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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 15531-5:2022. It supersedes PD CEN/TS 15531-5:2016, which is withdrawn.

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

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Öffentlicher Verkehr - Diensteschnittstelle für Echtzeitinformationen bezogen auf Betriebsabläufe im öffentlichen Verkehr - Teil 5: Funktionelle Serviceschnittstelle - Situativer Austausch

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European foreword

This document (CEN/TS 15531-5:2022) 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 shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TS 15531-5:2016.

SIRI (CEN/EN 15531-1:2006) has been a CEN Technical Specification since 2007 and a European normative standard since 2013 and has been widely used in Europe and elsewhere and proven its usefulness. This document proposes a revised version of SIRI as a European Standard, and is currently submitted to the Formal Vote. The proposed revisions are minor enhancements arising from experience of the deployment of SIRI in many live systems. This document also clarifies the relationship of SIRI to NeTEx, the CEN Technical Standard for the XML exchange of Public Transport Reference data based on the Transmodel CEN European Standard.

This document presents Part 5 of the European Standard 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.

The SIRI European Standard 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 PT, ET, ST, SM, VM, CT, CM, GM (Part 3).

Two additional parts define additional functional services as CEN Technical Specifications:

— additional data structures for additional application interface module FM (Part 4);

— additional data structures for additional application interface module SX (Part 5).

The XML schema can be downloaded from https://github.com/SIRI-CEN/SIRI, guidance on its use, example XML files, and case studies of national and local deployments is located at http://siri-cen.eu/.

It is recognised that SIRI is not complete as it stands, and from time to time will need to continue to be enhanced to add additional capabilities. It is therefore intended that a SIRI Management Group should continue to exist, at European level, based on the composition of SG7.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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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 European Standard 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 European Standard will improve a number of features of public transport information and service management:

— Interoperability – the European Standard 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; (iii) 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 European Standard 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 European Standard will assist the economic provision of improved data by; (i) enabling the gathering and exchange of real-time data between AVMS systems; (ii) providing standardised, well defined interfaces that can be used to deliver data to a wide variety of distribution channels. Version 2.0 of SIRI includes a new Simple Web Service designed to support the widespread, massively scalable use of mobile devices and web browsers and other applications to display public transport data directly to users.

Technical advantages include the following:

— Reusing a common communication layer for all the various technical services enables cost-effective implementations and makes the European Standard readily extensible in future.

— This 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).

History

Version 1.0 of SIRI was developed in 2004-2005 and submitted to vote, eventually passing through the CEN process to become an approved CEN Technical Specification in 2007. As well as the normative

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Version 1.0 XSD schema, successive informal working versions of the schema (v 1.1 – 1.4) were released to allow for fixes and to implement some very minor enhancements agreed by the working group. A WSDL version was also developed.

Version 2.0 of SIRI was developed in 2012 to coincide with making the SIRI standard a full CEN norm.

SIRI includes a Simple Web Services "SIRI-LITE" as an additional transport method and a WSDL document literal version and a WSDL2 version;

Version 2.1 of SIRI was developed in 2020/21 to address lessons from the now widespread implementation of SIRI.

The changes in SIRI version 2.1 include:

— remove the direct relationship with TPEG and other standards to enable support as the other standards change;

— support for new modes in line with TRANSMODEL and NeTEx;

— support for the Reason / Effect / Advice structure for disruptions in SIRI SX;

— increased granularity for occupancy data and Vehicle structures;

— improved subscription renewal options and filtering options;

— additional options and flexibility for STOP POINTS and relationships between journeys;

— migration of XSD to Github to improve access and change control processes.

Compatibility with previous versions

All changes in version 2.1 are intended to be fully backwards compatible, that is to say, existing documents that validate against earlier versions of the schema will also validate against the 2.1 schema without alteration (other than to schema version numbers), and version 2.1 documents that do not use new features will validate against earlier versions. Version 2.1 documents that use new features will not be backwards compatible.

Earlier version of the SIRI-SX service included data enumerations from TPEG that have since been superseded. These superseded enumerations will not be integrated into future version of SIRI-SX and are deprecated. They have been listed in a separate Annex E along with the replacement enumerations.

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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 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 that is an integrated part of CEN Transmodel conceptual model for Public Transport networks.

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 apply.

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:

EBU	European Broadcasting Union
ICS	Incident Capture System
NeTEx	Network Timetable Exchange TS 16614
QoS	Quality of Service
PTS	Public Transport Information Services (TISA TPEG specification)
TISA	Traveller Information Services Association
SIRI-SX	SIRISituation Exchange
SIRI-FM	SIRIFacilities 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.

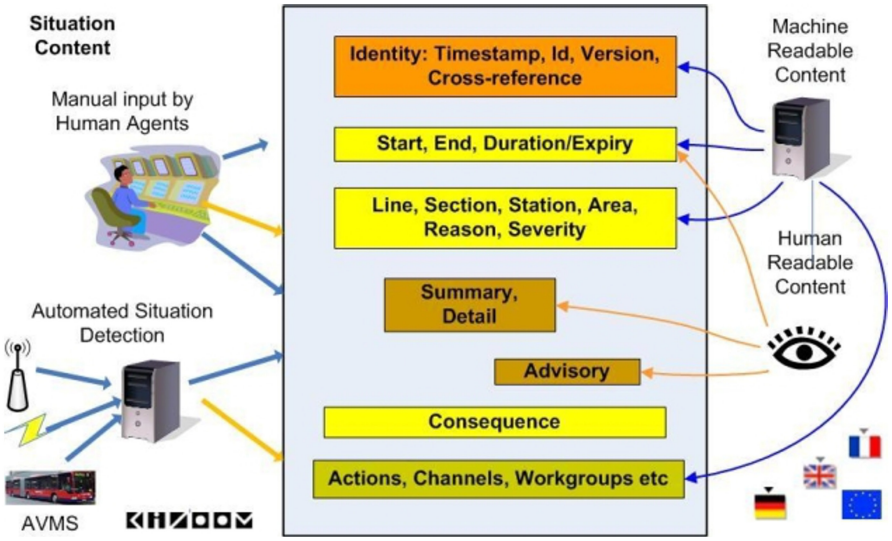


Figure 1 — Situation Structure elements

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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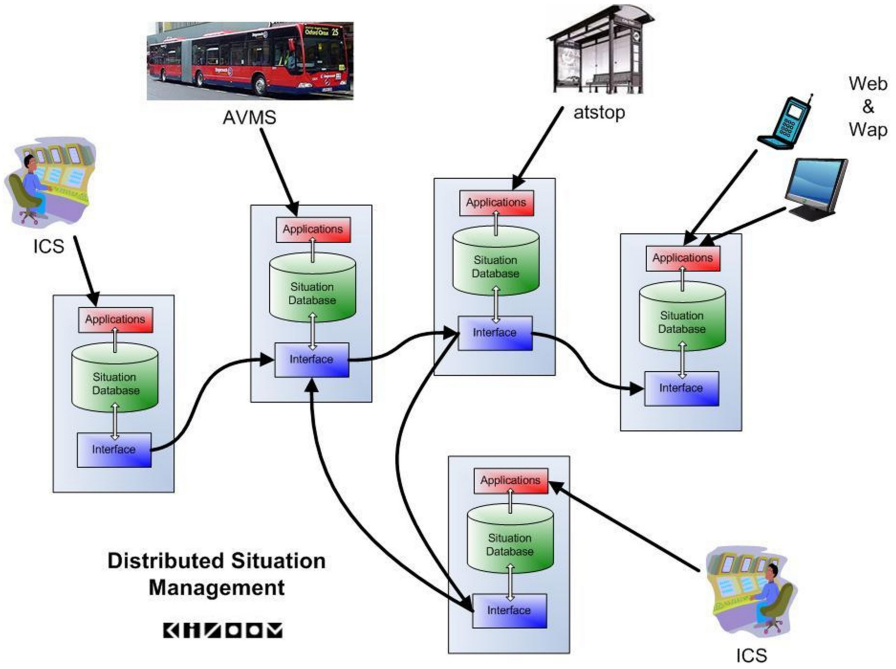


Figure 2— Distributed Message Management

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.

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.

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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 public transport SITUATIONs that affect the public transport network and services described by the other SIRI services, but to support interoperability with Datex2 can also embed a Datex2 TrafficElement.

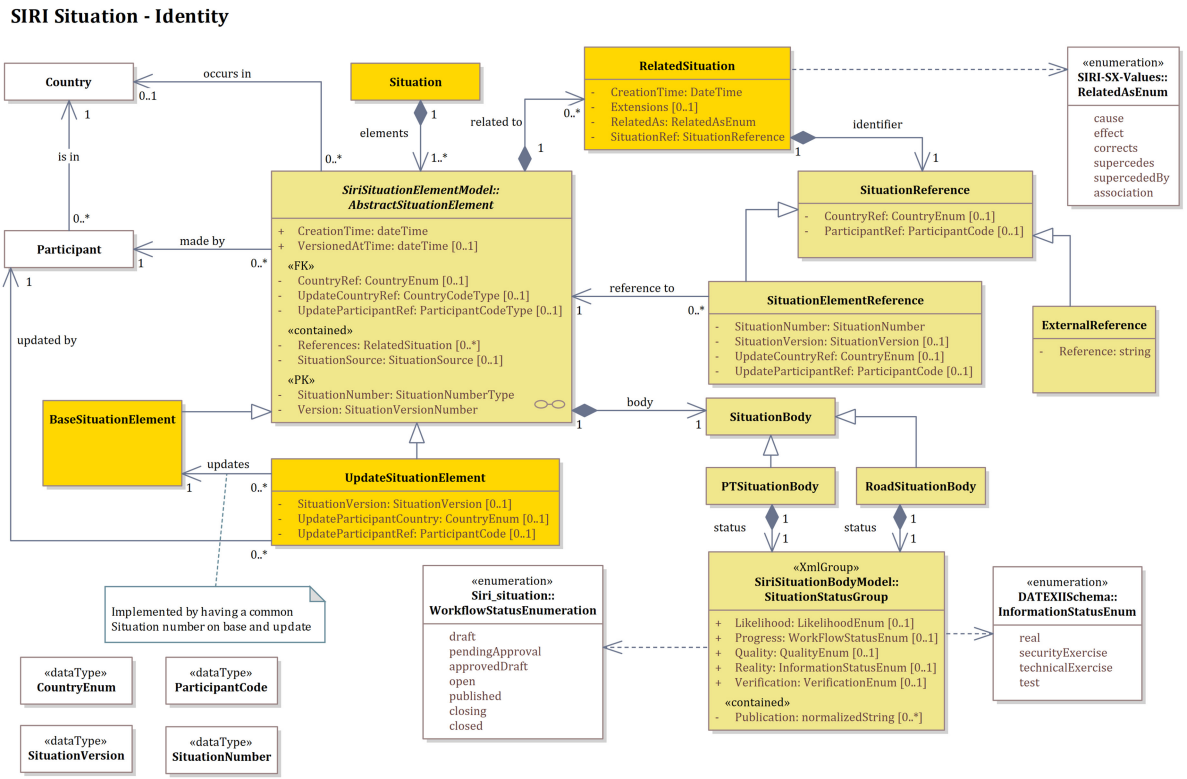


Figure 3 — UML Diagram of Situation Identity Elements

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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***.

