Introduction to GTFS-Flex

July 18, 2024

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MobilityData

We are a **global nonprofit** organization.
We develop the open-source data standards that provide traveler information.

We maintain **GTFS** and **GBFS** with the help of the community, and we develop free and open-source tools and documentation.

Through funding and membership of industry organizations, we are able to produce tools, and facilitate working groups, meetings and global summits to **fuel the community growth.**

What is GTFS?

General Transit Feed Specification

- ➔ Describes **transportation network information**.
- ➔ Is **traveler-centric** not operational.
- ➔ It has a component for **static information** and a component for **real time information**

- We encourage you to contribute to the conversations
  - Join the slack community https://share.mobilitydata.org/slack
  - Visit gtfs.org for documentation and resources
  - Visit the GitHub repo at github.com/google/transit

- Reach-out to specifications@mobilitydata.org for any specification questions

Goal of GTFS-Flex

Problems
- DRT works in standalone app/website/service
- Riders are not aware of DRT options

Riders discover DRT services through trip planners
Provide integrated routing options for both fixed-route and DRT services

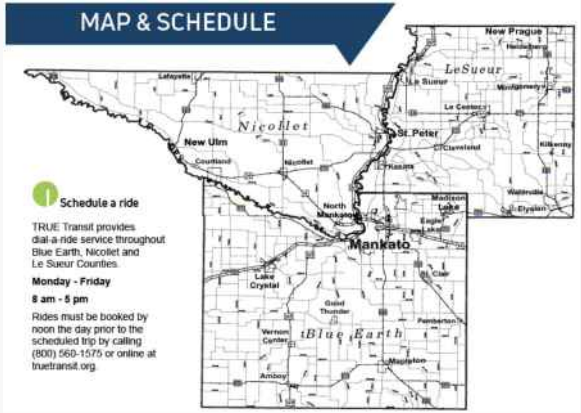
Not include - actual path, realtime info, “accurate” time duration, and transactional info

GTFS-Flex use cases

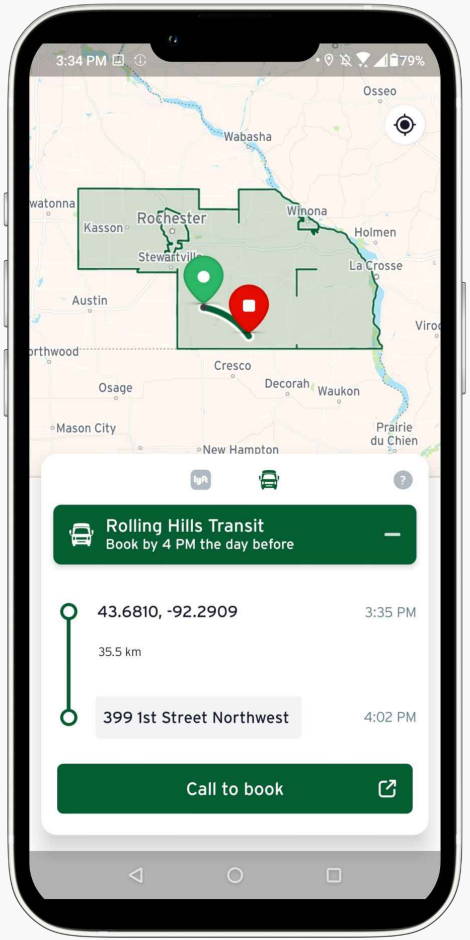
- Zone-based DRT
- Fixed-stops DRT
- Predefined Routes with Deviation

Zone-based DRT

The vehicle can pickup/dropoff riders anywhere within a zone or between zones to serve demand-responsive requests



Example: [TURE TRANSIT](#) (MN, US)



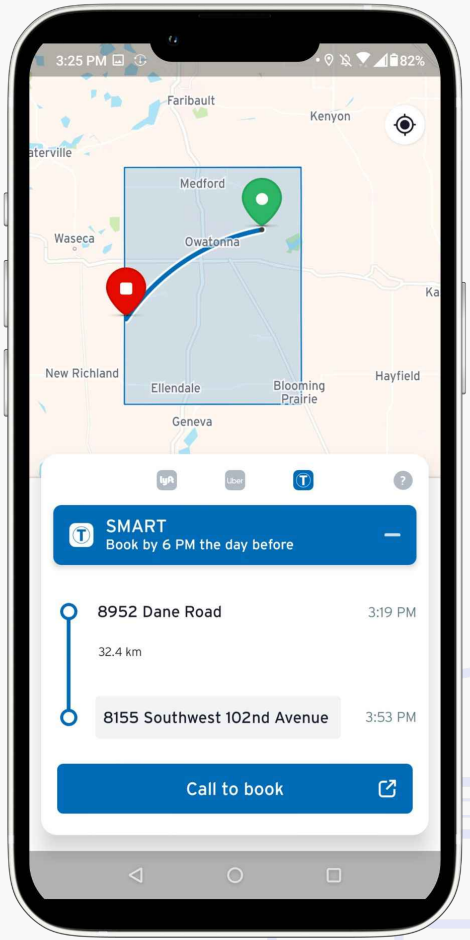
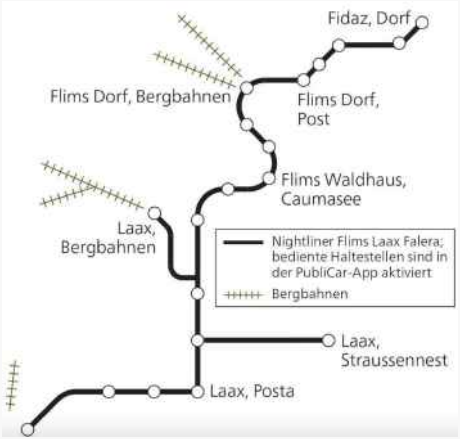


