REAL TIME

DOWN UNDER

Customer Project

EFA real-time with GTFS-R

Sydney, Australia

Customer	Transport for New South Wales (TfNSW)
Project Scope	Supply of journey planner With real-time from GTFS-R; www.transportnsw.info
Key Figures	New South Wales (NSW) 7.5 Mil. inhabitants 800.642 sq km area Capital Sydney 4.6 mil. inhabitants
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Within an open data framework, Transport for New South Wales (TfNSW) is making real-time information available for almost every transport authority in New South Wales (7.5 mil. inhabitants) using GTFS-R. The data comprise not only public transport in the metropolis of Sydney with a population of 4.5 mil., but also regional transport and a large amount of school transport.
In order to use the real-time information from GTFS-R in EFA when calculating journeys, the data has to be converted into SIRI ET. In addition to the peculiarities of GTFS-R, a number of so-called "polishing rules" were defined to detect inconsistencies and correctly process the supplied data.

GTFS

The General Transit Feed Specification (GTFS) defines a common format for public transportation schedules and associated geographic information. What was to become GTFS started out as a side project of Google employee Chris Harrelson in 2005, who "monkeyed around with ways to incorporate transit data into Google Maps. Due to the wide use of the format, the "Google" part of the original name was seen as a misnomer "that makes some potential users shy away from adopting GTFS". As a consequence, it was proposed to change the name of the specification to General Transit Feed Specification in 2009.*(Wikipedia)*

In the last few years, TfNSW has put increased value on the supply of real-time data to external developers. Today there is a range of common apps that use this data. As part of the re-development of their internet presence, real-time data are used as well as a responsive web design (for mobile & desktop) and a number of new ideas for the presentation of timetable data.

General Transit Feed Specification - GTFS/GTFS-R

Using GTFS, the static scheduled timetable data are defined (routes, stops, timetables, calendar etc.). Real-time format GTFS-R is based on GTFS, which is why the content of the GTFS scheduled timetable data must match the GTFS-R data and vice versa.

There are three services in GTFS-R:

- Trip Updates – provide all changes of the scheduled timetable regarding delays and early arrivals, additional trips, skipped stops, and trips cancellations (comparable to SIRI ET)
- Service Alerts – provide all notifications regarding incidents in the network. (comparable to SIRI SX)
- Vehicle Positions – provide the current position of all vehicles in the network (comparable to SIRI VM)

Data Flow with GTFS and GTFS-R in DIVA/EFA

Processing of GTFS-R data occurs in two parallel processes: in one process, the schelduled data (GTFS) are imported daily to DIVA. The GTFS data contain the yearly timetable and the daily timetable of the next day, which is supplied by SIRI via the reference service SIRI PT.

Parallel to the aforementioned process, the GTFS-R data (incl. GTFS data) from the GTFSProxy module are polished (see below) and converted to a SIRI ET subscription by the GTFS2ET module.

Finally, the SIRI agent sends the SIRI ET data to the EFAPTKernel, which takes the available real-time information into account when routing.

GTFS and GTFS-R in Sydney: 'Polishing Rules'

The GTFS(-R)-data in NSW have many features that are not covered by the GTFS(-R) specification. For example, there are unproductive trips in the data. These are trips that do not transport passengers, which also have to be accounted for in both the scheduled data stream and in the real-time data stream.

