Connected Corridors
Face-to-Face Meeting

Tuesday, August 4th, 2015 – 1:30 – 3:30 pm
Caltrans D7 HQ
Introductions and Remarks

- **Introductions**
  - New folks joining the effort

- **Remarks**
  - Ali Zaghari
  - Tom Hallenbeck
Meet the new Corridor Manager!

Review Schedule

Outreach - Lisa

Systems and Interfaces – Joe (for Alan Clelland)

Requirements Gathering – Joe (for Alan Clelland)

Traffic Intervention Strategies – Tom Choe

Evaluation Plan – Tom Choe

Action Items and Closing
Meet the New Corridor Manager

Welcome Samson!
Long-term TSM&O-focused Organization

System Management

- Principal TE

DDD Operations

- District Traffic Manager

System Monitoring & Evaluation

- Managed Lanes Monitoring
- TASAS, Table C
- Performance Monitoring
- System Analysis

Corridor Manager

- Operational Investigations
- Safety Investigations
- Ramp Metering
- Signal Ops
- Signing
- PIDs
- Staff from external units where needed

Planning for Operations

Int/Ext Coordination

District Traffic Manager

TMC Operations

Incident Mgmt

Planned Lane Closures

TMP

System Monitoring & Evaluation

ITS Support & Development

Traffic Design

Permits

- ITS Support & Development
- Traffic PS&E
- Truck Services

COS Coordination

Project Reports

Signing

Permits

System Metrics Group
Our Corridor: The I-210

ICM Elements
- Freeway Sections
- Freeway Interchanges
- Arterial Segments (bold-colored segments)
System Engineering “Vee” diagram

- **Planning:** Resource Allocation and Concept Refinement
- **Definition:** Requirements, System Architecture and Response Strategies
- **Build:** System Implementation and Testing
- **Operation:** Deployment, Operation and Evaluation
Systems Engineering Next Steps

- **Systems Requirements** – What should the ICM system do
- **Design Documents** – How will the requirements be met
Current I-210 Pilot Schedule

1. Project Initiation & Management
   10/1/13 - 6/29/18

2. Outreach & Communications
   10/1/13 - 6/29/18

3. Preliminary Concept Exploration & User Needs
   11/1/13 - 12/26/14

4. Corridor Preparation
   12/2/13 - 9/30/16

5a. AMS - Phase 1
    1/6/14 - 5/29/15

5b. AMS - Phase 2
    6/8/15 - 6/29/17

5c. AMS - Phase 3
    7/10/17 - 6/29/18

6. SEMP
   6/10/14 - 6/26/15

7a. ConOps
    9/12/14 - 5/20/15

8. System Requirements
   4/23/15 - 6/30/16

9. Organizational Design
   10/1/15 - 5/5/16

10. Technical Design
    11/3/15 - 1/14/16

11. Component Development
    11/10/15 - 2/28/17

12. System Integration
    1/8/16 - 4/28/17

13. Institutional Deployment
    3/8/16 - 12/30/16

14. Technical Deployment
    3/1/16 - 6/30/17

15. Training
    5/1/17 - 8/17/17

16. System Validation & Acceptance
    4/16/16 - 6/28/17

17. System Operations
    7/10/17 - 6/29/18

18. System Evaluation
    4/21/15 - 6/30/16

19. Lessons
    3/7/18 - 6/28/18

18. System Evaluation
4/21/15 - 6/30/16
Status – Doing Well

- **Planning Phase Complete and Successful**
  - New Caltrans organization in place and personnel being hired
  - PM, Conops, SEMP, AMS documents completed
  - Funding – Shopp and Metro funding on track
  - Project Charter Signed by 13 stakeholders
  - Integration across organizations and efforts underway
  - Corridor Management occurring via human interactions
  - Positive can do attitude
Outreach and Funding
Outreach

- Project Charter Signed by all stakeholders
- Call for Projects Update
- MOU Discussion
- New “Connected” Newsletter
- ITS California Get Together
- ICM Session at ITS California
- Web Site – Begin public release of planning documents and information
MOU – Memorandum of Understanding

- Describes the overall project with a focus on operational, organizational and funding agreements
- More detailed than the Project Charter; subject to legal review
- Possible MOU sections:
  - Background
  - Project Purpose
  - Project Description
  - Governance/Dispute Resolution
  - Stakeholder Responsibilities
  - Operations Strategies and Principles (after Requirements)
  - Cost and Funding
  - Amendment Process, Terms, Renewals
  - Signatures
Welcome Samson!