Image source: Transit

Fixed-stops DRT

The vehicle can pickup/dropoff riders at a certain point(or group of points) to serve demand-responsive requests



Example: [Flims Laax Falera Nightliner](#) (CH)

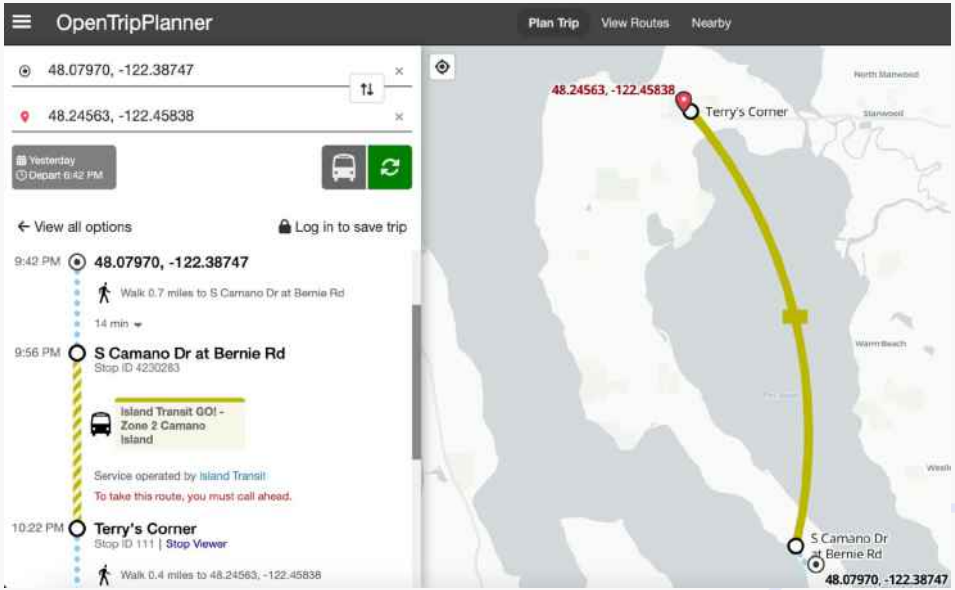
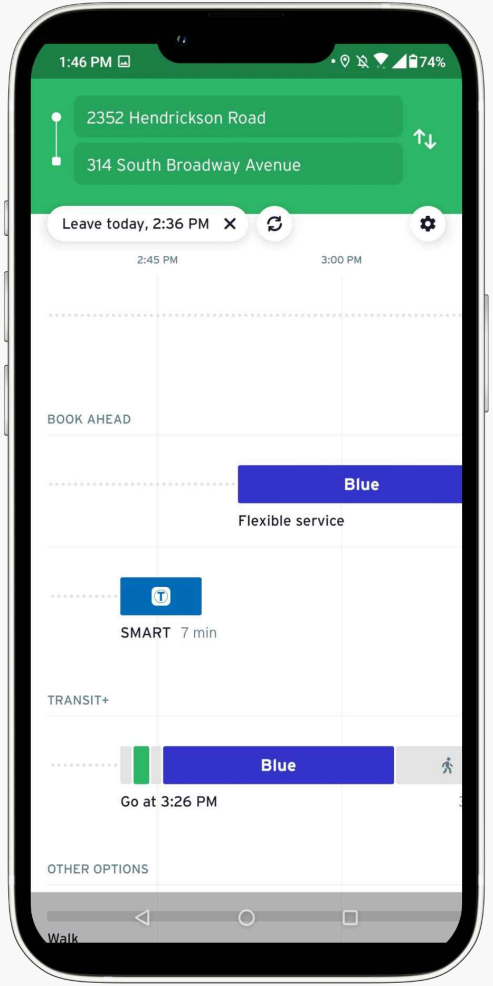


Image source: OpenTripPlanner

Route Deviation

Fixed-route services where the vehicle can deviate to serve demand-responsive requests around the path

Example: SMART (MN, US)



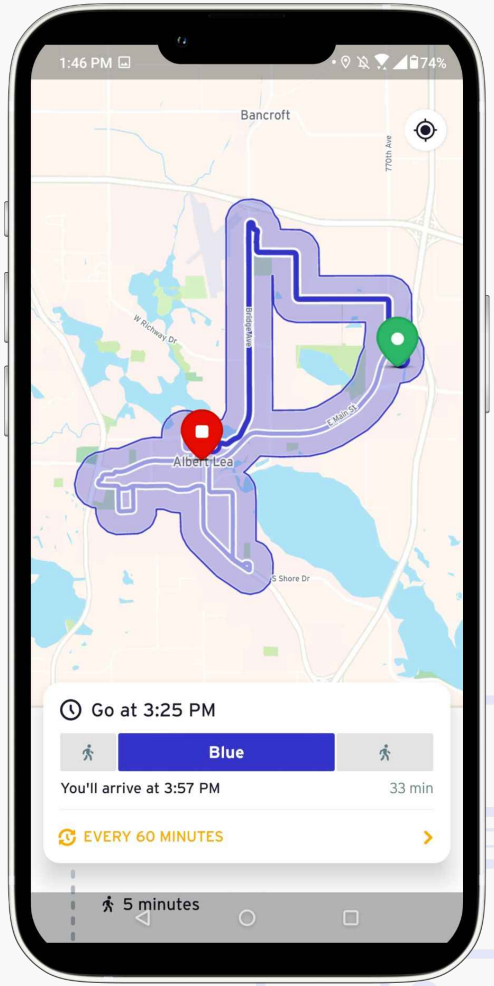
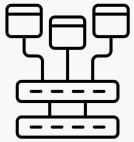


