

Trip Planning Tools for Flexible Transit Services

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Agenda

- GTFS Flex
- GTFS Flex and OpenTripPlanner
- Future Directions
- Building momentum for GTFS flex

Takeaways

GTFS Flex is about:

- Making sure flexible transit services can be discovered within trip planning tools
- Making sure that trip planning tools have the necessary information to combine flexible transit with other modes to create efficient itineraries

GTFS FLEX – WHAT AND WHY?

Benefits of GTFS

- GTFS = General Transit Feed Specification
- Open standard for defining *fixed route* transit services
 - » Routes, stops, days, times, etc.
- Dramatic impact over past decade
 - » Agencies define their services using GTFS
 - » Trip planners are built to read in GTFS
 - » Result -> emergence of ubiquitous trip planning tools (e.g. Google transit) that include fixed route transit wherever it is available and GTFS has been produced

Transit Trip Planning Works Well in Most Urban Areas

The screenshot displays a transit planning interface. On the left, a sidebar contains a menu with icons for various transport modes (car, train, bus, etc.), a search bar with the origin 'Sheraton Inner Harbor Hotel, 300 S Ch...' and destination 'Baltimore/Washington International Th...', a departure time of '4:00 PM' on 'Wed, Apr 17', and a button to 'Send directions to your phone'. Below this, three transit options are listed, each with a train icon, a time range, a duration of '38 min', and a route involving 'Light Raillink'. The main area is a map of Baltimore, Maryland, showing the Patapsco River, major highways (I-83, I-95, I-195), and various neighborhoods. A blue line indicates the transit route from the hotel to Camden Station, then to the airport. A 'Satellite' inset is visible in the bottom left of the map area.

Transit Options:

Departure Time	Arrival Time	Duration	Mode
4:12 PM (Wednesday)–4:50 PM	4:18 PM from Camden Station	38 min	Light Raillink
4:32 PM (Wednesday)–5:10 PM		38 min	Light Raillink
4:52 PM (Wednesday)–5:30 PM		38 min	Light Raillink

Limits of GTFS for Flexible Transit Services

- Fixed route transit is often not cost effective in lower population density areas
- Many rural and exurban areas may instead make use of various types of flexible, or demand responsive, transit:
 - » Flag stop / continuous stop
 - » Deviated fixed route
 - » Dial-a-ride / call-n-ride
- These services cannot be represented in GTFS, and so they are not included in current trip planning tools

Current Trip Planning Tools Do Not Include Flexible Services

The screenshot displays a web-based trip planning application. On the left, a blue sidebar contains navigation icons for car, transit, walking, and cycling. Below these, the start and end addresses are entered: "1787 Spaulding Rd, St Johnsbury, VT 05819" and "1 National Life Dr, Montpelier, VT 05602". The departure time is set to "10:00 AM" on "Tue, Oct 2". An "OPTIONS" button is visible. The main area shows a map of Vermont with various locations and roads. A red pin marks the starting location near St Johnsbury. A message box at the bottom of the map area contains the text: "Sorry, we could not calculate transit directions from '1787 Spaulding Rd, St Johnsbury, VT 05819' to '1 National Life Dr, Montpelier, VT 05602'".

Sorry, we could not calculate transit directions from "1787 Spaulding Rd, St Johnsbury, VT 05819" to "1 National Life Dr, Montpelier, VT 05602"

GTFS Flex Extends GTFS To Define Flexible Transit Services

- GTFS Flex is an emerging standard that provides additional information for defining flexible or “on demand” transit services
 - » Such as: deviated fixed route, flag stops, dial-a-ride
- Objectives of GTFS flex:
 - » Make it possible for agencies to accurately specify the flexible services that they provide
 - » Make it possible for trip planning tools to incorporate flexible services when searching for transit itineraries

1787 Spaulding Rd

1 National Life Dr

Depart by

7:28 AM

10/10/2018

Show Settings

Submit

Drag start and end location pins on the map or use the form above to adjust trip settings.

Option 1: departs at Oct 10th 10:44am

8 hr, 22 min

84

\$2.00

Option 2: departs approximately Oct 10th 7:34am

9 hr, 38 min +

Rural Community Transportation

Dial-a-Ride

Depart
From
Service note:

approximately Oct 10th 7:28am to 7:41am
service road
Call 802-748-8170 two days before your trip to request pickup.

