Connected Corridors
Face-to-Face Meeting

Tuesday, November 27th, 2018
1:30 – 3:30 pm
Monrovia
Agenda

- 1:30 - 1:45 - MOU – Mort
- 1:45 - 2:00 – Launch Date Update
- 2:00 - 2:30 - Summary of program - Joe
- 2:30 - 3:00 - Parsons update on Call projects
- 3:00 - 3:25 – Response Plan Discussion
- 3:25 - 3:30 – Closing
  - Next Meeting at Duarte – Tuesday January 15th
  - (County, Arcadia, Caltrans, Pasadena, Monrovia, Duarte)
MOU/Signs Mort
Launch Date
Update
Moving final launch date to end of year

- Due to delays in the delivery of our C2C interfaces and the development of the software we will not be able to do a full launch next July.

- We recommend a **soft launch** in July – Generate response plans but do not automatically send them to ITS devices (signals, ramps, signs)

- We recommend a **hard launch** end of December. A hard launch will involve sending commands to the ITS devices

- These dates are under some discussion
Soft Launch Description

- **In July we launch with:**
  - The data feeds that are ready - Arcadia, ATMS, Others maybe
  - The Kapsch system
  - The Data Hub
  - The Decision Support system with rules using live inventory checking

- **We review data quality and work to improve it**

- **When an incident is entered via the ATMS or the Kapsch system we run the DSS and generate response plans.**
  - We review these plans afterwards using the model and the data we have stored
  - Make appropriate changes

- **We complete system integration and perform testing from July to December**

- **As we deem systems ready we begin to test by setting values on real ITS field elements, one stakeholder at a time, and then the overall system**

- **We do a hard launch in January**
Soft Launch

- **Initial response plans will use rules and not modeling**
  - Live status information for all assets with live feeds
  - Assume all assets are available and working for jurisdictions without live feeds.
  - Limitations on time of day for use of certain routes

- **Post Incident:**
  - Response plans can be reviewed in the prediction model.
  - This will allow us to analyze how they might be expected to perform and make adjustments to the response strategies, timing plans, and route strategies.
Build Confidence and Reduce Risk

- **Overall:**
  - Gives more confidence in our response strategies
  - Reduces risk in the technical system
  - Provides a good opportunity for the reengagement of safety personnel
### Updated Schedule

