Supplementary Materials: An Open Source System for Public Transport Route Data Curation Using OpenTripPlanner in Australia

Kiki Adhinugraha [1], Yusuke Gotoh [2] and David Taniar [3,*]

Supplementary Materials

This supplementary document provides the technical and operational details required to reproduce the multi-router OpenTripPlanner (OTP) platform described in the main paper. It complements the methodological discussion by documenting data preparation steps, folder organisation, API usage, and deployment interfaces that were intentionally streamlined in the main manuscript.

The materials are intended for researchers, practitioners, and technical users who wish to replicate, extend, or adapt the platform for their own accessibility and transport analysis workflows.

S1. Folder Structure for Multi-Router OTP

In a multi-region OpenTripPlanner deployment, each routing graph must be stored in a dedicated router directory. Accordingly, each metropolitan area was assigned its own folder under the `graphs/` workspace, named using a region identifier corresponding to the state or territory (e.g., `vic`, `nsw`, `qld`).

This separation ensures clear graph boundaries, prevents cross-region interference, and allows each router to operate independently using its own GTFS and OpenStreetMap (OSM) inputs.

For most Australian cities, transport authorities publish a single consolidated GTFS feed that represents all public transport modes. Victoria is an exception. Public Transport Victoria (PTV) distributes separate GTFS feeds for heavy rail, tram, and bus services. To support full multimodal routing in Melbourne, all relevant GTFS feeds were imported into the same router directory, allowing OTP to merge them into a unified routing graph.

Each router folder contains three essential components:

1. A trimmed OSM extract representing the metropolitan area;
2. One or more GTFS feeds corresponding to public transport services;
3. Configuration files defining routing behaviour and graph construction options.

Although the high-level folder structure is consistent across regions, the size and complexity of each directory vary depending on network density, geographic extent, and GTFS feed design.

The complete directory structure and configuration files are publicly available in the project repository to support reproducibility: https://github.com/kiki-maulana/ptplanner.git.

S2. Graph Build Performance and Data Footprint

Routing graph construction time and memory footprint vary substantially across cities due to differences in transport network size, modal complexity, and geographic extent.

Table S1 summarises the size of the prepared OSM and GTFS datasets, graph build time, and structural characteristics of each routing graph, including the number of vertices ($|V|$) and edges ($|E|$). These metrics provide a quantitative indication of the computational effort required to maintain a multi-city routing platform.

Table S1. Routing graph build summary for each metropolitan area.

Route ID	Area (km^2)	Input Size (MB)		tBuild	Graph	| E |	| V |
		OSM	GTFS	(min)	(MB)		
act	5,099	18.5	6.3	0.7	74.1	204,990	560,030
nsw	22,780	74.7	291.1	10.1	1,690	2,232,473	5,026,758
nt	6,023	2.8	0.6	0.1	10.8	35,627	92,891
qld	30,861	66.8	35.2	2.6	447.1	858,526	2,208,403
sa	5,242	24.5	14.2	1.0	222.1	361,187	977,910
tas	3,849	11.2	7.0	0.3	41.9	88,665	209,189
vic	20,041	116.2	201.7	8.3	802.1	1,443,775	4,031,551
wa	13,608	33.5	28.0	2.2	358.7	575,242	1,575,462

Cities with dense multimodal networks, such as New South Wales and Victoria, produce substantially larger routing graphs than smaller or less transit-intensive regions. These differences influence both routing coverage and runtime performance, as reported in the Results section of the main paper.

S3. Deployment Strategy and Hosting Environment

The platform was deployed on an institutional virtual machine provided by La Trobe University, equipped with 8 CPU cores and 24 GB of RAM. Of this, 16 GB was allocated to the OpenTripPlanner process.

This configuration reflects realistic infrastructure available to universities and public-sector organisations rather than optimised commercial cloud deployments. Equivalent cloud-based infrastructure from major providers would incur ongoing costs of approximately USD 100 per month, which may be prohibitive for smaller research teams.