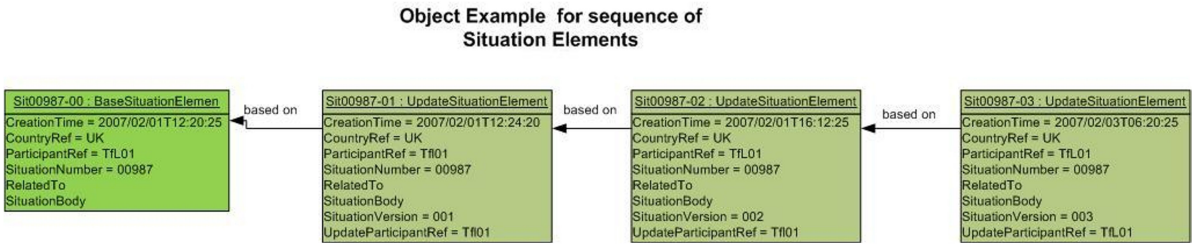


Figure 4 — Situation Instance example

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 a 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.

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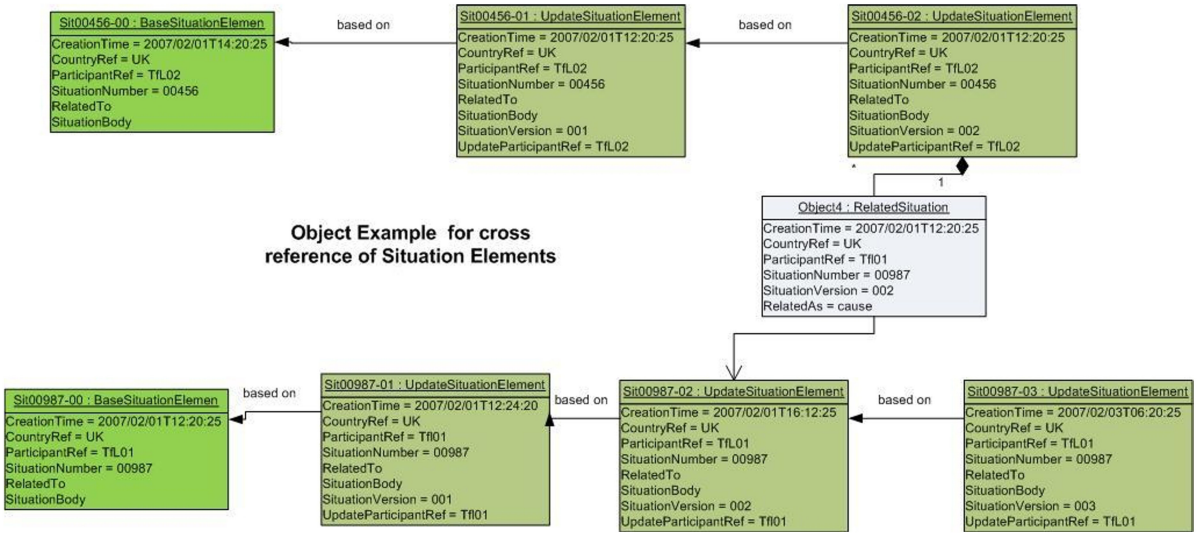


Figure 5 — Instance example – Situation cross-reference chains

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 one or another 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).

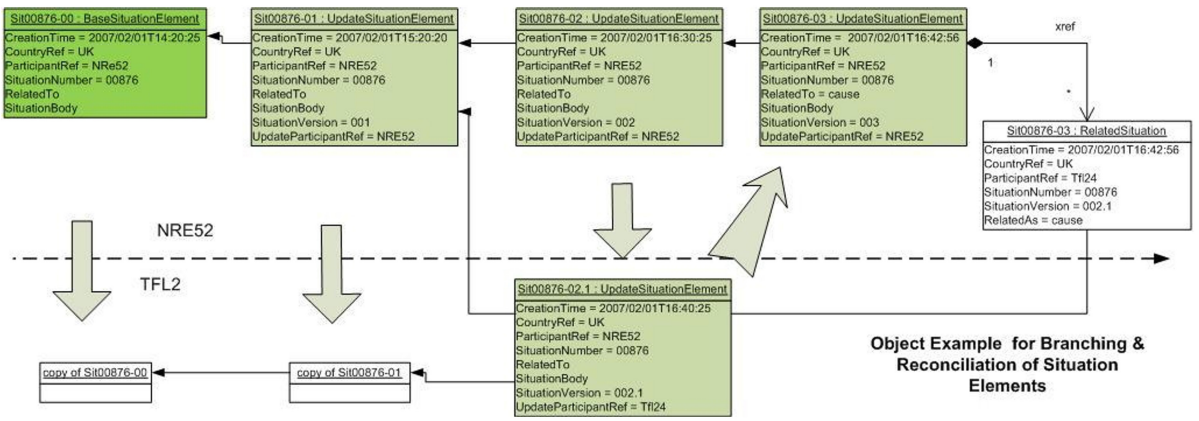


Figure 6 — Instance Example – Situation branching

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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 (Figure 7), 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.

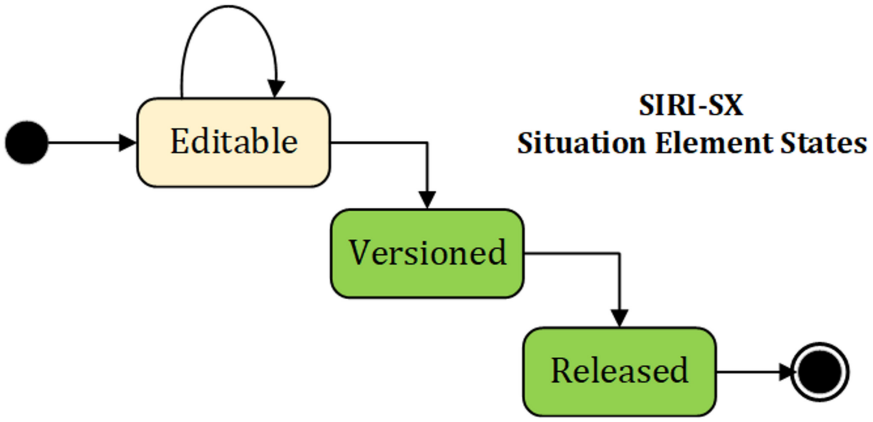


Figure 7 — Edit release cycle of an individual Situation Element

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 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. When a SITUATION becomes Published it should be published in customer information systems. 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*.

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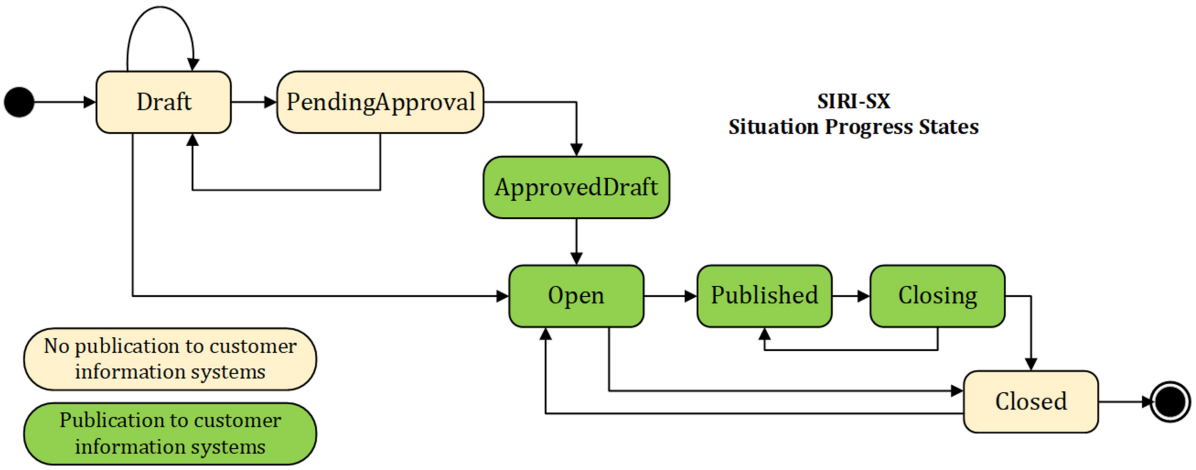


Figure 8 — Overall Life cycle Progress States of a Situation

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

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

b) 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.

c) 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.

d) 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.

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

Thus, situation elements in effect have a compound identifier, the specific makeup of this identifier should be specified in the specific profile, of example:

The full logical identifier of a Base Situation element comprises:

(CountryCode +) ParticipantCode + SituationNumber.

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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

f) 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.

g) 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

h) An update should only contain those additional content values for the situation element which have changed since previous ones when HasIncrementalUpdates is True. 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.

i) 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.

j) 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.

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

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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		VersionedAtTime
	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	0003	2007–02–23T16:30:57Z

5.4.6 Date time stamps as identifiers

All updates contain a versioned time which can be used to assess which is the most recent. 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 (see Figure 9).

Some types of road SITUATION affect certain public transport 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 public transport SITUATION models, there are very significant differences in the detailed models needed to describe Road SITUATIONs from those needed to describe public transport 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 describe SITUATIONs with content that is sufficiently uniform to achieve a useful level of computation and to support cross modal inferences.

