

Transport for NSW

GTFS Schedule & GTFS Realtime TfNSW Implementation Specification

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Document Control

Revision History

Version	Author	Issue Date	Changes
0.6	Donald Garlick	31 Oct 2017	Initial draft
0.7	Beth Beveridge	15 Aug 2018	Edits to clarify cancelled trip handling & other minor changes based on GTFS working group feedback.
1.0	Beth Beveridge David Ling	25 Jun 2019	- Add in scenarios and business rules. - Add sample GTFS/GTFS-R messages to demonstrate scenarios - Promoting to major version 1.0
1.0.1	Arvind Balakrishna	4 Jul 2019	- Adding extension in GTFS-R for demand response - Cancelled trip clarification
1.0.2	Heroly Chour	4 May 2020	Occupancy level clarification
1.0.3	Beth Beveridge	12 Dec 2020	Remove Phone number from Agency file. NO longer required by TfNSW
1.0.4	Beth Beveridge	4 Feb 2021	Added character length to trip_note and stop_notes
2.0	Beth Beveridge Terence Khoo Tiffany Wang Cindy Huynh Lincy Joseph	May 2025	- Remove TfNSW operator specific details to support generic TfNSW GTFS implementation specification. Operator/Data supplier specific's will be defined in the TfNSW operator GTFS Interface Agreement - Remove duplication with the International Base GTFS spec. - Update to currently application of GTFS at TfNSW - Added missing feed txt files used at TfNSW - Formatting update

Distribution List

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References

Document Name	Network Location or Documentation Link
International Base Transit Feed Specification	https://gtfs.org/
GTFS Extended route types	https://developers.google.com/transit/gtfs/reference/extended-route-types
GTFS Vehicle extension	https://docs.google.com/document/d/156RiBjI6FnWJvO8_XWX11Q9nLdOiBdS_rilA-oamlv8/edit?tab=t.0#heading=h.ac0wjxpkjnfo
TfNSW Carriage Descriptor extension 1007	https://groups.google.com/forum/#!topic/gtfs-realtime/G75O1zyQS_Q

Definitions, Acronyms and Abbreviations

Acronym/Term	Definition
TfNSW	Transport for NSW (TfNSW) is the lead NSW Government agency of the NSW Transport cluster. The role of TfNSW to lead the development of a safe, efficient, integrated transport system that keeps people and goods moving, connects communities and shapes the future of NSW cities, centres and regions.
TSN	Transit Stop Number, is the number applied to all transit stops in NSW for all modes. There are TSN for both Parent and child stop TSN TSN starts with the NSW Postcode of where the stop is located

1 Overview

1.1 GTFS Overview

The GTFS (General Transit Feed Specification) feed provides static timetabling information about a transit network, including stops, routes, trip schedules, trip route path and details about the transit agency operating the trips. This static data enables customers to plan trips and access trip information. In addition to static data the GTFS feed also contains Realtime information about the services. This realtime data provided Realtime service status, vehicle position for trips that are currently running, and predictions for upcoming stops, and trips due to run after the vehicle completes its current trip.

This document specifies the files included in the GTFS Schedule feed and the GTFS realtime feed, along with descriptions of each field and its meaning.

The bundle and Realtime components of the feed both conform to the international GTFS specification. There are some fields which are not requirements of the international GTFS specification but are permissible extensions.

The GTFS Schedule feed consists of multiple comma-delimited text files bundled into a single ZIP file. Each txt file contains scheduled information related to a different network aspect, such as `stop_times.txt`, which details the scheduled information and order of stops per for different trip.

The GTFS Realtime feed contains three component files encoded in Protocol Buffers format: Trip Updates, Vehicle Position and Service Alerts. All these three files are in protocol buffers format. Protocol buffers, enable efficient data serialization. Trip descriptors in these components specify the scheduled trips being tracked with realtime service status updates and predictions for future stops and trips.

The trip update file provides information about which stops have been completed by the running trip. It also contains information about the deviation between the actual arrival and scheduled arrival times as well as the actual and scheduled departure times for each of the stops.

The vehicle position file contains positional information for each of the currently running trips. The positional information includes a longitude, latitude and bearing. It also contains information about the vehicle, e.g. vehicle model, license number and if it is wheelchair accessible.

The service alerts file contains any alerts information that is applicable to stops, trips and routes. It informs the customers of any incident or disruption to their trip.

1.2 Purpose

The TfNSW GTFS and GTFS R Implementation Specification is required to:

1. Localise the International Base GTFS and GTFS R specification managed by MobilityData to TfNSW needs
2. Reduce the complexity and risk of implementation e.g. there are multiple ways of implementing GTFS to achieve the same or similar outcome, this specification 'localises' the implementation to a single way, based on best practise, communications and processing efficiency, and requirements.
3. Ensure consistent interpretation of the International Base GTFS and GTFS R specification

4. Describe relevant TfNSW business rules that are necessarily absent from the International Base GTFS and GTFS R specification
5. Define GTFS and GTFS R information sharing rules
6. Define common terminology

This TfNSW GTFS and GTFS Realtime implementation specification must be used with the base International Base GTFS and GTFS Realtime specification managed by MobilityData.

This comprehensive approach ensures the feed meets both international GTFS standards and local requirements defined by TfNSW

The GTFS and GTFS international and TfNSW Implementation Specification provide detailed guidelines of how the information is to be provided in the GTFS.txt files for the schedule data and in the GTFS real-time message feeds.

To ensure accurate information provided in the GTFS Schedule and GTFS Realtime feeds have dependency on solid understanding of the contextual planned and unplanned operational running scenarios, as well as the expected operational and customer outcomes. These contextual running scenarios plans inform the required GTFS Schedule and GTFS Realtime use case responses to achieve the expected operational and customer outcomes.

The agreed-upon use case GTFS response defined based on the International and the TfNSW Implementation specifications, form the basis for the development of the TfNSW Operator GTFS Schedule and GTFS Realtime Interface Agreement. This agreement is established at the start of the GTFS feed development and is updated as necessary throughout the lifecycle of the GTFS and GTFS Realtime feed to reflect changes that made to;

- in response to changes in operational plans,
- support improved customer information,
- in response to the changes to the International GTFS specification were adopted by TfNSW.

Refer to the International GTFS Schedule and GTFS Realtime specification here:

<https://gtfs.org/>

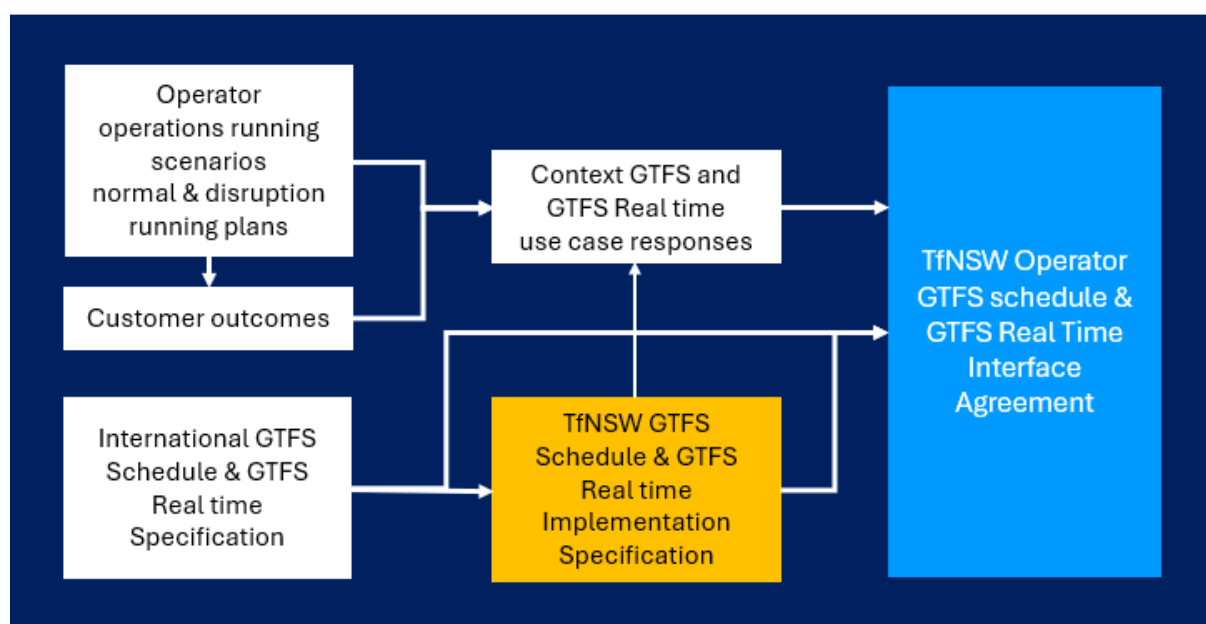


Figure 1: GTFS and GTFS Realtime context at TfNSW.

TfNSW also uses GTFS extensions to be able to achieve operational and customer outcome needs.

These include:

1. GTFS Extended route types
2. GTFS Vehicle extension
3. TfNSW Carriage Descriptor Extension 1007 – Approved 2017

Links to these can be found in the reference section.

1.3 Collaboration with Mobility Data

Mobility Data is the international organisation responsible for the oversee development and governance of the International Base GTFS Schedule and GTFS Realtime specification. TfNSW is a platinum member of the group and with other members contributes to the development of the International Base GTFS and GTFS R specification to continually improve and support the different scenarios at TfNSW and support alignment of GTFS and GTFS R internationally.

To find out more about MobilityData visit <https://mobilitydata.org/>

1.4 Data Feed Distribution and Access

The GTFS and GTFS R feed data will be distributed to TfNSW Customers and the wider community via the TfNSW Open Data Hub website.

