Connected Corridors
Face-to-Face Meeting

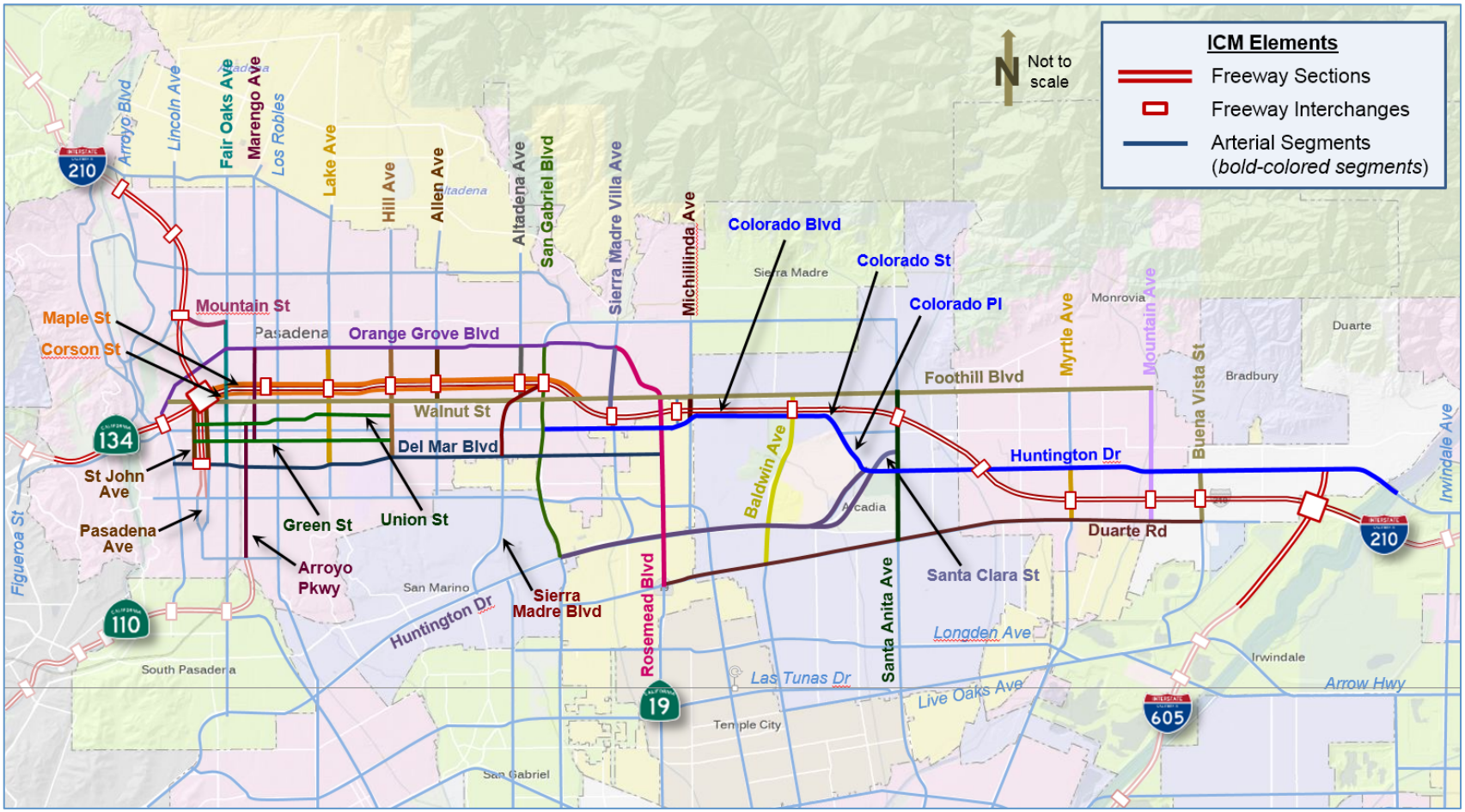
Tuesday, March 8th, 2016 – 1:30 – 3:30 pm
Caltrans D7 HQ