Arrive
To

approximately Oct 10th 7:53am to 8:06am
St. Johnsbury Welcome Center/Transit Hub

to St. Johnsbury Welcome Center/Transit Hub



GTFS FLEX AND OPEN TRIP PLANNER (OTP)

What Is OTP?

- Open source trip planning tool with a strong and growing community of agency users
 - » TriMet, RTD, LA Metro, VTA, NYMTA...
- Ingests GTFS and OpenStreetMap (OSM) data
- Can generate routes for combinations of fixed route transit, biking, walking, and driving
- Provides out-of-the-box user interfaces
- Open source -> can be modified to work with GTFS Flex as well!

GTFS Flex / OTP MOD Sandbox Grant

- FTA awarded MOD Sandbox grant to VTrans
 - » Project team includes Trillium, Cambridge Systematics
- First year objectives (done):
 - » Use GTFS Flex to define flexible transit services across Vermont
 - » Revise or extend GTFS Flex data standard as needed
 - » Modify OpenTripPlanner to work with GTFS flex
 - Load data, optimize routes, symbolize in UI
- Second year objectives (ongoing):
 - » Pilot test for Vermont, improving as needed
 - » Share data, code, lessons learned with developers, agencies

Flexible Service Types in Vermont

- Deviated fixed route
- Flag stops / continuous stops
- Dial-a-ride / call-n-ride

Deviated Fixed Route Example

From 186 Lincoln Ave, Barton, VT 05822, USA

To 25 Oak St, Newport, VT 05855, USA

Depart by

7:28 AM 10/10/2018

Show Settings

Submit

Drag start and end location pins on the map or use the form above to adjust trip settings.

Option 1: departs at Oct 10th 9:26am 34 min

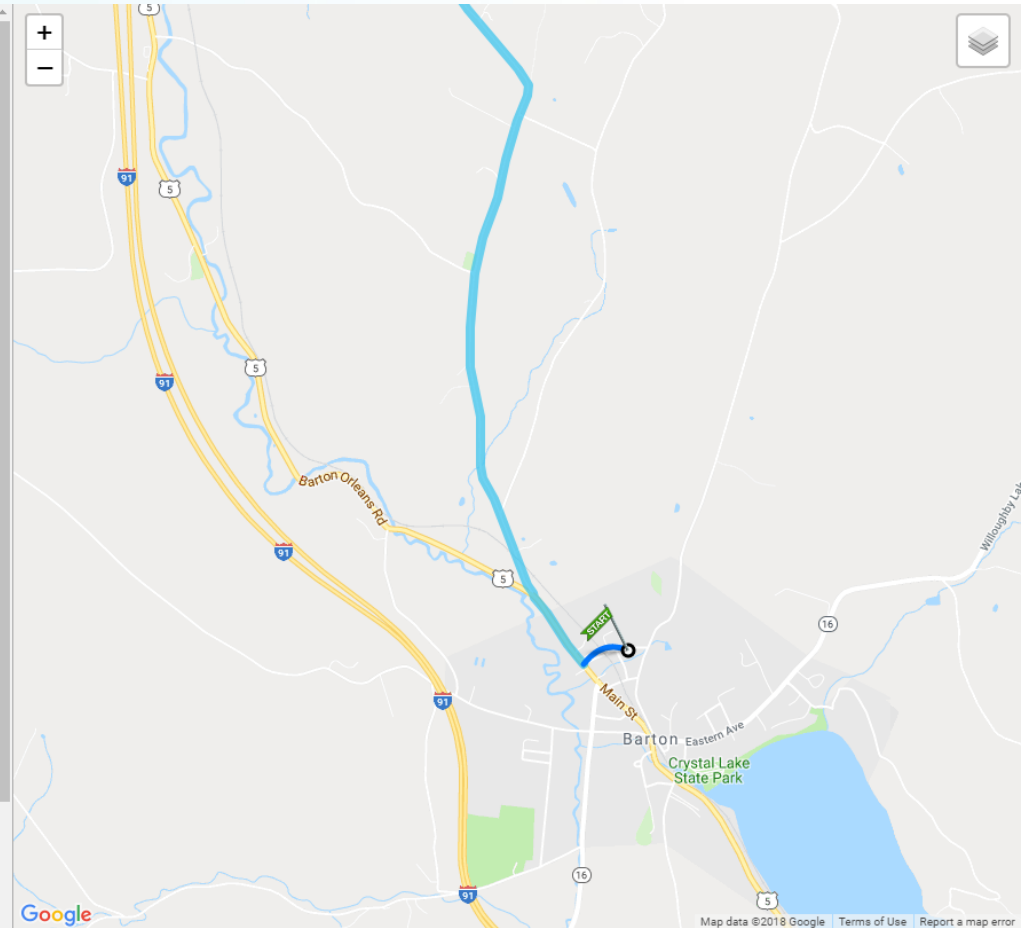
Rural Community Transportation **Kingdom Shopper 2**

