Flashback to 2005…

**Portal Home Page and System Architecture - 2005**
It really began before that…

- **Mid 1990s** – Community recognized the value of archiving Intelligent Transportation Systems (ITS) data
  - Evaluation
  - Planning
  - Performance measurement

- **1998** - FHWA ITS Program Plan addendum with Archived Data User Service (ADUS) vision
  - Articulates need to collect, retain and distribute ITS data

- **2004** - Portal created with a NSF grant to Robert Bertini

- **2005** - TransPort adopted Portland State University (PSU) as the region's official archiving entity in the region's ITS Architecture.

- **2015** – Archives now commonplace (iPEMS, RITIS, DriveNET, ITDb)
Portal today…

Portland-Vancouver Transportation Data Archive

- Policy of Open Data
- Publicly-funded (Thanks to NSF, FHWA, Metro, RTC, TREC)
- Focus on open-source software
- ~3 TB PostgreSQL Database

speed, count, travel time, weigh-in-motion, variable speed

Portal Data Archive

Travel Time, Traffic Signal, Bicycle Count, Pedestrian Push-Button

Freeway
ODOT, WSDOT, Lane County

Arterial
City of Portland, Clark County, Clackamas County, Washington County, Gresham, Tigard, Beaverton, Vancouver

Transit
TriMet, C-TRAN

Ons, Offs, On-Time Performance

Other
Weather, Weigh-in-Motion
Let’s start at the home page...

2005 Portal Home Page
The Home Page today...

Portal’s Own Map!

Vancouver, WA

New Sensors & New Data Feed
Home Page – Evolution

- Portal's Own Map!
  - 2005 map was a link to the ODOT web page
  - Allows custom mapping – current and historical speeds

- Geographic Expansion – Vancouver, WA, Central Lane, OR
  - Smaller region, but active transportation systems planning organization
  - Integrate across different systems
    - WSDOT feed structure different than ODOT feed structure.
    - WSDOT identifies detectors with strings, ODOT with integers.
    - WSDOT added a 20-second feed for compatibility with ODOT

- New Oregon Sensors and New Type of Sensing
  - Infill sensors, high-definition radar

- New Oregon Data Feed
  - ODOT DAC
FIGURE 4  Sample volume plot for I-5 North Going Street loop detector station, March 24, 2005.
Timeseries Speed & Volume Plot - 2015

- Updated Selectors
- Upstream/Downstream Buttons
- Two Quantities
- Updated technology
- Data download
Timeseries Plot – Evolution

- Updated Selectors
  - Separate date and hours
  - Add day of week

- Added upstream/downtream/opposite direction buttons

- Updated technology
  - HighCharts for plotting
  - Hover option to view data values
  - Data download
Portal: Arterial

Arterial Detection Stations
Portal: Arterial

Single-Day Speed Volume Plot
City of Portland Travel Time Map
Portal: Travel Time (Bluetooth)

City of Portland Travel Time Plot
Arterial - Evolution

- Current data sources
  - City of Portland TransSuite Central Signal System
    - Includes signals from surrounding area
    - Includes bicycle loop detectors
  - City of Portland Travel Time (Bluetooth) system
  - Oregon Department of Transportation Travel Time system
  - Clark County (WA) Wavetronix system

- Gathering arterial data has been a challenge
  - Freeway systems already had established data feeds
  - Arterial data systems are very different from each other
  - Multiple data formats and feed structures
Portal: Transit

- Combines GTFS (General Transit Feed Specification) with AVL/APC (Automatic Vehicle Location/Automatic Passenger Counter) data
Transit - Evolution

- Current data sources
  - TriMet quarterly transit data - passenger census, on-time performance (AVL/APC systems)
  - GTFS

- Planned data sources (near future)
  - TriMet daily transit data
  - C-Tran quarterly transit data (same AVL/APC vendor as TriMet)

- Performance metric maps
  - Ons/offs, on-time performance, utilized capacity
### Portal: Weigh-In-Motion Data

