



Connected Corridors Systems Engineering Update

May 22, 2014

1 of 15 Slides

Agenda and Introductions

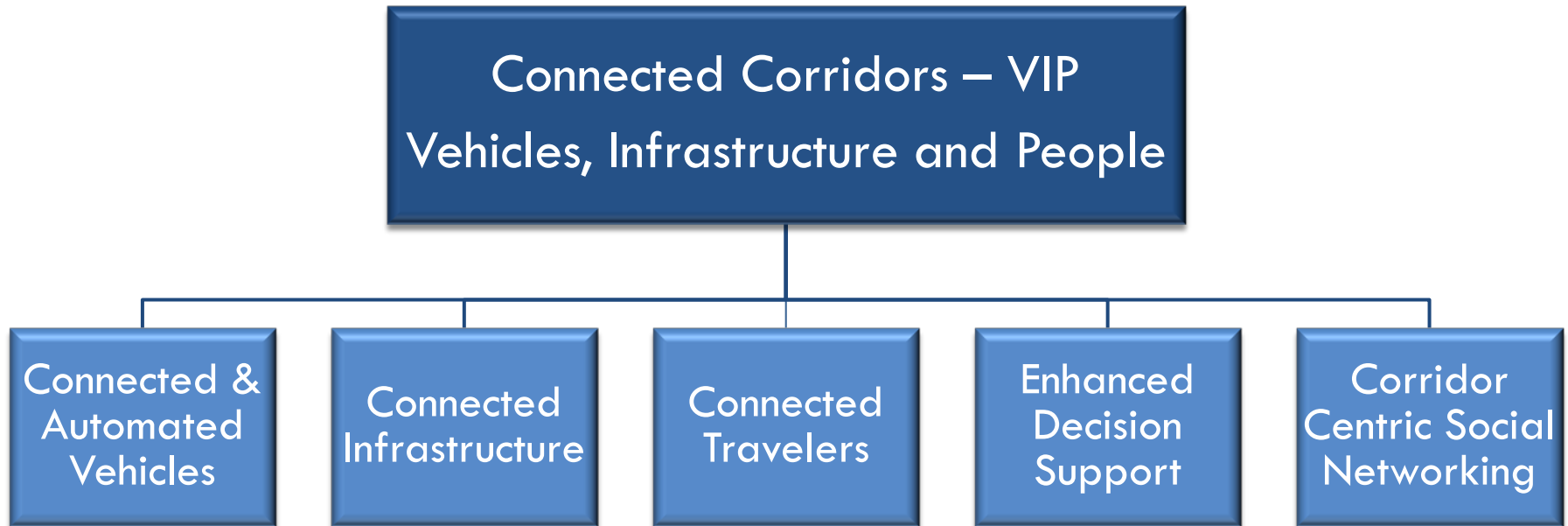
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- **Vision**
- **Corridor**
- **System Engineering Schedule**
- **Status by High Level Tasks**
- **Generic ICM System Components**
- **Discussion**



The Connected Corridors Vision

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TRB 2015 Theme: Corridors to the Future – Transportation and Technology

Caltrans and ICM - Connected Corridors

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- **Goal:** Caltrans will lead the planning, implementation and ongoing operational support for 50 corridor segments in California – “*ICM California*”
- **“Connected Corridors Program”** – Multi organizational program tasked with delivering the reusable components of “*ICM California*” and piloting those components”
- **“I-210 Pilot”** – First Caltrans-lead ICM effort in California and first corridor site in the “*ICM California*” plan.
- **“Connected Corridors: VIP (Vehicles, Infrastructure and People)”** – Longer term vision of coordinating all major actors in a transportation corridor.



The Connected Corridors Program

□ Caltrans

- Leadership of corridor management efforts
- Organizational and cultural changes (HQ and districts)
- Corridor focused and prioritized funding
- Commitment to proper sensing and control elements
- Integration with CMM (Capability Maturity Matrix) and TSM&O processes
- Development of Corridor Wide operational scenarios, systems and awareness
- I-210 Pilot

□ PATH

- Working with industry, government and academia to provide recommendations for “ICM California” components and methods
- Performing applied research on macro models, probe data, cell tower data and control strategies
- Designing fast, easy to calibrate simulation tools for use by Caltrans in day to day operations
- Supporting Caltrans in I-210 Pilot planning and implementation efforts
- Documenting the I-210 pilot so that its tools and processes may be more easily reused in other corridors

