

# *Flexible*

# transit trip planning

Adapting OTP to read  
GTFS-flex



**Trillium**

CAMBRIDGE  
SYSTEMATICS



Transportation Camp  
January 7, 2017

# Trip planners are easy

**PLAN YOUR TRIP**

**Start**  
Ukiah, CA, United States

**End**  
Navarro River Junction, Mendocino Count

**When**  
Leave at 10/3/2011 11:13 AM

See itinerary in [Google Maps](#)  
[More about transit in Google Maps and on your mobile phone.](#)

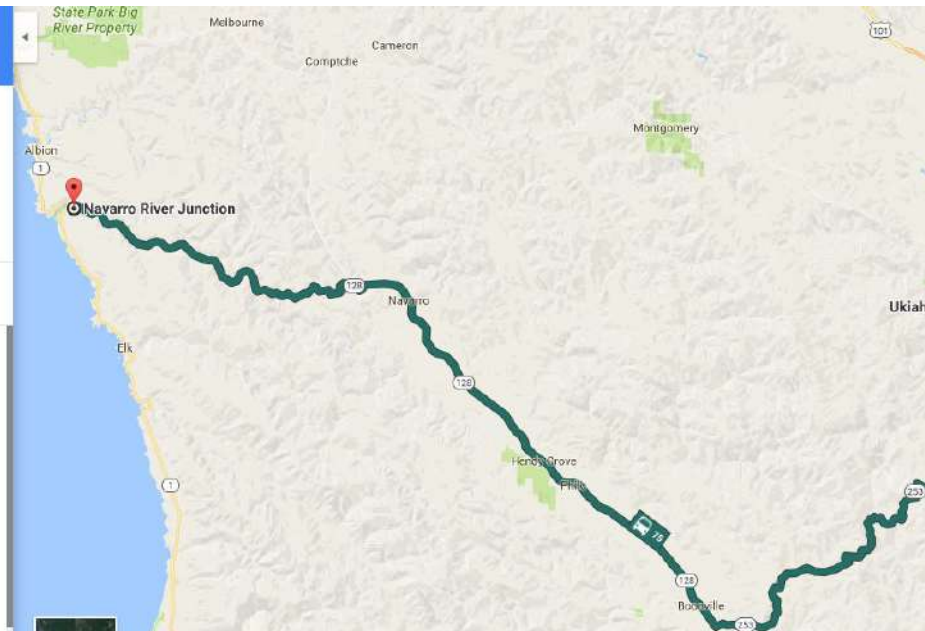
from Ukiah, CA  
Navarro River Junction

PM - 4:45 PM  
0 min)

from Pear Tree Center

[SCHEDULE EXPLORER](#)

- Ukiah, CA
- 2:55 PM Pear Tree Center
- 75 Gualala (Southbound)  
1 h 50 min (6 stops) · Stop ID: 59
- 4:45 PM Navarro River Junction
- 4:45 PM Navarro River Junction



