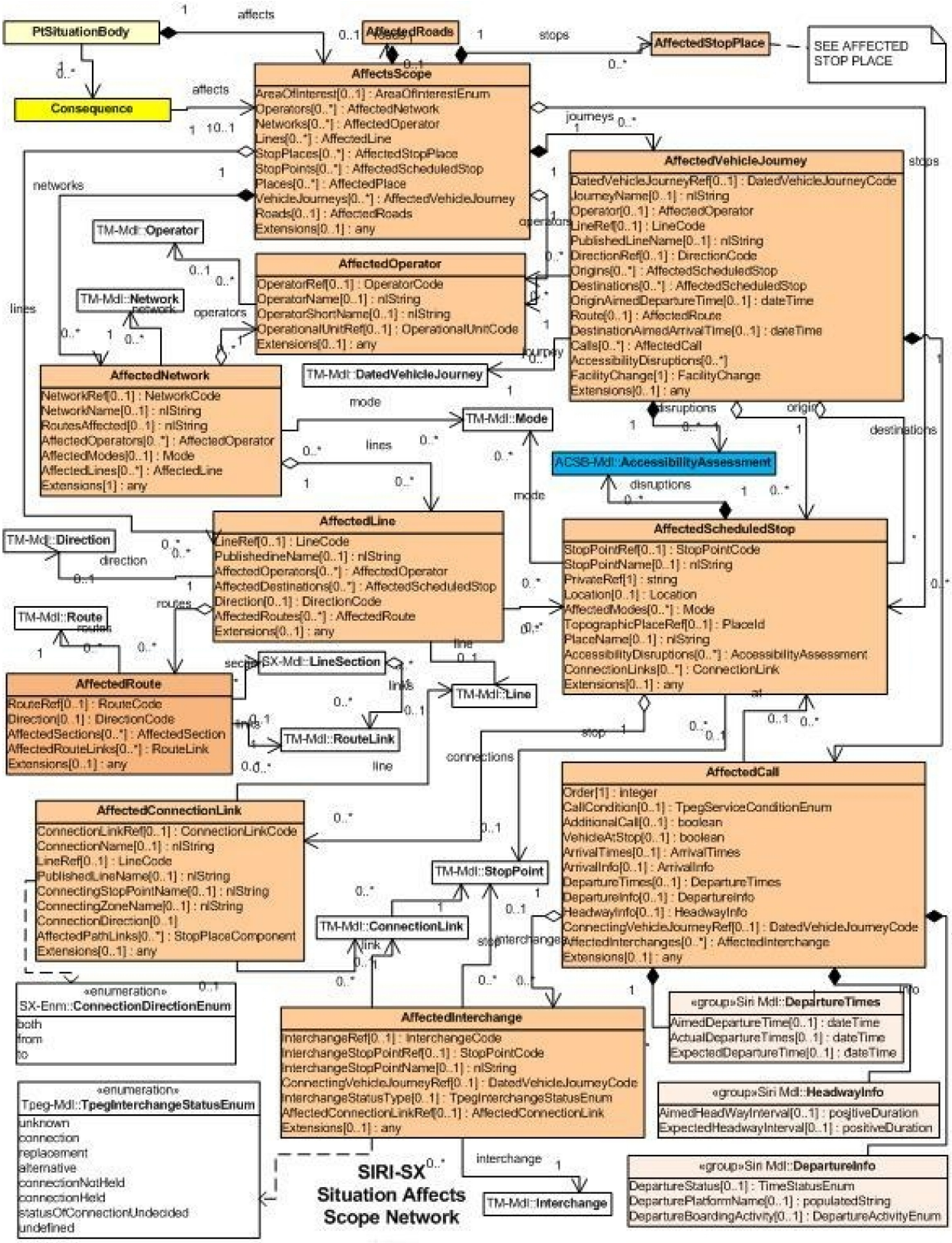



**Figure 16 — UML Diagram of Situation AffectsScope: Scheduled Timetable Elements**



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#### 6.2.6.3 AffectsScope for Stop Place

Figure 17 shows that part of the ***AffectsScope*** model that pertains to the STOP PLACE elements. It can be used to indicate that the scope of a SITUATION is all of STOP PLACE, or a specified part of it, such as a particular QUAY, ACCESS AREA, BOARDING POSITION, ENTRANCE or EQUIPMENT PLACE, or PATH LINK between them. For further details see the IFOPT technical specification.