□ **Our 210 Stakeholders – LAMETRO, LACounty, SCAG, SGVCOG, Pasadena, Arcadia, Monrovia, Duarte ++**

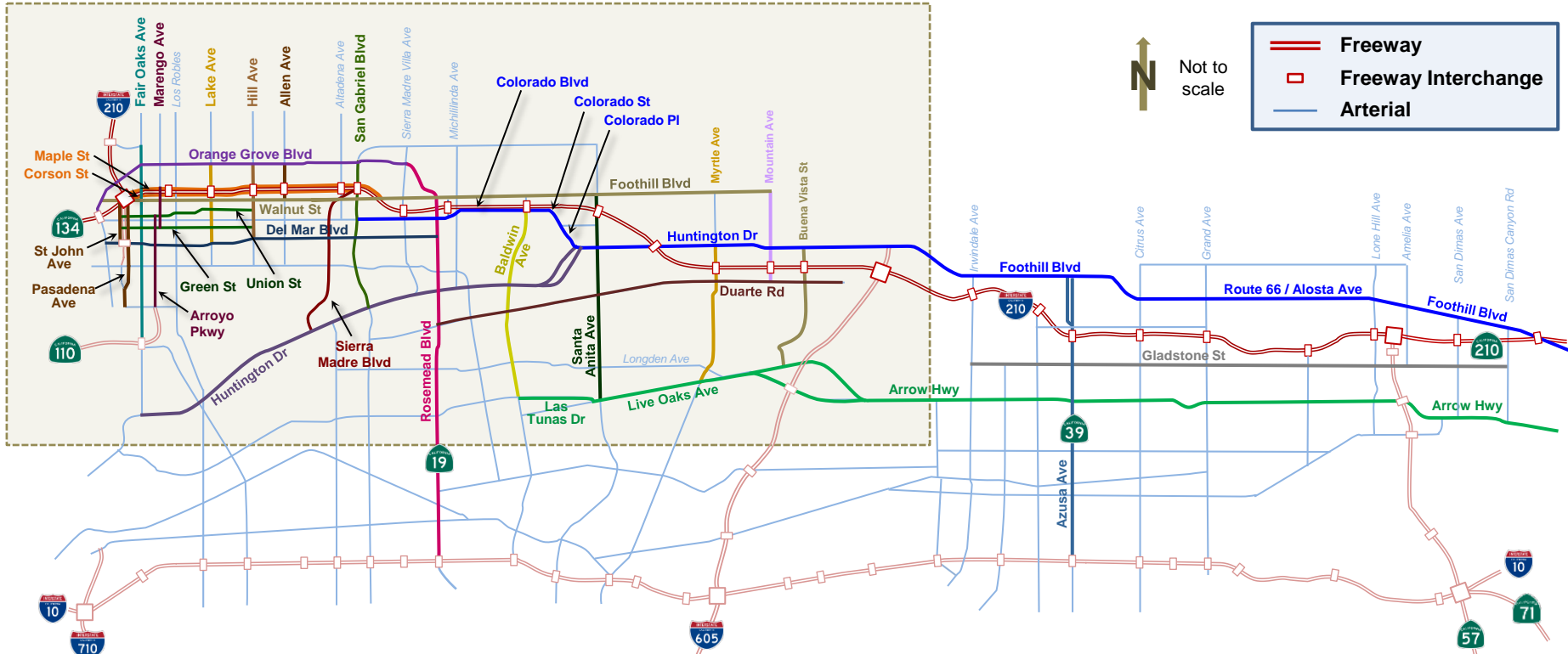
□ **Our 210 Partners and Vendors – SMG, SANDAG, TSS, Delcan, ITERIS ++**



I-210 Project Corridor & Caltrans Partners

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Phase 1 Area of Interest



Current Partners Identified (but not limited to):

- Caltrans, Metro, UC Berkeley PATH, LA County, Pasadena, Arcadia, Monrovia, Duarte (Phase 2 - Irwindale, Azusa, Glendora, San Dimas, and La Verne)



