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# **multigtfs Documentation**

*Release 1.1.2*

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**multigtfs** is an [Apache 2.0](#)-licensed Django app that supports importing and exporting of GTFS feeds. All features of the [June 20, 2012 reference](#) are supported, including [all changes](#) up to February 17, 2014. It allows multiple feeds to be stored in the database at once.

It requires a spatial databases compatible with [GeoDjango](#). [PostgreSQL 9.x](#) and [PostGIS 2.x](#) are recommended for development and production, since these support all the [GeoDjango](#) features.



`multigtfs` is ready for your GTFS project.

Point releases (such as 1.0.0 to 1.0.1) should be safe, only adding features or fixing bugs. Minor updates (1.0.1 to 1.1.0) may include significant changes that will break relying code. In the worst case scenario, you may need to export your GTFS feeds in the original version, update `multigtfs` and your code, and re-import.

`multigtfs` works with Django 1.8 (the long-term support, or LTS, release) through 1.11 (the next LTS release), and 2.0. Support will follow the Django supported releases, as well as the Python versions supported by those releases.

All valid GTFS feeds are supported for import and export. This includes feeds with extra columns not yet included in the GTFS spec, and feeds that omit `calendar.txt` in favor of `calendar_dates.txt` (such as the TriMet archive feeds). If you find a feed that doesn't work, [file a bug!](#)

See the [issues list](#) for more details on bugs and feature requests.



## CHAPTER 2

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### Example project

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Check out the [example project](#).

If you have [Docker](#) installed and working, you can run the example project without installing a database.

1. Add one or more feeds to import to the folder `feeds/import`. You can find a feed for download at <https://transitfeeds.com>, such as [Tulsa Transit's Feed](#).
2. Initialize the containers with `docker-compose up`. After a few minutes, it will display:

```
web_1 | Django version 1.8.18, using settings 'exploreproj.settings'  
web_1 | Development server is running at http://0.0.0.0:8000/  
web_1 | Using the Werkzeug debugger (http://werkzeug.pocoo.org/)  
web_1 | Quit the server with CONTROL-C.  
web_1 | * Debugger is active!  
web_1 | * Debugger PIN: XXX-XXX-XXX
```

3. Visit <http://localhost:8000> to view the example project.

See the [example project](#) for more details.



**Code** <https://github.com/tulsawebdevs/django-multi-gtfs>

**Issues** <https://github.com/tulsawebdevs/django-multi-gtfs/issues>

**Dev Docs** <http://multigtfs.readthedocs.io/>

**IRC** <irc://irc.freenode.net/tulsawebdevs>

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## 3.1 Projects using multigtfs

Projects using multigtfs include:

- [GTFS Explorer](#) - A web application from [MRCagney](#) to analyze and visualize public transport data.
- [tulsa-transit-google](#) - The original project that spawned multigtfs. Tulsa Transit no longer uses this code, but instead is using the GTFS export feature of their scheduling provider.

Want to see your project here? Send a [pull request](#) or [open an issue](#).

## 3.2 Installation

At the command line:

```
$ easy_install multigtfs
```

Or, if you have virtualenvwrapper installed:

```
$ mkvirtualenv multigtfs
$ pip install multigtfs
```

In your settings, add `multigtfs` to your `INSTALLED_APPS` and ensure you have a spatial database configured.

Use `./manage.py migrate` to install the tables.

## 3.3 Usage

### 3.3.1 Management Commands

There are two management commands to get GTFS feeds in and out of the database:

```
./manage.py importgtfs [--name name_of_feed] path/to/gtfsfeed.zip
./manage.py exportgtfs [--name basename_of_file] <feed_id>
```

A third command will update cached geometries, used for making geo-queries at the shape, trip, or route level:

```
./manage.py refreshgeometries --all # Refresh all geometries
./manage.py refreshgeometries 1 2 3 # Refresh just feeds 1, 2, and 3
```

*Note:* cached geometries are normally updated whenever the related shape points or stops are updated. This command is useful for refreshing geometries after manual changes or after a bug fix (like the v0.3.3 update).

### 3.3.2 In Code

`multigtfs` is composed of Django models that implement GTFS, plus helper methods for importing and exporting to the GTFS format. Where GTFS relates objects through IDs (such as Stop IDs for stops), `multigtfs` uses `ForeignKeys`.

`multigtfs` includes a `Feed` object, which is not part of GTFS. This is used to include several feeds in the same file without collisions. These can be feeds from different agencies, or different versions of a feed from the same agency. The object has a helper method, `in_feed`, that is sometimes useful in filtering objects by feed. At other times, it is easier to start at the feed and follow relations.

See the next section, [Implementation of GTFS](#), for details on how the GTFS specification is implemented in Django models. Load the app in your Django project, play with the admin, and read the source code to learn more.

### 3.3.3 Sample Project

The `examples/explore` sample project demonstrates a simple read-only website for viewing one or more GTFS feeds. It include [OpenLayers](#) maps for viewing the routes, trips, and shapes. You can use it as is, or as a starting place for your own projects. See the project README (`examples/explore/README.md`) for more information.

## 3.4 Implementation of GTFS

The [GTFS specification](#) is fairly stable. [Updates](#) occur about once a year, with the latest on February 2nd, 2015. This page describes how `multigtfs` implements the spec, using text from the spec.

### Contents

- [Implementation of GTFS](#)
  - [GTFS Feeds and general notes](#)

- *Required files*
  - \* *agency.txt (Agency)*
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  - \* *route.txt (Route)*
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  - \* *stop\_times.txt (StopTime)*
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- *Optional Files*
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  - \* *frequencies.txt (Frequency)*
  - \* *transfers.txt (Transfer)*
  - \* *feed\_info.txt (FeedInfo)*

### 3.4.1 GTFS Feeds and general notes

A GTFS feed is a zipfile containing one or more .txt files, containing comma-delimited text. The management commands `importgtfs` and `exportgtfs` can read and create these files (see the docs on [Management Commands](#) for more info).

Each .txt file is mapped to a Django model, with additional models to handle implicit relations in GTFS, and to handle multiple feeds in a single database.

The Feed model doesn't export as a file in the feed, but instead holds feed metadata, including these fields:

- `name` - A human-friendly name for the feed
- `created` - The time the feed was created
- `meta` - A JSON-encoded field with extra data about the feed. For example, if a `stops.txt` table include an additional column "shelter", then `meta` will contain:

```
{
  "extra_columns": {
    "Stop": [
      "shelter"
    ]
  }
}
```

Models that map to feed records commonly include these fields:

- `feed` - The relation to the Feed
- `id` - The database ID for the record
- `extra_data` - A JSON-encoded field tracking extra data for the record. For example, if a `stops.txt` file contains an extra column "shelter" with a value "1", `extra_data` will contain:

```
{
  "shelter": "1"
}
```

`Feed.extra_columns` and `<Model>.extra_data` work together to allow importing and exporting of non-standard feeds without losing data.

