SIRI 2.0-TfNSW SIRI Use Cases

Version 1.2.0

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Version History

Version	Author	Issued	Changes
1.0.0	PTMS Project Team	24/10/2019	Use the use cases sections from TfNSW SIRI specification 1.0.3 to create the document
1.0.1	PTMS Project Team	12/12/2019	Align SX XML example with updated XSD of Audience
1.1.0	PTMS Project Team	09/02/2021	Document structure altered. Use case structure altered. Removal of use cases not supported by current version of TfNSW SIRI specification or current broker implementation. Inclusion of more extensive sample XML files.
1.2.0	PTMS Project Team	30/07/2021	Addition of SIRI FM use-case. Minor edit of master data pre-requisite for Timetable use case.

Distribution List

Program	Group	Business Unit	Responsibility
PT Real-time Working Group	PT Real-time Working Group Members	TfNSW	Governance
Sydney Metro Project Team	Metro Product and Integration	Sydney Metro Delivery Office	Review and distribution to Project teams
Sydney CBD & South East Light Rail Project Team	Rail Systems	Sydney Light Rail Delivery Office	Review and distribution to Project teams
Newcastle Light Rail Project Team	Infrastructure & Services	Newcastle Transport Program	Review and distribution to Project teams
Parramatta Light Rail Project Team	Infrastructure & Services	Parramatta Light Rail Program	Review and distribution to Project teams
Sydney Trains		Sydney Trains	Review and distribution to Project teams
NSW TrainsLink		NSW TrainsLink	Review and distribution to Project teams
Sydney Ferries		Sydney Ferries	Review and distribution to Project teams

Table of Contents

Table of Figures

Table of Tables

1   Definitions, Acronyms and Abbreviations

Acronym / Term	Definition
CSELR	Sydney CBD and South East Light Rail
DO	Day-of-operation
LTT	Long-term time table
SIRI	Service Interface for Real Time Information is an JSON/xml protocol to allow distributed computers to exchange real time information about public transport services and vehicles as specified in the CEN technical specification.
SIRI ET	SIRI EstimatedTimetable service
SIRI FM	SIRI Facility Monitoring service
SIRI PT	SIRI Production Timetable service
SIRI SX	SIRI Situation Exchange service
SIRI VM	SIRI Vehicle Monitoring service
STT	Short-term time table
TXC	TransXChange

2 Introduction

2.1 Document Purpose

This document provides use cases and examples of implementing the SIRI protocol in compliance with TfNSW requirements to supply and interpret real time data to and from the TfNSW SIRI Message Broker.

Using the SIRI protocol will allow Operating Agencies and Private Operators of Automatic Vehicle Monitoring systems (AVMs) across all transport modes, and other data publishers / subscribers, to share consistent and accurate real time information throughout the TfNSW SIRI community and for customer information.

2.2 Intended Audience

The intended audience of this document are technical resources of TfNSW, Operating Agencies and Private Operators as well as System Integrators who will be responsible for the design and implementation of the AVM and scheduling systems. This includes:

- Data Architects for the accurate mapping of elements used in delivering the solution;
- Solution Designers for the detailed implementation framework of the AVM and scheduling systems;
- Developers for the configuration and delivery of the technical solution; and
- Testers for ensuring the solution meets the requirements of TfNSW as specified.

SIRI Use Cases have been defined to assist new TfNSW SIRI Community members in their understanding of SIRI data sets and guide consistent implementation.

The TfNSW SIRI Community is a business-to-business (B2B), not business-to-customer (B2C) interaction model. While the TfNSW SIRI Community will communicate customer facing data utilising the SIRI protocol, publication of real-time information to TfNSW Customers will be via the General Transit Feed Specification Real-Time (GTFS-R) protocol, via the TfNSW OpenData website, as well as other dedicated Application Programming Interfaces (APIs) targeting specific uses, such as feeding Transit Stop Display predictions at interconnection nodes.

This demarcation is chosen to enable a maximal uptake of third-party application developers within the transport community.

2.3 Assumed Knowledge

Readers responsible for implementing SIRI must be familiar with:

- Communication protocols
- Real-time public transport data
- Transmodel abstract relationship framework.
- TfNSW wayfinding and network terminology
- TfNSW TransXChange specification
- SIRI international standards
- TfNSW SIRI specification

2.4 Document Scope

This document provides use cases and examples of how to use SIRI within the TfNSW network.

2.5 Document References

The following table details the documents which provide supplementary information that is helpful in understanding this use case document.

Table 1 - Document References

Ref	Document Name	Network Location or Documentation Link
1	Transmodel CEN v6	CEN V6 http://transmodel-cen.eu/

2	SIRI standard specification	http://www.transmodel-cen.eu/standards/siri/ https://www.vdv.de/siri.aspx Additional information about standard SIRI is included in section "About SIRI Standard Specification"
3	TfNSW SIRI Implementation Specification	Available upon request.
4	TransXChange Schema Guide	http://naptan.dft.gov.uk/transxchange/schema/schemas.html Note: The TfNSW TransXChange Implementation Specification is based is v2.5.58.
6	TfNSW TXC Implementation Specification	TfNSW-TransXChange-Implementation-Specification v2.5.12.pdf
7	TfNSW SIRI sample XML	TfNSW-SIRI-XML Samples v1.2.0.zip

2.6 Security Classification

This document is unclassified.

2.7 Change Management

The TfNSW Operational Systems Public Transport (PT) Real-Time Working Group will continue using and maintaining this document once published. Where a change is necessary across Operating Agencies and Private Operators supplying SIRI messages to TfNSW, each impacted supplier will be engaged for change management.