Project Schedule

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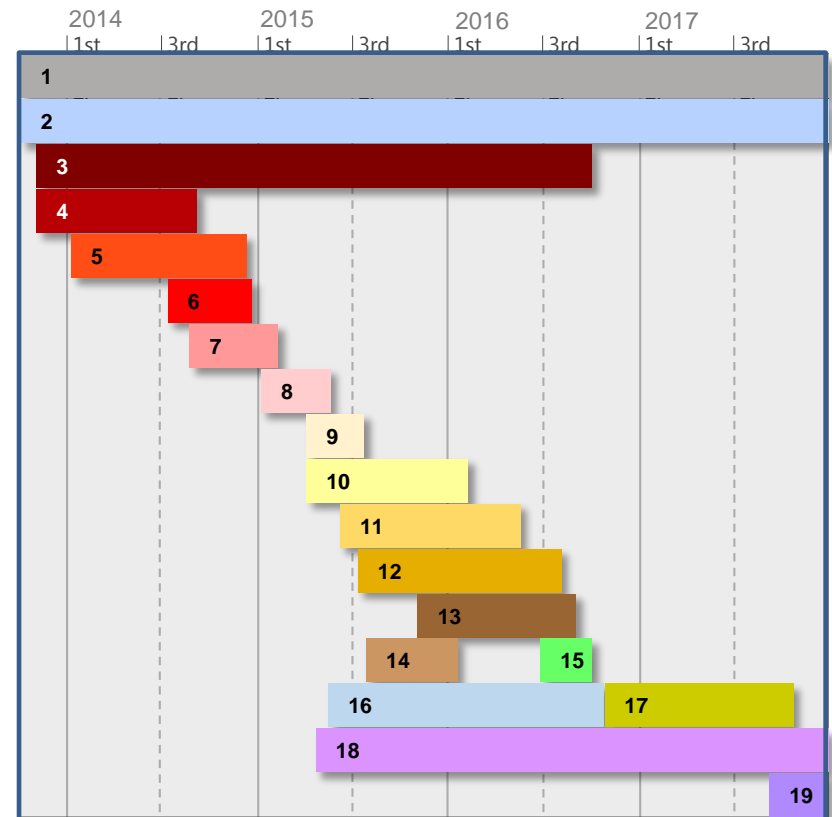
□ Key Deliverables

Name	Date
Submit Draft Project Management Plan	6/2014
Submit Preliminary System Concept to Stakeholders	8/2014
Submit Draft SEMP to Stakeholders	10/2014
Submit Draft ConOps to Stakeholders	11/2014
Submit Draft System Validation Plan to Stakeholders	11/2014
Alternative Analysis Report	12/2014
System Acceptance Tests	9/2016
System Validation and Acceptance Report	10/2016
System Launch	10/2016
System Evaluation Report	11/2017
Lessons Learned	12/2017