### 3.4.2 Required files

The specification marks these as required files for a valid GTFS feed:

- `agency.txt` - One or more transit agencies that provide the data in this feed.
- `stops.txt` - Individual locations where vehicles pick up or drop off passengers.
- `routes.txt` - Transit routes. A route is a group of trips that are displayed to riders as a single service.
- `trips.txt` - Trips for each route. A trip is a sequence of two or more stops that occurs at specific time.
- `stop_times.txt` - Times that a vehicle arrives at and departs from individual stops for each trip.
- `calendar.txt` - Dates for service IDs using a weekly schedule. Specify when service starts and ends, as well as days of the week where service is available. *Note - if `calendar_dates.txt` specifies all the feed dates, then this file can be empty. TriMet in Portland, OR, uses this style for their feed.*

#### `agency.txt` (Agency)

`agency.txt` is implemented in the `Agency` model. The fields are:

- `agency_id` (`Agency.agency_id`) (*optional*): The `agency_id` field is an ID that uniquely identifies a transit agency. A transit feed may represent data from more than one agency. The `agency_id` is dataset unique. This field is optional for transit feeds that only contain data for a single agency.
- `agency_name` (`Agency.name`) (*required*): The `agency_name` field contains the full name of the transit agency. Google Maps will display this name.
- `agency_url` (`Agency.url`) (*required*): The `agency_url` field contains the URL of the transit agency. The value must be a fully qualified URL that includes `http://` or `https://`, and any special characters in the URL must be correctly escaped. See [http://www.w3.org/Addressing/URL/4\\_URI\\_Recommendations.html](http://www.w3.org/Addressing/URL/4_URI_Recommendations.html) for a description of how to create fully qualified URL values.
- `agency_timezone` (`Agency.timezone`) (*required*): The `agency_timezone` field contains the timezone where the transit agency is located. Timezone names never contain the space character but may contain an underscore. Please refer to [http://en.wikipedia.org/wiki/List\\_of\\_tz\\_zones](http://en.wikipedia.org/wiki/List_of_tz_zones) for a list of valid values. If multiple agencies are specified in the feed, each must have the same `agency_timezone`.
- `agency_lang` (`Agency.lang`) (*optional*): The `agency_lang` field contains a two-letter ISO 639-1 code for the primary language used by this transit agency. The language code is case-insensitive (both `en` and `EN` are accepted). This setting defines capitalization rules and other language-specific settings for all text contained in this transit agency's feed. Please refer to [http://www.loc.gov/standards/iso639-2/php/code\\_list.php](http://www.loc.gov/standards/iso639-2/php/code_list.php) for a list of valid values.
- `agency_phone` (`Agency.phone`) (*optional*): The `agency_phone` field contains a single voice telephone number for the specified agency. This field is a string value that presents the telephone number as typical for the agency's service area. It can and should contain punctuation marks to group the digits of the number. Dialable text (for example, TriMet's "503-238-RIDE") is permitted, but the field must not contain any other descriptive text.

- `agency_fare_url` (`Agency.fare_url`) (*optional*): The `agency_fare_url` specifies the URL of a web page that allows a rider to purchase tickets or other fare instruments for that agency online. The value must be a fully qualified URL that includes `http://` or `https://`, and any special characters in the URL must be correctly escaped. See [http://www.w3.org/Addressing/URL/4\\_URI\\_Recommendations.html](http://www.w3.org/Addressing/URL/4_URI_Recommendations.html) for a description of how to create fully qualified URL values.

### stops.txt (Stop)

`stops.txt` is implemented in the `Stop` model. The fields are:

- `stop_id` (`Stop.stop_id`) (*required*): The `stop_id` field contains an ID that uniquely identifies a stop or station. Multiple routes may use the same stop. The `stop_id` is dataset unique.
- `stop_code` (`Stop.code`) (*optional*): The `stop_code` field contains short text or a number that uniquely identifies the stop for passengers. Stop codes are often used in phone-based transit information systems or printed on stop signage to make it easier for riders to get a stop schedule or real-time arrival information for a particular stop.

The `stop_code` field should only be used for stop codes that are displayed to passengers. For internal codes, use `stop_id`. This field should be left blank for stops without a code.

- `stop_name` (`Stop.name`) (*required*): The `stop_name` field contains the name of a stop or station. Please use a name that people will understand in the local and tourist vernacular.
- `stop_desc` (`Stop.desc`) (*optional*): The `stop_desc` field contains a description of a stop. Please provide useful, quality information. Do not simply duplicate the name of the stop.
- `stop_lat` (`Stop.point`) (*required*): The `stop_lat` field contains the latitude of a stop or station. The field value must be a valid WGS 84 latitude.
- `stop_lon` (`Stop.point`) (*required*): The `stop_lon` field contains the longitude of a stop or station. The field value must be a valid WGS 84 longitude value from -180 to 180.
- `zone_id` (`Stop.zone`) (*optional*): The `zone_id` field defines the fare zone for a stop ID. Zone IDs are required if you want to provide fare information using `fare_rules.txt`. If this stop ID represents a station, the zone ID is ignored.
- `stop_url` (`Stop.url`) (*optional*): The `stop_url` field contains the URL of a web page about a particular stop. This should be different from the `agency_url` and the `route_url` fields.

The value must be a fully qualified URL that includes `http://` or `https://`, and any special characters in the URL must be correctly escaped. See [http://www.w3.org/Addressing/URL/4\\_URI\\_Recommendations.html](http://www.w3.org/Addressing/URL/4_URI_Recommendations.html) for a description of how to create fully qualified URL values.

- `location_type` (`Stop.location_type`) (*optional*): The `location_type` field identifies whether this stop ID represents a stop or station. If no location type is specified, or the `location_type` is blank, stop IDs are treated as stops. Stations may have different properties from stops when they are represented on a map or used in trip planning.

The location type field can have the following values:

- **0 or blank - Stop.** A location where passengers board or disembark from a transit vehicle.
- **1 - Station.** A physical structure or area that contains one or more stop.

- `parent_station` (`Stop.parent_station`) (*optional*): For stops that are physically located inside stations, the `parent_station` field identifies the station associated with the stop. To use this field, `stops.txt` must also contain a row where this stop ID is assigned `location_type=1`.

If this stop ID represents a stop located inside a station, this entry's location type should be 0 or blank, and the entry's `parent_station` field contains the stop ID of the station where this stop is located. The stop referenced by `parent_station` must have `location_type=1`.

If this stop ID represents a stop located outside a station, this entry's location type should be 0 or blank, and the entry's parent\_station field contains a blank value. The parent\_station field doesn't apply to this stop.

If this stop ID represents a station, this entry's location type should be 1, and the entry's parent\_station field should be a blank value. Stations can't contain other stations.

- stop\_timezone (Stop.timezone) (*optional*): The stop\_timezone field contains the timezone in which this stop or station is located. Please refer to Wikipedia List of Timezones for a list of valid values: [http://en.wikipedia.org/wiki/List\\_of\\_tz\\_zones](http://en.wikipedia.org/wiki/List_of_tz_zones)

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 (Stop.wheelchair\_boarding) (*optional*): The wheelchair\_boarding field identifies whether wheelchair boardings are possible from the specified stop or station. The field can have the following values:
  - **0 (or empty) - indicates that there is no accessibility information for** the stop
  - **1 - indicates that at least some vehicles at this stop can be boarded** by a rider in a wheelchair
  - **2 - wheelchair boarding is not possible at this stop**

When a stop is part of a larger station complex, as indicated by a stop with a parent\_station value, the stop's wheelchair\_boarding field has the following additional semantics:

- **0 (or empty) - the stop will inherit its wheelchair\_boarding value from** the parent station, if specified in the parent
- **1 - there exists some accessible path from outside the station to the** specific stop / platform
- **2 - there exists no accessible path from outside the station to the** specific stop / platform

## route.txt (Route)

route.txt is implemented in Route.