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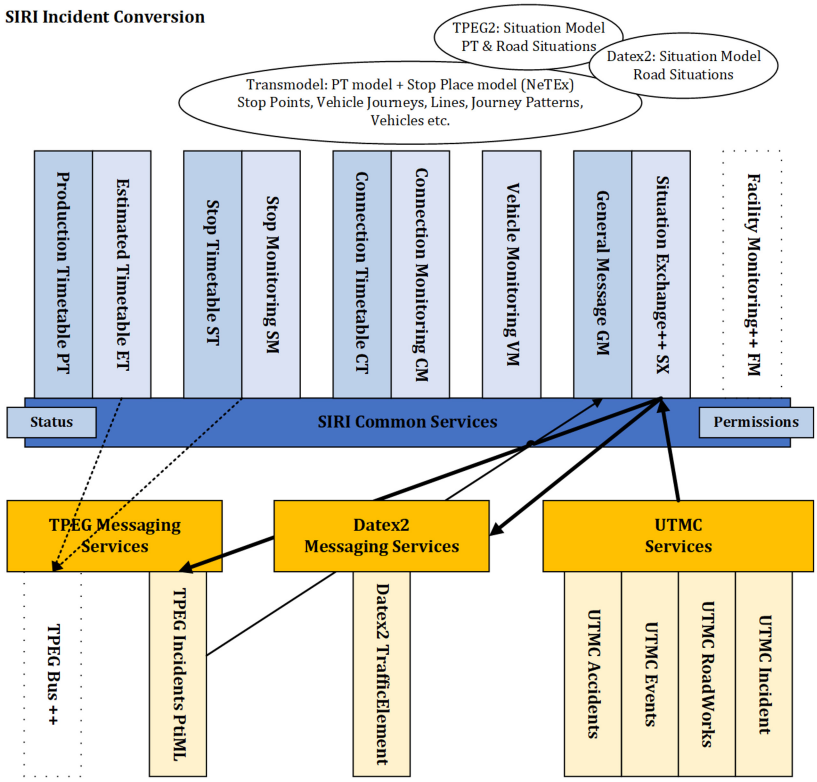


Figure 9 — Interoperability of message services

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:

a) A formal correspondence between most generic SIRI-SX and Datex2 Situation elements (see Annex B), allowing a uniform approach to managing both road and public transport 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.

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

c) Allowing the annotation of SIRI-SX public transport SITUATIONs with Datex2 Locations.

5.5.3 TPEG Interoperability

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

a) a correspondence can be seen between a subset of generic SIRI-SX and TPEG message elements, allowing a uniform approach to managing both TPEG PTS messages and public transport SITUATIONs, and making the construction of adaptors straightforward;

b) TPEG reason codes are used to categorize SIRI-SX messages. See E.5.6.

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5.5.4 General Transit Feed Speciation Real-time interface Mapping

To support interoperability with the General Transit Feed Speciation Real-time interface, SIRI-SX includes in Annex D a mapping of the common elements between the two formats.

5.5.5 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. 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.

There are separate descriptions of the public transport 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

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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 Public Transport Situation in SIRI-SX

6.2.1 Summary of Public Transport 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 a 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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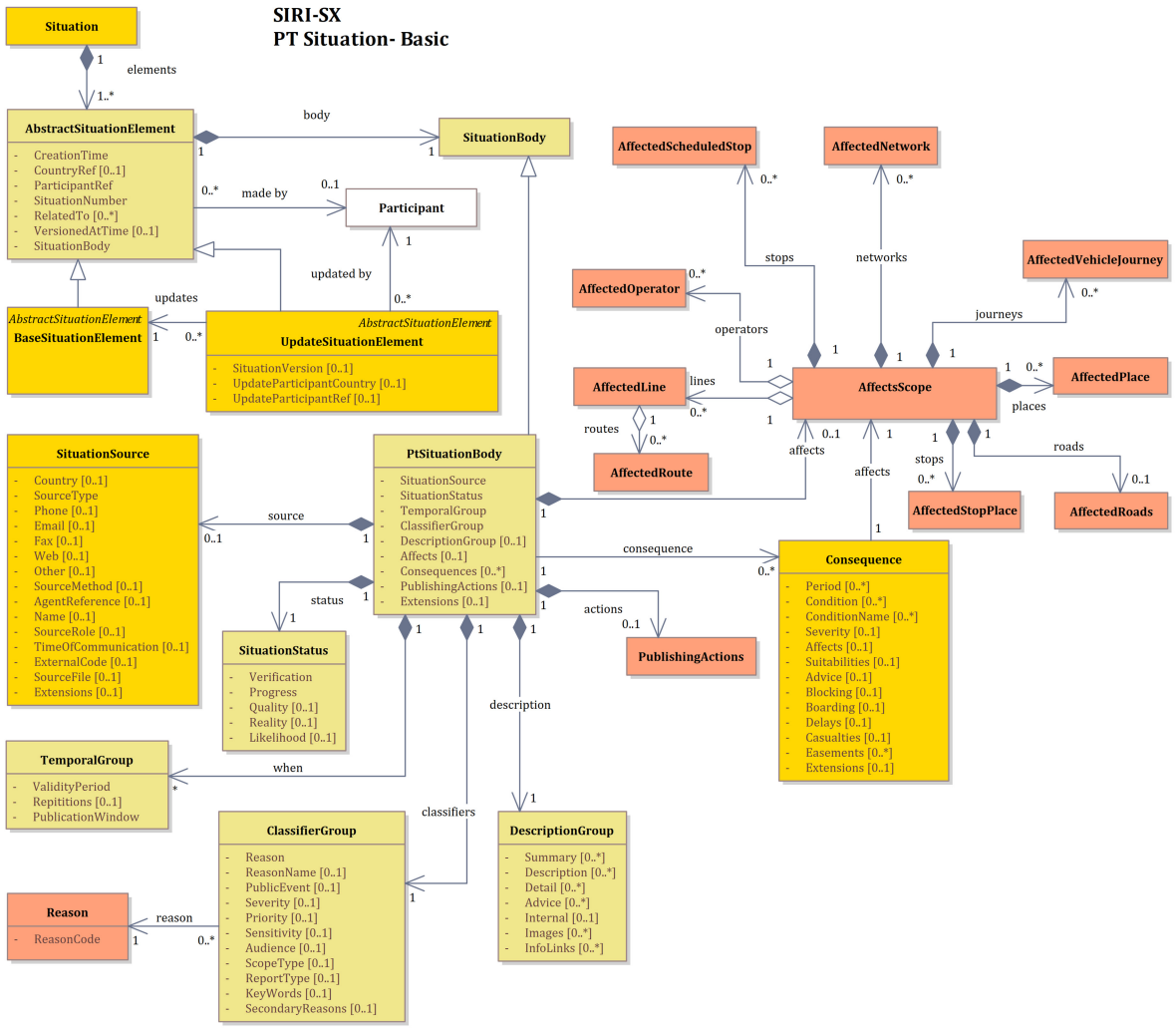


Figure 10 — UML Diagram of Overview of SIRI-SX Model for public transport Situations

6.2.2 PT Situation Element Body

Figure 11 elaborates Figure 10 to add in basic information about the properties of a public transport 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).

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

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— 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.***

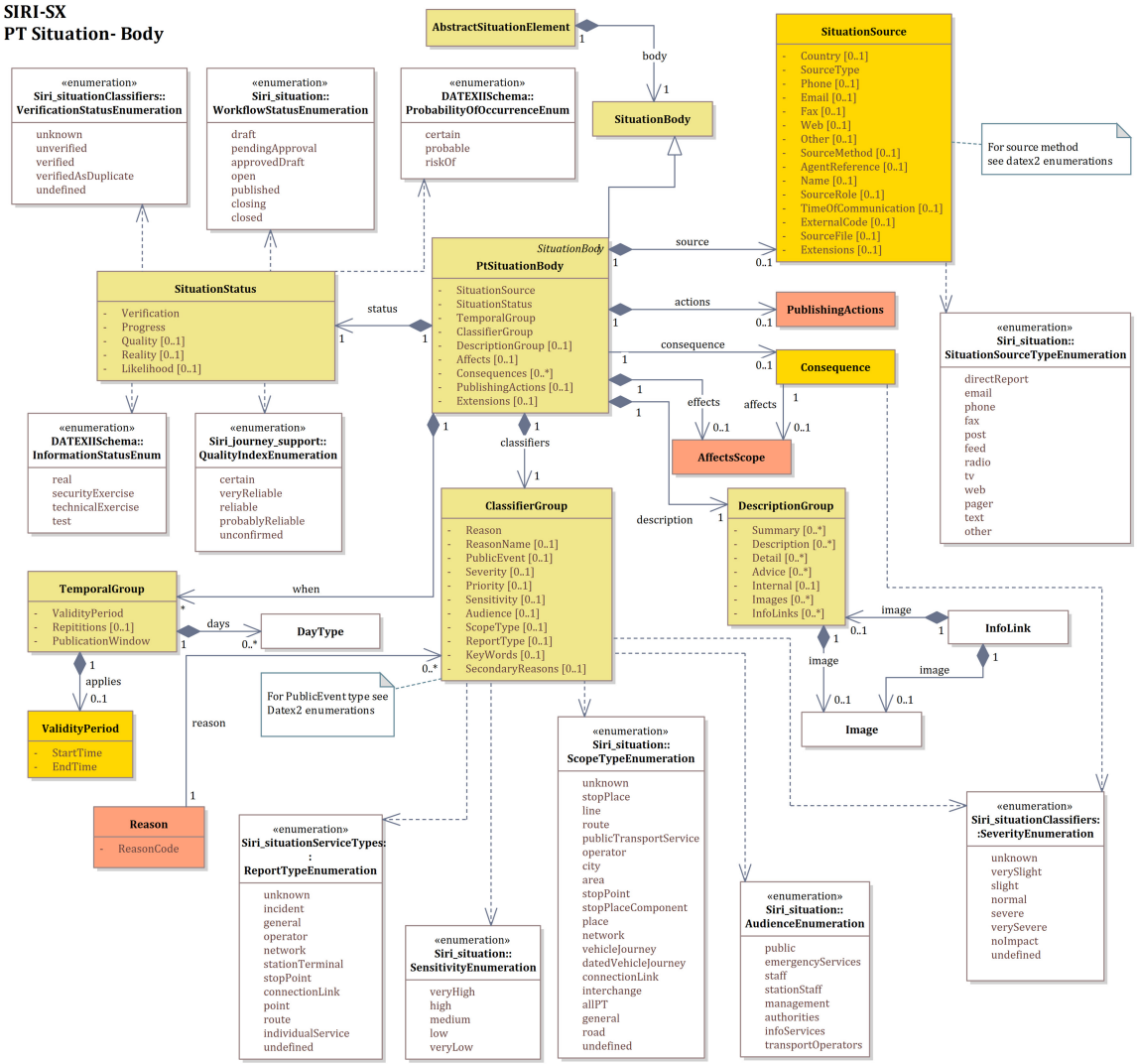


Figure 11 — UML Diagram of public transport Situation Body Summary

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.