— ***AffectedStopPlace*** describes a station or interchange level scope, such as might apply to SITUATIONs caused by a security alert at a station.

— ***AffectedStopPlaceComponent*** describes a scope of an element within a STOP PLACE, such as a QUAY, an ENTRANCE or an ACCESS SPACE.

— ***AffectedPlace*** describes a scope for SITUATIONs affecting other PLACEs (i.e. other than STOP PLACEs) such as POINTs OF INTEREST. This can also be used to specify an arbitrary point location

— ***AccessibilityAssessment:*** specifies an effect in terms of change to a SUITABILITY or LIMITATION, such as lack of use of a lift. This might arise from the SIRI-FM service.



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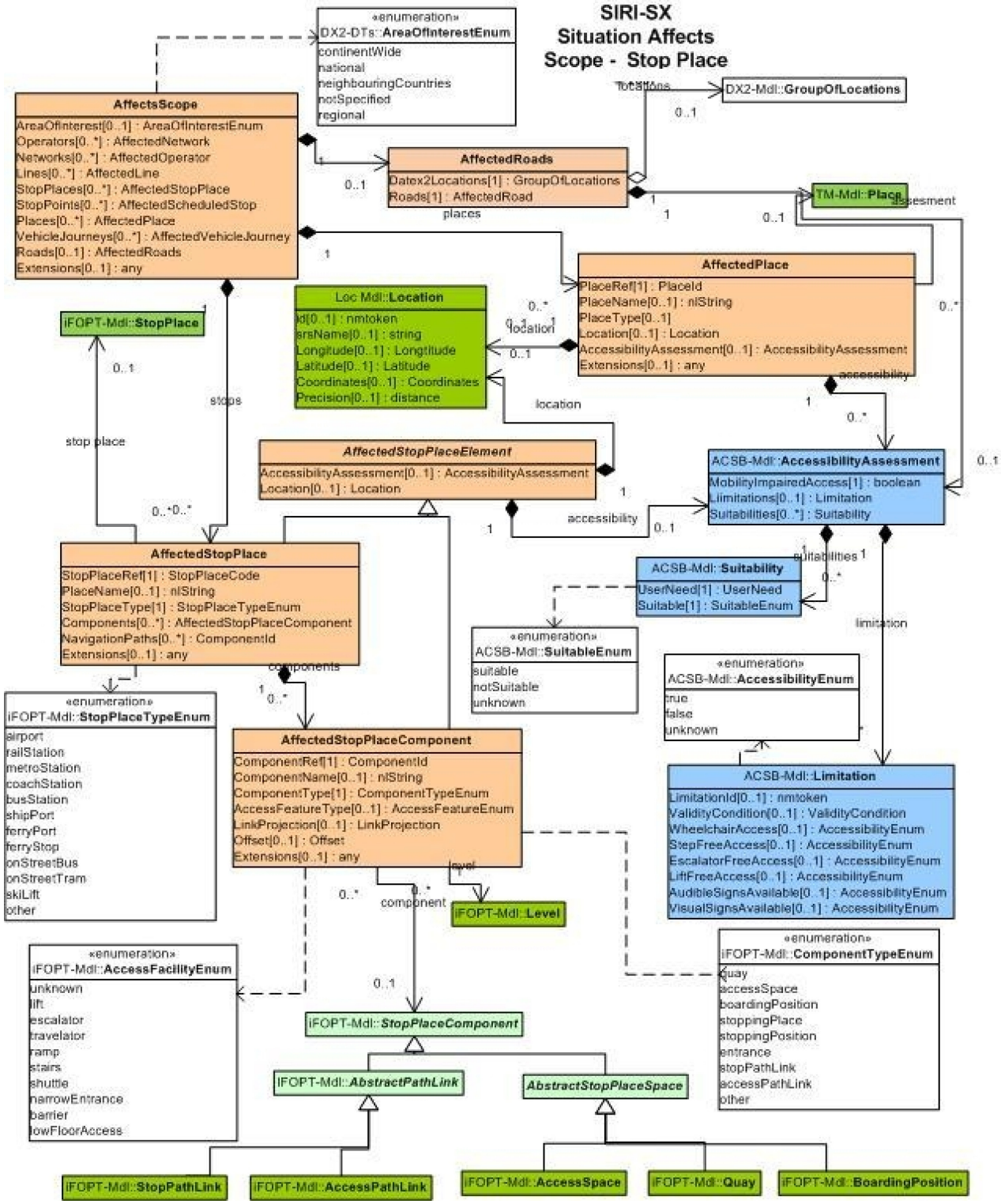



