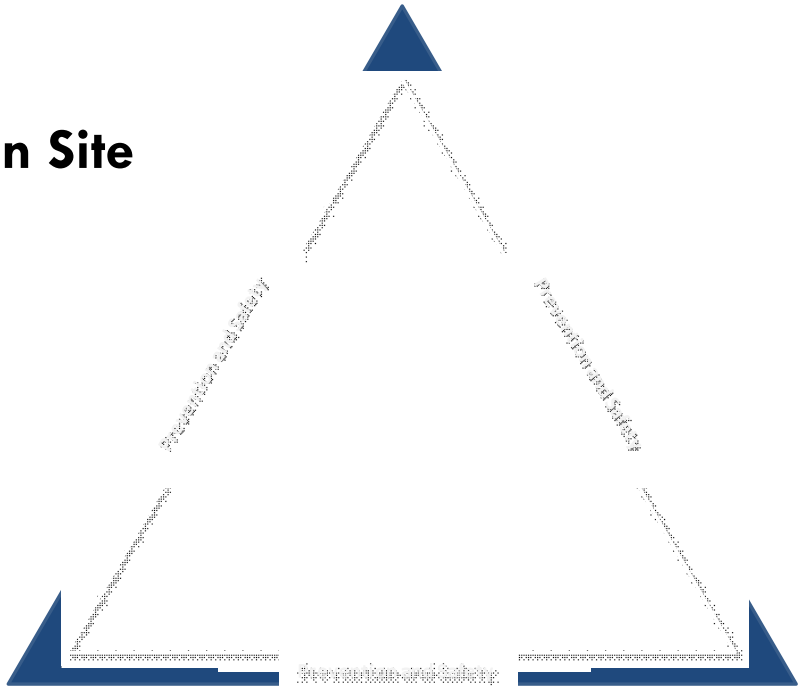
CONNECTED CORRIDORS
"ICM CALIFORNIA"

MANAGEMENT PRESENTATION

7/18/2013

I-210 "ICM California" Pilot Site

- **Executive Summary**
- **Integrated Corridor Management (ICM)**
- **Connected Corridors Program**
- **ICM California: I-210 Demonstration Site**
- **Discussion**



Executive Summary

- **Federal/State programs launched to encourage *demonstrable* transportation network *improvements* in safety, performance, reliability and environmental sustainability.**
  - USDOT launches 7-year *Integrated Corridor Management (ICM)* initiative
  - CTC requests Corridor System Management Plans
  - MAP-21 – Requires measurement and validation of improvements
  - SHRP2 – Recommends capability maturity model (CMM) for projects
- **To meet the requirements set forth in these initiatives, *Caltrans* sets system management goals including leading the day to day management of major California corridors, in tight integration with MPOs, cities and counties.**
- **Day to day traffic management includes:**
  - ***proactive real time*** supply management (ramp metering, signal light synchronization, guided rerouting, improved incident response, etc)
  - ***proactive*** demand management (mode, travel time and re-routing)

Executive Summary

- ***Goal: Caltrans* will lead the planning, implementation and ongoing operational support for 50 corridor segments in California – *"ICM California"***
- ***"I-210 Pilot"* – The first *Caltrans-lead* ICM effort in California and the first corridor site in the "ICM California" plan. (Not yet official)**
- ***"Connected Corridors"* – The multi organizational program tasked with delivering all reusable components of "ICM California."**
- ***Next Step: Connected Corridors–VIP (Vehicles, Information and People)* positions Caltrans for autonomous/connected vehicles, social network coordination and ultimately integration with future Smart City initiatives.**
- **Your support and understanding is key**