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 21).

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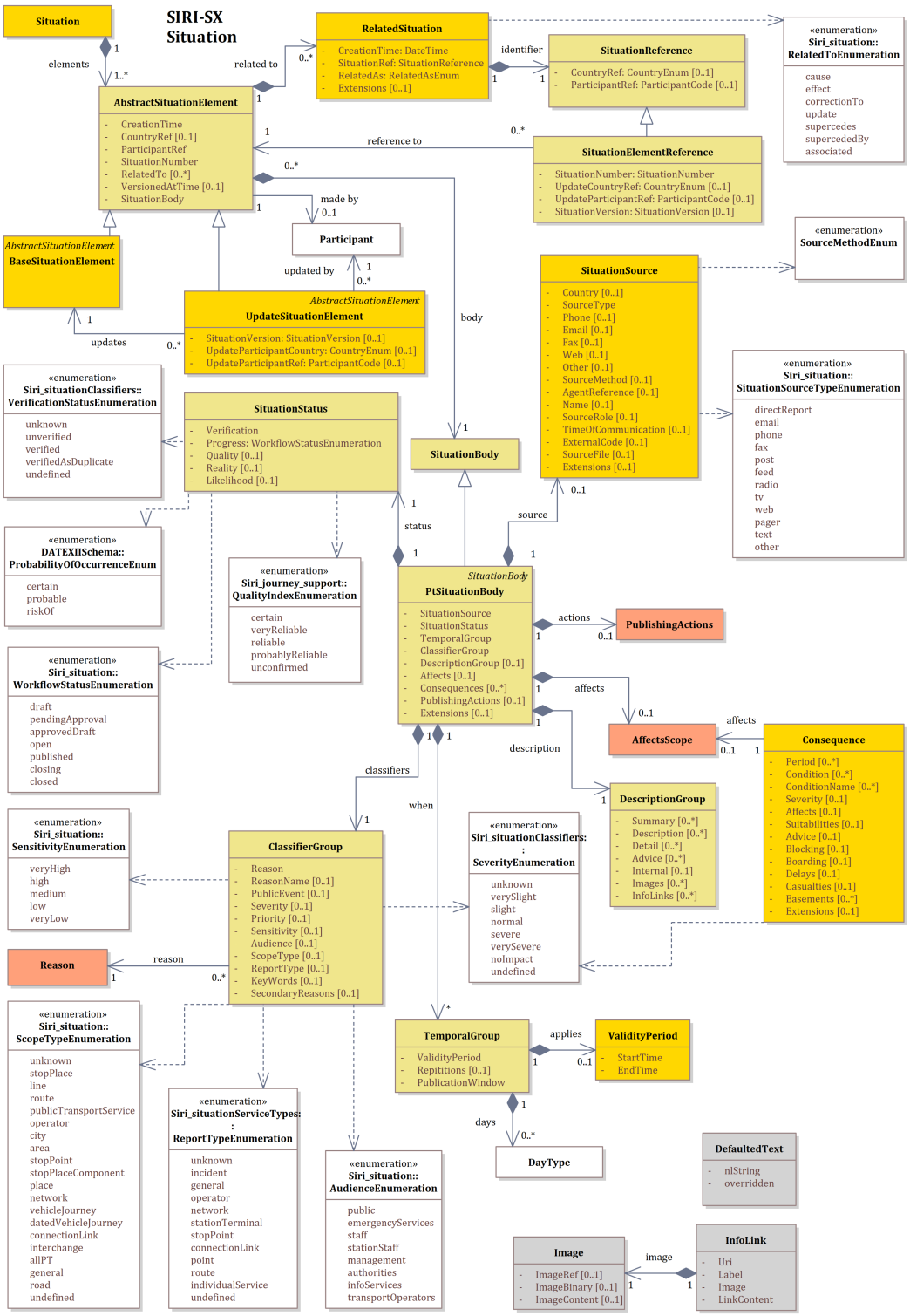


Figure 12 — UML Diagram of SIRI-SX Situation Body

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 an ***AlertCause***.

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In the SIRI-SX SITUATION model, for public transport SITUATIONs originally a two level classification system was used, corresponding to the TPEG PTI ontology at the time. Each main reason type (***PersonnelReason***, ***EquipmentReason***, ***EnvironmentReason*** etc) contained a set of subtypes that explain the reason in more detail; for example, for ***EnvironmentReason***, includes *heavySnow, rain, fog, flooding,* etc. These are listed in E.5.7.3 and are deprecated in SIRI v2.1, and will be removed from a future release of SIRI.

Note that TPEG in fact had 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.

In SIRI v2.1 the old two level classification is replaced with the newer single AlertCause, based on Pts038, removing the SubReason.

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 a 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 Table E.15. These are listed in E.5.7.3 and are deprecated in SIRI v2.1, and will be removed from a future release of SIRI.

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 a SIRI-SX schema is fully compatible for export to TPEG. For example, SIRI-SX distinguishes between 'Fire on Track' and a plain 'Fire'.

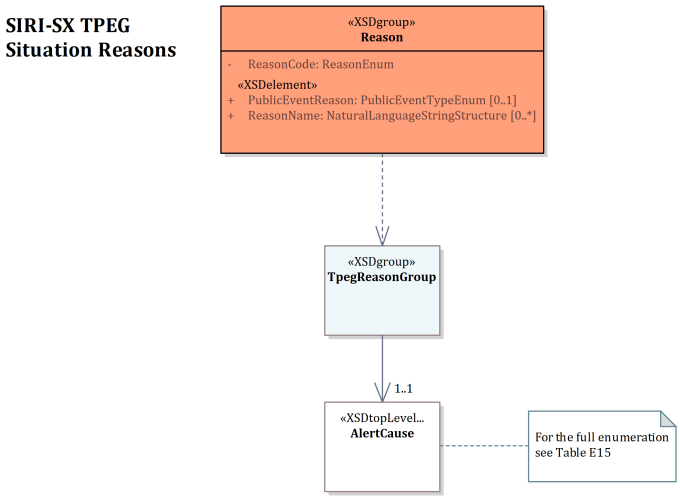


Figure 13 — UML Diagram of TPEG Situation Reason Values

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 Table E.6 for a tabular representation. ***Consequence*** is made up of an ***AffectsScope*** and other properties:

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

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— ***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 casualties;

— **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 Table E.6.

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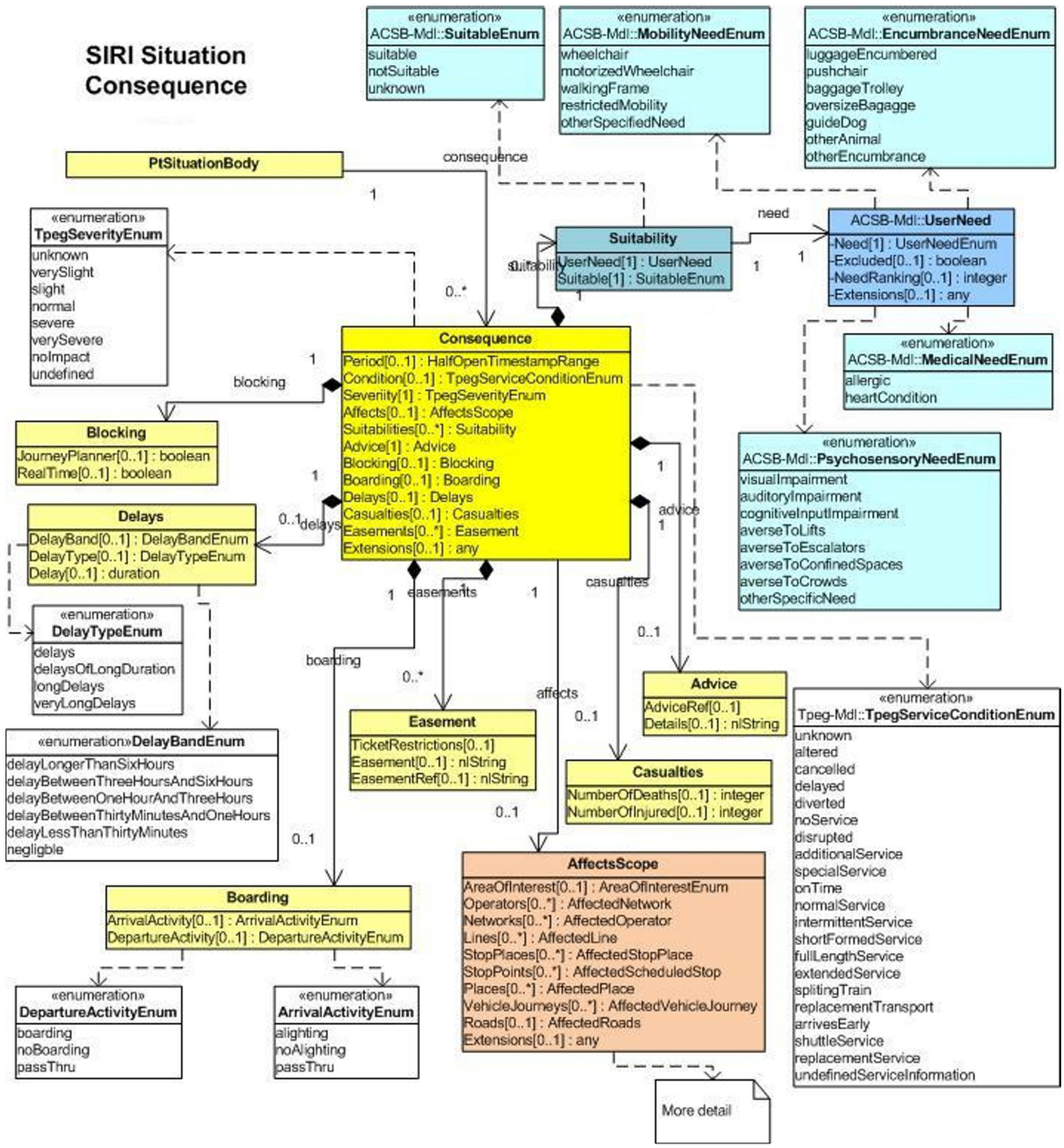


Figure 14 — UML Diagram of SIRI-SX Situation Consequence

6.2.6 The Public Transport AffectsScope

6.2.6.1 Overview of AffectsScope

The ***AffectsScope*** element describes the scope of a SITUATION or scope of the ***Consequence*** of a public transport SITUATION. It allows the use of tagged references to the identifiers of Transmodel entities. The same references to data elements can be shared with other SIRI services, allowing the efficient exchange of information.