to St. Johnsbury

Depart	From	Service note:
Oct 10th 9:26am	Lincoln Avenue	Call 802-748-8170 two days before your trip to request pickup.
Arrive	To	Flag Stop
Oct 10th 10:00am	corner of East Main Street and Oak Street	Please communicate with the driver about your desired drop off. It is at the driver's discretion to determine a safe location to stop.

to Destination 1 min

Option 2: departs approximately Oct 10th 7:41am 1 hr, 20 min +



Flag Stop Example

From 150 Parker Rd, Danville, VT 05828, USA

To 1 National Life Dr, Montpelier, VT 05620, USA

Depart by

7:28 AM 10/10/2018

Show Settings

Submit

Drag start and end location pins on the map or use the form above to adjust trip settings.

Option 1: departs at Oct 10th 3:56pm 1 hr, 9 min

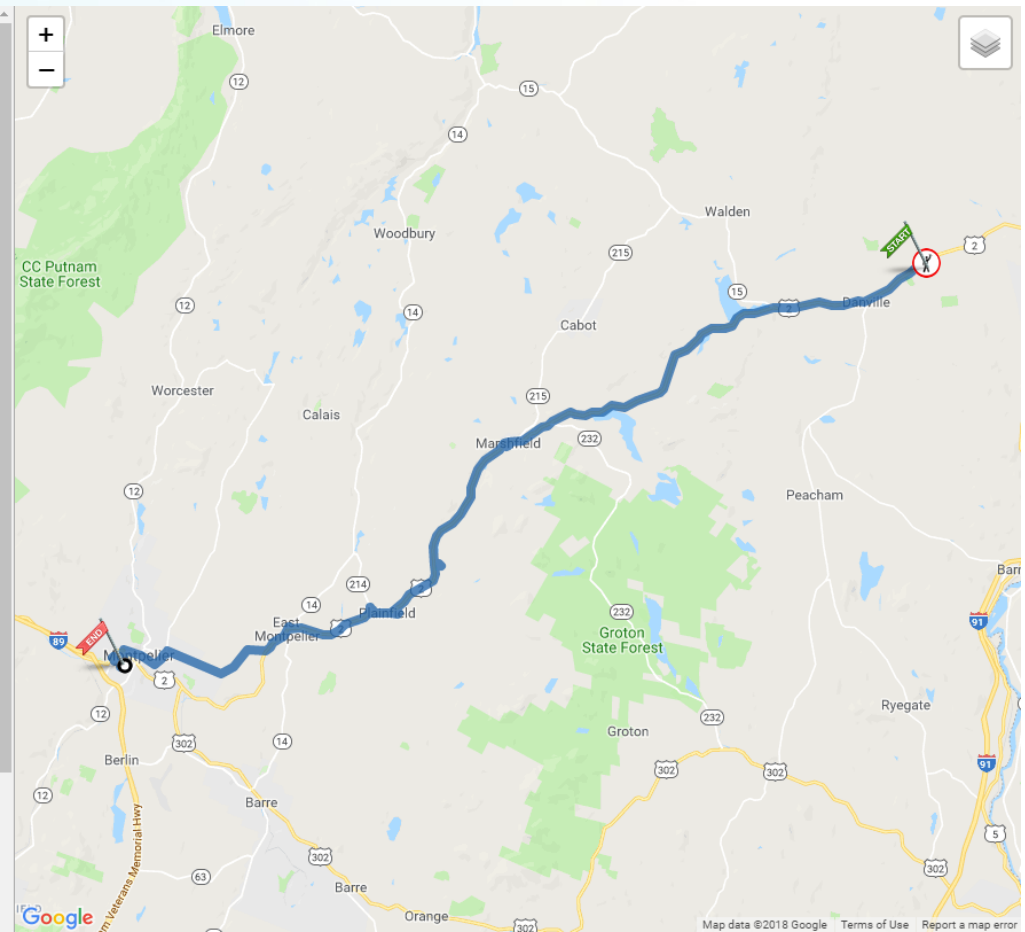
to corner of Parker Road and US 2 (NY/VT) 7 min