March 8th, 2016

Agenda

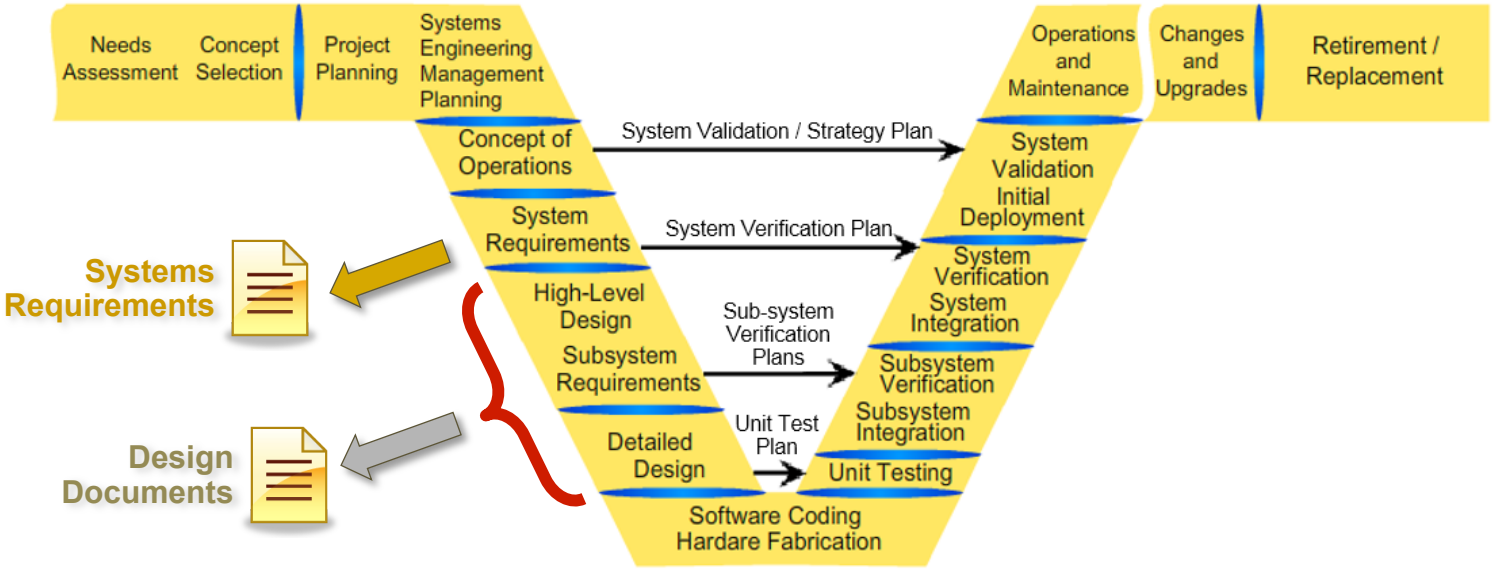
- Introductions
- Quick Summary
- Metro Funded Project Details
- Requirements Update
- High Level Design Preview
- Response Plans Design
- Before and After Evaluation
- Action Items and Closing

Our Corridor: The I-210



Systems Engineering Next Steps

- **Systems Requirements – What should the ICM system do**
- **Design Documents – How will the requirements be met**