- route\_id (Route.route\_id) (*required*): The route\_id field contains an ID that uniquely identifies a route. The route\_id is dataset unique.
- agency\_id (Route.agency.agency\_id) (*optional*): The agency\_id field defines an agency for the specified route. This value is referenced from the agency.txt file. Use this field when you are providing data for routes from more than one agency.
- route\_short\_name (Route.short\_name) (*required*): The route\_short\_name contains the short name of a route. This will often be a short, abstract identifier like "32", "100X", or "Green" that riders use to identify a route, but which doesn't give any indication of what places the route serves. If the route does not have a short name, please specify a route\_long\_name and use an empty string as the value for this field.

See a Google Maps screenshot highlighting the route\_short\_name: <http://bit.ly/yIS1sa>

- route\_long\_name (Route.long\_name) (*required*): The route\_long\_name contains the full name of a route. This name is generally more descriptive than the route\_short\_name and will often include the route's destination

or stop. If the route does not have a long name, please specify a `route_short_name` and use an empty string as the value for this field.

See a Google Maps screenshot highlighting the `route_long_name`: <http://bit.ly/wZw5yH>

- `route_desc` (`Route.desc`) (*optional*): The `route_desc` field contains a description of a route. Please provide useful, quality information. Do not simply duplicate the name of the route. For example, “A trains operate between Inwood-207 St, Manhattan and Far Rockaway-Mott Avenue, Queens at all times. Also from about 6AM until about midnight, additional A trains operate between Inwood-207 St and Lefferts Boulevard (trains typically alternate between Lefferts Blvd and Far Rockaway).”
- `route_type` (`Route.rtype`) (*required*): The `route_type` field describes the type of transportation used on a route. Valid values for this field are:
  - **0 - Tram, Streetcar, Light rail. Any light rail or street level system** within a metropolitan area.
  - **1 - Subway, Metro. Any underground rail system within a metropolitan** area.
  - 2 - Rail. Used for intercity or long-distance travel.
  - 3 - Bus. Used for short- and long-distance bus routes.
  - 4 - Ferry. Used for short- and long-distance boat service.
  - **5 - Cable car. Used for street-level cable cars where the cable runs** beneath the car.
  - **6 - Gondola, Suspended cable car. Typically used for aerial cable cars** where the car is suspended from the cable.
  - 7 - Funicular. Any rail system designed for steep inclines.

See a Google Maps screenshot highlighting the `route_type`: <http://bit.ly/wSt2h0>

- `route_url` (`Route.url`) (*optional*): The `route_url` field contains the URL of a web page about that particular route. This should be different from the `agency_url`.

The value must be a fully qualified URL that includes `http://` or `https://`, and any special characters in the URL must be correctly escaped. See [http://www.w3.org/Addressing/URL/4\\_URI\\_Recommentations.html](http://www.w3.org/Addressing/URL/4_URI_Recommentations.html) for a description of how to create fully qualified URL values.

- `route_color` (`Route.color`) (*optional*): In systems that have colors assigned to routes, the `route_color` field defines a color that corresponds to a route. The color must be provided as a six-character hexadecimal number, for example, 00FFFF. If no color is specified, the default route color is white (FFFFFF).

The color difference between `route_color` and `route_text_color` should provide sufficient contrast when viewed on a black and white screen. The W3C Techniques for Accessibility Evaluation And Repair Tools document offers a useful algorithm for evaluating color contrast: <http://www.w3.org/TR/AERT#color-contrast>

There are also helpful online tools for choosing contrasting colors, including the snook.ca Color Contrast Check application: [http://snook.ca/technical/colour\\_contrast/colour.html](http://snook.ca/technical/colour_contrast/colour.html)

- `route_text_color` (`Route.text_color`) (*optional*): The `route_text_color` field can be used to specify a legible color to use for text drawn against a background of `route_color`. The color must be provided as a six-character hexadecimal number, for example, FFD700. If no color is specified, the default text color is black (000000).

The color difference between `route_color` and `route_text_color` should provide sufficient contrast when viewed on a black and white screen.

## trips.txt (Trip)

`trips.txt` is implemented in `Trip`

- `route_id` (`Trip.route.route_id`) (*required*): The `route_id` field contains an ID that uniquely identifies a route. This value is referenced from the `routes.txt` file.
- `service_id` (`Trip.service.service_id`) (*required*): The `service_id` contains an ID that uniquely identifies a set of dates when service is available for one or more routes. This value is referenced from the `calendar.txt` or `calendar_dates.txt` file.
- `trip_id` (`Trip.trip_id`) (*required*): The `trip_id` field contains an ID that identifies a trip. The `trip_id` is dataset unique.
- `trip_headsign` (`Trip.headsign`) (*optional*): The `trip_headsign` field contains the text that appears on a sign that identifies the trip’s destination to passengers. Use this field to distinguish between different patterns of service in the same route. If the headsign changes during a trip, you can override the `trip_headsign` by specifying values for the `stop_headsign` field in `stop_times.txt`.

See a Google Maps screenshot highlighting the headsign: <http://bit.ly/A3ot2j>

- `trip_short_name` (`Trip.short_name`) (*optional*): The `trip_short_name` field contains the text that appears in schedules and sign boards to identify the trip to passengers, for example, to identify train numbers for commuter rail trips. If riders do not commonly rely on trip names, please leave this field blank.

A `trip_short_name` value, if provided, should uniquely identify a trip within a service day; it should not be used for destination names or limited/express designations.

- `direction_id` (`Trip.direction`) (*optional*): The `direction_id` field contains a binary value that indicates the direction of travel for a trip. Use this field to distinguish between bi-directional trips with the same `route_id`. This field is not used in routing; it provides a way to separate trips by direction when publishing time tables. You can specify names for each direction with the `trip_headsign` field.
  - 0 - travel in one direction (e.g. outbound travel)
  - 1 - travel in the opposite direction (e.g. inbound travel)

For example, you could use the `trip_headsign` and `direction_id` fields together to assign a name to travel in each direction on trip “1234”, the `trips.txt` file would contain these rows for use in time tables:

```
trip_id, ... ,trip_headsign,direction_id
1234, ... , to Airport,0
1505, ... , to Downtown,1
```

- `block_id` (`Trip.block.block_id`) (*optional*): The `block_id` field identifies the block to which the trip belongs. A block consists of two or more sequential trips made using the same vehicle, where a passenger can transfer from one trip to the next just by staying in the vehicle. The `block_id` must be referenced by two or more trips in `trips.txt`.
- `shape_id` (`Trip.shape.shape_id`) (*optional*): The `shape_id` field contains an ID that defines a shape for the trip. This value is referenced from the `shapes.txt` file. The `shapes.txt` file allows you to define how a line should be drawn on the map to represent a trip.
- **wheelchair\_accessible** (`Trip.wheelchair_accessible`) (*optional*):
  - **0 (or empty)** - indicates that there is no accessibility information for the trip
  - **1** - indicates that the vehicle being used on this particular trip can accommodate at least one rider in a wheelchair
  - **2** - indicates that no riders in wheelchairs can be accommodated on this trip
- **bikes\_allowed** (`Trip.bikes_allowed`) (*optional*):
  - 0 (or empty) - indicates that there is no bike information for the trip

- 1 - indicates that the vehicle being used on this particular trip can accommodate at least one bicycle
- 2 - indicates that no bicycles are allowed on this trip

### stop\_times.txt (StopTime)

stop\_times.txt is implemented in StopTime.

