



# **General Transit Feed Specification (GTFS) – Timetable and Realtime Feed for NSW Buses**

Fileset Consumer Guide

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## Change Record and Documentation Control

| Version | Date        | Name     | Change Reference   |
|---------|-------------|----------|--|
| 1.0     | 15-Apr-2016 | TfNSW    | Release Version  |
| 1.1     | 6-July-2016 | TfNSW    | References to stop_note and trip_note updated  |
| 1.2     | 10-Mar-2017 | TfNSW    | Realtime feed information included   |
| 1.3     | 14-Mar-2017 | TfNSW    | Realtime feed information updated to include: <ul style="list-style-type: none"> <li>• Wi-Fi buses identifier</li> <li>• Christmas buses identifier</li> </ul> Realtime feed availability for stakeholders page is removed as it is outdated.  |
| 2.0     | 15-Jun-2017 | TfNSW    | Realtime feed information updated as follows: <ul style="list-style-type: none"> <li>• Vehicle Description will be available only in the vehicle position updates feed</li> <li>• Cancelled trips will be published in the trip updates feed</li> <li>• Vehicle(s) associated with the cancelled trip will be removed from the vehicle position updates feed</li> <li>• Vehicle model in the vehicle position updates feed will include following information (separated by tilde (~)) - vehicleManufacturerName, chassisName, vehicleBodyManufacturerName and bodyName</li> </ul> |
| 2.1     | 26-Jun-2017 | TfNSW    | Realtime feed information updated to include the specifics of cancelled trip as to how it will be reflected in the trip updates feed.  |
| 2.2     | 5-Dec-2018  | TfNSW    | Updates special_vehicle_attributes bitmask to reflect STA 85 <sup>th</sup> anniversary livery, Wi-Fi availability and Christmas bus bitmask  |
| 2.21    | 5 Dec 2018  | TfNSW YL | Tidy up formats and names only   |

## Related Documents

| Ref | Document Name                         | Version / Date       | Location  |
|-----|---------------------------------------|----------------------|---|
| 01  | GTFS Guides on Google Developers      | Accessed 26-Oct-2015 | <a href="https://developers.google.com/transit/gtfs/?hl=en">https://developers.google.com/transit/gtfs/?hl=en</a>       |
| 02  | Realtime Transit on Google Developers | Accessed 26-Oct-2015 | <a href="https://developers.google.com/transit/gtfs-realtime/">https://developers.google.com/transit/gtfs-realtime/</a> |

# 1 Introduction

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## 1.1 Overview

The purpose of this document is to describe the structure and contents of the Bus Timetable data feed supplied by NSW Transport for consumption and use by Transport for NSW systems and business units and application developers.

The Bus Timetable data feed is in the form of a General Transit Feed Specification fileset, known as 'GTFS'.

The intended audience of this document is application developers.

While GTFS is well documented, it provides several optional fields and some flexibility in how to populate some fields. This document provides some general information regarding the specific contents and structure of the GTFS Timetable Feed for NSW Buses.

## 1.2 Purpose of GTFS Bus Fileset

The purpose of the GTFS Bus Timetable Feed is to publish in advance the schedules and route information of Bus services operated under the Sydney Metropolitan and Outer Sydney Metropolitan Bus Services Contracts ('O/SMBSC'), plus Sydney NightRide and Sydney Olympic Park Major Events Bus Contracts.

Consumers of the GTFS Bus Timetable Feed are expected to include:

- TfNSW Transport Info (<http://www.transportnsw.info>);
- Realtime Transport App providers (<http://www.transportnsw.info/en/travelling-with-us/keep-updated/apps/real-time-transport.page>);
- Open Data users (<https://opendata.transport.nsw.gov.au>)
- Google Maps, Apple Maps, other online services.

## 1.3 Definition of Terms Used

| Term                       | Definition   |
|----------------------------|--|
| <b>GTFS</b>                | The <b>General Transit Feed Specification</b> (GTFS) defines a common format for public transportation schedules and associated geographic information.  |
| <b>GTFS-R</b>              | <b>GTFS-realtime</b> is a feed specification that allows public transportation agencies to provide realtime updates about their fleet to application developers. It is an extension to GTFS.   |
| <b>LIM</b>                 | Location Information Message – is a message sent from the bus (at regular intervals) containing all the necessary information that is required for tracking the bus in realtime.   |
| <b>O/SMBSC</b>             | The current (at time of writing) contracts between Bus Operators and TfNSW for providing Bus services in Sydney, Newcastle, Wollongong and surrounding areas. <ul style="list-style-type: none"> <li>• <b>SMBSC: Sydney Metropolitan Bus Service Contract</b></li> <li>• <b>OSMBSC: Outer Sydney Metropolitan Bus Services Contract</b></li> </ul> |
| <b>Operator</b>            | Business contracted by TfNSW to operate a group of Bus Routes.   |
| <b>TrayID</b>              | Unique identifier of the tray that is fitted on the bus. This information is received in the LIM and it is used to uniquely identify each bus in the TfNSW bus fleet.  |
| <b>TODIS</b>               | Transport Operations Data Interchange Specification – is a collection of information about the timetable of scheduled bus services, the spatial path of the routes the bus services follow and the rostering of trips into shifts.   |
| <b>OSDVehicleJourneyId</b> | A globally unique identifier for bus trips derived as part of the TfNSW transformation process. Provides the unique ' <b>Trip ID</b> ' used in the GTFS Feed, and provides the link to GTFS Realtime data.   |

## 2 Background

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### 2.1 Lifecycle of GTFS Bus Timetable Feed

A brief overview of the process to generate the GTFS Bus Timetable feed.

- Operators of Sydney and Outer Sydney bus services, NightRide and Major Events contracted services, submit Timetable information a minimum of 2 weeks prior to the 'activation date' of timetable data.
- The TfNSW system detects new data and transforms the data into a Transmodel format.  
As part of this process, each Trip is analysed to determine similarity with a Vehicle Journey that already exists, based on attributes such as route path, stopping pattern, time pattern, start time and other elements.
- At the end of each calendar day, GTFS Bus Timetable filesets are generated for Contracts which have had changes successfully submitted by Operators during the day.  
At the end of each week, all GTFS Bus Timetable filesets are generated to ensure the minimum of 100 days of advanced timetable data is available.
- During GTFS Bus Timetable Fileset generation, timetables for which there are less than 100 days of schedules are projected up to the 100 days, based on most recent schedule information for each day-type.
- Filesets are transferred to the Open Data Hub via internal processes.

## 3 General Technical Notes

### 3.1 GTF Specification Compliance

#### 3.1.1 Variations

The fileset includes definitions for certain fields that are different to the GTF Specification:

| File       | Field      | GTFS Definition   | TfNSW Bus Definition  |
|------------|------------|---|---|
| routes.txt | route_desc | <p>The route_desc field contains a description of a route. Please provide useful, quality information. Do not simply duplicate the name of the route.</p> <p>For example, "<i>A trains operate between Inwood-207 St, Manhattan and Far Rockaway-Mott Avenue, Queens at all times. Also from about 6AM until about midnight, additional A trains operate between Inwood-207 St and Lefferts Boulevard (trains typically alternate between Lefferts Blvd and Far Rockaway).</i>"</p>   | <p>Describes the 'Bus Network' that the Route belongs to. Defined by <b>TfNSW</b>.</p> <p>For example:</p> <ul style="list-style-type: none"> <li>• "Sydney Buses Network"</li> <li>• "Illawarra Buses Network"</li> </ul> <p>...etc...</p>   |
| routes.txt | route_type | <p>The route_type field describes the type of transportation used on a route. Valid values for this field are:</p> <ol style="list-style-type: none"> <li>0. <i>Tram, Streetcar, Light rail. Any light rail or street level system within a metropolitan area.</i></li> <li>1. <i>Subway, Metro. Any underground rail system within a metropolitan area.</i></li> <li>2. <i>Rail. Used for intercity or long-distance travel.</i></li> <li>3. <i>Bus. Used for short- and long-distance bus routes.</i></li> <li>4. <i>Ferry. Used for short- and long-distance boat service.</i></li> <li>5. <i>Cable car. Used for street-level cable cars where the cable runs beneath the car.</i></li> <li>6. <i>Gondola, Suspended cable car. Typically used for aerial cable cars where the car is suspended from the cable.</i></li> <li>7. <i>Funicular. Any rail system designed for steep inclines.</i></li> </ol> | <p>Is a code indicating the Route Type of the Route, as per the extended GTFS route types following Hierarchical Vehicle Type (HVT) codes from the European TPEG standard</p> <p>Refer to <a href="https://support.google.com/transitpartners/answer/3520902?hl=en&amp;ref_topic=1095593">https://support.google.com/transitpartners/answer/3520902?hl=en&amp;ref_topic=1095593</a></p> |

### 3.1.2 Extensions

The fileset includes additional fields that do not for part of the GTF Specification:

| File           | Field                | Purpose  | Contents |
|----------------|----------------------|--|----------|
| stop_times.txt | stop_note            | To reference text contained in notes.txt, being Notes provided by Operators for each Stop, to be available to Customers. | Freetext |
| trips.txt      | trip_note            | To reference text contained in notes.txt, being Notes provided by Operators for each Trip, to be available to Customers. | Freetext |
| trips.txt      | route_direction      | To reflect the Route Direction Name for each Trip, to be visible to Customers in Timetables.                             | Freetext |
| notes.txt      | note_id<br>note_text | To reflect note text for Stop Notes and Trip Notes. Entire file is an extension to GTFS.                                 | Freetext |

## 3.2 Publication Cycle & Scope

### 3.2.1 One Regular Contract Per Filesset; NightRide Filesset; Major Events Filesset

In order to optimise the GTFS File sizes, and to align Filesset generation with actual updates received from Operators, the full GTFS timetable feed is broken into separate Filessets.