Quick Summary

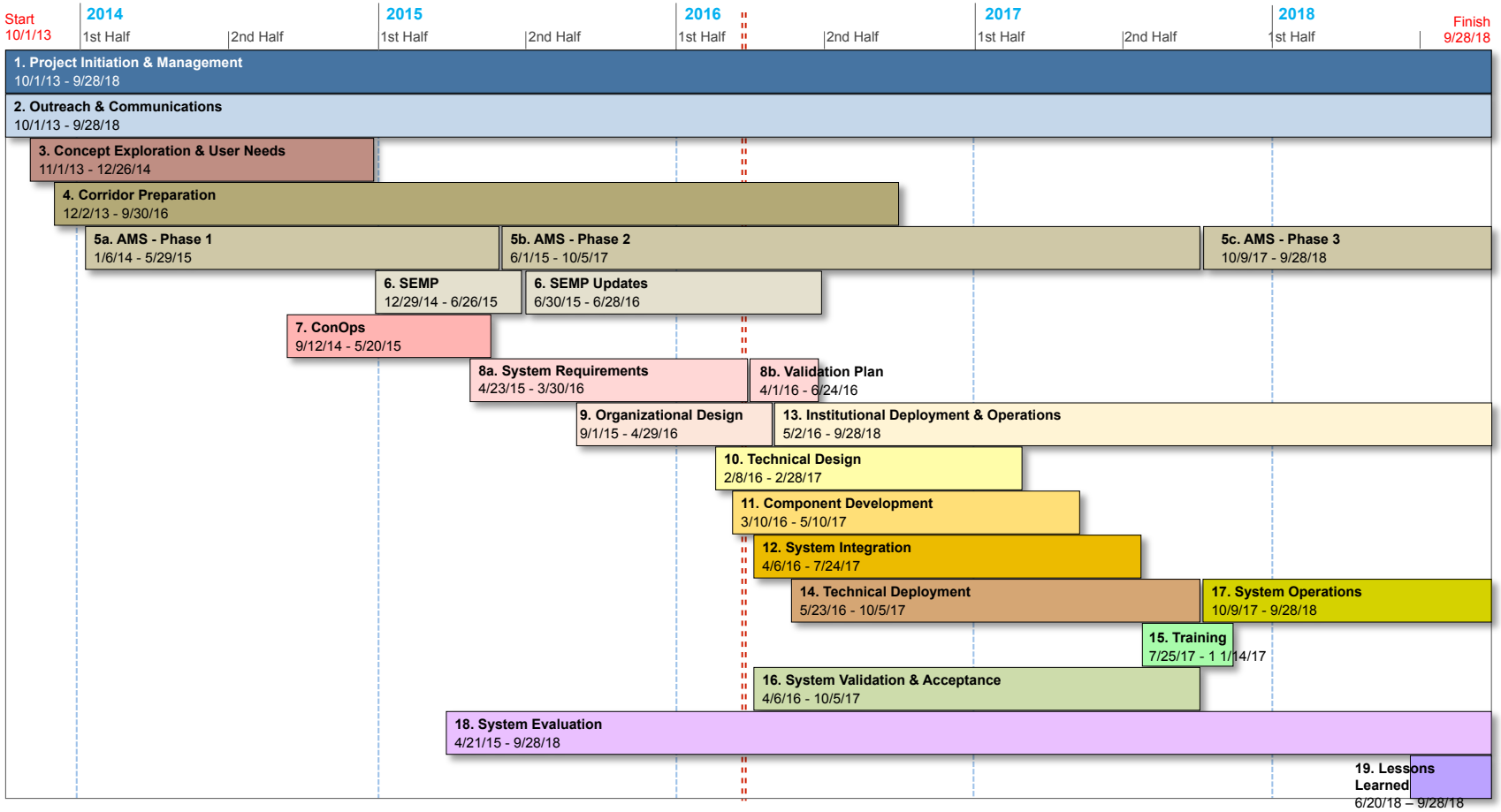
Quick Summary

- **Outreach**
  - Connected Newsletter, meeting with MTC/D4/HQ, updating of web sites
- **Call for Projects**
  - Letter of No Prejudice Signed – Yes!
  - Continuing to refine the exact definition and cost of both ITS elements and software
- **Requirements**
  - Reviews and updates under way – Over 400 comments so far, more expected
- **Architecture and High Level Design**
  - Meetings to be setup with County and Caltrans HQ management
- **Response Plan Generation**
  - Working on corridor models and rules
- **Before/After Evaluation**
  - Moving to Fall time frame – Possible month long evaluation in order to capture an incident

Schedule

- **Infrastructure work on corridor**
  - SHOPP – To be completed by end of 2017
  - Call for Projects Arterial Improvements - To be completed by mid 2018
- **Need to update launch schedule as appropriate**
- **Possible phasing of launch – Analysis required**
- **Updated schedule presented once High Level Design starts**

I-210 Pilot Schedule



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Metro Funded Projects Update

I-210 Arterial Call for Projects

- Letter of no prejudice approved – Very good
- 500K to be transferred to County for IEN upgrades and integration
- Caltrans managed Call for Projects funds involves two very different procurement paths
  - Items requiring standard A&E process
  - Service items involving software and other types of services

Items requiring standard A&E process

- Working with stakeholders to determine:
  - Current state of ITS elements
  - Desired upgrades
    - Agreeing on video where possible
  - Coming to agreement on small CMS signs at key intersections
    - Important because this is close to 2 Million of the funding
  - Costs of those elements
- Funding Agreement
  - Budget required by June as input to funding agreement
  - Funding Agreement expected to be approved by Sept of 2016
- Procurement
  - Project report will be completed by ?? for input to procurement
  - 6 months to post and award contracts –
    - Work should begin in 2017, Complete in 2018

Items requiring service contracts

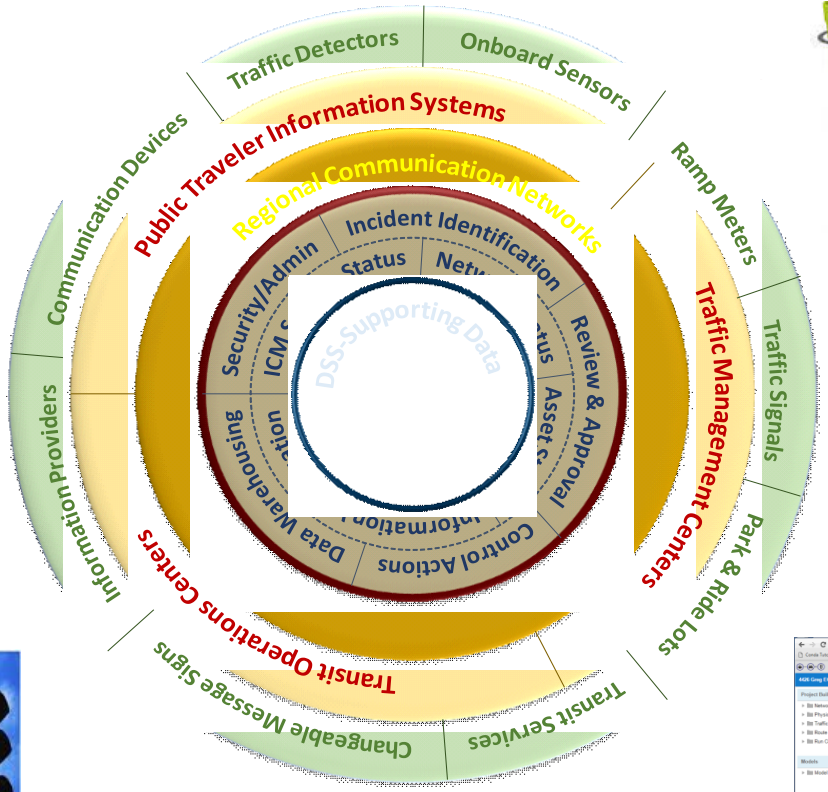
- Working with stakeholders to determine
  - Software upgrades
  - Firmware upgrades
  - Costs of those upgrades
- Funding Agreement
  - Budget required by June as input to funding agreement
  - Funding Agreement expected to be approved by Sept of 2016
- Procurement
  - Requirements to be generated by ?? for input to procurement
  - 3 months to post and award contracts
    - Work should begin in 2017
    - Complete in early 2018