Data consumers can access the GTFS Schedule and GTFS Realtime feeds by sending a HTTP GET request to the appropriate endpoint URL in Open Data Hub. There are multiple endpoint URLs for all transport services' feeds.

Access to these endpoints URLs is via TfNSW Open Data Hub after registration on the website. <https://opendata.transport.nsw.gov.au>

2 Timetable Data Feed – General Requirements

2.1 Scope

- Data providers are to provide timetable data for a minimum of **90 calendar** days of timetable data and changes to the timetables

Type	Change description	Days in advance
Standard/Base service timetable	Changes to a base timetable on going (including but not limited to changes to stops, route path, time updates, trips, routes (new/removed))	42
Short term change	Changes or supplement to base timetable for a short, medium period of time that will expire, and the timetable will return to the base timetable for example summer holiday timetables, events timetables, replacement.	21
Day of	Changes that are not planned and need to be made days or at least the day prior for an unplanned short term timetable changes to address an incident, stop work, road closure. Any changes on the day must be made and provided via GTFS Realtime information.	21 to 1

- GTFS data provisioned to TfNSW must adhere to specific standards and business rules (as detailed in this document and in the *Operator GTFS Schedule and GTFS Realtime Interface Agreement* developed at the time of delivery) to ensure the required level of data richness and consistency is delivered to downstream systems to support customer information (e.g., the Transport.info website, mobile and web applications) and transport operations.

2.2 Files

- Timetable schedule data is to be provided to TfNSW in accordance with the **General Transit Feed Specification (GTFS)** standards as well as the TfNSW specific business rules detailed in this document. For published GTFS standards refer to the reference guide available at <https://gtfs.org/>.
- GTFS file-set bundle requirements:
 - A GTFS feed is to be provided by in the form of a single file set bundle in .zip format.
 - The zip file is to be named in the format:
 “<Provider>_GTFS_<date/time of file generation in YYYYMMDDHHMMSS>” e.g. “NSWTrains_GTFS_20150813094500.zip”.
 - The provider agency name will be allocated by TfNSW and will be detailed in the TfNSW Operator GTFS Schedule and GTFS Realtime Interface Agreement

2.2.1. Summary of GTFS Schedules at TfNSW

Files specific requirements required by TfNSW in conjunction with the published GTFS standards are defined below:

Filename	Required by TfNSW	Defines
agency.txt	Required	• Transit Operators with service represented in this dataset.
stops.txt	Required	• Stop locations where vehicles pick up or drop off passengers. Also defines patents locations such as stations and station entrances.
routes.txt	Required	• Transit routes. A route is a group of trips that are displayed to passengers as a single service.
trips.txt	Required	• Trips for each route. A trip is a sequence of two or more stops that occur during a specific time period.
stop_times.txt	Required	• Times that a vehicle arrives at and departs from stops for each trip.

calendar.txt	Required	Dates for when a service will be operating in a weekly schedule. Specify dates when service starts and ends, as well as days of the week where service is available.
calendar_dates.txt	Required	- Exceptions for the services defined in the calendar.txt. - If calendar_dates.txt includes ALL dates of service, this file may be specified instead of calendar.txt.
shapes.txt	Required	Point data for mapping the planned vehicle travel paths on a map, sometimes referred to as route alignments.
notes.txt	Required	TfNSW Extension to the GTFS standard used for providing descriptive information about trips and stops.
vehicle_categories	As required	- Details about the vehicle type operating the trip. - This will be used for services where this level of information is required to support particular use cases and outcomes. - If this will be required will be determined at the time of GTFS feed development. - TfNSW will generate this txt file and will provide to supplier to include in their GTFS schedule bundle.
vehicle_couplings	As required	- Details about the cars/carriages that form the vehicle, usually a train. - This will be used for services where this level of information is required to support particular use cases and outcomes. - If this will be required will be determined at the time of GTFS feed development. - TfNSW will generate this txt file and will provide to supplier to include in their GTFS schedule bundle.
vehicle_boardings	As required	- Details of what cars that can service a stop on a particular trip. - This will be used for services where this level of information is required to support particular use cases and outcomes.

		• If this will be required will be determined at the time of GTFS feed development. • TfNSW will generate this txt file and will provide to supplier to include in their GTFS schedule bundle.
transfers.txt	As required	• Rules for making connections at transfer points between routes. • TfNSW will generate these txt files and publish in the GTFS complete feed via Open Data.
pathways.txt	As required	• Pathways linking together locations within stations. • TfNSW will generate these txt files and publish in the GTFS complete feed via Open Data.
levels.txt	As required	• Levels/floors levels within station, interchange. • TfNSW will generate these txt files and publish in the GTFS complete feed via Open Data.
feed_info.txt	Required	• Additional information about the feed itself, including publisher, version, and expiration information.

The determination on what files is required will be defined at the start of the GTFS feed development and detailed in the *Operator GTFS Schedule and GTFS Realtime Interface agreement*.

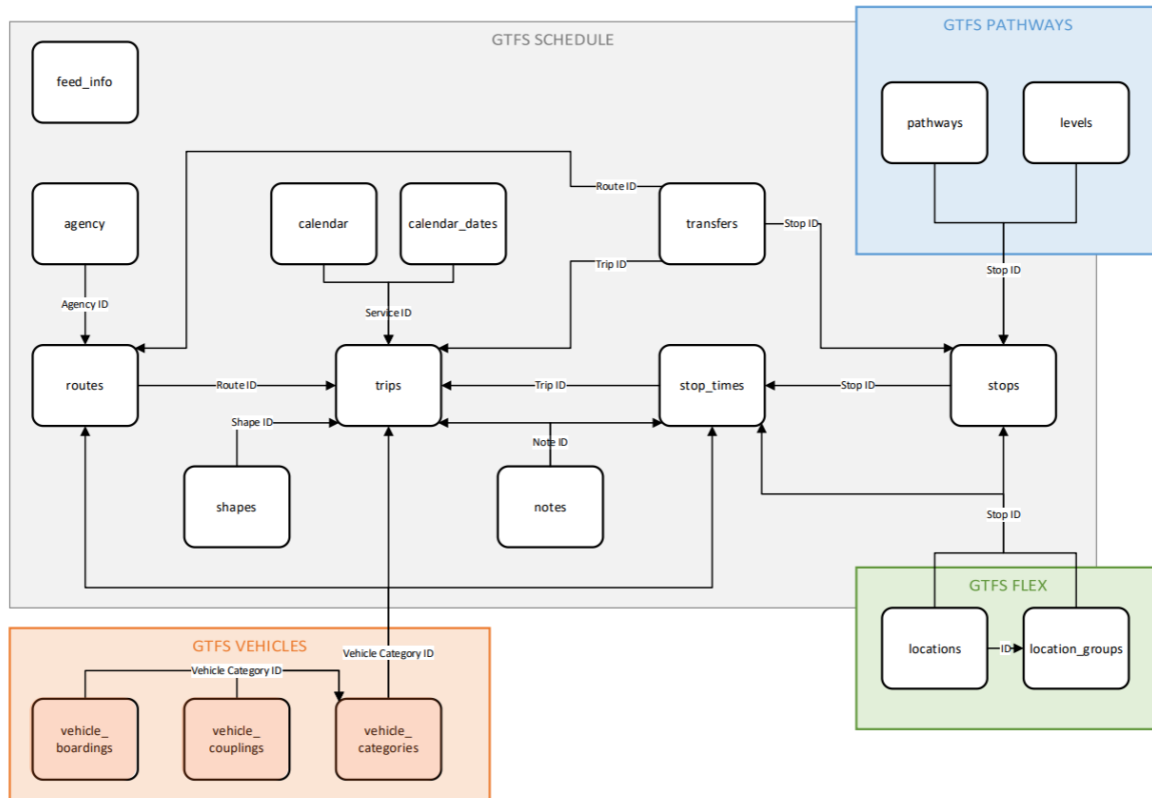


Figure 1: GTFS Files .txt used at TfNSW and their relationship to each other.

2.3 General file standards

- All values contained in files within the GTFS bundle must be enclosed by double quotations i.e. "**<data>**". This includes null or empty values (e.g, "X")

2.4 Validity period and timetable projection

- Service timetables must be forward looking ≥ 90 days in advance from today.
- Timetable projections are to be defined by utilising the `calendar.txt` (Section 3.4) and `calendar_dates.txt` (Section 3.5) files.

3 Timetable Data Feed – File and Field Specific Requirements

3.1 Agency.txt

The Agency file identifies all Operators whose timetable data has been included in the GTFS file.

Field specific requirements required by TfNSW in conjunction with the published GTFS standards for the generation of the **agency.txt** file is defined below:

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
agency_id	Required	This is the operator's agency id, allocated by TfNSW.
agency_name	Required	- The Operator's 'Customer Facing Name'. Note that this is not necessarily the same as the legal entity name. - Name will be allocated by TfNSW
agency_url	Required	- Must always be a fixed static value of "http://transportnsw.info" - Must be formatted in LOWERCASE
agency_timezone	Required	Must always be a fixed static value of "Australia/Sydney"
agency_lang	Required	Must always be a fixed static value of "EN"
agency_phone	Not Required	Do not use
agency_fare_url	Not Required	Do not use
agency_email	Not Required	Do not use

3.2 Routes.txt

The Routes file identifies all the routes in the GTFS file-set generated.

The data provided must reflect a passenger's view of the route, with the grouping of trips in logical routes. It must reflect a passenger's journey and not contain operational trips that do not allow passengers to travel on.