2.8 Document Version

The file naming convention (e.g. 1.0.1) has three elements separated by full stops in the form:

<version>.<release>.<modification>

Element descriptions are given in the table below.

Table 2 - Document Versions

Element	Meaning
Version	A major planned revision to the specification
Release	An enhancement to the specification that is not compatible with the previous revision
Modification	An enhancement to the specification that is compatible with the previous revision. For example, the addition of an optional attribute to an element – existing files would pass validation against the revised schema definition, thus data providers would not need to modify their systems at the same time as receiving systems, unless they wished to make use of the new features.

3   Use case reference

The following table provides a listing of the sample XML files referred to in the use cases.

Table 3 – Sample XML references

Name	Description
txc-timetable.xml	A sample TXC document representing timetable and related operator information.
et-add-trip-final-message.xml	A sample final SIRI ET message sent (at completion of the journey) for an added trip.
et-add-trip-subsequent-message.xml	A sample SIRI ET messages sent after the initial message, for an added trip.
et-add-trip-subsequent-message-delay.xml	A sample SIRI ET messages sent after the initial message, for an added trip, in the case of a delay.
et-add-trip-trip-creation.xml	A sample SIRI ET message representing the addition of an unscheduled trip.
et-cancel-trip-after-commencement-final-message.xml	A sample final SIRI ET message sent for a trip cancelled after the trip has commenced.
et-cancel-trip-before-commencement.xml	A sample SIRI ET message sent when a trip is cancelled before the journey has commenced.
et-delayed-trip-during-trip.xml	A sample SIRI ET messages sent after the initial message, for a scheduled trip, in the case of a delay.
et-trip-change-path.xml	A sample SIRI ET message describing the change of path (or platform) for a journey.
et-trip-change-path-final-message.xml	A sample SIRI ET message sent after a change of path (or platform) for a journey.
et-trip-final-message.xml	A sample final SIRI ET message sent, at completion of a trip.
et-trip-preview-window.xml	A sample SIRI ET message sent at the commencement of the preview window for a trip.
sx-add-trip-incident-close.xml	A sample SIRI SX message that closes the incident representing the addition of an unscheduled trip.
sx-add-trip-incident-open.xml	A sample SIRI SX message signalling the addition of an unscheduled trip.
sx-cancel-trip-after-commencement.xml	A sample SIRI SX message signalling the cancellation of a trip, after the trip has commenced.
sx-cancel-trip-after-commencement-close.xml	A sample SIRI SX messages that closes the incident representing the cancellation of a trip (after the trip has commenced).
sx-cancel-trip-before-commencement.xml	A sample SIRI SX message signalling the cancellation of a trip, before the trip has commenced.
sx-cancel-trip-before-commencement-close.xml	A sample SIRI SX messages that closes the incident representing the cancellation of a trip (before the trip has commenced).
sx-delayed-trip-long-delay.xml	A sample SIRI SX message signalling a trip being subject to a long delay.
sx-delayed-trip-long-delay-close.xml	A sample SIRI SX messages that closes the incident representing a trip being subject to a long delay.
sx-planned-incident-close.xml	A sample SIRI SX message that closes the planned incident.

Reference material – for information only

sx-planned-incident-facilities.xml	A sample SIRI SX message that signals a planned facility-related incident.
sx-trip-change-path.xml	A sample SIRI SX message that signals a trip has been subject to a change of path (or platform).
sx-trip-change-path-close.xml	A sample SIRI SX message that closes the incident representing that a trip has been subject to a change of path (or platform).
sx-unplanned-incident-single-stop.xml	A sample SIRI SX message signalling that a single stop has been affected by an incident.
sx-unplanned-incident-single-stop-close.xml	A sample SIRI SX message that closes the affected stop incident.
sx-unplanned-incident-single-stop-subsequent.xml	A sample SIRI SX message updating the status of an incident affecting a single stop.
vm-cancel-trip-after-commencement-final-message.xml	A sample final SIRI VM message sent for a trip cancelled after commencement.
vm-trip-at-origin.xml	A sample initial SIRI VM message for a trip, sent before the trip has commenced.
vm-trip-completed.xml	A sample final SIRI VM message for a trip, sent when the trip has completed.
vm-trip-in-progress.xml	A sample SIRI VM message sent whilst a trip is in progress.
fm-facility-status-available.xml	A sample SIRI FM message sent whilst a facility is available
fm-facility-status-not-available.xml	A sample SIRI FM message sent whilst a facility is not available
sx-facility-status-not-available.xml	A sample SIRI SX message signalling that journey planning has been affected by the change of status of a facility.
sx-facility-status-available.xml	A sample SIRI SX message signalling closure of the incident that was raised in response to a change of status of a facility.

4 Use Cases: Timetable

4.1 Timetable submission

4.1.1 Definition

An Operator is submitting a long-term timetable. Operators can also submit short-term variation and changes using the same TXC structure; submission of short-term timetable variations and changes is also covered by this use case.

4.1.2 Pre-requisites

- Master Data to be available to participants.
- Access to Traffic Studio granted

4.1.3 Behaviour

4.1.3.1 TXC

4.1.3.1.1 TXC message submission sequence

1. A single TXC document file is uploaded using the Traffic Studio application.
   Refer sample *TXC.xml*.
2. The uploaded TXC timetable document is imported, then verified (manually) against the source scheduling system for accuracy, using the Traffic Studio application and the source scheduling system.
3. The uploaded TXC timetable document is deployed and queued for global import, using the Traffic Studio application.