Call for Projects Application Recommended For Funding

LA Metro recently released the list of projects recommended for funding, which includes the I-210 Connected Corridors Pilot. While none of the projects are considered funded until the Metro Board approves the list in September, this is GREAT news for the Pilot. The funding will support the arterial components of the project and will supplement the SHOPP funding discussed on page 3. Some of the project elements include Bluetooth readers and air quality sensor stations for all jurisdictions, controller firmware and communication improvements, signal detection upgrades, interfaces with transit systems, new traffic signals, and upgrades to existing ramp signal detection systems.

The team applied for a total of $6.704 million and we are very hopeful that the full amount will be awarded. A HUGE thanks to all of our stakeholders for your time and energy preparing the application, including staff from System Metrics Group, LA County Public Works, the cities of Pasadena, Arcadia, Monrovia, and Duarte; Pasadena Transit and Foothill Transit; and Caltrans District 7 (the lead agency).

Your commitment and support of the Pilot is what makes this project unique and will continue to be instrumental to its success.

THANK YOU TO ALL THE I-210 PILOT STAKEHOLDERS FOR YOUR COMMITMENT TO THE PROJECT
ITS CALIFORNIA
I-210 CONNECTED CORRIDORS
CELEBRATION

Monday, Sept. 21, 2015, 8:45PM
LAX Hilton - Landings Bar
The first beverage is on us!

🌟 Phase 1 is Complete
🌟 The Project Charter is Signed
🌟 Multi-Agency Call for Projects Application is on the draft list of funding
ICM Session at ITS California

**ICM** (Joe Butler, PATH)  Integrated Corridor Management (ICM) - Continuing growth and adoption – Tuesday 9:00 AM – September 22nd

- From Integrated Corridor Management to Integrated Regional Management - Dallas Experience  Dr. Ahmad Sadegh, Schneider Electric/Todd Plesko, Dallas Area Rapid Transit

- California Connected Corridors Program - a strategic approach to statewide Integrated Corridor Management (ICM) Joan Sollenberger/Dr. Nick Compin – Caltrans

- Using Real-Time Data to Automate Variable Speeds and Traveler Information – Jim Peters, DKS

- The Future of Integrated Corridor Management - Enhanced decision support utilizing new data, new metrics and the internet of things and people – Dr. Jane MacFarlane - Here/Nokia
Definition and Architecture Phase
System Interfaces Review

- **Existing system interfaces in D7**
  - Information Exchange Network (IEN) – LA County DPW
    - Access to traffic control systems (TCS) for remote plan change support
    - Supplies real-time traffic data collected from the TCS
  - Regional Integration of ITS (RIITS) – Metro
    - Provides interface to multiple Advanced Traveler Information Systems (ATIS) including go511

- **Considerations**
  - Interfacing with these systems would maintain consistency with the LA County Regional ITS Architecture
  - Final interface determination dependent upon the requirements
Arterial System Planning

- **Caltrans:**
  - (Ramp) intersections currently on Pasadena Series 2000 to be transitioned to Caltrans TSMSS
  - Other Corridor (ramp) intersections to be connected to Caltrans TSMSS

- **LA County:**
  - Has started the process to replace the current IEN to bring the technologies used up-to-date

- **Pasadena:**
  - Intersections currently on i2 system to be transitioned to a (new?) TCS due to termination of support by Siemens
  - Move intersections on end-of-life Series 2000 to the QuicNet system
Arterial System Schedule

- Duarte and Monrovia on KITS: Completed
- County to bring KITS onto IEN: Fall 2015
- IEN Contractor Selection: Spring 2016
- go511 upgraded system installed: November 2016
- Pasadena i2 intersection change-over: December 2016
- Caltrans TSMSS Operational: June 2017
- I-210 ICM Operational: July 2017
- IEN Replacement System operational: October 2017
Important: Reusable Components

- Organizational structures being piloted in District 7 are to be used state-wide.

- We wish to determine which CC software and hardware components will be considered state-wide reusable assets.
  - TSMSS – This is a state wide standard that will be used for CC.
  - PEMS – We don’t know yet - We believe that the most economical and by far the least risky method for implementing our performance analysis requirements is through utilization of PEMS, Arterial PEMS and Corridor PEMS.
  - Data Hub – We don’t know yet.
  - Decision Support System – We believe this to be a reusable component but care must be taken in its design and in the integration of CC and DCCM.

