

GTFS-R Open Data Technical Documentation

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Document Control

Revision history

Version	Date	Author	Description
1	November, 2021	Department of Transport	Creating initial version of document
2.	December, 2021	Department of Transport	Updated and reviewed
3.	February, 2022	Department of Transport	Updated and reviewed to include Service Alerts
4.	June, 2022	Department of Transport	Updated and reviewed to include Metro Bus Trip Updates

References

Document Name	Location
GTFS Realtime	https://developers.google.com/transit/gtfs-realtime
GTFS	https://developers.google.com/transit/gtfs
Australian Government - API Design Standard	https://api.gov.au/standards/national_api_standards/

1. Overview

GTFS Realtime (GTFS-R) is a feed specification that allows public transportation agencies to provide real-time updates about their fleet to application developers. It is an extension of 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. The GTFS Realtime data exchange format is based on Protocol Buffers. The data structure is defined in a `gtfs-realtime.proto` file, which then is used to generate source code to easily read and write users' structured data to and from a variety of data streams, using a variety of languages.

An incremental approach has been taken to release features of the GTFS-R feed as they reach completion. As a result, not all features are readily available through the initial release but will be addressed in future releases. The initial GTFS-R release delivers trip updates, service alerts, vehicle positions and occupancy data for Metro trains. The Metro Bus trip updates is added to this latest release. The trip update feed provides real-time arrival and departure information of a trip, and the vehicle position feed contains live location and occupancy of the service, where data is available. The feed does not cover train replacement buses, school buses, service deviations and platform information.

This initial GTFS-R feeds release will contain the feeds outlined in the below table:

GTFS-R feed	Metro Trains	Metro Buses
Trip Updates	Available	Available
Vehicle Position Updates	Available	Not Available
Service Alerts	Available	Not Available

Table 1 Initial GTFS-R feeds release

Service alerts initial release will only include cancellations. Other modes of transport are not covered for this initial release and will be considered for future releases.

Data refresh has been scheduled at every 30 seconds; we recommend making one call per 20 seconds to each of the GTFS-R endpoints. Any further requests will be subject to rate limiting.

The GTFS static feed, to be used in conjunction with the GTFS-R feed, can be found on the Data Vic website (<https://discover.data.vic.gov.au/dataset/ptv-timetable-and-geographic-information-2015-gtfs>).

This document builds upon the Google Realtime Transit API reference which can be found on the Google Developers platform (<https://developers.google.com/transit/gtfs-realtime>). Both documents should be used and consulted in parallel when utilising this data feed.

2. Known Constraints

The following are known constraints which should be noted by the consumers of the GTFS-R feed:

1. The GTFS-R feed will contain real-time updates for the trips contained in the GTFS static file, where real-time updates are available.
2. The GTFS-R solution does not cater for “added” or “changed” trips that have been added to the daily operational timetable and do not exist in the weekly GTFS Static data.
3. There could be a delay of up to a day for the GTFS static and the GTFS-R feed to align on the day the GTFS feed is updated on the Data Vic website. The GTFS-R feed uses the GTFS static feed that was active as of 3am that day. If the static bundle is subsequently updated later in the day, the GTFS-R will still correspond to the GTFS static feed from 3am that day. The GTFS-R feed will align to the new static the following day.

3. Data Feed Access

The GTFS-R feed can be accessed directly via the Data Exchange Platform: [Data Exchange Platform](#)

The below websites also have a redirection link to the GTFS-R feed:

[PTV Open Data](#)

[DATA VIC](#)

[DATA VIC API developer](#)

4. Data Exchange Platform (DEP)

To access the GTFS-R API, the user is required to sign up to the DEP portal – <https://data-exchange.vicroads.vic.gov.au/>. This can be done through the following steps:

1. Click on the “Sign up” link found on the [DEP portal homepage](#) as seen below

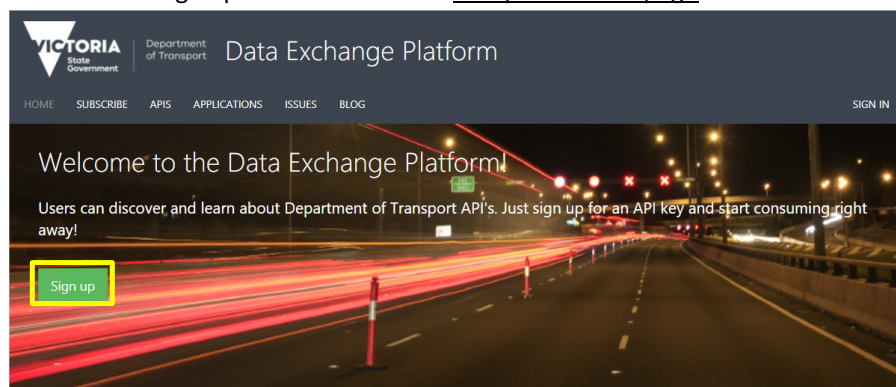


Figure 1 DEP homepage

2. The user will then be required to fill in the following details on the “Sign up” page as seen in the following screenshot

Email Address

Verification code

New Password

Confirm New Password

Surname

Given Name

Display Name

Figure 2 Details required for registration

3. The user will be able to subscribe to two products through the platform (<https://data-exchange.vicroads.vic.gov.au/products>) – Starter or Unlimited. Starter product can be used for data discovery. For production loads, please subscribe to the unlimited product.
 Note: For the GTFS-R feeds specifically, it is recommended to make one call per 20 seconds to each of the GTFS-R endpoints, any further requests will be subject to rate limiting
4. Users' subscriber key can be found from their profile which can then be used to request the GTFS-R API using the appropriate request URL by:
 - a. Signing into their profile

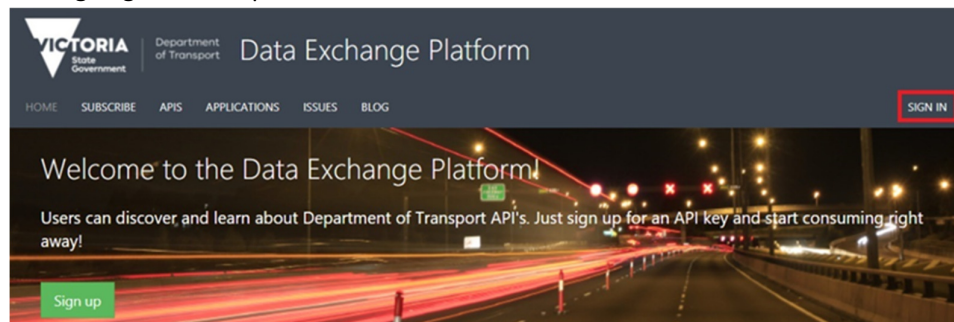
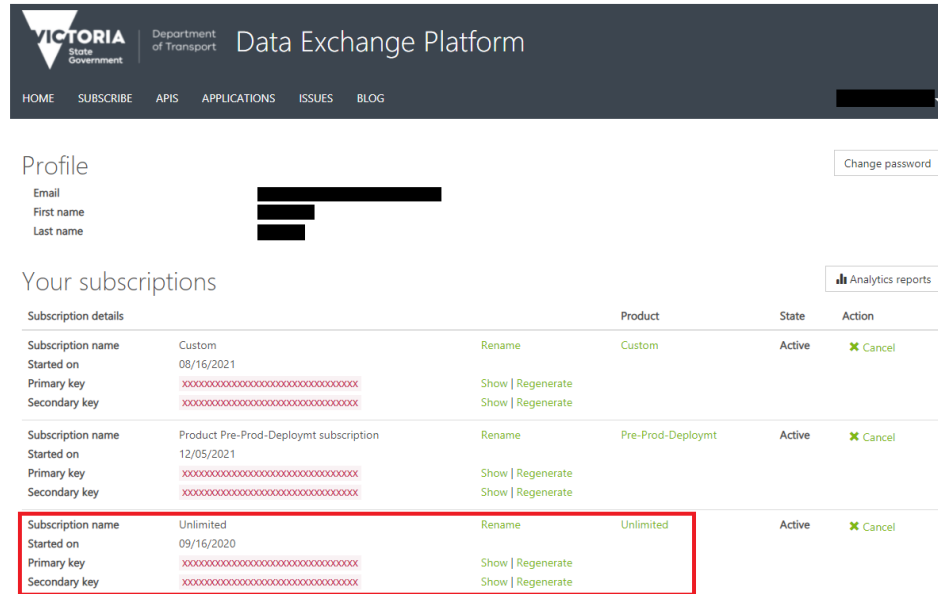


Figure 3 DEP homepage for users to sign in

- b. Under the user's account name, navigate to the profile
 - c. Click "show" and copy the Primary subscription key to be used as the token to access the API endpoint.



