OpenTripPlanner – creating and querying your own multi-modal route planner

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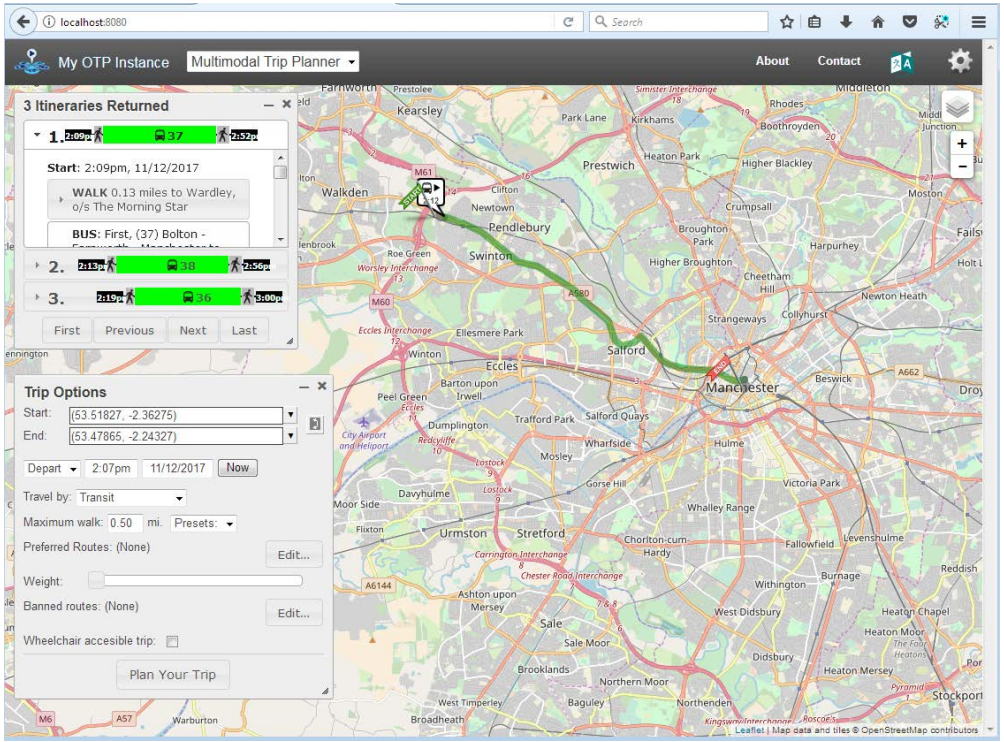

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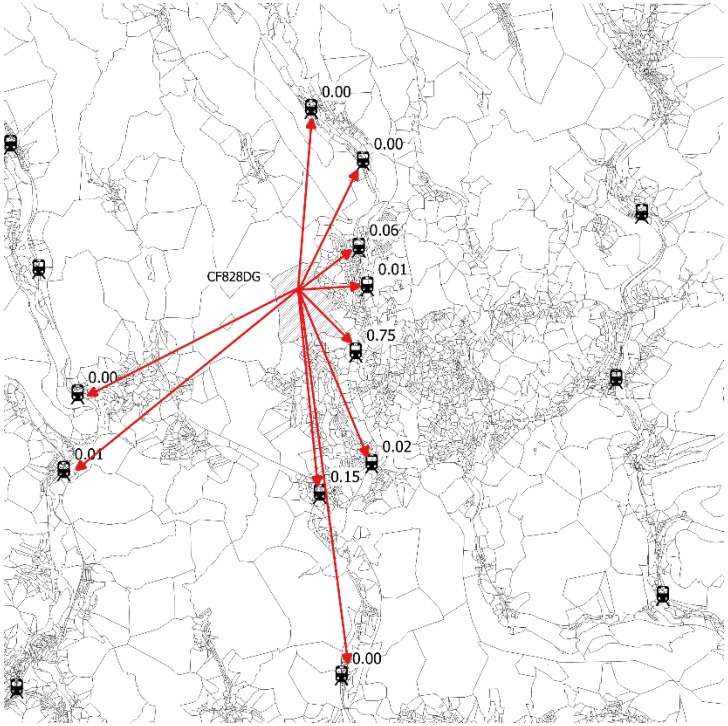
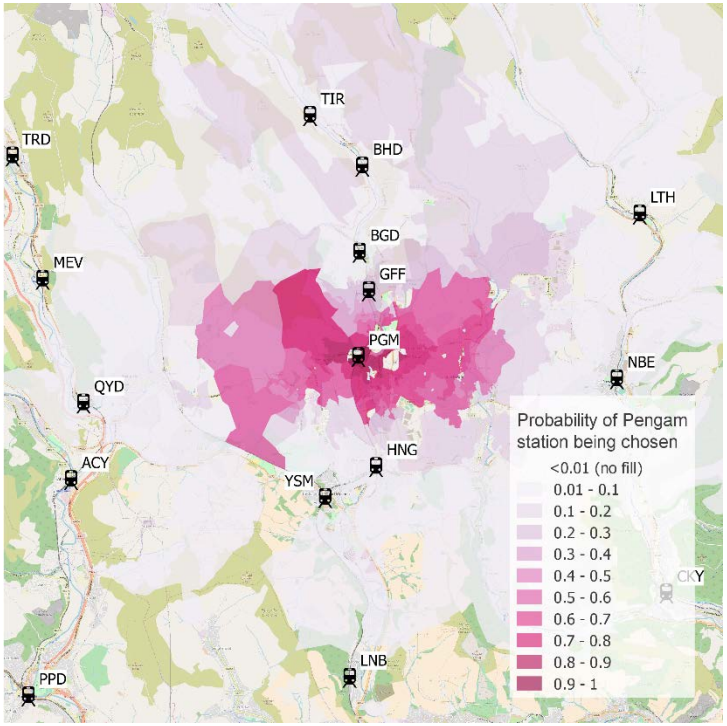
Key part of my research was developing station choice models to define probabilistic station catchments