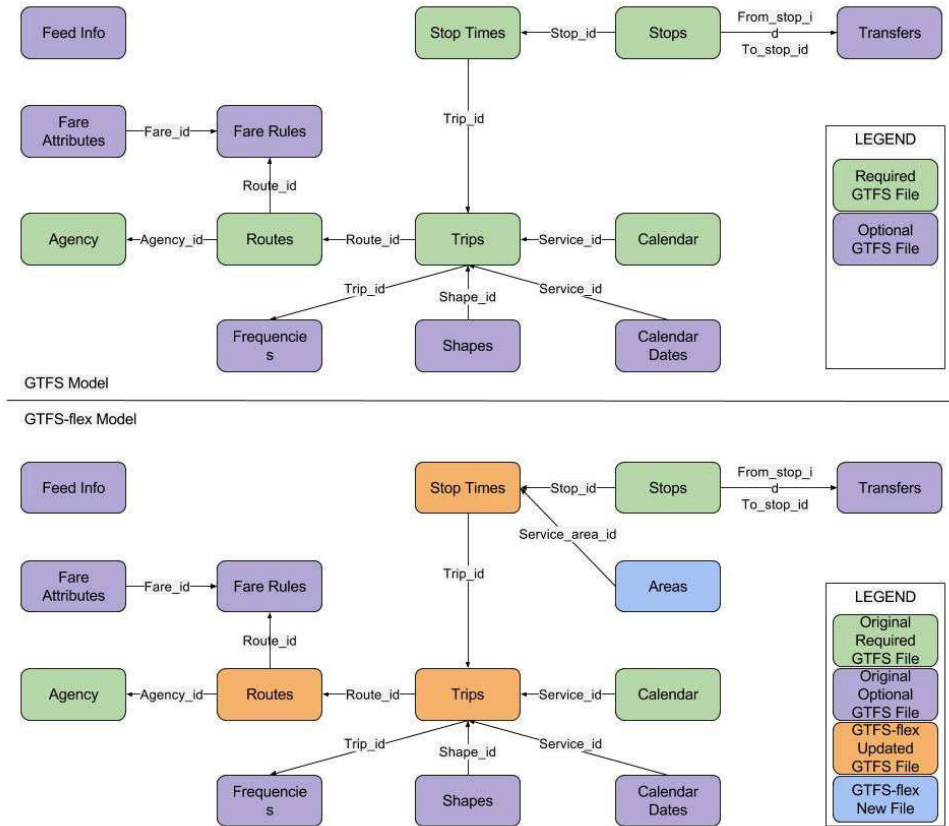
And all you need is GTFS

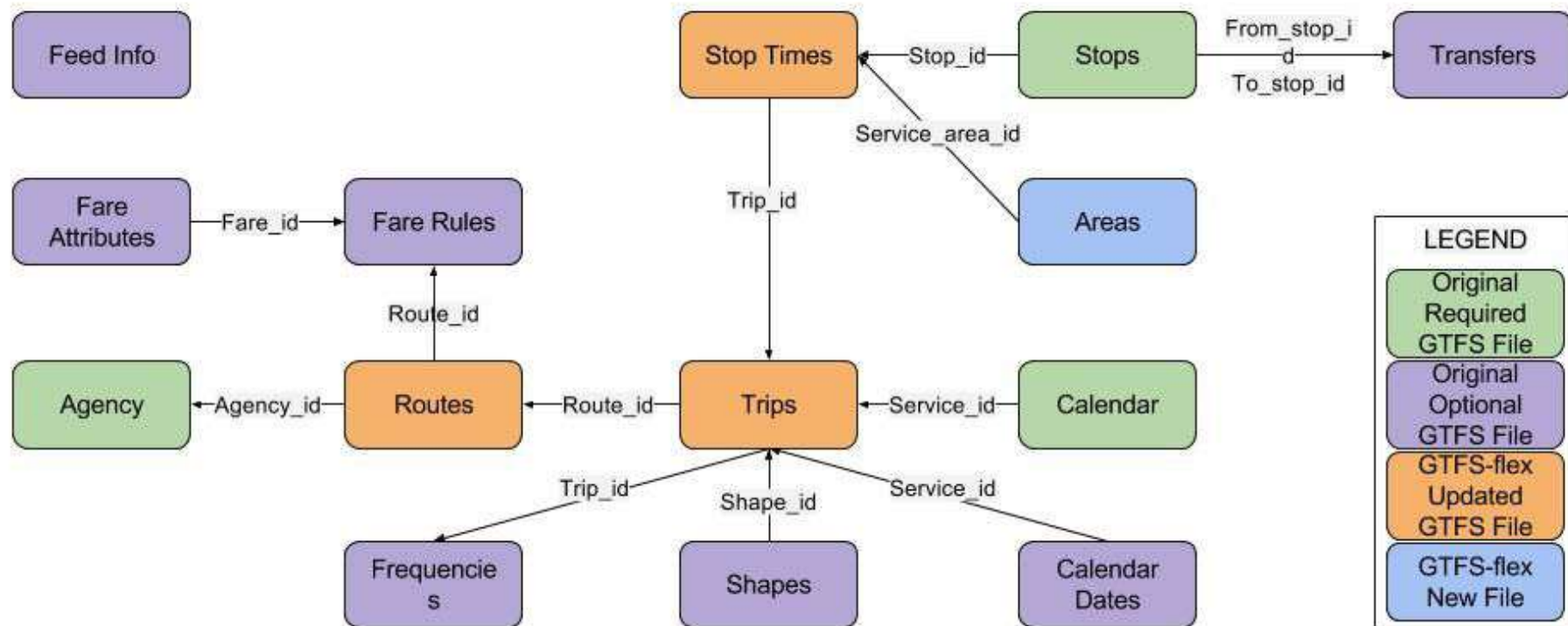
# But they don't work for everyone

- More than 2,000 NTD-reporting transit agencies in US
- Only ~1,000 have an OPEX > \$1MM
- Most of the smallest ones have no/few fixed routes
- Especially in rural areas, but also in some urban areas, much or most general public transit is flexible, because fixed routes aren't practical
- ADA complementary paratransit exists everywhere fixed-route transit does
- GTFS and OTP are exclusively fixed-route focused

# GTFS-flex models many services left out

- Backwards compatibility
- Adds
  - Hail-and-Ride
  - Deviated-fixed
  - Dial-a-Ride
- Flex-to-fixed connections





# ITD Consortium and GTFS best-practices

- Effort to establish broad alignment around GTFS practices to
  1. Support high-quality user experiences
  2. Establish clear expectations for data publishers
- Small industry working group
- Best practices will be released Feb 6





# A CONSORTIUM APPROACH TO TRANSIT DATA INTEROPERABILITY

BY JACKSON CRANE AND GREG RUCKS

[www.rmi.org/Consortium\\_Approach\\_ITD](http://www.rmi.org/Consortium_Approach_ITD)

# “OTP-flex” is our contribution

VTrans and Trillium submitted a MOD grant application

- Adapt OTP to read GTFS-flex
- Host and deploy a state-wide trip planner integrating all transit modes
- Cambridge Systematics, developer of 1-Click, will provide programming talent to adapt OTP
- Coordinate with TriMet, RTD, and other OTP projects to ensure work is efficient and integrated into master branch

The MOD grant has been awarded



# The vision

- An end to information silos
- Better public knowledge of services
- More accurate trip planning for semi-flexible services
- Provide equal access to trip planning in rural areas

# The problem

- How does this all work?
- Flexible services require much more information to be provided to riders
- How will that information be displayed in OTP, in a way that helps, and doesn't confuse riders?