- trip\_id (StopTime.trip.trip\_id) (*required*): The trip\_id field contains an ID that identifies a trip. This value is referenced from the trips.txt file.
- arrival\_time (StopTime.arrival\_time) (*required*): The arrival\_time specifies the arrival time at a specific stop for a specific trip on a route. The time is measured from “noon minus 12h” (effectively midnight, except for days on which daylight savings time changes occur) at the beginning of the service date. For times occurring after midnight on the service date, enter the time as a value greater than 24:00:00 in HH:MM:SS local time for the day on which the trip schedule begins. If you don’t have separate times for arrival and departure at a stop, enter the same value for arrival\_time and departure\_time.

You must specify arrival times for the first and last stops in a trip. If this stop isn’t a time point, use an empty string value for the arrival\_time and departure\_time fields. Stops without arrival times will be scheduled based on the nearest preceding timed stop. To ensure accurate routing, please provide arrival and departure times for all stops that are time points. Do not interpolate stops.

Times must be eight digits in HH:MM:SS format (H:MM:SS is also accepted, if the hour begins with 0). Do not pad times with spaces. The following columns list stop times for a trip and the proper way to express those times in the arrival\_time field:

Time	arrival_time value
08:10:00 A.M.	08:10:00 or 8:10:00
01:05:00 P.M.	13:05:00
07:40:00 P.M.	19:40:00
01:55:00 A.M.	25:55:00

Note: Trips that span multiple dates will have stop times greater than 24:00:00. For example, if a trip begins at 10:30:00 p.m. and ends at 2:15:00 a.m. on the following day, the stop times would be 22:30:00 and 26:15:00. Entering those stop times as 22:30:00 and 02:15:00 would not produce the desired results.

- departure\_time (StopTime.departure\_time) (*required*): The departure\_time specifies the departure time from a specific stop for a specific trip on a route. The time is measured from “noon minus 12h” (effectively midnight, except for days on which daylight savings time changes occur) at the beginning of the service date. For times occurring after midnight on the service date, enter the time as a value greater than 24:00:00 in HH:MM:SS local time for the day on which the trip schedule begins. If you don’t have separate times for arrival and departure at a stop, enter the same value for arrival\_time and departure\_time.

You must specify departure times for the first and last stops in a trip. If this stop isn’t a time point, use an empty string value for the arrival\_time and departure\_time fields. Stops without arrival times will be scheduled based on the nearest preceding timed stop. To ensure accurate routing, please provide arrival and departure times for all stops that are time points. Do not interpolate stops.

Times must be eight digits in HH:MM:SS format (H:MM:SS is also accepted, if the hour begins with 0). Do not pad times with spaces. The following columns list stop times for a trip and the proper way to express those times in the departure\_time field:

Time	departure_time value
08:10:00 A.M.	08:10:00 or 8:10:00
01:05:00 P.M.	13:05:00
07:40:00 P.M.	19:40:00
01:55:00 A.M.	25:55:00

Note: Trips that span multiple dates will have stop times greater than 24:00:00. For example, if a trip begins at 10:30:00 p.m. and ends at 2:15:00 a.m. on the following day, the stop times would be 22:30:00 and 26:15:00. Entering those stop times as 22:30:00 and 02:15:00 would not produce the desired results.

- `stop_id` (`StopTime.stop.stop_id`) (*required*): The `stop_id` field contains an ID that uniquely identifies a stop. Multiple routes may use the same stop. The `stop_id` is referenced from the `stops.txt` file. If `location_type` is used in `stops.txt`, all stops referenced in `stop_times.txt` must have `location_type` of 0.

Where possible, `stop_id` values should remain consistent between feed updates. In other words, stop A with `stop_id` 1 should have `stop_id` 1 in all subsequent data updates. If a stop is not a time point, enter blank values for `arrival_time` and `departure_time`.

- `stop_sequence` (`StopTime.stop_sequence`) (*required*): The `stop_sequence` field identifies the order of the stops for a particular trip. The values for `stop_sequence` must be non-negative integers, and they must increase along the trip.

For example, the first stop on the trip could have a `stop_sequence` of 1, the second stop on the trip could have a `stop_sequence` of 23, the third stop could have a `stop_sequence` of 40, and so on.

- `stop_headsign` (`StopTime.stop_headsign`) (*optional*): The `stop_headsign` field contains the text that appears on a sign that identifies the trip's destination to passengers. Use this field to override the default `trip_headsign` when the headsign changes between stops. If this headsign is associated with an entire trip, use `trip_headsign` instead.

See a Google Maps screenshot highlighting the headsign: <http://bit.ly/y2EO6a>

- `pickup_type` (`StopTime.pickup_type`) (*optional*): The `pickup_type` field indicates whether passengers are picked up at a stop as part of the normal schedule or whether a pickup at the stop is not available. This field also allows the transit agency to indicate that passengers must call the agency or notify the driver to arrange a pickup at a particular stop. Valid values for this field are:
  - 0 - Regularly scheduled pickup
  - 1 - No pickup available
  - 2 - Must phone agency to arrange pickup
  - 3 - Must coordinate with driver to arrange pickup

The default value for this field is 0.

- `drop_off_type` (`StopTime.drop_off_type`) (*optional*): The `drop_off_type` field indicates whether passengers are dropped off at a stop as part of the normal schedule or whether a drop off at the stop is not available. This field also allows the transit agency to indicate that passengers must call the agency or notify the driver to arrange a drop off at a particular stop. Valid values for this field are:
  - 0 - Regularly scheduled drop off
  - 1 - No drop off available
  - 2 - Must phone agency to arrange drop off
  - 3 - Must coordinate with driver to arrange drop off

The default value for this field is 0.

- `shape_dist_traveled` (`StopTime.shape_dist_traveled`) (*optional*): When used in the `stop_times.txt` file, the `shape_dist_traveled` field positions a stop as a distance from the first shape point. The `shape_dist_traveled` field represents a real distance traveled along the route in units such as feet or kilometers. For example, if a bus travels a distance of 5.25 kilometers from the start of the shape to the stop, the `shape_dist_traveled` for the stop ID would be entered as “5.25”. This information allows the trip planner to determine how much of the shape to draw when showing part of a trip on the map. The values used for `shape_dist_traveled` must increase along with `stop_sequence`: they cannot be used to show reverse travel along a route.

The units used for `shape_dist_traveled` in the `stop_times.txt` file must match the units that are used for this field in the `shapes.txt` file.

### calendar.txt (Service)

`calendar.txt` is implemented in `Service`.

