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

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© AP


ROAD
CLOSED
NO
PARKING


YOU'LL NEVER
GET TO WORK
ON TIME
HAHA!!
http://atom.smasher.org/construction/

NWP OTIIS

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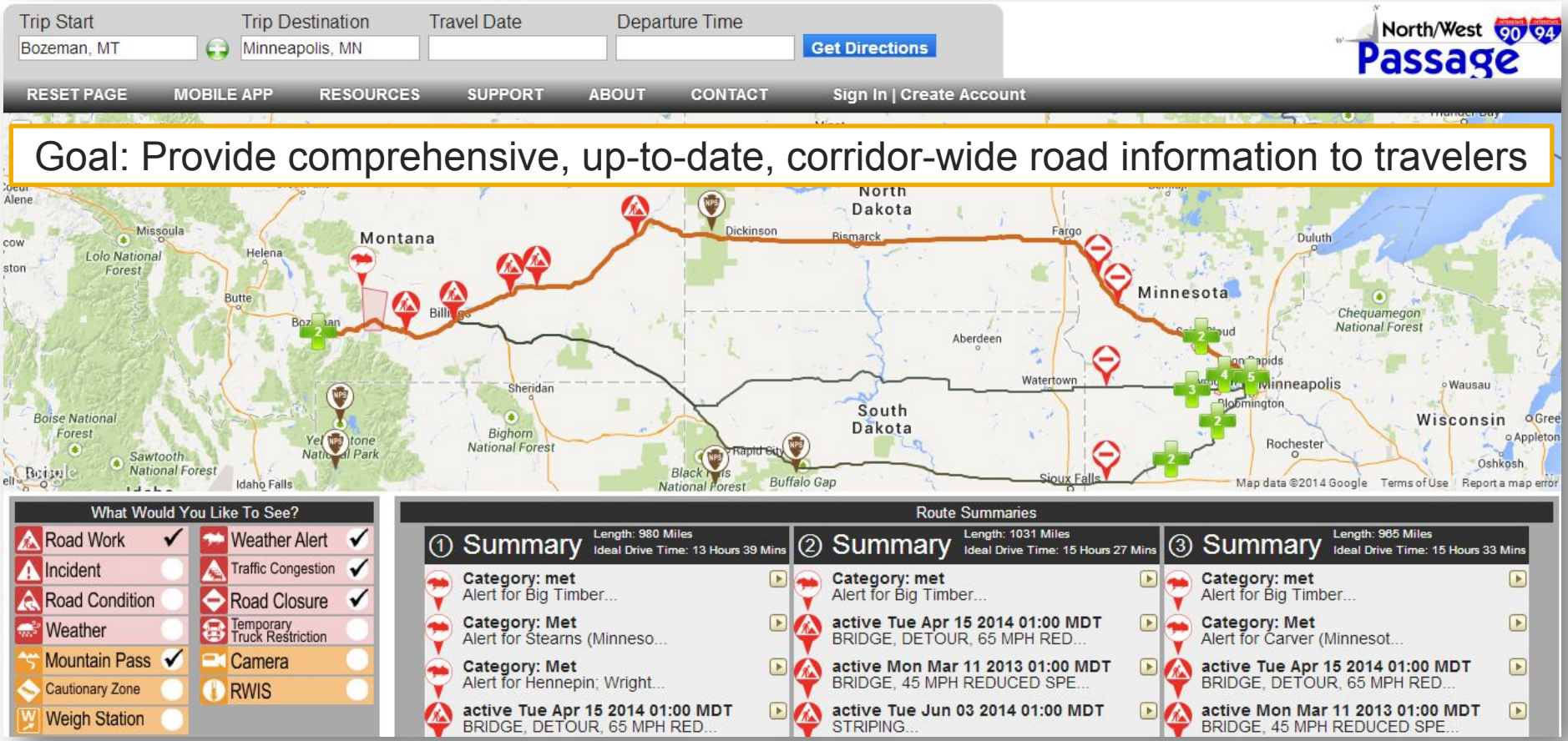