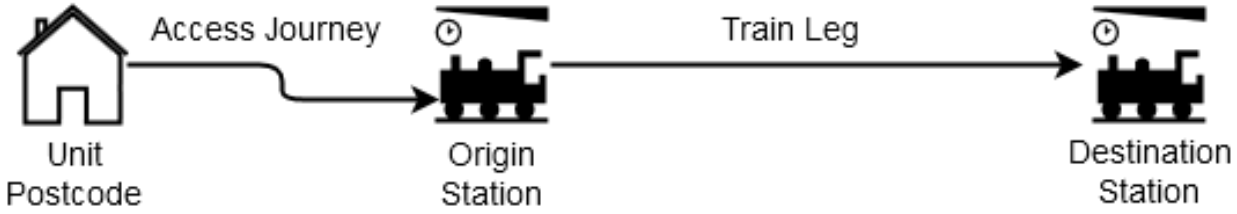


Probability of alternative stations being chosen for a postcode



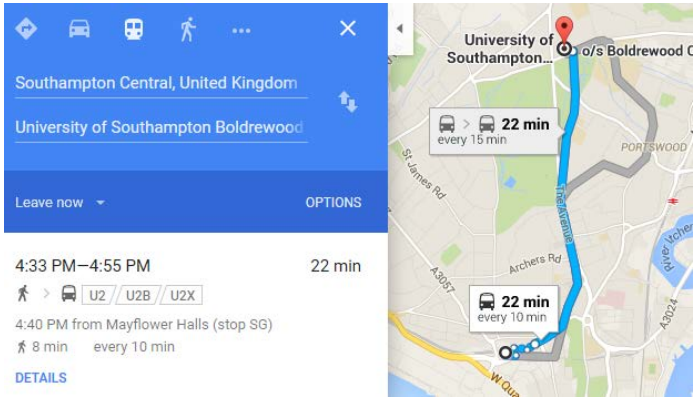
Probabilistic catchment for a station

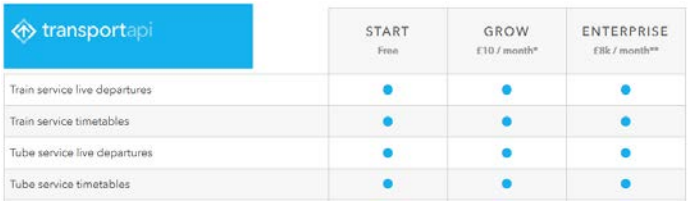
To calibrate models I needed data on station access journeys and the train leg