**Figure 17 — UML Diagram of Situation AffectsScope: Stop Place and Suitability Elements**

## 6.3 Representing a Road Situation in SIRI-SX

### 6.3.1 Summary of Road Situation model

Figure 18 introduces the SIRI-SX SITUATION model for Road SITUATIONs as a UML diagram. The SITUATION model has four main concepts: ***RoadSituationBody***, ***AffectsScope***, ***TrafficElement*** and

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***Actions***. It is intended primarily to indicate how interoperability with Datex2 to describe road SITUATIONs can be achieved.

— The ***RoadSituationBody*** brings together the information about a Road SITUATION and is made up of a number of structured parts, including the temporal scope; a systematic classification (based on TPEG); and set of text descriptions. Most of the elements are the same as described earlier under ***PtSituationBody***

— The ***AffectsScope*** element specifies the scope of the SITUATION – the location model in TPEG terms. This can be stated in terms of the NETWORK, and/or particular lines, stations or VEHICLE JOURNEYs or points in line with a Transmodel representation. See earlier.

— A ***TrafficElement*** element describes the effect of the SITUATION on services. It embeds a Datex2 Traffic Element. Note that a number of the generic SITUATION elements such as severity, status, probability, etc can be specified using either the Traffic Element, or in the SIRI-SX elements or both.

— A ***PublishingActions*** element suggests processing options for the SITUATION for use by downstream systems, for example whether it should appear on the web or not. This allows the SITUATION provider to tag the SITUATION with information guiding the business rules for different workflow steps in the subsequent use of the SITUATION.