- Each O/SMBSC Contract will represented in a single GTFS Filesset .zip file. For example, there will be a Filesset for SMBSC001, one for SMBSC002 and so-on.
- All Night Ride bus services will be published in a single separate GTFS Filesset.
- All Major Event bus services will be published in a single separate GTFS Filesset.

The full GTFS Filesset will be represented across 28 .zip files:

- 14 x Sydney Metro Contracts
- 12 x Outer Sydney Metro Contracts
- 1 x Night Ride (all)
- 1 x Major Events (all)

### 3.2.2 Validity Period and Timetable Projection

Filesset for each Contract will contain:

- timetables commencing the day of generation
- a minimum of 100 days of timetables
  - Schedule information provided by Operator in full. This may be a little as a few weeks to 180 days or more.
  - Projected information up to the minimum of 100 days, where less than 90 days of schedule information has been provided. The projection is based on the most recent information provided by Operators.



### 3.2.3 Generation Triggers

GTFS Filesets are generated:

- Every evening for each Fileset (O/SMBSC Contract, NightRide, Major Events) for which the responsible Operator(s) have submitted updated schedule information during the previous day.
- Every Sunday evening for all Filesets.

### 3.2.4 Modes / Geography

The GTFS Bus Timetable fileset specified in this document contains data for:

- All bus services contracted to TfNSW under the Outer / Sydney Metropolitan Bus Services Contracts ('O/SMBSC').
- Nightride and Sydney Olympic Park Major Event Bus Services.

These are detailed in **Section 5.2 below**.

The fileset excludes:

- Data for modes other than Sydney Metropolitan Buses.  
These modes are Sydney Trains, Sydney Ferries, Sydney Light Rail, NSW TrainLink Regional Trains and Coaches, Regional private buses
- Other services, including:
  - Charters operated on behalf of private companies;
  - Special services not part of the O/SMBSC, NightRide and Sydney Olympic Park Major Event contracts.
  - Trackwork buses

## 3.3 Standards Applied

### 3.3.1 Identifiers

Many of the identifiers used within the feed include underscore (\_) to join elements. Care may need to be taken to consider this when using the data or developing applications.

### 3.3.2 Value Quoting

All values in the text files are double-quoted. This includes numeric values and empty values.

For example (from agency.txt):

```
agency_id,agency_name,agency_url,agency_timezone,agency_lang,agency_phone  
"23537","Transdev NSW","http://transportnsw.info","Australia/Sydney","EN","131500"
```

## 3.4 File Structure

### 3.4.1 Single Fileset Contents:

Each fileset will be a 'ZIP' format compressed archive – a .zip file - containing 9 text files.

Each file within the .zip file is a comma delimited / comma separated format file with the ".txt" extension.

For example:

| Name               | Type          |
|--------------------|---------------|
| agency.txt         | Text Document |
| calendar.txt       | Text Document |
| calendar_dates.txt | Text Document |
| notes.txt          | Text Document |
| routes.txt         | Text Document |
| shapes.txt         | Text Document |
| stops.txt          | Text Document |
| stop_times.txt     | Text Document |
| trips.txt          | Text Document |

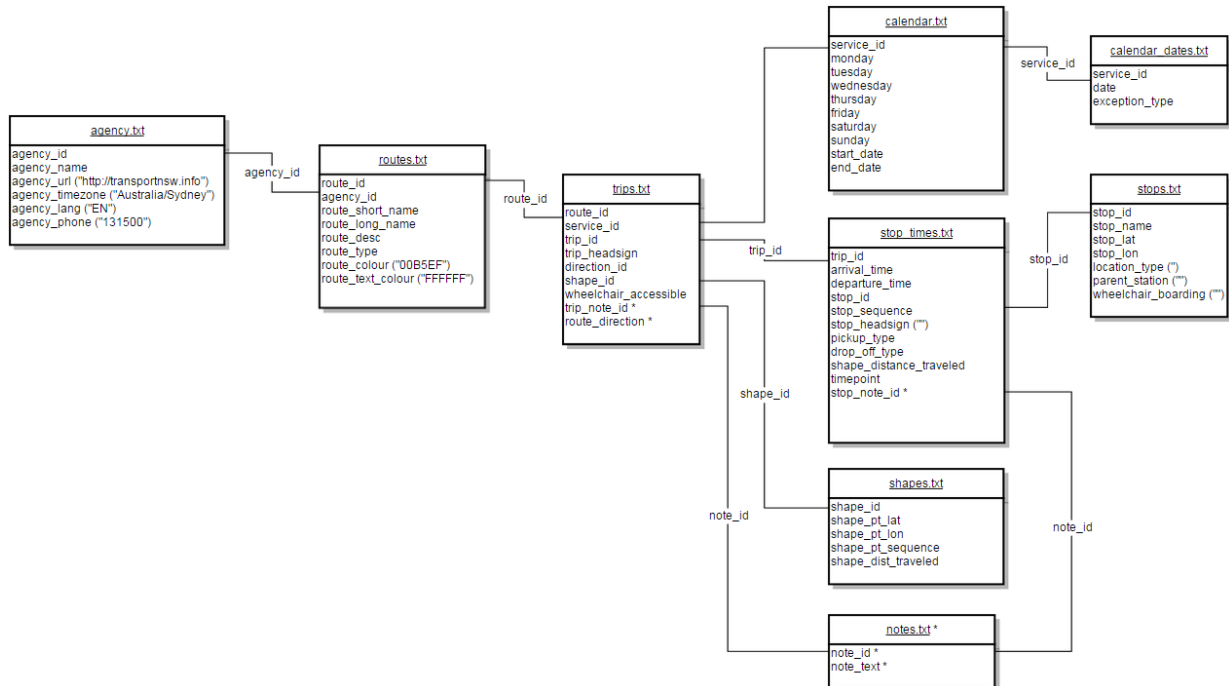
### 3.5 File Size

Compressed (.zip) filesets range in size from 100KB to 11 MB. Filesets are unlikely to ever be larger than 20MB each.

## 4 GTFS Timetable Feed for NSW Buses

### 4.1 Overview

The following diagram provides a physical data model view of the relationship between the TfNSW GTFS Bus Timetable Fileset files and fields.



Understanding this diagram:

- This is a representation of the relationships between the components of the GTFS Timetable fileset as implemented by TfNSW.
- "\*" denotes a TfNSW implemented extension on the GTFS standard.
- GTFS files and columns not implemented by TfNSW are not shown.
- Columns showing ("text") indicates hardcoded content.

## 4.2 agency.txt

Defines one or more transit agencies (Operators) that provide the data in this feed.

Note that for each O/SMBSC Fileset, there will be a single Agency record. For each of the NightRide and Major Events Fileset, there will be multiple Agency records.

| Field           | Included | TfNSW GTFS Bus Timetable Fileset Definition  |
|-----------------|----------|--|
| agency_id       | Yes      | The Contract ID, allocated by TfNSW.<br>For Example: "2447"  |
| agency_name     | Yes      | The Operator's 'Customer Facing Name'. Note that this is not necessarily the same as the legal entity name.<br>For example: "Transdev NSW" |
| agency_url      | Yes      | For all: "http://transportnsw.info"  |
| agency_timezone | Yes      | For all: "Australia/Sydney"  |
| agency_lang     | Yes      | For all: "EN"  |
| agency_phone    | Yes      | For all: "131500"  |
| agency_fare_url | No       | N/A  |

### 4.3 calendar\_dates.txt

Defines exceptions for the service IDs defined in the calendar.txt file.

| Field          | Included | TfNSW GTFS Bus Timetable Fileset Definition   |
|----------------|----------|---|
| service_id     | Yes      | The internally generated ID that identifies a set of dates when a service exception is available for one or more routes.<br>This identifier will be unique only within a GTFS Fileset, for example for a single Contract. This number has no meaning outside the Fileset. |
| date           | Yes      | The date field specifies a particular date when service availability is different than the norm.<br>For Example: "20160315"   |
| exception_type | Yes      | Indicates whether service is available on the date specified in the date field.<br>A value of 1 indicates that service has been added for the specified date.<br>A value of 2 indicates that service has been removed for the specified date.                             |

---

## 4.4 calendar.txt

Dates for service IDs using a weekly schedule. Specify when service starts and ends, as well as days of the week where service is available.

| Field      | Included | TfNSW GTFS Bus Timetable Fileset Definition   |
|------------|----------|---|
| service_id | Yes      | The service_id contains an ID that uniquely identifies a set of dates when service is available for one or more routes.<br>This identifier will be unique only within a GTFS Fileset, for example for a single Contract. This number has no meaning outside the Fileset.  |
| monday     | Yes      | Each day field contains a binary value that indicates whether the service is valid for all of that day.<br>A value of 1 indicates that service is available for all of that day in the date range. (The date range is specified using the start_date and end_date fields.)<br>A value of 0 indicates that service is not available on that day in the date range.<br>Note: Exceptions for particular dates, such as public holidays and service differences between school term and non-school term, are represented for the service_id in the calendar_dates.txt file. |
| tuesday    | Yes      |   |
| wednesday  | Yes      |   |
| thursday   | Yes      |   |
| friday     | Yes      |   |
| saturday   | Yes      |   |
| sunday     | Yes      |   |
| start_date | Yes      | The start_date field contains the start date for the service.   |
| end_date   | Yes      | The end_date field contains the end date for the service. This date is included in the service interval.  |

