Open Source Software and other Opportunities for Transit

2009 National Rural ITS Conference

Bibiana McHugh, IT Manager of GIS and Location-Based Services
OVERVIEW

Open Source

Open Source Internet Mapping Alternatives

Open Trip Planner Project

OS TimeTable Publisher

Open Data for Developer Resources
Advantages and Opportunities

Open Source

Open Source Internet Mapping Alternatives

Open Trip Planner Project

OS TimeTable Publisher

Open Data for Developer Resources
OSS ADVANTAGES

Proven method that works

$0.00 Capital Cost

Faster evolving software

Broad user & support base

Open Source Software
Include OS Solutions in Feasibility Studies and Requirement Analysis in addition to Commercial Off-The-Shelf (COTS)

OS Evaluation Criteria

- OS Code/Language – ex. can it be supported and maintained internally, does it adhere to IT standards
- Developer Base
- Working Implementations
- Terms and conditions of the OS license agreement
- Governance or Foundation
- Options for support and maintenance contracts
- No initial fee for the software, however, should calculate and compare long-term operating costs and resources against COTS
- Linux Operating System
- MySQL, PostGIS Databases
- Apache and Tomcat Web Server
- Mozilla Firefox Web Browser
- Eclipse Development Platform
- Subversion Version Control System for code, web pages…
- Openbravo Point of Sale Application for ticket purchases
- Plone Content Management System
- Redmine Software Management
- dotProject for Project Management and Right-of-Way Acquisition Tracking and Management
- Footprints Service Desk System
- TimeTable Publisher
- GeoServer & OpenLayers
OpenGeo Stack:
GeoServer
OpenLayers
PostGIS/PostGres

Open Source Internet Mapping Alternatives

Open Trip Planner Project

OS TimeTable Publisher

Open Data for Developer Resources
with Trip Planner functionality
Links to outside sources of information
TRIMET ARCHITECTURE

RLIS Regional Datasets (shapefiles)

SAM & SAMW
Stops, Amenities, Work Orders, Landmarks, P&Rs, TCs

AVL (onboard vehicles)

ACID Accidents & Incidents

CCS Rail Central Control

TransHR Work Orders

FMIS Fac Maint WOs

Oracle Financials

Postgres/PostGIS

Data Prep/Generation (uDig, QGIS, pgPL/SQL)

Scheduling Temporal Data, Route Shapepoints

TriMet Enterprise Database (Oracle)

Data Prep/Generation (PL/SQL)

RLIS Transit Datasets (shapefiles)

CCS Rail Central Control

ATIS Trip Planner

GeoServer Web Feature Service (WFS)

Real-Time Web Services

Trip Planner Web Service

Real-Time Web Services

GTFS

Trip Planner Web Service

Real-Time Web Services

GTFS

TimeTable Publisher
Web timetables, printed materials

On-Board Schedules
TRIMET ARCHITECTURE

Web Services Developed for Internal Developer Resources
Demonstrate the feasibility of implementing and maintaining an OS MMTPS.

Contribute documentation and source code improvements for the benefit of others.

Increase and strengthen the development community around the code.

Test the usability and accuracy of the MMTPS planned trips to improve core algorithm and regional datasets.

Document information such as lessons learned and feedback from participating partners and developers.
## PROJECT TIMELINE AND DELIVERABLES

<table>
<thead>
<tr>
<th>Task 1 – Project Management Plan</th>
<th>Sept. 2009</th>
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</thead>
<tbody>
<tr>
<td>Project Initiation Workshop July 15-17, 2009 is designed to identify detailed scope of work, project plan and schedule.</td>
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<tr>
<td>Deliverables: Detailed Scope of Work, Project Plan and Schedule</td>
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</table>

<table>
<thead>
<tr>
<th>Task 2 – Develop and implement the open source MMTPS</th>
<th>Jan. 2011</th>
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<tbody>
<tr>
<td>Deliverables: Working on-line prototype of the open source Trip Planner for Portland Metro area. It will plan walking, transit and bike modes.</td>
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<tr>
<th>Task 3 – Evaluation Study</th>
<th>May 2011</th>
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<tr>
<td>The Evaluation Study will focus on both the open source aspect of the project, and the accuracy and usability of the planned trips using the prototype.</td>
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<tr>
<td>Deliverable: Summary reports of Program Development Checks, Results of Data Efficacy Test.</td>
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</table>