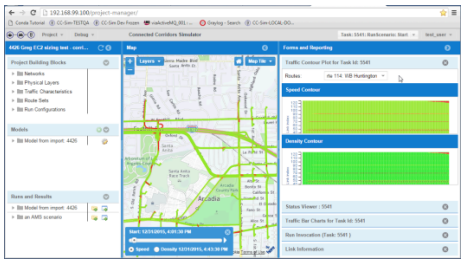
Opportunity for additional sensing

- **Sensys and Verizon would like to work with Connected Corridors stakeholders to trial sensing technology in the 210 corridor**
  - 24x7x365 archived and real time traffic volumes/counts, flow, and occupancy
  - Real-time color-coded congestion maps based on volume and/or occupancy
  - Detection system health monitoring and maintenance alerts
- **Metro invited PATH to the discussion and facilitated several phone calls**
- **PATH identified several locations where sensing would be useful to the CC project, where the Call for Projects funding was not providing sensing and where the Sensys/Verizon technology may work**
  - These are on Live Oak between Peck and Santa Anita
- **We wanted to see if County and Arcadia would be interested in exploring this possibility**

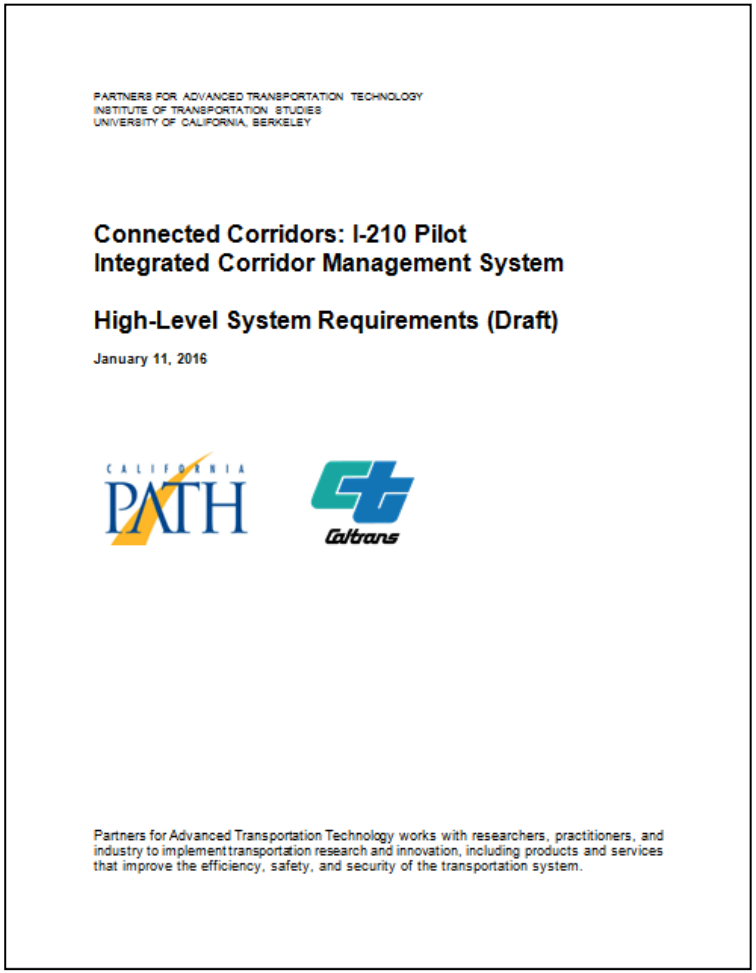
Requirements/Constraints Definition

Our System – People, Organizations, Hardware and Software





Requirements Document



PARTNERS FOR ADVANCED TRANSPORTATION TECHNOLOGY
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, BERKELEY

Connected Corridors: I-210 Pilot
Integrated Corridor Management System

High-Level System Requirements (Draft)

January 11, 2016

Partners for Advanced Transportation Technology works with researchers, practitioners, and industry to implement transportation research and innovation, including products and services that improve the efficiency, safety, and security of the transportation system.

Requirements - Current Status

- **Cities**
  - Arcadia – In person review, awaiting comments
  - Pasadena – In person review, awaiting comments
  - Duarte – Setting up meeting
  - Monrovia – Setting up meeting
- **Caltrans D7**
  - Maintenance – In review
  - Ramp Metering - In review
  - Signals – Reviewed and no comments
  - TMT & LCS – Comments received
  - TMC Operators – Comments received
  - TMC Support – Comments received
  - Office of ITS – Comments Received
- **Caltrans HQ**
  - Maintenance – Follow up planned
  - PEMS – Follow up planned
  - Signals – Follow up planned
  - TMT & LCS – Follow up planned
  - Office of Technology – Comments Received
- **Metro – Comments Received**
- **County – Comments Received**
- **CHP – Comments Received**
- **PIOs – Sent summary, awaiting comments**
- **Safety – Sent summary, awaiting comments**