## 4.5 routes.txt

Transit routes. A route is a group of trips that are displayed to riders as a single service.

| Field            | Included | TfNSW GTFS Bus Timetable Fileset Definition   |
|------------------|----------|---|
| route_id         | Yes      | The route_id field contains an ID that uniquely identifies a route. The route_id is dataset unique.<br>Constructed as "(CONTRACT ID)_(ROUTE ID)"<br>For example: "2447_10A"   |
| agency_id        | Yes      | The O/SMBSC Contract ID, allocated by TfNSW.<br>For Example: "2447"   |
| route_short_name | Yes      | The short code identifying the Route to the public. Sourced from the Bus Contracts Management System.<br>For example: "10A"   |
| route_long_name  | Yes      | The long name identifying the Route to the public. Sourced from the Bus Contracts Management System.<br>For example: "Marrickville Metro to City"   |
| route_desc       | Yes      | <b>Note: TfNSW Variation.</b><br>Indicates the Bus Network that the Route belongs to. The Bus Network is defined by <b>TfNSW</b><br>For example: "Sydney Buses Network".  |
| route_type       | Yes      | <b>Note: TfNSW Variation.</b><br>Indicates the Route Type of the Route.<br>as per the extended GTFS route types following Hierarchical Vehicle Type (HVT) codes from the European TPEG standard<br>Refer to<br><a href="https://support.google.com/transitpartners/answer/3520902?hl=en&amp;ref_topic=1095593">https://support.google.com/transitpartners/answer/3520902?hl=en&amp;ref_topic=1095593</a><br>For example: "700". |
| route_url        | No       | N/A   |
| route_color      | Yes      | For all: "00B5EF"   |
| route_text_color | Yes      | For all: "FFFFFF"   |

## 4.6 shapes.txt

Rules for drawing lines on a map to represent a transit organization's routes.

| Field               | Included | TfNSW GTFS Bus Timetable Fileset Definition   |
|---------------------|----------|---|
| shape_id            | Yes      | The shape_id field contains an ID that uniquely identifies a shape.   |
| shape_pt_lat        | Yes      | These fields associate a shape point's longitude and latitude with a shape ID. The field values must be valid WGS 84 values from -180 to 180. Each row in shapes.txt represents a shape point in the trip's shape definition.<br>For example: "-32.8407", "151.3551139"   |
| shape_pt_lon        | Yes      |   |
| shape_pt_sequence   | Yes      | The shape_pt_sequence field associates the latitude and longitude of a shape point with its sequence order along the shape. The values for shape_pt_sequence will be non-negative integers, and they will increase along the trip.<br>These numbers have no meaning outside the trip point sequence.  |
| shape_dist_traveled | Yes      | The shape_dist_traveled field positions a shape point as a distance travelled along a shape from the first shape point.<br>The shape_dist_traveled field represents a real distance travelled along the route in <b>meters</b> .<br>The values used for shape_dist_traveled will increase along with shape_pt_sequence: they cannot be used to show reverse travel along a route. |



## 4.7 stop\_times.txt

Times that a vehicle arrives at and departs from individual stops for each trip.

| Field               | Included | TfNSW GTFS Bus Timetable Fileset Definition   |
|---------------------|----------|---|
| trip_id             | Yes      | The trip_id field contains an ID that identifies a trip. This value is referenced from the trips.txt file.<br>This ID is internally generated by TfNSW as a <b>Vehicle Journey ID</b> . This ID is <b>not</b> the same as the trip ID used by Operators.  |
| arrival_time        | Yes      | The arrival time at a specific stop for a specific trip on a route. Times for trips starting before 04:00 am will be expressed in '36 hour format'.<br>For example: "25:07" (01:07 am)  |
| departure_time      | Yes      | The departure time from a specific stop for a specific trip on a route. Times for trips starting before 04:00 am will be expressed in '36 hour format'.<br>For example: "25:09" (01:09 am)  |
| stop_id             | Yes      | The TSN ID for the Stop. This uniquely identifies a stop. This ID is the unique Transit Stop Number that identifies a stop in the <b>Transit Stop Management System ('TSM')</b> , the original Transit Stop reference resource maintained by TfNSW.<br>For example: "220411".   |
| stop_sequence       | Yes      | The sequence of the Stop within the Trip.<br>The stop_sequence will be a non-negative integer, and will increase along the trip.<br>For example: "3" indicates that the stop is the 3 <sup>rd</sup> in the Trip.  |
| stop_headsign       | Yes      | For all: "" (i.e. null)   |
| pickup_type         | Yes      | Indicates whether the Stop is for Pickup.<br>For example: "0" indicates that regularly scheduled pickup occurs at the Stop for the Trip.  |
| drop_off_type       | Yes      | Indicates whether the Stop is for Pickup.<br>For example: "1" indicates that no drop off available for the Stop for the Trip.   |
| shape_dist_traveled | Yes      | The shape_dist_traveled field positions a shape point as a distance travelled along a shape from the first shape point. The shape_dist_traveled field represents a real distance travelled along the route in <b>meters</b> .<br>The values used for shape_dist_traveled will increase along with stop_sequence: they cannot be used to show reverse travel along a trip. |
| timepoint           | Yes      | Indicates whether the Stop is a timing point for the Trip. Timing Points are considered more accurate than non-timing point stops.<br>For example: "1" indicates that the Stop is a Timing Point for the Trip.  |

| Field     | Included | TfNSW GTFS Bus Timetable Fileset Definition   |
|-----------|----------|---|
| stop_note | Yes      | <p><b>Note: TfNSW Extension.</b></p> <p>To reflect Notes provided by Operators for each Stop, to be available to Customers.</p> <p>May be empty.</p> <p>The value is referenced from the notes.txt file.</p> <p>For example: “<b>2143</b>” refers to notes.txt note_txt “<b>Stops only on request</b>”.</p> |

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Additional notes:

- Arrival and departing times should be used verbatim from the GTFS Timetable Feed. **Refer 5.1 below.**

## 4.8 stops.txt

Individual locations where vehicles pick up or drop off passengers.

| Field               | Included | TfNSW GTFS Bus Timetable Fileset Definition  |
|---------------------|----------|--|
| stop_id             | Yes      | The Transit Stop Number (TSN) ID for the Stop. This uniquely identifies a stop.<br>This ID is the unique TSN that identifies a stop in the <b>Transit Stop Management System (TSM)</b> , the original Transit Stop reference resource maintained by TfNSW.<br>For example: “ <b>220411</b> ” |
| stop_code           | No       | N/A  |
| stop_name           | Yes      | The correct name of the Stop.<br>This Stop name is the ‘official’ name for the Stop as recorded in the TSM System.<br>For example: “ <b>Smidmore St Terminus</b> ”   |
| stop_desc           | No       | N/A  |
| stop_lat            | Yes      | The WGS 84 longitude (‘y’ coordinate’) for the stop.<br>For example: “ <b>-33.907666</b> ”   |
| stop_lon            | Yes      | The WGS 84 longitude (‘x’ coordinate’) for the stop.<br>For example: “ <b>151.172236</b> ”   |
| zone_id             | No       | N/A  |
| stop_url            | No       | N/A  |
| location_type       | Yes      | For all: “” (i.e. null).<br>Indicates that the stop is a ‘Stop’ as opposed to a ‘Station’.   |
| parent_station      | Yes      | For all: “” (i.e. null).   |
| stop_timezone       | No       | N/A  |
| wheelchair_boarding | Yes      | For all: “” (i.e. null)<br>Indicates there is no accessibility information for the stop.   |

## 4.9 trips.txt

Trips for each route. A trip is a sequence of two or more stops that occurs at specific time.

| Field                 | Included | TfNSW GTFS Bus Timetable Fileset Definition   |
|-----------------------|----------|---|
| route_id              | Yes      | The route_id field contains an ID that uniquely identifies a route. The route_id is dataset unique. The value is referenced from route.txt. Constructed as "(CONTRACT ID)_(ROUTE ID)". For example: "2447_10A"  |
| service_id            | Yes      | The service_id contains an ID that uniquely identifies a set of dates when service is available for one or more routes. This identifier will be unique only within a GTFS Fileset, for example for a single Contract. This number has no meaning outside the Fileset.   |
| trip_id               | Yes      | The trip_id field contains an ID that identifies a trip. This value is referenced from the trips.txt file. This ID is internally generated by TfNSW as a <b>Vehicle Journey ID</b> . This ID is <b>not</b> the same as the trip ID used by Operators.   |
| trip_headsign         | Yes      | The trip_headsign field contains the text that appears on a sign that identifies the trip's destination to passengers. For example: "Parramatta to Rouse Hill Town Centre"  |
| trip_short_name       | No       | N/A   |
| direction_id          | Yes      | Indicates the direction (outgoing, inbound) of the Trip. Possible values are: <ul style="list-style-type: none"> <li>"0": Outbound</li> <li>"1": Inbound</li> </ul> Note that 'Loop' services will be indicated as '1 – Inbound'.   |
| block_id              | Yes      | For all: "" (i.e. null).  |
| shape_id              | Yes      | Contains an ID that defines a shape for the trip. This value is referenced from the <b>shapes.txt</b> file.   |
| wheelchair_accessible | Yes      | Indicates wheelchair accessibility for a scheduled trip. Note that this may not be the same as the accessibility status of a trip as operated. Possible values are: <ul style="list-style-type: none"> <li>"0": No accessibility information available.</li> <li>"1": Scheduled to be an accessible service.</li> </ul> |
| bikes_allowed         | No       | N/A   |
| trip_note             | Yes      | <b>Note: TfNSW Extension.</b><br>To reflect Notes provided by Operators for each Trip, to be available to Customers. May be empty. The value is referenced from the notes.txt file. For example: "2143" refers to notes.txt note_txt "Trip terminates at Railway Square".   |

| Field           | Included | TfNSW GTFS Bus Timetable Fileset Definition  |
|-----------------|----------|--|
| route_direction | Yes      | <p><b>Note: TfNSW Extension.</b></p> <p>To describe the Route Direction for each Trip, to be visible to Customers in Timetables.</p> <p>Enables grouping of Trips together in a meaningful way.</p> <p>For example: “<b>Parramatta to Rouse Hill Town Centre via North-West T-way service</b>”</p> |

## 4.10 notes.txt

**This file is an extension on the GTFS Fileset standard.**

Contains a list of notes referenced from trips.txt and stop\_times.txt.

| Field    | Included | TfNSW GTFS Bus Timetable Fileset Definition  |
|----------|----------|--|
| note_id  | Yes      | Unique ID for Notes referenced in trips.txt (trip_note) and stop_times.txt (stop_note).  |
| note_txt | Yes      | Text for note used in stop_times.txt and trips.txt.<br>A single Note may be re-used multiple times.<br>For example: <b>“Trip terminates at Railway Square”</b> . |

## 5 GTFS Timetable Feed Usage Notes

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### 5.1 Stop Arrival and Departure Times

End users should display arrival\_time and departure\_time as supplied in stop\_times.txt. Users should not interpolate values between timepoints.