Field specific requirements required by TfNSW in conjunction with the published GTFS standards for the generation of the **routes.txt** file is defined below:

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
route_id	Required	- Unique identifier for a trip independently generated by Data Provider. - The route_id is to be unique within the GTFS file set provided. - Prefix agency_id and a dot example "SF.XXX".
agency_id	Required	- This is the operator's agency id, allocated by TfNSW. - The same id as used across the other files in the GTFS file-set
route_short_name	Required	- The route number identifying the route to the passenger and aligns to what the passenger sees when traveling across the TfNSW network in the real world. - This field is CASE SENSITIVE - For Example: "T1" "333" "S300", "F1" - Provide. - Should be no longer than 4-characters - Route number must be registered with TfNSW route master reference data store and align to the TfNSW route numbering and naming requirements. - Route names will be allocated by TfNSW

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
route_long_name	Required	- The long name identifying the Route to the passenger and aligns to what the passenger sees on the front of PDF timetables and elsewhere on the transport network. - This field is CASE SENSITIVE - For Example: “Dulwich Hill Line”, “North Bondi to City Circular Quay via Bondi Junction” - Route name must be registered with TfNSW route master reference data store and align to the TfNSW route numbering and naming requirements. - Route names will be allocated by TfNSW
route_desc	Required	- Indicates the Network that the Route belongs to as defined by TfNSW Wayfinding. - For Example: Sydney Light Rail Network, Sydney Trains Network - Route description must be registered with TfNSW route master reference data store and align to the TfNSW Wayfinding network. - Route description will be allocated by TfNSW
route_type	Required	- Indicates the type of transportation used on a route - The transport network in NSW is complex and TfNSW uses a mix of the standard GTFS route types and the Extended route types (https://developers.google.com/transit/gtfs/reference/extended-route-types) - Route type must be registered with TfNSW route master reference data store and align to the TfNSW Wayfinding network. - Route type will be allocated by TfNSW at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement if this type will be used.
route_url	No	Where provided, this should refer to the TfNSW website and/or designated /URL and not that of the operator or data provider.

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
route_color	Required	- Route colour for a route is defined by TfNSW Wayfinding - Must use the TfNSW approved colours
route_text_color	Required	- Route colour for a route is defined by TfNSW Wayfinding - Must use the TfNSW approved colours
route_sort_order	No	Nil
booking_required	Current restricted use to NSW Trains.	Non- standard TfNSW Extension "" (empty): booking status is unknown "0": no booking is required "1": bookings are required

3.3 Trips.txt

The Trips file provides information on all the trips for route in the GTFS file-set generated.

Only trips that passenger can travel on shall be included in the txt file

All trips must have at least 2-stops. Trips with less than two stops omitted from the txt file.

Field specific requirements required by TfNSW in conjunction with the published GTFS standards for the generation of a **trips.txt** file are defined below:

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
route_id	Required	Must be the same as the route_id in the routes.txt file
service_id	Required	Must be the same as the service_id in the calender.txt file
trip_id	Required	- Unique identifier for a trip independently generated by Data Provider. - The trip_id is to be unique within the GTFS file set provided. - trip_id is the primary reference identifier for matching static timetables with Realtime data feeds (GTFS-R) - Prefix agency_id and a dot example "SF.XXX".
trip_headsign	Required	- The trip_headsign field is to contain the text that appears on a sign that identifies the trip's destination to passengers on front of the vehicle and at stops on Passenger displays and customer travel Apps. - trip_headsign applied will be in agreement with TfNSW in some cases allocated by TfNSW. - Trip_headsign is restricted to 18 characters.

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
trip_short_name	No	- This is the customer facing route number - Must be the same name as in the routes.txt file
direction_id	Required	'Loop' services will be indicated as '1 – Inbound' so the possible values will be: 1 – Inbound 0 – Outbound 1 – Loop (becomes Inbound) - Trip stopping pattern direction Id should be different to the stopping pattern in the opposite direction if it is an in and out service.
block_id	Required	- Follow International Base GTFS specification - Unique identifier for a block independently generated by data provider - Prefix agency_id and a dot example "SF.XXX".
shape_id	Required	Must be the same as the id in the shapes.txt file
wheelchair_accessible	Required	A value of either "1" or "2" must be provided
bikes_allowed	Required	A value of either "1" or "2" must be provided

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
trip_note	Required	Non-standard TfNSW extension. • Trip notes are provided by operators for each trip to provide further information to customers. • Trip notes must not be more than 150 characters lengths • Reference key to the notes.txt file where trip notes can be defined. • Unique identifier for a note independently generated by data provider. • Prefix agency_id and a dot example "SF.XXX". • For trips without a trip note this field can be left blank e.g. ""
route_direction	Required	Non-standard TfNSW extension. • The passenger facing description for the route service direction name for all the trips operating in the same direction for a route. • The customer facing description of the route direction will be allocated by TfNSW • For Example: T4 "Waterfall or Cronulla to Bondi Junction" • Route description must be registered with TfNSW route master reference data store and align to the TfNSW Wayfinding network. • Route_direction name will be allocated by TfNSW
Vehicle_category_id	Required	GTFS Vehicle extension. - in proposal. Implemented by TfNSW ahead of full endorsement into International GTFS spec to address a key use case at TfNSW. TfNSW will review this and if need make adjustments at the time of endorsement. • Applied where applicable • Reference key to the Vehicle_category.txt file where vehicle category is defined • If required will be defined at time of start of GTFS development and documented in detailed in the <i>Operator GTFS Schedule and GTFS Realtime Interface agreement</i>.

3.4 Calendar.txt

The Calendar file provides a set of dates when service is available for one or more routes.

TfNSW require that timetable data provided is projected forward so that customers can view service timetables at least 100 days in advance. This means:

- The **start_date** should be <today> i.e. the day the GTFS file set was generated. This represents the effective start date of the GTFS file-set bundle.
- The **end_date** should be at least ($\geq$) **90 days** from <today> and represents the effective end date of the GTFS file-set bundle provided.
- For the time periods where services have not been officially scheduled **a timetable projection is required**. The projected portion of the timetable should be based on a “**standard timetable**” which can be any historical timetable the Data Provider deems suitable for each of the **7 day types (Monday through to Sunday)**. For example:
 - If the timetable for **Monday the 22nd of February 2016** is considered “standard” then that timetable can be used as the projected timetable for all Mondays in the GTFS file-set where a projection is required. This process can be repeated for all remaining day types (Tuesday through to Sunday).
 - Exceptions:
 - Consideration should be given **for public holidays**, special events and school holidays that are expected to occur within the projection period

Field specific requirements required by TfNSW in conjunction with the published GTFS standards for the generation of a **calendar.txt** file are defined below:

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
service_id	Required	Unique identifier for a route independently generated by Data Provider that identifies a set of dates when a service is available for one or more routes.
monday	Required	Follow International Base GTFS specification
tuesday	Required	Follow International Base GTFS specification
wednesday	Required	Follow International Base GTFS specification

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
thursday	Required	Follow International Base GTFS specification
friday	Required	Follow International Base GTFS specification
saturday	Required	Follow International Base GTFS specification
sunday	Required	Follow International Base GTFS specification
start_date	Required	Follow International Base GTFS specification.
end_date	Required	Follow International Base GTFS specification.

3.5 Calendar_dates.txt

The Calendar dates file provides the ability to define service exceptions for one or more of the provided routes. The calendar_dates is used to override standard timetables in the Calendar.txt file e.g. when a particular service will not be running on a specific day for a limited period of time.

Field specific requirements required by TfNSW in conjunction with the published GTFS standards for the generation of a **calendar_dates.txt** file is defined below:

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
service_id	Required	Unique identifier for a route independently generated by the data provider that identifies a set of dates when a service is available for one or more routes.
date	Required	Follow International Base GTFS specification
exception_type	Required	Follow International Base GTFS specification

3.6 Shapes.txt

The Shapes file contains data to enable visual representation of a trip's path based on the route paths shape points. The route path shape points used to create a continuous route path with no gaps that reflect real world alignment on maps. There must be a point for each change in direction to prevent straight lines presented on maps to customers.

Field specific requirements required by TfNSW in conjunction with the published GTFS standards for the generation of a **shapes.txt** file is defined below:

Field	Required by TfNSW	TfNSW specific requirements, additional business rules and sample data
shape_id	Required	- Unique identifier for a shape independently generated by Data Provider. - Unique identifier generated by the Data Provider timetable system that identifies the shape in question. - TfNSW requirement, Prefix agency_id and a dot example "e.g."SF.XXX".
shape_pt_lat	Required	Must be formatted to at least 6 decimal places
shape_pt_lon	Required	Must be formatted to at least 6 decimal places
shape_pt_sequence	Required	Follow International Base GTFS specification
shape_dist_traveled	Required	Follow International Base GTFS specification

3.7 Stops.txt

The stops listed in this file must be passenger stops and can be used by operators, service provider.

The Stops.txt file contains the stops that can be referenced by one or more trips within the GTFS file-set bundle.

