Benefits of Open Source Software to Transit Agencies

CUTR Webinar – May 25, 2016

Dr. Kari Edison Watkins, Georgia Tech
Sean Óg Crudden, Developer

All I really need to know I learned in Kindergarten

1. Share everything.
2. Play fair.
3. Don’t hit people.
4. Put things back where you found them.
5. CLEAN UP YOUR OWN MESS.
6. Don’t take things that aren’t yours.
7. Say you’re SORRY when you HURT somebody.
8. Wash your hands before you eat.
10. Warm cookies and cold milk are good for you.
11. Live a balanced life - learn some and drink some and draw some and paint some and sing and dance and play and work everyday some.
12. Take a nap every afternoon.
13. When you go out into the world, watch out for traffic, hold hands, and stick together.
14. Be aware of wonder. Remember the little seed in the Styrofoam cup: The roots go down and the plant goes up and nobody really knows how or why, but we are all like that.
15. Goldfish and hamster and white mice and even the little seed in the Styrofoam cup - they all die. So do we.
16. And then remember the Dick-and-Jane books and the first word you learned - the biggest word of all – LOOK.
Sharing Economy

The sharing economy refers to economic and social systems that enable shared access to goods, services, data and talent.

These systems take a variety of forms but all leverage information technology to empower individuals, corporations, non-profits and government with information that enables distribution, sharing and reuse of excess capacity in goods and services.

-Wikipedia

Shared Code = Open Source

- Open source products exist in many spheres
  – WordPress blogging platform
  – Web browsers Mozilla and Firefox
  – Postgres, MySql, Tomcat.

- Definition for open source:
  “Software with source code that anyone can inspect, modify and enhance.”
Open Source

• Any agency can use without licence fee and adapt to meet specific needs

• Installation can be run by
  – Agency IT department
  – Vendors
  – Independent Developers

Enabler 1 = Automated Vehicle Location
Enabler 2 = Increasing Mobile Usage

Enabler 3 = Open Data

Agency produces data and opens it once.

Anyone can access data

Small subset of riders find this specific tool useful.

Many riders access a diverse market of tools powered by GTFS.
Enabler 4 = Open Data Standards

**GTFS**
- General Transit Feed Specification

**GTFS realtime**
- Vehicle Position, Trip Updates and Alerts

**SIRI**
- The Service Interface for Real Time Information
- Stop and Vehicle Monitoring

**OpenStreetMap**
- Free editable map of the world

Real-time Information

ONEBUSAWAY
Strategies to Address Unreliability

- Traditional methods of improving reliability are expensive, supply-side approaches, including:
  - Dedicated right-of-way
  - Service planning

- An inexpensive, demand-side approach is providing riders with real-time information (Carrel et al. 2013; Schweiger 2011).

What is OneBusAway?

- **What?** Suite of tools that provides real-time bus/train tracking information
  - Open source software
  - API for developers
  - Free to riders

- **Why?** Make riding public transit easier by providing good information in usable formats
  - Research to evaluate the impacts
Mobile Apps and More

Support user location, route, stop contextual /personalized information
All OPEN-SOURCE!

OneBusAway Multi-region

- Created centralized server directory
- Modified apps to find cities using directory
- Add a new city by adding a record in the directory
Where is OneBusAway?

Seattle, WA: Original deployment 2008

New York, NY: Adapted for the MTA (Bus Time)


Atlanta, GA: 2013

Tampa, FL: 2013

York, ON: 2015

Rouge Valley, DR: 2015

San Joaquin, CA: Beta

San Diego, CA: 2016

Lappeenranta, Finland: Beta

Sroda Wielkopolska, Poland: Launched May 2016

transiTime

OPEN-SOURCE PUBLIC TRANSIT REAL-TIME INFORMATION

AN OPEN-SOURCE SOLUTION

Full ownership by transit agency
Any GPS system
Expandable
Accurate
Reliable
Developing Countries
What is transiTime

• **What?** transiTime records the real-time and historical movements of vehicles to predict arrival and departure times.
  - Provides predictions in GTFS realtime and SIRI format
  - Schedule adherence reports
  - Prediction analysis reports
  - 3rd Party predictions analysis
  - Web interface
  - API for developers
  - Auto assigns vehicles to trips based on GPS data

• **Why?**
  - To produce accurate arrival predictions to be displayed to passengers
  - To provide reporting on performance of transit systems and existing real-time infrastructure

transiTime: HART Map
transiTime: Prediction Analysis

**Prediction Accuracy Range for Hillsborough Area Regional Transit, route 1, Other predictions, 05-23-2017 for 1 day**

Prediction Accuracy for ASC, TransiTime predictions, 05-03-2017 for 1 day
transiTime: Vehicle Assignment