# Hail-and-ride

- Riders may “hail” a vehicle at any safe spot along a route alignment (usually with a wave)
- Vehicle may have defined stops at moderate interval, or there may be *\*very\** few stops
- GTFS-flex adds continuous\_stops field in stop\_times.txt, indicating that between one stop\_time entry and the next, riders may hail

# Deviated-fixed

- Two types: Route-deviation, point-deviation
- Broadly: route has a defined series of time points and will service all as scheduled.
  - But in between serving timepoints vehicle may leave route alignment
  - Rider generally calls in advance for off-alignment pickup; possibly need only notify driver for off-alignment drop-off

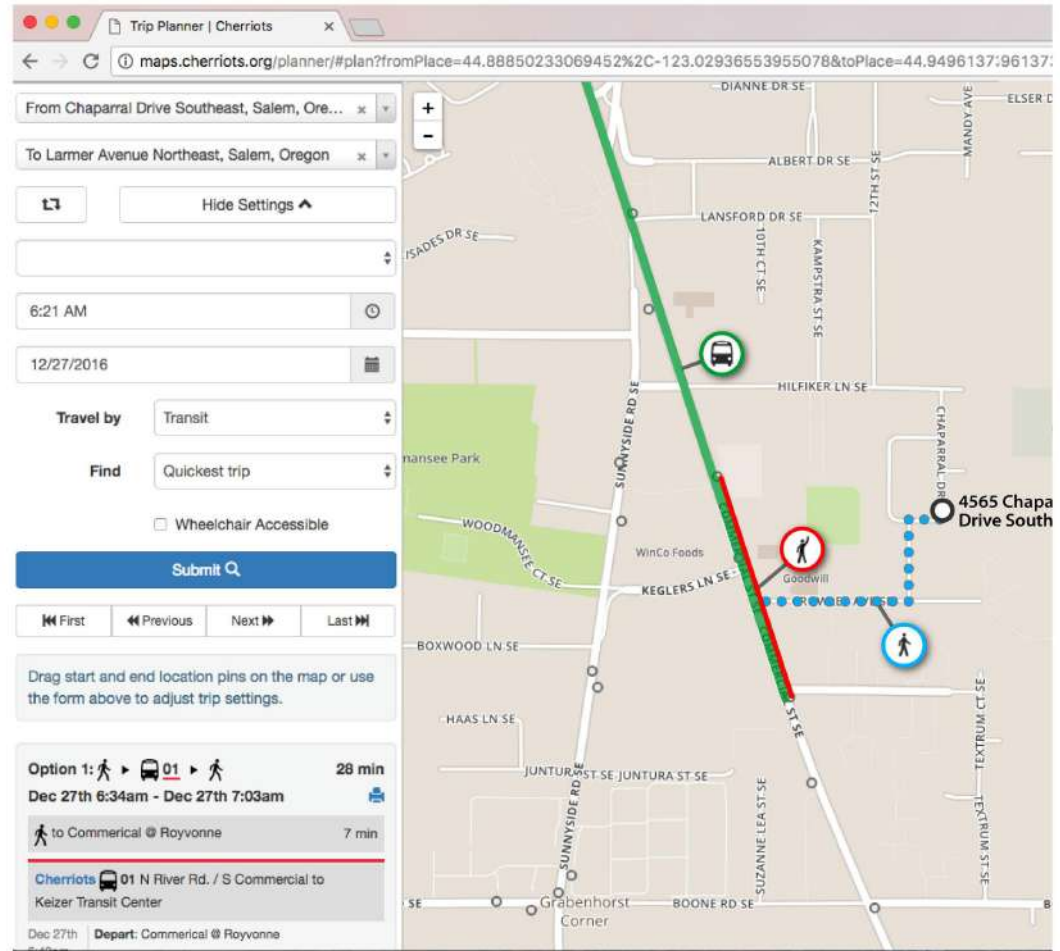
## Deviated-fixed, continued...