Field specific requirements required by TfNSW in conjunction with the published GTFS standards for the generation of a **stops.txt** file is defined below:

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
stop_id	Required	- All stops must be the TfNSW registered and sourced from TfNSW Transit Stop Management (TSM) data store, the source of truth for all stops in NSW. - The stops must be a public stop and used by the operator. - Contain only actively used stops in the Stop_time.txt
stop_code	No	Not currently used at TfNSW
stop_name	Required	Stop names must be sources from the TfNSW Transit Stop Management (TSM) data store, the source of truth of stop names in NSW
tts_stop_name	No	Nil
stop_desc	No	Nil
stop_lat	Required	Must be formatted to at least 6 decimal places
stop_lon	Required	Must be formatted to at least 6 decimal places
zone_id	No	Nil
stop_url	No	Nil

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
location_type	Required	Follow International Base GTFS specification
parent_station	Required	Parent stations as supplied by TfNSW from the TfNSW Transit Stop Management (TSM) data store, the source of truth of stop names in NSW.
stop_timezone	Required	- The stop_timezone field contains the timezone in which this stop or station is located. - If omitted, the stop should be assumed to be located in the timezone specified by agency_timezone in agency.txt. - When a stop has a parent station, the stop is considered to be in the timezone specified by the parent station's stop_timezone value. If the parent has no stop_timezone value, the stops that belong to that station are assumed to be in the timezone specified by agency_timezone, even if the stops have their own stop_timezone values. In other words, if a given stop has a parent_station value, any stop_timezone value specified for that stop must be ignored. - Even if stop_timezone values are provided in stops.txt, the times in stop_times.txt should continue to be specified as time since midnight in the timezone specified by agency_timezone in agency.txt. This ensures that the time values in a trip always increase over the course of a trip, regardless of which timezones the trip crosses
wheelchair_boarding	Required	Follow International Base GTFS specification
level_id	No	- Nil - Only used in the TfNSW GTFS Complete Feed.
platform_code	Required	Platform code must sourced from TfNSW Transit Stop Management (TSM) data store, the source of truth of stop names for NSW

3.8 Stop_times.txt

The Stops times file provides stop time information for all stops included in trips defined within the GTFS file-set bundle.

Field specific requirements required by TfNSW in conjunction with the published GTFS standards for the generation of a **stops_times.txt** file is defined below:

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
trip_id	Required	- Must be unique id - Prefix agency_id and a dot example "SF.XXX".
arrival_time	Required	- The arrival time at a specific stop for a specific trip on a route. - Times are to be provided to seconds (level of accuracy) - Times for trips starting before 04:00 am will be expressed in '36 hour format'. - For Example: "25:25:10"
departure_time	Required	- The departure time from a specific stop for a specific trip on a route. - Times are to be provided to seconds (level of accuracy) - Times for trips starting before 04:00 am will be expressed in '36 hour format'. - For Example: "25:25:10"
stop_id	Required	Stop numbers must be the same as the stop_id in the Stops.txt
stop_sequence	Required	- The sequence of the Stop within the Trip. - For Example: "3" (indicating that the stop is the 3rd in the Trip) - Stop sequence must maintain ascending chronological order.

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
stop_headsign	Required	- Use where applicable. This field overrides the default trip_headsign when the headsign changes between stops. - stop_headsign value specified for one stop_time. When need to apply to for multiple stops in the same trip the value must be repeated in each stop_times row. - Must not be greater than 18 characters (the current limit) and follow the TfNSW naming standard
pickup_type	Required	Follow International Base GTFS specification
continuous_pick_up	No	Nil
continuous_drop_off	No	Nil
drop_off_type	Required	Follow International Base GTFS specification
shape_dist_traveled	Required	Follow International Base GTFS specification
timepoint	Required	- Indicates whether the Stop is a timing/measure point for the Trip. - Timepoint names are used to as key locations to passengers in PDF route timetables - All stops for Train, Light, Ferry, Coach are timing points. For bus services only the first and last stop and key locations such as Points of Interest, interchanges along a route are timing points.

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
stop_note	Required	Non- standard TfNSW Extension • Stop notes are provided by operators for a stop to provide further information to customers. • Stop notes must not be more than 150 characters lengths • Reference key to the notes.txt file (a TfNSW extension to the standard GTFS • Unique identifier for a note independently generated by data provider. • Prefix agency_id and a dot example "SF.XXX" • For trips without a trip note this field can be left blank e.g. "X"

3.9 Notes.txt

The Notes file is a TfNSW defined extension to the standard GTFS file-set. It is used to provide additional informed such as irregularities of a trip or special conditions on a stop to complement standard timetable information. This file contains the actual note text and is reference by the **Trips.txt** file (via the trip_note field) and or the **Stop_times.txt** file (via the stop_note field).

Field specific requirements required by TfNSW in conjunction with the published GTFS standards for the generation of the **notes.txt** file is defined below:

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
note_id	Required	• Unique identifier for a note independently generated by Data Provider. • The same note_id applied in either the trip.txt or the stop.txt file. • Prefix agency_id and a dot example "SF.XXX".
note_text	Required	• Leading and trailing spaces should be trimmed • For Example: "Gates close two minutes before scheduled departure time." • Notes must follow the TfNSW guidelines notes and must not be greater than (150) characters.

3.10 Feed_info.txt

As feed_info.txt is a conditionally required. TfNSW does not require this file to be developed.

If there is a case to develop this file at the time of GTFS feed development TfNSW will consider the proposal at that time.

This may change in the future if the file changes to being required in the International GTFS specification, this TfNSW GTFS implementation specification will be updated as required.

3.11 transfers.txt

The Transfer file provides information about special transfer conditions between two trips at stop location. It provides a way of explicitly calling out the places that customers can connect their trips. The most common use case is an "in-seat transfer"

The determination on if a transfer.txt file is required will be defined in at the start of the GTFS feed development (or as agreed after initial feed development) based on the operational and customer outcomes for the service and detailed in the *Operator GTFS Schedule and GTFS Realtime Interface agreement*.

The transfer types used will be defined and agreed between TfNSW and the operator/data provider.

Field specific requirements required by TfNSW in conjunction with the published GTFS standards for the generation of a **transfers.txt** file are defined below:

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
from_stop_id	Required	Follow International Base GTFS specification
to_stop_id	Required	Follow International Base GTFS specification
from_route_id	Required	Follow International Base GTFS specification
to_route_id	Required	Follow International Base GTFS specification
from_trip_id	Required	Follow International Base GTFS specification

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
to_trip_id	Required	Follow International Base GTFS specification
Transfer type	Required	- Follow International Base GTFS specification - Key transfer type used by TfNSW is 4 = in-seat-transfer” to present information to customers to let them know they can stay on the same vehicle as it finished one trip and starts the next trip..
Min_transfer_time	Required	- Applied in agreement where applicable - Follow International Base GTFS specification

3.12 Vehicle_categories.txt

The vehicle categories is part of the **GTFS Vehicle extension** currently in proposal (bit.ly/gtfs-vehicles). TfNSW has implemented this extension ahead of full endorsement into International GTFS spec to address key use cases at TfNSW. TfNSW will review this and if need make adjustments at the time of endorsement by the GTFS community.

The vehicle categories file provides details of the scheduled vehicle type planned to run a scheduled trip. This maybe updated on the day in the GTFS Vehicle Position feed.

Describe categories of physical vehicles, i.e. a set of vehicles that share the same attributes.

The determination on if a vehicle categories.txt file is required will be defined in at the start of the GTFS feed development (or as agreed after initial feed development) based on the operational and customer outcomes for the service and detailed in the *Operator GTFS Schedule and GTFS Realtime Interface agreement*.

Files will be generated by TfNSW based on reference data from a centralised data store with input from Operator/Service provider and asset owner.

The vehicle_catergoy.txt file will be added to the Operator/Data provider GTFS file set at time of generation.

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
vehicle_catergoy_id	Required	Operator id for the vehicle type
vehicle_category_name	Required	Name of the vehicle type category

3.13 Vehicle_couplings.txt

The vehicle couplings is part of the **GTFS Vehicle extension** currently in proposal (bit.ly/gtfs-vehicles). TfNSW has implemented this extension ahead of full endorsement into International GTFS spec to address key use cases at TfNSW. TfNSW will review this and if need make adjustments at the time of endorsement but the GTSF community.

The vehicle couplings file provides details of the makeup of a vehicle type if in has more than one carriage. Describes the vehicle composition, allows the description of several coupling levels. (e.g. a coupled train set, composed of two 8-carriages train sets).

The determination on if a vehicle couplings.txt file is required will be defined in at the start of the GTFS feed development (or as agreed after initial feed development) based on the operational and passenger outcomes for the service and detailed in the *Operator GTFS Schedule and GTFS Realtime Interface agreement*.

Files will be generated by TfNSW based on reference data from a centralised data store with input from Operator/Service provider and asset owner.

The vehicle_couplings.txt file will be added to the Operator/Data provider GTFS file set at time of generation.

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
parent_id	Required	The same as the vehicle_category_id
child_id	Required	The id for child i.e. carriage
child_sequence	Required	The position of the child in the parent i.e. train consist/configuration
child_label	Required	The label applied for passenger to identify which carriage to board

3.14 Vehicle_boardings.txt

The vehicle boardings is part of the **GTFS Vehicle extension** currently in proposal (bit.ly/gtfs-vehicles). TfNSW has implemented this extension ahead of full endorsement into International GTFS spec to address key use cases at TfNSW. TfNSW will review this and if need make adjustments at the time of endorsement by the GTFS community.

The vehicle boardings file provides details on what child/carriage of a vehicle type can allow a passenger to board and alighting from the vehicle at a specific stop.

The determination on if a vehicle boardings.txt file is required will be defined in at the start of the GTFS feed development (or as agreed after initial feed development) based on the operational and passenger outcomes for the service and detailed in the *Operator GTFS Schedule and GTFS Realtime Interface agreement*.

Files will be generated by TfNSW based on reference data from a centralised data store with input from Operator/Service provider and asset owner.

The vehicle_boardings.txt file will be added to the Operator/Data provider GTFS file set at time of generation.

Field	Required by TfNSW	TfNSW specific requirements and additional business rules
Vehicle_category_id	Required	- The same id as the vehicle_category_id in the vehicle_category.txt file - The same id as the parent_id in the vehicle_couplings.txt file.
child_sequence	Required	- A section of a vehicle with more than one carriage. - Where a vehicle is made up of 2 or more sections and passages cannot move between the sections
Grandchild_sequence	Required	The position of the individual Car/carriages within the child/section of the vehicle
Boarding_area_id	Required	- Is the stop where the boarding and alighting rules are applied - Is the same number as the Stop_id in the Stops.txt file for the stop location

4 Realtime Data Feed – General Requirements

4.1 Scope

A GTFS Realtime feed lets transit agencies provide consumers with realtime information about service status and any disruptions to their service (platform/stop change, change in stopping pattern on the day, diversions, cancel trips, add trips, delays, etc.) location of their vehicles, and predictive arrival and departure times.

