SANDAG C-PeMS Project
Integrating ICMS with PeMS
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Project Goals

1. Computation of corridor performance across modes
   - Multi-modal performance measures

2. Visualization of performance
   - Highlight performance issues

3. Ability to “replay” events and responses
   - Useful as a training platform to look back at what happened

All done by integrating data into PeMS and then extending PeMS to have additional features
Progress

- Configured SANDAG ICMS GIS network into PeMS
- Collected and aligned many, many different data sources
- Computed additional performance measures on top of new GIS network
- Implemented full “Corridor PeMS”
- Captured the predictions coming out of the ICMS system
- Captured the response plans coming out of the ICMS system
- Visualized the response plans
## Data Collection – many types of feeds

<table>
<thead>
<tr>
<th>Data Feed Name</th>
<th>Organizational IDs</th>
<th>Observed update Frequency</th>
<th>Data Feed Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bus_location</td>
<td>MTS-SD NCTD</td>
<td>2 min</td>
<td>real-time location of buses</td>
</tr>
<tr>
<td>bus_passenger</td>
<td>MTS-SD NCTD</td>
<td>1 hr</td>
<td>passenger count data - used for t-poms functionality</td>
</tr>
<tr>
<td>detector_data</td>
<td>ATTS, Caltrans, Carlsbad, ChulaVista, ElCajon, Encinitas, Escondido, LaMesa, NationalCity, Oceanside, Poway, SanDiego, SanDiegoCounty, SanMarcos, Santee, Vista, CPS, Caltrans-D11</td>
<td>1 min</td>
<td>standard arterial and freeway detector data</td>
</tr>
<tr>
<td>detector_inventory</td>
<td>ATTS, Caltrans, Carlsbad, ChulaVista, ElCajon, Encinitas, Escondido, LaMesa, NationalCity, Oceanside, Poway, SanDiego, SanDiegoCounty, SanMarcos, Santee, Vista</td>
<td>Static</td>
<td>location of detectors</td>
</tr>
<tr>
<td>dms</td>
<td>CPS, Caltrans, SANDAG</td>
<td>1 min</td>
<td>DMS text with markup language</td>
</tr>
<tr>
<td>dms_inventory</td>
<td>CPS, Caltrans, SANDAG</td>
<td>Static</td>
<td>location of DMS</td>
</tr>
<tr>
<td>incident</td>
<td>CHP-SD, CPS, Caltrans, ICMS, LCS SD, MTS-SD</td>
<td>1 min</td>
<td>incidents</td>
</tr>
<tr>
<td>link_prediction</td>
<td>SANDAG</td>
<td>5 min</td>
<td>prediction of flow, occupancy, speed on links</td>
</tr>
<tr>
<td>managed_lane</td>
<td>CPS</td>
<td>2 min</td>
<td>status of reversible lanes</td>
</tr>
<tr>
<td>parking_data</td>
<td>ParkingCarma, SANDAG</td>
<td>2 min</td>
<td>should have # of spaces available but counts are currently not changing</td>
</tr>
<tr>
<td>parking_inventory</td>
<td>ParkingCarma, SANDAG</td>
<td>Static</td>
<td>location and size of lots</td>
</tr>
<tr>
<td>ramp_meter</td>
<td>Caltrans, SANDAG</td>
<td>1 min</td>
<td>status of ramp meters</td>
</tr>
<tr>
<td>ramp_meter_inventory</td>
<td>Caltrans, SANDAG</td>
<td>Static</td>
<td>location of ramp meters</td>
</tr>
<tr>
<td>response_plan</td>
<td>ICMS</td>
<td>1 min</td>
<td>response plans and action items proposed/implemented to deal with events</td>
</tr>
<tr>
<td>signal_inventory</td>
<td>Caltrans, Carlsbad, ChulaVista, ElCajon, Encinitas, Escondido, LaMesa, NationalCity, Oceanside, Poway, SANDAG, SanDiego, SanDiegoCounty, SanMarcos, Santee, Vista</td>
<td>Static</td>
<td>location of signals</td>
</tr>
<tr>
<td>signal_status</td>
<td>Caltrans, Carlsbad, ChulaVista, ElCajon, Encinitas, Escondido, LaMesa, NationalCity, Oceanside, Poway, SANDAG, SanDiego, SanDiegoCounty, SanMarcos, Santee, Vista</td>
<td>1 min</td>
<td>status of signals - which timing plan is in effect</td>
</tr>
<tr>
<td>signal_timing_plan</td>
<td>Caltrans, Carlsbad, ChulaVista, ElCajon, Encinitas, Escondido, LaMesa, NationalCity, Oceanside, Poway, SANDAG, SanDiego, SanDiegoCounty, SanMarcos, Santee, Vista</td>
<td>Static</td>
<td>timing plan details</td>
</tr>
<tr>
<td>travel_time</td>
<td>ATTS</td>
<td>1 min</td>
<td>travel time on arterial links - sparse data</td>
</tr>
<tr>
<td>weather_data</td>
<td>WeatherBug</td>
<td>5 min</td>
<td>unknown blob format representing weather</td>
</tr>
<tr>
<td>weather_inventory</td>
<td>WeatherBug</td>
<td>Static</td>
<td>location of 17 environmental sensors</td>
</tr>
</tbody>
</table>
Monitoring the Feed Status