Rural Community Transportation US 2 Commuter

to Montpelier

Depart	From	Flag Stop
Oct 10th 4:03pm	corner of Parker Road and US 2 (NY/VT)	Wait in a safe area along the route. Wave to the driver as bus approaches and wait for the vehicle to stop before boarding.
Arrive	To	
Oct 10th 5:05pm	National Life	

to Destination 1 min



Dial-A-Ride Example

1787 Spaulding Rd

1 National Life Dr

Depart by

7:28 AM 10/10/2018

Show Settings

Submit

Drag start and end location pins on the map or use the form above to adjust trip settings.

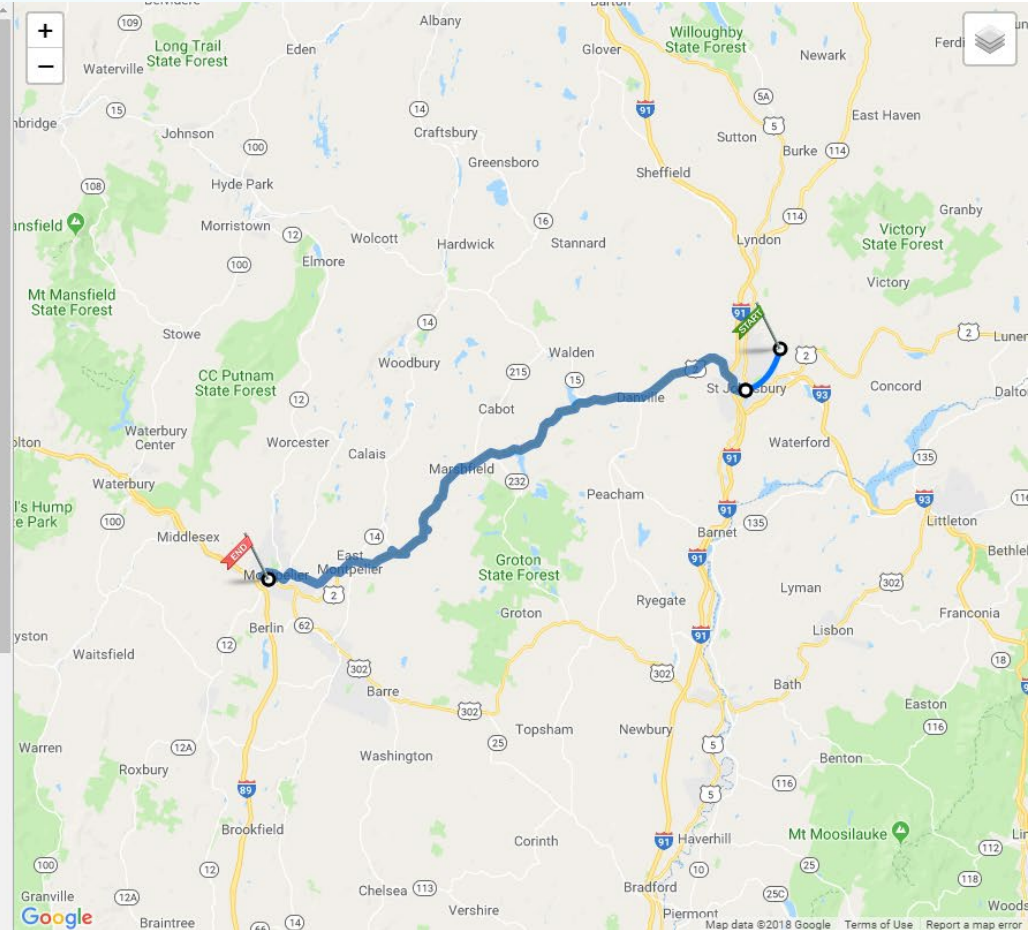
Option 1: departs at Oct 10th 10:44am 8 hr, 22 min \$2.00