4.1.3.1.2 Notes

None.

4.1.3.1.3 Variations

- **Long-term (base) timetable submission**
  Long-term timetable refers to the standard timetable an operator will submit and operate, and it is typically submitted frequently enough to maintain a minimum future view of timetabled services. Long term timetable submission requires only a single TXC document to be submitted.
- **Short-term timetable submission**
  The broker supports the insertion of a short-term timetable change into an existing long-term timetable. To achieve this, an existing (or new) long-term timetable document must be uploaded simultaneously with the document representing the short-term changes. Files presented simultaneously to Traffic Studio will be processed by Traffic Studio in order of the file modified date. A TXC document representing a short-term timetable change (to a long-term timetable TXC document) must therefore be presented with a later file modified date. The following diagram illustrates how the order of the file modified date affects how the timetable documents will be interpreted.
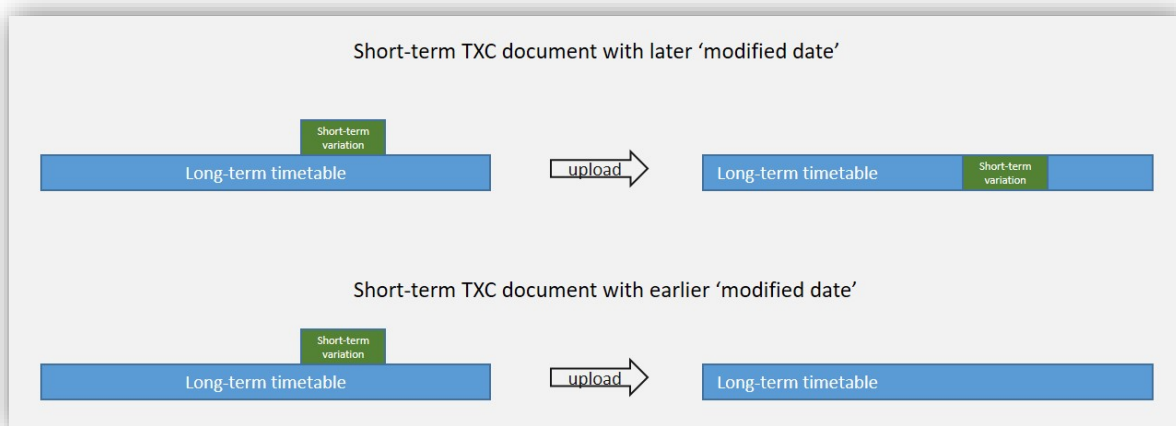

Figure 1 - Use of 'modified date' with long and short-term timetable submission

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5   Use cases: Service operation

5.1   Real time information available and trip on-time

5.1.1   Definition

A vehicle is doing a scheduled trip, as per schedule, i.e. the vehicle is on time. There is no current delay and no delay is expected for the remaining stops.

5.1.2   Pre-requisites

1. A scheduled timetable has been made available via TXC.
2. The scheduled timetable for current day-of-operation has been made available to the real-time system.

5.1.3   Behaviour

5.1.3.1   SIRI ET

5.1.3.1.1   Sequence of SIRI messages

1. The first SIRI ET message is sent by the operator on the commencement of the preview interval window.
   Refer sample *et-trip-preview-window.xml*.
2. No further SIRI ET messages are sent until trip completion.
3. A final ET messages is sent by the operator at the completion of the trip.
   Refer sample *et-trip-final-message.xml*.

5.1.3.1.2   Notes

- When real-time information becomes available, the first ET message is sent at the beginning of the preview interval. This can happen before or at the actual departure time of the journey.
- In the case of a normal running trip, the producer has to send ET at the first stop and last stops only. Further messages would be sent (and relevant) only if there was a delay.
- The final ET message is sent at trip completion, and contains actual passing times in *RecordedCalls* for all stops in the sequence.

5.1.3.1.3   Variations

None.

5.1.3.2   SIRI VM

5.1.3.2.1   Sequence of SIRI messages

1. The first SIRI VM message is sent at origin, when the vehicle is ready to commence the journey.
   Refer sample *vm-trip-at-origin.xml*.
2. When the vehicle is en-route, SIRI VM messages are sent periodically, at the defined interval, until trip completion.
   Refer sample *vm-trip-in-progress.xml*
3. When the vehicle reaches the destination, a SIRI VM message is sent representing the completion of the trip.
   Refer sample *vm-trip-completed.xml*.

5.1.3.2.2   Notes

None.

5.1.3.2.3   Variations

None.

5.2 Delay and early running trips

5.2.1 Definition

A real-time enabled trip, running on the stop sequence provided with scheduled data, is delayed or is running early. The cause of the delay (or early-running) is unspecified in this use case.

5.2.2 Pre-requisites

1. A scheduled timetable has been made available via TXC.
2. The scheduled timetable for current day-of-operation has been made available to the real-time system.

5.2.3 Behaviour

5.2.3.1 SIRI ET

5.2.3.1.1 Sequence of messages

1. The first SIRI ET message is sent by the operator on the commencement of the preview interval window.
   Refer sample *et-trip-preview-window.xml*.
2. A SIRI ET message will be sent every time the change in predicted arrival or departure time, of any stop on the journey, is larger than the defined hysteresis value.
   Refer sample *et-delayed-trip-during-trip.xml*.
3. A final ET messages is sent by the operator at the completion of the trip.
   Refer sample *et-trip-final-message.xml*.