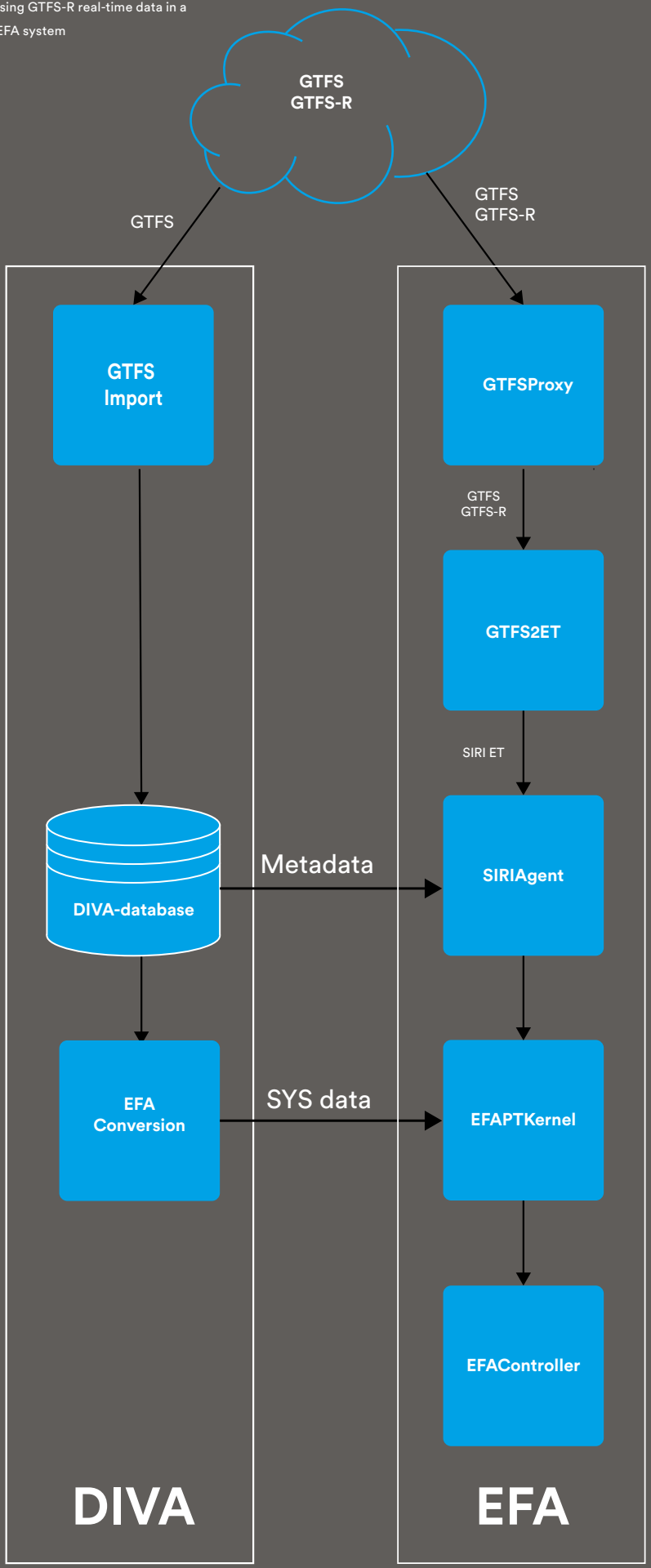
Another interesting example is the real-time data of Sydney's light rail system. It travels from the Central Station to Dulwich Hill and back. For trips from Central Station, due to technical reasons the AVM system of light rail can only generate real-time data starting from the fourth stop. This is not optimal from a customer's perspective because Central Station and the subsequent stops are the most important boarding stops of the light rail system. The GTFSProxy generates real-time data for these trips by extrapolating the previous trip in the vehicle block.

As these two examples have demonstrated, in addition to converting from GTFS-R to SIRI ET (process: GTFS2ET) it is important to implement a process that modifies the GTFS-R data according to specified rules (GTFSProxy). In NSW, there are approx. 15 rules in the project that have been labelled 'polishing rules'.

Experience during Implementation

A decisive factor to successfully implementing this project is the technical exchange with the data suppliers. GTFS and especially GTFS-R are formats that leave a few questions unanswered.

Figure 1: Overview of the data flow when processing GTFS-R real-time data in a DIVA/EFA system



For example, in GTFS-R there is not one single required field, all fields are optional. Accordingly, there are a number of ways in which the specification can be interpreted. As a consequence, individual use cases or standard scenarios, and how they should be depicted, are not discussed.