- Need to monitor all of the feeds flowing in
- Under the corridor in PeMS users can see the samples received over time
Computing Measures

- Wanted measures on many different modes on top of the ICM GIS network
- Freeway link measures
- Arterial link measures
- Transit route measures
- Measures about events (e.g., count of the number of incidents)
- Measures on routes across modes
Freeway Link Reports

- The user can specify the quantity, granularity and date range for the detailed link report
- Quantities are selected from the drop down list
- Contour plots over freeway sections
Arterial Measures

- We’re receiving real-time flows from some arterial links
- We know the currently-applied static timing plan for some signals
- When available, the combination of these allows us to estimate link performance
- Top plot is showing the green time by approach for a link
- Bottom: V/C ratio on link
Transit Routes

- One can see transit routes listed by transit agency (MTS)
- This is throughout the region
Transit Route Report

- Each transit route has a detailed reporting, where 1 or 2 quantities can be displayed for comparison (scheduled vs measured)
- These quantities can be selected from drop down lists
- Currently showing scheduled vs actual miles for Route 10
Transit Route Travel Time

- Each transit route has one or more service patterns
- Travel time is reported by service pattern
- Scheduled travel time can be compared with the measured one
Route Reports

• Routes span links: either freeways or arterials or both
• Route details are specified on the left panel, including the route map
• Reporting quantities are to be selected from the drop down list
• Granularity and date range can also be specified
• Top: Travel time versus time
• Bottom: Travel time versus time of day
Incident Reports

- Standard reports of different types of events
- Broken down by organizational ID
- Here we’re just counting incidents
- Top: versus time
- Bottom: versus time of day
Corridor PeMS

- Define multi-modal corridors in PeMS
  - Database entity in PeMS to define parts of the transportation system to measure
- Enable the ability to navigate to a “corridor” to see performance measures
- Soon to have its own performance dashboard
Capturing Predictions

- We’re capturing and storing the predictions that are made every 5 minutes (for 15,30,45,60 minutes out)
- Users can show those predictions for any day in the past against the measurements on the link (if available)
- Here we view predictions and compare them with the measured data
- Time slider at the bottom allows the user to specify the time of the prediction
- Bottom plot compares the flow prediction made at 7am on 11/22/2013 for the next hour with the flow measured on that day
Response Plan Capture and Visualization

- Ribbon on top shows timeline
- Users can select a day and time
- Events during that time period show up on map
- DMS, signals, ramp meters can be toggled to be displayed on the map
- Details of ITS element configuration and status are displayed in the information panel on the right
Executive Summary

- **Status**
  - Working on features with Peter and Alex now
  - Beta will be available on Caltrans’ instance of PeMS soon

- **Features still in progress**
  - Computation of corridor-wide performance measures
  - Computation of simulation “quality” performance measures (ability to track final differences over time)
  - Finishing visualization of response plans