TRAVELLER
INFORMATION
EXCHANGE

Transport Certification Australia

PRODUCER INTEGRATION GUIDE

An application of the National Telematics Framework

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EXECUTIVE SUMMARY

The Traveller Information Exchange (TIX) is an application of the *National Telematics Framework* that delivers the ability to exchange information between:

- Producers of information

  and

- Providers of information services

  for use by

- Consumers of information.

TIX allows for the collation and distribution of information published by Producers and makes it available to Providers in a standardised format.

This document describes the TIX architecture and interface specification in sufficient detail to allow Producers to understand, scope, and design the data components necessary to be able to provide information to TIX.

The content of this document comprises:

- *Implementation Guide* – this section provides a description of the responsibilities and implementation requirements for Producers.

- *Reference Guides* – detailed description of the TIX data model and software interface applicable to Producers.

The content of this document is technical, and reflective of the target audience being those personnel with responsibility for system design and implementation.

Related documents:

- For an overview of TIX, refer to *Traveller Information Exchange Overview*.

- For implementation requirements for Providers with TIX, refer to *Traveller Information Exchange Provider Integration Guide*.

Contents

1 OVERVIEW

The Traveller Information Exchange (TIX) is an application of the *National Telematics Framework* that delivers the ability to exchange information between:

- Producers of information

  and

- Providers of information services

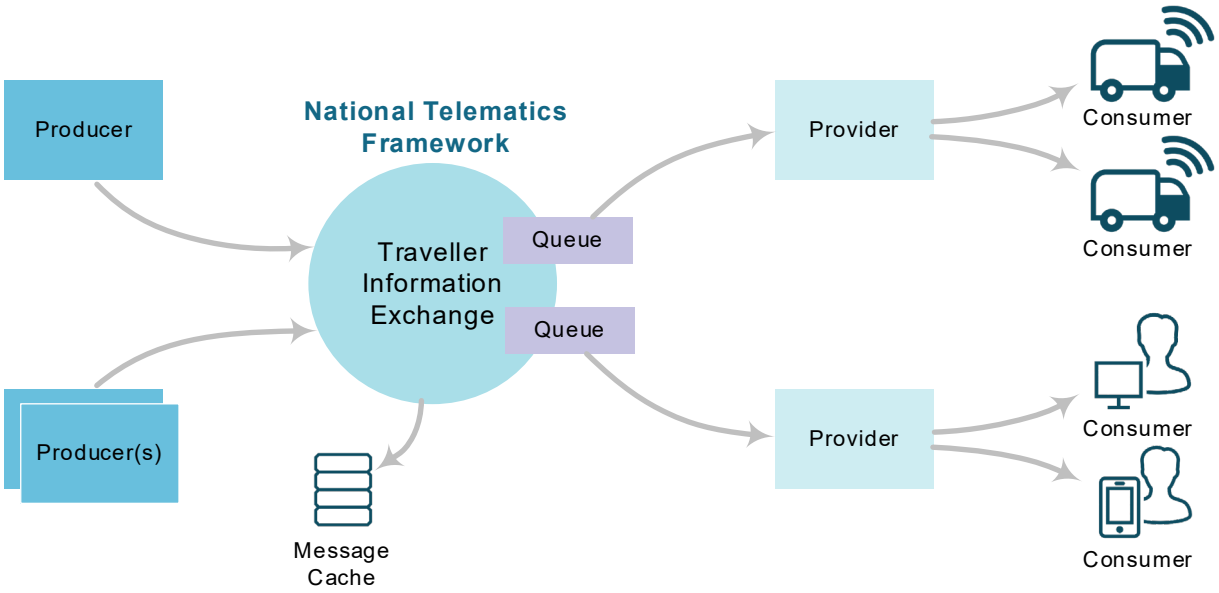
  for use by

- Consumers of information.

TIX allows for the collation and distribution of information published by Producers (in the form of messages) and makes it available to Providers in a standardised format.

Each message, generated by a Producer, describes the current status of some real-world event. Examples may include traffic congestion or road closures, weather phenomenon, port stevedore slot openings, rest area availability, etc. Each message is designed to be useful to its recipient, as it may influence an on-road decision related to a journey.