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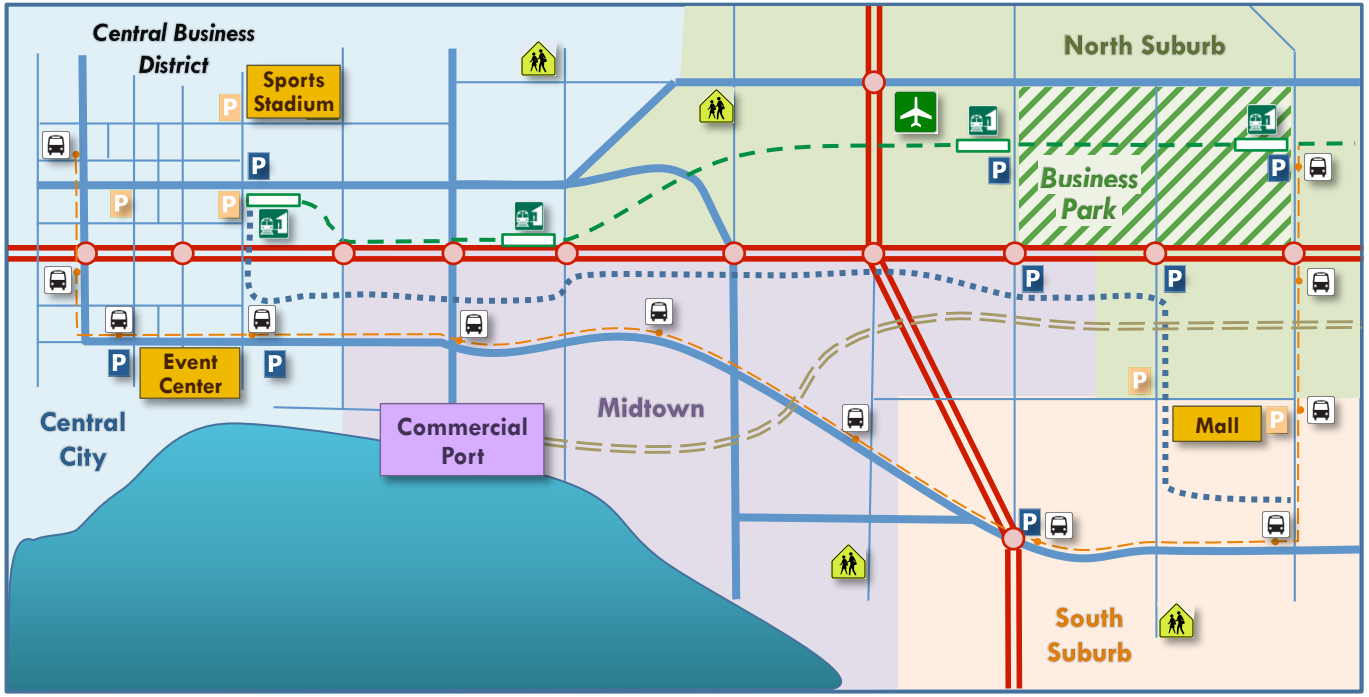
Integrated Corridor Management (ICM)

- **What is Integrated Corridor Management (ICM)?**
- **Caltrans' System Management Goals + Related Programs**
- **Existing ICM Efforts and Strategies**

ICM – Integrated Corridor Management

- **While the ICM term is well known, various existing management efforts already support the ICM concept, particularly ITS applications**
  - Active Traffic and Demand Management (ATDM) systems is the dynamic management, control, and influence of travel demand, traffic demand, and traffic flow of transportation facilities.
  - Advanced public transportation system (APTS), such as automated vehicle tracking, dynamic schedule adjustments, bus rapid transit
  - Advanced traffic management system (ATMS), such as traffic-responsive and real-time signal control systems
  - Advanced traveler information systems (ATIS), such as real-time traveler information systems, dynamic navigation systems
- **The key to ICM is integrating existing systems and management efforts with new concepts and relationships to develop a coherent multi-modal, multi-jurisdiction, corridor-wide transportation management system**