### 5.2 Filesets and Operators

For each of the Bus GTFS Timetable Filesets, the current 'Agencies' are listed below. **Agency parameters for download are as follows:**

#### Sydney Metro:

- **SMBSC001:** Busways Western Sydney
- **SMBSC002:** Interline Bus Services
- **SMBSC003:** Transit Systems
- **SMBSC004:** Hillsbus
- **SMBSC005:** Punchbowl Bus Company
- **SMBSC006:** State Transit Sydney
- **SMBSC007:** State Transit Sydney
- **SMBSC008:** State Transit Sydney
- **SMBSC009:** State Transit Sydney
- **SMBSC010:** Transdev NSW
- **SMBSC012:** Transdev NSW
- **SMBSC013:** Transdev NSW
- **SMBSC014:** Forest Coach Lines
- **SMBSC015:** Busabout

#### Outer Sydney Metro:

- **OSMBSC001:** Rover Coaches
- **OSMBSC002:** Hunter Valley Buses
- **OSMBSC003:** Port Stephens Coaches
- **OSMBSC004:** Hunter Valley Buses
- **OSMBSC005:** State Transit Newcastle
- **OSMBSC006:** Busways Central Coast
- **OSMBSC007:** Red Bus Service
- **OSMBSC008:** Blue Mountains Transit
- **OSMBSC009:** Premier Charters
- **OSMBSC010:** Premier Illawarra
- **OSMBSC011:** Coastal Liner
- **OSMBSC012:** Dions Bus Service

#### Others:

- **Nightride:** NightRide
- **Major\_Events:** Sydney Olympic Park Major Event Buses

### 5.3 Scope and Source of Identifiers (Keys) within the Fileset

In order for Fileset consumers to understand keys used within the GTFS Bus Timetable Filesets, the following table provides details.

Additional notes:

- Direction ID is not a key but an indicator.
- This analysis does not consider modes other than Bus.

| Files   | Attribute         | Definition   | Source   | Scope  | Note   |
|---|-------------------|--|--|--|--|
| agency.txt,<br>routes.txt                         | <b>agency_id</b>  | Identifies a transit agency (operator)                                     | TfNSW Operator Accreditation ID  | Unique across ALL Filesets.<br>Will be consistent from one Fileset version to another. |  |
| routes.txt,<br>trips.txt                          | <b>route_id</b>   | Identifies a route   | Agency (operator) ID + Operator Route ID   | Unique across ALL Filesets.<br>Will be consistent from one Fileset version to another. | Route number on its own is NOT unique across filesets. |
| trips.txt,<br>calendar.txt,<br>calendar_dates.txt | <b>service_id</b> | Identifies a set of dates when service is available for one or more routes | Sequentially numbered 'on-the-fly' during the creation of each GTFS Fileset  | Unique only with EACH fileset.<br>Can change from one Fileset version to another.      |  |
| trip.txt,<br>stop_times.txt                       | <b>trip_id</b>    | Identifies a trip.   | TfNSW generates a 'Vehicle Journey ID' for each identifiable trip encompassing route, stopping pattern, stopping times, start time and other elements. Where a trip has the same features, the Vehicle Journey is re-used. | Unique across ALL Filesets.<br>Will be consistent from one Fileset version to another. |  |



| Files                                      | Attribute                                    | Definition  | Source  | Scope  | Note   |
|--|--|---|---|--|--|
| trips.txt,<br>shapes.txt                   | <b>shape_id</b>                              | Identifies a shape for the trip.  | TfNSW generates a 'route path ID' for each different route path provided by Operators. Route paths are re-used where they are the same. | Unique across ALL Filesets.<br>Will be consistent from one Fileset version to another. | Route paths that vary by even the smallest amount will produce a different route path ID.  |
| trips.txt,<br>stop_times.txt,<br>notes.txt | <b>stop_note,<br/>trip_note,<br/>note_id</b> | stop_note and trip_note each identify a note contained in notes.txt file. | TfNSW generates a Note ID for each different note string provided by Operators. Notes are re-used where text string is the same.        | Unique across ALL Filesets.<br>Will be consistent from one Fileset version to another. | An extension to GTFS. Notes are currently suppressed in the GTFS Feed to allow Operators time to apply customer facing notes and remove operational notes. |
| stop_times.txt,<br>stops.txt               | <b>stop_id</b>                               | Identifies a stop or station  | TfNSW 'Transit Stop Management (TSM) System'.   | Unique across ALL Filesets.<br>Will be consistent from one Fileset version to another. |  |

## 6 GTFS Realtime

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***“GTFS-realtime is a feed specification that allows public transportation agencies to provide realtime updates about their fleet to application developers. It is an extension to GTFS (General Transit Feed Specification), an open data format for public transportation schedules and associated geographic information. GTFS-realtime was designed around ease of implementation, good GTFS interoperability and a focus on passenger information.”***

- 'What is GTFS-realtime', Google Realtime Transit Overview (<https://developers.google.com/transit/gtfs-realtime/>)

The TfNSW Bus GTFS Realtime feed is generated by PTIPS as part of the live bus tracking system.

A GTFS-realtime feed lets transit agencies provide consumers with realtime information about disruptions to their service (stations closed, lines not operating, important delays, etc.) location of their vehicles, and expected arrival times.

The specification currently supports the following types of information:

- Trip updates - delays, cancellations, changed routes
- Service alerts - stop moved, unforeseen events affecting a station, route or the entire network
- Vehicle positions - information about the vehicles including location and congestion level

TfNSW Realtime buses do not support Service Alerts at present, both Trip updates and Vehicle Positions are provided. Trip Update and Vehicle Position both use the proto buff format.

All items in **GRAY** are **not** provided in the realtime feed.

Following TfNSW Rules are applicable to the feeds:

1. **Configurable capacity** – Feeds are configured to contain all the trips that are currently in progress and started up to 120 minutes in the past as well as trips that will commence within next 60 minutes. This capacity is configurable and can be extended/reduced depending on future needs.
2. **Operator Exclusion List** – Feeds currently work off the 'Operator Exclusion List' to determine which trips are to be included/excluded. I.e. trips serviced by the operators that are in this list will not be available in the feed.
3. **Route Variant Types Exclusion List** – Feeds currently work off the 'Route Variant Types Exclusion List' to determine which route variant types (per operator) are to be included/excluded.
4. **Mid-trip driver swap** – GIVEN where a driver has logged off in the middle of a trip AND another driver has logged on to complete the remainder of the trip THEN the trip will remain on the feed until it is finished by the second driver AND will not be removed from the feed when the first driver logged out.
5. **Prediction management**
  - a. During off-route or reverse journey – GIVEN where the bus has gone off-route or starts doing reverse journey during the trip THEN certain smarts are applied to compare the scheduled arrival/departure times at the remaining TSNs with the current time and replace predicted arrival/departure times with scheduled times.
  - b. During pre-journey – GIVEN where the bus hasn't arrived at the first TSN but the driver has already logged onto the trip THEN predicted arrival/departure

times from the TSNs of that trip will not be published. Instead, scheduled arrival/departure times will be published. Vehicle information will also not be published.

6. **Next trip delay calculation** – Trip updates feed is enhanced to include delay (from schedule) in the start of the next trip. For example, if a bus is running late then certain smarts are applied to figure out the delay in the start of the next trip and published in the trip updates feed.
7. **Additional bus information** – Vehicle position updates feed is extended to include following information about each bus that is in service:
  - a. Air-conditioning is available or not
  - b. Wheelchair access is available or not
  - c. Vehicle Model
  - d. Wi-Fi availability
  - e. Christmas bus identifier
  - f. Special bus livery
8. **Publishing cancelled trips** – Trip updates feed is enhanced to start publishing the trips that are cancelled by the bus operators via PTIPS web. Reference to all the vehicles that are associated with a cancelled trip will be removed from the vehicle position updates feed.