Figure 1: TIX Ecosystem



The diagram in Figure 1 shows the TIX ecosystem, noting that:

- TIX is an application of the *National Telematics Framework* and is hosted by Transport Certification Australia (TCA).

- TIX allows any information sources from any Producer to be utilised and made available. Providers receive that information in a standardised format.

- Producers make messages available to TIX. A Producer may already have an Application Programming Interface (API) to make their messages accessible (which can be used by TIX), or alternatively can utilise functionality of TIX to supply messages directly.

- Providers create one or message queues within TIX. Providers subscribe queues to messages made available by Producers through TIX, and can merge one or more sources of information from multiple Producers before distributing messages to Consumers who would have an interest in them (e.g. based on location, route, destination, time of day and/or other registered interest in the information).

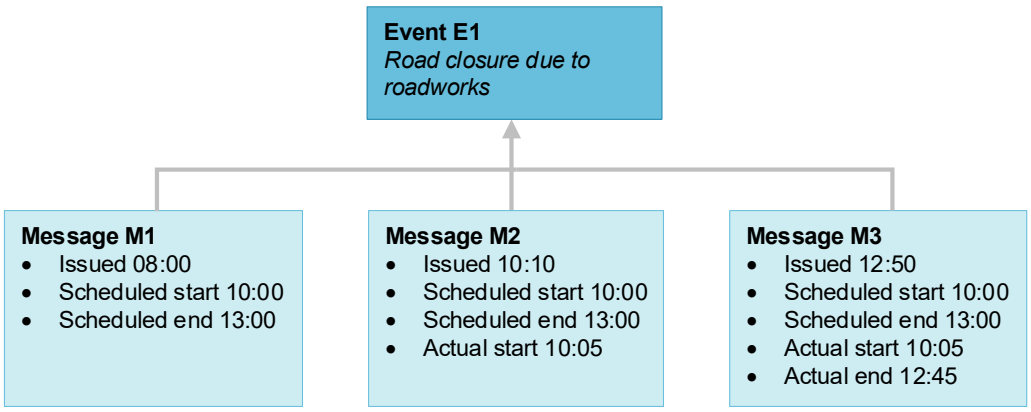
- Consumers are those for whom the information made available by the Producer may be relevant when making decisions related to their journeys. Consumers, utilising services enabled by Providers, choose which types of information to subscribe to in order to allow messages to be communicated through devices.

2 BACKGROUND

2.1 Business Domain Model

Underpinning TIX are the key concepts of events and messages and the relationship between them as illustrated in Figure 2.

Figure 2: Relationship Between Events and Messages



An event, generated by a Producer, represents a real-world occurrence – for example, a port closure or roadworks. Over time, each event will have a different status, and the information known about the event will change and be updated by the originating Producer. Events are not explicitly modelled or tracked within TIX, but rather are described by a sequence of messages.

Each individual message is immutable (i.e. it never changes), and the sequence of messages relating to a single event is correlated by a common event identifier. The status of an event is therefore described by the most recently issued message pertaining to that event, and consequently each message supersedes all previously issued messages pertaining to the same event.

2.2 Capability for Producers

Producers are required to generate messages to describe the current status of events, with a new message being produced on any change to an event. All messages must have unique identifiers, and messages related to a given event are correlated by an event identifier.

Producers can send or 'push' messages to TIX (using a published RESTful API) but may alternatively have TIX gather or 'pull' messages (such as through a polling mechanism).

The integration requirements for Producers are discussed in detail in Section 4.

3 REFERENCES

Documents referenced in this Guide are referenced below:

a. Transport Certification Australia (TCA). 2018. *Traveller Information Exchange Overview*, Transport Certification Australia. Melbourne, Australia.

b. Transport Certification Australia (TCA). 2018. *Traveller Information Exchange Provider Integration Guide*, Transport Certification Australia. Melbourne, Australia.

4 IMPLEMENTATION GUIDE

This section describes the requirements of APIs and messages that Producers generate, and the communication channels that allow a Producer to work with TCA to integrate with TIX.

4.1 Producer Integration with the Traveller Information Exchange

TIX has been developed to accept messages from Producers via a formally specified RESTful API. However, where the Producer prefers not to use this RESTful API, alternate strategies may be employed to accommodate different data interface protocols and technologies. Data may be gathered from Producers by TIX (such as through a polling mechanism) or pushed by Producers to TIX (such as through an event mechanism).