- Guidance is needed in the near future from Caltrans HQ on these topics.

- This is important and one of the largest risks to the timing and funding of the program.
Requirements Gathering
Requirements Gathering

- **Our “system”**
  - Composed of people, organizations, software and hardware
  - All must work together to accomplish our goals
  - Requirements must specify expectations for each component

- **Requirements gathering**
  - Both an educational and a definitional process
  - Requirements are emergent from interactions among users
  - How to gather emergent requirements?
Actors and Stories

- **First we define the Actors in our system**
  - Any person, organization, software or hardware that either comprise the system or interact with the system
  - These actors perform one or more roles in the operation of the system

- **Next we tell each other Stories**
  - A story describes in a step by step process what each person expects both themselves and other system components to do
Actors

- Managers
- Technical Staff
- Operators
- Public Relations
- Data Managers
- Drivers and Passengers
- Organizations
- Public Safety
- Systems
- System Managers
- 3rd Party
Stories

- Incident Management Planning - Generic
- Incident Management Execution - Generic
- Daily Activities
- Maintenance – Planned changes to people, organizations, software and hardware
- Unplanned problems - Errors/Malfunctions/Unplanned changes to people, organizations, software and hardware
- Reporting and Performance Evaluation
- Program Management
Requirements

- Requirements emerge from combining the stories and resolving differences of opinion between the different participants in the story telling process.

- **Two types of Requirements**
  - Purely Functional
  - Design Constraints

- **Deliverables**
  - Requirements that can be tested
  - Clear view of how users will judge success
  - Design guidelines in certain areas
  - Outline for an operational manual
Current Status

- Start with actors and story themes brainstormed by the requirements gathering team
  - Initial actors/stories listing completed
  - Forms basis for first round of “small team” meetings
  - Stories to be used as catalyst for discussion to expose requirements in our meetings

- Build the matrix of actors and organizations
  - Used to identify meetings
  - Iteris to present to and review with Corridor Stakeholders in August

- Meet with small user teams to educate, validate and update
Caltrans HQ

- Held requirements gathering introductory meeting
  - Well attended
  - No shortage of input
  - Probably future focus on design constraints as functional requirements to be provided by Corridor stakeholders

- Looking forward to follow on meetings:
  Khan Vu          Brian Simi          Alan Benson          Joe Butler
  Martha Styer     Tim Hart          Nick Compin          Francois Dion
  Mike Jenkinson   Gomez Gonzalo     Raj Porandla
  Larry Wooster    Stan Slavin       Ted Lombardi

Have we missed anyone?
210 Corridor Stakeholders

☐ Initial Meetings Begun
  - Consulted with Pasadena and County during preparation

☐ Complete Initial Meetings with remaining stakeholders
  - Early August

☐ Carry out Requirements Meetings
  - August/September/Early October
I-210 Connected Corridors

Incident Management
Response Plans - Examples

August 4, 2015
Approach

- Minor – Moderate – Major Incident Scenarios
- Automated Response Plans for Scenarios
  - Freeway ramp metering & ramp signal operations
  - Local arterial signal operations (designated routes only)
- Develop Rules Based Response Plans
  - Preliminary concepts
  - Alternative local arterial corridor routes
  - Factors to consider (for restrictive days/hours on select corridors)
    - Major events and activity centers
    - Schools and other high pedestrian activity areas (senior centers, rec centers, etc)
    - Businesses and residents
    - Bikes, peds, and transit (LRT grade crossing)
Influence Zones
### ZONES 2 and 3

**Zone 2**
- LA County - Arcadia
  - Zone 2A
    - LA County
  - Zone 2B
    - Arcadia

**Zone 3**
- Monrovia - Duarte
  - Zone 3A
    - Monrovia
  - Zone 3B
    - Duarte
ZONE 1, 2, and 3 Impact

- Reduce ramp metering rate
- Increase ramp metering rate
- Primary response route
- Alternate response route
- Route restrictions
ZONE 1, 2, and 3 Impact

- Reduce ramp metering rate
- Increase ramp metering rate
- Primary response route
- Alternate response route
- Route restrictions

Minor Incident
Moderate Incident
Major Incident
ZONE 2 and 3 Impact

Increase ramp metering rate (& coordinate ramp signals)
ZONE 1, 2, and 3 Impact

- **Reduce ramp metering rate**
- **Increase ramp metering rate**
- **Primary response route**
- **Alternate response route**
- **Route restrictions**

