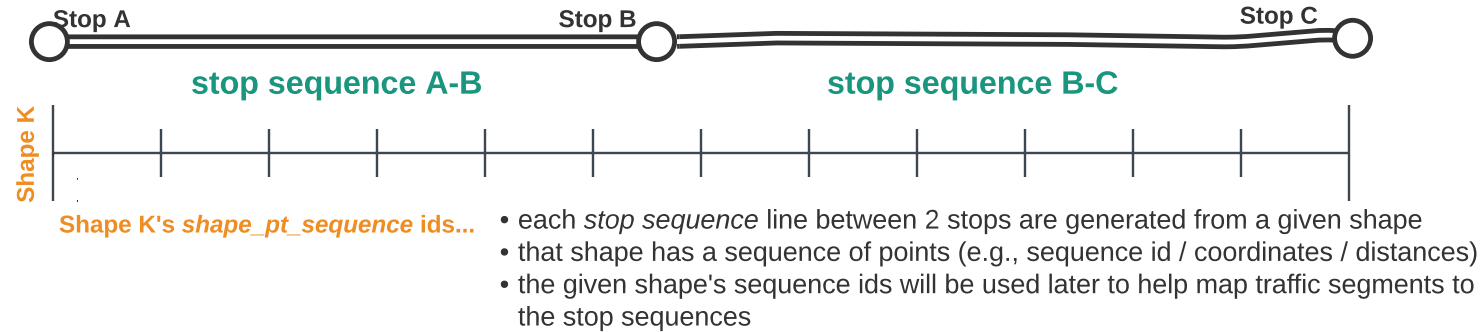
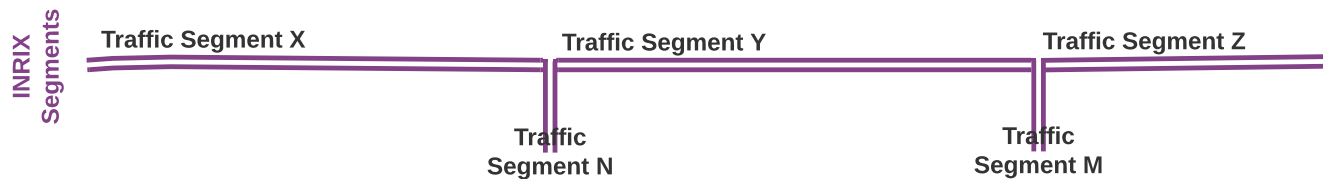


stops => segments => speed

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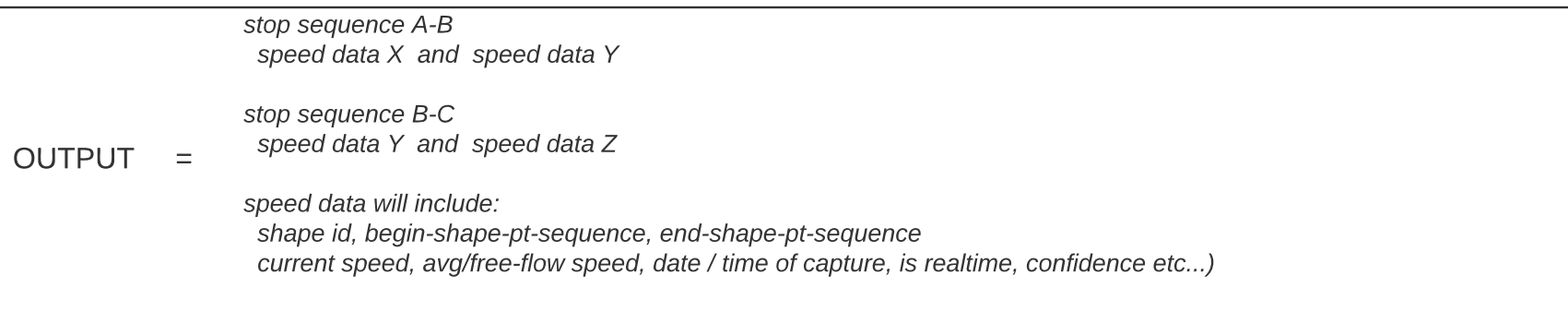
gtfsdb