#### Project Management
- **1. Project Management**
  - Start: 10/1/13
  - End: 12/31/21

#### Outreach & Communications
- **2. Outreach & Communications**
  - Start: 10/1/13
  - End: 12/31/21

#### Concept Exploration / User Needs
- **3. Concept Exploration / User Needs**
  - Start: 11/1/13
  - End: 12/26/14

#### Corridor Preparation
- **4. Corridor Preparation**
  - Start: 12/2/13
  - End: 12/31/19

#### AMS - Phase 1
- **5a. AMS - Phase 1**
  - Start: 1/6/14
  - End: 5/29/15

#### AMS - Phase 2
- **5b. AMS - Phase 2**
  - Start: 6/1/15
  - End: 6/30/19

#### SEMP Updates
- **6a. SEMP Updates**
  - Start: 7/2/15
  - End: 6/30/16

#### SEMP
- **6b. SEMP**
  - Start: 1/1/15
  - End: 6/30/15

#### ConOps
- **7. ConOps**
  - Start: 3/12/14
  - End: 5/20/15

#### System Requirements
- **8a. System Requirements**
  - Start: 4/23/15
  - End: 7/29/16

#### Validation & Verification Plans
- **8b. Validation & Verification Plans**
  - Start: 8/1/16
  - End: 12/31/18

#### Institutional Design
- **13a. Institutional Design**
  - Start: 1/2/17
  - End: 6/30/19

#### Institutional Operations
- **13b. Institutional Operations**
  - Start: 7/1/19
  - End: 6/30/21

#### Technical Design
- **10. Technical Design**
  - Start: 7/1/16
  - End: 9/30/18

#### Component Development
- **11. Component Development**
  - Start: 8/15/16
  - End: 3/31/19

#### System Deployment
- **14. System Deployment**
  - Start: 6/1/18
  - End: 6/30/19

#### System Operations and Maintenance
- **17. System Operations and Maintenance**
  - Start: 7/8/19
  - End: 6/30/21

#### Training
- **15. Training**
  - Start: 4/1/19
  - End: 6/30/21

#### Validation and Acceptance
- **16. Validation and Acceptance**
  - Start: 5/1/18
  - End: 12/31/20

#### Pre Evaluation
- **18a. Pre Evaluation**
  - Start: 1/1/19
  - End: 12/31/19

#### Post-Deployment Evaluation
- **18b. Post-Deployment Evaluation**
  - Start: 1/1/20
  - End: 6/30/21

#### Lessons
- **19. Lessons**
  - Start: 1/1/21
  - End: 6/30/21

#### Lessons on Production
- **19. Migration to Production**
  - Start: 4/1/20
  - End: 6/30/21
Systems Engineering Next Steps

- **Design Documents**
  - Details of interfaces and implementations

- **Hardware/Software**
  - Building the system

- **Integration**
  - Subsystems will come on line this year
Summary
Caltrans Data Quality: Good!

- **I-210 PM 25 - 43.25**
  - EB 89.8% --- good, should improve next week
  - WB 80.4% --- should improve next week

- **SR-134 PM 11.4 - 13.5**
  - EB 78.3% --- sporadic data from MSID 4200
  - WB 69.0% --- sporadic data from MSID 4200

- **I-605 PM 22.93 – 28**
  - NB 83.2% --- recent drop from last week
  - SB 87.2% --- recent drop from last week
Signal Plans and DSS Review

- **Caltrans Signal Plan Review & Approval**
  - Flush plans and space-time diagrams on Central/Evergreen provided to Samson for review

- **Pasadena Signal Plan Review & Approval**
  - Agreement on procedures for signal plan submission
  - 150 intersections agreed upon where the plans to be updated
  - Established a shared Box Folder to communicate plans
  - Pasadena has agreed to enter these plans into the Transparity system

- **DSS Workflows and Rules**
  - First cut completed of rules spreadsheets to specify allowable combinations of proposed routes, signal plans, ramp meter plans, and wayfinding signs
Response Plan Generation

- Response Plan workshop at the D7 TMC – Much discussion
- Improvements to the desktop application’s logging and mapping output
- Internal discussions of Response Plan trigger threshold and scoring
- Discussions of incident location limitations and opportunities -- both internal and with David Lau – Detailed discussions to begin
- Initial meeting with writer on Response Plan documentation
Communication – Kali to Comment

- Pasadena VPN connection will be in place by the end of January
- LA County connection is in place! We will be testing it in December
- RIITS and PATH continuing to work:
  - DNS – Domain Name Servers
  - Hostnames
  - SSL certificates
C2C Interface Implementations - Status

- KITS
- Transparity
- TransSuite
- Sign Vendor
- Caltrans ATMS

- DSS
- Data Hub
- TSS Model Interface (Optional)
- Kapsch
- Parsons
- Telegra

- TMDD Tested Interface
- TMDD Tested Interface
- TMDD Tested Interface
- TMDD Tested Interface
- TMDD Tested Interface
Traffic Control Systems

- TransCore – Arcadia and Caltrans
  - Installed in Arcadia, planned for install in Caltrans in January
  - We are now reading data from Arcadia
- McCain - Pasadena
  - In design
- Kimley Horn – LA County, Monrovia and Duarte
  - In design

ATMS – Caltrans (CMS Signs, Ramps)

- Initial release delivered in July
- We are testing out the interface and have identified some updates that are needed
- We also need integration support
Systems Development and Integration

- **Cloud Infrastructure**
  - Automating deployment for AWS – Deployment to Spark completed. Continuous Integration strategy has been developed and reviewed with Amazon. Will implement this next.
  - Goal is to turn off our Blue Dev environment (publicly accessible) before Christmas and begin working and deploying within the D7 private space in January.
Systems Development and Integration

- **DSS**
  - Continued working on response plan generation and workflow orchestration between DSS, Data Hub, and Corridor Management System.
    - Early version of timed response plan updates (30 minutes after first response plan and 15 minutes after each subsequent response plan).
    - Early version of incident update handling/response plan generation.
Systems Development and Integration

- **Data Hub**
  - Pipeline control in place for all pipelines (start/stop). Integrated with automated deployment and configuration. Will continue to improve this capability.