Option 2: departs approximately Oct 10th 7:34am 9 hr, 38 min +

Rural Community Transportation Dial-a-Ride

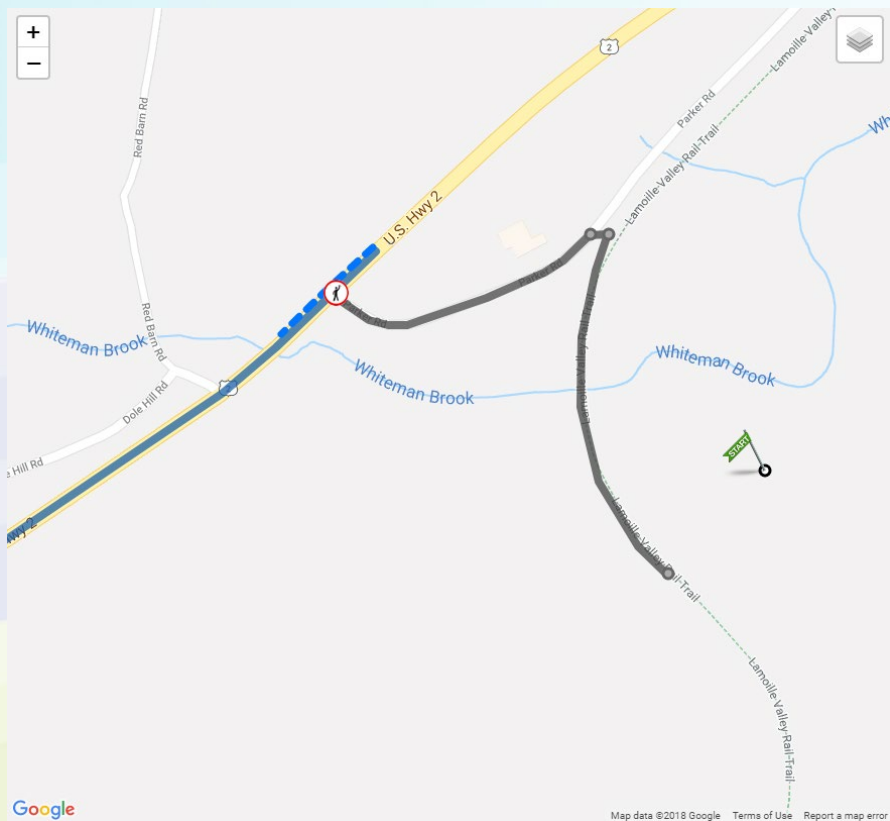
Depart	From	Service note:
approximately Oct 10th 7:28am to 7:41am	service road	Call 802-748-8170 two days before your trip to request pickup.
Arrive	To	
approximately Oct 10th 7:53am to 8:06am	St. Johnsbury Welcome Center/Transit Hub	