<table>
<thead>
<tr>
<th>Data for most recent two months:</th>
<th>11/2013</th>
<th>12/2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # of trucks observed (thousands)</td>
<td>1353.98</td>
<td>1092.26</td>
</tr>
<tr>
<td>Average # of trucks per day</td>
<td>45.13</td>
<td>35.23</td>
</tr>
<tr>
<td>Average weight of five-axle trucks (kips)</td>
<td>53.42</td>
<td>52.28</td>
</tr>
<tr>
<td>Total # of trucks over 80 kips</td>
<td>57.9</td>
<td>41.84</td>
</tr>
<tr>
<td>Percent of total trucks over 80 kips</td>
<td>4.28</td>
<td>3.83</td>
</tr>
<tr>
<td>Total # trucks over 105.5 kips</td>
<td>2.56</td>
<td>1.74</td>
</tr>
<tr>
<td>Percent of trucks over 105.5 kips</td>
<td>0.19</td>
<td>0.16</td>
</tr>
<tr>
<td>Total # of trucks observed with transponder (thousands)</td>
<td>394.57</td>
<td>329.6</td>
</tr>
<tr>
<td>Percent of total trucks observed with transponder</td>
<td>29.14</td>
<td>30.18</td>
</tr>
<tr>
<td>Total station-hours of data</td>
<td>15533</td>
<td>14662</td>
</tr>
<tr>
<td>Percent complete</td>
<td>98.06</td>
<td>89.58</td>
</tr>
<tr>
<td>Stations reporting in month (of 23)</td>
<td>22</td>
<td>22</td>
</tr>
</tbody>
</table>
Portal: Weigh-In-Motion Data
USES OF PORTAL
ATM Project Development

SOUTHBOUND Speed Data for OR 217

Southbound OR 217 Congestion Plot
(Figure Credit: Jennifer Bachman, DKS Associates)
## Oregon 217 ATM Scenario Using Portal Data

(Figure Credit: Carl S. Olson, DKS Associates)

### Variable Speed Sign & Detector Information

<table>
<thead>
<tr>
<th>MPH Step</th>
<th>Distance</th>
<th>VAS Location</th>
<th>Detection Type</th>
<th>Inside Lane Speed</th>
<th>Outside Lane Speed</th>
<th>Γ-3 Lane Speed (if 3 lanes)</th>
<th>Crash Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0.73</td>
<td>US 26 Walker Rd</td>
<td>Loop</td>
<td>58</td>
<td>53</td>
<td>53</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0.67</td>
<td>BH Hwy</td>
<td>Loop</td>
<td>58</td>
<td>59</td>
<td>54</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0.89</td>
<td>Allen Blvd</td>
<td>Loop</td>
<td>60</td>
<td>53</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>1.36</td>
<td>Hall Blvd</td>
<td>Loop</td>
<td>42</td>
<td>35</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>1.11</td>
<td>Greenburg</td>
<td>Loop</td>
<td>56</td>
<td>53</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>1.39</td>
<td>72nd Ave</td>
<td>Loop</td>
<td>55</td>
<td>55</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Lane by lane speeds

<table>
<thead>
<tr>
<th>Row Lx</th>
<th>Average of Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1081</td>
<td>31.6</td>
</tr>
<tr>
<td>1082</td>
<td>43.2</td>
</tr>
<tr>
<td>1551</td>
<td>57.5</td>
</tr>
<tr>
<td>1552</td>
<td>59.4</td>
</tr>
<tr>
<td>1553</td>
<td>54.4</td>
</tr>
<tr>
<td>1559</td>
<td>60.0</td>
</tr>
<tr>
<td>1560</td>
<td>59.3</td>
</tr>
<tr>
<td>1566</td>
<td>51.3</td>
</tr>
<tr>
<td>1567</td>
<td>42.1</td>
</tr>
<tr>
<td>1573</td>
<td>41.6</td>
</tr>
<tr>
<td>1574</td>
<td>34.9</td>
</tr>
<tr>
<td>1580</td>
<td>60.6</td>
</tr>
<tr>
<td>1501</td>
<td>53.0</td>
</tr>
<tr>
<td>1507</td>
<td>60.4</td>
</tr>
<tr>
<td>1588</td>
<td>54.0</td>
</tr>
<tr>
<td>1594</td>
<td>56.0</td>
</tr>
<tr>
<td>1595</td>
<td>52.0</td>
</tr>
<tr>
<td>1608</td>
<td>55.1</td>
</tr>
<tr>
<td>1603</td>
<td>51.3</td>
</tr>
<tr>
<td>1610</td>
<td>47.1</td>
</tr>
<tr>
<td>1783</td>
<td>57.7</td>
</tr>
<tr>
<td>1987</td>
<td>24.9</td>
</tr>
</tbody>
</table>
# ATM Project Development

**Oregon 217 ATM Scenario Using Portal Data**  
(Figure Credit: Carl S. Olson, DKS Associates)
Connecting the Loop: Research -> Planning -> Implementation -> Evaluation
Travel Model Usage: *Base Year Network Assignments for Travel Demand Modeling.*

Cutline Analysis For Traffic Demand Modeling

(Figure Credit: Peter Bosa, Metro)
Other Uses...