- Deviated-fixed and Dial-a-Ride are managed similarly in GTFS-flex
- GTFS-flex adds polygons in areas.txt referenced in stop\_times.txt that indicate area within which vehicle will deviate
- Similar to hail-and-ride, areas.txt reference indicates that after one stop\_time entry, vehicle will deviate within a polygon
- So, Dial-a-ride is just two stop\_times entries, with time points at beginning and end of service hours

# Hail-and-ride visualizations

## Basic idea:

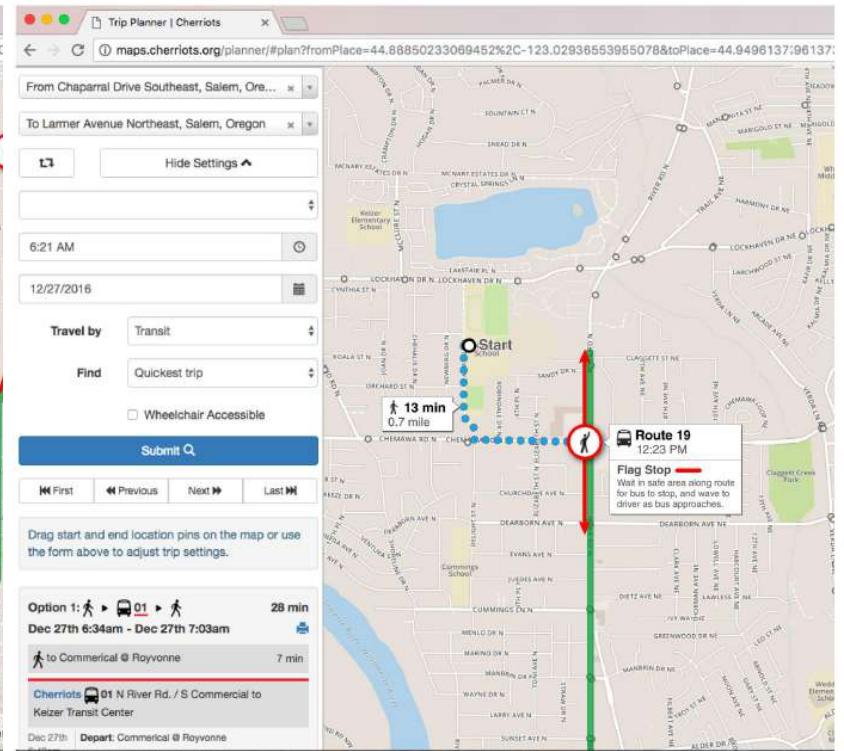
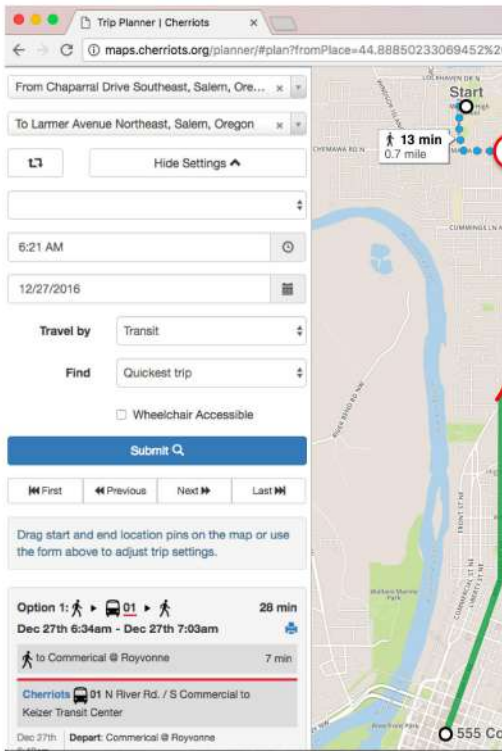
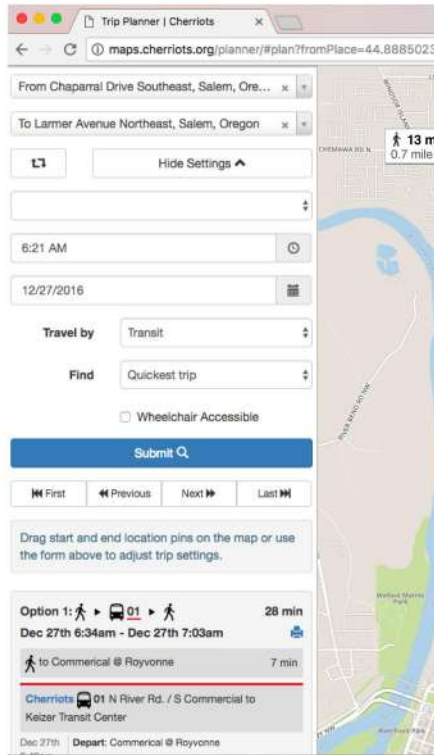
- Hand-waving stick figure
- Highlight side of alignment with “alert” color





# Hail-and-ride visualizations

- How to indicate extent of hail-and-ride zone?



# Hail-and-ride visualizations

- What happens at different zoom levels?

This screenshot shows the Cherriots Trip Planner interface at a low zoom level. The map displays a broad area of Salem, Oregon, with the Willamette River visible. The input fields show a trip from Chaparral Drive Southeast to Larmer Avenue Northeast. The travel mode is set to Transit, and the date is 12/27/2016. The 'Find' button is set to 'Quickest trip'. The results section shows a 28-minute trip starting at 6:34am and ending at 7:03am, with a 7-minute walk to the destination. The route is highlighted in blue on the map.