Typical ICM Corridor



Stakeholders

State DOT – Freeway Management

Local Jurisdictions – Arterial & local traffic management

Transit Agencies – Bus, rail and other public transportation

Parking operators

Information service providers

Potentially many mores…

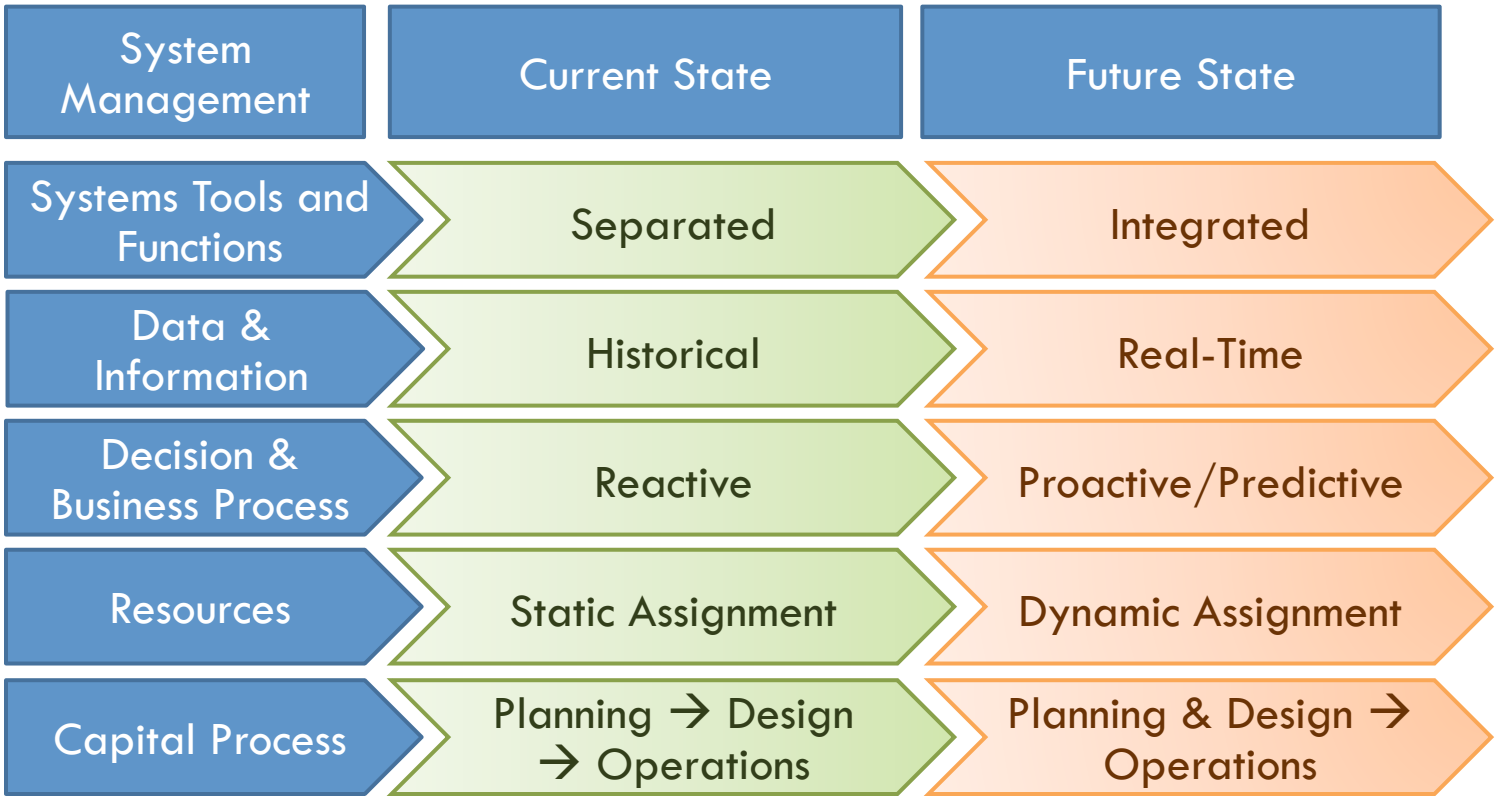
California's Progress towards ICM …

- $20B transportation bond in 2006
- California Transportation Commission is on-board
  - Demand science based reasoning for project selection
  - Require to consider the use of technology as a cost effective investment
  - Allocate over $100M to ITS projects
- $4.5B for Corridor Mobility Improvement (CMIA)
- Corridor System Management Plans (CSMPs) required on all CMIA corridors
  - CSMPs developed for over 50 freeway corridors
  - 31 using microscopic traffic simulation to assess impacts of improvements
  - Simulations and scientific assessments point to ITS elements as being among most cost effective investments