Requirements

- We have received over 400 comments on the requirements.
- We have processed about 100 at this point
- We expect it will take two more weeks to process the comments
- Awaiting additional comments

Themes of the comments

- **Not much disagreement with the basic requirements**
  - Some questions on inclusion of non software requirements and of introductory material
- **Concern about the ability to implement requirements**
- **Concern about interfacing of Caltrans systems to the ICM system**
- **Questions on Role of Transit and Parking**
- **Questions on Metrics**
- **Quite a few grammar and wording comments**

Review Schedule

- **General Release – Jan 26th**
- **First Round Comments due – Feb 26th**
  - Summary and Generic
  - Detailed as desired
- **Updated Document – March 18th**
- **Second Round Comments due – April 15th**
  - All sections
- **Final Release – May 9th**

Caltrans Office of Technology

Office of Technology

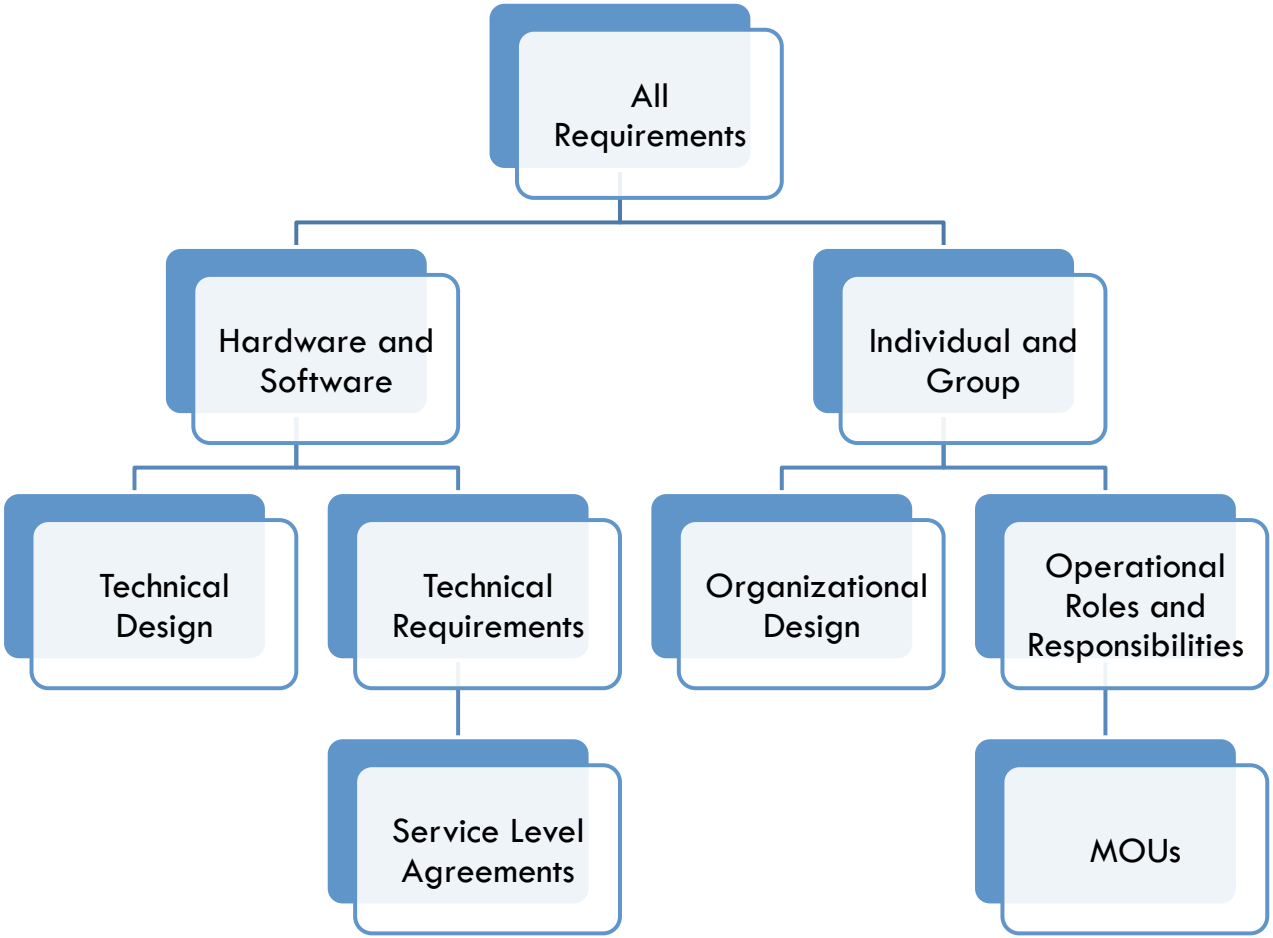
- Continued participation with the DCCM DSS RSCS
- Coordination meetings with HQ IT
- Research on Data Hub
- TMS Pilot Corridor Reporting Coordination

High Level Design

High Level Design

- **Purpose - Map requirements to actual high level system components**
  - Defines the major components of the system
    - Organizations
    - Roles
    - Software Systems
    - Hardware Systems
  - Defines which components exist versus which ones need to be acquired
  - Defines high level data to be exchanged between components
  - Defines strategies for how components will communicate with each other
  - Defines who is responsible for each component
  - Guided by System Engineering Management Plan