## 6.1 Trip Updates Message

| Message Structure  | Example Values  |
|--|---|
| <pre> header {   gtfs_realtime_version: "1.0"   incrementality: FULL_DATASET   timestamp: } entity {   id: ""   trip_update {     trip {       trip_id: ""       start_time: ""       start_date: ""       schedule_relationship:       route_id: ""     }     vehicle     {       id: ""       label: ""     }     stop_time_update     {       stop_sequence:       arrival {         delay:         time:       }       departure {         delay:         time:       }       stop_id: ""       schedule_relationship:     }     stop_time_update {       stop_sequence:       arrival {         delay:         time:       }       departure {         delay:         time:       }       stop_id: ""       schedule_relationship:     }   } } </pre> | <pre> header {   gtfs_realtime_version: "1.0"   incrementality: FULL_DATASET   timestamp: 1471916326 } entity {   id: "33553_11215421_2436_T66"   trip_update {     trip {       trip_id: "300117"       start_time: "12:00:00"       start_date: "20160823"       schedule_relationship: SCHEDULED       route_id: "2436_T66"     }     vehicle     {       id: "33553_11215410_2436_T66_1"     }     stop_time_update     {       stop_sequence: 1       arrival {         delay: 0         time: 1471917600       }       departure {         delay: 0         time: 1471917600       }       stop_id: "2150109"       schedule_relationship: SCHEDULED     }     stop_time_update {       stop_sequence: 2       arrival {         delay: 0         time: 1471917780       }       departure {         delay: 0         time: 1471917780       }       stop_id: "2150300"       schedule_relationship: SCHEDULED     }   } } </pre> |

### 6.1.1 Trip Updates Message

| Field Name | Type                              | Cardinality | Description  | TfNSW Rules   |
|------------|-----------------------------------|-------------|--|---|
| id         | int32                             | required    | Unique identity for each trip entity   | <ol style="list-style-type: none"> <li>1. This field is the concatenation of the following - &lt;OperatorID&gt;_&lt;TODISTRIPID&gt;_&lt;TodisContractID&gt;_&lt;TodisRouteID&gt;_&lt;TripInstanceNumber&gt;</li> <li>2. GIVEN where any of the information in the concatenation is not available THEN it will be replaced with an 'underscore' ( _ ). For example if 'TODISTRIPID' is not available then the concatenation will look like - &lt;OperatorID&gt;_&lt;_&gt;_&lt;TodisContractID&gt;_&lt;TodisRouteID&gt;_&lt;TripInstanceNumber&gt;</li> </ol>   |
| Trip       | <a href="#">TripDescriptor</a>    | required    | The Trip that this message applies to. There can be at most one TripUpdate entity for each actual trip instance. If there is none, that means there is no prediction information available. It does *not* mean that the trip is progressing according to schedule. | <ol style="list-style-type: none"> <li>1. All the trips that should be in progress as per the schedule are listed up to the configured time period of 120 minutes in the past.</li> <li>2. All the trips that will be running in the future (up to the configured time period, by default 60 minutes), as per the schedule are listed</li> <li>3. All the unscheduled trips that are currently in progress i.e. bus is sending a LIM containing no Trip ID but a valid 'RouteID' and 'RouteVarNum' (that cannot be associated with any of the Trip ID's in the schedule) are listed.</li> <li>4. Refer to section 'Trip Descriptor' below for field mapping.</li> </ol> |
| Vehicle    | <a href="#">VehicleDescriptor</a> | optional    | Additional information on the vehicle that is serving this trip.   | <ol style="list-style-type: none"> <li>1. GIVEN driver has logged into the trip<br/>WHEN trip updates feed is generated<br/>AND the trip is part of the feed<br/>THEN the vehicle information will be included for the trip</li> </ol>  |

| Field Name       | Type                           | Cardinality | Description   | TfNSW Rules   |
|------------------|--------------------------------|-------------|---|---|
|                  |                                |             |   | <p>2. <b>GIVEN</b> bus is on pre-journey (i.e. bus has not departed from the first TSN)<br/> <b>WHEN</b> trip updates feed is generated<br/> <b>AND</b> the trip is part of the feed<br/> <b>THEN</b> the vehicle information will be removed for the trip.</p> <p>3. <b>GIVEN</b> a trip in PTIPS is canceled<br/> <b>WHEN</b> trip updates feed is generated<br/> <b>AND</b> it contains a canceled trip<br/> <b>THEN</b> the vehicle information associated with the trip will be removed</p> <p>4. For all other cases, refer to section 'Vehicle Descriptor' below for field mapping rules applicable to this field.</p> |
| stop_time_update | <a href="#">StopTimeUpdate</a> | repeated    | Updates to StopTimes for the trip (both future, i.e., predictions, and in some cases, past ones, i.e., those that already happened). The updates must be sorted by stop_sequence, and apply for all the following stops of the trip up to the next specified one. | <p>1. <b>GIVEN</b> a trip in PTIPS is canceled<br/> <b>WHEN</b> trip updates feed is generated<br/> <b>AND</b> it contains a canceled trip<br/> <b>THEN</b> the stop time information associated with the trip will be removed</p> <p>2. Only future TSNs will contain stop time updates</p> <p>3. For all other cases, refer to section 'StopTimeUpdate' below for field mapping rules applicable to this field.</p>   |
| timestamp        | uint64                         | optional    | Moment at which the vehicle's real-time progress was measured. In POSIX time (i.e., the number of seconds since January 1st 1970 00:00:00 UTC).   | For each trip that is in progress and being serviced by a vehicle, this field will be populated with the driver console's time from the most recent message from that vehicle else this field will not be   |

| Field Name | Type  | Cardinality | Description   | TfNSW Rules                       |
|------------|-------|-------------|---|-----------------------------------|
|            |       |             |   | included in the feed.             |
| delay      | int32 | optional    | <p>The current schedule deviation for the trip. Delay should only be specified when the prediction is given relative to some existing schedule in GTFS.</p> <p>Delay (in seconds) can be positive (meaning that the vehicle is late) or negative (meaning that the vehicle is ahead of schedule). Delay of 0 means that the vehicle is exactly on time.</p> <p>Delay information in StopTimeUpdates take precedent of trip-level delay information, such that trip-level delay is only propagated until the next stop along the trip with a StopTimeUpdate delay value specified.</p> <p>Feed providers are strongly encouraged to provide a TripUpdate.timestamp value indicating when the delay value was last updated, in order to evaluate the freshness of the data.</p> | N/A - this field is not populated |

### 6.1.1.1 Trip Descriptor

| Field Name | Type   | Cardinality | Description   | TfNSW Rules  |
|------------|--------|-------------|---|--|
| trip_id    | string | optional    | The trip_id from the GTFS feed that this selector refers to. For non frequency-based trips, this field is enough to | <ol style="list-style-type: none"> <li>1. This field is to be mapped to the following field in the PTIPS database - OSDVehicleJourneyId</li> <li>2. GIVEN where a trip id is not available in the</li> </ol> |

| Field Name   | Type   | Cardinality | Description   | TfNSW Rules  |
|--------------|--------|-------------|---|--|
|              |        |             | uniquely identify the trip. For frequency-based trip, start_time and start_date might also be necessary.                  | <p>LIM and route id (and route variant number) cannot be mapped to the trips in the schedule THEN this field will be blank.</p> <p>3. GIVEN where the schedule_relationship is equal to 'ADDED' THEN this field is to contain the 'TripID' along with '_' (underscore) AND the number of the instance. For example if there is a trip running with a trip id '249451' and there is an additional trip running with the same trip id then the second trip id will be appended with '_2' to show that it is the second service. Similarly if there are two additional services running then their trip id will be appended with '_2' and '_3'.</p> |
| route_id     | string | optional    | The route_id from the GTFS that this selector refers to.  | <p>1. This field will be equivalent of the following concatenation - 'TodisContractID_TodisRouteID'</p> <p>2. GIVEN where an 'unscheduled' trip is being serviced (i.e. a valid route id and route variant number is available in the LIM but it cannot be associated with any trips in the schedule) THEN this field will be populated with the 'RouteID' received in the LIM.</p>  |
| direction_id | uint32 | optional    | The direction_id from the GTFS feed trips.txt file, indicating the direction of travel for trips this selector refers to. | N/A  |
| start_time   | string | optional    | The initially scheduled start time of this trip instance. When the trip_id corresponds to a non-frequency-based           | <p>1. This is to be equivalent of the trip start time associated with the trip ID in the schedule.</p> <p>2. GIVEN where a trip id is not available and route</p>  |



| Field Name | Type   | Cardinality | Description  | TfNSW Rules   |
|------------|--------|-------------|--|---|
|            |        |             | <p>trip, this field should either be omitted or be equal to the value in the GTFS feed. When the trip_id corresponds to a frequency-based trip, the start_time must be specified for trip updates and vehicle positions. If the trip corresponds to exact_times=1 GTFS record, then start_time must be some multiple (including zero) of headway_secs later than frequencies.txt start_time for the corresponding time period. If the trip corresponds to exact_times=0, then its start_time may be arbitrary, and is initially expected to be the first departure of the trip. Once established, the start_time of this frequency-based trip should be considered immutable, even if the first departure time changes -- that time change may instead be reflected in a StopTimeUpdate. Format and semantics of the field is same as that of GTFS/frequencies.txt/start_time, e.g., 11:15:35 or 25:15:35.</p> | <p>id (and route variant number) cannot be mapped to the trips in the schedule THEN this field will be blank.</p>   |
| start_date | string | optional    | <p>The scheduled start date of this trip instance. This field must be provided to disambiguate trips that are so late as to collide with a scheduled trip on a next day. For example, for a train that departs 8:00 and 20:00 every day, and is 12 hours late, there would be two distinct trips on the same time. This field can be</p>   | <ol style="list-style-type: none"> <li>1. This is to be equivalent of the trip start date associated with the trip ID in the schedule.</li> <li>2. GIVEN where a trip id is not available and route id (and route variant number) cannot be mapped to the trips in the schedule THEN this field will contain the present date.</li> </ol> |

| Field Name            | Type                 | Cardinality | Description  | TfNSW Rules   |
|-----------------------|----------------------|-------------|--|---|
|                       |                      |             | provided but is not mandatory for schedules in which such collisions are impossible - for example, a service running on hourly schedule where a vehicle that is one hour late is not considered to be related to schedule anymore. In YYYYMMDD format. |   |
| schedule_relationship | ScheduleRelationship | optional    | The default relationship is SCHEDULED.   | <ol style="list-style-type: none"> <li>1. Refer to section 'Schedule Relationship' below for mapping.</li> <li>2. GIVEN where none of the mappings are applicable THEN this field will be blank.</li> </ol> |