It can also be used to associate TRANSMODEL 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

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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, AffectedVehicleJourney, AffectedStopPoint, AffectedStopPlace, AffectedPlace, AffectedVehicle and AffectedRoad*** elements, each of which may reference specific Transmodel entities. This is elaborated in Figure 16.

The ***AffectedVehicle*** element (Table 88) groups information about an individual VEHICLE affected by the SITUATION

The scope of effect on PLACE and STOP PLACE usage is made using ***AffectedPlace***, ***AffectedStopPlace,*** and ***AffectedStopPlaceComponent***. This is elaborated in Figure 18.

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

Where more than one element is given an **AffectsScope**, the values will be logically ANDed together, that is the AffectsScope indicates that just the specific combination of elements is affected.

For example:

— if a Network is specified, then all services on the Network are affected;

— if a Network and an Operator is indicated, then just the services for the given operator on the given network are affected. (Services for other Operators are unaffected);

— if a Network and an Operator and a Mode is indicated, then just the services for that operator on the network for that mode are affected.

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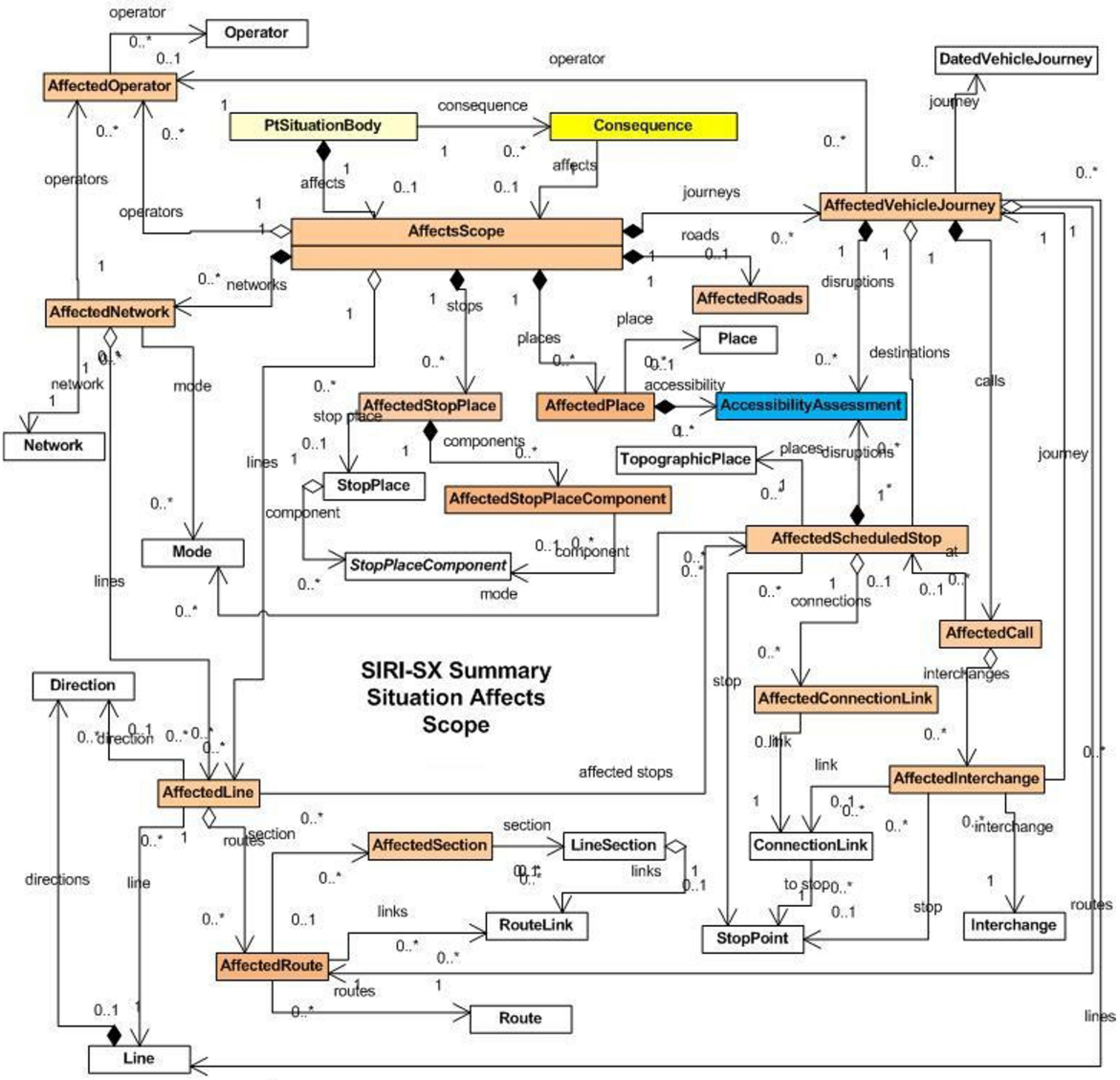


Figure 15 — UML Diagram of AffectsScope Summary

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.

— ***AffectedLine*** describes a LINE or line section scope for SITUATIONs affecting part of a NETWORK, ORIGIN, STOP POINT or STOP PLACE 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,

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— ***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. In SIRI v2.1 this has been refined to cater for SITUATIONS effecting part of a VEHICLE JOURNEY by using ***JourneyParts***.

— ***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*** or ***AffectedStopPoint*** elements – see Figure 18

— ***AffectedSection*** describes how only some COMMON SECTIONs are affected. This can be done by the use of ***IndirectSectionRef***.

— ***AffectedConnectionLink*** describes a scope of an individual 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 public transport SITUATIONs – for ***RoadSituationBody*** it would typically be specified on a ***TrafficElement*** of.

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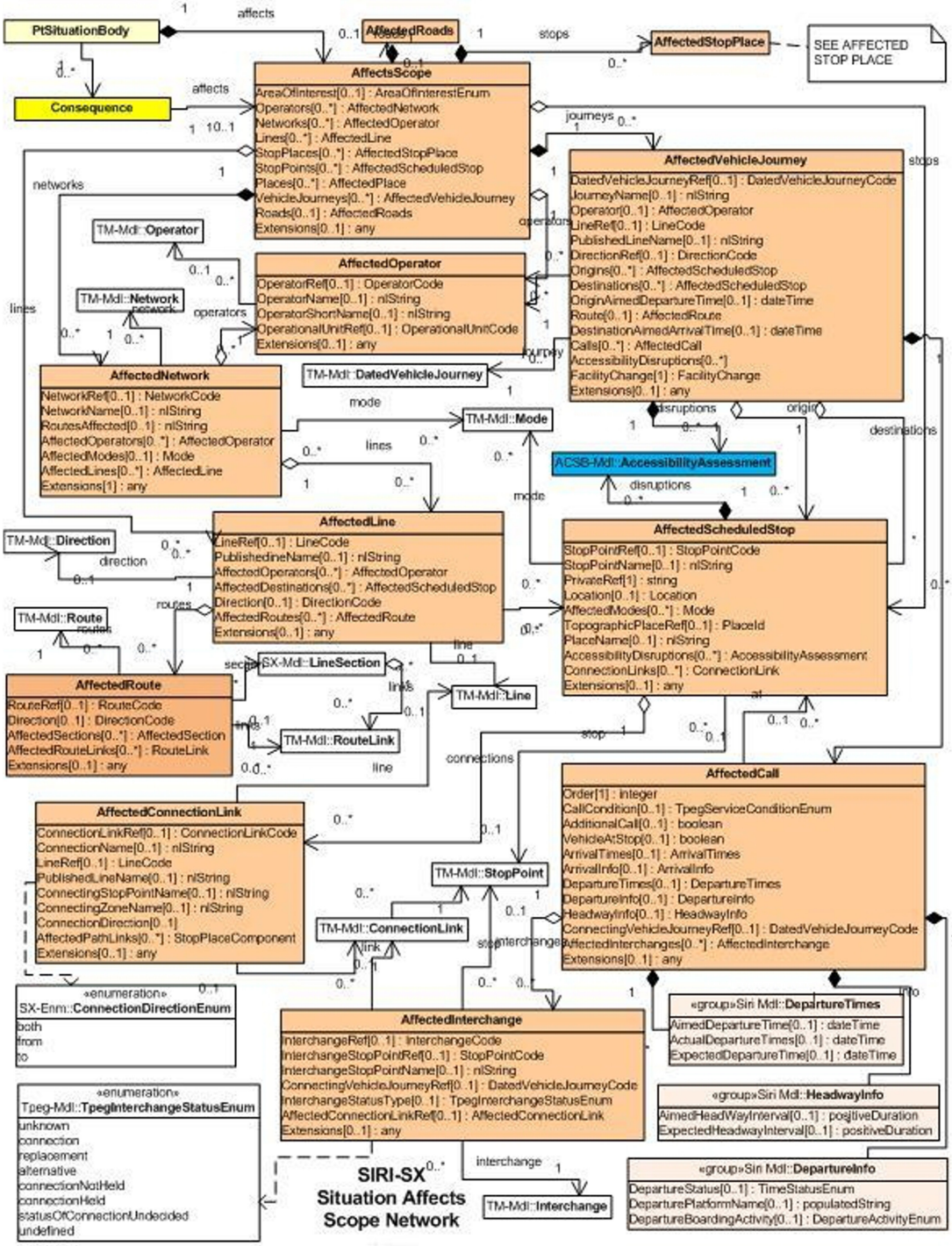


Figure 16 — UML Diagram of Situation AffectsScope: Scheduled Timetable Elements

6.2.6.3 AffectsScope for Vehicle

Figure 17 shows that part of the ***AffectsScope*** model that pertains to the VEHICLE elements. It can be used to indicate the scope of a SITUATION effecting a VEHICLE.