- **Corridor Management System**
  - Continue efforts with Kapsch – good discussions regarding incident messaging, interfaces
  - Started integration efforts with Telegra Corridor Management System (with the ATMS)

- **Integration (Data Sources)**
  - Successful integration with Arcadia
Signs - New Guidelines

- No arterial wayfinding signs in Arcadia, Monrovia and Duarte
- Use major arterials to reroute traffic
  - Huntington
  - Foothill
- Place signs to ensure travelers are directed to Huntington and Foothill
  - Static signs as needed
  - Dynamic message signs on Caltrans ramps as needed
- Once on Huntington and Foothill travelers will drive until they come to a junction with I-210. They will not be directed to make a turn in order to return to the freeway earlier
Final Recommendations

Arcadia, Monrovia and Duarte
Final Recommendations
Pasadena and LA County
Call for Projects
Parsons
Agenda

- I-210 CC Arterial Systems Improvement Project
  System Consulting Services – Scope
- Expected Timeline
- Status of 9 procurement package
- Next Steps
I-210 CONNECTED CORRIDORS ARTERIAL SYSTEMS IMPROVEMENT PROJECT
SYSTEM CONSULTING SERVICES

SCOPE OF WORK

November 27th, 2018
## Project Objective

- Assist Caltrans D7 to manage and coordinate the execution of the 9 arterial ITS improvement projects

<table>
<thead>
<tr>
<th>#</th>
<th>Package Description</th>
<th>Contract #</th>
<th>Contract Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bluetooth – Iteris Velocity</td>
<td>07A4470</td>
<td>Awarded</td>
</tr>
<tr>
<td>2</td>
<td>Bluetooth – BlueToad</td>
<td>07A4477</td>
<td>Awarded</td>
</tr>
<tr>
<td>3</td>
<td>New Controller Cabinets</td>
<td>07A4603</td>
<td>Package being updated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Being Re-advertised</td>
</tr>
<tr>
<td>4</td>
<td>Communication Upgrades</td>
<td>07A4479</td>
<td>Awarded</td>
</tr>
<tr>
<td>5</td>
<td>Firmware/Timing Plan Updates/Controller Upgrades</td>
<td>07A4480</td>
<td>Awarded</td>
</tr>
<tr>
<td>6</td>
<td>Video Detection System</td>
<td>07A4481</td>
<td>Awarded</td>
</tr>
<tr>
<td>7</td>
<td>Data Communication Module and Video Detection Software Upgrade</td>
<td>07A4601</td>
<td>Being Re-advertised</td>
</tr>
<tr>
<td>8</td>
<td>Advanced Traveler Information Systems</td>
<td>N/A</td>
<td>Divided to 3 packages</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>To be advertised</td>
</tr>
<tr>
<td>9</td>
<td>Environmental Stations with Air Quality Sensors and Open Data Systems</td>
<td>07A4388</td>
<td>Awarded</td>
</tr>
<tr>
<td>#</td>
<td>Package Description</td>
<td>Contract #</td>
<td>Metro &amp; Caltrans</td>
</tr>
<tr>
<td>----</td>
<td>----------------------------------------------------------</td>
<td>------------</td>
<td>------------------</td>
</tr>
<tr>
<td>1</td>
<td>Bluetooth – Iteris Velocity</td>
<td>07A4470</td>
<td>√</td>
</tr>
<tr>
<td>2</td>
<td>Bluetooth – BlueToad</td>
<td>07A4477</td>
<td>√</td>
</tr>
<tr>
<td>3</td>
<td>New Controller Cabinets</td>
<td>07A4603</td>
<td>√</td>
</tr>
<tr>
<td>4</td>
<td>Communication Upgrades</td>
<td>07A4479</td>
<td>√</td>
</tr>
<tr>
<td>5</td>
<td>Firmware/Timing Plan Updates/Controller Upgrades</td>
<td>07A4480</td>
<td>√</td>
</tr>
<tr>
<td>6</td>
<td>Video Detection System</td>
<td>07A4481</td>
<td>√</td>
</tr>
<tr>
<td>7</td>
<td>Data Communication Module and Video Detection Software Upgrade</td>
<td>07A4601</td>
<td>√</td>
</tr>
<tr>
<td>8</td>
<td>Advanced Traveler Information Systems</td>
<td>N/A</td>
<td>√</td>
</tr>
<tr>
<td>9</td>
<td>Environmental Stations with Air Quality Sensors and Open Data Systems (ODS)</td>
<td>07A4388</td>
<td>√</td>
</tr>
</tbody>
</table>
Project Area (cont.)
UPDATE ON