#### 6.1.1.1.1 Schedule Relationship

| Field Name  | Description  | TfNSW Rules   |
|-------------|--|---|
| SCHEDULED   | Trip that is running in accordance with its GTFS schedule, or is close enough to the scheduled trip to be associated with it.                    | <p>GIVEN no other trip with same 'OSDVehicJourneyId' is in progress<br/>           WHEN trip entity is created<br/>           THEN the schedule relationship for the trip will be 'SCHEDULED'</p> |
| ADDED       | An extra trip that was added in addition to a running schedule, for example, to replace a broken vehicle or to respond to sudden passenger load. | <p>GIVEN another trip with same 'OSDVehicJourneyId' is in progress<br/>           WHEN trip entity is created<br/>           THEN the schedule relationship for the trip will be 'ADDED'</p>      |
| UNSCHEDULED | A trip that is running with no schedule associated to it, for example, if there is no schedule at all.   | <p>GIVEN driver has logged into an unscheduled trip</p>   |

| Field Name | Description  | TfNSW Rules  |
|------------|--|--|
|            |  | <p>AND has provided the Route ID</p> <p>AND has provided the Route Variant Number</p> <p>WHEN trip entity is created</p> <p>THEN the schedule relationship for the trip will be 'UNSCHEDULED'</p>    |
| CANCELED   | A trip that existed in the schedule but was removed. | <p>GIVEN a trip in PTIPS is cancelled</p> <p>WHEN trip updates feed is generated</p> <p>AND it contains a cancelled trip</p> <p>THEN the 'schedule_relationship' for the trip will be 'CANCELED'</p> |

### 6.1.1.2 Vehicle Descriptor

| Field Name | Type   | Cardinality | Description   | TfNSW Rules  |
|------------|--------|-------------|---|--|
| id         | string | optional    | Internal system identification of the vehicle. Should be unique per vehicle, and is used for tracking the vehicle as it proceeds through the system. This id should not be made visible to the end-user; for that purpose use the label field | <ol style="list-style-type: none"> <li>1. This field will be the concatenation of the following -<br/>&lt;OperatorID&gt;_&lt;TODISTRIPID&gt;_&lt;TodisContractID&gt;_&lt;TodisRouteID&gt;_&lt;TripInstanceNumber&gt;</li> <li>2. GIVEN where any of the information in the concatenation is not available THEN it will be replaced with an 'underscore' ( _ ). For example if 'TODISTRIPID' is not available then the concatenation will look like -<br/>&lt;OperatorID&gt;_&lt;_&gt;_&lt;TodisContractID&gt;_&lt;TodisRouteID&gt;_&lt;TripInstanceNumber&gt;</li> </ol> |

| Field Name    | Type   | Cardinality | Description  | TfNSW Rules  |
|---------------|--------|-------------|--|--|
|               |        |             |  | NOTE: TripInstanceNumber is the ordered number (1,2,3....) of buses based on when the driver pushed driver trip start. |
| label         | string | optional    | User visible label, i.e. something that must be shown to the passenger to help identify the correct vehicle. | N/A  |
| license_plate | string | optional    | The license plate of the vehicle.  | N/A  |

### 6.1.1.3 StopTimeUpdate

| Field Name    | Type                   | Cardinality | Description   | TfNSW Rules  |
|---------------|------------------------|-------------|---|--|
| stop_sequence | uint32                 | optional    | Must be the same as in stop_times.txt in the corresponding GTFS feed. | 1. This field will be populated from the 'PTIPS_OperatingDayRoutePaths' view and map to the sequence number in that view   |
| stop_id       | <a href="#">string</a> | optional    | Must be the same as in stops.txt in the corresponding GTFS feed.      | <ol style="list-style-type: none"> <li>For each trip listed as per the schedule, all the related stop ID's will be listed</li> <li>For all the 'unscheduled' trips listed (i.e. a valid route id and route variant number is available in the LIM but it cannot be associated with any trips in the schedule), all the related stop ID's will be listed</li> </ol> |

| Field Name            | Type                                 | Cardinality | Description                            | TfNSW Rules                                    |
|-----------------------|--------------------------------------|-------------|--|--|
| arrival               | <a href="#">StopTimeEvent</a>        | optional    |  | Refer to section 'StopTimeEvent' below         |
| departure             | <a href="#">StopTimeEvent</a>        | optional    |  | Refer to section 'StopTimeEvent' below         |
| schedule_relationship | <a href="#">ScheduleRelationship</a> | optional    | The default relationship is SCHEDULED. | Refer to section 'Schedule Relationship' below |

#### 6.1.1.3.1 StopTimeEvent

| Field Name | Type                  | Cardinality | Description  | TfNSW Rules   |
|------------|-----------------------|-------------|--|---|
| delay      | <a href="#">int32</a> | optional    | Delay (in seconds) can be positive (meaning that the vehicle is late) or negative (meaning that the vehicle is ahead of schedule). Delay of 0 means that the vehicle is exactly on time. | <ol style="list-style-type: none"> <li>1. GIVEN the arrival field is to be populated in the 'StopTimeUpdate' entity THEN one of the following conditions will apply: <ol style="list-style-type: none"> <li>a. For a particular 'TSN', compare the predicted arrival time for that 'TSN' with the scheduled arrival time and if there is delay then convert it in seconds and populate this field with it.</li> <li>b. For a particular 'TSN', compare the predicted arrival time for that 'TSN' with the scheduled arrival time and if it is early then convert it in seconds, prefix it with '-' symbol and populate this field with it.</li> <li>c. For a particular 'TSN', compare the predicted arrival time for that 'TSN' with the scheduled arrival time and if there no difference then populate this field</li> </ol> </li> </ol> |

| Field Name | Type                  | Cardinality | Description  | TfNSW Rules   |
|------------|-----------------------|-------------|--|---|
|            |                       |             |  | <p>with 0.</p> <p>d. For a particular 'TSN', if a prediction is not available then populate this field with 0.</p> <p>2. GIVEN the departure field is to be populated in the 'StopTimeUpdate' entity THEN one of the following conditions will apply:</p> <p>a. For a particular 'TSN', compare the predicted departure time for that 'TSN' with the scheduled departure time and if there is delay then convert it in seconds and populate this field with it.</p> <p>b. For a particular 'TSN', compare the predicted departure time for that 'TSN' with the scheduled departure time and if it is early then convert it in seconds, prefix it with '-' symbol and populate this field with it.</p> <p>c. For a particular 'TSN', compare the predicted departure time for that 'TSN' with the scheduled departure time and if there no difference then populate this field with 0.</p> <p>d. For a particular 'TSN', if a prediction is not available then populate this field with 0.</p> |
| time       | <a href="#">int64</a> | optional    | Event as absolute time. In POSIX time (i.e., number of seconds since January 1st 1970 00:00:00 UTC). | <p>1. GIVEN the arrival field is to be populated in the 'StopTimeUpdate' entity THEN this field is to contain the predicted arrival time when the bus will be arriving at the TSN.</p> <p>2. GIVEN the departure field is to be populated in the 'StopTimeUpdate' entity THEN this field is</p>   |

| Field Name  | Type  | Cardinality | Description  | TfNSW Rules   |
|-------------|-------|-------------|--|---|
|             |       |             |  | <p>to contain the predicted departure time when the bus will be departing from the TSN.</p> <p>3. GIVEN where the arrival field is to be populated AND the predicted arrival time is not available AND the scheduled arrival time is more than the feed generation time THEN this field is to be populated with the scheduled arrival time ELSE this field is to be blank.</p> <p>4. GIVEN the departure field is to be populated AND the predicted departure time is not available AND the scheduled departure time is more than the feed generation time THEN this field is to be populated with the scheduled departure time ELSE this field is to be blank.</p> <p>5. GIVEN the arrival field is to be populated AND the bus is on pre-journey THEN arrival time at the TSNs in the trip updates feed is to contain scheduled time rather than predicted time.</p> <p>6. GIVEN the departure field is to be populated AND the bus is on pre-journey THEN departure time at the TSNs in the trip updates feed is to contain scheduled time rather than predicted time.</p> |
| uncertainty | int32 | optional    | If uncertainty is omitted, it is interpreted as unknown. To specify a completely certain prediction, set its uncertainty to 0. | GIVEN a 'TripID' is available AND prediction is available THEN this field will be populated with 0 ELSE this field will be blank  |