Note: As these protocols and technologies may be proprietary, a small amount of software development may be necessary to add a corresponding new interface management component to TIX for communication with that Producer. This will facilitate the open technology market transition. If this is the case, TCA will work with the Producer to determine what needs to be developed, which includes:

- *Message structures and formats; and*
- *Technical interfaces.*

Whichever message format, interface, authentication and security method a Producer proposes, the details and structure of the information should be fully documented and forwarded to TCA at the email address in Table 1 so that the most effective outcome can be achieved. If a web API is used, documentation must include how TCA can access the web API, and details of how the API is to be implemented.

Note: Even if a standard API is used, Producers should communicate with TCA so that TCA can provide guidance on the use of the API consistent with how it is intended to be used.

Table 1: TCA Contact Details

Email	Phone
tca@tca.gov.au	+61 3 8601 4600

TCA can work with the Producer to determine the requirements and any extra development that may be necessary for integration of data with the TIX RESTful API.

5 DATA MODEL REFERENCE GUIDE

5.1 Message Data Model

TIX allows Providers to access messages that may be relevant to one or more Consumers. The inclusion of appropriate data elements in each message helps to ensure that Consumers receive only the messages that are relevant to them (for example, messages that may influence journey decisions). The inclusion of appropriate data elements maximises the value of that data to Consumers.

At a minimum, it is recommended that Producers generate the following data elements along with the core advisory message to enable message lifetime management and other filtering:

- Message name
- Priority
- Message text
- Scheduled and actual start time
- Scheduled and actual end time.

Other data elements, such as location of interest and other geospatial attributes may be included (and are strongly recommended), where appropriate, to maximise the value of data to end users.

Table 2 describes key elements of the TIX Message Data Model. Each entity is formally encoded as an XML schema (see Appendix A - XML Schema Reference), and both XML and JSON messages are constructed against these XML schemas. Example messages appear within the RESTful API reference (where relevant).

Table 2: TIX Message Data Model

Element	Description	Data Type	Use
`Message Id`	A unique message identifier assigned by (or on behalf of) the message source. Message IDs are not required to be ordered, just unique per Producer.	String	Required
`Issued`	The UTC date and time the message was generated at and by the source. Message order is defined by message date and time. Where multiple messages share the same message date and time, only one message can reference any given event.	DateTime	Required
`Expiry`	The UTC date and time after which the message should be discarded or ignored. A message cannot expire prior to the previous message for the same event. *Note: A message is also expired whenever a subsequent message is generated which refers to the same event.* *Note: The recommended expiry period is 4 hours, but longer expiry periods are appropriate for future events.*	DateTime	Required

Element	Description	Data Type	Use
Producer Id	The identity of the producer of the message. This is assigned by TCA.	String	Required
Producer Name	The name of the source of the message.	String	Required
Event Id	The identifier of the real-world event described by this message.	String	Required
Event Code	A unique code describing the event.	String	Required
Event Name	A short name describing the event (e.g. ROAD CLOSED).	String	Required
Event Description	A description of the event. This can be as expansive as required.	String	Optional
Event Scheduled Start	The local date and time (including UTC offset) when the event is scheduled to start (if known).	DateTime	Optional
Event Scheduled End	The local date and time (including UTC offset) when the event is scheduled to end (if known).	DateTime	Optional
Event Actual Start	The local date and time (including UTC offset) when the event started.	DateTime	Optional
Event Actual End	The local date and time (including UTC offset) when the event finished.	DateTime	Optional
Event Severity	The severity of the event. One of: ADVISORY, LOW, ROUTINE, HIGH, EMERGENCY	String	Required
Location Point Latitude	The location of the event described as a point comprising latitude and longitude.	Double	Optional
Location Point Longitude	The location of the event described as a point comprising latitude and longitude.	Double	Optional
Location Circle Latitude	The location of the event described as a circle comprising latitude, longitude and radius.	Double	Optional
Location Circle Longitude	The location of the event described as a circle comprising latitude, longitude and radius.	Double	Optional
Location Circle Radius	The location of the event described as a circle comprising latitude, longitude and radius.	Integer	Optional
Location Box North	The location of the event described as a box comprising North, West, South, East coordinates.	Double	Optional