4.2 Standards

Feed data is to be provided to International Base GTFS Realtime standard as well as the TfNSW GTFS Implementation specific business rules detailed in this document.

4.3 Structure

The specification currently supports the following types of information:

- Trip updates - delays, cancellations, adding in new trips, changed routes, stop changes, prediction arrival and departure times
- Vehicle positions - information about the vehicles including location, status, congestion and occupancy level
- Service alerts – context messages about stop moved, unforeseen events affecting a station, route or the entire network (Only provided when as agreed with TfNSW and detailed in the interface agreement with the data provider)

4.4 Trip Updates

Trip update provides information about the trip and is used to inform customers of any updates to trip schedule information. It informs the customers of any delays, platform changes, stopping pattern of the trips.

Only trips that passenger can travel on shall be included in the feed.

Ascending Trip Times

All stop time updates should be in ascending times when generating in predictions.

Historical Trips

Historical trips should be included in the feed for a configurable period of time, initially set to 60-minutes. The definition of a historical trip is a trip where the scheduled arrival time AND actual arrival time < current time.

Trips with less than two stops

All trips must have at least 2-stops. Trips with less than two stops omitted from the feed.

Configurable Realtime information trip availability

Feeds are configured to contain all the trips that are currently in progress and started up to 60 minutes in the past as well as trips that will commence within next 60 minutes. This Realtime information trip availability parameter is configurable and can be extended/reduced depending on future needs.

The determination on what the Realtime trip availability to be set at will be defined at the start of the GTFS feed development (or as agreed after initial feed development) based on the operational and customer outcomes for the service and detailed in the *Operator GTFS Schedule and GTFS Realtime Interface agreement*

The initial default values are:

Trains	Light Rail	Metro	Ferry	Bus
120 minutes	60 minutes	60 minutes	60 minutes	60 minutes

Blocking and Next trip delay calculation

Trip updates should apply BLOCKING to previous trips to convey delay information for the next trip.

Trip update frequency

Trip updates must be published at least every 10 second.

While the minimum requirement is 10-second intervals, the source systems are expected to operate at 5 second intervals, ensuring updates are as close to realtime as possible.

The determination on what the Realtime trip update frequency to set at will be defined at the start of the GTFS feed development (or as agreed after initial feed development) and detailed in the *Operator GTFS Schedule and GTFS Realtime Interface agreement*

4.5 Vehicle Position

Vehicle Position provides information about the vehicle that is servicing the trip. It allows the customer to know the location of the vehicle, model of the vehicle and the occupancy levels of the vehicle.

Vehicle position frequency

Vehicle positions must be published at least every 10 second.

While the minimum requirement is 10-second intervals, source systems are expected to operate at 5 second intervals, ensuring updates are close to realtime live as possible.

The determination on what the Realtime Vehicle Position frequency to set at will be defined at the start of the GTFS feed development (or as agreed after initial feed development) and detailed in the *Operator GTFS Schedule and GTFS Realtime Interface agreement*

5 Realtime Data Feed - File and Field Specific Requirements

5.1 Element index at TfNSW

Trip Update	Vehicle Position
GTFS Realtime Trip Update Element index at TfNSW FeedMessage • FeedHeader ◦ Incrementality • FeedEntity • TripDescriptor ◦ trip.id ◦ route.id ◦ direction.id ◦ start_time ◦ start_date ◦ scheduleRelationship – Trip ◦ modified_trip • VehicleDescriptor ◦ WheelchairAccessible • StopTimeUpdate ◦ Stop_sequence ◦ Stop_id ◦ Arrival ▪ Stop time event • Delay • Time • uncertainty ◦ Departure ▪ top time event • Delay • Time • uncertainty ◦ Departure occupancy – Train predictive occupancy ◦ transit_realtime.carriage_seq_predictive_occupancy ▪ position_in_consist ▪ deparute_occupancy_status ◦ StopTimeProperties • Timestamp • Trip Properties ◦ Transit_realtime.trip_properties ▪ Block_id ▪ Shape_id	GTFS Vehicle Position Element index at TfNSW FeedMessage • FeedHeader ◦ Incrementality • FeedEntity ◦ id • TripDescriptor ◦ trip.id ◦ start_time ◦ start_date ◦ scheduled_relationship ◦ route_id ◦ direction_id • Position ◦ latitude ◦ longitude ◦ bearing ◦ odpmeter ◦ speed • VehicleDescriptor ◦ id ◦ label ◦ licence_plate ◦ WheelchairAccessible ◦ Transit_realtime.tfns_vehicle_Descriptor (TfNSW approved extension) ▪ Air_conditined ▪ Wheelchair_accessible ▪ Vehicle_model ▪ Performing_prior_trip ▪ Special_vehicle_attributes • vehicleStopStatus ◦ current_Status • Congestion_Level • Occupancy_Status • CarriageDescriptor ◦ Name ◦ Position_in_consist ◦ Occupancy_status ◦ Quite_carriage ◦ Toilet ◦ Luggage_rack • Current_stop_sequence • Timestamp • Stop_id

5.2 Trip Update – message Trip

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
Id	string	Required	The id should be traceable back to the source realtime SIRI message or other source systems
trip	TripDescriptor	Required	- All the trips that should be in progress as per the schedule are listed up to the configured time period of 60 minutes (configurable) in the past. - All the trips that will be running in the future (up to the configured time period (60 mins as a default), as per the schedule are listed. - All the added trips that will be running in the future are listed. - All cancelled trips in the past and in the future for the rest of the service day are provided. - All Skipped stops that will be running in the future for the rest of the service day are provided. - All change in stop that will be running in the future for the rest of the service day are provided.
vehicle	VehicleDescriptor	Required	The information of the vehicle that are servicing the trip.
stop_time_update	StopTimeUpdate	Required	- CANCELED – stop time information is not required for CANCELED trip - Follow International Base specification
timestamp	uint64	Required	The most recent moment at which the vehicle's realtime progress was measured via a vehicle on board system and then used to estimate StopTimes in the future.

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
			• POSIX time (i.e., the number of seconds since January 1st 1970 00:00:00 UTC)
delay	int32	Optional	• Will be determined if required at time of GTFS feed development
trip_properties	TripProperties	Required	• Where available (will be determined if required at time of GTFS feed development)

5.2.1 Trip Descriptor

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
trip_id	string	Required	• trip_id must be unique within a GTFS-R feed • For GTFS-R messages that have duplicate trip_ids these trips will be set back to scheduled time. All Realtime information will be ignored by the consuming system. • In GTFS-R used elements must be consistent with values coming from GTFS. The trip_id in GTFS_R must match in GTFS, except for trips which have been ADDED. • This field is to be mapped to the Vehicle Journey ID in the input feed
route_id	string	Required	• In GTFS-R used element route_id must be the same as route_id in the GTFS Schedule feed. • For inconsistent route_id's, the trip is mapped back to the GTFS using the stopping sequence in order to derive a route id.

direction_id	uint32	Conditionally required	- For trip_update:: SCHEDULED where direction_id is not provided, then direction is taken from GTFS on basis of consistent trip_id's. - For trip_update::ADDED, direction is required
start_time	string	Required	- This is to be equivalent of the trip start time associated with the trip_id in the schedule. - Follow International Base specification
start_date	string	Required	- Where we have repeated trip_id on subsequent days (everyday trips) a start_date is required - This is to be equivalent of the trip start date associated with the trip ID in the schedule - 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. - Follow International Base specification
schedule_relationship	ScheduleRelationship	Required	Trip Scheduled relationship – see section 5.2.1.1 for scheduled relationship used at TfNSW
Modified_trip	MobifiesTrip Selecto	Optional	- Not currently applied by TfNSW, will be in the future - Currently TfNSW use Trip Scheduled relationship “REPLACEMENT” for trip modifications.

5.2.1.1 ScheduleRelationship - trip

Value	TfNSW specific requirements and additional business rules
SCHEDULED	- GTFS-R trip_id must exist in the GTFS schedule and must be unique in corresponding GTFS data - When no other trip with same trip_id is in Progress when the trip entity is created then the schedule relationship for the trip will be SCHEDULED - The message must continually full stop sequence must be provided, including passed stops if a trip is in progress until the trip is completed - Follow International Base GTFS specification
ADDED	- GTFS-R trip_id for added trip must not exist in GTFS scheduled data and must be unique across all GTFS/GTFS-R trip_ids - The trip must include full stop sequence and be consistent and persistent across all updates. - trip_id of CANCELED trip must not be reused for a new ADDED trip - The route_id of an added trip must refer to a route_id in GTFS. - direction_id is required for ADDED trips - When another trip with same trip_id is in progress when the trip entity is created then the schedule relationship for the trip will be 'ADDED' - The message must continually full stop sequence must be provided, including passed stops if a trip is in progress until the trip is completed. NOTE: As of May 2025 ADDED is deprecated type however the suggested NEW type still experimental. - TfNSW will do a change impact assessment on the use of this new type (as of May 2025). - ADDED will continue to be used until determined.