High Level Design



High Level Design – Manual and Automated

- **Design of Manual Components**
  - Organizational structures
  - Role definitions
  - Ownership/management of organizations and personnel
  - High level processes for communication and decision making
- **Automated Components**
  - Software
  - Hardware
  - Ownership
  - Communication, data management and process flows

High Level Design – Gap Analysis

- **Map requirements to components**
- **Map components to owners who will provide the components**
  - Existing
  - Existing requiring modifications
  - New
- **Perform gap analysis**
  - Components with no owners
  - Components with owners but no resources to actually provide components

SEMP Guidance

- **ITS National and Regional Architectures**
- **Integration Approach**
  - Horizontal integration - Specialized components responsible for enabling communication between other components
  - Corridor Manager and Data Functionality requirements
- **Multi-Phase Integration**
- **Configuration Management**
  - Creation of a Bill of Materials that contains all system components and is gradually made more granular as design and implementation occur

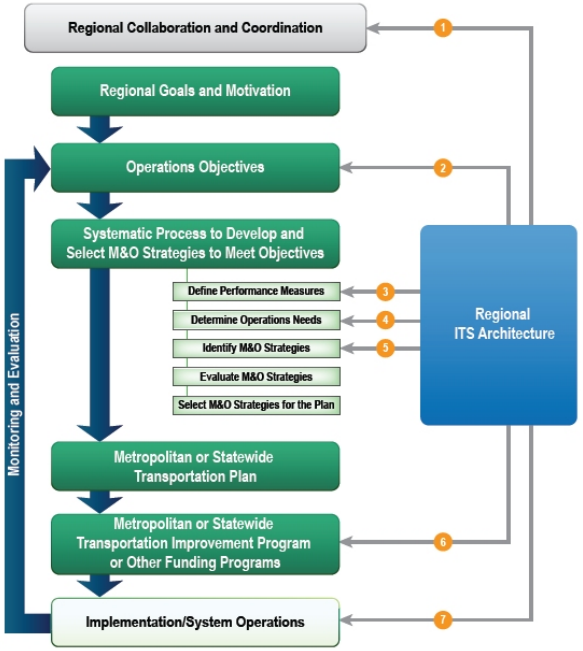
High-level Architecture

System Architecture Tools

- **Need a set of tools for:**
  - Capturing and documenting the system architecture and high level design
  - Providing a documentation trail
  - Future Update of the Regional Architecture
  - Corridor Staff Training
- **Would like the tools to be:**
  - An agreed upon standard
  - Widely used
  - Appropriate for our system needs

Proposed Development Tool: Turbo Architecture

- **FHWA supported tool for Regional ITS Architecture development**
- **Can be used for project system architecture development**
- **Addresses all the considerations presented**
- **Flexible reporting and diagram capabilities allow all project agencies to benefit without the need for Turbo training**
- **Well supported:**
  - In widespread use; well documented
  - Local FHWA office is supportive and offering Technical Assistance



Response Plans

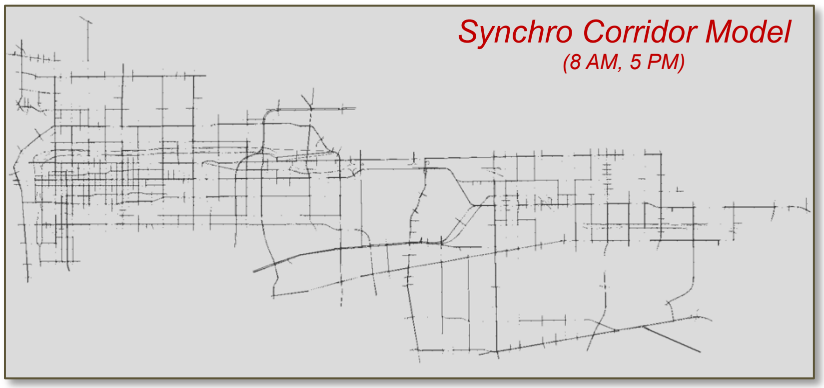
Decision Support and Response Planning

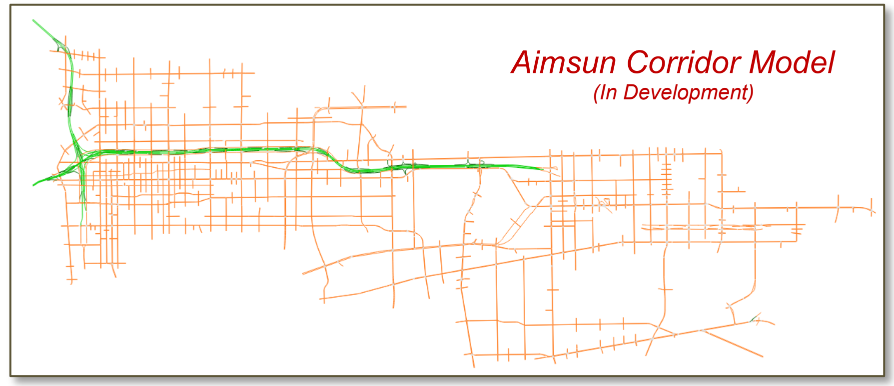
- **Key Principle: Decisions will be based on measureable, quality data**
- **Decision Support needed for:**
  - Planning incident responses
  - Choosing incident responses in real time
  - Post incident analysis
- **Decision Support capabilities include:**
  - Data Quality Determination and Management – PEMS and Berkeley Tools
  - Signal Synchronization Tools – Synchro and possibly others like TranSync
  - Demand determination – Berkeley tools
  - Modeling – Aimsun
  - Rules Engines – Drools
  - Performance Metrics – PEMS and Berkeley tools