5.2.3.1.2 Notes

- When real-time information becomes available, the first ET message is sent at the beginning of the preview interval. This can happen before or at the actual departure time of the journey.
- The final ET message is sent at trip completion, and contains actual passing times in *RecordedCalls* for all stops in the sequence.
- This ET message would have the same structure whether describing an early or a delayed trip. In the case of an early trip the *ExpectedArrivalTime* would carry a smaller value then *AimedArrivalTime*; for a delayed trip this would be reversed.

5.2.3.1.3 Variations

- **Delay/Early-running prior to preview window**
  In this case, the delay/early-running is communicated on the first ET message at the commencement of the preview window (assuming the delay is still expected when the preview window arrives).
- **Delay/Early-running within preview window, but before trip has commenced**
  In this case, a SIRI ET message will be sent every time the predicted arrival or departure time of any stop on the journey is larger than the defined hysteresis value.
- **Delay/Early-running within preview window, whilst journey in progress**
  In this case, a SIRI ET message will be sent every time the predicted arrival or departure time of any future stop on the journey is larger than the defined hysteresis value.
- **Long delay**
  If delay exceeds the defined value for long delay, an incident is required to also be reported with a SIRI SX message.

5.2.3.2 SIRI VM

5.2.3.2.1 Sequence of SIRI messages

1. The first SIRI VM message is sent at origin, when the vehicle is ready to commence the journey.
   Refer sample *vm-trip-at-origin.xml*.
2. When the vehicle is en-route, SIRI VM messages are sent periodically at the defined interval, until trip completion.
   Refer sample *vm-trip-in-progress.xml*
3. When the vehicle reaches the destination, a SIRI VM message is sent representing the completion of the trip.
   Refer sample *vm-trip-completed.xml*.

5.2.3.2.2 Notes

- An early trip is expressed as a negative delay, a negative sign is added to the value in the element *Delay*.

5.2.3.2.3   Variations

None.

5.2.3.3   SIRI SX

5.2.3.3.1   Sequence of SIRI messages

1. A SIRI SX message is created when the vehicle becomes delayed by more than the defined interval.
   Refer sample **sx-delayed-trip-long-delay.xml**.
2. A SIRI SX message should also be sent at the end of the day-of-operation, representing the closing of the (long delay) situation.
   Refer sample **sx-delayed-trip-long-delay-close.xml**

5.2.3.3.2   Notes

- The long delay is calculated by the prediction engine on the AVLS system.
- A long delay SIRI SX message should transmit the value **transportOperator** in the element *Audience*.

5.2.3.3.3   Variations

None.

6 Use cases: Service variation

6.1 Added trip

6.1.1 Definition

A new unscheduled trip is being added by the operator, to run an existing route.

6.1.2 Pre-requisites

1. The definition of the route has previously been supplied as part of the scheduled timetable (the trip itself has not been supplied).

6.1.3 Behaviour

6.1.3.1 SIRI ET

6.1.3.1.1 Sequence of messages

1. The first SIRI ET message is sent by the operator as soon as the added trip is created on the AVLS system.
   Refer sample **et-add-trip-trip-creation.xml**.
2. The next SIRI ET message is sent by the operator on the commencement of the preview interval window.
   Refer sample **et-add-trip-subsequent-message.xml**.
3. A SIRI ET message will be sent every time the change in predicted arrival or departure time, of any stop on the journey, is larger than the defined hysteresis value.
   Refer sample **et-add-trip-subsequent-message-delay.xml**.
4. A final ET messages is sent by the operator at the completion of the trip.
   Refer sample **et-trip-final-message.xml**.

6.1.3.1.2 Notes

- If the trip is created within the preview interval window the first two messages in the sequence will still be sent, one to signal trip creation, and one to signal real-time update commencement.
- The first SIRI ET message on creation of an added trip, must contain the complete stop sequence.
- For an added trip all SIRI ET messages must contain the attribute *ExtraJourney* with value **true**.
- The final ET message is sent at trip completion, and contains actual passing times in *RecordedCalls* for all stops in the sequence.

6.1.3.1.3 Variations

None.

6.1.3.2 SIRI VM

6.1.3.2.1 Sequence of SIRI messages

1. The first SIRI VM message is sent at origin, when the vehicle is ready to commence the journey.
   Refer sample *vm-trip-at-origin.xml*.
2. When the vehicle is en-route, SIRI VM messages are sent periodically at the defined interval, until trip completion.
   Refer sample *vm-trip-in-progress.xml*
3. When the vehicle reaches the destination, a SIRI VM message is sent representing the completion of the trip.
   Refer sample *vm-trip-completed.xml*.

6.1.3.2.2 Notes

None.

6.1.3.2.3 Variations

None.

6.1.3.3 SIRI SX

6.1.3.3.1 Sequence of SIRI messages

1. A SIRI SX message is created at the same time the first SIRI ET message is created, and will be sent sequentially (immediately) after the first SIRI ET message.
   Refer sample *sx-add-trip-incident-open.xml*.
2. A SIRI SX message should also be sent at the end of the day-of-operation, representing the closing of the (added trip) situation.
   Refer sample *sx-add-trip-incident-close.xml*.

6.1.3.3.2   Notes

- The initial SIRI SX message that signals the added trip, should contain the situation validity period, represented by start and end times in the *PtSituationElement* element, the end time should be the end of the current day-of-operation.
- The sending of the SIRI SX message representing the closing of the situation, could be initiated manually by a human operator or automatically by the AVLS system.

6.1.3.3.3   Variations

None.

6.2   Cancellation of a trip, before trip has commenced

6.2.1   Definition

A scheduled trip that has not yet commenced is being cancelled by the operator.