NWP OTIIS – A partnership

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U.S. Department of Transportation
Federal Highway Administration

WTI
Western Transportation
INSTITUTE

MONTANA
STATE UNIVERSITY
College of Engineering

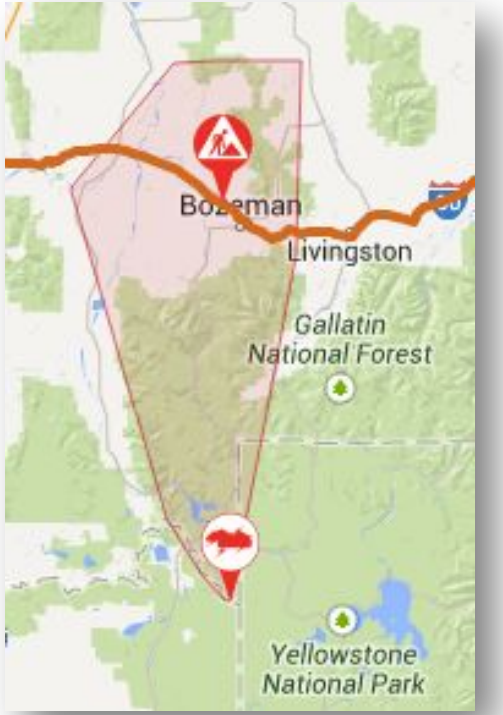
What makes NWP OTIIS unique

- 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

NWP OTIIS Traveler View