This screenshot shows the Cherriots Trip Planner interface at a medium zoom level. The map provides a more detailed view of the area around the start and end locations. The route is highlighted in blue, and the walking distance of 0.7 miles is indicated. The results section shows a 28-minute trip starting at 6:34am and ending at 7:03am, with a 7-minute walk to the destination. The route is highlighted in blue on the map.

This screenshot shows the Cherriots Trip Planner interface at a high zoom level. The map provides a very detailed view of the area around the start and end locations. The route is highlighted in blue, and the walking distance of 0.7 miles is indicated. The results section shows a 28-minute trip starting at 6:34am and ending at 7:03am, with a 7-minute walk to the destination. The route is highlighted in blue on the map.

# Hail-and-ride visualizations

- What can be adjusted?



# Hail-and-ride visualizations

- Other considerations:
  - Safe spaces along road?
    - Long-term, this should be pulled from OSM
  - What text/verbiage needs to be explained?
    - Can it be standard for all continuous\_stops, or does it need to be custom defined in GTFS-flex feed?
  - Is the goal to educate about service, or to provide best possible trip?

# Hail-and-ride visualizations

## Feedback from TransportationCamp:

- Don't rely on color (accessibility)
- Option for less text, or more text
- Down the line: how do we highlight recommended, safe areas?
- Crowd-sourced
- OSM
- Worms



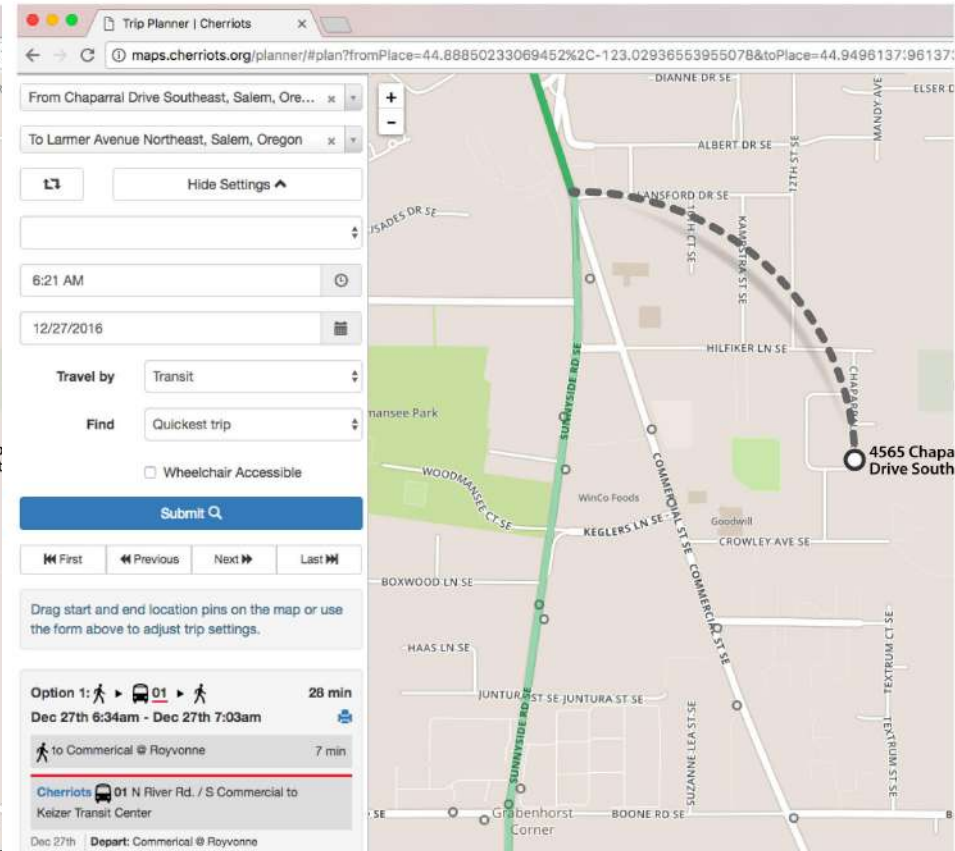
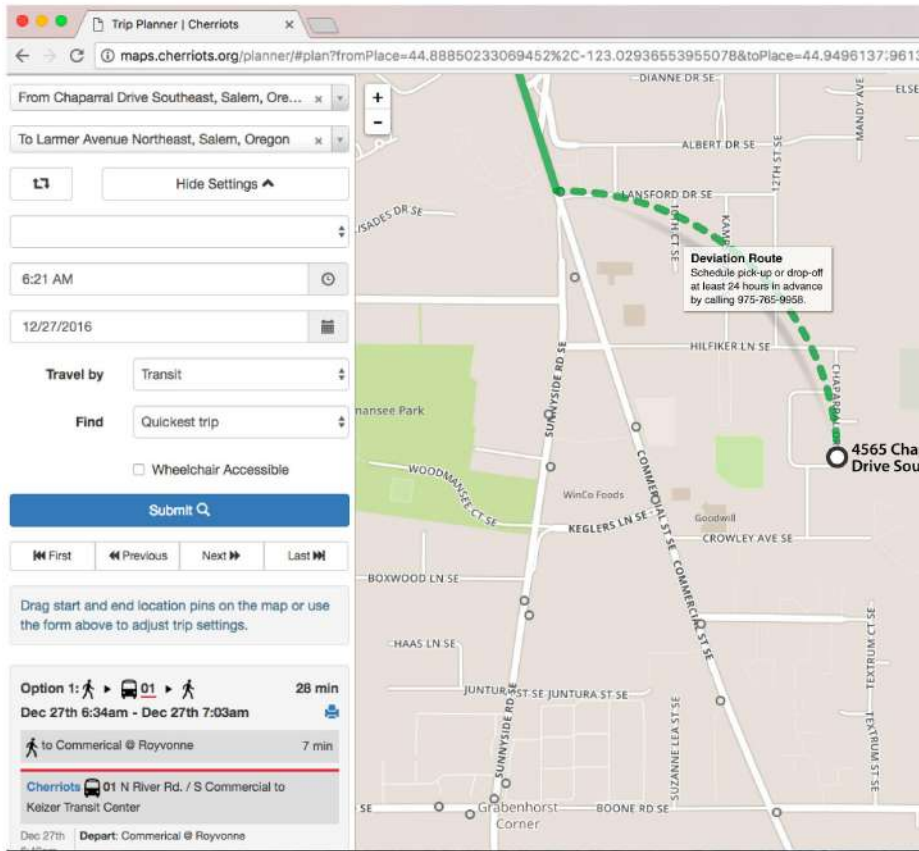
# Deviated-fixed visualizations