- **Minor Incident**
  - High school
  - Grade school
  - Middle school

- **Moderate Incident**
  - High school

- **Major Incident**
  - High school
  - Grade school
  - Senior Center

- **High school**
- **Grade school**
- **Middle school**
- **Senior Center**
Develop Rules Based Response Plans

Freeway Minor Incident Response (initial script)

- Reduce ramp metering (RM) rate at ramps within 2 miles upstream (RU1, RU2)
  - 50% reduction to start (adjust as needed)
  - Reduce green time to ramp intersection signal movements to on-ramps

- Increase RM rate at ramps within 2 miles downstream (RD1, RD2)
  - 50% increase to start (adjust as needed)
  - More green time to ramp I/S signal movements to access on-ramps (RID1, RID2)

- Increase RM rate at opposite direction ramps within 1 mile (RO1, RO2)
  - 25% increase to start (adjust as needed)

Alternative local arterial corridor routes (A1, A2)
  - More green time for arterial I/S signals (AID1, AID2) thru movements to RID1/RID2
  - Factors to consider (for restrictive days/hours on select corridors)
Current Status

- Have met with several cities

- Have begun raising detailed questions in re areas of activity, signal plans, rerouting mechanisms, etc.

- Recent 4 lane closure provided an excellent focus for some of the challenges and opportunities
I-210 Connected Corridors
Project Evaluation Framework

June 9, 2015
Facilities

- **I-210 corridor facilities to evaluate include:**
  - I-210 freeway and ramps (by city boundary segments)
  - Key parallel arterials & connecting arterials (by city segments)
  - Key intersections (at least 90 locations)
Strategies

- **Key strategies include:**
  - Non-Recurrence Congestion (focus of the project)
    - Incident Response Planning
    - Advisory Diversion Management and Rerouting
  - Recurrent Congestion & Off-Peak Period (measure residual benefits of project elements)
    - Freeway Adaptive Ramp Metering
    - Arterial Coordinated Signal Operations
Possible incident scenarios include:

- Scenario 1: Major Incident on Freeway (All Lanes Blocked)
- Scenario 2: Moderate Incident on Freeway (Partial Lane Closure)
- Scenario 3: Major Incident on Arterial (All Lanes Blocked)
- Scenario 4: Moderate Incident on Arterial (Partial Lane Closure)
- Scenario 5: Major Incident on Arterial Intersection (I/S Blocked)
- Scenario 6: Moderate Incident on Arterial I/S (Partial I/S Closure)
- Scenario 7: Incident on Freeway On-Ramp
- Scenario 8: Incident on Freeway Off-Ramp
Challenges

- **Non-recurrent congestion:**
  - How do we compare conditions before/after incidents?
    - We cannot time accidents
    - Every accident is different and resulting traffic is different
    - Accidents do not occur at same time or like days
    - Incidents are unpredictable
    - Requires robust detection data
    - Requires expert analysis

- **Timing of implementation**
  - Implementation is not done at one time - it is done in phases
  - When is it truly “after”? (measure in between phases?)
  - When and what is “before”?
Why “Significant” Non-Recurrent Congestion

I-210 from SR-134 to I-605
Caltrans TASAS Data - 2012
Percentage of Days with Number of Collisions from Total Weekdays

- 5% No Collisions
- 12% 1 Collision
- 20% 2 Collisions
- 20% 3 Collisions
- 43% 4 or More Collisions

Not many collision-free days
Why “Significant” Non-Recurrent Congestion

Not many incident-free days
Suitable Performance Measures

- **Estimated performance measures on other projects:**

<table>
<thead>
<tr>
<th>PERFORMANCE MEASURE AREAS</th>
<th>San Diego</th>
<th>Dallas</th>
<th>Minneapolis</th>
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<tbody>
<tr>
<td>Annual Travel Time Savings (Person-Hours)</td>
<td>246,000</td>
<td>740,000</td>
<td>132,000</td>
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<td>Improvement in Travel-Time Reliability</td>
<td>10.6%</td>
<td>3%</td>
<td>4.4%</td>
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<td>(Reduction in Travel-Time Variance)</td>
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<tr>
<td>Fuel Saved Annually (in Gallons)</td>
<td>323,000</td>
<td>981,000</td>
<td>17,600</td>
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<tr>
<td>Tons of Mobile Emissions Saved Annually (in Tons)</td>
<td>3,100</td>
<td>9,400</td>
<td>175</td>
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<td>(GHG Emissions)</td>
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*Requires use of modeling (e.g., Caltrans Cal-B/C economic model)*
Suitable Performance Measures