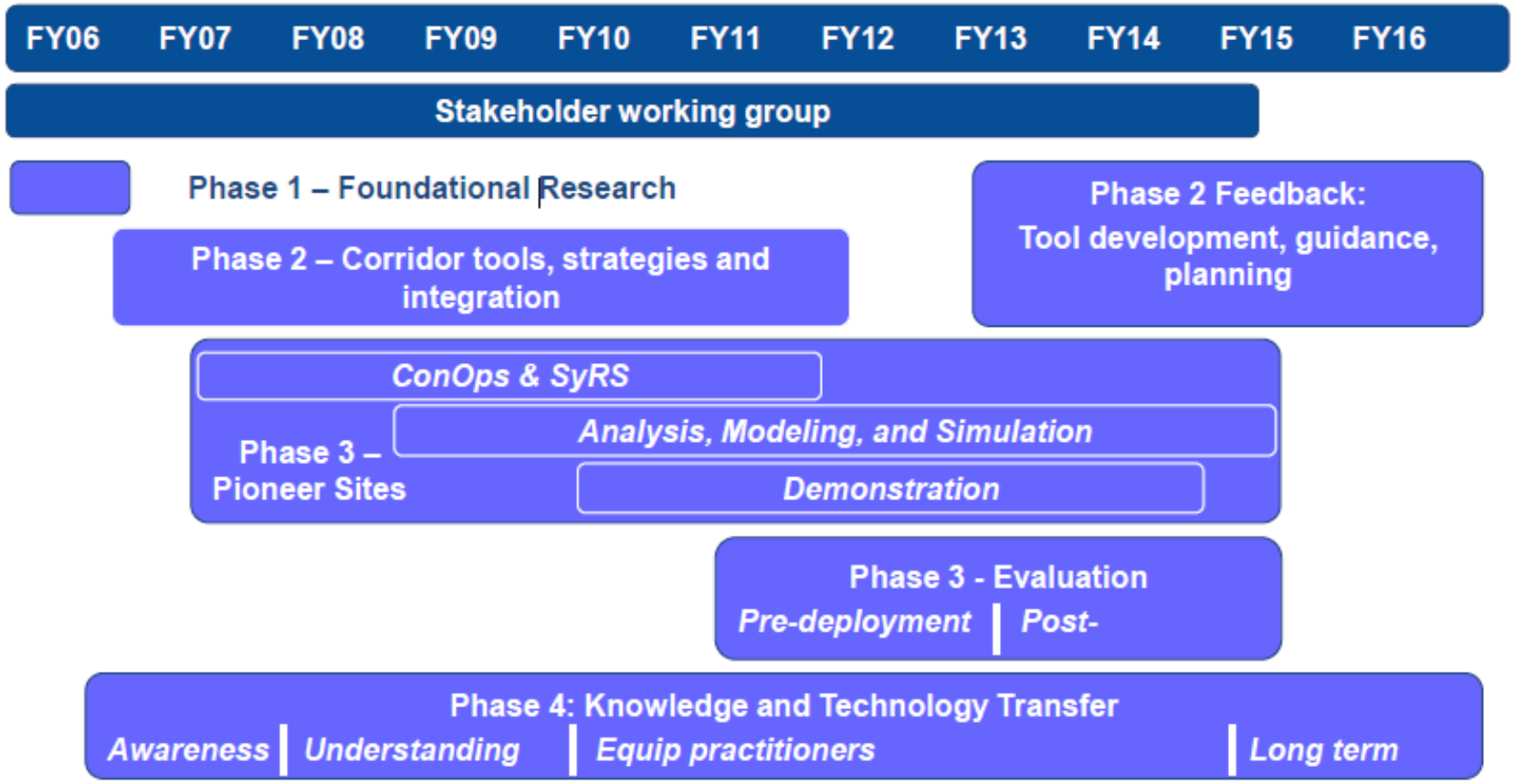
Caltrans System Management Goals

1. **Create a system management culture**
2. **Performance-based framework for all TMS work activities and funding prioritization**
3. **Establish a well-maintained and high-performing TMS infrastructure that supports real-time traffic management**
4. **Cooperatively develop and implement real-time (active) traffic management to optimize flow, safety and aid regions and the State to meet greenhouse gas reduction (GHG) targets from transportation**
5. **Renew consensus on and adhere to critical statewide standards**

System Management Vision

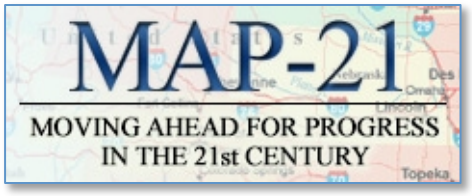


USDOT ICM Initiative



Effect of MAP-21 Requirements

- **Outcome-driven approach tracking performance**
  - USDOT to establish performance measures
  - State DOTs to develop performance targets in consultation Metropolitan Planning Organizations and others
  - Utilization of performance targets expected to provide agencies with an effective tool to help allocate limited resources towards effective improvement projects



- **Areas for which performance measures are to be defined include**
  - *Safety*
  - Infrastructure condition
  - *Congestion reduction*
  - *System reliability*
  - *Freight movement and economic vitality*
  - *Environmental sustainability*
  - Reduced project delivery delays

SHRP2 – Strategic Highway Research Program

- **Focused on planning, reliability, safety and renewal**
- **Recommends Capability Maturity Model (CMM)**

SHRP2
STRATEGIC HIGHWAY RESEARCH PROGRAM