- `service_id` (`Service.service_id`) (*required*): The `service_id` contains an ID that uniquely identifies a set of dates when service is available for one or more routes. Each `service_id` value can appear at most once in a `calendar.txt` file. This value is dataset unique. It is referenced by the `trips.txt` file.
- `monday` (`Service.monday`) (*required*): The `monday` field contains a binary value that indicates whether the service is valid for all Mondays.
  - A value of 1 indicates that service is available for all Mondays in the date range. (The date range is specified using the `start_date` and `end_date` fields.)
  - A value of 0 indicates that service is not available on Mondays in the date range.

Note: You may list exceptions for particular dates, such as holidays, in the `calendar_dates.txt` file.

- `tuesday` (`Service.tuesday`) (*required*): The `tuesday` field contains a binary value that indicates whether the service is valid for all Tuesdays.
  - A value of 1 indicates that service is available for all Tuesdays in the date range. (The date range is specified using the `start_date` and `end_date` fields.)
  - A value of 0 indicates that service is not available on Tuesdays in the date range.

Note: You may list exceptions for particular dates, such as holidays, in the `calendar_dates.txt` file.

- `wednesday` (`Service.wednesday`) (*required*): The `wednesday` field contains a binary value that indicates whether the service is valid for all Wednesdays.
  - A value of 1 indicates that service is available for all Wednesdays in the date range. (The date range is specified using the `start_date` and `end_date` fields.)
  - A value of 0 indicates that service is not available on Wednesdays in the date range.

Note: You may list exceptions for particular dates, such as holidays, in the `calendar_dates.txt` file.

- `thursday` (`Service.thursday`) (*required*): The `thursday` field contains a binary value that indicates whether the service is valid for all Thursdays.
  - A value of 1 indicates that service is available for all Thursdays in the date range. (The date range is specified using the `start_date` and `end_date` fields.)
  - A value of 0 indicates that service is not available on Thursdays in the date range.

Note: You may list exceptions for particular dates, such as holidays, in the `calendar_dates.txt` file.

- `friday` (`Service.friday`) (*required*): The `friday` field contains a binary value that indicates whether the service is valid for all Fridays.

- A value of 1 indicates that service is available for all Fridays in the date range. (The date range is specified using the `start_date` and `end_date` fields.)
- A value of 0 indicates that service is not available on Fridays in the date range.

Note: You may list exceptions for particular dates, such as holidays, in the `calendar_dates.txt` file.

- `saturday` (`Service.saturday`) (*required*): The `saturday` field contains a binary value that indicates whether the service is valid for all Saturdays.
  - A value of 1 indicates that service is available for all Saturdays in the date range. (The date range is specified using the `start_date` and `end_date` fields.)
  - A value of 0 indicates that service is not available on Saturdays in the date range.

Note: You may list exceptions for particular dates, such as holidays, in the `calendar_dates.txt` file.

- `sunday` (`Service.sunday`) (*required*): The `sunday` field contains a binary value that indicates whether the service is valid for all Sundays.
  - A value of 1 indicates that service is available for all Sundays in the date range. (The date range is specified using the `start_date` and `end_date` fields.)
  - A value of 0 indicates that service is not available on Sundays in the date range.

Note: You may list exceptions for particular dates, such as holidays, in the `calendar_dates.txt` file.

- `start_date` (`Service.start_date`) (*required*): The `start_date` field contains the start date for the service. The `start_date` field's value should be in YYYYMMDD format.
- `end_date` (`Service.end_date`) (*required*): The `end_date` field contains the end date for the service. This date is included in the service interval. The `end_date` field's value should be in YYYYMMDD format.

### 3.4.3 Optional Files

The specification marks these as optional files for a valid GTFS feed:

- `calendar_dates.txt` - Exceptions for the service IDs defined in the `calendar.txt` file. If `calendar_dates.txt` includes ALL dates of service, this file may be specified instead of `calendar.txt`.
- `fare_attributes.txt` - Fare information for a transit organization's routes.
- `fare_rules.txt` - Rules for applying fare information for a transit organization's routes.
- `shapes.txt` - Rules for drawing lines on a map to represent a transit organization's routes. *Note: If this data is not included, then routes will be drawn as straight lines between stops.*
- `frequencies.txt` - Headway (time between trips) for routes with variable frequency of service.
- `transfers.txt` - Rules for making connections at transfer points between routes.
- `feed_info.txt` - Additional information about the feed itself, including publisher, version, and expiration information.

#### `calendar_dates.txt` (`ServiceDate`)

`calendar_dates.txt` is implemented in `ServiceDate`

The `calendar_dates` table allows you to explicitly activate or disable service IDs by date. You can use it in two ways.

Recommended: Use `calendar_dates.txt` in conjunction with `calendar.txt`, where `calendar_dates.txt` defines any exceptions to the default service categories defined in the `calendar.txt` file. If your service is generally regular, with a few changes on explicit dates (for example, to accomodate special event services, or a school schedule), this is a good approach.

Alternate: Omit `calendar.txt`, and include ALL dates of service in `calendar_dates.txt`. If your schedule varies most days of the month, or you want to programmatically output service dates without specifying a normal weekly schedule, this approach may be preferable.

- `service_id` (`ServiceDate.service.service_id`) (*required*): The `service_id` contains an ID that uniquely identifies a set of dates when a service exception is available for one or more routes. Each (`service_id`, `date`) pair can only appear once in `calendar_dates.txt`. If the a `service_id` value appears in both the `calendar.txt` and `calendar_dates.txt` files, the information in `calendar_dates.txt` modifies the service information specified in `calendar.txt`. This field is referenced by the `trips.txt` file.
- `date` (`ServiceDate.date`) (*required*): The `date` field specifies a particular date when service availability is different than the norm. You can use the `exception_type` field to indicate whether service is available on the specified date.

The `date` field's value should be in YYYYMMDD format.

- `exception_type` (`ServiceDate.exception_type`) (*required*): The `exception_type` indicates whether service is available on the date specified in the `date` field.
  - A value of 1 indicates that service has been added for the specified date.
  - A value of 2 indicates that service has been removed for the specified date.

For example, suppose a route has one set of trips available on holidays and another set of trips available on all other days. You could have one `service_id` that corresponds to the regular service schedule and another `service_id` that corresponds to the holiday schedule. For a particular holiday, you would use the `calendar_dates.txt` file to add the holiday to the holiday `service_id` and to remove the holiday from the regular `service_id` schedule.

## fare\_attributes.txt (Fare)

`fare_attributes.txt` is implemented in `Fare`.

- `fare_id` (`Fare.fare_id`) (*required*): The `fare_id` field contains an ID that uniquely identifies a fare class. The `fare_id` is dataset unique.
- `price` (`Fare.price`) (*required*): The `price` field contains the fare price, in the unit specified by `currency_type`.
- `currency_type` (`Fare.currency_type`) (*required*): The `currency_type` field defines the currency used to pay the fare. Please use the ISO 4217 alphabetical currency codes which can be found at the following URL: <http://www.iso.org/iso/en/prods-services/popstds/currencycodeslist.html>.
- `payment_method` (`Fare.payment_method`) (*required*): The `payment_method` field indicates when the fare must be paid. Valid values for this field are:
  - 0 - Fare is paid on board.
  - 1 - Fare must be paid before boarding.
- `transfers` (`Fare.transfers`) (*required*): The `transfers` field specifies the number of transfers permitted on this fare. Valid values for this field are:
  - 0 - No transfers permitted on this fare.
  - 1 - Passenger may transfer once.
  - 2 - Passenger may transfer twice.