PACKAGES 1-9
Estimated Timeline

<table>
<thead>
<tr>
<th>Year</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month</td>
<td>6 7 8 9 10 11 12</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12</td>
</tr>
<tr>
<td>Prepare Submittal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Procurement &amp; Delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Plan/Procedure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testing &amp; Acceptance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Initial Testing of I-210 CC System
Deployment of I-210 CC System
## Update on 9 Packages

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
</table>
| 1      | Bluetooth – Iteris Velocity 07A4470 PTM |  | - NTP: 7/10/2018  
- Kick-off Meeting: 7/30/2018  
- Submittal Approved: 8/16/2018  
- Equipment has been procured  
- Starting permit application process  
- Expected to be completed: Mar 2019 (90%) |
| 2      | Bluetooth – BlueToad 07A4477 DBX |  | - NTP: 7/10/2018  
- Kick-off Meeting: 7/30/2018  
- Submittal Approved: 10/12/2018  
- Materials to be ordered in December  
- Starting permit application process  
- Current Schedule  
  - Order Equipment: 12/17/18 – 1/7/19  
  - Pre-Configure BlueTOAD Spectra Units: 1/7/19 – 1/11/19  
  - Download/Configure Server Software: 1/14/19 – 1/18/19  
  - Begin BlueTOAD Spectra Unit Installation: 1/22/19 – 2/15/19  
  - Acceptance Test Plan Completed: 1/22/19 – 2/15/19  
  - Acceptance Test Report: 2/4/19 – 3/1/19  
- Expected to be completed: Mar 2019 (90%) |
### Update on 9 Packages (cont.)

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>New Controller Cabinets</td>
<td>07A4603</td>
<td>• Disqualified: Bids came above the SB limit (314k).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Procurement Package revised per Stakeholder comments on Pkg. 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Resubmittal is being reviewed by DPAC for approval</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• To be re-advertised</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Expected to be awarded: Dec, 2018 - Jan, 2019</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Expected to be completed: Jun, 2019</td>
</tr>
<tr>
<td>4</td>
<td>Communication Upgrades</td>
<td>07A4479</td>
<td>• NTP: 7/13/2018</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kanaan</td>
<td>• Kick-off Meeting: 7/30/2018</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction</td>
<td>Makes, models for cabinets at specific locations have been received and shared with the contractor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Expected to be completed: Mar 2019 (70%), May 2019 (90%)</td>
</tr>
</tbody>
</table>
### Update on 9 Packages (cont.)

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
</table>
| 5      | Firmware/Timing Plan Updates/Controller Upgrades | 07A4480 CPE, Inc | - NTP: 7/17/2018  
- Kick-off Meeting: 7/30/2018  
- Submittal Reviewed and Required Equipment changed per Stakeholder  
  Comment  
- Contractor has been given revised requirements on the controller configuration from all 3 jurisdictions  
- Contractor revising submittal  
- Expected to be completed: Mar 2019 (80%), May 2019 (90%) |
## Update on 9 Packages (cont.)

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
</table>
| 6      | Video Detection System           | 07A4481             | • NTP: 7/10/2018  
• Kick-off Meeting: 7/30/2018  
• Submittal v3 being revised per stakeholder comments on v2 and to be re-submitted  
• 10/9/2018: Conducted Site Survey  
• 10/18/18: Submittal approved  
• 11/2/2018: Permit to Pasadena applied, need to wait until new signal timing for 3 intersections are provided  
• 11/26/2018 – 11/30/2018: plan to start installation in Pasadena after permit is issued  
• Expected to be completed: Mar 2019 (90%) |
| 7      | Data Communication Module and Video Detection Software Upgrade | 07A4601            | • Disqualified: Bids came above the SB limit (314k).  
• Resubmittal is being reviewed by DPAC for approval for re-advertisement  
• Expected to be awarded: Dec, 2018 - Jan, 2019  
• Expected to be completed: Jun, 2019 |
## Update on 9 Packages (cont.)