Element	Description	Data Type	Use
Location Box West	The location of the event described as a box comprising North, West, South, East coordinates.	Double	Optional
Location Box South	The location of the event described as a box comprising North, West, South, East coordinates.	Double	Optional
Location Box East	The location of the event described as a box comprising North, West, South, East coordinates.	Double	Optional
Location Direction Code	The direction of travel affected by this event. One of: NORTH, SOUTH, WEST, EAST, ANY	String	Optional
Location Road Ids	The location of the event described by a set of road identifiers	n x String	Optional
Location POI Ids	The location of the event described by a set of point of interest identifiers.	n x String	Optional
Location Description	A description of the event location.	String	Optional
Location Road Name	The location of the event described by road name(s).	String	Optional
Location Locality	The locality (e.g., suburb, town) in which the event exists.	String	Optional
Location State	The state or territory in which the event exists, specified as a capitalised and accepted abbreviation (e.g. ACT, NSW, NT, QLD, SA, TAS, VIC, WA).	String	Optional
Contact Web	A web address to contact for further information.	String	Optional
Contact Phone	A phone number to contact for further information.	String	Optional
Contact Description	A textual description of context details for further information.	String	Optional
Timestamp	A sequencing time stamp assigned by TIX upon receipt.	DateTime	Optional

Each message implicitly has one of the following statuses:

- *Active and Scheduled* – the message has not expired, but the event described by the message has not yet started (the ACTUAL START date and time is not populated);
- *Active and Current* – the message has not expired, and the event described by the message has started (ACTUAL START date and time is populated) but has not ended (ACTUAL END date and time is populated);
- *Active and Closed* – the message has not expired, and the event described by the message has ended (ACTUAL END date and time is populated); or
- *Expired* – the message's EXPIRY date and time is in the past, indicating that the event is in the past, and is no longer of interest to Consumers.

6 RESTFUL API REFERENCE GUIDE

6.1 Authentication and Authorisation

All invocations of the TIX RESTful API must be authenticated to the TIX server. Authentication is currently via the BASIC authentication mechanism using a user name and password. To protect the confidentiality of TIX credentials, all access is protected via Transport Layer Security (TLS).

Access to RESTful APIs is controlled on the basis of the authenticated user.

6.2 Resource Identifiers (URLs)

All RESTful API URLs are relative to the following base URL:

```
https://tis.tca.gov.au/tis/rest
```

6.3 Messages API

The TIX RESTful API comprises the resources and operations as detailed in Table 3.

Table 3: TIX Messages API

Resource	Operation

POST /messages/inbound	Submits a list of messages to TIX, and returns (reflects) the messages in the form they were accepted:
	• Each returned message has its time stamp set. Where messages previously existed within TIX, they have the original message time stamp set upon return.
	• Each message will have the `producerId` field set (or overridden) to reflect the authenticated user.
	• Returns:
	  ○ 200 OK – if messages are submitted successfully
	  ○ 403 Forbidden – if the caller does not have authorisation to submit messages

Consider the following example of the POST /messages/inbound API:

```
POST /tis/rest/messages/inbound HTTP/1.1
Content-Type: application/json
Content-Length: 578
Authorization: Basic dGlzYWRtaW46UGFzcy0xMjM=

{"message": [{
   "messageId": "a6296597-1e89-4138-b684-d5a2dc41ced8",
   "issued": "2017-10-29T21:25:15Z",
   "producerId": "ABC",
   "producerName": "Alphabet Operations",
   "expiry": "2017-10-29T22:25:15Z",
   "event":    {
      "eventId": "a6296597-1e89-4138-b684-d5a2dc41ced8",
      "eventCode": "0",
      "name": "SPEED LIMIT",
      "description": "SPEED LIMIT 20 KM/H IN SOUTHERN ENTRANCE",
      "scheduledEnd" : "2018-03-07T21:15:00Z",
      "actualStart" : "2018-03-07T21:14:30Z",
      "severityCode": "ROUTINE"
   }
}]}

HTTP/1.1 200
Cache-Control: no-cache, no-store, no-transform, must-revalidate
Content-Type: application/json
Content-Length: 623
Date: Wed, 07 Mar 2018 21:14:30 GMT

{
  "message" : [ {
    "messageId" : "a6296597-1e89-4138-b684-d5a2dc41ced8",
    "issued" : "2018-03-07T21:14:30Z",
    "producerId": "ABC",
    "producerName": "Alphabet Operations",
    "expiry" : "2018-03-07T21:15:00Z",
    "event" : {
      "eventId" : "a6296597-1e89-4138-b684-d5a2dc41ced8",
      "eventCode" : "0",
      "name" : "SPEED LIMIT",
      "description": "SPEED LIMIT 20 KM/H IN SOUTHERN ENTRANCE",
      "scheduledEnd" : "2018-03-07T21:15:00Z",
      "actualStart" : "2018-03-07T21:14:30Z",
      "severityCode" : "ROUTINE"
    },
    "timestamp" : "2018-03-07T21:14:30Z"
  } ]
}
```