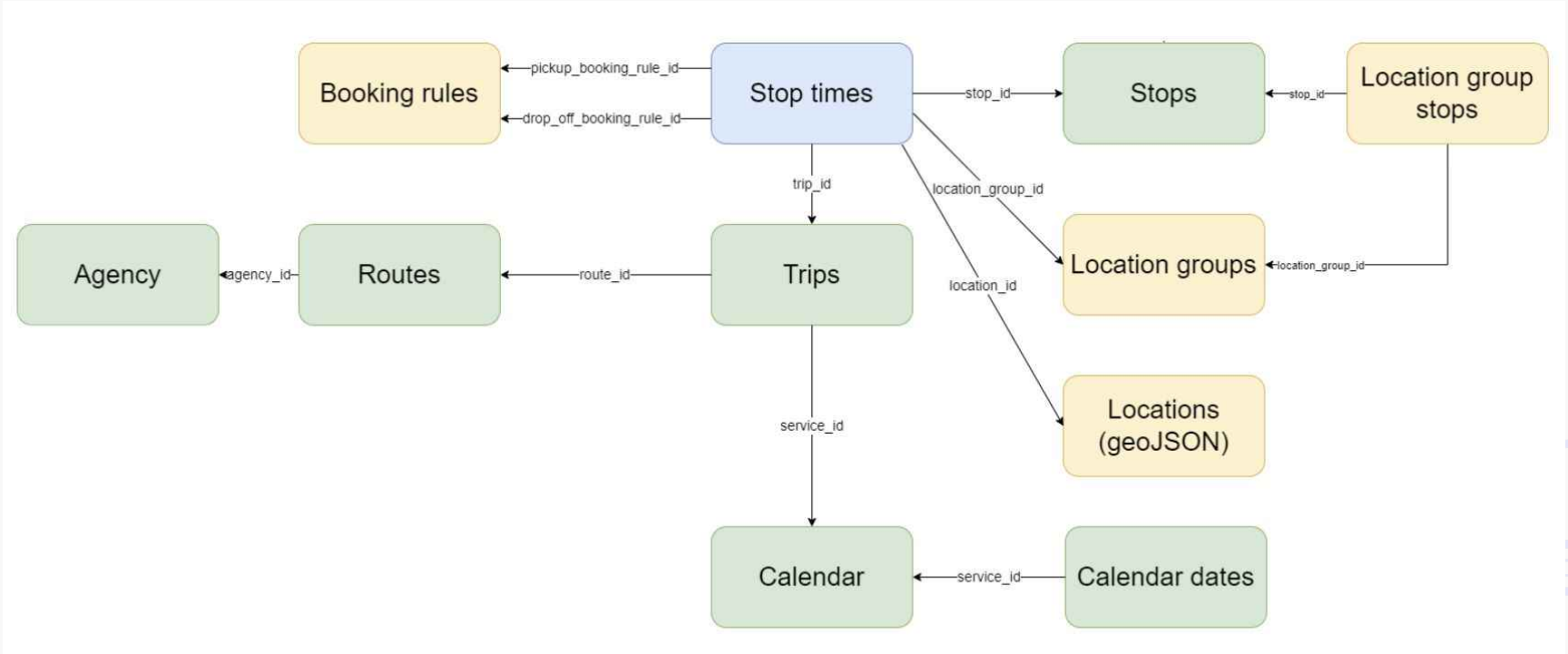
Image source: TransitApp

Where is implementing GTFS-Flex

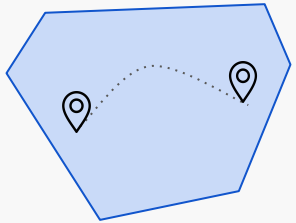


How to model different use cases

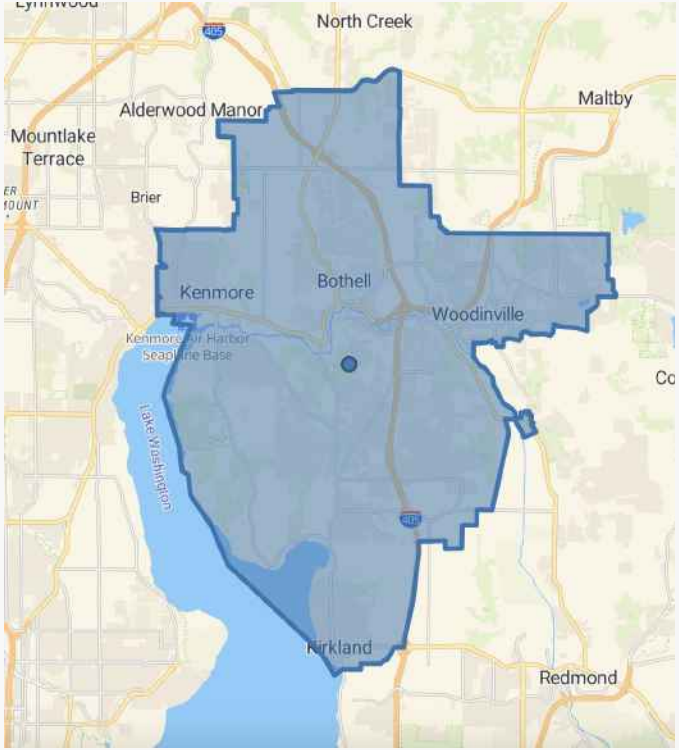
Changes with GTFS-Flex



Zone-based DRT



Define polygon by locations.geojson

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      "type": "Feature",
      "geometry": {
        "type": "Polygon",
        # Simplified, only presenting 3 coordinates here.
        "coordinates": [
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              45.5023960
            ],
            [
              -73.641593,
              45.5054392
            ],
            [
              -73.636580,
              45.5081683
            ]
          ]
        ]
      },
      "properties": {}
    }
  ]
}
```

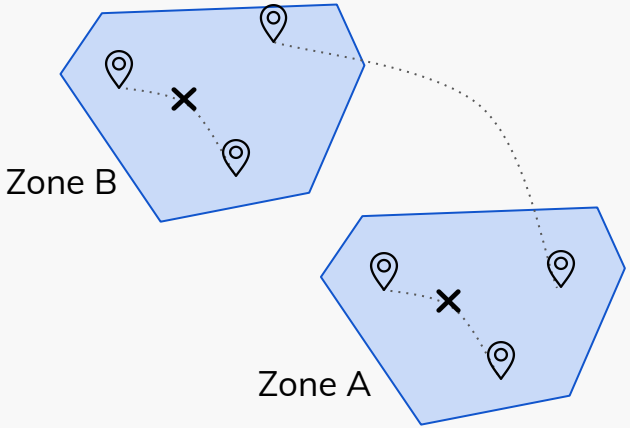

Tools?

- GIS applications
- Web-based geojson tools
- Tools from the community!

DRT between multiple zones

stop_times.txt

trip_id	stop_sequence	location_id	start_pickup_drop_off_window	end_pickup_drop_off_window	pickup_type	drop_off_type
001	1	zone_A	09:00:00	18:00:00	2	1
001	2	zone_B	09:00:00	18:00:00	1	2



The above modelling allows:

- From Zone A to Zone B

Does NOT allow:

- From Zone A to Zone A
- From Zone B to Zone B
- From Zone B to Zone A

River Valley Transit example dataset

Fixed-stops DRT

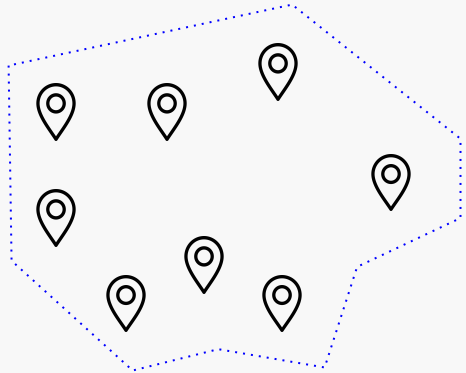
Define group of stops by location_groups.txt & location_group_stops.txt

location_groups.txt