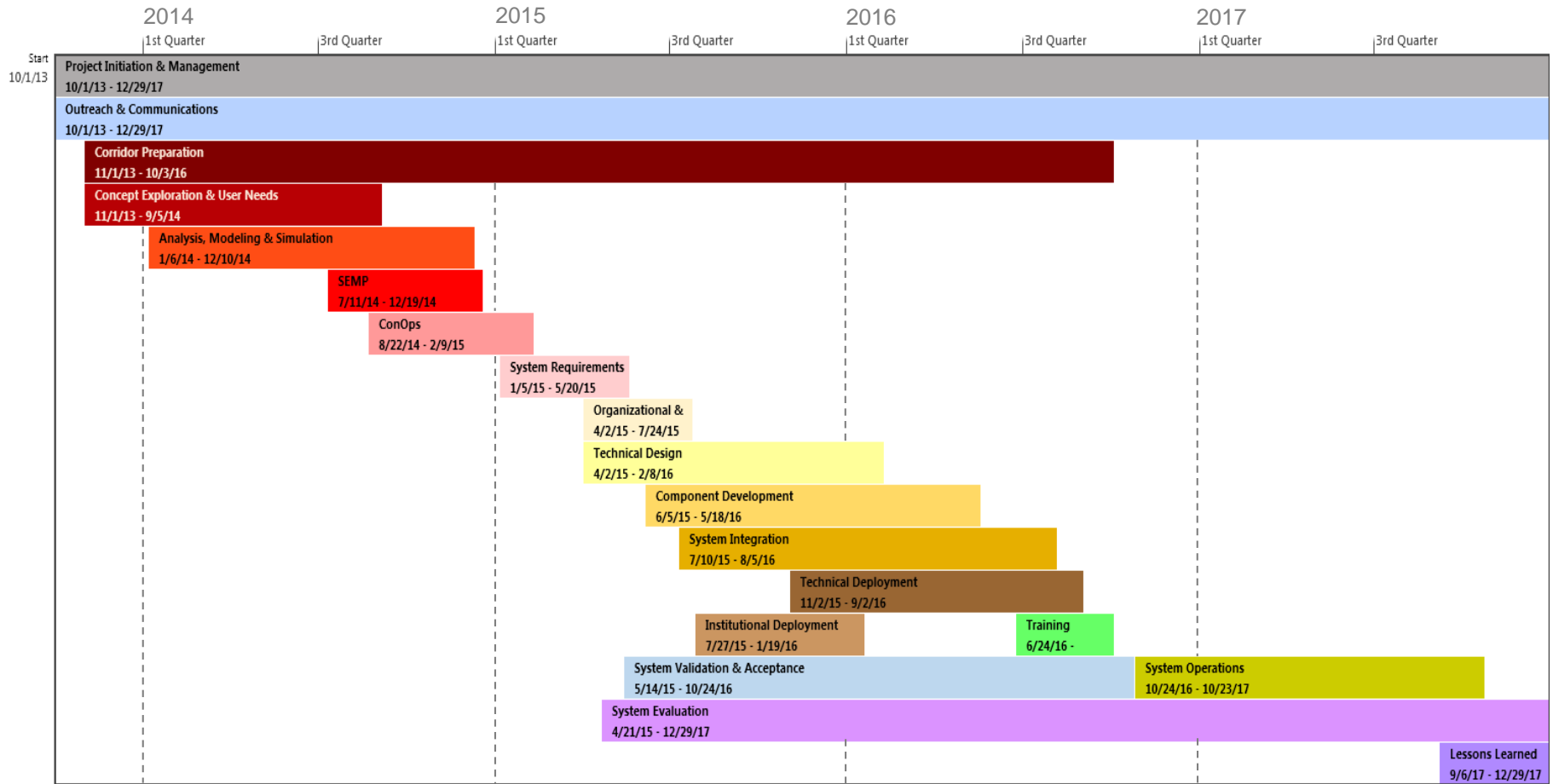
Project Schedule

□ Main Project Tasks

1.	Ongoing	Project Initiation & Management
2.	Ongoing	Outreach & Communications
3.	11/13 – 10/16	Corridor Preparation
4.	11/13 – 9/14	Concept Exploration & User Needs
5.	1/14 – 12/14	Analysis, Modeling & Simulation (AMS)
6.	7/14 – 12/14	System Engineering Management Plan (SEMP)
7.	8/14 – 2/15	Concept of Operations (ConOps)
8.	1/15 – 5/15	System Requirements
9.	4/15 – 7/15	Organizational & Procedural Design
10.	5/15 – 2/16	Technical Design
11.	6/15 – 5/16	Component Development
12.	7/15 – 8/16	System Integration
13.	7/15 – 1/16	Institutional Deployment
14.	11/15 – 9/16	Technical Deployment
15.	6/16 – 10/16	Training
16.	5/15 – 10/16	System Validation & Acceptance
17.	10/16 – 10/17	System Operations & Maintenance
18.	4/15 – 12/17	System Evaluation
19.	9/17 – 12/17	Lessons Learned



Project Schedule



Stages in 210 Pilot – Focus on Planning

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□ Planning – *We are here!*

- ▣ Assemble Sponsors and Stakeholders
- ▣ Concept Exploration
- ▣ AMS
- ▣ PMP and SEMP
- ▣ Concept of Operations
- ▣ Funding and Organizational Structures
- ▣ Initial Requirements

□ Implementation

- ▣ Agree on MOUs, Playbooks, Deployment
- ▣ Integrate/build supporting systems
- ▣ Refine corridor sensing and control capabilities
- ▣ Deployment (System and MOUs)

□ Operations and Maintenance

- ▣ Operate the system
- ▣ Evaluate the system
- ▣ Maintain the system
- ▣ Upgrade the system

1. Project Initiation and Management

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- **Corridor Selected end of 2013**
- **Contractual Items**
 - ▣ Program currently funded by Caltrans HQ through June 2015
 - ▣ Subsequent three year contract in process
- **Funding efforts at Caltrans**
 - ▣ PID due by end of June
- **Organizational efforts**
 - ▣ Reorganization plan in process
- **PMP in internal PATH review. Caltrans review in early June**