6.2.2   Pre-requisites

1. A scheduled timetable has been made available via TXC.
2. The scheduled timetable for current day-of-operation has been made available to the real-time system.

6.2.3   Behaviour

6.2.3.1   SIRI ET

6.2.3.1.1   *Sequence of messages*

1. A single SIRI ET message is sent by the operator as soon as the trip has been cancelled on the AVLS system.
Refer sample *et-cancel-trip-before-commencement.xml*.

6.2.3.1.2   *Notes*

- The SIRI ET messages sent to represent the cancellation of the trip must have the value **true** in the element *Cancellation*.

6.2.3.1.3   *Variations*

None.

6.2.3.2   SIRI SX

6.2.3.2.1   *Sequence of SIRI messages*

1. A SIRI SX message is created at the same time the SIRI ET cancellation message is created, and will be sent sequentially (immediately) after the SIRI ET message.
Refer sample *sx-cancel-trip-before-commencement.xml*.
2. A SIRI SX message should also be sent at the end of the day-of-operation, representing the closing of the (cancel trip) situation.
Refer sample *sx-cancel-trip-before-commencement-close.xml*.

6.2.3.2.2   *Notes*

- The SIRI SX message that signals the cancelled trip, should contain the situation validity period, represented by start and end times in the *PtSituationElement* element, the end time should be the end of the current day-of-operation.
- The sending of the SIRI SX message representing the closing of the situation, could be initiated manually by a human operator or automatically by the AVLS system.

6.2.3.2.3   *Variations*

None.

6.3 Cancellation of a trip, after trip has commenced

6.3.1 Definition

A scheduled trip that has commenced is being cancelled by the operator.

6.3.2 Pre-requisites

1. A scheduled timetable has been made available via TXC.
2. The scheduled timetable for current day-of-operation has been made available to the real-time system.

6.3.3 Behaviour

6.3.3.1 SIRI ET

6.3.3.1.1 Sequence of SIRI messages

1. The first SIRI ET message is sent by the operator on the commencement of the preview interval window.
   Refer sample *et-trip-preview-window.xml*.
2. A SIRI ET message will be sent every time the change in predicted arrival or departure time, of any stop on the journey, is larger than the defined hysteresis value.
   Refer sample *et-delayed-trip-during-trip.xml*.
3. A final SIRI ET message is sent by the operator as soon as the trip has been cancelled on the AVLS system.
   Refer sample *et-cancel-trip-after-commencement-final-message.xml*.

6.3.3.1.2 Notes

- The final SIRI ET message will include a complete stop sequence.
- Stops which have been passed at time of cancellation will include actual passing times in *RecordedCalls.*
- Stops which have not been passed at time of cancellation will include estimated passing times in *EstimatedCalls*, and will also carry the value **true** in element *Cancellation* (for each of these *EstimatedCalls*).
- In this case the trip was partially completed. The trip is not represented as cancelled, instead the stops that have not been passed (due to the cancellation) are represented as cancelled.

6.3.3.1.3 Variations

None.

6.3.3.2 SIRI VM

6.3.3.2.1 Sequence of SIRI messages

1. The first SIRI VM message is sent at origin, when the vehicle is ready to commence the journey.
   Refer sample *vm-trip-at-origin.xml*.
2. When the vehicle is en-route, SIRI VM messages are sent periodically at the defined interval, until trip completion.
   Refer sample *vm-trip-in-progress.xml*
3. When the trip is cancelled, a SIRI VM message is sent representing the cancellation of the trip.
   Refer sample *vm-cancel-trip-after-commencement-final-message.xml*.

6.3.3.2.2 Notes

- The final SIRI VM message representing the completion of the trip should contain the value **cancelled** in the element *VehicleStatus*.

6.3.3.2.3 Variations

None.

6.3.3.3 SIRI SX

6.3.3.3.1 Sequence of messages

1. A SIRI SX message is created at the same time the SIRI ET cancellation message is created, and will be sent sequentially (immediately) after the SIRI ET message.
Refer *sx-cancel-trip-after-commencement.xml*.

2. A SIRI SX message should also be sent at the end of the day-of-operation, representing the closing of the (cancel trip) situation.
Refer *sx-cancel-trip-after-commencement-close.xml*.

6.3.3.3.2   Notes

- The SIRI SX message that signals the cancelled trip, should contain the situation validity period, represented by start and end times in the *PtSituationElement* element, the end time should be the end of the current day-of-operation.
- The sending of the SIRI SX message representing the closing of the situation, could be initiated manually by a human operator or automatically by the AVLS system.
- The SIRI SX messages shall only contain *AffectedStopPoint*s for stops that had not yet been passed when the trip was cancelled, i.e. the same stop points that are contained as *EstimatedCalls* in the SIRI ET message.

6.3.3.3.3   Variations

None.

6.4 Path change

6.4.1 Definition

The path of a scheduled or added trip is changed in one of the following ways:

- Additional stop(s)
- Cancellation of stop(s)
- Change of stop (addition plus cancellation of stops)
- Platform change

Note, these variations exclude changes to an underlying route-path, which would have to be described by altered timetable information.

6.4.2 Pre-requisites

1. A scheduled timetable has been made available via TXC.
2. The scheduled timetable for current day-of-operation has been made available to the real-time system.