Value	TfNSW specific requirements and additional business rules
	It will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement if this type will be used
UNSCHEDULED	Not applied at TfNSW
CANCELED	- The trip_id must either reference a SCHEDULED trip in GTFS Scheduled feed or an ADDED trip in the GTFS Trip Update feed,. - The trip update for the service's schedule_relationship shows CANCELED which indicates the service has been cancelled. - This message should remain for the duration of the service's original scheduled start and end time. - If a CANCELED trip is reinstated the trip scheduled relationship is changed to SCHEDULED
DUPLICATED	- Not currently applied at TfNSW. TfNSW will do a change impact assessment on the use of this new type (as of May 2025). - It will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement if this type will be used. - ADDED will continue to be used until determined.
DELETED	Do not use, not applied at TfNSW
REPLACEMENT	- REPLACEMENT to indicate the SCHEDULED trip is being replaced with new data. - REPLACEMENT trips are used when an existing scheduled trip is rerouted, change in stopping pattern, change in stop (i.e. a platform change and a Station) - route_id and trip_id in REPLACEMENT trip must reference to GTFS Scheduled data

Value	TfNSW specific requirements and additional business rules
	• The message must continually provide full stop sequence in the scheduled trip, including passed stops if a trip is in progress until the trip is completed, including stops in the past that were CANCELED. • Where in the trip there is a stop change and a stop is skipped the trip scheduled relationship is REPLACEMENT. The stop that has been changes has a stop schedule relationship SCHEUELED and where the stop has been skipped it is a stop scheduled relationship SKIPPED • Both the stop_time and stop_date are required. • Both timetable_arrival_time, timetable_depature_time and arrival_time and departure_time are required for each stop. • Delay for each stop is also required in order for those consumers who do not require the arriva_time, departure_time only the delay.
NEW	• Not currently applied at TfNSW. TfNSW will do a change impact assessment on the use of this new type (as of May 2025). • It will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement if this type will be used. • ADDED will continue to be used until determined. • It will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement if this type will be used

5.2.2 VehicleDescriptor - Trip

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
id	string	Required	Must Follow International Base GTFS specification
label	string	Optional	Must be Visible to the Passenger (will be determined if required at time of GTFS feed development)
license_plate	string	Optional	License plate of the vehicle (will be determined if required at time of GTFS feed development)
wheelchair_accessible	enum	Optional	Where available (will be determined if required at time of GTFS feed development)

5.2.2.1 Wheelchair Accessible - Trip

Value	TfNSW specific requirements and additional business rules
NO_VALUE	Follow International Base GTFS specification
UNKNOWN	Follow International Base GTFS specification
WHEELCHAIR_ACCESSIBLE	Follow International Base GTFS specification
WHEELCHAIR_INACCESSIBLE	Follow International Base GTFS specification

5.2.3 StopTimeUpdate

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
stop_sequence	uint32	Required	- Must be the same as in the stop_times.txt - Follow International Base GTFS specification
stop_id	string	Required	- Must be the same as in the stop_times.txt - Follow International Base GTFS specification
arrival	StopTimeEvent	Required	- Must provide - Follow International Base GTFS specification
departure	StopTimeEvent	Required	- Must provide - Follow International Base GTFS specification
departure_occupancy_status	OccupancyStatus	Required	- Predictive departure occupancy information, whenever available, should be provided on the vehicle and carriage level. - When data is available - Follow International Base GTFS specification
schedule_relationship	ScheduleRelationship	Required	- Stop schedule relationship - Follow the international Base GTFS spec and guidelines in this implementation specification

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
carriage_seq_predictive_occupancy	CarriageDescriptor	Required	When data is available Note: TfNSW extension to support providing occupancy to the individual car/section of a train/vehicle
Stop_time_properties		Not used	Not applied at TfNSW

5.2.3.1 StopTimeEvent

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
delay	int32	Required	- stop_time_update::delay for all trips that have trip_update:: = SCHEDULED is mandatory, for stops in the sequence. When the arrival field is populated in the 'StopTimeUpdate' entity then one of the following conditions will apply: - 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. - For a particular 'TSN', compare the predicted arrival time for that 'TSN' with the scheduled arrival time and if it is early then convert into seconds, prefix it with '-' symbol and populate this field with it. - For a particular 'TSN', compare the predicted arrival time for that 'TSN' with the scheduled arrival time and if there no difference then populate the field with 0. - For a particular 'TSN', if a prediction is not available do not populate. When the departure field is populated in the 'StopTimeUpdate' entity then one of the following conditions will apply: - 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. - 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. - 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.

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
			For a particular 'TSN', if a prediction is not available do not populate.
time	int64	Required	- For all trips that have trip_update:: = SCHEDULED, actual time will be calculated by adding stop_time_update::delay to scheduled time taken from GTFS. This is true for arrival and departure. Therefore trip_update::time is optional. - When the arrival field is populated in the 'StopTimeUpdate' entity then this field contains the predicted arrival time when the vehicle will be arriving at the TSN.
uncertainty	int32	Optional	- Uncertainty applies to both the time and the delay value of a StopTimeUpdate. - The uncertainty specifies the expected error in true delay as an integer in seconds. - For example, a service with an estimated delay of 60-seconds arriving to its next stop within a 30-second window of error (+/- 15 seconds) will have an Uncertainty value of 30.

5.2.3.2 ScheduleRelationship - Stop

Value	TfNSW specific requirements and additional business rules
SCHEDULED	- Stop must have same stop_sequence in GTFS and GTFS-R - For each trip listed as per the schedule, if a vehicle is associated then apply SCHEDULED for that trip - Follow International Base GTFS specification
SKIPPED	- Skipped stop must have the same stop_sequence in GTFS and GTFS-R. All stops before and after the skipped stop do not change and retain the same stop_sequence - The trip scheduled relationship will be SCHEDULED - Where all scheduled stops are skipped excepted one stop, trip schedule relationship CANCELED should be applied. All trips that have the trip scheduled relationship SCHEDULED must have at least 2 active stops. - Follow International Base GTFS specification
NO_DATA	- stop must have same stop_sequence in GTFS and GTFS-R - NO_DATA results in realtime not being available for the full trip - Follow International Base GTFS specification
UNSCHEDULED	Not used at TfNSW

5.2.3.3 Occupancy Status – departure (predictive vehicle and carriage occupancy)

Value	TfNSW specific requirements and additional business rules
EMPTY	Do not use – status not applied at TfNSW
MANY_SEATS_AVAILABLE	- Occupancy levels will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement - Occupancy will be calculated and contextualised based on the mode, vehicle type and the TfNSW policy on current social distancing. - Value is configurable and may change from time to time to support social distancing events i.e. COVID
FEW_SEATS_AVAILABLE	- Occupancy levels will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement - Occupancy will be calculated and contextualised based on the mode, vehicle type and the TfNSW policy on current social distancing. - Value is configurable and may change from time to time to support social distancing events i.e. COVID
STANDING_ROOM_ONLY	- Occupancy levels will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement - Occupancy will be calculated and contextualised based on the mode, vehicle type and the TfNSW policy on current social distancing. - Value is configurable and may change from time to time to support social distancing events i.e. COVID
CRUSHED_STANDING_ROOM_ONLY	Do not use – status not applied at TfNSW

Value	TfNSW specific requirements and additional business rules
FULL	Do not use – status not applied at TfNSW
NOT_ACCEPTING_PASSENGERS	Do not use – status not applied at TfNSW
NO_DATA_AVAILABLE	Where data is not available apply
NOT_BOARDABLE	Do not use – status not applied at TfNSW

5.2.3.4 CarriageOccupancyStatus – carriage stop predictive departure occupancy

TfNSW has been assigned extension 1007 for these attributes. https://groups.google.com/forum/#!topic/gtfs-realtime/G75O1zyQS_Q

Field Name	Type	Required by TfNSW	Cardinality	Description
name	string	Required	one	- Applied where available - This should refer to a value (number/code) displayed to passenger
position_in_consist	Int	Required	one	- Carriage position in the consist/configuration of a train. - The position of carriages is relative to the current leading carriage and commences with 1 for the leading carriage.
departure_occupancy_status	OccupancyStatus	Required	one	- OccupancyStatus of the vehicle or individual carriage. - For vehicles with more than one passenger carriage, the carriage level must be provided - Occupancy levels will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement - Occupancy will be calculated and contextualised based on the mode, vehicle type and the TfNSW policy on current social distancing. - Value is configurable and may change from time to time to support social distancing events i.e. COVID - Referring to 5.2.3.3 for occupancy status levels.