location_group_id	location_group_name
group_1	Access Service 7 stops

location_group_stops.txt

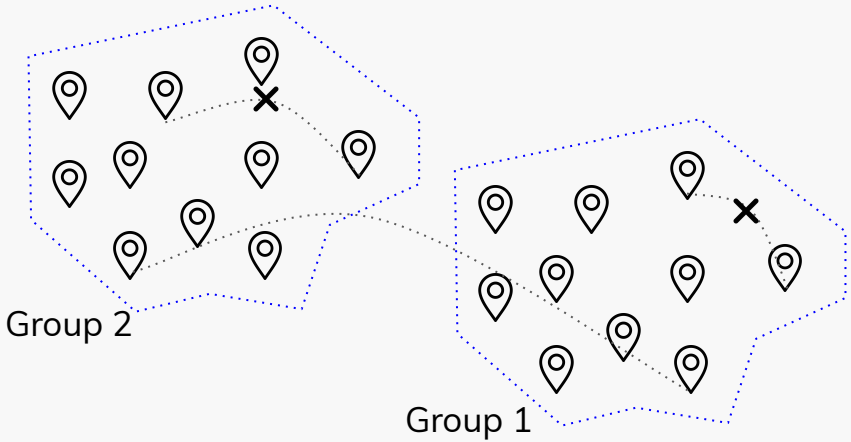
location_group_id	stop_id
group_1	001
group_1	002
group_1	003
group_1	004
group_1	005
group_1	006
group_1	007



DRT between multiple fixed-stops group

stop_times.txt

trip_id	stop_sequence	location_ group_id	start_pickup_drop_off_window	end_pickup_drop_off_window	pickup_type	drop_off_type
001	1	group_1	09:00:00	18:00:00	2	1
001	2	group_2	09:00:00	18:00:00	1	2



The above modelling allows:

- From Group 1 to Group 2

Does NOT allow:

- From Group 1 to Group 1
- From Group 2 to Group 2
- From Group 2 to Group 1

Booking Rules

booking_rule_id	booking_type	prior_notice_start_day	prior_notice_start_time	prior_notice_last_day	prior_notice_last_time	message	phone_number	info_url
rule_1	2	14	08:00:00	1	15:00:00	Door-to-door on-demand transportation. To request a ride, call 1-507-359-2717 or 1-800-707-2717 by 3pm at least one business day ahead of your trip.	(507) 359-2717	https://www.co.brown.mn.us/heartland-express-transit

The above modeling represents the following booking rule:

- Rides must be requested one business day prior to day of the ride.
- Ride requests can be made up to 14 days in advance.
- Ride requests should be made between 8 AM on the earliest day and 3 PM on the last day.

Free MobilityData resources

gtfs.org

- Spec: https://gtfs.org/schedule/reference/
- Data examples: gtfs.org/schedule/examples/flex/
- Adoption tracker: https://gtfs.org/extensions/flex/#adoption-tracker