to St. Johnsbury Welcome Center/Transit Hub

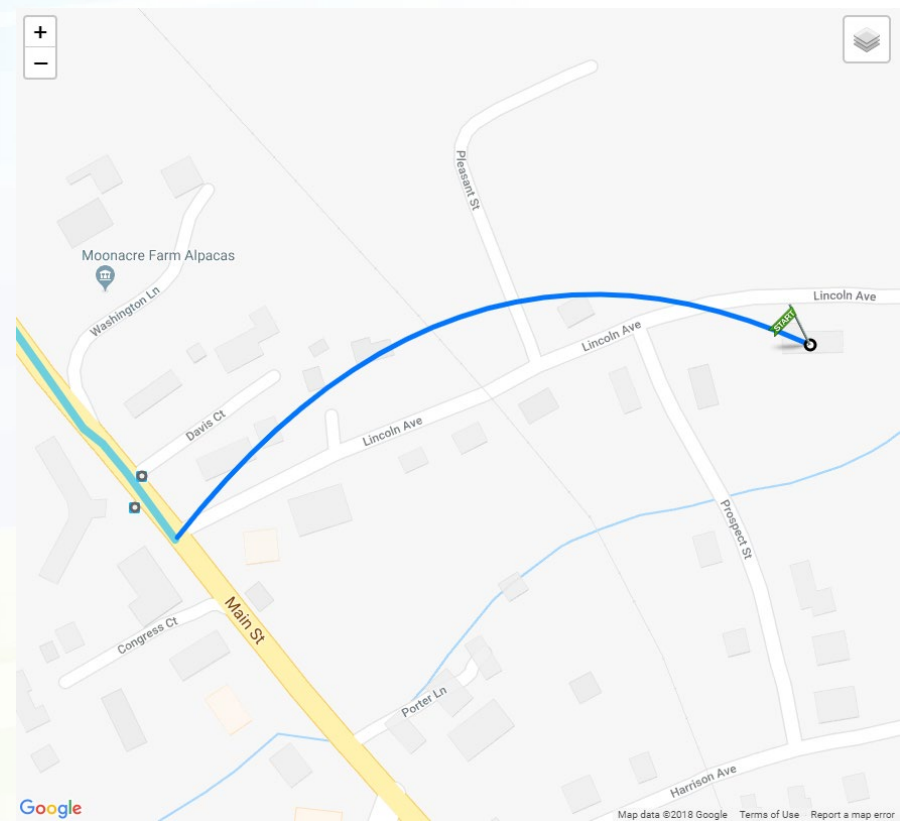


New User Interface Conventions

Uncertain Stop Location



Uncertain Route



Transferability of GTFS Flex: Testing with Denver RTD

- The “G” in GTFS stands for “General”
 - » Should work well for other agencies!!!
- Denver RTD has strong interest in GTFS Flex
 - » Extensive demand-responsive call-n-ride system
 - » Already use OTP-based trip planning tools
- Testing out GTFS Flex with RTD
 - » RTD created GTFS Flex files for call-n-ride system
 - » CS deployed version of OTP with RTD’s GTFS and GTFS Flex data

Transferability of GTFS Flex: Testing with Denver RTD

6492 Greenwood Plaza Blvd, Englewood, Colorado, 80111

Colorado School of Mines

Depart by

10:05 AM

10/02/2018

Show Settings

Submit

Drag start and end location pins on the map or use the form above to adjust trip settings.

Option 1: departs at Oct 2nd 10:05am1 hr, 52 min

ORCR RS F 16L 16L

Oct 2nd 10:05am - Oct 2nd 11:57am

Option 2: departs at Oct 2nd 10:35am1 hr, 52 min

ORCR RS F 16L 16L

Oct 2nd 10:35am - Oct 2nd 12:27pm

Option 3: departs at Oct 2nd 10:20am1 hr, 55 min

ORCR RS E W GDCR FR B

Oct 2nd 10:20am - Oct 2nd 12:15pm

Regional Transportation District ORCR RS Orchard Reservation

FUTURE DIRECTIONS FOR MULTI-MODAL PLANNING

Future Directions

- Include additional modes in mixed-mode itineraries
 - » TNCs, bike share, scooter share, ... (structurally, a TNC looks a lot like a call-n-ride in terms of routing algorithms)
 - » Complementary OTP work in TriMet MOD Sandbox
- Present tradeoffs between travel time and cost
- Allow for unified booking and payment options

PUSHING GTFS FLEX FORWARD

What You Can Do

- Building momentum for GTFS:
 - » Play around with GTFS Flex at <https://plan.govermont.org>
 - » Contact Google and let them know of your interest at transit-partners@google.com
 - » Get engaged at [gtfsflex.com](https://github.com/google/gtfsflex) – ask questions, express interest (GitHub repository)
 - » Work with state DOTs / larger regional transit providers to start thinking about how to get flexible services included in state or regional trip planning tools
- Reach out to CS or Trillium with any additional questions:
 - » psorensen@camsys.com
 - » thomas@trilliumtransit.com

Thanks! Questions?