*Lots of options*



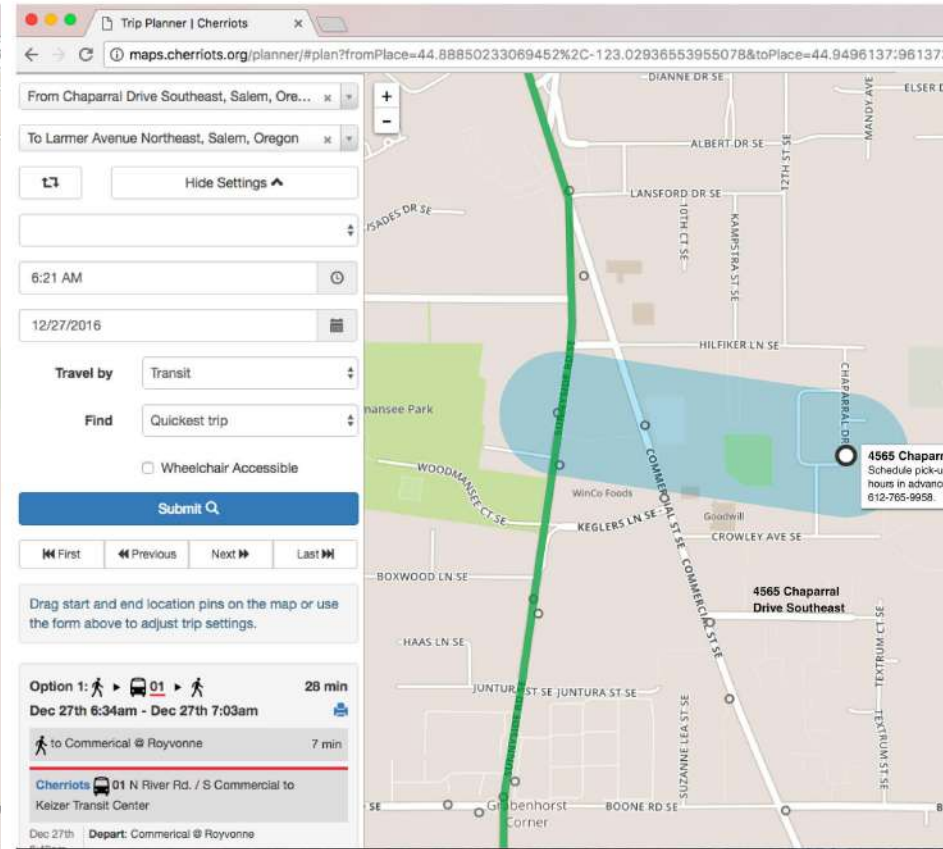
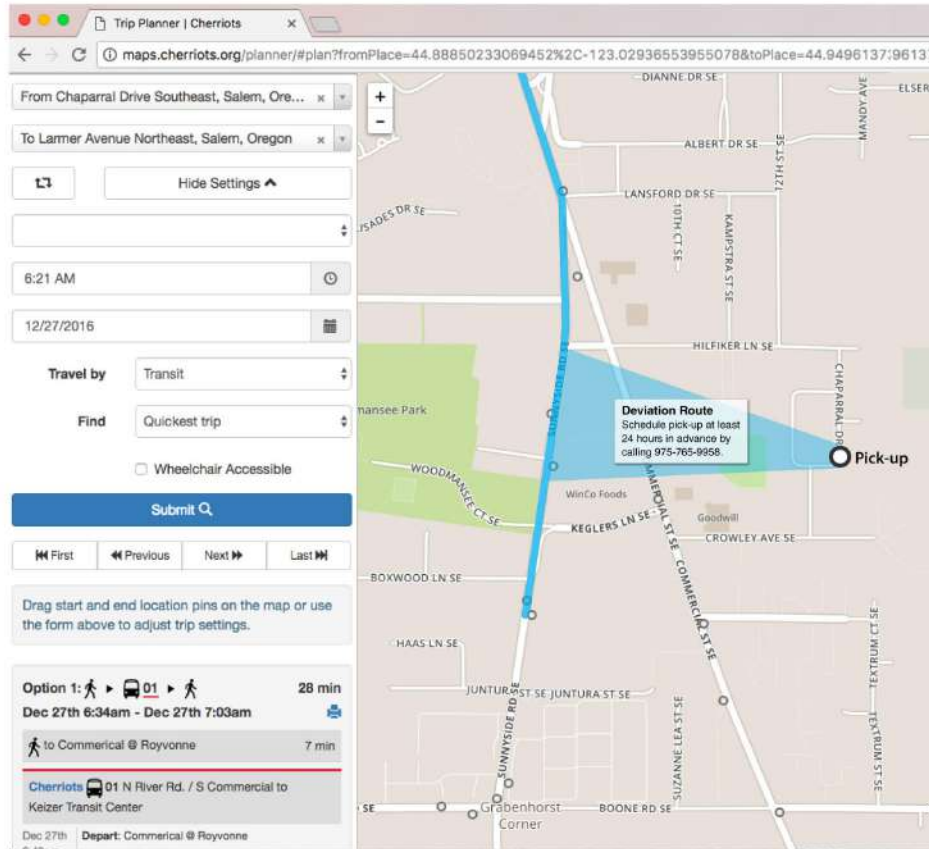
# Deviated-fixed visualizations