6.2.6.4 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

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particular QUAY, ACCESS AREA, BOARDING POSITION, ENTRANCE or EQUIPMENT PLACE, or PATH LINK between them. For further details see the TRANSMODEL 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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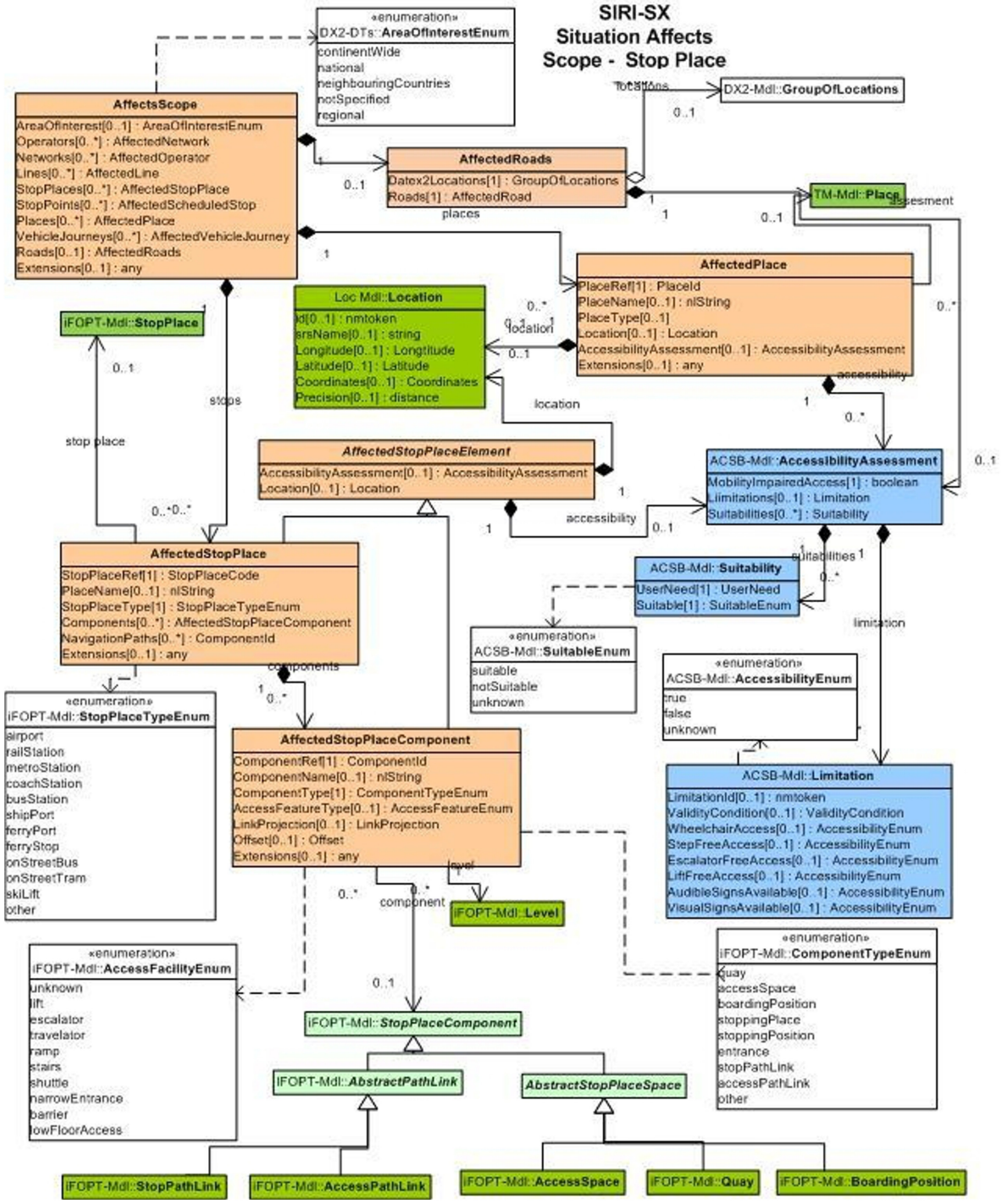


Figure 17 — UML Diagram of Situation AffectsScope: Stop Place and Suitability Elements

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

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— The ***RoadSituationBody*** 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. 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 TrafficElement. Note that a number of the generic SITUATION elements such as severity, status, probability, etc can be specified using either the TrafficElement, 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.

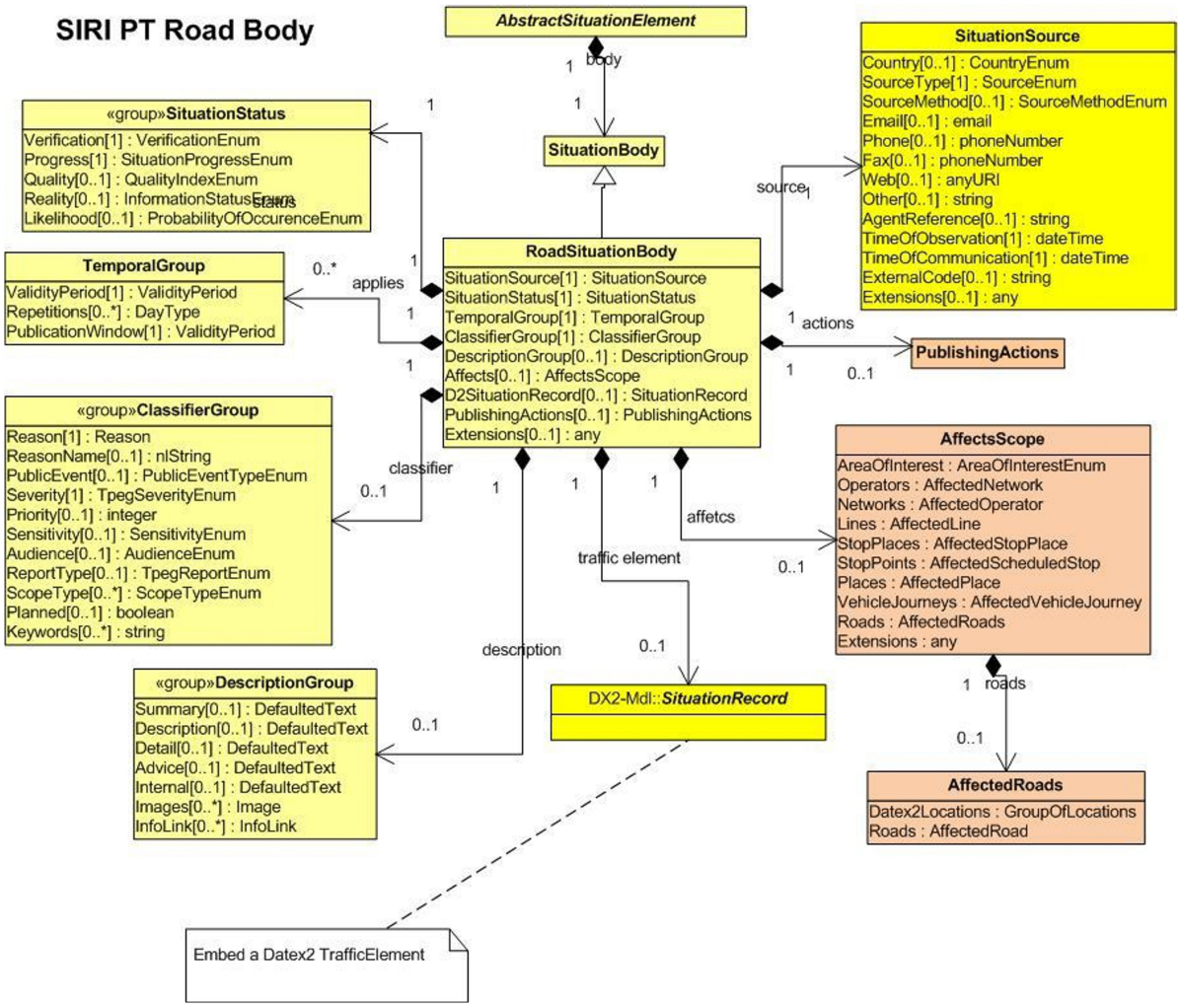


Figure 18 — UML Diagram of Overview of SIRI-SX Model for Roads

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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 public transport NETWORK VEHICLE JOURNEYs to be stated.

6.4 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*** (Figure 19).

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

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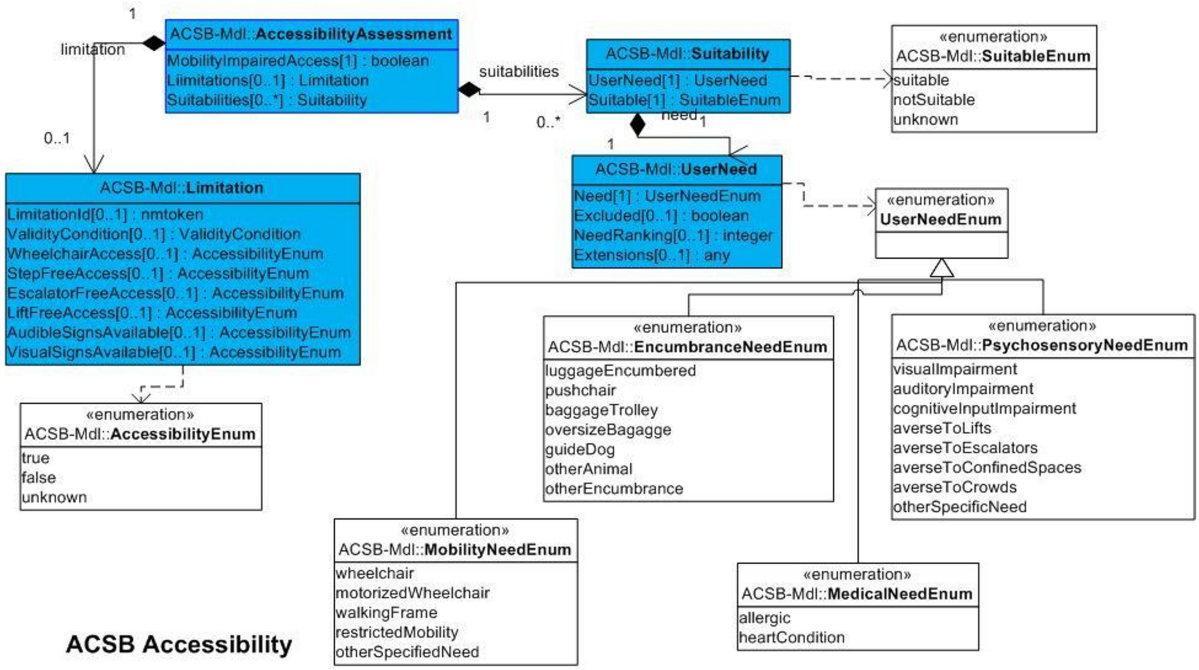


Figure 19 — UML Diagram of Common Accessibility Types

6.5 Publishing Actions

The ***PublishingActions*** (Figure 20) annotate the SITUATION with information to direct its distribution by dissemination systems. Each action type specifies use in a particular channel. The values are intended as guidance to filtering and consumer systems to drive automated rule driven processing of SITUATIONs for electronic dissemination.