Profile

Email
First name
Last name

[Change password](#)

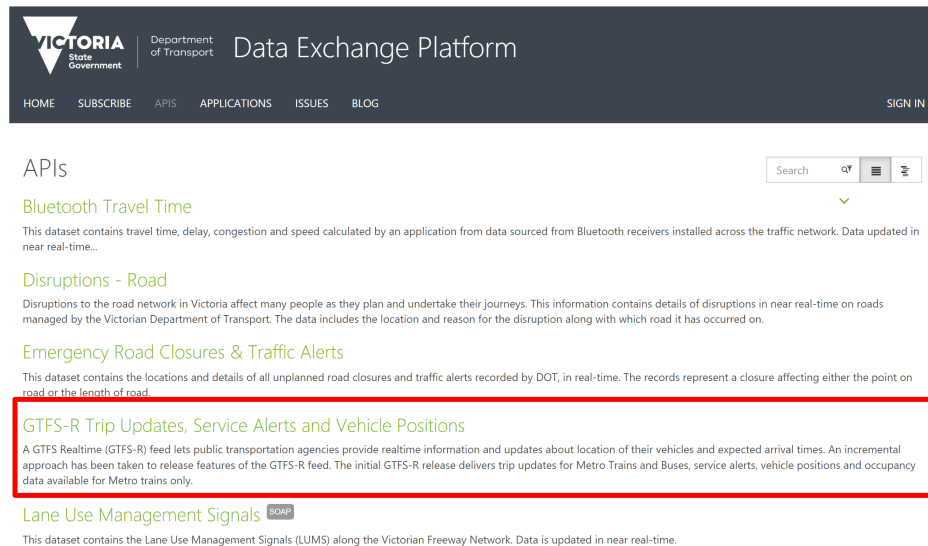
Your subscriptions

[Analytics reports](#)

Subscription details		Product	State	Action
Subscription name	Custom	Custom	Active	Cancel
Started on	08/16/2021			
Primary key	xx	Show Regenerate		
Secondary key	xx	Show Regenerate		
Subscription name	Product Pre-Prod-Deploymt subscription	Pre-Prod-Deploymt	Active	Cancel
Started on	12/05/2021			
Primary key	xx	Show Regenerate		
Secondary key	xx	Show Regenerate		
Subscription name	Unlimited	Unlimited	Active	Cancel
Started on	09/16/2020			
Primary key	xx	Show Regenerate		
Secondary key	xx	Show Regenerate		

Figure 4 Accessing the primary subscription key

- For the GTFS-R feeds:
 - Click on the API tab then select **GTFS-R Trip Updates, Vehicle Positions and Service Alerts**



APIs

Search

[Bluetooth Travel Time](#)

This dataset contains travel time, delay, congestion and speed calculated by an application from data sourced from Bluetooth receivers installed across the traffic network. Data updated in near real-time...

[Disruptions - Road](#)

Disruptions to the road network in Victoria affect many people as they plan and undertake their journeys. This information contains details of disruptions in near real-time on roads managed by the Victorian Department of Transport. The data includes the location and reason for the disruption along with which road it has occurred on.

[Emergency Road Closures & Traffic Alerts](#)

This dataset contains the locations and details of all unplanned road closures and traffic alerts recorded by DOT, in real-time. The records represent a closure affecting either the point on road or the length of road.

GTFS-R Trip Updates, Service Alerts and Vehicle Positions

A GTFS Realtime (GTFS-R) feed lets public transportation agencies provide realtime information and updates about location of their vehicles and expected arrival times. An incremental approach has been taken to release features of the GTFS-R feed. The initial GTFS-R release delivers trip updates for Metro Trains and Buses, service alerts, vehicle positions and occupancy data available for Metro trains only.