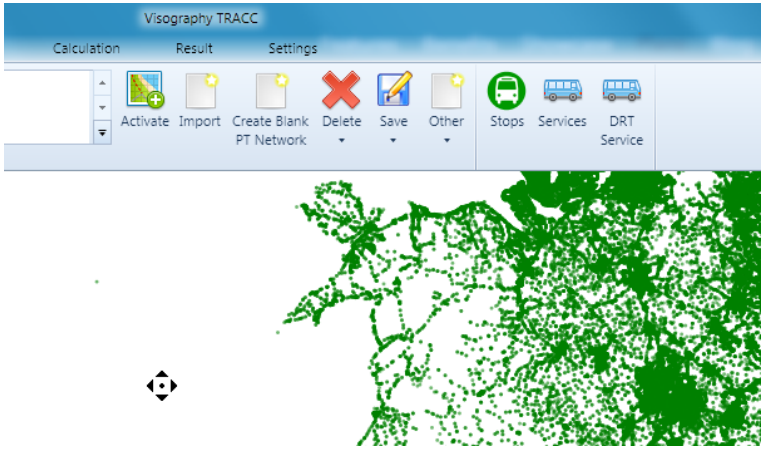
individual	Choice set	Chosen	Distance (road)	Time (road)	Duration (mode specific)	Train leg duration	Walk time	Wait time	Transfers	On-train time	Fare
1556	ADR	1	0.64	2.48	9.40	28.33	2.33	0	0	26	6.40
1556	COA	0	2.06	6.13	26.63	26.33	2.33	0	0	24	6.20
1556	WFF	0	3.94	12.93	41.12	43.00	0.00	6	1	37	6.40
1556	CBC	0	3.85	13.20	50.12	41.00	0.00	6	1	35	6.40
1556	HLY	0	7.66	16.03	83.55	34.10	8.10	0	0	26	6.90
1556	KWD	0	5.69	20.10	68.62	58.10	8.10	0	0	50	6.20
1556	BAI	0	5.17	14.73	65.30	19.33	2.33	0	0	17	5.80
1556	CBS	0	3.85	11.27	48.67	23.33	2.33	0	0	21	5.90
1556	CRF	0	8.22	17.32	97.47	36.10	8.10	0	0	28	6.90
1556	DRU	0	3.35	8.92	37.18	33.33	2.33	0	0	31	6.70

Variety of route planning tools were considered, but found unsuitable and rejected



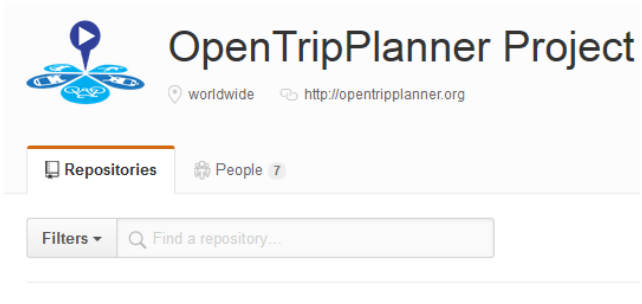


Online services - not free and restricted to current services - not useful for planning or retrospective analysis



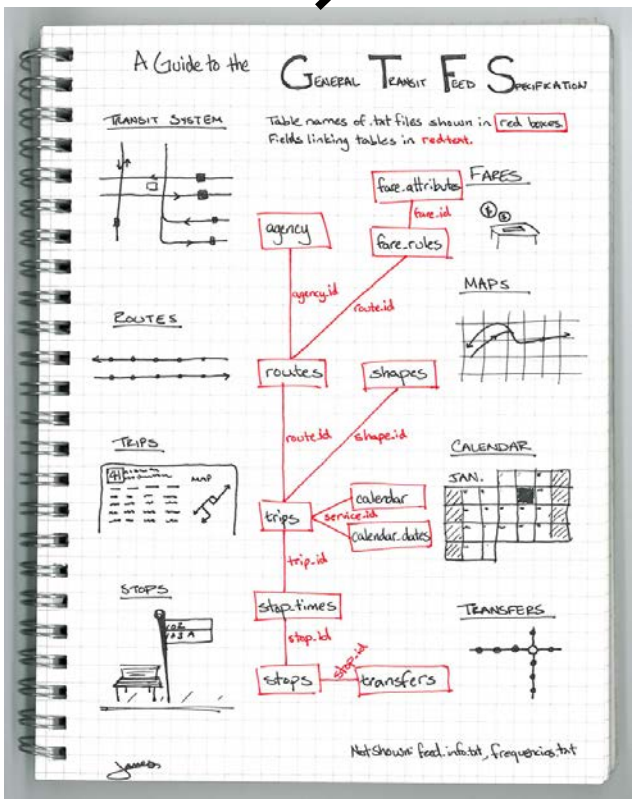
Commercial desktop options – expensive, and restrictive.