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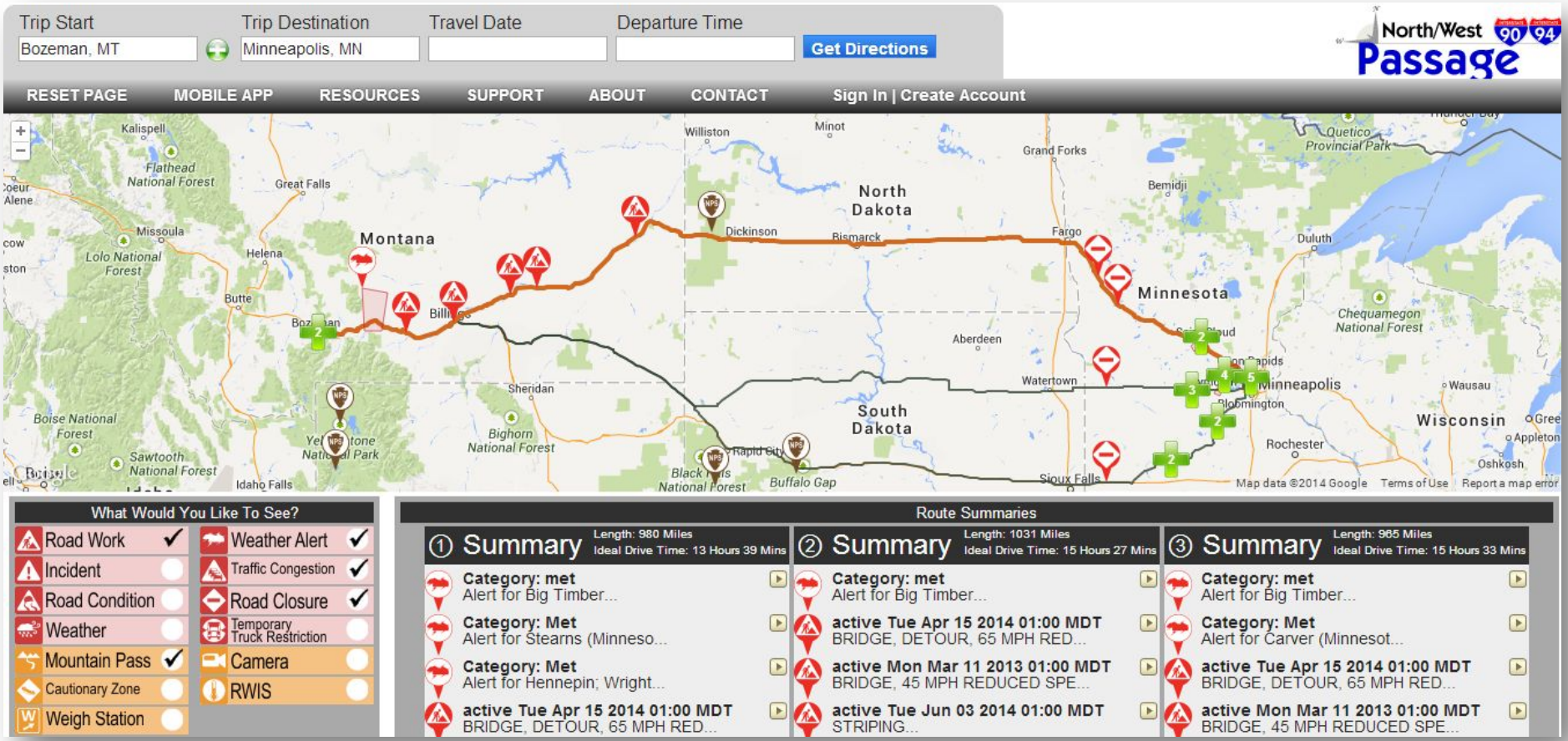
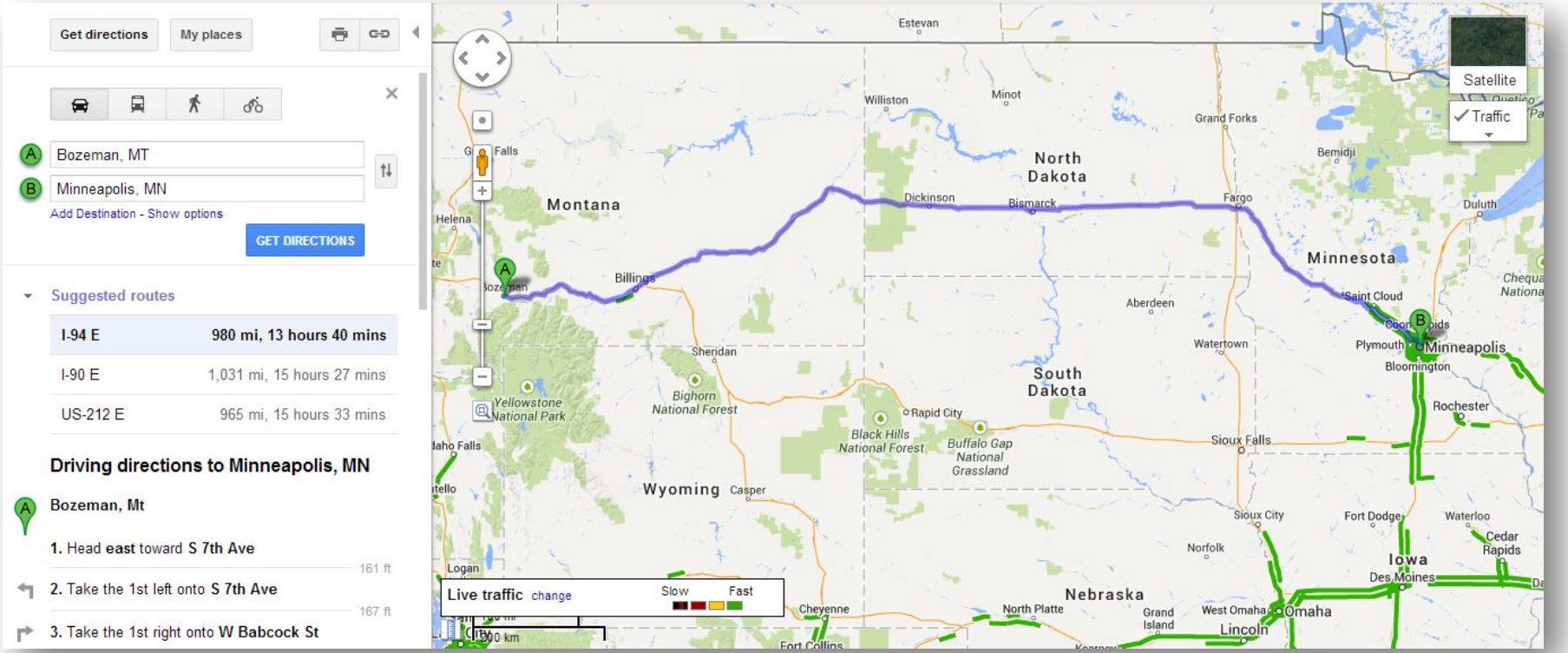
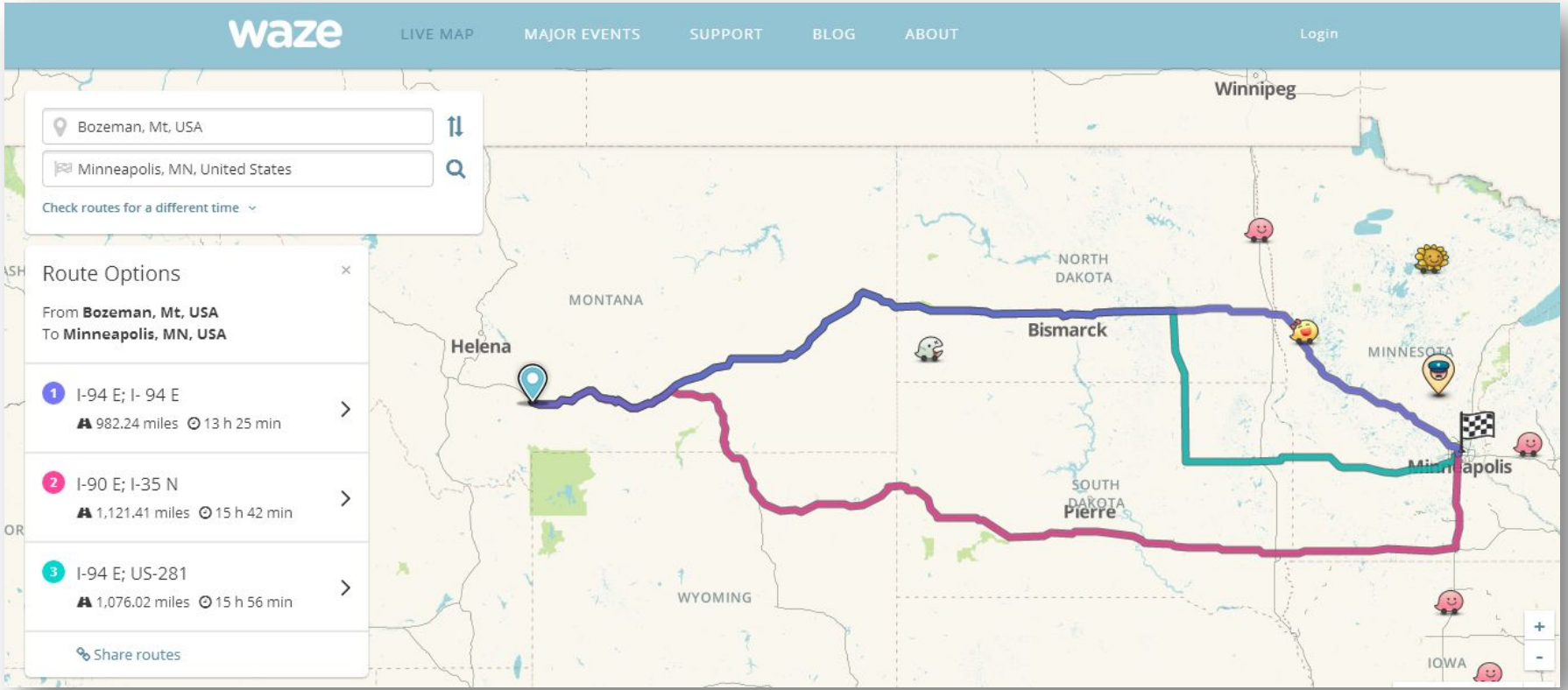