- Educational Use
  - Cloud Data Management
  - Civil and Environmental Engineering Curriculum

- Agency Performance Reporting

- Oregon Department of Transportation Bottleneck Analysis
  - Corridor Bottleneck Operational Study
  - Bottleneck Analysis

- Powell Blvd Signal Analysis

- Portland Arterial Concept of Operations

- I-84 Traffic Management Plan

- Ronler ATMS Project (Washington Cty)
Going Forward…

- Usability
- Arterial Data Visualization
  - Verification of Traffic Signal Programming
  - Data Quality
- Transit Daily Data
- New Data Sources
  - C-TRAN Transit Data
  - Port of Portland Data
  - Variable Speed and Travel Time Sign Data
  - Vehicle Length Data
- Expansion
  - Arterial Data from cities and counties (Clackamas, Washington, Beaverton, Tigard)
  - Central Lane, OR
**Big Data and Transportation...**

- **Increased Volume and Variety of Transportation Data**
  - Improved sensor and mobile device technology
  - Realization that data is too valuable to delete
    - ADUS - ITS Program Plan addendum 1998
  - Decreased storage costs

- **Increased Demand for Data-Driven Decision Making (MAP-21)**

  - **Freeways**
    - Inductive Loops
    - High-Definition Radar
    - Third-Party
  - **Transit**
    - AVL/APC
    - GTFS
  - **Arterial**
    - Measured Travel Time
    - Traffic Signal Systems
  - **Safety**
    - Incident Reports
    - Crash Reports
  - **Bicycle/Pedestrian**
    - Automated
    - Manual

Ideas credit: David DeWitt, Microsoft/UW-Madison, SQL Server PASS Talk 2011


Big Data and Transportation...

- **Data Integration (a.k.a. Fusion, Linkage)**
  - ODOT Integers vs. WSDOT strings
  - Varied Arterial Signal and Bluetooth Systems
  - Corridor Flow
    - Portland’s I-84/Powell Corridor has: car, light rail, bus even bike

- **Data Bias**
  - “Can I use this data for that purpose?”
  - Capturing and communicating that information
THANK YOU!

http://portal.its.pdx.edu
http://demo.portal.its.pdx.edu

tufte@pdx.edu
DOT Data Sources (Freeway)

- ODOT DAQ
  - XML Feed
  - 20 second granularity
  - automated station inventory file

- ODOT
  - Loop Detectors
  - High-definition radar
  - Travel Time
  - Variable Speed and Travel Time Sign Messages

- Lane County
  - High-definition radar

- OR-WA Archive

- WSDOT
  - Loop Detectors
  - High-definition radar

Planned:
ODOT
- Length Data
**Arterial Data Sources**

- **City of Portland**
  - Travel Time
  - Travel time data gathered from devices by scripts on CoP servers
  - Data uploaded to Portal hourly
  - Processing scripts calculate travel times

- **City of Portland**
  - Signal System, including MOE Logs (TransSuite) and Bicycle Counts
  - Central Signal Server is Shared

- **Washington & Clackamas County**
  - Signal System (TransSuite)

- **Portal OR-WA Archive**
  - Hourly data feed created by TransSuite
  - Data uploaded to PSU hourly (sftp)

- **Clark County**
  - Wavetronix
  - Data generated using Wavetronix report-generation system
  - Data uploaded to PSU nightly

- **Planned:**
  - Clark County
    - Travel Time
  - City of Vancouver
    - Wavetronix
    - Signal System (ATMS.Now)
Transit Data Sources

- Portal Archive import processing combines PAX and GTFS data
- Quarterly PAX data exported
- PAX data inserted in Enterprise Database
- Data is cleaned and aggregated
- GTFS data published publicly
- No enterprise database (yet)
- Process to be determined

TriMet
- AVL/APC (Init)
- GTFS Data

Portal OR-WA Archive

C-Tran
- AVL/APC (Init)
- GTFS
Portal: Freeways

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