INRIX Segment
geojson



trafficdb



stops => segments => speed

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```
OUTPUT = {"segments": [{"id": "9981-8262", "distance": 2383.6000, "direction": "SW", "bearing": 244.0, "shapeld": "152363251", "speeds": [{"beginShapePtSequence": 0, "endShapePtSequence": 133, "vendorId": 448835216, "speed": 19.0, "avg": 25.0, "freeflow": 26.0, "traversalTime": 0.465, "capture_time": 1609794520, "realtime": true, "confidence": 100}, {"beginShapePtSequence": 133, "endShapePtSequence": 149, "vendorId": 447717222, "speed": 17.0, "avg": 23.0, "freeflow": 23.0, "traversalTime": 0.260, "capture_time": 1609794520, "realtime": true, "confidence": 90}]}, {"id": "9981-8262", "distance": 2383.6000, "direction": "SW", "bearing": 244.0, "shapeld": "152363251", "speeds": [{"beginShapePtSequence": 0, "endShapePtSequence": 133, "vendorId": 448835216, "speed": 19.0, "avg": 25.0, "freeflow": 26.0, "traversalTime": 0.465, "capture_time": 1609794520, "realtime": true, "confidence": 100}, {"beginShapePtSequence": 133, "endShapePtSequence": 149, "vendorId": 447717222, "speed": 17.0, "avg": 23.0, "freeflow": 23.0, "traversalTime": 0.260, "capture_time": 1609794520, "realtime": true, "confidence": 90}]}]}
```

Question:
want / need
for geometry
information?

Question: some INRIX segments have 'sub-speeds'. Would including a minSpeed and maxSpeed, and/or a list of the speeds, be of any help? Again, only a portion of segments have these sub-speeds. For example, SE Milwaukie between Hawthorn and Division is a single segment, where I've seen the speeds fluctuate across the segments (e.g., slower speeds than the segment 'speed' value often appear at SE Division ... no surprise)