APPENDIX A - XML SCHEMA REFERENCE

A.1 Message XML Schema

This XML schema is used to describe messages that can be submitted to TIX (produced) or read from TIX (subscribed).

```
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
   targetNamespace="http://tca.gov.au/schemas/traffic/message/2017-09"
xmlns:tns="http://tca.gov.au/schemas/traffic/message/2017-09"
   elementFormDefault="qualified">


   <!--
    ! Describes a geographical point at a given latitude and longitude.
    -->
   <xsd:complexType name="GeoPointType" >
      <xsd:sequence>
            <xsd:element name="latitude" type="xsd:double" />
            <xsd:element name="longitude" type="xsd:double" />
      </xsd:sequence>
   </xsd:complexType>


   <!--
    ! Describes a geographical circle centred at a given latitude and longitude.
    -->
   <xsd:complexType name="GeoCircleType" >
      <xsd:sequence>
            <xsd:element name="latitude" type="xsd:double" />
            <xsd:element name="longitude" type="xsd:double" />
            <xsd:element name="radius" type="xsd:int" />
      </xsd:sequence>
   </xsd:complexType>


   <!--
    ! Describes a geographical box.
    -->
   <xsd:complexType name="GeoBoxType" >
      <xsd:sequence>
            <xsd:element name="north" type="xsd:double" />
            <xsd:element name="west" type="xsd:double" />
            <xsd:element name="south" type="xsd:double" />
            <xsd:element name="east" type="xsd:double" />
      </xsd:sequence>
   </xsd:complexType>


   <!--
    ! Possible directions of travel affected by the event (e.g., northbound, southbound). The
    ! value 'ALL' is used where all directions of travel are affected, and the field is left
    ! blank where direction of travel is not known.
    -->
   <xsd:simpleType name="TravelDirectionEnum">
      <xsd:restriction base="xsd:string">
         <xsd:enumeration value="NORTH"/>
         <xsd:enumeration value="SOUTH"/>
         <xsd:enumeration value="WEST"/>
         <xsd:enumeration value="EAST"/>
         <xsd:enumeration value="ALL"/>
      </xsd:restriction>
   </xsd:simpleType>
```

```
<!--
 ! Describes a location via a number of mechanisms:
 ! * optionally a point comprising latitude and longitude
 ! * optionally a bounding circle or a bounding box
 ! * optionally a sequence of STREET_LINE identifiers
 ! * optionally a sequence of Point Of Interest (POI) identifiers.
 ! * optionally a description of the location
 ! * optionally road name(s)
 ! * optionally locality name
 ! * optionally state or territory
 -->
<xsd:complexType name="LocationType" >
   <xsd:sequence>
      <xsd:choice minOccurs="0">
         <xsd:element name="point" type="tns:GeoPointType" />
         <xsd:element name="boundingCircle" type="tns:GeoCircleType" />
         <xsd:element name="boundingBox" type="tns:GeoBoxType" />
      </xsd:choice>
      <xsd:element name="directionCode" type="tns:TravelDirectionEnum" minOccurs="0" />
      <xsd:element name="streetLineId" type="xsd:string" minOccurs="0" maxOccurs="unbounded" />
      <xsd:element name="poiId" type="xsd:string" minOccurs="0" maxOccurs="unbounded" />
      <xsd:element name="description" type="xsd:string" minOccurs="0" />
      <xsd:element name="roadName" type="xsd:string" minOccurs="0" />
      <xsd:element name="locality" type="xsd:string" minOccurs="0" />
      <xsd:element name="state" type="xsd:string" minOccurs="0" />
   </xsd:sequence>
</xsd:complexType>


<!--
 ! Possibly severity levels for messages.
 -->
<xsd:simpleType name="SeverityEnum">