### 6.1.1.3.2 Schedule Relationship

| Field Name | Description  | TfNSW Rules  |
|------------|--|--|
| SCHEDULED  | The vehicle is proceeding in accordance with its static schedule of stops, although not necessarily according to the times of the schedule. This is the default behaviour. At least one of arrival and departure must be provided. If the schedule for this stop contains both arrival and departure times then so must this update. | <ol style="list-style-type: none"> <li>1. For each trip listed as per the schedule, if a vehicle is associated then this option will be selected for that trip</li> <li>2. For each 'unscheduled' trip listed (i.e. a valid route id and route variant number is available in the LIM but it cannot be associated with any trips in the schedule), this option will be selected for that trip</li> </ol> |
| SKIPPED    | The stop is skipped, i.e., the vehicle will not stop at this stop. Arrival and departure are optional.   | <ol style="list-style-type: none"> <li>1. GIVEN the scheduled arrival time at a TSN is less than the feed generation time THEN the 'schedule_relationship' field in the 'StopTimeUpdate' entity of the trip updates feed will be populated with a value of 'SKIPPED'.</li> </ol>   |
| NO_DATA    | No data is given for this stop. It indicates that there is no realtime information available. When set NO_DATA is propagated through subsequent stops so this is the recommended way of specifying from which stop you do not have realtime information. When NO_DATA is set neither arrival nor departure should be supplied.       | <ol style="list-style-type: none"> <li>1. GIVEN predictions are not available for TSN(s) THEN this option is to be selected for those TSN(s).</li> </ol>   |



## 6.2 Vehicle Position Updates Message

| Message Structure  | Example Values  |
|--|---|
| <pre> header {   gtfs_realtime_version: "1.0"   incrementality: FULL_DATASET   timestamp: } entity {   id: ""   vehicle   {     trip     {       trip_id: ""       start_time: ""       start_date: ""       schedule_relationship:       route_id: ""     }     position     {       latitude:       longitude:       bearing:       speed:     }     timestamp:     congestion_level:     vehicle     {       id: ""       [transit_realtime.tfnsw_vehicle_descriptor]       {         air_conditioned:         wheelchair_accessible:         vehicle_model:         special_vehicle_attributes:       }     }     occupancy_status:   } } </pre> | <pre> header {   gtfs_realtime_version: "1.0"   incrementality: FULL_DATASET   timestamp: 1471916328 } entity {   id: "33553_11215410_2436_T66_1"   vehicle   {     trip     {       trip_id: "300116"       start_time: "11:00:00"       start_date: "20160823"       schedule_relationship: SCHEDULED       route_id: "2436_T66"     }     position     {       latitude: -33.681965       longitude: 150.92903       bearing: 302.0       speed: 18.6     }     timestamp: 1471916324     congestion_level: RUNNING_SMOOTHLY     vehicle     {       id: "33553_11215410_2436_T66_1"       [transit_realtime.tfnsw_vehicle_descriptor]       {         air_conditioned: true         wheelchair_accessible: 0         vehicle_model: "Mercedes~O405NH~Custom Coaches~CUSTOMCITARO"         special_vehicle_attributes: 2       }     }     occupancy_status: MANY_SEATS_AVAILABLE   } } </pre> |

## 6.2.1 Vehicle Position Updates Message

| Field Name | Type                                  | Cardinality | Description  | TfNSW Rules   |
|------------|---------------------------------------|-------------|--|---|
| id         | int32                                 | required    | Unique identity for each trip entity   | <ol style="list-style-type: none"> <li>1. This field will be the concatenation of the following -<br/>&lt;OperatorID&gt;_&lt;TODISTRIPID&gt;_&lt;TodisContractID&gt;_&lt;TodisRouteID&gt;_&lt;TripInstanceNumber&gt;</li> <li>2. GIVEN where any of the information in the concatenation is not available THEN it will be replaced with an 'underscore' ( _ ). For example if 'TODISTRIPID' is not available then the concatenation will look like -<br/>&lt;OperatorID&gt;_&lt;_&gt;_&lt;TodisContractID&gt;_&lt;TodisRouteID&gt;_&lt;TripInstanceNumber&gt;</li> <li>3. GIVEN a trip in PTIPS is canceled<br/>AND there are one or more vehicles associated with the trip<br/>AND one or more of the associated vehicles have serviced one or more TSNs of the trip<br/>WHEN vehicle position updates feed is generated<br/>AND it contains the vehicle that is associated with the canceled trip<br/>THEN the vehicle information is to be removed from the vehicle position updates feed</li> </ol> |
| trip       | <a href="#">TripDescription</a><br>or | optional    | The Trip that this vehicle is serving. Can be empty or partial if the vehicle cannot be identified with a given trip instance. | <ol style="list-style-type: none"> <li>1. All the trips that should be in progress as per the schedule are listed up to the configured time period of 120 minutes in the past.</li> <li>2. All the trips that will be running in the future (up to the configured time period, by default 60 minutes), as per the schedule are listed</li> </ol>  |

|                       |                                   |          |  |  |
|-----------------------|-----------------------------------|----------|--|--|
|                       |                                   |          |  | <ol style="list-style-type: none"> <li>3. All the trips that are currently in progress, sending a LIM containing no Trip ID but a valid 'RouteID' and 'RouteVarNum' (that cannot be associated with any of the Trip ID's in the schedule) are listed.</li> <li>4. For all other cases, refer to section 'Trip Descriptor' below.</li> </ol>  |
| vehicle               | <a href="#">VehicleDescriptor</a> | optional | Additional information on the vehicle that is serving this trip. Each entry should have a unique vehicle id.   | <ol style="list-style-type: none"> <li>1. GIVEN driver has logged into the trip<br/>WHEN trip updates feed is created<br/>AND the trip is part of the feed<br/>THEN the vehicle information will be included for the trip</li> <li>2. GIVEN bus is on pre-journey (i.e. bus has not departed from the first TSN)<br/>WHEN trip updates feed is created<br/>AND the trip is part of the feed<br/>THEN the vehicle information is to be removed for the trip.</li> <li>3. For all other cases, refer to section 'Vehicle Descriptor' below for field mapping rules that are applicable to this field.</li> </ol> |
| position              | <a href="#">Position</a>          | optional | Current position of this vehicle.  | <ol style="list-style-type: none"> <li>1. Refer to section 'Position' below</li> </ol>   |
| current_stop_sequence | uint32                            | optional | The stop sequence index of the current stop. The meaning of current_stop_sequence (i.e., the stop that it refers to) is determined by current_status. If current_status is missing IN_TRANSIT_TO is assumed. |  |
| stop_id               | string                            | optional | Identifies the current stop. The value   | This field is equivalent of 'TSN' sent in the message  |

|   |                                  |          |   |   |
|---|----------------------------------|----------|---|---|
|   |                                  |          | must be the same as in stops.txt in the corresponding GTFS feed.  | from the bus  |
| current_status                            | VehicleStopStatus                | optional | The exact status of the vehicle with respect to the current stop. Ignored if current_stop_sequence is missing.                          | Refer to section 'Vehicle Stop Status' below  |
| timestamp                                 | <a href="#">uint64</a>           | optional | Moment at which the vehicle's position was measured. In POSIX time (i.e., number of seconds since January 1st 1970 00:00:00 UTC).       | This field is equivalent of 'ConsoleTime' in the message received from the bus  |
| congestion_level                          | <a href="#">Congestion Level</a> | optional |   | Refer to section 'Congestion Level' below   |
| Occupancy_status                          | OccupancyStatus                  | optional | The degree of passenger occupancy of the vehicle  | Refer to section 'Occupancy Status' below   |
| Transit_realtime.tfnsw_vehicle_descriptor | User Extension                   | optional | Include following information about the bus in service: Air-conditioning is available or not and Wheelchair access is available or not. | <p>This field contains following information:</p> <ul style="list-style-type: none"> <li>• Air-conditioning availability – sent as a 'True/False' value</li> <li>• Wheelchair access availability – sent as a bit value – 0 being not available and 1 being available</li> <li>• Vehicle Model – this field will be a combination of the following information - vehicleManufacturerName, chassisName, vehicleBodyManufacturerName and bodyName; separated by tilde (~). E.g. Mercedes~O405NH~Custom Coaches~CUSTOMCITARO</li> <li>• Special vehicle attributes – sent as an integer representing a bitmask:</li> </ul> |

|  |  |  |  |   |
|--|--|--|--|---|
|  |  |  |  | <ul style="list-style-type: none"> <li>○ 1 (0001) – STA 85<sup>th</sup> Anniversary Bus</li> <li>○ 2 (0010) – Wi-Fi availability</li> <li>○ 4 (0100) – Christmas Bus</li> </ul> <p>Example:<br/> special_vehicle_attributes = 4<br/> is a Christmas Bus.<br/> special_vehicle_attributes = 2   4 = 6<br/> is a Christmas Bus with Wi-Fi availability.<br/> special_vehicle_attributes = 2   1 = 3<br/> is an STA 85<sup>th</sup> Anniversary bus with Wi-Fi availability.</p> |
|--|--|--|--|---|