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Advanced Traveler Information Systems</td>
<td>N/A</td>
<td>• Revised parts of Package 8 have been resubmitted with updated pricing, TMDD interface requirements, and estimated TMDD software costs:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• DMS Procurement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Static Sign Procurement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Integration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Expected to be awarded: Jan-Feb, 2019</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Expected to be completed: Aug, 2019</td>
</tr>
<tr>
<td>9</td>
<td>Environmental Stations with Air Quality Sensors</td>
<td>07A4388</td>
<td>• NTP: 6/29/2018</td>
</tr>
<tr>
<td></td>
<td>and Open Data Systems (ODS)</td>
<td>Cal Poly Pomona</td>
<td>• Kick-off Meeting: 7/12/2018</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Cal Poly Pomona coordinated with Caltrans &amp; Parsons to get test data in TMDD format from D7 ATMS Test Server to feed Open Data System; Initial Testing in Dec 2018</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Coordination meeting between Cal Poly Pomona and PATH Scheduled on 11/30/2018 to discuss data interface to I-210 CC data hub</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Ready for ESS field installation in Jan, 2019</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Expected to be completed: Jun, 2019 (90%)</td>
</tr>
</tbody>
</table>
Next Steps

- Advertise Packages 3, 7, & 8
- Support Contractors to understand & address the submittal review comments
- Support Contractors to schedule site investigation and get permit
- Collect and distribute detailed master schedule when it is ready
Thank You and Questions?
Environmental Impact Evaluation for I-210 Connected Corridor Pilot Project

Xinkai Wu, Ph.D.; Xudong Jia, Ph.D., PE; Cal Poly Pomona
Allen Chen, PE; Geromar, Hasta; Leila Sy; Caltrans District 7

Nov. 27, 2018
Task Needs

• To evaluate the air quality before and after the deployment of the CC project, the project needs to collect high frequency data including:
  o Toxic gases (CO, NO, NO2, O3, SO2, CO2);
  o Particulates (PM1, PM2.5, PM10);
  o Meteorological data (temperature and relative humidity); and
  o Potential traffic data (traffic flow, vehicle types, speed, etc.).

• Other specific features include:
  o Allow remote access for customized data collection and configuration through Linux system;
  o Support 3G/4G cellular communication through multiple carriers;
  o Low power usage;
  o Support to use solar panel power;
  o An integrated device that supports data collection and transmission;
  o Portable;
  o Provide ready-to-mount for easy implementation;
  o Provide a camera for field condition monitoring;
  o Provide unique feature of traffic data collection (optional); and
  o Low-cost.
Device: iAQBox

- iAQBox (intelligent Air Quality measure Box)
- A Roadside Air Quality Measurement Device, customized from CLR Analytics Inc.
- Fulfill all required functions
- Portable
- Low-cost
- Solar power supported
iAQBox: Overview

- Wind speed & direction, camera
- PM2.5 & PM10 detector
- Temperature & Humidity detector
- Waterproof box
- Built-in battery
- 12V Solar charge controller
- 12V to 5V Voltage converter
- Raspberry pi 3b
- GPS Module
- USB3.0 4Port Hub
- 5V Relay
- Gas detectors for CO, CO2, O3, SO2, NO, NO2
Database Architecture

- Data Collection
  - iAQBox air quality monitoring station

- Data Receiving and Processing
  - AWS Kinesis
  - AWS Lambda function
  - AWS DynamoDB

- Data Publishing
  - AWS Lambda function
  - AWS S3
  - AWS API gateway
Preliminary Testing: http://opendatasym.com

Real-Time Data Online
Next Step: Field Installation - Mounting iAQBox on CCTV Poles

✓ Electricity Power Support
✓ Potential Ethernet Support
Installation Diagram
Selected Two CCTV Poles for Field Installation

Location 1:
I-210WB/Carmelo
FT452/PM28.09

Location 2:
I-210EB W/O Myrtle Ave
CCTV-455
Thank You!
Questions?