   <xsd:restriction base="xsd:string">
      <xsd:enumeration value="ADVISORY"/>
      <xsd:enumeration value="LOW"/>
      <xsd:enumeration value="ROUTINE"/>
      <xsd:enumeration value="HIGH"/>
      <xsd:enumeration value="EMERGENCY"/>
   </xsd:restriction>
</xsd:simpleType>


<!--
 ! Describes a 'real-world' event. Each such event is desdribed by multiple messages.
 -->
<xsd:complexType name="EventType" >
   <xsd:sequence>
      <xsd:element name="eventId" >
         <xsd:simpleType><xsd:restriction base="xsd:string">
            <xsd:minLength value="1" />
            <xsd:maxLength value="128" />
         </xsd:restriction></xsd:simpleType>
      </xsd:element>
      <xsd:element name="eventCode" >
         <xsd:simpleType><xsd:restriction base="xsd:string">
            <xsd:minLength value="1" />
            <xsd:maxLength value="128" />
         </xsd:restriction></xsd:simpleType>
      </xsd:element>
      <xsd:element name="name" >
         <xsd:simpleType><xsd:restriction base="xsd:string">
            <xsd:minLength value="1" />
            <xsd:maxLength value="64" />
         </xsd:restriction></xsd:simpleType>
      </xsd:element>
      <xsd:element name="description" type="xsd:string" minOccurs="0" />
      <xsd:element name="scheduledStart" type="xsd:dateTime" minOccurs="0" />
      <xsd:element name="scheduledEnd" type="xsd:dateTime" minOccurs="0" />
      <xsd:element name="actualStart" type="xsd:dateTime" minOccurs="0" />
      <xsd:element name="actualEnd" type="xsd:dateTime" minOccurs="0" />
```

```
        <xsd:element name="severityCode" type="tns:SeverityEnum" />
        <xsd:element name="location" type="tns:LocationType" minOccurs="0" />
        <xsd:element name="contactWeb" type="xsd:anyURI" minOccurs="0" />
        <xsd:element name="contactPhone" type="xsd:string" minOccurs="0" />
        <xsd:element name="contactDescription" type="xsd:string" minOccurs="0" />
     </xsd:sequence>
  </xsd:complexType>


  <!--
   ! A message that describes an event.
   -->
  <xsd:complexType name="MessageType" >
     <xsd:sequence>
        <xsd:element name="messageId" >
           <xsd:simpleType><xsd:restriction base="xsd:string">
              <xsd:minLength value="1" />
              <xsd:maxLength value="128" />
           </xsd:restriction></xsd:simpleType>
        </xsd:element>
        <xsd:element name="issued" type="xsd:dateTime" />
        <xsd:element name="producerId" >
           <xsd:simpleType><xsd:restriction base="xsd:string">
              <xsd:minLength value="1" />
              <xsd:maxLength value="16" />
           </xsd:restriction></xsd:simpleType>
        </xsd:element>
        <xsd:element name="producerName" >
           <xsd:simpleType><xsd:restriction base="xsd:string">
              <xsd:minLength value="1" />
              <xsd:maxLength value="256" />
           </xsd:restriction></xsd:simpleType>
        </xsd:element>
        <xsd:element name="expiry" type="xsd:dateTime" />
        <xsd:element name="event" type="tns:EventType" />
     </xsd:sequence>
     <xsd:attribute name="timestamp" type="xsd:dateTime" use="optional" />
  </xsd:complexType>


  <xsd:complexType name="MessageListType" >
     <xsd:sequence>
        <xsd:element name="message" type="tns:MessageType" minOccurs="0" maxOccurs="unbounded" />
     </xsd:sequence>
  </xsd:complexType>


  <xsd:element name="message" type="tns:MessageType" />


  <xsd:element name="messageList" type="tns:MessageListType" />


</xsd:schema>
```

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