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<tr>
<th>Task 4 – Develop Final Report</th>
<th>June 2011</th>
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<tbody>
<tr>
<td>Deliverables: Final report on development and test, including next steps, produced.</td>
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</table>
**EVALUATION PLAN**

**Program Development Checks**

- Summary of actual accomplishments compared to program objectives
- Lessons Learned
- Feedback from partners, vendors, developers, TriMet staff
- Project activities for the test period

**Data Efficacy Test**

- Respondents will be recruited to include: transit riders/non-riders, bikers, walkers, men, women, minorities, LEP, and elderly and disabled.
- Respondents will:
  - plan their trips using the prototype;
  - take the trips; and
  - report on the accuracy and usefulness of the trips generated.

**Final Report:**

- Next steps for TriMet and collaborators
- Demonstration of prototype and report this summary to the RTO Subcommittee.
Walking preferences filters choices based on distance (it does not produce 1 mile walks)
Trip Planner
Core/Engine Comparisons
API
TriMet ATIS
A-Train
GraphServer

GraphServer
OS Multi-Modal Trip Planner Engine
Developer.TriMet.org

Open Source

Open Source Internet Mapping Alternatives

Open Trip Planner Project

OS TimeTable Publisher

Open Data for Developer Resources
2004 TRB Transit IDEA Project #39
ConSysTech’s Dynamic Timetable Generator (DTG)

2005 Transit Forum Workshop
DTG was suggested for a potential open source project
http://tech.groups.yahoo.com/group/TransitForumNet/

2006 TriMet Replaced Legacy System with TTPUB

2007 TTPUB Released with OS License
Based on Mozilla Public License 1.1
Internal Uses at TriMet
- Generates all printed timetable materials
- Generates Web HTML & PDF Timetables

Consistent Customer Information

Current Customer Information
Internal Uses at TriMet
  Generates all printed timetable materials
  Generates Web HTML & PDF Timetables

Test Implementations:
  KING Co. Metro
  NYSDOT
  Hampton Roads Transit
  Lane County Transit

T3 Webinar
LESSONS LEARNED

Working together with other agencies has been great.

Timetable issues are similar between agencies.

Minimal effort to implement.

No showstoppers yet encountered.

Java and Java Web Application Servers Experience – required only to add to the code

Many enhancement opportunities
## 1. Raw Schedule Data

<table>
<thead>
<tr>
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</table>
TTPUB PROCESS

1. Raw Schedule Data

2. Input into TTP System
TTPUB PROCESS

1. Raw Schedule Data
2. Input into TTP System
3. Configure & Prepare Data
1. Raw Schedule Data
2. Input into TTP System
3. Configure & Prepare Data
4. Output into Various Formats for Public Use (digital and paper)
## Vintage Trolley
**Eastbound to Lloyd Center • Sunday**

<table>
<thead>
<tr>
<th>Time</th>
<th>11th Avenue MAX Turnaround Stop ID 10119</th>
<th>Pioneer Square South MAX Station Stop ID 6334</th>
<th>Old Town/Chinatown MAX Station Stop ID 6339</th>
<th>Rose Quarter TC MAX Station Stop ID 8340</th>
<th>Lloyd Center/D bliss &amp; Vintage Trolley Stop ID 9419</th>
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<tbody>
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</table>

**Please note:** Schedules may change without notice by up to three minutes to relieve overcrowding or adjust to traffic conditions. Service can also be affected by construction, accidents and weather conditions. You can check for any current detours or service disruptions at trimet.org/alerts or call 503-238-RIDE (7433) for real-time status information from TransitTracker™. All buses, MAX trains and streetcars are accessible to people with disabilities.