- The tool to evaluate the quality of your data - **Canonical GTFS Validator**
  - Coming soon!
  - Contribute to this tool! - rules proposal
- The Mobility database - https://mobilitydatabase.org/
  - Add your dataset in the database!
- Awesome-transit list (GTFS-related tools): https://github.com/MobilityData/awesome-transit
- GTFS Flex blogpost on https://mobilitydata.org/news/

Become a member!

Support MobilityData's ability to facilitate events that bring together industry minds from around the globe: online events, working groups, the Summit!

Benefits include:

- Marketing benefits like the Members Directory, 1 on 1 onboarding
- Members only events, networking
- Resources library, discounts on workshops and summit
- Organizational voting rights

https://share.mobilitydata.org/Membership-form

It’s time to book your Summit tickets!

Better transportation through data

A 2-day event dedicated solely to mobility through the lens of data.

What you can expect:

- Keynotes, panels, fireside chats, and working sessions. We will also have a Happy Hour networking event.
- A new addition to the program in 2024 is a one day hackathon!

https://share.mobilitydata.org/2024-international-mobility-data-summit

Advancing Rural Mobility
Michigan

July 17, 2024

Tech Talk – GTFS Flex

Project History

- MDOT OPT developed the Advancing Rural Mobility Project (pilot project) to implement **GTFS-Flex** at four rural transit agencies.

- The project is funded by the Bipartisan Infrastructure Law's (BIL) Strengthening Mobility and Revolutionizing Transportation (SMART) discretionary grant program.