Despite these modest resources, the deployment successfully supported eight concurrent routing graphs and sustained public access. This demonstrates that a national-scale, multi-router OTP platform can be maintained without specialised hardware, provided that data preparation and graph management are carefully designed.

The platform is publicly accessible at: `https://ptplanner.latrobe.edu.au`

Each metropolitan region is served through a dedicated API path, such as:

1. `/otp/routers/act/plan` for Canberra - Australian Capital Territory
2. `/otp/routers/nsw/plan` for Sydney - New South Wales
3. `/otp/routers/nt/plan` for Darwin - Northern Territory
4. `/otp/routers/qld/plan` for Brisbane - Queensland
5. `/otp/routers/sa/plan` for Adelaide - South Australia
6. `/otp/routers/tas/plan` for Hobart - Tasmania
7. `/otp/routers/vic/plan` for Melbourne - Victoria
8. `/otp/routers/wa/plan` for Perth - Western Australia

S4. Access Interfaces

S4.1 Interactive Web Interface

OpenTripPlanner provides a built-in web-based trip planner that allows users to select origins and destinations interactively via a map interface. The interface displays travel time, transfer points, and route geometry.

This mode is intended for exploratory use by students, educators, and decision-makers who wish to examine public transport accessibility without writing code. Figure S1 illustrates the interface.

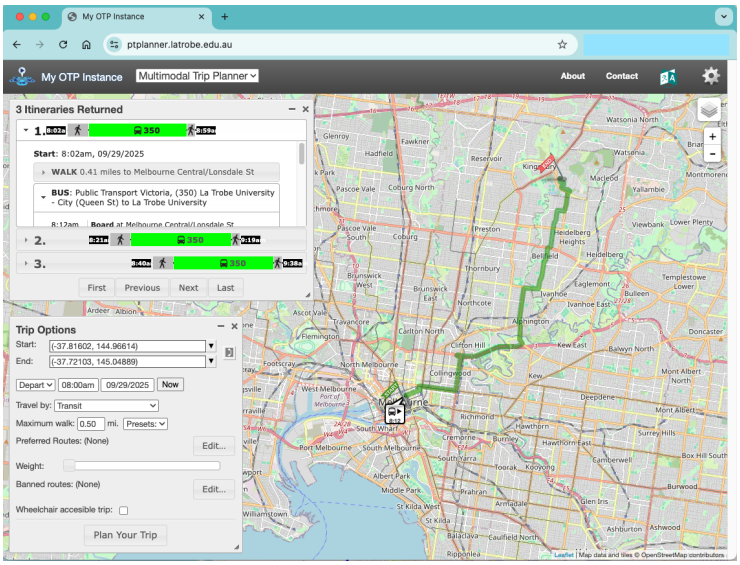


Figure S1. OTP interactive map interface.

S4.2 Programmatic HTTP API

For automated analysis, the platform exposes an HTTP API at: `/otp/routers/<router_id>/plan`.

The API supports standard parameters such as origin, destination, date, time, and travel mode. A typical request follows the format:

```
https://ptplanner.latrobe.edu.au/otp/routers/vic/plan?
  fromPlace=-37.8183,144.9671&
  toPlace=-37.7215,145.0470&
  mode=TRANSIT,WALK&
  date=2025-09-17&
  time=08:00am
```

The response is returned as a structured JSON object containing trip duration, legs, transport modes, transfer points, and geometry.

Key parameters are summarised in Table S2.

Table S2. Key HTTP request parameters for OTP routing queries.

Parameter	Type	Description
`router-id`	String	Region identifier (e.g., `vic`, `nsw`).
`fromPlace`	String	Origin coordinates in `latitude,longitude`.
`toPlace`	String	Destination coordinates in `latitude,longitude`.
`mode`	String	Modes of transport (e.g., `WALK,TRANSIT`).
`date`	String	Travel date in `YYYY-MM-DD`.
`time`	String	Travel time in `HH:MM:SS`.

S4.3 Bulk Processing Interface

To support large-scale routing experiments, a bulk-processing interface is provided at: https://kiki-maulana.github.io/otp.