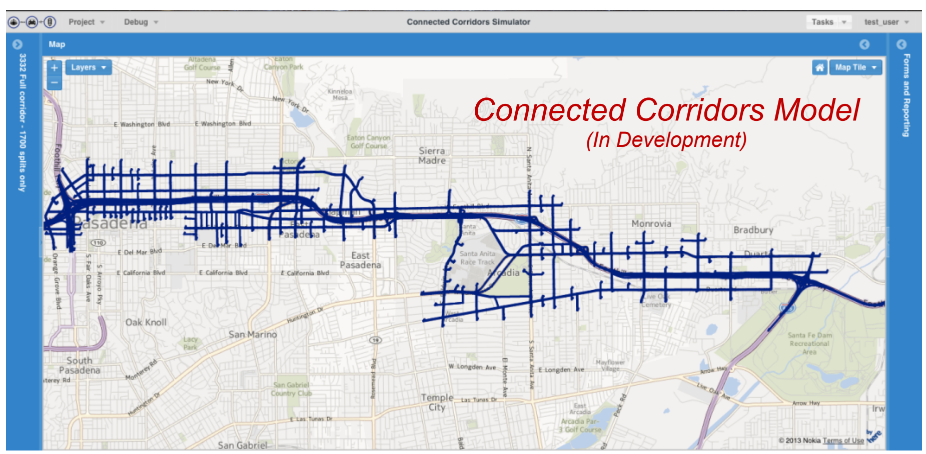
Response Plan Meetings

- **Samson, Raj, Francois, Tom Choe, Tarek Hatata met to continue planning out response plans for review with stakeholders**
- **Next Meeting on March 24th**
- **In three months we plan to be:**
  - Running simulations
  - Running response plan scenarios
  - Running data quality analysis for freeway
  - Executing reasonably complex rules
  - Using rules to define simple response plans
- **Plan to integrate with Samson's "Human ICM"**
- **Plan to integrate with Tadeo's Corridor Health Management**