6.4.3 Behaviour

6.4.3.1 SIRI ET

6.4.3.1.1 *Sequence of messages*

1. The first SIRI ET message is sent by the operator on the commencement of the preview interval window.
   Refer sample *et-trip-preview-window.xml*.
2. A SIRI ET message will be sent every time the change in predicted arrival or departure time, of any stop on the journey, is larger than the defined hysteresis value.
   Refer sample *et-delayed-trip-during-trip.xml*.
3. A SIRI ET message will be sent every time a change in path is made.
   Refer sample *et-trip-change-path.xml*.
4. A final ET messages is sent by the operator at the completion of the trip.
   Refer sample *et-trip-change-path-final-message.xml*.

6.4.3.1.2 *Notes*

- If the trip path is changed before the commencement of the preview interval, it is not necessary to communicate the change until the commencement of the preview interval.
- If the trip path is changed after the commencement of the preview interval, or during the trip, a SIRI ET message communicating the change should be sent immediately.
- A path change is fundamentally represented as cancellation of stops and/or addition of stops. Regardless of how many times a path is changed the SIRI ET message must always contain all the stops from the original trip, whether they have been cancelled or not.
- The final ET message is sent at trip completion, and contains actual passing times in *RecordedCalls* for all stops in the sequence.

6.4.3.1.3 *Notes*

6.4.3.1.4 *Variations*

None.

6.4.3.2 SIRI VM

6.4.3.2.1 *Sequence of SIRI messages*

1. The first SIRI VM message is sent at origin, when the vehicle is ready to commence the journey.
   Refer sample *vm-trip-at-origin.xml*.
2. When the vehicle is en-route, SIRI VM messages are sent periodically at the defined interval, until trip completion.
   Refer sample *vm-trip-in-progress.xml*
3. When the vehicle reaches the destination, a SIRI VM message is sent representing the completion of the trip.
   Refer sample *vm-trip-completed.xml*.

Reference material – for information only

- The SIRI VM messages that are sent following the stop-point changes, should follow the changed path.

6.4.3.2.3   Variations

None.

6.4.3.3   SIRI SX

6.4.3.3.1   Sequence of messages

1. A SIRI SX message is created at the same time the SIRI ET change-path message is created, and will be sent sequentially (immediately) after the SIRI ET message.
    Refer sample *sx-trip-change-path.xml*.
2. A SIRI SX message should also be sent at the end of the day-of-operation, representing the closing of the (change path) situation.
    Refer sample *sx-trip-change-path-close.xml.*

6.4.3.3.2   Notes

None.

6.4.3.3.3   Variations

None.

6.5 Degraded service

6.5.1 Definition

Due to disruption, services have diverged sufficiently from planned schedules that they must temporarily run as frequency-based services. When the disruption is resolved, vehicle operation according to scheduled timetable is resumed.

6.5.2 Pre-requisites

1. A scheduled timetable has been made available via TXC.
2. The scheduled timetable for current day-of-operation has been made available to the real-time system.

6.5.3 Behaviour

6.5.3.1 SIRI ET

6.5.3.1.1 Sequence of messages

1. The first SIRI ET message is sent by the operator on the commencement of the preview interval window.
   Refer sample *et-trip-preview-window.xml*.
2. A SIRI ET message will be sent every time the change in predicted arrival or departure time, of any stop on the journey, is larger than the defined hysteresis value.
   Refer sample *et-delayed-trip-during-trip.xml*.
3. When entering degraded mode, the following messages are sent for each affected vehicle:
   a. SIRI ET message cancelling the currently running timetabled trip.
      Refer sample *et-cancel-trip-after-commencement-final-message.xml*.
   b. SIRI ET messages cancelling any timetabled trip that was planned to run in the look-ahead window.
      Refer sample *et-cancel-trip-before-commencement.xml*.
   c. SIRI ET add-trip message for the frequency-based trip that will complete the remaining part of the cancelled timetabled trip.
      Refer sample *et-add-trip-trip-creation.xml*.
   d. SIRI ET add-trip messages for the frequency-based trips that will replace the cancelled timetabled trips for the configured look-ahead window.
      Refer sample *et-add-trip-trip-creation.xml*.
4. When exiting degraded mode, and returning to timetabled service, the following messages are sent for each affected vehicle:
   a. SIRI ET message to cancel the currently running frequency-based trip.
      Refer sample *et-cancel-trip-after-commencement-final-message.xml*.
   b. SIRI ET add-trip message for the trip that will complete the remaining part of the cancelled (frequency-based) trip.
      Refer sample *et-add-trip-trip-creation.xml*.
   c. SIRI ET add-trip messages for the original timetabled trips that were cancelled and are now being reinstated. This only relates to trips that are in the look-ahead window.
      Refer sample *et-add-trip-trip-creation.xml*.
5. A final ET messages is sent by the operator at the completion of the trip.
   Refer sample *et-trip-final-message.xml*.

6.5.3.1.2 Notes

- Whilst the service remains in frequency-based mode, the messages described in the sequence above, shall continue to be sent for the configured look-ahead window.
- The contents of the sent SIRI ET, VM and SX messages will differ slightly, depending on whether a vehicle is 'at a stop' or 'between stops' when entering degraded mode, as follows:
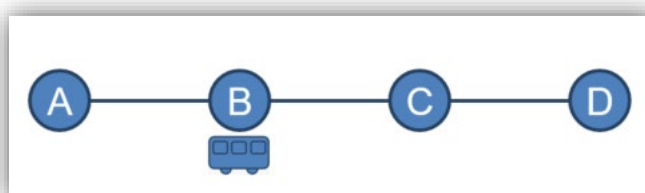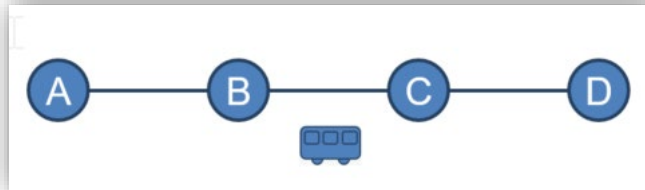   a. Degraded mode, entered at stop