– (empty) - If this field is empty, unlimited transfers are permitted.

- `transfer_duration` (`Fare.transfer_duration`) (*optional*): The `transfer_duration` field specifies the length of time in seconds before a transfer expires.

When used with a `transfers` value of 0, the `transfer_duration` field indicates how long a ticket is valid for a fare where no transfers are allowed. Unless you intend to use this field to indicate ticket validity, `transfer_duration` should be omitted or empty when `transfers` is set to 0.

## fare\_rules.txt (FareRule)

`fare_rules.txt` is implemented in `FareRule`

The `fare_rules` table allows you to specify how fares in `fare_attributes.txt` apply to an itinerary. Most fare structures use some combination of the following rules:

- Fare depends on origin or destination stations.
- Fare depends on which zones the itinerary passes through.
- Fare depends on which route the itinerary uses.

For examples that demonstrate how to specify a fare structure with `fare_rules.txt` and `fare_attributes.txt`, see [FareExamples](#) in the [GoogleTransitDataFeed](#) open source project wiki.

- `fare_id` (`FareRule.fare_id`) (*required*): The `fare_id` field contains an ID that uniquely identifies a fare class. This value is referenced from the `fare_attributes.txt` file.
- `route_id` (`FareRule.route.route_id`) (*optional*): The `route_id` field associates the fare ID with a route. Route IDs are referenced from the `routes.txt` file. If you have several routes with the same fare attributes, create a row in `fare_rules.txt` for each route.

For example, if fare class “b” is valid on route “TSW” and “TSE”, the `fare_rules.txt` file would contain these rows for the fare class:

```
b, TSW
b, TSE
```

- `origin_id` (`FareRule.origin.zone_id`) (*optional*): The `origin_id` field associates the fare ID with an origin zone ID. Zone IDs are referenced from the `stops.txt` file. If you have several origin IDs with the same fare attributes, create a row in `fare_rules.txt` for each origin ID.

For example, if fare class “b” is valid for all travel originating from either zone “2” or zone “8”, the `fare_rules.txt` file would contain these rows for the fare class:

```
b, , 2
b, , 8
```

- `destination_id` (`FareRule.destination.zone_id`) (*optional*): The `destination_id` field associates the fare ID with a destination zone ID. Zone IDs are referenced from the `stops.txt` file. If you have several destination IDs with the same fare attributes, create a row in `fare_rules.txt` for each destination ID.

For example, you could use the `origin_id` and `destination_id` fields together to specify that fare class “b” is valid for travel between zones 3 and 4, and for travel between zones 3 and 5, the `fare_rules.txt` file would contain these rows for the fare class:

```
b, , 3,4
b, , 3,5
```

- `contains_id` (`FareRule.contains.zone_id`) (*optional*): The `contains_id` field associates the fare ID with a zone ID, referenced from the `stops.txt` file. The fare ID is then associated with itineraries that pass through every `contains_id` zone.

For example, if fare class “c” is associated with all travel on the GRT route that passes through zones 5, 6, and 7 the `fare_rules.txt` would contain these rows:

```
c, GRT, , , 5
c, GRT, , , 6
c, GRT, , , 7
```

Because all `contains_id` zones must be matched for the fare to apply, an itinerary that passes through zones 5 and 6 but not zone 7 would not have fare class “c”. For more detail, see [FareExamples](#) in the [GoogleTransitDataFeed](#) project wiki.

### shapes.txt (ShapePoint)

`shapes.txt` is implemented in `ShapePoint`. It is optional for a valid feed, but without it, routes will be drawn as direct lines between stops (going through buildings, etc.) instead of following the roads.

- `shape_id` (`ShapePoint.Shape.shape_id`) (*required*): The `shape_id` field contains an ID that uniquely identifies a shape.
- `shape_pt_lat` (`ShapePoint.point`) (*required*): The `shape_pt_lat` field associates a shape point’s latitude with a shape ID. The field value must be a valid WGS 84 latitude. Each row in `shapes.txt` represents a shape point in your shape definition.

For example, if the shape “A\_shp” has three points in its definition, the `shapes.txt` file might contain these rows to define the shape:

```
A_shp, 37.61956, -122.48161, 0
A_shp, 37.64430, -122.41070, 6
A_shp, 37.65863, -122.30839, 11
```

- `shape_pt_lon` (`ShapePoint.point`) (*required*): The `shape_pt_lon` field associates a shape point’s longitude with a shape ID. The field value must be a valid WGS 84 longitude value from -180 to 180. Each row in `shapes.txt` represents a shape point in your shape definition.

For example, if the shape “A\_shp” has three points in its definition, the `shapes.txt` file might contain these rows to define the shape:

```
A_shp, 37.61956, -122.48161, 0
A_shp, 37.64430, -122.41070, 6
A_shp, 37.65863, -122.30839, 11
```

- `shape_pt_sequence` (`ShapePoint.sequence`) (*required*): The `shape_pt_sequence` field associates the latitude and longitude of a shape point with its sequence order along the shape. The values for `shape_pt_sequence` must be non-negative integers, and they must increase along the trip.

For example, if the shape “A\_shp” has three points in its definition, the `shapes.txt` file might contain these rows to define the shape:

```
A_shp, 37.61956, -122.48161, 0
A_shp, 37.64430, -122.41070, 6
A_shp, 37.65863, -122.30839, 11
```

- `shape_dist_traveled` (`ShapePoint.traveled`) (*optional*): When used in the `shapes.txt` file, the `shape_dist_traveled` field positions a shape point as a distance traveled along a shape from the first shape point.

The `shape_dist_traveled` field represents a real distance traveled along the route in units such as feet or kilometers. This information allows the trip planner to determine how much of the shape to draw when showing part of a trip on the map. The values used for `shape_dist_traveled` must increase along with `shape_pt_sequence`: they cannot be used to show reverse travel along a route.

The units used for `shape_dist_traveled` in the `shapes.txt` file must match the units that are used for this field in the `stop_times.txt` file.

For example, if a bus travels along the three points defined above for `A_shp`, the additional `shape_dist_traveled` values (shown here in kilometers) would look like this:

```
A_shp, 37.61956, -122.48161, 0, 0
A_shp, 37.64430, -122.41070, 6, 6.8310
A_shp, 37.65863, -122.30839, 11, 15.8765
```

### frequencies.txt (Frequency)

`frequencies.txt` is implemented in `Frequency`

This table is intended to represent schedules that don't have a fixed list of stop times. When trips are defined in `frequencies.txt`, the trip planner ignores the absolute values of the `arrival_time` and `departure_time` fields for those trips in `stop_times.txt`. Instead, the `stop_times` table defines the sequence of stops and the time difference between each stop.