Models used as part of I-210 Pilot





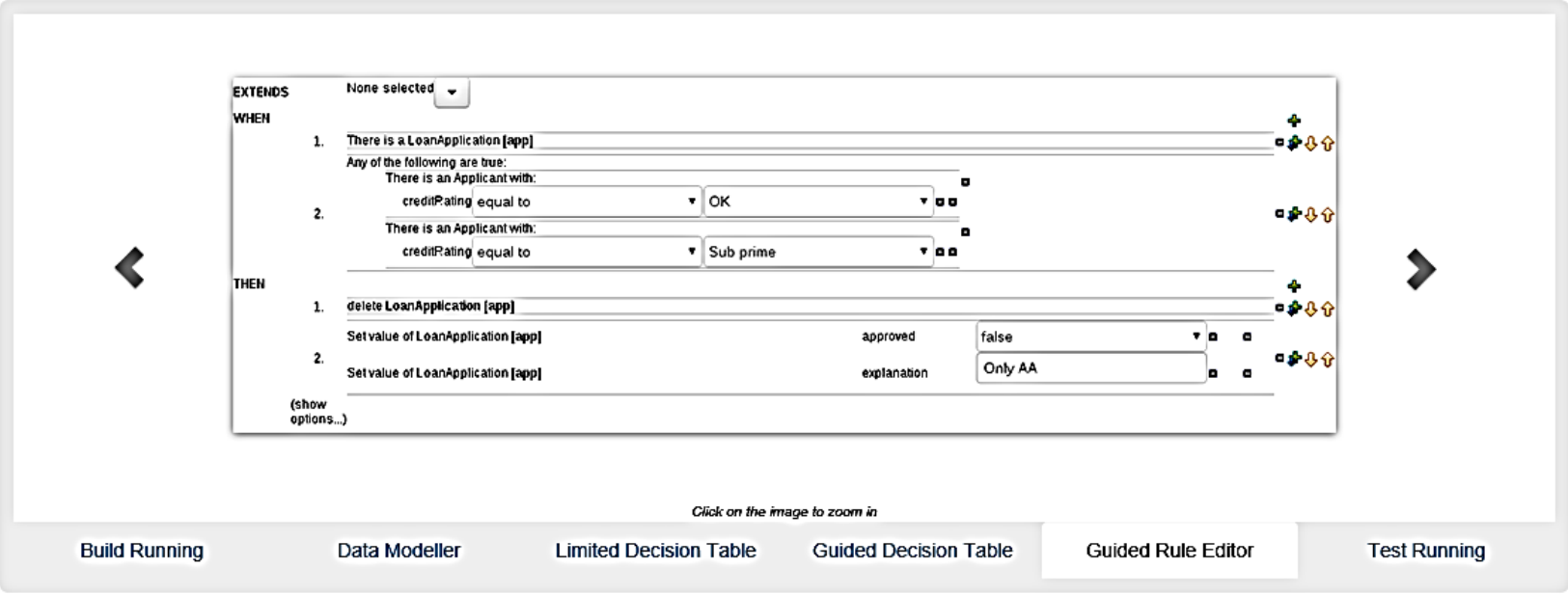


Rule Types Identified in the Requirements

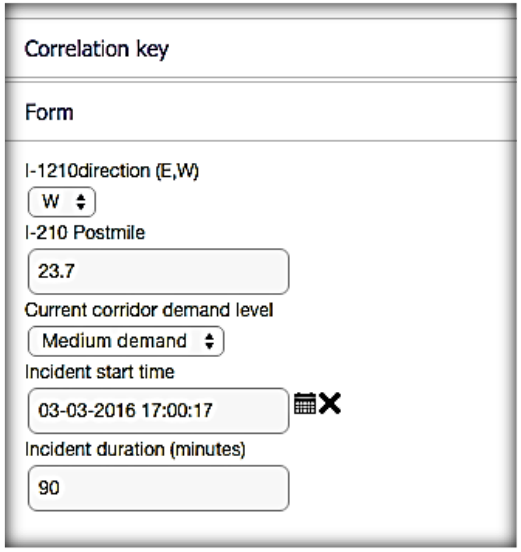
- Existence of an Incident
- Severity of an Incident
- Zone of Influence of an Incident
- Special Limitations
- Response Plan Components
- Building Response Plans from Components
- Selecting a Response Plan for Implementation
- Implementing a Response Plan
- Ending a response plan

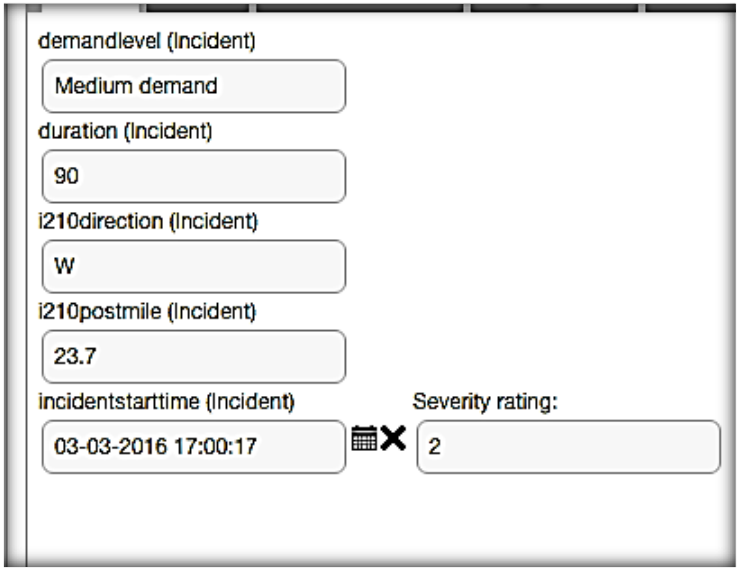
Rules Engine

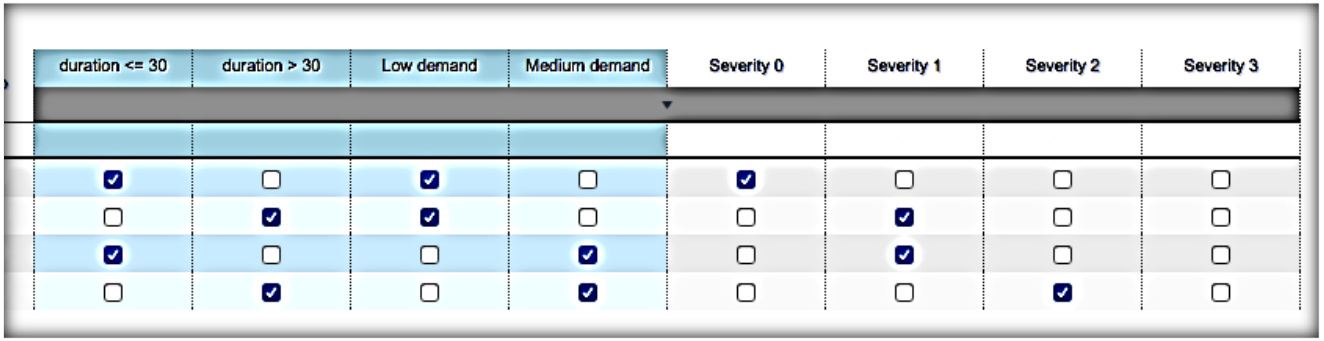
- **We are using DROOLS**
  - Open source Business Rules Management System (BRMS) solution.
  - It provides a core Business Rules Engine (BRE), and a web authoring and rules management application (Drools Workbench)



Rules Capture







Action Items and Next Meeting Time

Thank You