The actions are grouped into three categories: demand channels, indicating that the data should be made available through the channels on demand:

— ***PublishToWebAction*** indicates that the SITUATION should be published on the web (other elements such the ***Audience*** and ***Sensitivity*** can be used to decide whether the SITUATION should be on private intranets only or on the public internet);

— ***PublishToMobileAction*** indicates that the SITUATION should be published on mobile delivery channels (other elements such the ***Audience*** and sensitivity can be used to decide whether the SITUATION should be on private mobile intranets only or the public mobile internet;

— ***PublishToTvAction*** indicates that the SITUATION should be published to broadcasting dissemination channels such as Teletext;

— ***PublishToDisplayAction*** indicates that the SITUATION should be published to in station and onboard displays channels;

— ***OtherPublishAction*** can be used for arbitrary dissemination channels.

The second group constitutes the push channels. For SITUATIONs that are published with push systems, additional information on the scheduling of messages to handle and clear the SITUATION can be specified. Thus for example, for a planned engineering works, a SITUATION could be tagged with a publication schedule that states that reminders should be sent at say three week, one week, one day intervals before the works start, and at the end of the of the works.

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SITUATIONs can also be tagged with information for individually targeted distribution. Each different type of channel may be tagged with different attributes.

— ***PublishToAlertsAction*** indicates that the SITUATION should be published on generic alert channels.

— ***NotifyByEmailAction*** indicates that the SITUATION should be published as an Email to a specific named user.

— ***NotifyBySmsAction*** indicates that the SITUATION should be published as an SMS to a specific named user.

— ***NotifyByPagerAction*** indicates that the SITUATION should be published as Pager message to a specific named user.

— ***NotifyUserAction*** indicates that the SITUATION should be published by some other means to a specific named user.

The third category constitutes publishing to a passenger perspective. End systems subscribe a specific perspective depending on how a passenger accesses information. Following perspectives may be provided:

— ***General*** indicates that the passenger can access this information everywhere. Information is not intended to be published only physically on a specific stop;

— ***StopPoint*** indicates that the passenger can only access this information when being physically on a specific stop point or when requesting information about a specific stop point;

— ***VehicleJourney*** indicates that the passenger can access this information inside a specific vehicle during a journey or when requesting information about a specific journey online.

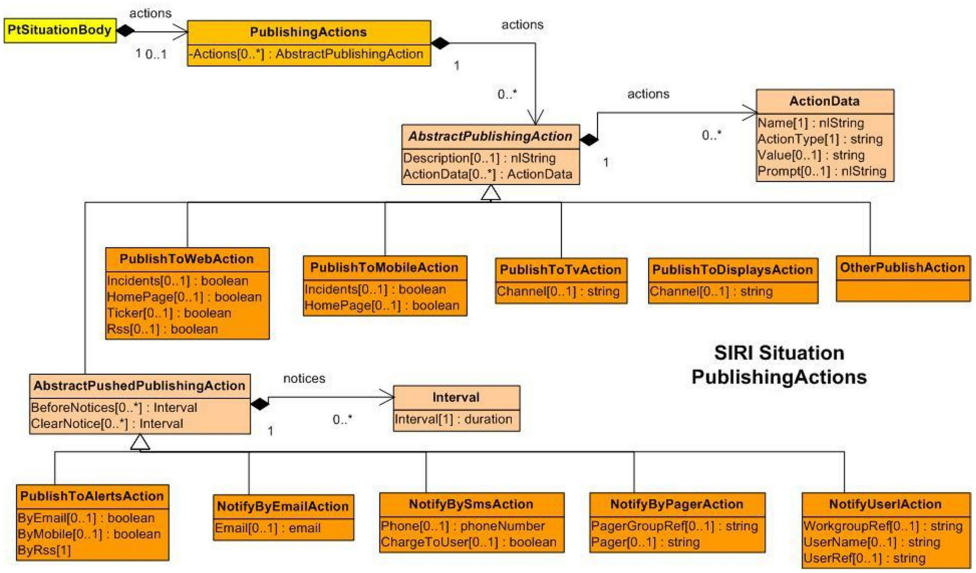


Figure 20 — UML Diagram of SIRI-SX Publishing Actions

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6.6 Common Types

6.6.1 Common SIRI Data Types

The SIRI-SX services use a number of common SIRI data types. The common SIRI data types are listed in Figure 21. ErrorTypes are common across SIRI and are described in Part 2.

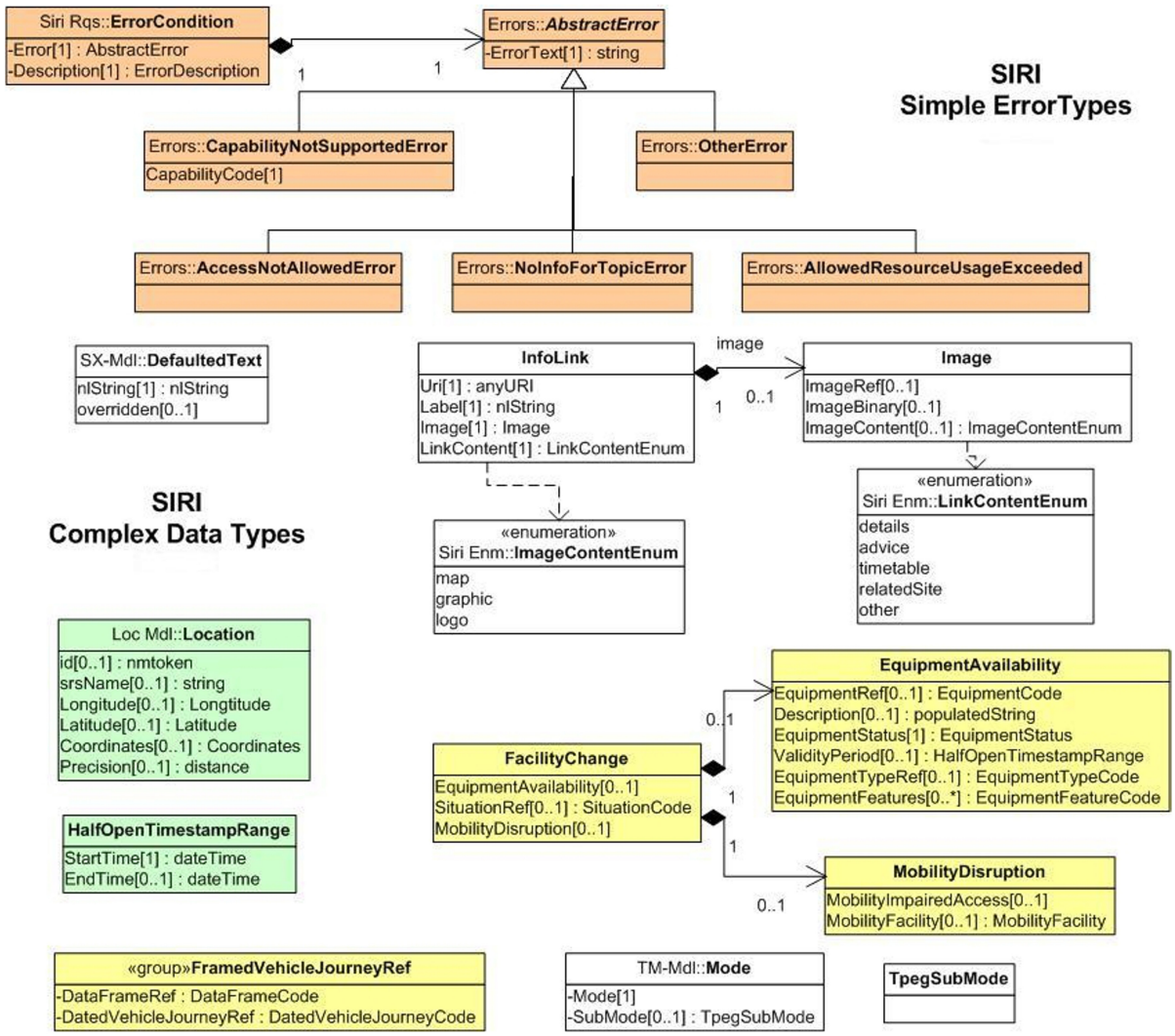


Figure 21 — UML Diagram of Common SIRI Data Types

6.6.2 Common General SIRI Enumerations

The SIRI-SX services use a number of common SIRI enumerations. The common SIRI enumerations are listed in Figure 22.

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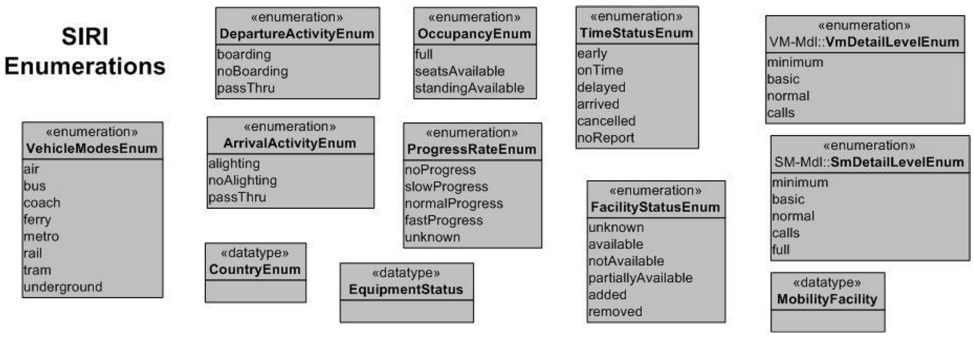


Figure 22 — UML Diagram of SIRI enumerations

6.6.3 SIRI-SX Enumerations

Figure 23 summaries the enumerations that are specific to SIRI-SX. These also appear in context on individual diagrams.