- `trip_id` (`Frequency.trip.trip_id`) (*required*): The `trip_id` contains an ID that identifies a trip on which the specified frequency of service applies. Trip IDs are referenced from the `trips.txt` file.
- `start_time` (`Frequency.start_time`) (*required*): The `start_time` field specifies the time at which service begins with the specified frequency. The time is measured from “noon minus 12h” (effectively midnight, except for days on which daylight savings time changes occur) at the beginning of the service date. For times occurring after midnight, enter the time as a value greater than 24:00:00 in HH:MM:SS local time for the day on which the trip schedule begins. E.g. 25:35:00.
- `end_time` (`Frequency.end_time`) (*required*): The `end_time` field indicates the time at which service changes to a different frequency (or ceases) at the first stop in the trip. The time is measured from “noon minus 12h” (effectively midnight, except for days on which daylight savings time changes occur) at the beginning of the service date. For times occurring after midnight, enter the time as a value greater than 24:00:00 in HH:MM:SS local time for the day on which the trip schedule begins. E.g. 25:35:00.
- `headway_secs` (`Frequency.headway_secs`) (*required*): The `headway_secs` field indicates the time between departures from the same stop (headway) for this trip type, during the time interval specified by `start_time` and `end_time`. The headway value must be entered in seconds.

Periods in which headways are defined (the rows in `frequencies.txt`) shouldn't overlap for the same trip, since it's hard to determine what should be inferred from two overlapping headways. However, a headway period may begin at the exact same time that another one ends, for instance:

```
A, 05:00:00, 07:00:00, 600
B, 07:00:00, 12:00:00, 1200
```

- `exact_times` (`Frequency.exact_times`) (*optional*): The `exact_times` field determines if frequency-based trips should be exactly scheduled based on the specified headway information. Valid values for this field are:
  - 0 (or (empty)) - Frequency-based trips are not exactly scheduled. This is the default behavior.
  - 1 - Frequency-based trips are exactly scheduled. For a `frequencies.txt` row, trips are scheduled starting with `trip_start_time = start_time + x * headway_secs` for all `x` in `(0, 1, 2, ...)` where `trip_start_time < end_time`.

The value of `exact_times` must be the same for all `frequencies.txt` rows with the same `trip_id`. If `exact_times` is 1 and a `frequencies.txt` row has a `start_time` equal to `end_time`, no trip must be scheduled. When `exact_times` is 1, care must be taken to choose an `end_time` value that is greater than the last desired trip start time but less than the last desired trip start time + `headway_secs`.

### transfers.txt (Transfer)

`transfer.txt` is implemented in `Transfer`.

Trip planners normally calculate transfer points based on the relative proximity of stops in each route. For potentially ambiguous stop pairs, or transfers where you want to specify a particular choice, use `transfers.txt` to define additional rules for making connections between routes.

- `from_stop_id` (`Transfer.from_stop.stop_id`) (*required*): The `from_stop_id` field contains a stop ID that identifies a stop or station where a connection between routes begins. Stop IDs are referenced from the `stops.txt` file. If the stop ID refers to a station that contains multiple stops, this transfer rule applies to all stops in that station.
- `to_stop_id` (`Transfer.to_stop.stop_id`) (*required*): The `to_stop_id` field contains a stop ID that identifies a stop or station where a connection between routes ends. Stop IDs are referenced from the `stops.txt` file. If the stop ID refers to a station that contains multiple stops, this transfer rule applies to all stops in that station.
- `transfer_type` (`Transfer.transfer_type`) (*required*): The `transfer_type` field specifies the type of connection for the specified (`from_stop_id`, `to_stop_id`) pair. Valid values for this field are:
  - 0 or (empty) - This is a recommended transfer point between two routes.
  - **1 - This is a timed transfer point between two routes. The departing** vehicle is expected to wait for the arriving one, with sufficient time for a passenger to transfer between routes.
  - **2 - This transfer requires a minimum amount of time between arrival and** departure to ensure a connection. The time required to transfer is specified by `min_transfer_time`.
  - 3 - Transfers are not possible between routes at this location.
- `min_transfer_time` (`Transfer.min_transfer_time`) (*optional*): When a connection between routes requires an amount of time between arrival and departure (`transfer_type=2`), the `min_transfer_time` field defines the amount of time that must be available in an itinerary to permit a transfer between routes at these stops. The `min_transfer_time` must be sufficient to permit a typical rider to move between the two stops, including buffer time to allow for schedule variance on each route.

The `min_transfer_time` value must be entered in seconds, and must be a non-negative integer.

### feed\_info.txt (FeedInfo)

`feed_info.txt` is implemented in `FeedInfo`.

The file contains information about the feed itself, rather than the services that the feed describes. GTFS currently has an `agency.txt` file to provide information about the agencies that operate the services described by the feed. However, the publisher of the feed is sometimes a different entity than any of the agencies (in the case of regional aggregators). In addition, there are some fields that are really feed-wide settings, rather than agency-wide.

- `feed_publisher_name` (`FeedInfo.publisher_name`) (*required*): The `feed_publisher_name` field contains the full name of the organization that publishes the feed. (This may be the same as one of the `agency_name` values in `agency.txt`.) GTFS-consuming applications can display this name when giving attribution for a particular feed's data.
- `feed_publisher_url` (`FeedInfo.publisher_url`) (*required*): The `feed_publisher_url` field contains the URL of the feed publishing organization's website. (This may be the same as one of the `agency_url` values

in agency.txt.) The value must be a fully qualified URL that includes `http://` or `https://`, and any special characters in the URL must be correctly escaped. See: [http://www.w3.org/Addressing/URL/4\\_URI\\_Recommendations.html](http://www.w3.org/Addressing/URL/4_URI_Recommendations.html) for a description of how to create fully qualified URL values.

- `feed_lang` (`FeedInfo.lang`) (*required*): The `feed_lang` field contains a IETF BCP 47 language code specifying the default language used for the text in this feed. This setting helps GTFS consumers choose capitalization rules and other language-specific settings for the feed. For an introduction to IETF BCP 47, please refer to: <http://www.rfc-editor.org/rfc/bcp/bcp47.txt> <http://www.w3.org/International/articles/language-tags/> *DEV NOTE - some historical feeds omit this parameter.*
- `feed_start_date` (`FeedInfo.start_date`) and `feed_end_date` (`FeedInfo.end_date`) (*optional*): The feed provides complete and reliable schedule information for service in the period from the beginning of the `feed_start_date` day to the end of the `feed_end_date` day. Both days are given as dates in YYYYDDMM format as for `calendar.txt`, or left empty if unavailable. The `feed_end_date` date must not precede the `feed_start_date` date if both are given. Feed providers are encouraged to give schedule data outside this period to advise of likely future service, but feed consumers should treat it mindful of its non-authoritative status. If `feed_start_date` or `feed_end_date` extend beyond the active calendar dates defined in `calendar.txt` and `calendar_dates.txt`, the feed is making an explicit assertion that there is no service for dates within the `feed_start_date` or `feed_end_date` range but not included in the active calendar dates.
- `feed_version` (`FeedInfo.version`) (*optional*): The feed publisher can specify a string here that indicates the current version of their GTFS feed. GTFS-consuming applications can display this value to help feed publishers determine whether the latest version of their feed has been incorporated.