```
segments: 9981-8262 (SW 2383.6') -- 448835216 (W 772.3'):
2020-12-31 05:36am -- speed: 24.0 freeflow: 26.0 avg: 27.0 time: 0.358 (realtime is true with 100% confidence)
2020-12-31 07:17am -- speed: 19.0 freeflow: 26.0 avg: 24.0 time: 0.465 (realtime is true with 100% confidence)
2020-12-31 08:56am -- speed: 16.0 freeflow: 26.0 avg: 24.0 time: 0.537 (realtime is true with 100% confidence)
2021-01-03 05:27am -- speed: 37.0 freeflow: 26.0 avg: 29.0 time: 0.237 (realtime is true with 90% confidence)
2021-01-03 05:40am -- speed: 32.0 freeflow: 26.0 avg: 29.0 time: 0.268 (realtime is true with 90% confidence)
2021-01-03 07:31am -- speed: 30.0 freeflow: 26.0 avg: 30.0 time: 0.285 (realtime is true with 39% confidence)
2021-01-03 07:33am -- speed: 32.0 freeflow: 26.0 avg: 30.0 time: 0.274 (realtime is true with 0% confidence)
2021-01-04 09:49am -- speed: 19.0 freeflow: 26.0 avg: 22.0 time: 0.465 (realtime is true with 100% confidence)
```

stops => segments => speed

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segments: 9981-8262 (SW 2383.6') -- 1236997384 (S 333.3'):

| | | | | | |
|--------------------|----------------|----------------|-----------|-------------|--|
| 2020-12-31 05:36am | -- speed: 9.0 | freeflow: 17.0 | avg: 17.0 | time: 0.439 | (realtime is true with 90% confidence) |
| 2020-12-31 07:17am | -- speed: 16.0 | freeflow: 17.0 | avg: 16.0 | time: 0.237 | (realtime is false with 0% confidence) |
| 2020-12-31 08:56am | -- speed: 9.0 | freeflow: 17.0 | avg: 16.0 | time: 0.410 | (realtime is true with 90% confidence) |
| 2021-01-03 05:27am | -- speed: 13.0 | freeflow: 17.0 | avg: 13.0 | time: 0.293 | (realtime is false with 0% confidence) |
| 2021-01-03 05:40am | -- speed: 9.0 | freeflow: 17.0 | avg: 13.0 | time: 0.410 | (realtime is true with 90% confidence) |
| 2021-01-03 07:31am | -- speed: 23.0 | freeflow: 17.0 | avg: 17.0 | time: 0.166 | (realtime is true with 0% confidence) |
| 2021-01-03 07:33am | -- speed: 23.0 | freeflow: 17.0 | avg: 17.0 | time: 0.166 | (realtime is true with 0% confidence) |
| 2021-01-04 09:49am | -- speed: 11.0 | freeflow: 17.0 | avg: 18.0 | time: 0.362 | (realtime is true with 90% confidence) |

segments: 9981-8262 (SW 2383.6') -- 440939848 (S 878.3'):

| | | | | | |
|--------------------|----------------|----------------|-----------|-------------|--|
| 2020-12-31 05:36am | -- speed: 15.0 | freeflow: 16.0 | avg: 15.0 | time: 0.653 | (realtime is false with 0% confidence) |
| 2020-12-31 07:17am | -- speed: 14.0 | freeflow: 16.0 | avg: 14.0 | time: 0.713 | (realtime is true with 90% confidence) |
| 2020-12-31 08:56am | -- speed: 14.0 | freeflow: 16.0 | avg: 15.0 | time: 0.682 | (realtime is true with 90% confidence) |
| 2021-01-03 05:27am | -- speed: 27.0 | freeflow: 16.0 | avg: 11.0 | time: 0.365 | (realtime is true with 0% confidence) |
| 2021-01-03 05:40am | -- speed: 27.0 | freeflow: 16.0 | avg: 11.0 | time: 0.365 | (realtime is true with 0% confidence) |
| 2021-01-03 07:31am | -- speed: 10.0 | freeflow: 16.0 | avg: 16.0 | time: 0.980 | (realtime is true with 0% confidence) |
| 2021-01-03 07:33am | -- speed: 10.0 | freeflow: 16.0 | avg: 16.0 | time: 0.980 | (realtime is true with 0% confidence) |