## "Fly" to alignment



# Deviated-fixed visualizations

## “Zone” to alignment



# Deviated-fixed visualizations

## Tell don't show

Trip Planner | Cherriots

maps.cherriots.org/planner/#plan?fromPlace=44.88850233069452%2C-123.02936553955078&toPlace=44.949613796137

From Chaparral Drive Southeast, Salem, Ore...  
To Larmer Avenue Northeast, Salem, Oregon

6:21 AM  
12/27/2016

Travel by: Transit  
Find: Quickest trip  
☐ Wheelchair Accessible

Submit

First Previous Next Last

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

Option 1: 28 min  
Dec 27th 6:34am - Dec 27th 7:03am

to Commercial @ Royvonne 7 min

Cherriots 01 N River Rd. / S Commercial to Keizer Transit Center

Dec 27th Depart: Commercial @ Royvonne

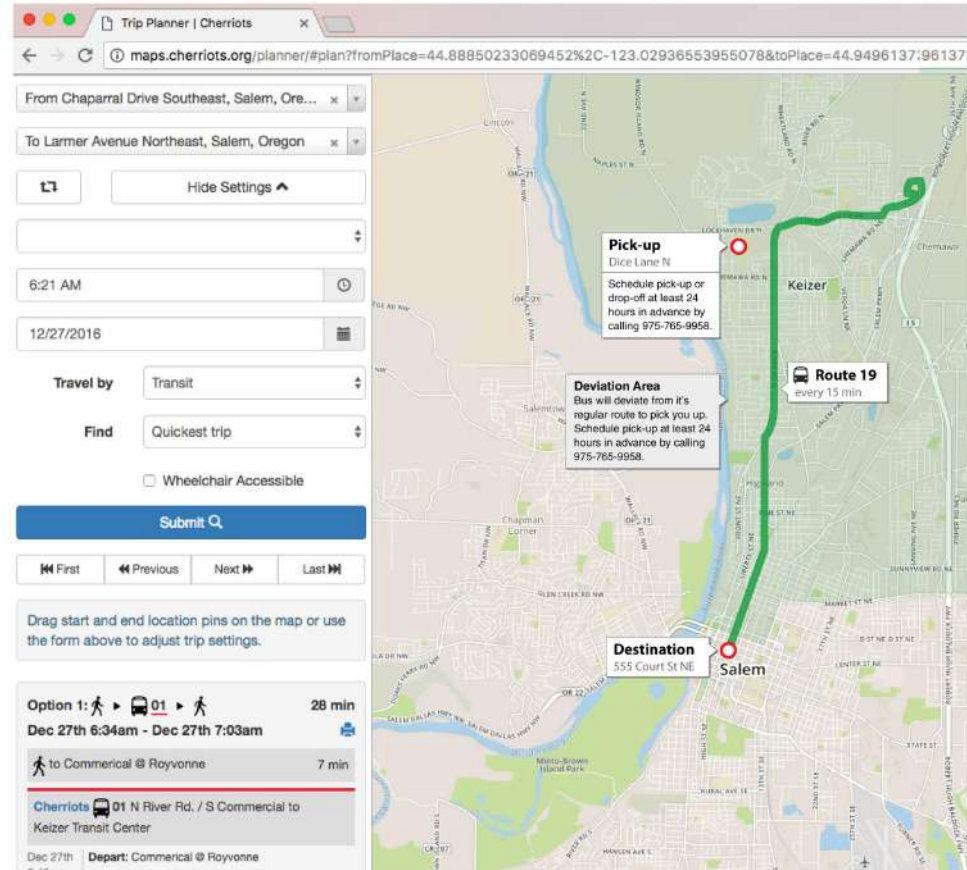
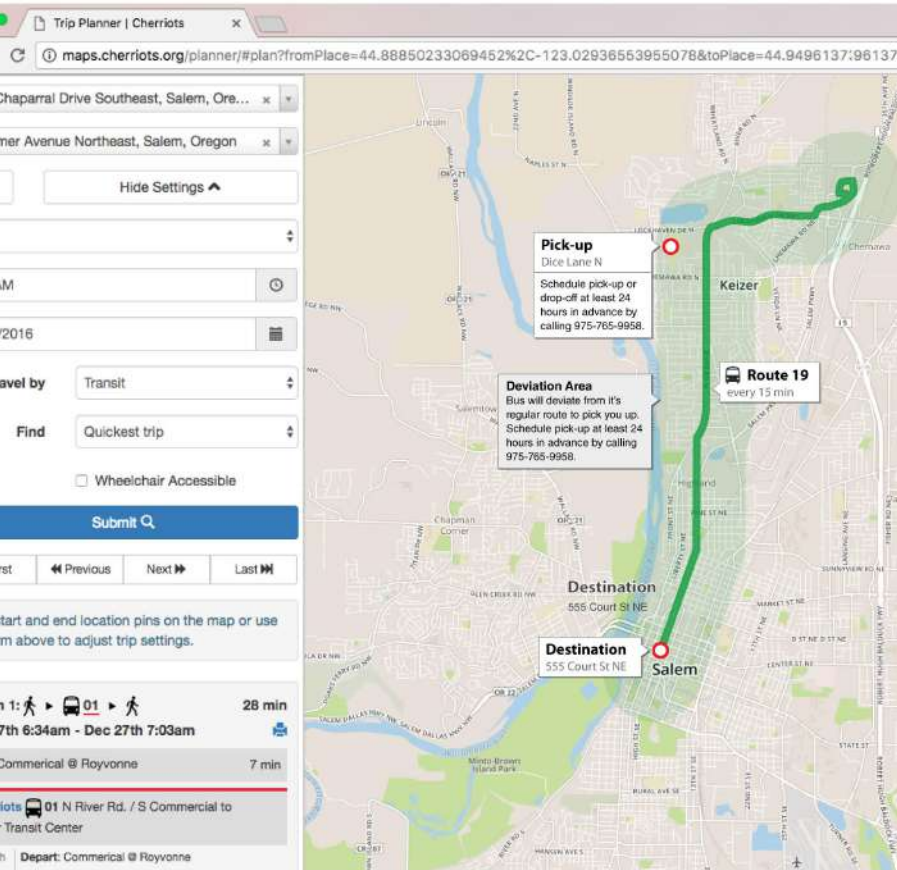
4565 Chaparral Drive South

Deviations Route  
Bus will deviate from its regular route to pick you up. Schedule pick-up at least 24 hours in advance by calling 975-765-8958.

4565 Chaparral Drive Southeast

# Deviated-fixed visualizations

## Is deviation area important enough to show?



# Deviated-fixed visualizations

- Other considerations:
  - How many ways do we need to enforce that a phone call is necessary?
  - What are the limits to showing deviation zones?
    - What happens when 2+ deviation zones are relevant?
    - Do we show the deviation zone for the full route, or just the zone within which deviation is relevant for the trip?
    - What happens on the borders of deviation zones?



# Deviated-fixed visualizations

## Feedback from TransportationCamp:

- Initially, many voices indicated that trip planners were for a single trip, but after explanation, “system discovery” was accepted as a main goal.
- Split between desire to show whole deviation area for route, or only relevant “zones”.
- Concern about showing definite routing, when none exists.
- Down the road, privacy will be a concern, and locations must be “fuzzified”



# Beyond visualizations

- What information needs to be filterable, and how do we make filtering easy?
- Accessibility and services that require sign-up/qualifications?
- How to think forward to booking trips, managing capacity, integrating with ride-hailing and other transportation modes?
- What communities does this technology make sense for?
- What is the right amount of text?

# Technical considerations

1. Call-n-ride service
  - Very similar to kiss-n-ride in OTP
2. Deviated route service (“connector” service)
  - Temporary edges in routing context?
3. “Flag stop” service
  - OSM nodes on such segments become transit vertices?