SMART

Project History

- SMART is a two-stage program:
  - Stage 1 pilots GTFS-Flex at four rural transit agencies.
  - Stage 2 will refine technologies and guide implementation statewide.
- Pilot agencies were selected based on technological readiness.
- The performance period for evaluating the project's initial stage is from January 2024 to December 2024.

MDOT Statewide MaaS

- MDOT's Statewide MaaS system aims to provide a single interface to access transit information across Michigan.

- The Advancing Rural Mobility project will contribute to MaaS functionality by laying the groundwork for standardized data specifications for demand-response.

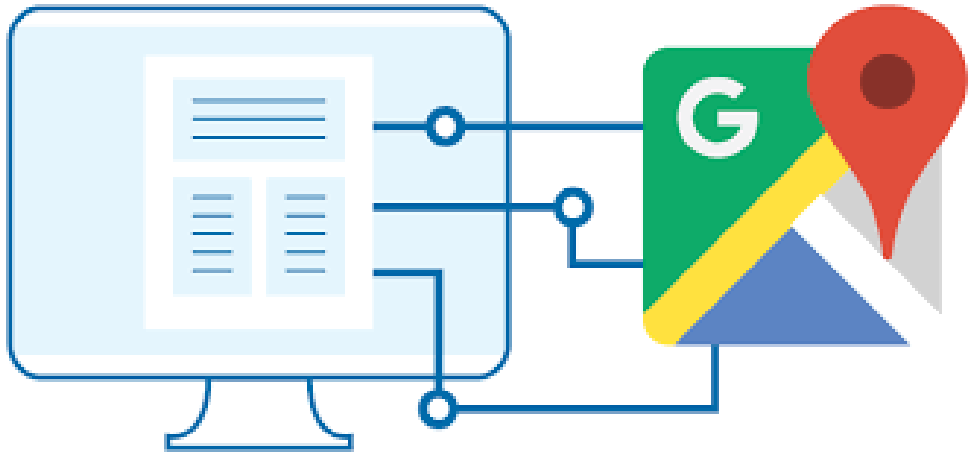
Project Stages

- **Stage 1:**
  - Developing data specifications for four rural transit agencies.
  - Create a trip planning tool that provides information on available ride options.

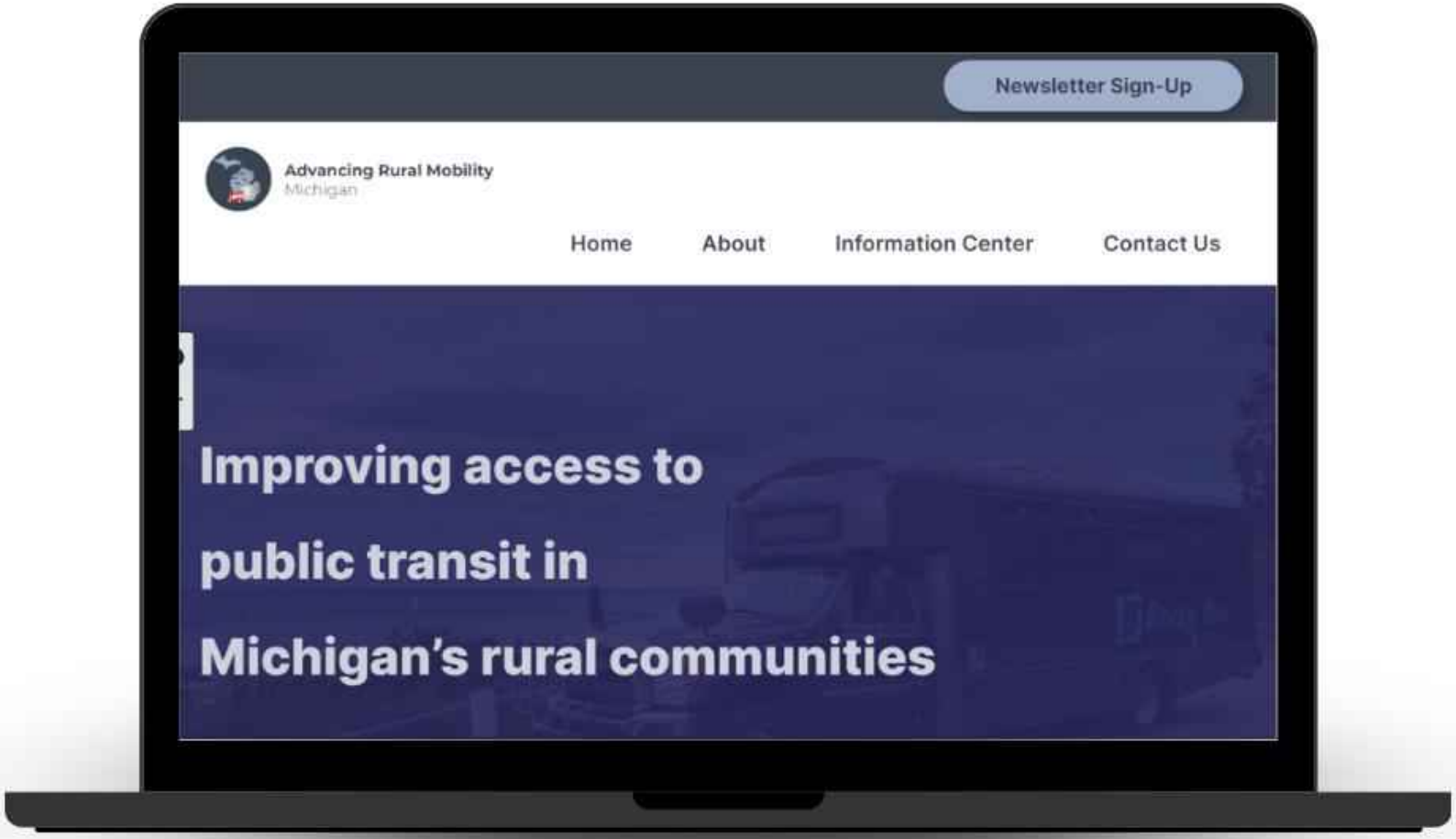
- **Stage 2:**
  - Aims to expand data to the rest of the State and connect with urban agencies.

GTFS in Michigan

- Open-standard GTFS data is common at urban transit agencies in Michigan.
- GTFS data has not supported most rural services.
  - With the adoption of GTFS-Flex, there is an opportunity to provide riders with information.

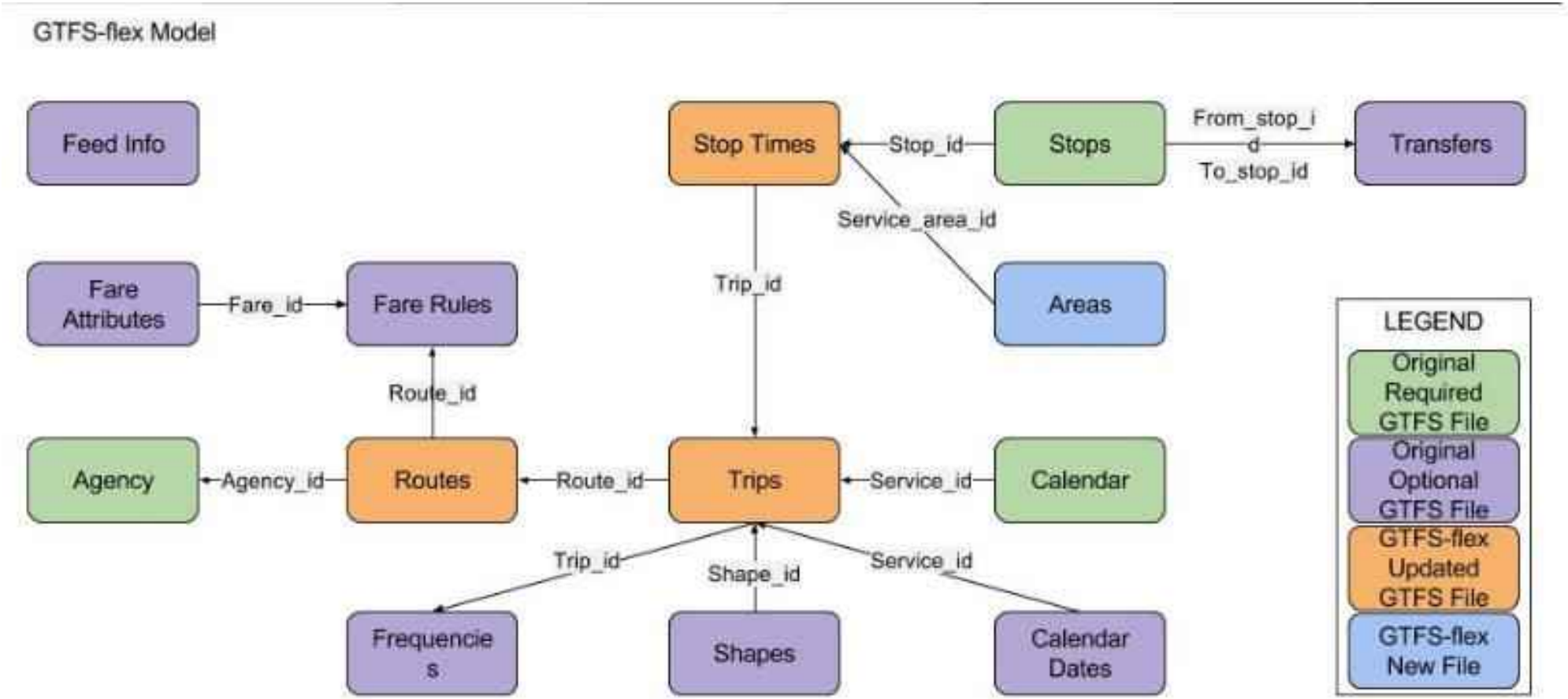


Project Website



Transit Trip Planner Demonstration

GTFS-Flex Model



Example of a GTFS file

agency.txt - Notepad

File Edit Format View Help