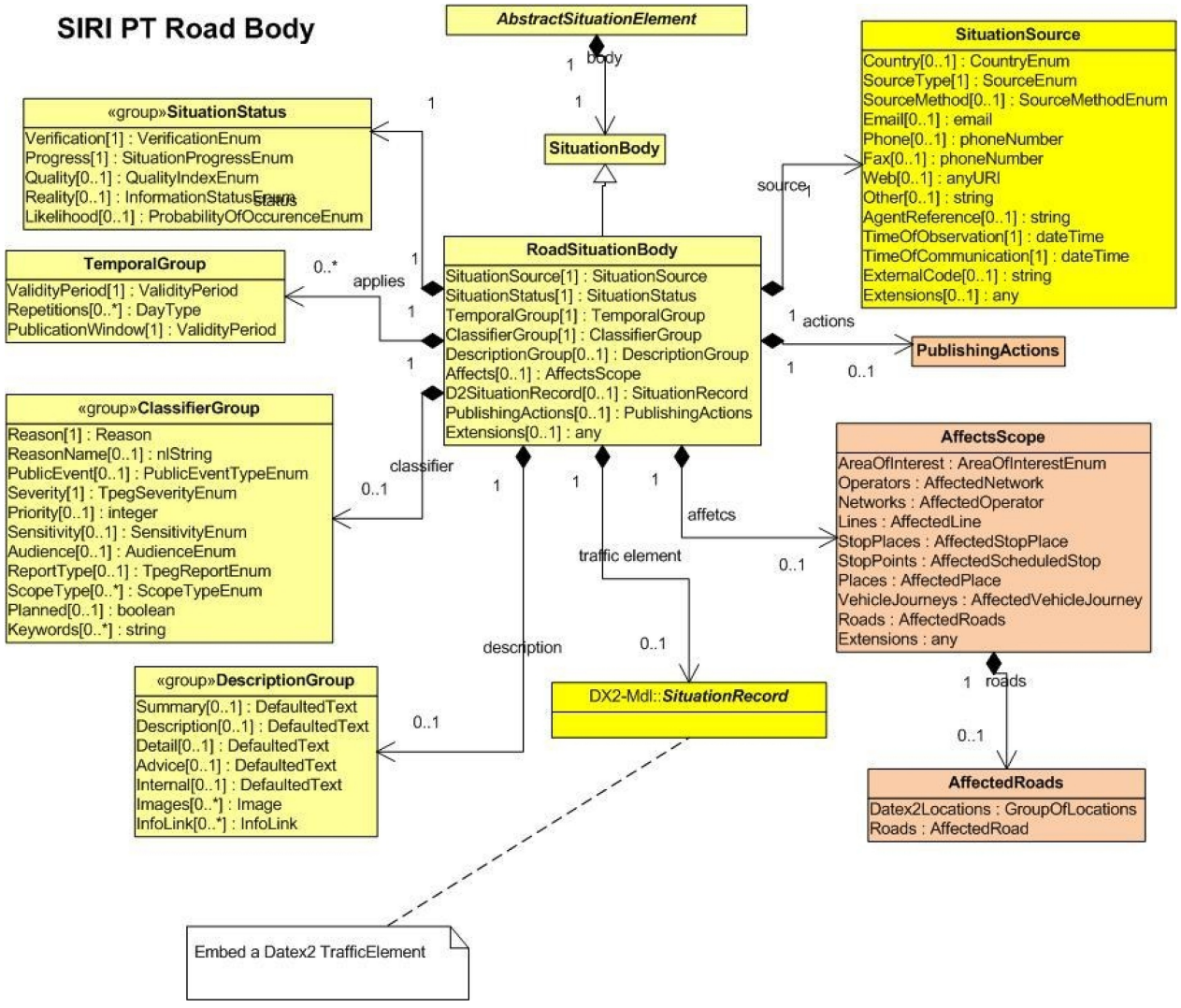



**Figure 18 — UML Diagram of Overview of SIRI-SX Model for Roads**



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### 6.3.2 Road Situation Element Body

The ***RoadSituationBody*** groups the descriptive properties of Road SITUATIONs. It has many common properties with ***PtSituationBody.***

— *SituationStatus* describes the current status of the SITUATION, including *Verification*, *Progress. Reality* and *QualityIndex.*

— *SituationSource* describes the information source from which the SITUATION was obtained. Some aspects of the source may additionally be specified using the *TrafficElement*.

— A Group of Temporal elements describes the Temporal scope of the SITUATION, including *ValidityPeriod*, (when the SITUATION occurs) *Repetitions* (if it recurs at a regular periodicity) and *PublicationWindow.* (If the period for informing customers is different from the validity period). Some aspects of the temporal scope may alternatively or as well be specified using the *TrafficElement*.

— A Group of Classifier elements describes the Classification of the SITUATION by *Reason*, *Severity*, *Priority*, *Audience*. Some aspects of the Classification may alternatively or as well be specified using the *TrafficElement*.

— A Group of Descriptor elements provides a set of textual descriptions of the SITUATION. This can contain different components, for example *Summary*, *Description*, *Details*, *Advice*, *Internal* as well as *Image* and *InfoLinks.*

— An embedded DATEX2 *TrafficElement* specifies the road location model, and other DATEX2 elements.

— An *AffectsScope* allows the additional impact on PT NETWORK VEHICLE JOURNEYs to be stated.

### 6.3.3 Common Accessibility

The ***AccessibilityAssessment*** element describes the effect of a SITUATION on Accessibility. The effect may be stated either as a change to a ***Limitation***, or as a change to a ***Suitability*** to a specific ***UserNeed***.

A ***Limitation*** describes the accessibility attributes of an element of the infrastructure (fixed or moving) in terms of a number of standard properties.

A ***Suitability*** explicitly defines whether an element of the infrastructure is suitable for use by someone with a specific ***UserNeed.***

Limitations may imply specific suitabilities – it is up to applications to decide the correspondence.

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