On the other hand, the GTFS-R format, especially compared to SIRI ET, is kept quite simple. Practically every AVM system manufacturer can supply real-time data as GTFS-R. In this way, NSW is able to provide most of their data in real-time. The simplicity of the format also enables fast and uncomplicated adjustments of the supplied data.

In sum, the assessment is quite positive: in just a few months, integration of what is a nearly comprehensive supply of real-time to the EFA system was realized at TfNSW. Today there are 49 real-time feeds using GTFS-R with up to 6,000 simultaneously real-time monitored trips in EFA. In contrast to other large real-time systems, the supply of real-time in NSW was not built in steps, but rather was switched on all at once by all operators. This was only made possible through the standardization of data flows for target and real-time data. Another positive aspect is the possibility to harmonize non-compliant GTFS-R data and to transform it into meaningful real-time data.

Finally, it is important to note that the conversion of GTFS-R data to SIRI ET creates benefits: SIRI ET and the German equivalent VDV 454 AUS have existed for years as well known real-time standards for journey planners. MENTZ is very actively involved in the development and continuity of both VDV and CEN standards. Due to the great deal of experience gained in the last few years, the conversion of GTFS-R into SIRI ET was made just a bit smoother.

TfNSW's journey planner can be accessed at transportnsw.info. The new website with integrated real-time data will be launched at the end of 2016 / beginning of 2017.

Melbourne

Change to GTFS-R to Supply Google Maps in Melbourne

Yarra Tram is the tram operator in Melbourne (4.5 mil. inhabitants). On behalf of Google, real-time requests are made to a freely –accessible proprietary interface by Yarra Tram. This interface can be requested by HTTP and provides the target and actual departure time for each individual stop in JSON format for any selected route for any tram operated by Yarra Tram. These requests are made each minute with the MENTZ program YARRA2GTFS-R for all stops and routes. The responses received from this ongoing process are changed into GTFS-R format and subsequently retrieved by Google to make real-time information accessible to the public in Google Maps.

The GTFS data (scheduled data) are available free of charge on the PTV (Public Transport Victoria) Homepage, are downloaded there weekly and supplied to Google. In addition, YARRA2GTFS-R requires GTFS data to successfully depict trips using the route number and route option. To display real-time data on the GTFS data, a translation table of stop numbers and individual directions must be maintained because the two are not consistent with one another.

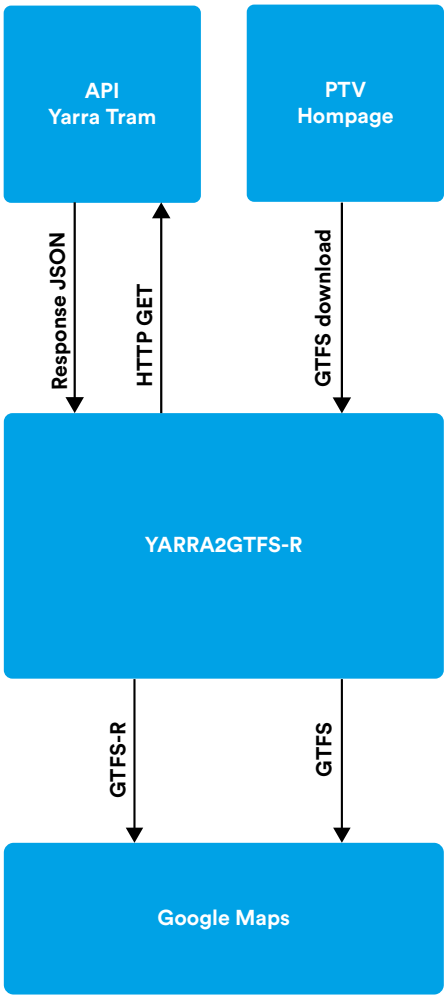


Figure 1: Overview of the dataflow to supply Google Maps with real-time