Basic Institutional Capability Maturity Elements and Levels

Institutional Elements	Level 1 Ad Hoc	Level 2 Rationalized	Level 3 Mainstreamed
Culture/ leadership	Mixed, hero driven	Championed/ internalized across disciplines	Commitment to customer mobility
Organization and staffing	Fragmented, understaffed	Aligned, trained	Integrated
Resource allocation	Project level	Criteria-based program	Sustainable budget line item
Partnerships	Informal, unaligned	Formal, aligned	Consolidated

Source: SHRP2 S2-L06-RR-2 Report

ICM Projects – United States

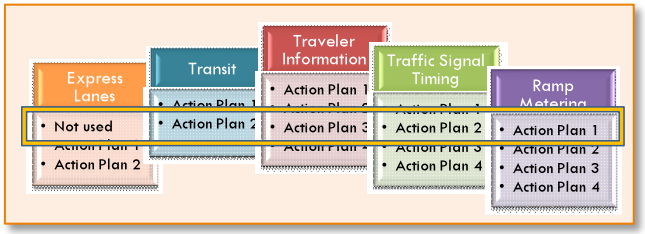
Corridor	Corridor Type	Lead Agencies	Activities
I-15 Diego	Suburban	SANDAG	• ConOps and System Requirements developed in 2008 • Simulation evaluation in 2009-2010 • System launched in spring 2013 • Currently in evaluation phase
US-75 Dallas	Suburban/urban	DART	• ConOps and System Requirements developed in 2008 • Simulation evaluation in 2009-2010 • System launched in spring 2013 • Currently in evaluation phase
I-80 Bay Area	Suburban/urban	MTC / Caltrans	• ConOps developed in 2010 • Project groundbreaking in October 2012 • Project expected to be completed summer 2015
I-95 / I-395 Virginia	Rural, Suburban & Urban	Virginia DOT	• ConOps development initiated in 2012 • Currently developing deployment plan & partnerships
I-394 Minneapolis	Suburban/urban	Minnesota DOT	• ConOps and System Requirements developed in 2008 • Simulation evaluation in 2009 • No apparent activity since 2009
I-270 Maryland	Suburban	Maryland DOT	• ConOps and System Requirements developed in 2008 • No apparent activity since 2008