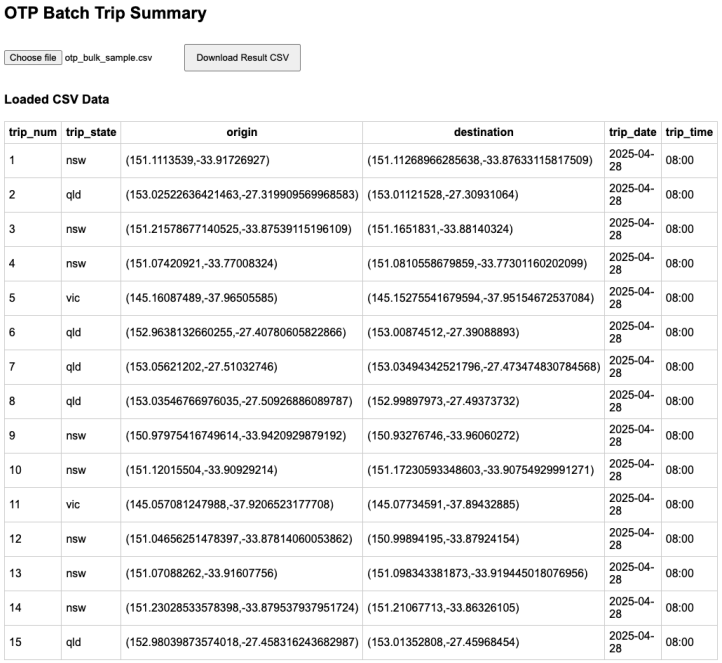
Users can upload a CSV file containing multiple origin–destination pairs, dates, times, and routing options. Each row is processed as a separate API request, and results are returned as JSON or aggregated CSV outputs.

The input file uses a `|` separator with the following fields:

- `trip_num`
- `trip_state`

- `origin`
- `destination`
- `trip_date`
- `trip_time`

Figure S2 shows the bulk processing interface.



OTP Batch Trip Summary

Choose file otp_bulk_sample.csv Download Result CSV

Loaded CSV Data

trip_num	trip_state	origin	destination	trip_date	trip_time
1	nsw	(151.1113539,-33.91726927)	(151.11268966285638,-33.87633115817509)	2025-04-28	08:00
2	qld	(153.02522636421463,-27.319909569968583)	(153.01121528,-27.30931064)	2025-04-28	08:00
3	nsw	(151.21578677140525,-33.87539115196109)	(151.1651831,-33.88140324)	2025-04-28	08:00
4	nsw	(151.07420921,-33.77008324)	(151.0810558679859,-33.77301160202099)	2025-04-28	08:00
5	vic	(145.16087489,-37.96505585)	(145.15275541679594,-37.95154672537084)	2025-04-28	08:00
6	qld	(152.9638132660255,-27.40780605822866)	(153.00874512,-27.39088893)	2025-04-28	08:00
7	qld	(153.05621202,-27.51032746)	(153.03494342521796,-27.473474830784568)	2025-04-28	08:00
8	qld	(153.03546766976035,-27.50926886089787)	(152.99897973,-27.49373732)	2025-04-28	08:00
9	nsw	(150.97975416749614,-33.9420929879192)	(150.93276746,-33.96060272)	2025-04-28	08:00
10	nsw	(151.12015504,-33.90929214)	(151.17230593348603,-33.90754929991271)	2025-04-28	08:00
11	vic	(145.057081247988,-37.9206523177708)	(145.07734591,-37.89432885)	2025-04-28	08:00
12	nsw	(151.04656251478397,-33.87814060053862)	(150.99894195,-33.87924154)	2025-04-28	08:00
13	nsw	(151.07088262,-33.91607756)	(151.098343381873,-33.919445018076956)	2025-04-28	08:00
14	nsw	(151.23028533578398,-33.879537937951724)	(151.21067713,-33.86326105)	2025-04-28	08:00
15	qld	(152.98039873574018,-27.458316243682987)	(153.01352808,-27.45968454)	2025-04-28	08:00

Figure S2. OTP Bulk Processing Interface.