```
"agency_id","agency_url","agency_lang","agency_name","agency_phone","agency_timezone","agency_fare_url","tts_agency_name"
"BB","https://www.benziebus.com/","en","Benzie Transportation Authority","(231)-325-3000","America/Detroit","",""
"CC","https://www.charlevoixcounty.org/county_transit/","en","Charlevoix County Transit","(231)582-6900","America/Detroit","https://cctt
"RC","https://www.roscota.net/","en","Roscommon County Transportation Authority","(989)366-5309","America/Detroit","",""
"WC","https://www.wexexpress.us/","en","Cadillac / Wexford Transportation Authority","(231)582-6900","America/Detroit","",""
```

stop_times.txt - Notepad

File Edit Format View Help

```
"trip_id","arrival_time","departure_time","stop_id","location_id","stop_sequence","stop_headsign","pickup_type","drop_off_type","shape_d
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","2","","1","2","","","","","booking_rule_BB1","booking_rule_BB1","07:00:00","18:00:00","1","3
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booking_rules.txt	Text Document	1 KB	No	1 KB	44%	1/26/2024 1:06 PM
calendar.txt	Text Document	1 KB	No	1 KB	45%	1/26/2024 1:06 PM
calendar_attributes.txt	Text Document	1 KB	No	1 KB	33%	1/26/2024 1:06 PM
calendar_dates.txt	Text Document	1 KB	No	1 KB	50%	1/26/2024 1:06 PM
directions.txt	Text Document	1 KB	No	1 KB	34%	1/26/2024 1:06 PM
feed_info.txt	Text Document	1 KB	No	1 KB	45%	1/26/2024 1:06 PM
locations.geojson	GEOJSON File	16 KB	No	146 KB	90%	1/26/2024 1:06 PM
routes.txt	Text Document	1 KB	No	1 KB	44%	1/26/2024 1:06 PM
stop_times.txt	Text Document	1 KB	No	1 KB	67%	5/8/2024 2:46 PM
stops.txt	Text Document	1 KB	No	1 KB	44%	1/26/2024 1:06 PM
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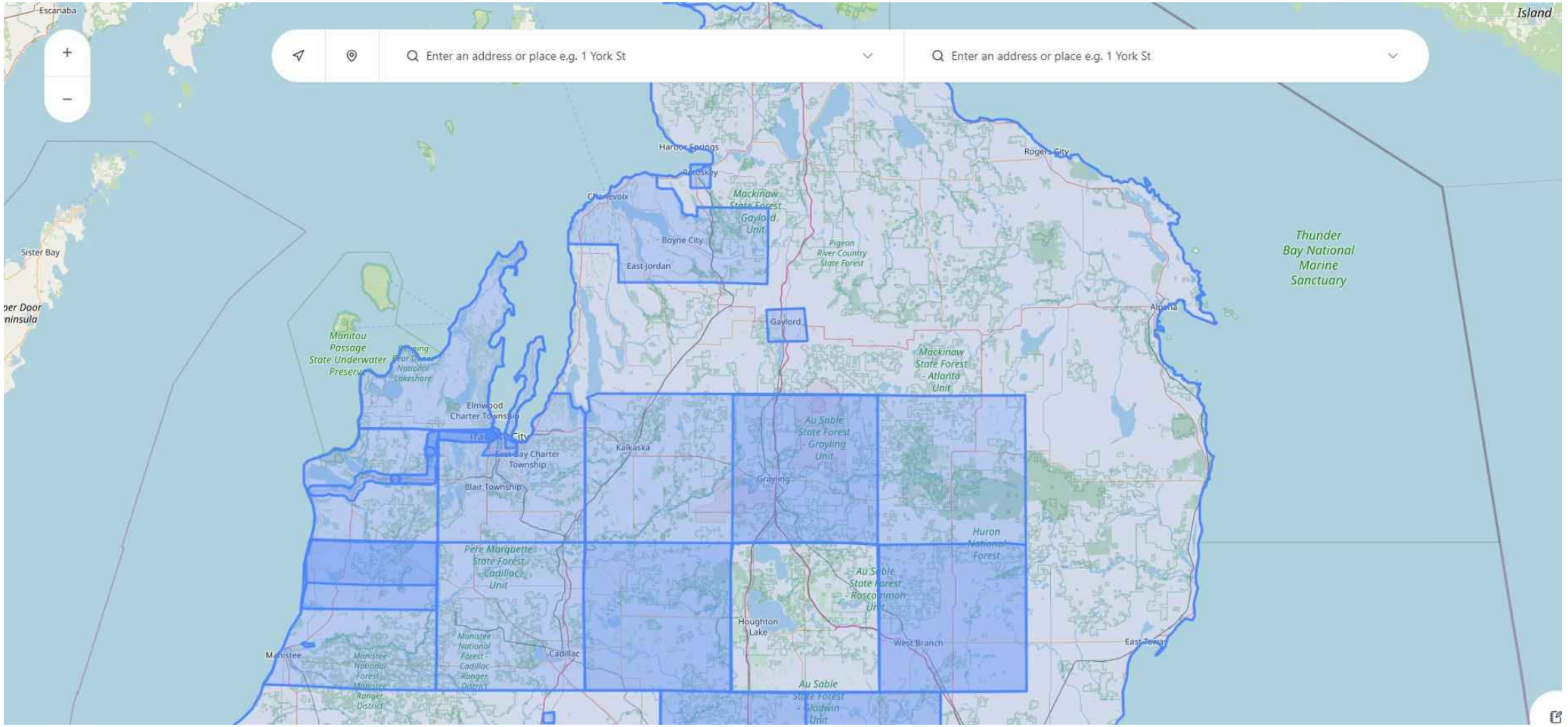
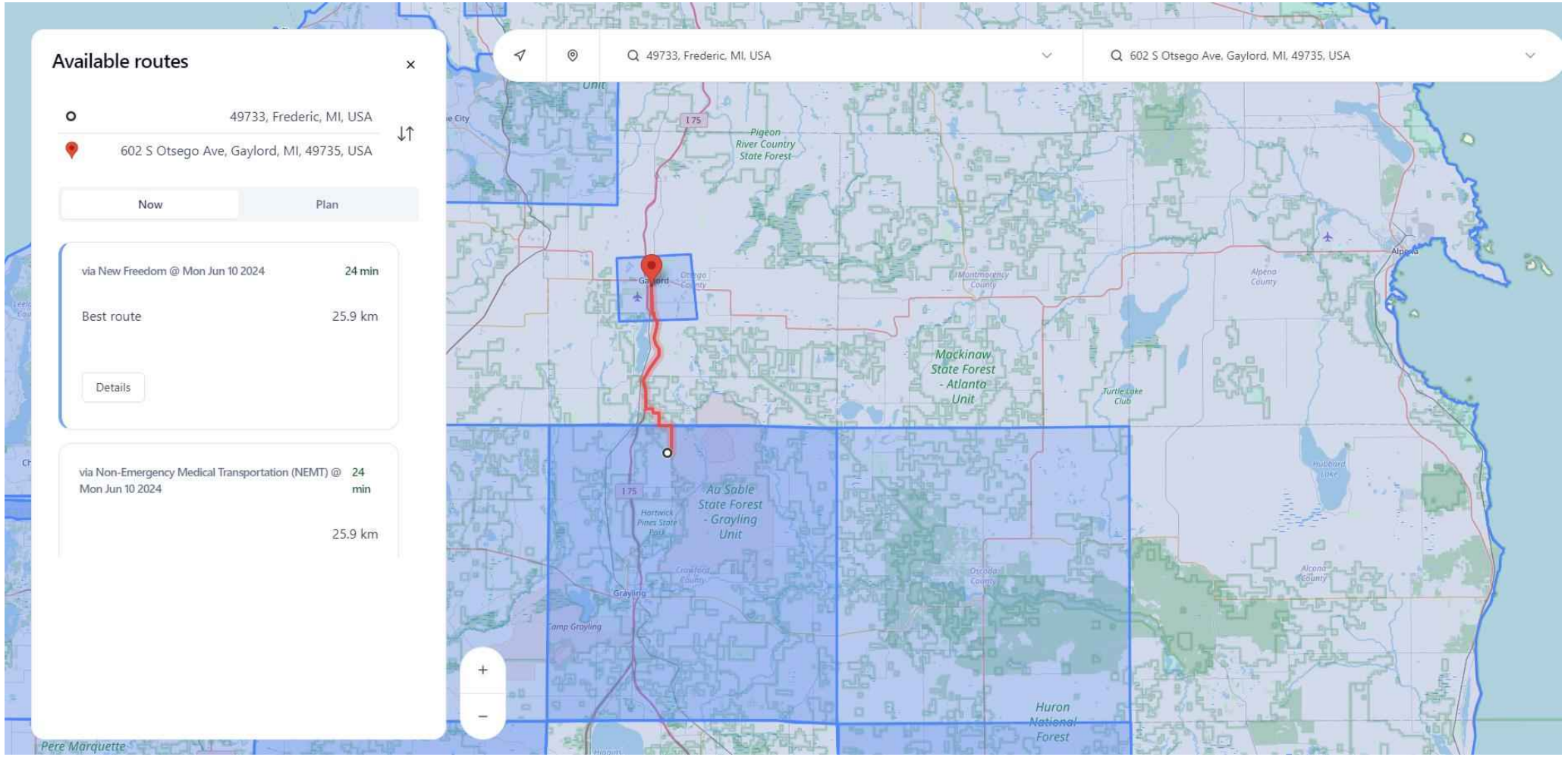
ARM Trip Planner



ARM Trip Planner



Reach out with questions!

Elias Fischer, HNTB

efischer@HNTB.com