5.2.4 TripProperties - Trip

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
trip_id	string	Optional	- trip_id must be the same as trip_id in GTFS Schedule feed unless ADDED Trip. - Follow International Base GTFS specification
start_date	string	Optional	Follow International Base GTFS specification
start_time	string	Optional	Follow International Base GTFS specification
shape_id	string	Required	- Follow International Base GTFS specification - Where applicable
Block_id		Required	Where applicable

5.3 VehiclePosition

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
Id	string	Required	The id should be traceable back to the source providing system
trip	TripDescriptor	Required	Trip_id the vehicle is currently running..
vehicle	VehicleDescriptor	Required	Follow International Base GTFS specification
position	Position	Required	Follow International Base GTFS specification
current_stop_sequence	uint32	Required	If the vehicle is in transit to the first stop then the current_stop_sequence will be "1".
stop_id	string	Required	- If the vehicle is in transit to the first stop then the stop_id will be that of the first TSN. - This field is equivalent of 'TSN' sent in the message from the vehicle
current_status	VehicleStopStatus	Required	Apply as per section 5.3.4
timestamp	uint64	Required	This field is equivalent of 'ConsoleTime' in the received from the vehicle
congestion_level	CongestionLevel	Required	Apply level are per section 5.3.
occupancy_status	<i>OccupancyStatus</i>	Required	Apply status as per section 5.3.6

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
			Current vehicle occupancy level data, whenever available, should be provided in vehicle position feed
consist	CarriageDescriptor	Required	- Where applicable - TfNSW has been assigned extension 1007 for these attributes. https://groups.google.com/forum/#!topic/gtfs-realtime/G75O1zyQS_Q - It will be determined at the time of GTFS Feed development if this is required and define TfNSW and Operator GTFS interface agreement

5.3.1 TripDescriptor

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
trip_id	string	Required	- trip_id must be unique within a GTFS-R feed - trip_id must be the same as trip_id in GTFS Schedule feed unless ADDED Trip - For GTFS-R messages that have duplicate trip_ids these trips will be set back to scheduled time. All Realtime information will be ignored. - In GTFS-R used elements must be consistent with values coming from GTFS. The trip_id in GTFS_R must match in GTFS, except for trips which have been ADDED. - This field is to be mapped to the Vehicle Journey ID in the input feed
route_id	string	Required	- In GTFS-R used element route_id must be the same as route_id in the GTFS Schedule feed. - For inconsistent route_id's, the trip is mapped back to the GTFS using the stopping sequence in order to derive a route id.
direction_id	uint32	Required	- For trip_update:: SCHEDULED where direction_id is not provided, then direction is taken from GTFS on basis of consistent trip_id's. - For trip_update::ADDED, direction is required
start_time	string	Required	This is to be equivalent of the trip start time associated with the trip ID in the schedule.

start_date	string	Required	- This is to be equivalent of the trip start date associated with the trip ID in the schedule. - Where we have repeated trip_id on subsequent days (everyday trips) a start_date is required - 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.
schedule_relationship	ScheduleRelationship	Required	- Refer to 5.2.1.1 Trip Update, TripDescriptor, Scheduled_ScheduleRelationship – Trip - The same is applied in Vehicle Position

5.3.1.1 ScheduleRelationship

Refer to section 5.2.1.1 for trip schedulrelationship values.

5.3.2 VehicleDescriptor

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
id	string	Required	The unique identifier for the individual vehicle
label	string	Required	- Where available - The identifier the passenger can see on the vehicle
license_plate	string	Required	Where available
tfnsw_vehicle_descriptor	TfnswVehicleDescriptor	Required	Approved TfNSW Extension TfNSW has been assigned extension 1007 for these attributes. https://groups.google.com/forum/#!topic/qtfs-realtime/G75O1zyQS_Q This field contains following information: - Air-conditioning availability - Wheelchair access availability - Vehicle Model - Performing prior trip - special_vehicle_attributes': - It will be determined at the time of GTFS Feed development if this is required and define TfNSW and Operator GTFS interface agreement

5.3.2.1 TfnswVehicleDescriptor

Field Name	Type	Required by TfNSW	Cardinality	TfNSW specific requirements and additional business rules
air_conditioned	True/false	Required	One	Air-conditioning availability – sent as a ‘True/False’ value
wheelchair_accessible	Boolean	Required	One	Wheelchair access availability – sent as a bit value 0 being not available 1 being available
vehicle_model	string	Required	One	For Bus, 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 - For other mode it will be a single description of the model e.g. “Alstom Metropolis”
performing_prior_trip	True/False	Required	One	When the vehicle has not yet commenced its current trip and is performing the prior trip this will be populated as “true”
special_vehicle_attributes	Boolean	Required	One	Following information is sent as a bitmask in the ‘special_vehicle_attributes’: - Wi-Fi availability – bitmask value 0001 - Christmas bus or not – bitmask value 0010 - Both Wi-Fi and Christmas bus –bitmask value 0011

5.3.3 Position

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
latitude	float	Required	- Follow International Base GTFS specification - Formatted to at least 6 decimal places
longitude	float	Required	- Follow International Base GTFS specification - Formatted to at least 6 decimal places
bearing	float	Optional	- Follow International Base GTFS specification - Rounded to 2 decimal places
odometer	double	Optional	- Follow International Base GTFS specification - Provide where available
speed	float	Optional	- Follow International Base GTFS specification - Rounded to 2 decimal places

5.3.4 VehicleStopStatus

Value	TfNSW specific requirements and additional business rules
INCOMING_AT	Do not use – status not applied at TfNSW
STOPPED_AT	Follow International Base GTFS specification
IN_TRANSIT_TO	- Follow International Base GTFS specification - Vehicle has departed its previous stop and in transit to its next stop.

5.3.5 CongestionLevel

Following is the notation for the mathematical formulas below:

- $\bar{x}$ = mean average
- σ_{Long} = Long term standard deviation
- $\bar{x}_{Long}$ = mean Long term average
- $\bar{x}_{short}$ = mean Short term average

Value	TfNSW specific requirements and additional business rules
UNKNOWN_CONGESTION_LEVEL	• Unknown is when the short term average is not known. I.e $\bar{x}_{short}$ has no value • Calculation of congestion levels will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement
RUNNING_SMOOTHLY	• $\bar{x}_{Long} + \sigma_{Long} > \bar{x}_{short}$ • Calculation of congestion levels will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement
STOP_AND_GO	• $\bar{x}_{Long} + \sigma_{Long} \leq \bar{x}_{short} < \bar{x}_{Long} + 2\sigma_{Long}$ • Calculation of congestion levels will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement
CONGESTION	• $\bar{x}_{Long} + 2\sigma_{Long} \leq \bar{x}_{short} < \bar{x}_{Long} + 3\sigma_{Long}$

Value	TfNSW specific requirements and additional business rules
	Calculation of congestion levels will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement
SEVERE_CONGESTION	$\bar{x}_{Long} + 3\sigma_{Long} \leq \bar{x}_{short}$ - Calculation of congestion levels will be determined at the time of GTFS Feed development and defined in the TfNSW and Operator GTFS interface agreement

5.3.6 OccupancyStatus

Refer to section 5.2.3.3 for occupancy status levels.

5.3.7 CarriageDescriptor

Field Name	Type	Required by TfNSW	Cardinality	Description	TfNSW specific requirements and additional business rules
name	string	optional	one	This should refer to a value customers can see	Apply where applicable
position_in_consist	Int	required	one	Carriage position in the consist. The position of carriages is relative to the current leading carriage and commences with 1 for the leading carriage.	
occupancy_status	OccupancyStatus	required	one	- OccupancyStatus of the vehicle or individual carriage. - For vehicles with more than one passenger carriage, the carriage level provides a more granular view. - The field in VehiclePosition should be a rollup of the individual carriage occupancy metrics.	If passenger count is not available then omit the occupany_status field.
quiet_carriage	Boolean	optional	one	Is this a quiet carriage - used to indicate to	Apply where applicable

Field Name	Type	Required by TfNSW	Cardinality	Description	TfNSW specific requirements and additional business rules
				passengers they should keep noise to a minimum	If not available then omit the quiet_carriage field.
toilet	ToiletStatus	optional	One	- Does the carriage have a toilet and if so, is it an accessible toilet? - NONE = 0; // No toilet in this carriage - NORMAL = 1; // regular toilet for able bodied people - ACCESSIBLE = 2;	- Apply where applicable - If not available then omit the toilet field.
luggage_rack	Boolean	Optional	One	Does the carriage have luggage racks	- Apply where applicable - If not available then omit the luggage_rack field.

5.4 Alert

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
active_period	TimeRange	Required	Follow International Base GTFS specification
informed_entity	EntitySelector	Required	Follow International Base GTFS specification
cause	Cause	Required	Follow International Base GTFS specification
cause_detail	TranslatedString	Optional	Not used at TfNSW
effect	Effect	Required	Follow International Base GTFS specification
effect_detail	TranslatedString	Optional	Not used at TfNSW
url	TranslatedString	Required	- Follow International Base GTFS specification - url link to alert message on TfNSW transportnsw.info website
header_text	TranslatedString	Required	Short description of situation no greater than 100 characters
description_text	TranslatedString	Required	Description to provide call to action and details on the reason for the alert.
tts_header_text	TranslatedString	Required	Follow International Base GTFS specification
tts_description_text	TranslatedString	Required	Follow International Base GTFS specification
severity_level	SeverityLevel	Optional	Not used at TfNSW

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
image	TranslatedString	Optional	Not used at TfNSW
image_alternative_text	TranslatedString	Optional	Not used at TfNSW

TimeRange

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
start	uint64	Required	Follow International Base GTFS specification
end	uint64	Required	Follow International Base GTFS specification

EntitySelector

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
agency_id	string	Required	Required by TfNSW
route_id	string	Required	Provide on the route, line level.
route_type	int32	Required	- TfNSW uses route types from the base International GTFS spec and some from the Extended GTFS route Types. - TfNSW has applied extended route types as the base spec only has a limited number of route types and does not support all the different route types across NSW. - The route type for the feed will be determined at the time of the feed development and defined in the TfNSW and Operator GTFS interface agreement.
trip	TripDescriptor	Required	If there is only one trip affected
stop_id	string	Required	Number for a Station, Wharf, Stop

5.4.1 TripDescriptor

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
trip_id	string	Conditionally required	The same trip_id used in the GTFS Schedule feed and or the GTFS Trip Update feed if its an added trip.
route_id	string	Conditionally required	The same route_id as use in the GTFS Scheduled feed and or GTFS Trip Update feed.
direction_id	uint32	Conditionally required	The same direction_id as used in the GTFS scheduled feed and or the GTFS Trip Update feed.
start_time	string	Conditionally required	Follow International Base GTFS specification
start_date	string	Conditionally required	Follow International Base GTFS specification
schedule_relationship	ScheduleRelationship	Optional	The same as what is applied in the GTFS Trip Update feed.

5.4.1.1 ScheduleRelationship – Trip/Stop

Refer to section 5.2.1.1 for trip schedulrelationship values.