## 3.5 How To Contribute

We'd love your help in building `multigtfs`. Here's some tips:

- Fork the project on [GitHub](#), clone it locally, and create a feature branch for your work.
- When working with your Django project, use `pip install -e /path/to/multigtfs` to use your modified version.
- Use a separate `virtualenv` for development (`virtualenvwrapper` is helpful as well). Install the recommended requirements (`pip install -r requirements.txt`; `pip install -r requirements.dev.txt`).
- Test changes with `./run_tests.py`
- Test [PEP 8](#) and code coverage with `./qa_check.sh`
- Add yourself to `AUTHORS.rst`
- When you are happy with the change, publish your branch on GitHub and request a merge to the master branch.

## 3.6 Authors

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## 3.7 Project History

multigtfs was first developed for the [Tulsa Web Devs](#)' project to get Tulsa's buses into [Google Maps](#). [tulsa-transit-google](#) is the Tulsa-specific portion, and multigtfs contains the parts useful for any GTFS effort. Tulsa's bus schedule appeared on [Google Maps](#) in July 2013, after a two-year effort. The Tulsa Web Devs founded [Code for Tulsa](#) to collaborate on future civic tech projects.

Several features, including [GeoDjango](#) support and much faster feed imports, were generously sponsored by [MRCagney](#).

## 3.8 Future

multigtfs is production ready. It is likely that future releases will be driven by maintenance needs rather than the release of interesting new features.

Maintenance includes:

- Keeping up with [Django](#) releases
- Keeping up with [GTFS](#) spec updates

Ideas for future features include:

- Validating the feed against Google's requirements
- Creating a difference report against two feeds

See the [issues](#) list for more details.

## 3.9 Changelog

### 3.9.1 1.1.2 (2018-08-26)

- Add support for Django 2.0 and 2.1
- Handle latitude and longitudes with initial + sign. ([issue #70](#)).
- Use `.iterator()` to save memory during export ([PR #80](#))
- Fix validation error in admin for `Frequency.exact_times`

### 3.9.2 1.1.1 (2017-08-02)

- Strip whitespace after commas in CSV files with `skipinitialspace` ([issue #64](#), [PR #65](#) and [#68](#)).
- Discard empty lines in CSV files ([issue #66](#), [PR #67](#))

### 3.9.3 1.1.0 (2017-07-09)

- Add support for Django 1.10 and 1.11
- Drop support for Django 1.7 and earlier, and for South migrations. If you are using these, upgrade to 1.0.0 first, migrate your codebase to Django 1.8 and Django migrations, then update to 1.1.0.
- Move Python 2 / Python 3 and other compatibility code to `multigtfs/compat.py`. Exclude this file from the `make qa coverage` report, unless the `COVERAGE_COMPAT` environment variable is set. Because the cross-environment code is now in this file, many lines will be uncovered in a particular environment, while other files should be 100% covered. This file is tested in the supported environments in TravisCI, and a combined coverage report is generated in Coveralls, where `compat.py` should be 100% covered.
- Add a dockerized environment for the explore example app, and run it under Django 1.11.
- Whitespace-only values in import files are treated as empty values (PR #56)

### 3.9.4 1.0.0 (2016-03-29)

- The project has been production-ready for a while. Updating the version number and the PyPI classifiers to reflect that.
- Add support for Django 1.7 through 1.9, and a compatibility layer to handle future versions.
- Add support for transitioning from South to Django migrations.

### 3.9.5 0.4.3 (2015-02-24)

- Added documentation (issue #26)
- `exportgtfs` uses compression if available. Reduces one exported feed from 141MB to 21MB. (issue #27)
- Feeds that omit `calendar.txt` can be imported and exported. GTFS allows this if all dates are specified in `calendar_dates.txt` instead. This alternate format is used by the TriMet archive feeds from Portland, OR (issue #28).
- Django 1.7 is *not* supported by multigtfs. Version is limited in `setup.py` to 1.5 and 1.6.

### 3.9.6 0.4.2 (2014-07-20)

- `importgtfs` handles feeds with whitespace strings (issue #36)
- Can update objects with JSON fields in admin (issue #37)
- `importgtfs` can import an extracted GTFS feed (issue #30)
- `importgtfs` defaults to a Feed name based on the agency name and start of service (issue #33)

### 3.9.7 0.4.1 (2014-07-11)

- Import GTFS feeds using BOM (issue #31)
- Export non-ASCII GTFS feeds in Python 2 (issue #34)
- Various admin improvements (issue #29, issue #32)

### 3.9.8 0.4.0 (2014-06-21)

This release was generously sponsored by MRCagney.

- Import and export are 17-21x faster. Very large feeds (~20MB) can now be imported and exported without running out of memory (4 GB of RAM recommended). When running management commands, increasing verbosity ('-v 1' or '-v 2') will print useful status messages.
- Additional columns not in the current GTFS spec are now imported into 'extra\_data', a new JSON field. The columns are noted in the Feed's new JSON field, 'meta'. These addition items appear in the example project, and are exported after standard columns in the exported feed.
- Added Python 3 compatibility
- Extend more fields for real-world data (Trip.short\_name, Zone.zone\_id, and Block.block\_id)
- On import, if two rows have duplicate unique ID (trip\_id, stop\_id, etc.), then only the first will be imported. A warning will printed to stderr. Previously, both may have been imported, with unknown consequences.
- Dropped support for South 0.7.x (not Python 3 compatible)
- Trips now have a single Service. Extra services will be detected by migration 0018, and will have to be manually removed.

### 3.9.9 0.3.3 (2014-03-28)

- Add new optional fields (issue #23):
  - trip.wheelchair\_accessible
  - trip.bikes\_allowed
  - stop.wheelchair\_boarding
- Route.geometry does not include duplicate Trip.geometry lines (issue #24)
- Fix order of points in Shape.geometry (issue #25)
- Add management command 'refreshgeometries' to refresh cached geometries (useful if you were impacted by issues #24 or #25)

### 3.9.10 0.3.2 (2014-03-16)

This release was generously sponsored by MRCagney.

- Fix migration 0007 for PostGIS (issue #22)

### 3.9.11 0.3.1 (2014-03-12)

This release was generously sponsored by MRCagney.

- Add example project 'explore', which represents a feed as linked pages with OpenLayer maps.
- Add cached geometry for Routes, Trips, and Shapes.
- Extend fields for real-world data (FeedInfo.version, Route.short\_name).
- Drop support for Points as geography fields.

### **3.9.12 0.3.0 (2014-02-01)**

This release was generously sponsored by MRCagney.

- Convert to GeoDjango: Stops and ShapePoints use Points rather than lat/long, admin shows map of points, and new configuration settings to customize.
- Import south in try/except blocks (so that South really is optional).
- Django 1.5 or above is now required.

### **3.9.13 0.2.6 (2013-06-07)**

- Remove verify\_exists from URLField, so it can be used in Django 1.5

### **3.9.14 0.2.5 (2013-02-13)**

- Human-friendly sorting for rest of GTFS output

### **3.9.15 0.2.4 (2013-02-06)**

- Added optional manual sorting of output, used on stop\_times.txt

### **3.9.16 0.2.3 (2012-11-09)**

- Added South migrations for applying 0.2.2 changes

### **3.9.17 0.2.2 (2012-11-09)**

- Fixed Fare.transfers for unlimited rides (use None instead of -1)
- First PyPi version