*This schedule is effective 01-01-2020.*
### MAX Red Line
**Eastbound to Portland City Center and Airport - Weekday**

#### Directions Form
- **Pioneer Square South**
- **Directions**: To here - From here
- **Start address**:

![Map with Stop Locations](image)

<table>
<thead>
<tr>
<th>Elmonica/SW 170th Ave Stop ID 9830</th>
<th>Merlo Rd/SW 158th Ave Stop ID 9626</th>
<th>Beaverton TC MAX Station Stop ID 9621</th>
<th>Sunset TC MAX Station Stop ID 9969</th>
<th>Washington Park MAX Station Stop ID 10120</th>
<th>Goose Hollow/SW Jefferson Stop ID 10118</th>
<th>Pioneer Square South Stop ID 8334</th>
<th>Old Town/Chinatown Stop ID 8339</th>
<th>Rose Quarter TC MAX Station Stop ID 8340</th>
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<td>WHY USE THE TTPUB</td>
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<td><strong>Consistent</strong></td>
<td>Single system for print and Web output.</td>
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<td><strong>Current</strong></td>
<td>Quicker turn-around &amp; can generate directly from database.</td>
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<td><strong>Control</strong></td>
<td>TimeTablePublisher gives Marketing team full control over public schedule information.</td>
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<td><strong>Costs</strong></td>
<td>Cost reduction from automation &amp; repeatable processes (from 30 to 2 hours per route).</td>
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<td><strong>GTFS</strong></td>
<td>Standardized data format lowers the barrier to using the TimeTablePublisher.</td>
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<td><strong>Bottom Line</strong></td>
<td>Better Information and Reduced Costs.</td>
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</table>
Uses GTFS so implementation is simple

Intuitive friendly user-interface

Webinar & documentation for reference

Development community is growing

Cort Buchholz, President
503.914.6272
cort@singlemindconsulting.com
www.singlemindconsulting.com
Exposing public data to leverage external resources

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Open Source Internet Mapping Alternatives

Open Trip Planner Project

OS TimeTable Publisher

Open Data for Developer Resources
TRIMET ARCHITECTURE

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(onboard vehicles)

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Trip Planner Web Service

Real-Time Web Services

GTFS

Exposed for External Developer Resources
TriMet Developer Resources

TriMet has made resources available to software developers, to promote the use of transit and information related to transit.

At this time these resources include a schedule published in the Google Transit Feed Specification (GTFS) format as well as web services from TriMet's TransitTracker and trip planner systems.

As more resources are made available they will be announced here.

A number of tools developed using TriMet's developer resources are listed [here].

Getting started:

We have built a brief list of definitions to transit terms. We are working on populating a GTFS data.

To start using our GTFS data you can read about it [here].

To start using our Web Services feed you must first register.

The Web Services currently available are documented [here].

The TimeTable Publisher project is hosted as a [google code] project.
Google's transit feed specification is well documented by [Google's page on the subject](http://developer.trimet.org/schedule/). Schedule data in GTFS format is available for download at [http://developer.trimet.org/schedule/](http://developer.trimet.org/schedule/). You will find directories numbered according to the date the schedule takes effect:

<4 digit year><2 digit month><2 digit day>

TriMet schedules start on Sunday at 12:00 a.m. and generally are valid until the following Sunday at 12:00 a.m. Schedules are not always published each week, so a published schedule may remain valid for more than one week. Schedules usually are published no later than 6:00 p.m. on Saturday.
Web Services API

All web services TriMet has made available use the Representational State Transfer (REST) RPC-style calls over HTTP GET requests with parameters URL encoded into the request.

Each web service begins with a base URL followed by parameters and arguments. Parameters and arguments can be separated by a forward slash ("/"). Parameters can also be passed using the HTTP GET parameter style; following the base URL with a "?", argument names followed by an equals "=" followed by the argument value and the next parameters separated by a &.

The final parameter will always be "appID" and should be a valid registered AppID. AppIDs registration can be done here.