OpenTripPlanner was selected – open source, cross-platform, with web interface and routing API



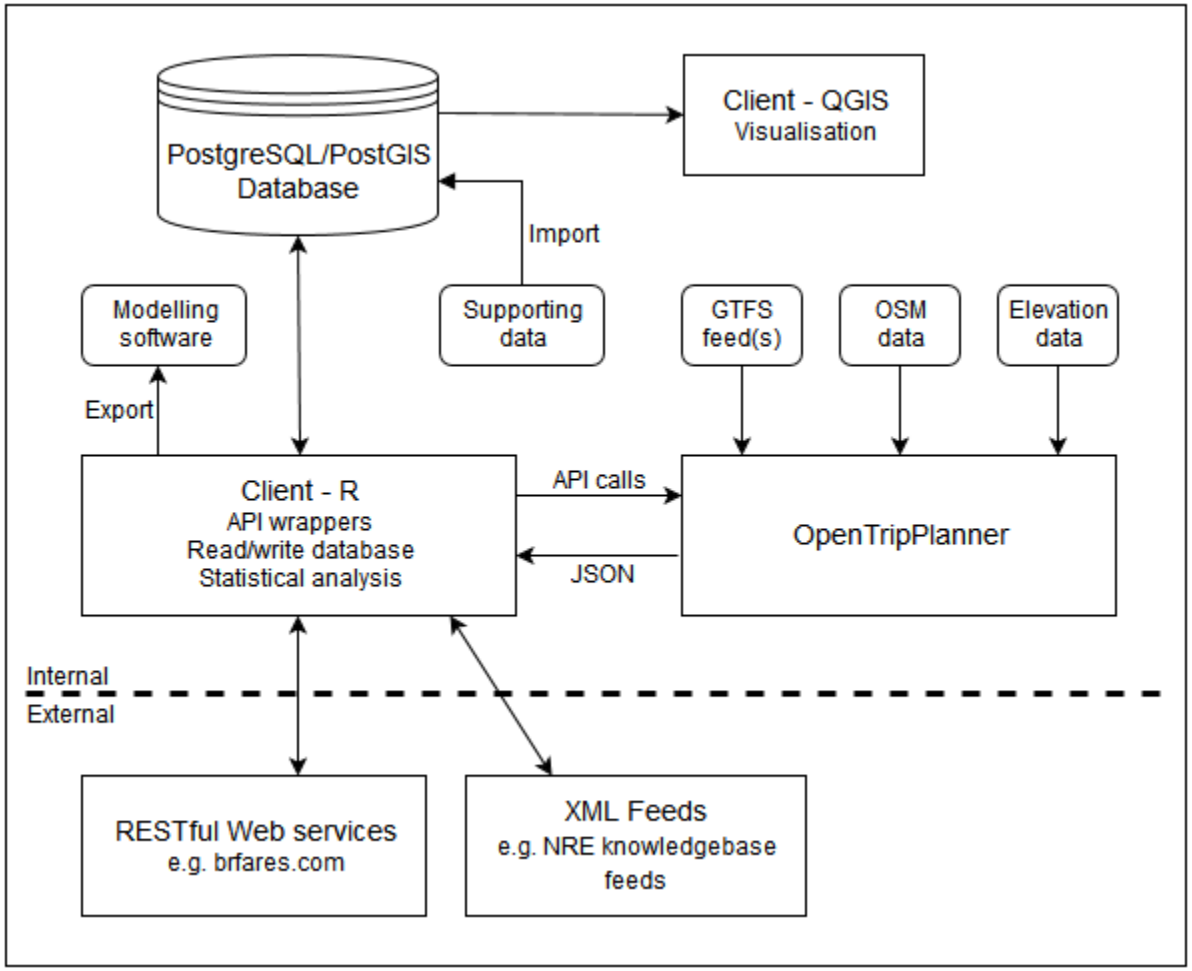
OpenStreetMap

GTFS



Source: http://blog.openplans.org/2012/08/the-openplans-guide-to-gtfs-data/

An automated framework to derive explanatory variables from disparate open transport data sources

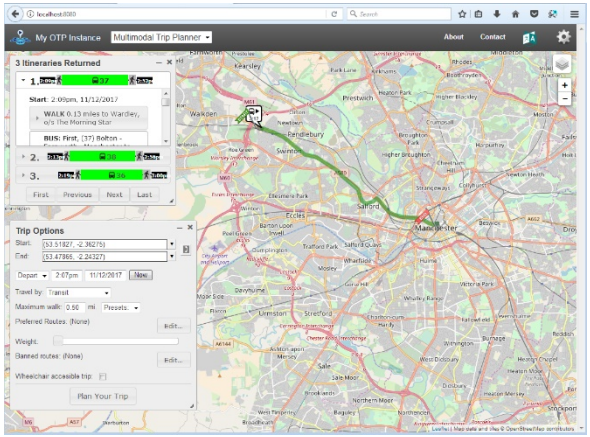


From: Young, Marcus. 2016. “An automated framework to derive model variables from open transport data using R, PostgreSQL and OpenTripPlanner.” Paper presented at 24th GIS Research, UK Conference.