**Active Blocks**

- 1 - Florida Avenue
- 2 - Nebraska Avenue
- 4 - Palms Citi-South Tampa
- 5 - 40th Street
- 6 - 54th Street
- 7 - West Tampa - Citrus Park
- 8 - Progress Village/Brandon
- 9 - 25th Street
- 10 - Cypress Street
- 12 - 22nd Street
- 14 - Armenia Avenue
- 15 - Columbus Drive
- 16 - Waters Avenue
- 18 - 30th Street
- 19 - Port Tampa
- 30 - Town 'N Country
- 31 - South Hillsborough County

transiTime: API including GTFS realtime

**API Calls for Hillsborough Area Regional Transit**

- New: This is a only a partial list of the API calls
- Agency Specific API calls
  - Routes
  - Route Details
  - Vehicles
  - Vehicle Details
  - Vehicle Configurations
  - Predictions by Stop
  - Predictions by Location
  - Trip
  - Trip With Travel Times
  - Block
  - Block Details
  - Service ID
  - Service ID Current
  - GTFS-realtime Trip Updates
  - GTFS-realtime Vehicle Positions
  - GTFS Vehicle Monitoring
  - GTFS Stop Monitoring
  - Schedule by Route, stops horizontal
  - Schedule by Route, stops vertical
- Not Agency Specifics
  - Agencies
  - Predictions by Location
transiTime: Current Developments

transiTime: Extension
Trials on VIA, Atlanta Streetcar, GTech Trolley
transiTime: Extension
Trials on VIA, Atlanta Streetcar, GTech Trolley

transiTime Extension: Distribution of Headways
Histogram of headways from Centennial Park (Control Point) for schedule and proposed method.
transiTime Extension: Route Level Stability

Open Source Systems: OpenTripPlanner
What is OpenTripPlanner?

- **What?** OpenTripPlanner (OTP) is an open source platform for multi-modal and multi-agency journey planning.
  - Open source software
  - Web interface
  - API for developers
  - Mobile apps
  - Integrated with OneBusAway Mobile Apps
- **Why?** To provide up to date itinerary to passengers
- **Where?** Tampa, Atlanta, Puget Sound, Helsinki........

OpenTripPlanner: Web Interface - Rail/Tram Journey
OpenTripPlanner: API

REST Resources
This API supports a Representational State Transfer (REST) model for accessing a set of resources through a fixed set of operations. The following resources are available through the RESTful model:
- Artifacts
- Stops
- ExternalDepotResource
- LocationResource
- GeographicPerformanceResource
- Schedule
- LocationResource
- Location
- Timetable
- Route
- Service
- Stage
- ScheduleResource
- Segment
- StopTimeResource
- Structure
- SurfaceResource
- Ticket
- TimeSchedule
- Timetable
- SphereGeoResource

There is also a JSON document describing the REST API.

OpenTripPlanner: Mobile App
How they fit together

Benefits of Open Source

1. Users never pay license fees
   - Base code is free and upgrades can be specifically bid out

2. Open source uses up-to-date tools and technologies.
   - Code is constantly being updated with the latest design, user interface and user experience standards.

3. Enhancements made by other users are available free of charge for everyone.
   - Every open source project has rules that govern how enhancements developed by other users can be available for all. Shared cost by multiple agencies.

4. The agency can use its own staff to manage and deploy the software.
   - IT staff with the skills to manage software can do so.

Source: Sept 2016, Metro Magazine
Benefits of Open Source

5. The agency can seek assistance from a competitive market of contractors.
   - Pool of potential vendor partners can expand beyond transportation-specific, proprietary software companies to include consulting firms, university students and general software development firms.

6. Federal grants are available to develop and enhance platforms.
   - Any grant that allows for capital funding can be leveraged for open source platforms.

7. Open source can be deployed either in-house or in the cloud.

8. Open source is designed for easy integration with other systems.
   - Integration is problematic, at best, with proprietary software, which is designed to protect it and increase its value by barring communication with other systems.

Source: Sept 2016, Metro Magazine

Thank You!

Urban Transportation Information Lab
http://util.gatech.edu
Civil & Environmental Engineering
Georgia Tech

Dr. Kari Watkins
kari.watkins@ce.gatech.edu
Twitter @transitmom

Sean Óg Crudden
og.crudden@gmail.com
https://github.com/scrudden