| 2021-01-04 09:49am | -- speed: 15.0 | freeflow: 16.0 | avg: 14.0 | time: 0.653 | (realtime is true with 90% confidence) |

segments: 9981-8262 (SW 2383.6') -- 448835216 (W 772.3'):

| | | | | | |
|--------------------|----------------|----------------|-----------|-------------|---|
| 2020-12-31 05:36am | -- speed: 24.0 | freeflow: 26.0 | avg: 27.0 | time: 0.358 | (realtime is true with 100% confidence) |
| 2020-12-31 07:17am | -- speed: 19.0 | freeflow: 26.0 | avg: 24.0 | time: 0.465 | (realtime is true with 100% confidence) |
| 2020-12-31 08:56am | -- speed: 16.0 | freeflow: 26.0 | avg: 24.0 | time: 0.537 | (realtime is true with 100% confidence) |
| 2021-01-03 05:27am | -- speed: 37.0 | freeflow: 26.0 | avg: 29.0 | time: 0.237 | (realtime is true with 90% confidence) |
| 2021-01-03 05:40am | -- speed: 32.0 | freeflow: 26.0 | avg: 29.0 | time: 0.268 | (realtime is true with 90% confidence) |
| 2021-01-03 07:31am | -- speed: 30.0 | freeflow: 26.0 | avg: 30.0 | time: 0.285 | (realtime is true with 39% confidence) |
| 2021-01-03 07:33am | -- speed: 32.0 | freeflow: 26.0 | avg: 30.0 | time: 0.274 | (realtime is true with 0% confidence) |
| 2021-01-04 09:49am | -- speed: 19.0 | freeflow: 26.0 | avg: 22.0 | time: 0.465 | (realtime is true with 100% confidence) |

segments: 9981-8262 (SW 2383.6') -- 448835217 (W 533.1'):

| | | | | | |
|--------------------|----------------|----------------|-----------|-------------|---|
| 2020-12-31 05:36am | -- speed: 33.0 | freeflow: 27.0 | avg: 27.0 | time: 0.182 | (realtime is true with 100% confidence) |
| 2020-12-31 07:17am | -- speed: 21.0 | freeflow: 27.0 | avg: 24.0 | time: 0.284 | (realtime is true with 100% confidence) |
| 2020-12-31 08:56am | -- speed: 21.0 | freeflow: 27.0 | avg: 24.0 | time: 0.284 | (realtime is true with 100% confidence) |
| 2021-01-03 05:27am | -- speed: 36.0 | freeflow: 27.0 | avg: 32.0 | time: 0.166 | (realtime is true with 90% confidence) |
| 2021-01-03 05:40am | -- speed: 32.0 | freeflow: 27.0 | avg: 32.0 | time: 0.189 | (realtime is true with 90% confidence) |
| 2021-01-03 07:31am | -- speed: 35.0 | freeflow: 27.0 | avg: 31.0 | time: 0.172 | (realtime is true with 0% confidence) |
| 2021-01-03 07:33am | -- speed: 35.0 | freeflow: 27.0 | avg: 31.0 | time: 0.172 | (realtime is true with 0% confidence) |
| 2021-01-04 09:49am | -- speed: 17.0 | freeflow: 27.0 | avg: 22.0 | time: 0.357 | (realtime is true with 100% confidence) |

TRAFFIC / SPEED DATA

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INRIX:

pros:

- cheap (free) for TriMet via ODOT contract
- responsive technical contact

cons:

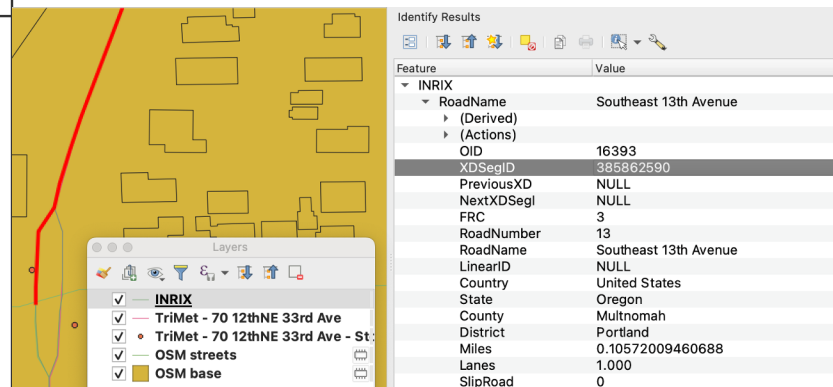
- hard to match between OSM / GTFS
(there is a INRIX id to OSM Way id rosetta stone, but time will tell how easy it is to use)
- availability of historical speed data?
- might have to collect data to create needed dataset for the model from realtime api
- if we have to collect data, at what interval would we collect? How often can we call the bulk data grab? how often do we refresh the data we've previously collected? etc...

step 1: renew cert (once per day / session):