Xinkai Wu
xinkaiwu@cpp.edu
Response Plans
Response Plan Generation

- There has been quite a bit of discussion around response plan generation
  - How is it done
  - What information is considered
  - How much improvement will they enable
  - Do they consider unreported capacity reductions

- We are going to take a look at some of these items
How are they generated - Planning

- **Routes**
  - Determine available routes with stakeholders
  - Determine which routes will be used for a given incident location
  - Move to Rules
How are they generated - Planning

- **Signals plan changes**
  - Determine signal plan timing changes that are acceptable
  - Determine likely demand increases during an incident
  - Run this through Synchro and generate updated timing plans
  - Run these plans + incident information through the Aimsun model
  - Do this based on historical time of day normal demand
  - Tune as needed
  - Review with stakeholders and update
  - Move to rules
How they are generated - Planning

- **CMS Messages**
  - Work with Caltrans on the messages
  - Review with stakeholders
  - Add to rules

- **DMS Messages**
  - Recommend to stakeholders
  - Update as requested
  - Add to rules

- **Ramp Metering**
  - We either set the ramps to green or we don’t
  - Review with Caltrans
  - Add to rules
How they are generated - Planning

- **Unique Rules**
  - Identify unique Time of Day rules – Schools for example
  - Review with stakeholders
  - Move to rules

- **Time of Day, Day of Week Rules**
  - Determine when a route can be used even if a lane(s) are blocked
  - Based on historical data
  - Review with stakeholders
  - Move to rules
How they are generated - Planning

- **Time of Day - Determine which signal plan should be used**
  - Based on historical demands determine which plan will work best
  - Review with stakeholder
  - Move to Rules

- **Determine scoring criteria**
  - What criteria will be used for scoring
    - Proximity and length of route(s)
    - Queue length over one-hour horizon
    - Attractiveness: additional capacity provided to advantaged movements
    - Secondary impacts: potential for unsatisfied demand on disadvantaged movements
How they are executed

- An incident is created and provided to the rules
  - Location
  - Expected Duration
  - Lanes Blocked
  - Time and Date

- We check the availability of
  - Lanes
  - Assets

- Rules use this information to:
  - Choose the routes
  - Choose the signals
  - Choose the messages

- Rules then rank these based on scoring criteria
Rules, Estimation and Prediction
Rules, Estimation, and Prediction

- **A Rules Engine**
  -Executes rules and facts in order to develop a response plan.
  -The response plan contains routes and the settings for the control devices along the route.
  -For soft launch it will utilize the real time availability of control devices.

- **An Estimation Engine**
  -Takes in data from freeway and arterial sensors and uses that data to create a picture of the traffic state of the overall corridor.
  -It fills in missing values and attempts to minimize the effect of bad data.

- **Predictions Provided by a Modeling Engine**
  -A micro model of the corridor that is used to provide a prediction of the effect of applying a particular response plan to an incident.
  -It uses the state provided by the estimation engine as its starting point and historical data (potentially scaled based on current state) for future demand.

- **Good Data → Estimation → Predictions**
Is modeling needed for the hard launch

<table>
<thead>
<tr>
<th>DSS Type</th>
<th>Rules</th>
<th>Real Time Inventory</th>
<th>Real Time Traffic Data</th>
<th>Traffic Studies</th>
<th>Network Detail</th>
<th>Modeling</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rules</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Simple</td>
<td>Rough</td>
<td>No</td>
<td>Good</td>
</tr>
<tr>
<td>Estimation</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Medium</td>
<td>Medium</td>
<td>No</td>
<td>Better</td>
</tr>
<tr>
<td>Modeling</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Detailed</td>
<td>Thorough</td>
<td>Yes</td>
<td>Best</td>
</tr>
</tbody>
</table>
Detecting unexpected changes in flow

- We explicitly determined early on that we were not doing incident detection. For example: A parked truck on an arterial.

- This can be difficult to do, especially on arterials

- That said, our system is at risk of providing inappropriate advice should there be an unreported incident. We do check for broken ITS elements.

- Mort has asked that we use our real time data to determine if the route is working correctly. This is akin to detecting an incident.

- In speaking with Anthony and Francois, they have said it is difficult to do well and will require data read over time. So even if we can determine there is a problem on the route it will take time.
Thank You
and
Next Meeting
(Suggest January 15th
at Duarte)