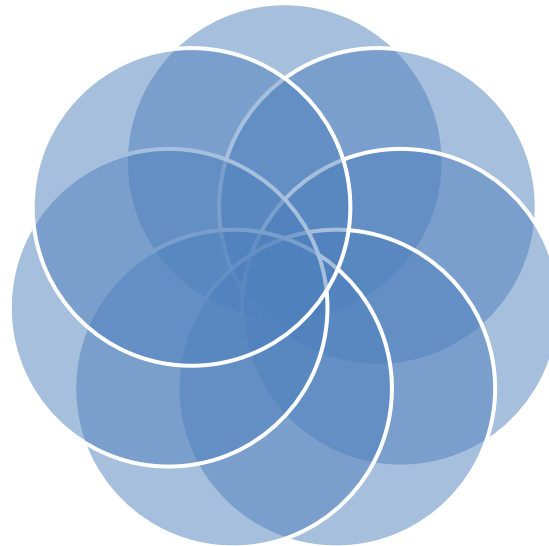
2. Outreach and Communication

Engaged primary stakeholders early on – Caltrans D7, LA Metro, LA County Dept. of PW, and Phase 1 cities (Pasadena, Arcadia, Monrovia, Duarte) – Held initial and technical meetings; User Needs Workshop

Upcoming meetings: City Councils, Foothill Transit, South Coast Air Quality Management District, Metro Gold Line Construction Authority, other first responders, community and non-profit groups

Developed one page fliers, website, and bi-monthly “Digest”

Outreach & Communications is going well and on schedule; positive feedback from stakeholders!



Outreach meetings: San Gabriel Valley Council of Govts. (staff and Transportation Committee), SCAG, CHP/Coroner, Metro Transit

Prepared **Outreach & Communications Work Plan** (part of Project Management Plan) in late 2013

Videoconference series this summer for “launch;” **newsletter and Fact Sheets** under development; upcoming **conference participation; Letter Agreement** with primary stakeholders; then **MOU; Resolution of Support** from SGVCOG

3. Corridor Preparation

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- **Corridor Analysis**
 - ▣ Detector health
 - ▣ Detection gaps
 - ▣ Current traffic control capabilities

- **Maintenance and upgrade needs**
 - ▣ Preparation of PIDS
 - ▣ Lining up of possible funding

- **Currently starting AMS**
 - ▣ Modeling of corridor for simulation analyses
 - ▣ Development of evaluation scenarios

4. Concept Exploration

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- **Inventory of corridor systems**
 - ▣ Transportation networks (freeway, arterial, transit, parking, etc.)
 - ▣ Traffic signal control systems (intersections, ramp metering)
 - ▣ Traffic detection systems
 - ▣ Traveler information options
 - ▣ Understanding institutional environment
- **Review of other ICM efforts**
 - ▣ Lessons learned
 - ▣ Desirable common features
 - ▣ Basic connectivity needs
- **Identification of basic user needs for I-210 Pilot**
- **Review of regional ITS architecture**
 - ▣ Setting up a team to identify basic communication, sensing and control capabilities

Key Underlying Goal:

*To get a head start
on funding requests
and construction
projects*

4. Summary of User Needs and Metrics

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- **Initial concepts defined by I-210 Stakeholders**
 - ▣ Focus on incidents where ramp metering rates, signal timings, alternate routes and transit services are modified to ameliorate the situation
 - ▣ Pre-agreed playbook scenarios
 - ▣ Enable turn key operations when traffic managers are not available and coordinated system actions are needed

- **Metrics recommended by I-210 Stakeholders**
 - ▣ Citizen and traveler satisfaction
 - ▣ Mobility, Reliability and Productivity
 - ▣ Safety and Incident Management
 - ▣ Air Quality

4. Preliminary User Needs

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Data Collection	
1	Asset Availability Monitoring
2	Travel Demand Data Collection & Processing
3	Traffic Operational Data Collection & Processing
Decision Support	
4	Operational Forecasts
5	Decision-making Assistance
6	Operational Evaluation
Control Capabilities	
7	Strategy Customization
8	Automated Control
9	Manual/Override Control Options
10	Multi-Agency Coordination
11	Information Visualization
Information Dissemination to Travelers	
12	Provision of Real-Time, Multi-Modal Information to System Operators
13	Provision of Real-Time, Multi-Modal Information to System Users
14	Trip Decision Support Tools for Travelers
Data Management	
15	Data Archival
System Management and Maintenance	
16	ICM System Management
17	System Maintenance