Tutorial – Part 1 (approx. 25 mins)

- Build an OTP network graph for Greater Manchester and then launch your OTP instance and test the web interface.
- https://github.com/marcusyoung/otp-tutorial
  - intro-otp.pdf & materials.zip

```
/otp
  otp.jar
  /graphs
     /current
          rail-gtfs.zip
          tfgm-gtfs.zip
          greater-manchester-osm.pbf
          router-config.json
```



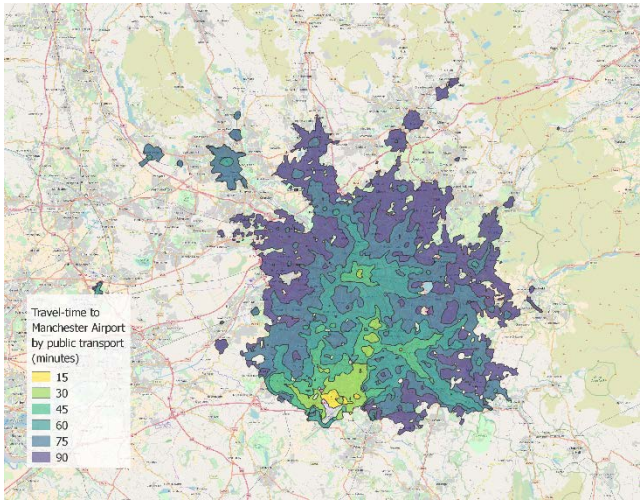

```
java -Xmx2G -jar otp.jar --build graphs/current
```

```
java -Xmx2G -jar otp.jar --router current --graphs graphs --server
```

Tutorial – Part 2 (approx. 40 mins)

- Query the OTP Isochrone API to obtain travel-time polygons for accessing Manchester Airport.
- Challenge: assess impact of new airport link service
- No OTP instance? Use: otp.graspit.co.uk

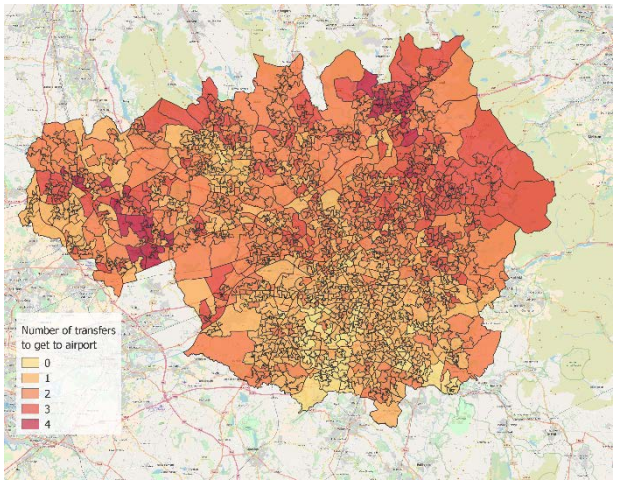
```
library(httr)
airport_current <- GET(
  "http://localhost:8080/otp/routers/current/isochrone",
  query = list(
    fromPlace = "53.3627432,-2.2729342", # latlong of Mar
    mode = "WALK,TRANSIT", # modes we want the route plar
    date = "07-10-2017",
    time= "08:00am",
    maxWalkDistance = 1600, # in metres
    walkReluctance = 5,
    minTransferTime = 600, # in secs (allow 10 minutes)
    cutoffSec = 900,
    cutoffSec = 1800,
    cutoffSec = 2700,
    cutoffSec = 3600,
    cutoffSec = 4500,
    cutoffSec = 5400
  )
)
```



Tutorial – Part 3 (approx. 40 mins)

- Use an R script to automate querying the OTP route planner API
- Look up route to Manchester Airport by public transport for each LSOA in Greater Manchester

```
# Call otpTripTime to get attributes of
   otpTripTime(
      otpcon,
      from = '53.43329,-2.13357',
      to =   '53.36274,-2.27293',
      modes = 'WALK,TRANSIT',
      detail = TRUE,
      date = '2017-07-12',
      time = '08:00am',
      maxWalkDistance = '1600',
      walkReluctance = '5',
      minTransferTime = '600'
    )
```



	code	easting	northing	latlong	status	duration	waitingtime	transfers
1	E01005756	391223	392954	53.43329,-2.13357	OK	49.50	10.03	1
2	E01005757	390660	391186	53.41739,-2.14199	OK	41.95	0.03	0
3	E01005754	390870	392662	53.43066,-2.13888	OK	55.47	10.03	1
4	E01005755	391140	391965	53.4244,-2.13479	OK	44.23	10.03	1