### 6.2.1.1 Trip Descriptor

| Field Name | Type                   | Cardinality | Description   | Example  |
|------------|------------------------|-------------|---|--|
| trip_id    | <a href="#">string</a> | optional    | The trip_id from the GTFS feed that this selector refers to. For non frequency expanded trips, this field is enough to uniquely identify the trip. For frequency expanded, start_time and start_date might also be necessary. | <ol style="list-style-type: none"> <li>1. This field will be mapped to the following field in the PTIPS database – OSDVehicleJourneyId</li> <li>2. GIVEN a trip id is not available and route id (and route variant number) cannot be mapped to the trips in the schedule THEN this field will be blank.</li> </ol>  |
| route_id   | string                 | optional    | The route_id from the GTFS that this selector refers to.  | <ol style="list-style-type: none"> <li>1. This field will be equivalent of the following concatenation - 'TodisContractID_TodisRouteID'</li> <li>2. GIVEN an 'unscheduled' trip is being serviced (i.e. a valid route id and route variant number is available in the LIM but it cannot be associated with any trips in the schedule) THEN this field will be populated with the 'RouteID' received in the LIM.</li> </ol> |

| Field Name   | Type   | Cardinality | Description  | Example   |
|--------------|--------|-------------|--|---|
| direction_id | uint32 | optional    | The direction_id from the GTFS feed trips.txt file, indicating the direction of travel for trips this selector refers to.  |   |
| start_time   | string | optional    | The scheduled start time of this trip instance. This field should be given only if the trip is frequency-expanded in the GTFS feed. The value must precisely correspond to start_time specified for the route in the GTFS feed plus some multiple of headway_secs. Format of the field is same as that of GTFS/frequencies.txt/start_time, e.g., 11:15:35 or 25:15:35.   | <ol style="list-style-type: none"> <li>1. This is to be equivalent of the trip start time associated with the trip ID in the schedule.</li> <li>2. GIVEN where a trip id is not available and route id (and route variant number) cannot be mapped to the trips in the schedule THEN this field will be blank.</li> </ol>                 |
| start_date   | string | optional    | The scheduled start date of this trip instance. This field must be provided to disambiguate trips that are so late as to collide with a scheduled trip on a next day. For example, for a train that departs 8:00 and 20:00 every day, and is 12 hours late, there would be two distinct trips on the same time. This field can be provided but is not mandatory for schedules in which such collisions are impossible - for example, a service running on hourly schedule where a vehicle that is one hour late is not considered to be related to schedule anymore. In YYYYMMDD | <ol style="list-style-type: none"> <li>1. This is to be equivalent of the trip start date associated with the trip ID in the schedule.</li> <li>2. GIVEN where a trip id is not available and route id (and route variant number) cannot be mapped to the trips in the schedule THEN this field will contain the present date.</li> </ol> |

| Field Name            | Type                  | Cardinality | Description | Example   |
|-----------------------|-----------------------|-------------|-------------|---|
|                       |                       |             | format.     |   |
| schedule_relationship | Schedule Relationship | optional    |             | <ol style="list-style-type: none"> <li>1. Refer to section 'Schedule Relationship' below for mapping.</li> <li>2. Given where none of the mappings are applicable THEN this field will be blank.</li> </ol> |

#### 6.2.1.1.1 Schedule Relationship

| Field Name  | Description  | TfNSW Rules  |
|-------------|--|--|
| SCHEDULED   | Trip that is running in accordance with its GTFS schedule, or is close enough to the scheduled trip to be associated with it.                    | GIVEN NO other trip with same 'OSDVehicleJourneyId' is in progress<br>WHEN trip entity is created<br>THEN the schedule relationship for the trip will be 'SCHEDULED'   |
| ADDED       | An extra trip that was added in addition to a running schedule, for example, to replace a broken vehicle or to respond to sudden passenger load. | GIVEN another trip with same 'OSDVehicleJourneyId' is in progress<br>WHEN trip entity is created<br>THEN the schedule relationship for the trip will be 'ADDED'  |
| UNSCHEDULED | A trip that is running with no schedule associated to it, for example, if there is no schedule at all.   | GIVEN driver has logged into an unscheduled trip<br>AND has provided the Route ID<br>AND has provided the Route Variant Number<br>WHEN trip entity is created<br>THEN the schedule relationship for the trip will be 'UNSCHEDULED' |
| CANCELED    | A trip that existed in the schedule but was removed.   |  |

### 6.2.1.2 Vehicle Descriptor

| Field Name    | Type                   | Cardinality | Description   | TfNSW Rules  |
|---------------|------------------------|-------------|---|--|
| id            | <a href="#">string</a> | optional    | Internal system identification of the vehicle. Should be unique per vehicle, and is used for tracking the vehicle as it proceeds through the system. This id should not be made visible to the end-user; for that purpose use the label field | <ol style="list-style-type: none"> <li>1. This field will be the concatenation of the following -<br/>           &lt;OperatorID&gt;_&lt;TODISTRIPID&gt;_&lt;TodisContractID&gt;_&lt;TodisRouteID&gt;_&lt;TripInstanceNumber&gt;</li> <li>2. GIVEN where any of the information in the concatenation is not available THEN it will be replaced with an 'underscore' ( _ ). For example if 'TODISTRIPID' is not available then the concatenation will look like -<br/>           &lt;OperatorID&gt;_&lt;_&gt;_&lt;TodisContractID&gt;_&lt;TodisRouteID&gt;_&lt;TripInstanceNumber&gt;<br/>           NOTE: TripInstanceNumber is the ordered number (1,2,3....) of buses based on when they pushed driver trip start and trayid (in case they push start at the same time).</li> </ol> |
| label         | <a href="#">string</a> | optional    | User visible label, i.e., something that must be shown to the passenger to help identify the correct vehicle.   |  |
| license_plate | <a href="#">string</a> | optional    | The license plate of the vehicle.   |  |



### 6.2.1.3 Position

| Field Name | Type                   | Cardinality | Description  | TfNSW Rules   |
|------------|------------------------|-------------|--|---|
| latitude   | <a href="#">float</a>  | required    | Degrees North, in the WGS-84 coordinate system.  | This field is equivalent of 'Latitude' received in the message from the bus.  |
| longitude  | <a href="#">float</a>  | required    | Degrees East, in the WGS-84 coordinate system.   | This field is equivalent of 'Longitude' received in the message from the bus. |
| bearing    | <a href="#">float</a>  | optional    | Bearing, in degrees, clockwise from True North, i.e., 0 is North and 90 is East. This can be the compass bearing, or the direction towards the next stop or intermediate location. This should not be deduced from the sequence of previous positions, which clients can compute from previous data. | This field is equivalent of 'Bearing' received in the message from the bus.   |
| odometer   | <a href="#">double</a> | optional    | Odometer value, in meters.   |   |
| speed      | <a href="#">float</a>  | optional    | Momentary speed measured by the vehicle, in meters per second.   | This field is equivalent of 'Velocity' received in the message from the bus.  |

### 6.2.1.4 Vehicle Stop Status

| Value             | Description  | TfNSW Rules |
|-------------------|--|-------------|
| INCOMING_AT       | The vehicle is just about to arrive at the stop (on a stop display, the vehicle symbol typically flashes). |             |
| STOPPED_AT        | The vehicle is standing at the stop.   |             |
| IN_TRANSIT_T<br>O | The vehicle has departed the previous stop and is in transit.  |             |

### 6.2.1.5 Congestion Level

Following is the notation for the mathematical formulas below:

$\bar{x}$  = mean average

$\sigma_{\text{Long}}$  = Long term standard deviation

$\bar{x}_{\text{Long}}$  = mean Long term average

$\bar{x}_{\text{short}}$  = mean Short term average

| Value                    | TfNSW Rules   |
|--------------------------|---|
| UNKNOWN_CONGESTION_LEVEL | Unknown is when the short term average is not known. I.e. $\bar{x}_{\text{short}}$ has no value                             |
| RUNNING_SMOOTHLY         | $\bar{x}_{\text{Long}} + \sigma_{\text{Long}} > \bar{x}_{\text{short}}$   |
| STOP_AND_GO              | $\bar{x}_{\text{Long}} + \sigma_{\text{Long}} \leq \bar{x}_{\text{short}} < \bar{x}_{\text{Long}} + 2\sigma_{\text{Long}}$  |
| CONGESTION               | $\bar{x}_{\text{Long}} + 2\sigma_{\text{Long}} \leq \bar{x}_{\text{short}} < \bar{x}_{\text{Long}} + 3\sigma_{\text{Long}}$ |
| SEVERE_CONGESTION        | $\bar{x}_{\text{Long}} + 3\sigma_{\text{Long}} \leq \bar{x}_{\text{short}}$   |

### 6.2.1.6 Occupancy Status

| Field Name           | Description  | TfNSW Rules   |
|----------------------|--|---|
| EMPTY                | The vehicle is considered empty by most measures, and has few or no passengers onboard, but is still accepting passengers.   |   |
| MANY_SEATS_AVAILABLE | The vehicle has a large percentage of seats available. What percentage of free seats out of the total seats available is to be considered large enough to fall into this category is determined at the discretion of the producer. | <p>GIVEN the count of the number of passengers received in the LIM from the bus is 50% or less than the seating capacity of the bus (based on the feed received from the 'Bus Fleet Management System')</p> <p>WHEN feed is created</p> <p>THEN this option is to be selected for populating the occupancy status.</p>            |
| FEW_SEATS_AVAILABLE  | The vehicle has a small percentage of seats available. What percentage of free seats out of the total seats available is to be considered small enough to fall into this category is determined at the discretion of the producer. | <p>GIVEN where the count of the number of passengers received in the LIM from the bus is equal to or less than the seating capacity of the bus (based on the feed received from the 'Bus Fleet Management System')</p> <p>WHEN feed is created</p> <p>THEN this option is to be selected for populating the occupancy status.</p> |
| STANDING_ROOM_ONLY   | The vehicle can currently accommodate only standing passengers.  | <p>GIVEN where the count of the number of passengers received in the LIM from the bus is greater than the seating capacity of the bus (based on the feed received from the 'Bus Fleet Management System')</p> <p>WHEN feed is created</p> <p>THEN this option is to be selected for populating the occupancy status.</p>          |

| Field Name                 | Description   | TfNSW Rules |
|----------------------------|---|-------------|
| CRUSHED_STANDING_ROOM_ONLY | The vehicle can currently accommodate only standing passengers and has limited space for them.  |             |
| FULL                       | The vehicle is considered full by most measures, but may still be allowing passengers to board. |             |
| NOT_ACCEPTING_PASSENGERS   | The vehicle cannot accept passengers.   |             |