5. AMS

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- **Lack of detection health is a challenge**

6. System Engineering Management Plan (SEMP)

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- **Extension of Project Management Plan (PMP)**
- **Focus on technical system engineering elements**
 - ▣ System configuration management
 - ▣ System verification plan
 - ▣ System deployment plan
 - ▣ Evaluation strategy
 - ▣ Operations and maintenance plan
 - ▣ Possibly others
- **Initial draft in progress (started early)**

7. Concept of Operation

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- **Expansion of preliminary concepts exploration and identified user needs into a formal ConOps document**
- **Key activities**
 - ▣ Formalization of key system components
 - ▣ Development of operational scenarios
 - ▣ Development of key performance metrics
 - ▣ Characterization of operational and support environments
 - ▣ Assessment of potential impacts on corridor operations
- **Preliminary step to the development of system requirements**

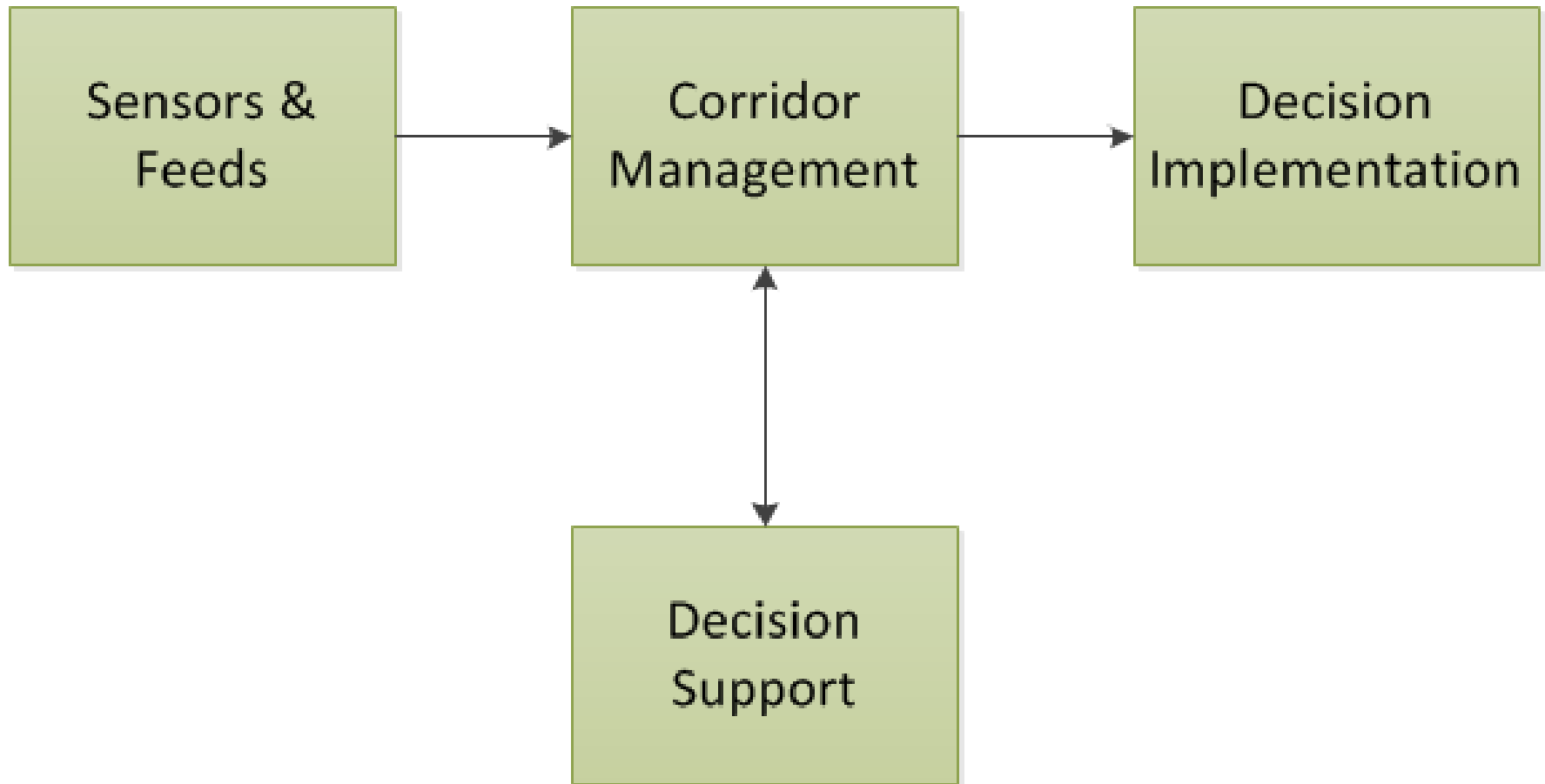
Summary

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- **SE Plan being followed**
- **On Schedule**
- **Challenges**
 - Apparent gaps in both data and control capabilities – Are working to reduce these but this is slowing down the AMS effort.
 - Corridor Infrastructure upgrades take time – Wise to start early before detailed requirements are in place
 - Education on ICM – Introduction to other ICMs and their components underway. Will speed up subsequent tasks.
 - Diversity of traffic control and detection systems – Start planning for communication and standardization where possible.
 - More agencies wish to be involved than originally planned – Adjusting tasks and schedules (hopefully only in a small way)