```
// http://na.api.inrix.com/traffic/Inrix.ashx?format=json&action=getsecuritytoken&ce6a9c3325fe&

{
  "docType": "GetSecurityToken",
  "copyright": "Copyright INRIX Inc.",
  "versionNumber": "17.2",
  "createdDate": "2020-11-23T22:36:28Z",
  "statusId": 0,
  "statusText": "OK",
  "responseId": "41b75c8f-58fc-44b7-9b05-c5e7784fa160",
  "result": {
    "token": "01LQnv3pDL0ryr7N4NpMgxU1FEaa9ebfiRqoIgQ46aUI",
    "tokenExpiresUtc": "2020-11-23T23:35:00Z"
  }
}
```

step 2: match XD segment IDs to GTFS



| Feature | Value |
|------------|-----------------------|
| INRIX | |
| RoadName | Southeast 13th Avenue |
| (Derived) | |
| (Actions) | |
| OID | 16393 |
| XDSegID | 385862590 |
| PreviousXD | NULL |
| NextXDSeg | NULL |
| FRC | 3 |
| RoadNumber | 13 |
| RoadName | Southeast 13th Avenue |
| LinearID | NULL |
| Country | United States |
| State | Oregon |
| County | Multnomah |
| District | Portland |
| Miles | 0.10572009460688 |
| Lanes | 1.000 |
| SlipRoad | 0 |

step 3: match speed data to segments

Not Secure | api.inrix.com/Traffic/Inrix.ashx?Action=GetSegmentSpeedInGeography&geolID=243&token=01LQnv3pDL0ryr7N4NpMgxU1

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<?xml version="1.0" encoding="UTF-8" standalone="1" ?>
<Inrix docType="GetSegmentSpeedInGeography" copyright="Copyright INRIX Inc." versionNumber="17.2" createdDate="2020-11-23T23:07:25Z" statusId="0" statusText="OK" responseId="41b75c8f-58fc-44b7-9b05-c5e7784fa160" result="{"token":"01LQnv3pDL0ryr7N4NpMgxU1FEaa9ebfiRqoIgQ46aUI","tokenExpiresUtc":"2020-11-23T23:35:00Z"}"/>
  <Segment code="124636950" type="XDS" speed="17" average="15" reference="20" score="30" c-value="100" travelTimeMinutes="0.329" speedBucket="2"/>
  <Segment code="125200636" type="XDS" speed="24" average="15" reference="20" score="30" c-value="100" travelTimeMinutes="0.329" speedBucket="2"/>
  <Segment code="385862585" type="XDS" speed="19" average="19" reference="22" score="30" c-value="100" travelTimeMinutes="0.144" speedBucket="2"/>
  <Segment code="385862586" type="XDS" speed="19" average="19" reference="22" score="30" c-value="100" travelTimeMinutes="0.144" speedBucket="2"/>
  <Segment code="385862590" type="XDS" speed="19" average="19" reference="22" score="30" c-value="100" travelTimeMinutes="0.329" speedBucket="2"/>
  <Segment code="385703529" type="XDS" speed="18" average="19" reference="22" score="30" c-value="100" travelTimeMinutes="0.226" speedBucket="2"/>
  <Segment code="440964537" type="XDS" speed="16" average="19" reference="22" score="30" c-value="100" travelTimeMinutes="0.327" speedBucket="2"/>
  <Segment code="440964542" type="XDS" speed="13" average="19" reference="22" score="30" c-value="100" travelTimeMinutes="0.279" speedBucket="1"/>
  <Segment code="1237014851" type="XDS" speed="17" average="19" reference="22" score="30" c-value="100" travelTimeMinutes="1.036" speedBucket="2"/>
```

note: INRIX XD segment to OSM Way ID

| USA_Oregon | | | | | | |
|------------|-------------------|------------------|------------------|----------------|------------------------|----------------------|
| XDSegID | OSMWayIDs | OSMWayDirections | WayStartOffset_m | WayEndOffset_m | WayStartOffset_percent | WayEndOffset_percent |
| 116331545 | 5125042 | N | 82.95 | 184.51 | 12.508 | 27.821 |
| 116337789 | 115687195;5126796 | N/N | 230.09 | 11.47 | 57.433 | 6.006 |
| 116342301 | 5124714 | N | 203.76 | 304.92 | 66.824 | 100 |
| 116343155 | 5129878 | N | 398.36 | 593.19 | 58.059 | 86.454 |

GTFS BEGIN_STOP => END_STOP SEGMENTATION

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SEGMENT GTFS STOPS:

BeginStop => EndStop pairs from GTFS

GTFS stops.txt

provides the lat / lon

```
stop_id,stop_code,stop_name,tts_stop_name,stop_desc,stop_lat,stop_lon,zone_id,stop_url,location_type,parent_station,direction,position
2,2,A Ave & Chandler,ae avenue & chandler,Eastbound stop in Lake Oswego (Stop ID 2),45.420609,-122.675671,B,https://trimet.org/#tracker/stop/2,0,,East,Nearside
3,3,A Ave & Second St,ae avenue & second street,Eastbound stop in Lake Oswego (Stop ID 3),45.419388,-122.665197,B,https://trimet.org/#tracker/stop/3,0,,East,Farside
4,4,A Ave & 10th St,ae avenue & 10th street,Westbound stop in Lake Oswego (Stop ID 4),45.420703,-122.675152,B,https://trimet.org/#tracker/stop/4,0,,West,Nearside
6,6,A Ave & 8th St,ae avenue & 8th street,Eastbound stop in Lake Oswego (Stop ID 6),45.420217,-122.67307,B,https://trimet.org/#tracker/stop/6,0,,East,Nearside
7,7,A Ave & 8th St,ae avenue & 8th street,Westbound stop in Lake Oswego (Stop ID 7),45.420411,-122.67268,B,https://trimet.org/#tracker/stop/7,0,,West,Nearside
```

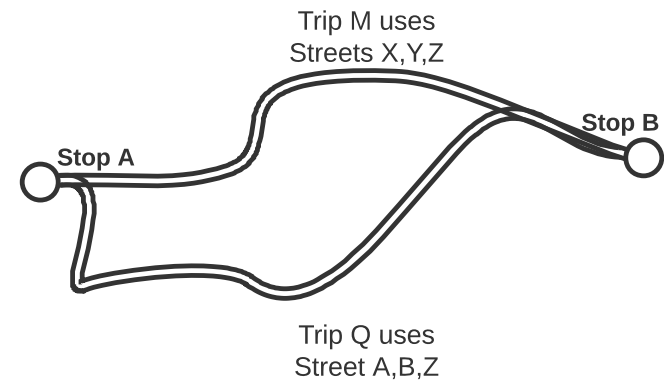
GTFS stop_times.txt

provides the stop pairs (segments), plus times and service keys (when joined to trips.txt)

```
trip_id,arrival_time,departure_time,stop_id,stop_sequence,stop_headsign,pickup_type,drop_off_type,shape_dist_traveled,t
10292960,06:44:00,06:44:00,13170,1,45th Ave,0,0,0,0,1,,
10292960,06:45:26,06:45:26,7631,2,45th Ave,0,0,875.0,0,,
10292960,06:47:31,06:47:31,7625,3,45th Ave,0,0,2162.7,0,,
10292960,06:49:36,06:49:36,7612,4,45th Ave,0,0,3433.7,0,,
10292960,06:51:20,06:51:20,7616,5,45th Ave,0,0,4498.5,0,,
10292960,06:53:02,06:53:02,10491,6,45th Ave,0,0,5543.4,0,,
10292960,06:55:02,06:55:02,7588,7,45th Ave,0,0,6772.2,0,,
10292960,06:56:00,06:56:00,7591,8,45th Ave,0,0,7366.1,0,,
10292960,06:56:34,06:56:34,175,9,45th Ave,0,0,8688.6,0,,
10292960,06:56:50,06:56:50,198,10,45th Ave,0,0,9284.7,0,,
10292960,06:57:14,06:57:14,196,11,45th Ave,0,0,10225.4,0,,
```

ASSUMPTION:

each BeginStop to EndStop pair travels along the same street(s)
e.g., this situation will not happen, either between trips / routes



DERRIVED BEGIN_STOP => END_STOP

```
begin_stop_id,end_stop_id,dist_travelled,begin_time,end_time,m,t,w,th,f,s,su
13170,7631,875.0,06:44:00,26:33:53,1,1,1,1,1,1,1
7631,7625,1135.7,06:45:26,26:35:20,1,1,1,1,1,1,1
...
12644,442,835.2,07:11:00,19:21:12,1,1,1,1,1,0,0
```