- **Potential suitable performance measures:**
  - Demand
    - Vehicle Miles Traveled (VMT)
  - Mobility
    - Speeds and Travel Times
    - Delay (vehicle and/or person) and Vehicle Hours Traveled (VHT)
    - Congestion Period (peak period hours)
  - Productivity
    - Traffic Flow (volumes - vehicles an/or persons)
    - Level of Service (intersections)
  - Reliability
    - Travel Time Variability (Buffer Index)
    - Planning Time Index
  - Safety (SWTRS/TASAS data available year or more later)
Suitable Performance Measures

- **Transit (?)**
  - Transit on-time performance (*if transit agency provides data*)
  - Average travel times (*if transit agency provides data*)
  - Transit ridership (*if transit agency provides data*)

- Need to investigate available Gold Line data
  - Time of day
  - Accuracy
  - Access

- Ridership on specific incident days
Data Sources

- **Data sources:**
  - Available sources (before & after)
    - Caltrans Freeway PeMS (or ATMS) – freeway & all ramps
    - Arterial intersection signal detection
    - Arterial segment speed/occupancy detection
    - Arterial blue tooth readers
    - Caltrans TASAS, CHP SWTRS, CHP CAD; Metro FSP data
    - Local agency collision database (Pasadena Traffic Records System)
    - INRIX or HERE crowd sourcing (Metro/SCAG in process of acquiring INRIX)
  - Potential manual needed (before & after)
    - Arterial link tube and I/S turning movement counts (before & after)
      - select locations where detection is not available
    - Probe vehicle runs to validate INRIX, HERE, PeMS, blue tooth
For Any Manual Data Collection

- **Before** (before implementation) – Fall 2015 or Spring 2016
- **After** (after implementation) – at least 3-6 months after implementation
## LOCAL RISKS

<table>
<thead>
<tr>
<th>Overall Project Risk</th>
<th>Duarte</th>
<th>Arcadia</th>
<th>Monrovia</th>
<th>Pasadena</th>
<th>LA County</th>
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<tbody>
<tr>
<td>Funding</td>
<td></td>
<td>What, if anything, needs to be cut from the Pilot project due to funding constraints or shortfalls?</td>
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<tr>
<td>Staffing/Personnel</td>
<td>Overtime required?</td>
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<td>Systems</td>
<td>Communications needs to be reliable (100% on-line?)</td>
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<td>Fiber connections to CT through the current project LA 210 EA 30640</td>
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<td>Organizational</td>
<td>Do all parties continue to work together?</td>
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<td>Agency Risk</td>
<td>No local funds available.</td>
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<tr>
<td>Funding</td>
<td>No or limited local funds.</td>
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<td></td>
<td>Prioritization of limited funds (balancing city needs versus needs of the CC).</td>
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<td>Due of Traffic Impact fees (are other funds available)?</td>
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<td>Unsuccessful Metro grant.</td>
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<td>Requires more funding than anticipated.</td>
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<td>Staffing/Personnel</td>
<td>Project requires additional staffing (consultants).</td>
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<td>Management won't pay for staff/personnel required (esp. after hours).</td>
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<td>All hands on deck (ca we drop everything when an incident occurs?).</td>
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<td>Not enough people or time.</td>
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<td>Systems</td>
<td>Requires accurate infrastructure inventory.</td>
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<td>Requires accurate fiber/wireless infrastructure.</td>
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<td></td>
<td>Keeping local systems supported and up and running (M&amp;O).</td>
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<td>No redundancy in the system.</td>
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<td>Reliability of the local agency traffic signal network (no or faulty detection or BBS).</td>
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<td>Supporting local systems (i.e. CCTV/video).</td>
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<tr>
<td>Organizational</td>
<td>N/A</td>
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<td>City Attorney, Council and/or management no longer supportive (change in stance or leave office).</td>
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<td>Negative publicity (the smallest opposing voice may be the loudest).</td>
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<td>Agreements not signed.</td>
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<td>Insufficient outreach.</td>
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Action Items and Next Meeting Time
Thank You