5.4.2 Cause

TfNSW will provide business rules on when to apply each cause value as these link to the customer outcomes in digital product, announcements.

These will be provided at the start of the GTFS feed development (or as agreed after initial feed development) based on the operational and customer outcomes for the service and detailed in the *Operator GTFS Schedule and GTFS Realtime Interface agreement*.

Value	TfNSW specific requirements and additional business rules
UNKNOWN_CAUSE	TfNSW will provide rules for when to apply this cause value
OTHER_CAUSE	TfNSW will provide rules for when to apply this cause value
TECHNICAL_PROBLEM	TfNSW will provide rules for when to apply this cause value
STRIKE	TfNSW will provide rules for when to apply this cause value
DEMONSTRATION	TfNSW will provide rules for when to apply this cause value
ACCIDENT	TfNSW will provide rules for when to apply this cause value
HOLIDAY	TfNSW will provide rules for when to apply this cause value
WEATHER	TfNSW will provide rules for when to apply this cause value
MAINTENANCE	TfNSW will provide rules for when to apply this cause value
CONSTRUCTION	TfNSW will provide rules for when to apply this cause value

Value	TfNSW specific requirements and additional business rules
POLICE_ACTIVITY	TfNSW will provide rules for when to apply this cause value
MEDICAL_EMERGENCY	TfNSW will provide rules for when to apply this cause value

5.4.3 Effect

TfNSW will provide business rules on when to apply each Effect value as these link to the customer outcomes in digital product, announcements.

These will be provided at the start of the GTFS feed development (or as agreed after initial feed development) based on the operational and customer outcomes for the service and detailed in the Operator GTFS Schedule and GTFS Realtime Interface agreement.

Value	TfNSW specific requirements and additional business rules
NO_SERVICE	TfNSW will provide rules for when to apply this effect value
REDUCED_SERVICE	TfNSW will provide rules for when to apply this effect value
SIGNIFICANT_DELAYS	TfNSW will provide rules for when to apply this effect value I
DETOUR	TfNSW will provide rules for when to apply this effect value
ADDITIONAL_SERVICE	TfNSW will provide rules for when to apply this effect value
MODIFIED_SERVICE	TfNSW will provide rules for when to apply this effect value
OTHER_EFFECT	TfNSW will provide rules for when to apply this effect value

Value	TfNSW specific requirements and additional business rules
UNKNOWN_EFFECT	TfNSW will provide rules for when to apply this effect value
STOP_MOVED	TfNSW will provide rules for when to apply this effect value

5.4.4 TranslatedString

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
translation	Translation	Required	Follow International Base GTFS specification

5.4.5 Translation

Field Name	Type	Required by TfNSW	TfNSW specific requirements and additional business rules
text	string	Required	Follow International Base GTFS specification
language	string	Conditionally required	Must always be a fixed static value of "EN"

6 Glossary

6.1 Glossary of Terms

Term	Explanation
Passing Stops	Transit Stops on a trip which are ahead of a vehicle on a route path
Passed Stops	Transit Stops on a trip which a vehicle has already passed
Skipped	Services will not stop and the planned/scheduled stop/platform/wharf
International Base GTFS or Base Spec	The International GTFS and GTFS Realtime specification managed by MobilityData

7 Appendix

7.1 Sample GTFS Realtime Trip Update and Vehicle Position

TfNSW Sample Vehicle Position

```
header {
  gtfs_realtime_version: "0.0"
  incrementality: FULL_DATASET
  timestamp: 0000000000
}
entity {
  id: "XXXXXX"
  trip_update {
    trip {
      trip_id: "XXXXX"
      start_time: "00:00:00"
      start_date: "YYYYMMDD"
      schedule_relationship: SCHEDULED
      route_id: "XXXX"
      direction_id: 1
    }
    stop_time_update {
      stop_sequence: 1
      arrival {
        delay: 0
        time: 0000000000
        uncertainty: 0
      }
    }
    departure {
      delay: 247
      time: 0000000000
      uncertainty: 0
    }
    stop_id: "20XXXXXX"
    schedule_relationship: SCHEDULED
    departure_occupancy_status: MANY_SEATS_AVAILABLE
    [transit_realtime.carriage_seq_predictive_occupancy] {
      position_in_consist: 1
      departure_occupancy_status: MANY_SEATS_AVAILABLE
    }
    [transit_realtime.carriage_seq_predictive_occupancy] {
      position_in_consist: 2
      departure_occupancy_status: MANY_SEATS_AVAILABLE
    }
  }
}
vehicle {
  id: "XXXXXX"
  label: "XXX"
  license_plate: "XXX"
}
[transit_realtime.tfnsw_vehicle_descriptor] {
  vehicle_model: "XXX"
}
timestamp: 0000000000
delay: 000
[transit_realtime.trip_properties] {
  block_id: "XXXXX"
}
```

TfNSW Sample Vehicle Position

```
header {
  gtfs_realtime_version: "0.0"
  incrementality: FULL_DATASET
  timestamp: 0000000000
}
entity {
  id: "XXX"
  vehicle {
    trip {
      trip_id: "XXXX"
      start_time: "00 00:00:00"
      start_date: "YYYYMMDD"
      schedule_relationship: SCHEDULED
      route_id: "XXXX"
    }
    position {
      latitude: -00.000000
      longitude: 000.00000
      bearing: 000.00
      speed: 0.0
    }
  }
  current_stop_sequence: X
  current_status: IN_TRANSIT_TO
  timestamp: 0000000000
  congestion_level: UNKNOWN_CONGESTION_LEVEL
  stop_id: "2000000"
```

7.2 Standard Trip update responses

This is the standard GTFS Realtime Trip Update responses.

At the time for GTFS feed development other responses will be defined to support development of a GTFS feed that achieves operational and customer outcome for the mode, service type and specific use cases.

These will be defined at the start of the GTFS feed development and documented in the TfNSW and Operator GTFS interface agreement.

7.2.1 Cancelled trip

```
entity {
  id: "XXXXXX "
  trip_update {
    trip {
      trip_id: "XXXXX"
      start_time: "00:00:00"
      start_date: "YYYYMMDD"
      schedule_relationship: CANCELED
      route_id: "XXXX"
      direction_id: 1
    }
  }
}
```

The trip update for the service's schedule_relationship shows CANCELED which indicates the service has been cancelled. This message should remain for the duration of the service's original scheduled start and end time.

7.2.2 Skipped/cancel a stop to remove stop from trip

This should use the stop `scheduled_relationship` value `SKIPPED` for the stop(s) being skipped/removed from the trip

This could be for any stop in a trip including the first stop where the trip will start at a later stop.

<pre> } entity { id: "XXXXXX " trip_update { trip { trip_id: "XXXXX" start_time: "00:00:00" start_date: "YYYYMMDD" schedule_relationship: SCHEDULED route_id: "XXXX" direction_id: 1 } stop_time_update { stop_sequence: 1 arrival { delay: 0 time: 0000000000 uncertainty: 0 } departure { delay: 247 time: 0000000000 uncertainty: 0 } stop_id: "20XXXXX" schedule_relationship: SKIPPED } } } </pre>	The trip update for the service <code>scheduled_relationship</code> is set to <code>SCHEDULED</code> to indicate the service is a Scheduled trip. The stop <code>scheduled_relationship</code> of the 2nd stop is skipped
---	--

7.2.3 Change in platform/stop

```
entity {
  id: "XXXXXX "
  trip_update {
    trip {
      trip_id: "XXXXX"
      start_time: "00:00:00"
      start_date: "YYYYMMDD"
      schedule_relationship: REPLACEMENT
      route_id: "XXXX"
      direction_id: 1
    }
    stop_time_update {
      stop_sequence: 1
      arrival {
        delay: 0
        time: 0000000000
        uncertainty: 0
      }
      departure {
        delay: 247
        time: 0000000000
        uncertainty: 0
      }
      stop_id: "2126159"
      schedule_relationship: SCHEDULED
    }
  }
}
```

In the subsequent TripUpdate, a schedule_relationship of REPLACEMENT is set to indicate there are changes to the trip compared to the original trip.

The stop_id/TSN is changed to 2126159

7.2.4 Start short and change in platform

```
entity {
  id: "20190617_104042_2"
  trip_update {
    trip {
      trip_id: "186-15.100619.7.1010"
      start_time: "10:10:00"
      start_date: "20190617"
      schedule_relationship: REPLACEMENT
      route_id: "SMNW_M"
    }
    stop_time_update {
      stop_sequence: 1
      stop_id: "2155269"
      schedule_relationship: SKIPPED
    }
    stop_time_update {
      stop_sequence: 2
      arrival {
        delay: 342
      }
      departure {
        delay: 405
      }
      stop_id: "212610"
      schedule_relationship: SCHEDULED
    }
  }
}
```

The trip update for the service schedule_relationship is set to REPLACEMENT to indicate the service is being replaced with new data.

The schedule_relationship of the 1st stop is shown as SKIPPED as the service is no longer starting from the scheduled first stop and will start from a latter stop.

The trip is now starting at stop 2 stop_id however there is a stop change for stop 2 stop_id and the schdueld stop is changed to a new stop stop_id

The schedule_relationship of the 2st stop is shown as SCHEDULED with the stop_id has a change in stop_id from the planned schedule stop_id

7.2.5 Added trip

```
trip_update {
  trip {
    trip_id: "319-11.130619.8.1010"
    start_time: "10:10:00"
    start_date: "20190613"
    schedule_relationship: ADDED
    route_id: "SMNW_M"
  }
  stop_time_update {
    stop_sequence: 1
    departure {
      delay: -273
      time: 1560384326
    }
    stop_id: "2067143"
    schedule_relationship: SCHEDULED
  }
  ...
}
```

A new trip is added to the GTFS-R file with the stops for the service.