[Lane Use Management Signals](#)

This dataset contains the Lane Use Management Signals (LUMS) along the Victorian Freeway Network. Data is updated in near real-time.

Figure 5 List of APIs

- Click on the API and you will find the endpoints for Metro Trains and Metro Bus Trip Updates, Metro Trains Vehicle Positions and Metro Trains Service Alerts.

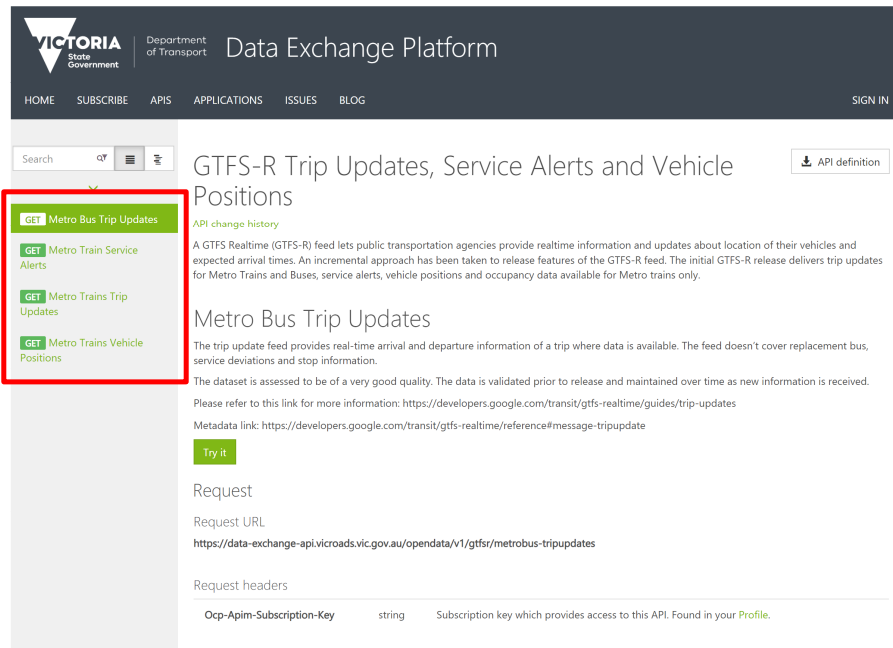


Figure 6 GTFS-R Trip Updates, Vehicle Positions and Service Alerts endpoints

- Click on the “Try It” and then “Send” button to test the response of the endpoint



Figure 7 Testing the API endpoints

5. General Transit Feed Specification – Static

Consumption of GTFS static data is required as a prerequisite for integration with GTFS-R feed. The GTFS static data is accessible through the Data Vic website with respective release notes available for users.

To see the GTFS static documentation please visit <https://discover.data.vic.gov.au/dataset/ptv-timetable-and-geographic-information-2015-gtfs> for more information.

6. General Transit Feed Specification – Real time

The specification below is a close representation of a JSON message and will be in a protobuf binary message format. It will not be legible in API client platforms such as Postman without conversion.

To understand the details of GTFS-R protobuf please visit <https://developers.google.com/transit/gtfs-realtime> for further information.

6.1 Trip Updates

The trip update feed provides information about the arrival and departure times for the stops of a trip.

6.1.1 Coverage

The Metro Trains and Metro Bus trip updates feed will cover the metropolitan train and bus network. The feed does not cover train replacement buses, school buses, service deviations and platform information.

Example

```
header {
  gtfs_realtime_version: "2.0"
  incrementality: FULL_DATASET
  timestamp: 1638762990 # 2021-12-06 03:56:30 UTC
}
entity {
  id: "2021-12-06-1693"
  trip_update {
    trip {
      trip_id: "1235.T5.2-MER-E-mjp-1.4.R"
      start_time: "13:49:00"
      start_date: "20211206"
    }
    stop_time_update {
      stop_sequence: 26
      arrival {
        time: 1638762060 # 2021-12-06 03:41:00 UTC
      }
      departure {
        time: 1638762120 # 2021-12-06 03:42:00 UTC
      }
    }
  }
}
```

Figure 8 An example of a base trip message format for trip updates

6.1.2 Field descriptions

Please refer to the GTFS-R documentation for field descriptions:

<https://developers.google.com/transit/gtfs-realtime/reference#message-tripupdate>

6.2 Vehicle Position

Vehicle position is used to provide information on the location and occupancy status of a vehicle, where data is available.