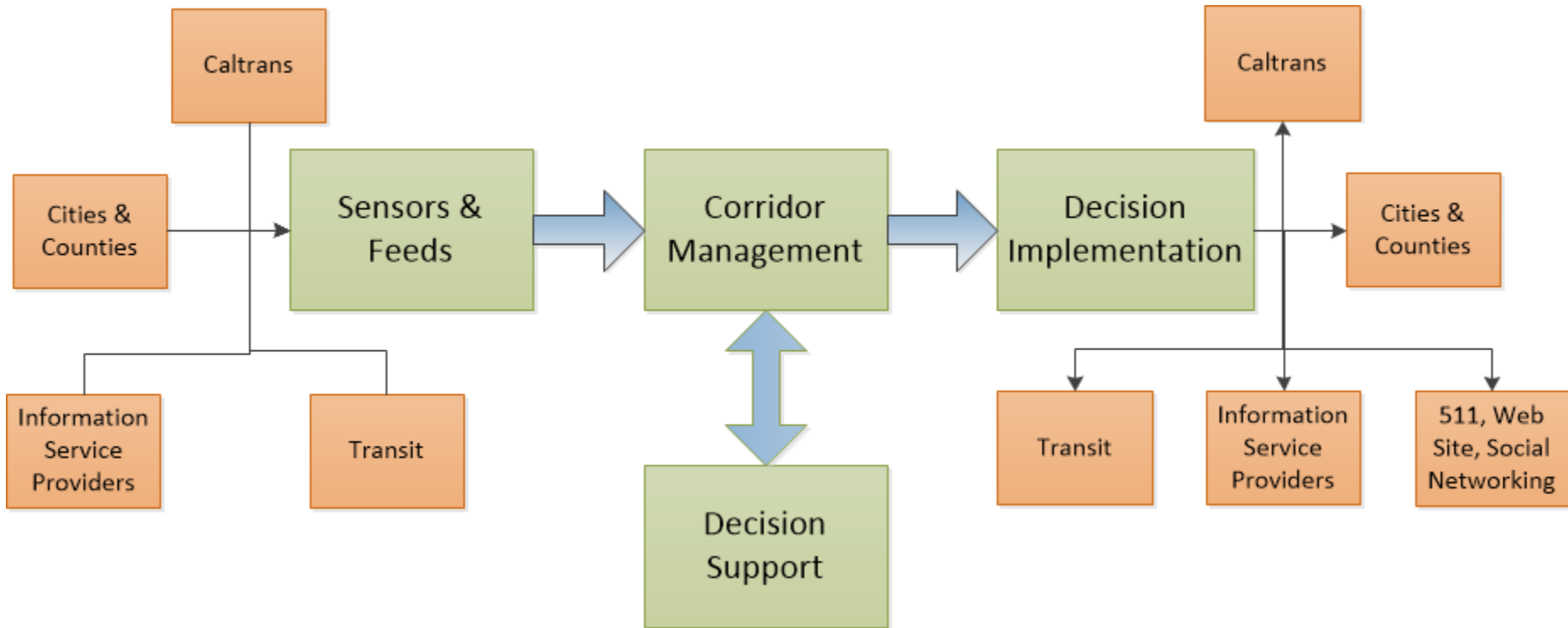
ICM System

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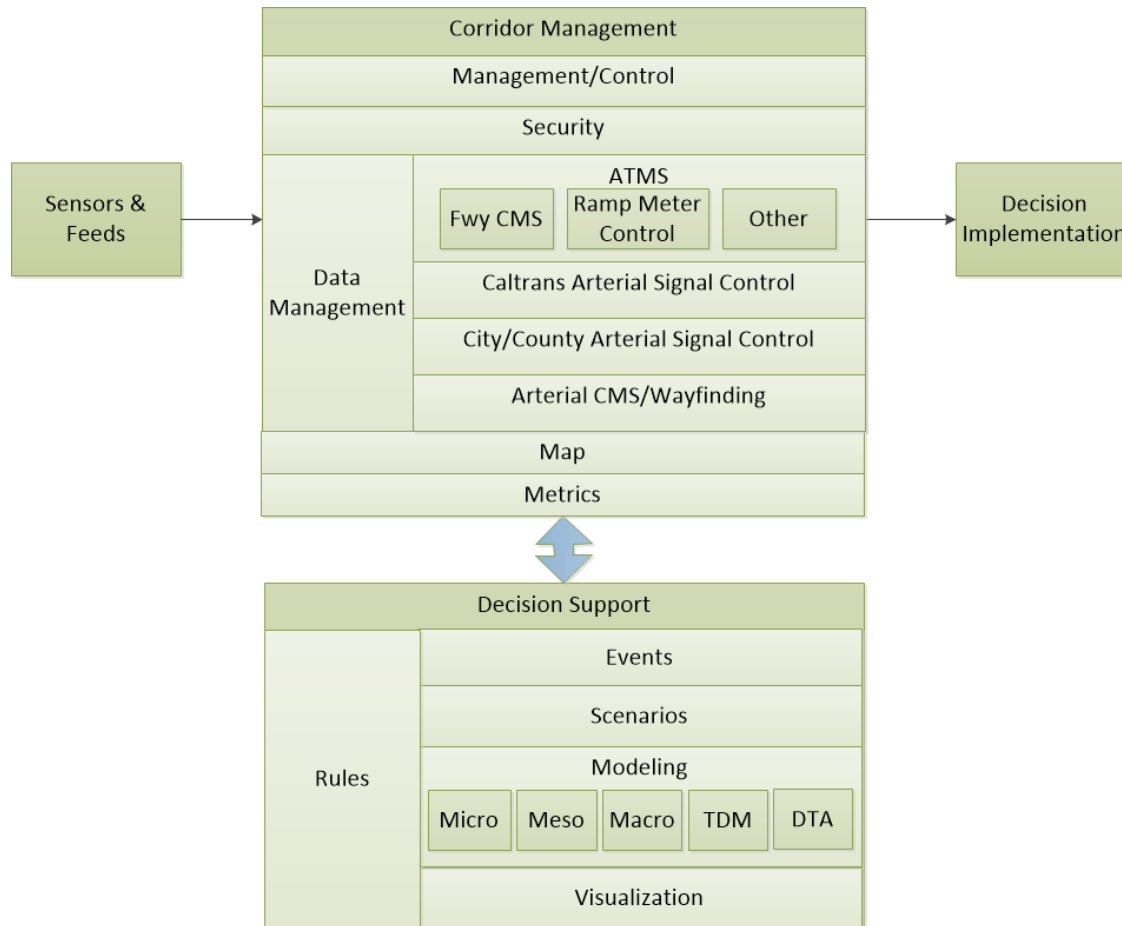
Communication and Data Standardization

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System Components

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Items for Discussion

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- **Connected Corridors Messaging**
 - ▣ Role of other organizations in this effort
 - ▣ Role of PATH in future corridors
 - ▣ Interplay between work PATH is doing for Caltrans on DSS and the requirements we end up with

- **Registration for TRB Mid Year (Posters etc)**

- **D7 beginning to work with us on simulation tools**
 - ▣ Demonstration end of June?
 - ▣ Ongoing work each month or so

- **Upgrading**