Figure 2 - Vehicle enters degraded mode 'at stop'

i. Cancelled trip
- SIRI ET, cancelled stops, C D
- SIRI SX, affected stops, C D
- SIRI ET, final message, recorded calls, A B
- SIRI VM, final message, monitored stops, B (status=Cancelled)

ii. Added trip
- SIRI ET, added stops, B C D
- SIRI SX, affected stops, B C D
- SIRI ET, final message, recorded calls, B C D
- SIRI, first message, monitored stops, B (status=AtOrigin)

b. Degraded mode, entered between stops

Figure 3 - Vehicle enters degraded mode 'between stops'

iii. Cancelled trip
- SIRI ET, cancelled stops, C D
- SIRI SX, affected stops, C D
- SIRI ET, final message, recorded calls, A B
- SIRI VM, final message, monitored stops, B (status=Cancelled)

iv. Added trip
- SIRI ET, added stops, B C D
- SIRI SX, affected stops, B C D
- SIRI ET, final message, recorded calls, B C D
- SIRI, first message, monitored stops, B (status=InProgress)

6.5.3.1.3   Variations

None.

6.5.3.2   SIRI VM

6.5.3.2.1   Sequence of SIRI messages

1. The first SIRI VM message is sent at origin, when the vehicle is ready to commence the journey.
   Refer sample *vm-trip-at-origin.xml*.
2. When the vehicle is en-route, SIRI VM messages are sent periodically (until trip completion) at the defined interval.
   Refer sample *vm-trip-in-progress.xml*
3. When the trip is cancelled, a SIRI VM message is sent representing the cancellation of the trip.
   Refer sample *vm-cancel-trip-after-commencement-final-message.xml*.
4. When the vehicle reaches the destination, a SIRI VM message is sent representing the completion of the trip.
   Refer sample *vm-trip-completed.xml*.

6.5.3.2.2   Notes

None.

6.5.3.2.3   Variations

None.

6.5.3.3   SIRI SX

6.5.3.3.1   Sequence of SIRI messages

1. When entering degraded mode, the following messages are sent for each affected vehicle:
    a. SIRI SX message cancelling the currently running timetabled trip.
    b. SIRI SX messages cancelling any timetabled trip that was planned to run in the look-ahead window.
    c. SIRI SX message for the frequency-based trip that will complete the remaining part of the cancelled timetabled trip.
    d. SIRI SX messages for the frequency-based trips that will replace the cancelled timetabled trips for the configured look-ahead window.

   For the above SIRI SX add and cancel trip messages, refer to the specific add and cancel trip use cases samples.

2. When exiting degraded mode, and returning to timetabled service, the following messages are sent for each affected vehicle:
    a. SIRI SX message to cancel the currently running frequency-based trip.
    b. SIRI SX message for the trip that will complete the remaining part of the cancelled (frequency-based) trip.
    c. SIRI SX messages for the original timetabled trips that were cancelled and are now being reinstated. This only relates to trips that are in the look-ahead window.

   For the above SIRI SX add and cancel trip messages, refer to the specific add and cancel trip use cases samples.

6.5.3.3.2   Notes

None.

6.5.3.3.3   Variations

None.

7 Use cases: Disruption management

7.1 Unplanned Incident

7.1.1 Definition

An incident, which was unforeseen, has impacted the normal operation of a service (or services). The impact has been deemed to be sufficient to warrant notification to customers, other operators, and relevant operations management centres (e.g. the TMC).

In the event of an incident, a notification will be sent by an Incident Management System (IMS). The IMS may be an independent system, or a component of an AVLS.

The messages sent as part of this use case do not represent a mechanism for managing incidents ('incident response'), they are intended only to provide status and relevant information regarding the incident.

This business use case includes many possible scenarios, catering for (but not limited to) the following:

- Problems at a stop place affecting some or all journeys, for some or all modes
- Problems affecting a whole line or a section of a line between two stop places
- Problems affecting an interchange
- Problems affecting a whole network
- Degradation of normal travel experience (e.g. crowding);
- Problems affecting particular classes of users, e.g. those with impaired mobility

7.1.2 Pre-requisites

1. A scheduled timetable has been made available via TXC.
2. The scheduled timetable for current day-of-operation has been made available to the real-time system.

7.1.3 Behaviour

7.1.3.1 SIRI SX

7.1.3.1.1 Sequence of messages
1. A SIRI SX message is created and sent as soon as the unplanned incident is known.
   Refer sample **sx-unplanned-incident-single-stop.xml**.
2. A SIRI SX message is sent when the status of the incident changes, and further relevant information is available.
   Refer sample **sx-unplanned-incident-single-stop-subsequent.xml**.
3. A final SIRI SX message should be sent to represent closure of the incident.
   Refer sample **sx-unplanned-incident-single-stop-close.xml**.

7.1.3.1.2 Notes
- An initial SIRI SX message should be sent with value in *Version* element set to **1**. As subsequent messages are sent that relate to the same incident, the *Version* element should each time be incremented by 1, including for final incident update.
- The *EndTime* element under *PublicationWindow* and *ValidityPeriod* may be unknown at the time of incident creation, but will be known for the final message.