6.2.1 Coverage

The Metro Trains vehicle positions feed will cover the metropolitan train network. The feed does not cover train replacement buses.

6.2.2 Example

```
header {
  gtfs_realtime_version: "2.0"
  incrementality: FULL_DATASET
  timestamp: 1638763021 # 2021-12-06 03:57:01 UTC
}
entity {
  id: "2021-12-06-X089"
  vehicle {
    trip {
      trip_id: "1419.T5.2-SDM-C-mjp-1.1.H"
      start_time: "14:36:00"
      start_date: "20211206"
    }
    position {
      latitude: -37.904743
      longitude: 145.00266
      bearing: 187.36104
    }
    timestamp: 1638762955 # 2021-12-06 03:55:55 UTC
    vehicle {
      id: "1123T-545M-546M"
    }
    occupancy_status: MANY_SEATS_AVAILABLE
  }
}
```

Figure 9 An example of a base trip message format for vehicle positions

6.2.3 Field descriptions

Please refer to the GTFS-R documentation for field descriptions:

<https://developers.google.com/transit/gtfs-realtime/reference#message-vehicleposition>

6.3 Service Alerts

Service alerts allow you to provide updates whenever there is disruption on the network. Delays are delivered via Trip Updates, whereas cancellations are published via Service Alerts.

For initial release of Service Alerts, only cancellations will be published.

6.3.1 Coverage

The Metro Trains Service Alert will be displayed where appropriate within the given time range. This range should cover the entire time that the alert is useful for the passenger to see.

Cancellations will only be published for current operational date along with applicable trip ID. The rate of data refresh is every 30 second.

If no time is given, we will display the alert for as long as it is in the feed. If multiple ranges are given, we will display all the time ranges.

6.3.2 Example

```
header {
  gtfs_realtime_version: "2.0"
  incrementality: FULL_DATASET
  timestamp: 1644449835 # 2022-02-10 10:37:15 AM
}
entity {
  id: "2022-02-10-5255"
  alert {
    informed_entity {
      trip {
        trip_id: "3793.T5.2-B31-C-mjp-1.2.H",
        start_time: "09:16:00",
        start_date: "20220210",
      }
    }
    effect: NO_SERVICE
    header_text {
      translation {
        text: "CANCELED"
        language: "en"
      }
    }
    description_text {
      translation {
        text: "Craigieburn Line, outbound: The 10-02-2022 09:16 from Flinders Street to Craigieburn has been cancelled"
        language: "en"
      }
    }
  }
}
```

Figure 10 An example of a base trip message format for service alerts

6.3.3 Field descriptions

Please refer to the GTFS-R documentation for field descriptions:

<https://developers.google.com/transit/gtfs-realtime/reference#message-alert>

7. Error Handling

GTFS-R APIs will use the status-line part of the HTTP response message to inform users of the result of their request.

The HTTP status codes are separated into five categories:

1. 100-199 – provides protocol-level information
2. 200-299 – provides information that the user's request was successful accepted by the API
3. 300-399 – indicates further action is needed by the user for the API to complete the request
4. 400-499 – indicates that the error status codes arose from the user's side
5. 500-599 – indicates that the error status codes arose from the server's side

Some common examples of HTTP status codes that users may come across are the following:

- 200 OK – the request has been successful
- 400 Bad Request – incorrect syntax has led to the request being misunderstood by the server
- 404 Not Found – the requested resource cannot be found by the server
- 429 Rate limit is exceeded. Try again in xx seconds – API request exceeded the limit on the endpoint
- 500 Internal Server error – request could not be handled due to an internal server error

The error codes used is aligned to the Victorian Government's National API Design Standards (NAPIDS).

Further information on HTTP response codes that must be supported can be found here:

https://api.gov.au/standards/national_api_standards/api-response.html#http-response-codes.

Users will also be able to report errors about the API by contacting the DEP administrators via data_exchange@roads.vic.gov.au.