For example called the arrivals service with a base url of "http://developer.trimet.org/ws/V1/arrivals" would be called:

Using slashes:
"http://developer.trimet.org/ws/V1/arrivals/locIDs/6849,6850/appID/000000000000000000000000000"

Using HTTP GET parameters:
"http://developer.trimet.org/ws/V1/arrivals?locIDs=6849,6850&appID=000000000000000000000000000"

<table>
<thead>
<tr>
<th>Arrivals:</th>
<th>Reports next arrivals at a stop identified by location ID.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detours:</td>
<td>Retrieves a list of detours currently in effect by route.</td>
</tr>
<tr>
<td>RouteConfig:</td>
<td>Retrieves a list of routes being reported by TransitTracker from the active schedule, optionally a list of directions for those routes and stops in each of those directions.</td>
</tr>
<tr>
<td>Trip Planner:</td>
<td>Plan trips between two locations programatically.</td>
</tr>
</tbody>
</table>
Customer Information at Airport
Port of Portland’s Use of Data

External Use of TransitTracker APIs
TriMet App Center
Transit tools for the web and mobile devices

Since TriMet made its schedule and arrival data available to the public several years ago, independent programmers have created a number of useful transit tools for riders.

Below are some of the free and commercial applications that are available from third-party developers using TriMet's open data.

- **Arrival**
  - anythingfrom.com/arrival
  - Provides arrival information.
  - For iPhone

- **Dadnab™**
  - dadnab.com
  - Provides public transit directions (trip planning) via text messaging.
  - For phones with text messaging

- **Google Earth™**
  - earth.google.com
  - Provides public transit directions (trip planning) via text messaging.
  - For iPhone, iPad Touch

- **Google Maps™**
  - maps.google.com
  - Provides public transit directions (trip planning) and information.
  - For web browsers and various mobile devices

- **iBus**
  - iBus.com/trimet
  - Searches for nearest stops, provides arrival information and displays a map.
  - For iPhone, iPad Touch

- **iMap**
  - iMap.me/iMap.php
  - Alerts you when nearing a destination.
  - For iPhone

- **iTransitBuddy**
  - iTransitBuddy.com
  - Provides schedule information.
  - For iPhone, iPad Touch

- **MyTriMet**
  - mytrimet.com
  - Provides arrival information.
  - For mobile web browsers

- **PDX Bus**
  - pdxbus.transitapp.com
  - Searches for nearest stops, provides arrival information and displays a map.
  - For iPhone, iPad Touch

- **PDXT.org**
  - pdxt.org
  - Provides arrival information.
  - For phones with text messaging

- **POI Factory**
  - poi.google.com/trimet
  - Provides points of interest (POI) files of TriMet stops.
  - For GPS Wayfinding Devices

- **Portland Transit**
  - trimet.com/transitapp.com
  - Searches for nearest stops, provides arrival information.
  - For iPhone, iPad Touch

- **Public Routes™**
  - trimet.com/Public
  - Provides public transit directions and information.
  - For web browsers

- **Public Transportation Stop and Service Finder**
  - trimet.com/stopfinder.php
  - Displays all stops and routes within a geographic location.
  - For web browsers
SMS Service
trimet.com/apps/sms
Promotes arrival information.
For phones with text messaging.

trainlogic.net
www.trainlogic.net
Displays schedule information for trains.
For JRT/BlackBerry.

Transcast
www.transcast.com
Searches for internet sources, provides arrival information, and
shows vehicle locations on a map.
For Android

TransitQ
www.transitq.com
Provides schedule information.
For Palm OS.

TriMet Android App
trimet.com/android
Provides arrival information.
For Android.

TriMet Arrival Times
trimet.com/arrival
Provides arrival information.
For Google Gadgets.

TriMet Tracker
www.trimyphone.net
Provides arrival information.
For mobile phone web browsers.

Transit Board
trimet.com/apps/sms
Displays arrival information intended for use on full-size
computer screens or kiosk displays.
For web browsers.

Transit Maps
transitmaps.org
Displays public transit routes.
For web browsers.

Transit Surfer
trimet.com/880745
Provides arrival information.
For mobile phone web browsers.

TriMet Arrival Times
trimet.com/arrival
Provides arrival information.
For Google Gadgets.

TriMet Tracker
www.trimyphone.net
Provides arrival information.
For mobile phone web browsers.

Note: These aren’t “official” TriMet products, so we don’t endorse, warrant or support any of the applications
listed here. We tested them initially to make sure they work, but use them at your own risk. TriMet, in its sole
discretion, may remove/hold application listings without notice.
External Use of TransitTracker APIs
External Use of GTFS and TransitTracker APIs
External Use of GTFS (20+)
Questions?

VISIT:
ride.trimet.org
developer.trimet.org
trimet.org/apps