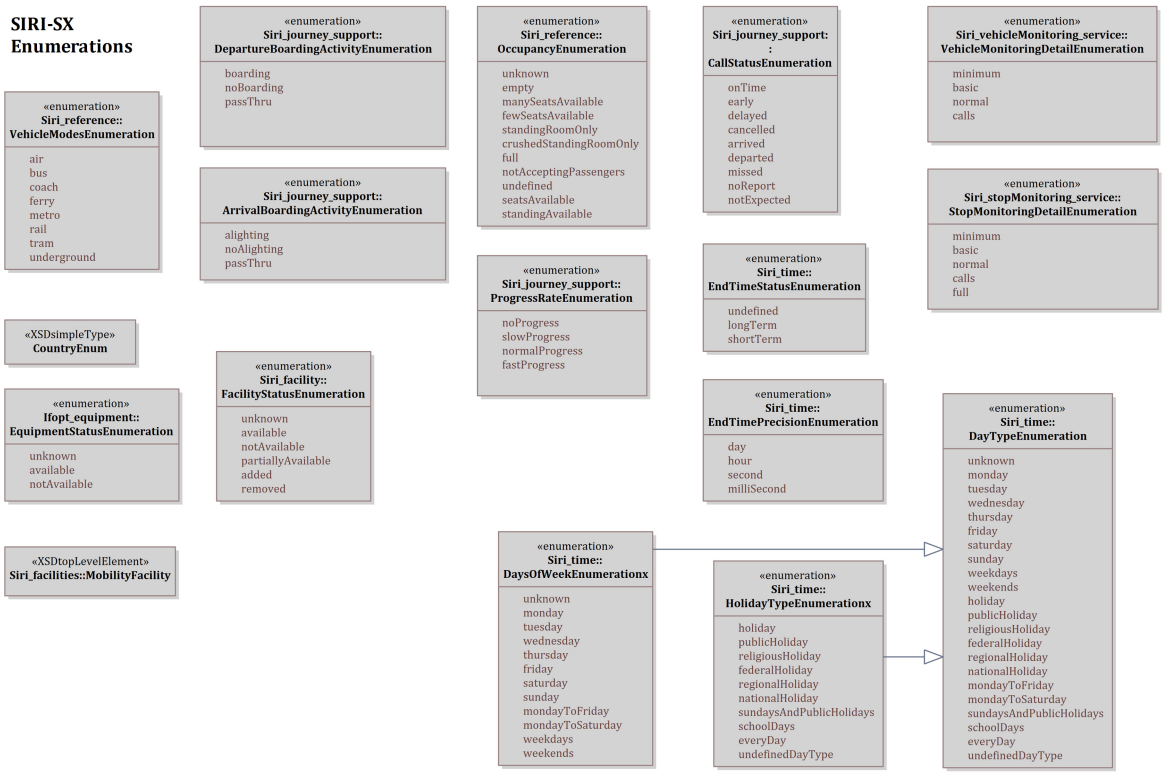


Figure 23 — UML Diagram of SIRI-SX Enumerations

6.6.4 TRANSMODEL Enumerations

Figure 24 summarizes the TRANSMODEL STOP PLACE enumerations that are used in SIRI-SX. These mostly also appear in context on individual UML diagrams.

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Figure 24 — UML Diagram of TRANSMODEL Stop Place Enumerations

6.6.5 TPEG Miscellaneous Enumerations

Figure 25 summarizes the miscellaneous TPEG enumerations that are used in SIRI-SX. These mostly also appear in context on individual UML diagrams.

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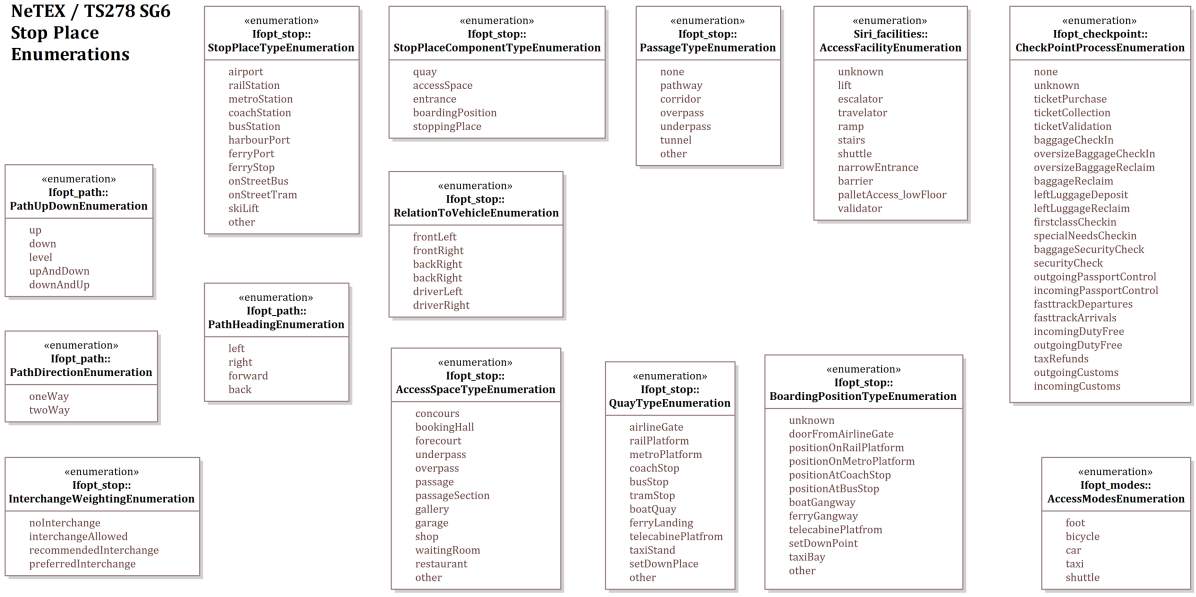


Figure 25 — UML Diagram of TPEG Enumerations

6.6.6 TPEG Mode Enumerations

Figure 26 summarizes the TPEG MODE enumerations that are used in SIRI-SX. These mostly also appear in context on individual UML diagrams.

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Figure 26 — UML Diagram of TPEG submodes

7 Situation Exchange Service [SX]

7.1 Purpose

The SIRI-SX Service is for exchanging SITUATION content in real-time. It uses a structured SITUATION model for describing disruptions to services that includes element references that relate directly to the Public Transport model entities used by other SIRI services. SITUATIONs can thus be directly linked to stops, LINEs, VEHICLE JOURNEYs, pathways, etc: and provide an explanation of the disruption. As a

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corollary, the entities of other information services may be referenced to provide further details about a SITUATION.

7.2 Description

The Situation Exchange Service comprises the ***SituationExchangeRequest*** message used to specify the contents of request or subscription messages, and the ***SituationExchangeDelivery*** message, used to deliver the response. The ***SituationExchangeSubscription*** message allows a subscriber to request asynchronous updates for the service: it contains an embedded ***SituationExchangeRequest***, along with further parameters controlling the asynchronous delivery.

SituationExchangeRequest has *topic* parameters to filter the information by OPERATOR, NETWORK, VEHICLE, LINE, and STOP POINT, etc, and *policy* parameters to control the amount of data returned.

The ***SituationExchangeDelivery*** returns information about one or more SITUATIONs and their associated status as one or more ***SituationElements***. Each ***SituationElement*** is made up of a number for structured parts including the source, temporal scope, a systematic classification, a layered text description, etc. See Clause 6. It also includes:

— the ***AffectsScope*** element provides a location model of the scope of the SITUATION. This can be stated in terms of the NETWORK, and / or particular LINEs, stations or VEHICLE JOURNEYs or points, this location is provided as a reference to a Transmodel object (STOP POINT, LINE, VEHICLE, etc.) or to an TRANSMODEL object;

— one or more ***Consequences***, describing the effect the SITUATION will have;

— the ***PublishingActions*** describe a suggest processing of the SITUATION, 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.

7.3 Reference Data

The ***SituationExchangeRequest*** requires the participants to have agreed data reference models for any Affect scope references that are used: LINEs, STOP POINTs, VEHICLE JOURNEYs, CONNECTION LINKs, INTERCHANGEs and VEHICLEs, STOP PLACEs, STOP PLACE COMPONENTs, etc. Not all elements need to be used.

7.4 Capability and Permission Matrices

7.4.1 Capability Matrix

The following set of required and optional capabilities is defined for the Situation Exchange service. If the service supports Capability Discovery the ***SituationExchangeCapabilitiesRequest*** / ***SituationExchangeCapabilitiesResponse*** message pair can be used to determine the implementation's capabilities.

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Table 2 — SituationExchangeServiceCapabilities Matrix
\siri_situationExchange_service.xsd

SituationExchangeServiceCapabilities				*+Structure*	Capabilities describing implementation of Situation Exchange service. (see this table)
inherit	*:::*		*0:1*	*See xxxCapability Response*	See SIRI Part 2 – 12.4 for Common Capability attributes.
Topic	***TopicFiltering***		0:1	*+Structure*	Which optional filtering features are supported? See next rows.
		DefaultPreviewInterval	**1:1**	*PositivedurationType*	Default preview interval. Default is 60 min.
		FilterByFacilityRef	0:1	*xsd:boolean*	Whether results can be filtered by FACILITY. Default is true
		FilterByLocationRef	0:1	*xsd:boolean*	Whether results can be filtered by LOCATION. Default is true
		FilterByVehicleRef	0:1	*xsd:boolean*	Whether results can be filtered by VEHICLE. Default is true
		FilterByMode	0:1	*xsd:boolean*	Whether results can be filtered by MODE. Default is true. (+SIRI v2.0)
		FilterByNetworkRef	0:1	*xsd:boolean*	Whether results can be filtered by NETWORK. Default is true
		FilterByLineRef	0:1	*xsd:boolean*	Whether results can be filtered by LINE and or DIRECTION. Default is true
		FilterByStopPointRef	0:1	*xsd:boolean*	Whether results can be filtered by STOP POINT. Default is true
		FilterByStopPlaceRef	0:1	*xsd:boolean*	Whether results can be filtered by StopPlace. Default is false. (+SIRI v2.0).
		FilterByVehicleJourneyRef	0:1	*xsd:boolean*	Whether results can be filtered by VEHICLE JOURNEY. Default is false.
		FilterByConnectionLinkRef	0:1	*xsd:boolean*	Whether results can be filtered by CONNECTION LINK. Default is false.
		FilterByInterchangeRef	0:1	*xsd:boolean*	Whether results can be filtered by INTERCHANGE Default is false.
		FilterBySpecificNeeds	0:1	*xsd:boolean*	Whether results can be filtered by Accessibility Needs. Default is true.
		FilterByKeyword	0:1	*xsd:boolean*	Whether results can be filtered by keyword. Default is false.
Request Policy	***RequestPolicy***		0:1	*+Structure*	Which features of ***RequestPolicy*** are supported by service?
		NationalLanguage	**1:***	*xsd:language*	National languages used by service.
		Translations	0:1	*xsd:boolean*	Whether the producer supports translations. SIRI 2.0 Default is false.
		Coordinates		*choice*	Location coordinate system for results.
		GmlCoordinateFormat	0:1	*SrSNameType*	Use GML format
		WgsDecimalDegrees	0:1	*EmptyType*	Default coordinate data system is WGS 84 latitude and longitude.
		HasMaximumNumberOfSituati	0:1	*xsd:boolean*	Whether Maximum number of SITUATIONs

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