NWP OTIIS: Heterogeneous Data Integration for Operations and Travel Information Sharing

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Goal: Provide comprehensive, up-to-date, corridor-wide road information to travelers
NWP OTIIS – A partnership
What makes NWP OTIIS unique

- Detailed and up-to-date road data
  - Richer and more accurate information than Google Maps and Waze
- Integration with weather and camera feeds
- Clear road data presentation
  - Categorization into user selectable layers
  - Clear route alternatives
  - Unified experience between website and mobile app
- Open access to data through Application Programming Interface (API)
  - Single corridor-wide data representation schema
Weather

Forecasts

Alerts
Other Information

Mountain Passes

Attractions

Yellowstone National Park

It's a wonderland. Old Faithful and the majority of the world’s geysers are preserved here. They are the main reason the park was established in 1872 as America’s first national park—an idea that spread worldwide. A mountain wildland, home to grizzly bears, wolves, and herds of bison and elk, the park is the core of one of the last, nearly intact, natural ecosystems in the Earth’s temperate zone. [More Info]
Google Maps Traveler View
Waze Traveler View
Challenges of data integration

- Hard to get all needed data
  - States in different stages of digitizing their information
- States use different data formats
  - Location indexing (lat/long, milepost)
  - Date/time formats, e.g., ‘late October’
  - Direction of travel
- States report data differently
  - Spatial resolution of updates
- Heterogeneity of data
  - Optional fields
  - TMDD and custom formats
  - Overlapping data
    - ex. truck restriction in accident feed

Solutions:

- Good communication with DOT partners
- Integrated with a separate milepost to lat/long database
- Text pattern matching
- Aggregation icons
- Keyword search
- Unified ontology of road information
Functionality Enhancements

Two-point events

Separation of data reporting, storage, and presentation

Mountains & Minds
Lessons Learned

• Separate data reporting, storage, and presentation
  – Ultimately will be able to support different users
• Consistent sentence construction aids semantic analysis
  – Ex. ‘bridge construction’ → easy to interpret
  – Ex. ‘bridge spanning the river is under construction’ → super hard!
  – Semantic analysis will always be hard as long as open text fields in data reporting
  – Consistent use of terms can produce both human and machine readable data
• Selective requests to DOTs
  – Standard data reporting formats, i.e. XML, CSV
  – No nested formats, ex. URL inside a description field
NWP OTIIS API

• Road information database accessible via Web requests

```
getEvents {
  segments: '47.70859 -122.32323000000001 ... 47.25278 -122.44427',
  layers: 'RoadWork',
  startTimeInSeconds: 'Mon Jun 09 2014 10:00:00 GMT-0600 (MDT)',
  endTimeInSeconds: 'Mon Jun 09 2014 12:00:00 GMT-0600 (MDT)',
}
```
<eventListResponse>
  <roadWorkList>
    <roadWork>
      <eventID>WA 160533</eventID>
      <path>47.571880341,-122.319869995</path>
      <headline>Construction</headline>
      <headlineDescription>Ramp closures are scheduled.</headlineDescription>
      <impactEstimate>High</impactEstimate>
      <startTime>Fri Jun 06 2014 23:00:00 GMT-0600 (MDT)</startTime>
      <endTime>Tue Jun 15 2014 09:05:23 GMT-0600 (MDT)</endTime>
      <lastUpdated>Tue Jun 03 2014 12:05:23 GMT-0600 (MDT)</lastUpdated>
    </roadWork>
  </roadWorkList>
</eventListResponse>
Future work – Near term

- **Enhance functionality** of NWP OTIIS
- **Mobile application**
  - Mobile application version of the NWP OTIIS system
  - Route condition alerts pushed to users en route
  - Will collect and make available road congestion information
- **Semantic analysis of data feed information**
  - Allow more uniform presentation of data across all layers and states
- **Order events in lists by travel distance along the route**
  - Interleave driving directions with incidents
Future work – Long Term

• Major tasks that leverage NWP OTIIS data
• Accident prediction and integration with freight scheduling
  – Proposal under submission to the FHWA EAR program
  – Collaboration with JB Hunt and Watkins & Sheppard
  – MSU-lead team (CS and Civil Eng.) in collaboration with FSU
• Selective active traffic management
  – Suggest alternative routes in real-time through notifications
  – Balance traffic based on observed shifts
  – Keep trucks on highway, but route passenger traffic onto local roads
• Integration with connected vehicles, passenger and commercial
Thank You