Google Maps Traveler View



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
- Heterogeneity of data
  - Optional fields
  - TMDD and custom formats
  - Overlapping data
    - ex. truck restriction in accident feed

	Road Work	Truck Restriction	Crash / Incident	Road Closure	Road Conditions	Traffic Congestion	Camera	RWIS
WA								
ID								
MT								
WY								
ND								
SD								
MN								
WI								

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

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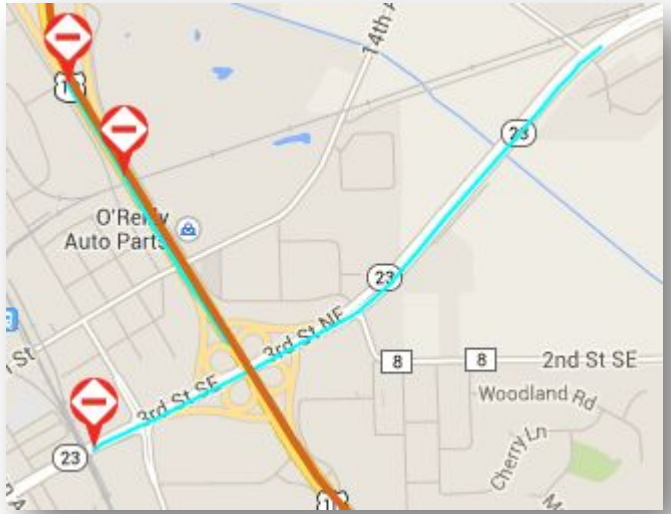
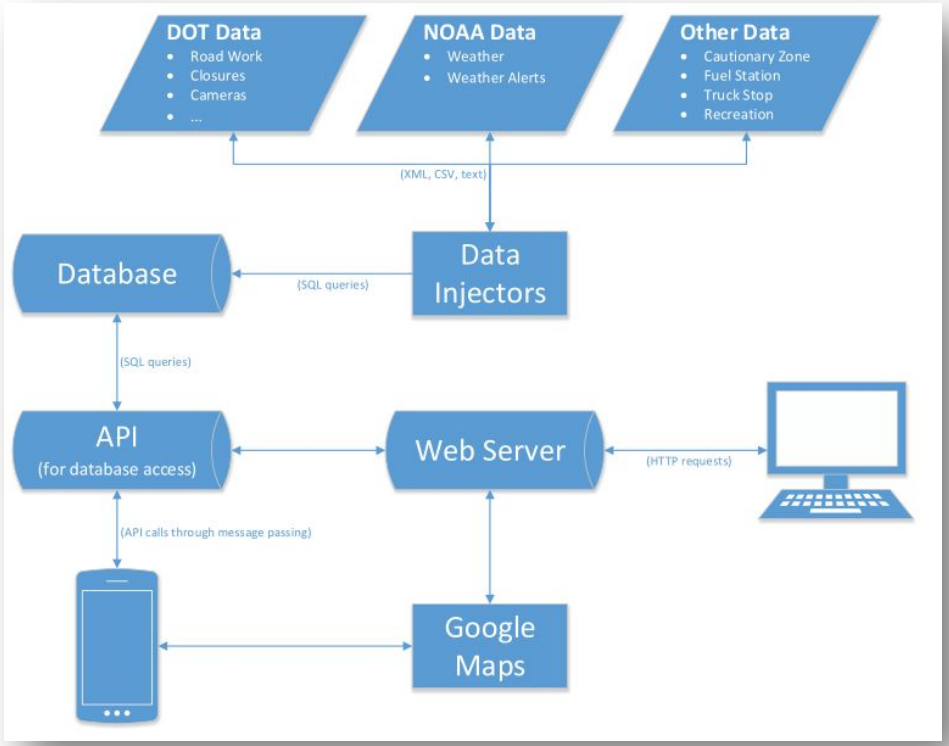
Two-point events



Separation of data reporting, storage, and presentation



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

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- 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)',
}
```

NWP OTIIS API Response

```
<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

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Thank You