7.1.3.1.3 Variations
None.

7.2 UC 10: Planned Incident

7.2.1 Definition

A planned incident or event, is planned to impact the normal operation of services, and it is required to inform customers, other operators, and/or relevant operations management centres (e.g. the TMC).

In the event of a planned event, a notification will be sent by an Incident Management System (IMS). The IMS may be an independent system, or a component of an AVLS.

The messages sent as part of this use case do not represent a mechanism for managing incidents ('incident response'), they are intended only to provide status and relevant information regarding the incident.

This business use case includes many possible scenarios, catering for (but not limited to) the following:

- Track work
- Large public events, e.g. VIVID
- Electrical maintenance
- Road works
- Station or vehicle upgrades
- Systems change management

7.2.2 Pre-requisites

1. A scheduled timetable has been made available via TXC.
2. The scheduled timetable for current day-of-operation has been made available to the real-time system.

7.2.3 Behaviour

7.2.3.1 SIRI SX

7.2.3.1.1 *Sequence of messages*
1. A SIRI SX message is created and sent as soon as the unplanned incident is known.
   Refer sample *sx-planned-incident.xml*.
2. A SIRI SX message is sent when the status of the incident changes, and further relevant information is available.
3. A final SIRI SX message should be sent to represent closure of the incident.
   Refer sample *sx-planned-incident-close.xml.*

7.2.3.1.2 *Notes*
- An initial SIRI SX message should be sent with value in *Version* element set to **1**. As subsequent messages are sent that relate to the same incident, the *Version* element should each time be incremented by 1, including for final incident update.
- The *EndTime* element under *PublicationWindow* and *ValidityPeriod* will be known at the time of incident creation and should be provided.

7.2.3.1.3 *Variations*
None.

8 Use cases: Facility Monitoring

8.1 Facility Monitoring Status

8.1.1 Definition

The Facility Monitoring Service provides information about the availability of a facility (or a group of facilities) and the potential impact on accessibility.

In order for data to be created, the facility will have been monitored in some way; either automatically using a sensor system, or manually through regular control visits.

The Facility Monitoring Service can be used to monitor the status of facilities, and inform travellers about the availability of facilities during their journey; this may be of particular relevance for mobility restricted customers.

The facilities may be located on any place along a journey, for example at a Stop Point, a Stop Place, or on a Vehicle.

This business use case includes many possible scenarios, catering for (but not limited to) the following:

- Facility monitoring status is available.
- Facility monitoring status becomes unavailable and is later made available
- Facility monitoring status is currently available with a planned single outage in the future.
- Facility monitoring status is currently unknown
- Facility monitoring status is currently partially available
- A facility is temporarily added to a location
- A facility is permanently removed from a location
- A facility monitoring status change generates a service alert
- A facility monitoring status includes utilisation / availability levels

8.1.2 Pre-requisites

- Facility Master Data to be available to participants.

8.1.3 Behaviour

8.1.3.1 SIRI FM

8.1.3.1.1 Sequence of messages
1. A SIRI FM message is created and sent as soon as the Facility Monitoring has been subscribed to.
   Refer sample *fm-facility-status-available.xml*.
2. A SIRI FM message is sent when the status of the facility changes.
   Refer sample *fm-facility-status-not-available.xml*.
3. A SIRI FM message should be sent at the defined monitoring interval.
   Refer sample *fm-facility-status-available.xml*.

8.1.3.1.2 Notes
- At the time of subscription the current Facility Status should be received by the SIRI Broker

8.1.3.1.3 Variations
None.

8.1.3.2 SIRI SX

8.1.3.2.1 Sequence of messages

1. A SIRI SX message is created at the same time the SIRI FM Facility Monitoring message is created, and will be sent sequentially (immediately after) the SIRI FM message reporting the Facility non-availability status.
   Refer sample *sx-facility-status-not-available.xml*.

2. A SIRI SX message should also be sent either when the impact of Facility non-availability has been removed, or once the facility status returns to Available.
   Refer sample *sx-facility-status-available.xml*.

8.1.3.2.2   Notes

- At the time of sending SIRI FM, the producer will be required to include the optional attribute of *SituationRef* to link the SIRI FM and SIRI SX message where the Facility non-availability impacts customer journey and/or journey planning.
- Though linked, the SIRI FM and SIRI SX messages can be closed independently of each other.

8.1.3.2.3   Variations

None.

Reference material – for information only

Appendix A: Communications and control messages

This appendix lists the communication and control message types that are used between the TfNSW SIRI broker, and associated parties, in accordance with the general and TfNSW SIRI specifications. A sample is provided for each of these message types.

SubscriptionRequest, and HeartbeatNotification
- ET, refer sample et-subscription-request.xml
- VM, refer sample vm-subscription-request.xml
- SX, refer sample sx-subscription-request.xml

SubscriptionResponse
- ET, refer sample et-subscription-response.xml
- VM, refer sample vm-subscription-response.xml
- SX, refer sample sx-subscription-response.xml
- Heartbeat, heartbeat-notification.xml

SubscriptionRequest, with filter
- ET, refer sample et-subscription-request-filter.xml
- VM, refer sample vm-subscription-request-filter.xml
- SX, refer sample sx-subscription-request-filter.xml

ServiceRequest
- VM, refer sample vm-service-request.xml

ServiceDelivery
- VM, refer sample vm-service-delivery.xml

DataReceivedAcknowledgement
- ET, VM, SX, refer sample data-acknowledgement.xml
- ET, VM, SX, refer sample data-acknowledgement-error.xml

CheckStatusRequest
- Refer sample check-status-request.xml

CheckStatusResponse
- Refer sample check-status-response.xml

End of Document