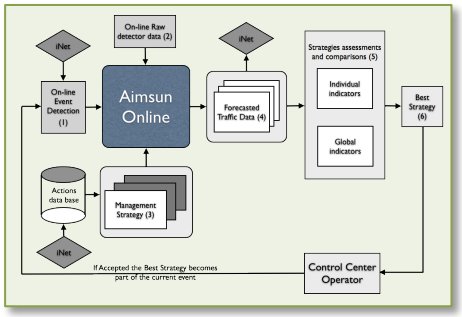
ICM Element Examples

- **Enhanced traffic monitoring systems**
  - Collection of real-time freeway, arterial, transit and weather data
- **Enhanced communication**
  - Data sharing capabilities among agencies
  - Information service provider access to select datasets
- **Freeway operations**
  - Traffic-responsive ramp metering
  - Coordination of ramp meters with arterial traffic signals
  - Dynamic HOV/HOT restrictions
  - Ramp queue warning
  - Variable advisory speeds
  - Dynamic Lane use control
  - Dynamic hard shoulder running

ICM Element Examples

- **Arterial operations**
  - Traffic-responsive signal control
  - Transit signal priority
  - Emergency preemption
- **Enhanced traveler information**
  - Multi-modal 511 systems
  - Real-time traffic/transit/parking info
  - Comparative trips across modes
  - Freeway CMSs
  - Arterial trailblazer signs
  - Mobile travel information applications
  - Social media links
- **Decision support system**
  - Automated response plan development
  - Evaluation of impacts using simulation





ICM Projects – International

Corridor	Corridor Type	Activities
M1 Freeway, Melbourne (Australia)	Suburban / Urban	• Deployment of traffic management and traveler information systems along the freeway and freeway ramps
M42 Freeway, Birmingham (UK)	Suburban / Rural	• Deployment of traffic management and traveler information systems along the freeway and freeway ramps

No documented evidence of active projects seeking to integrate the control of freeways and neighboring arterials

Connected Corridors

- **Definition**
- **Tools and Techniques**
- **Integration defined**

California Connected Corridors Vehicles, Information & People (CC-VIP) Pilot

- Enable existing transportation infrastructure and vehicles to work together in a highly coordinated manner
- Deliver improved corridor performance (safety and mobility)
- Improve accountability
- Evolve Caltrans to Real-Time operations and management
- Enhance regional , local and private sector partnerships

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What is Connected Corridors?

- **Program comprised of a number of efforts in partnership with various agencies and industry partners**
- **Tasked with:**
  - Developing methods and tools for how transportation corridors will be managed in California (Connected Corridors templates)
  - Advancing and integrating technologies needed for corridor management
  - Planning for Caltrans district level organizational support for ICM
  - Identifying and securing funding
  - Providing strategic and tactical education on corridor management
  - Implementing a pilot showcasing the above elements
  - Facilitating the implementation of ICM in multiple corridors in California

Connected Corridor History

- **3 years ago**
  - Active traffic management gains acceptance with John Wolf and others in response to growth of both ITS capabilities and ballooning construction costs
  - Connected Corridors program / ICM California envisioned
- **2 years ago**
  - Program officially started with joint effort between Caltrans and PATH/ CCIT
  - Joan Sollenberger assumes leadership role
  - Decision support development started with best of breed from TOPL, Mobile Millennium and PEMS
- **1 year ago**
  - Site selection begins – LA Region
  - Organizational work begins
  - Systems management concepts grow in popularity
  - Generic Concept of Operations
- **Last six months**
  - I-210 Selected as candidate pilot site
  - Nick Compin is now "Connected Corridors Manager"
  - D7/LA Metro assign resources
  - Web site launched
  - Integration with MAP-21 and SHRP2

Integration

Institutional Integration

Coordination to collaboration between various agencies and jurisdictions that transcends institutional boundaries.

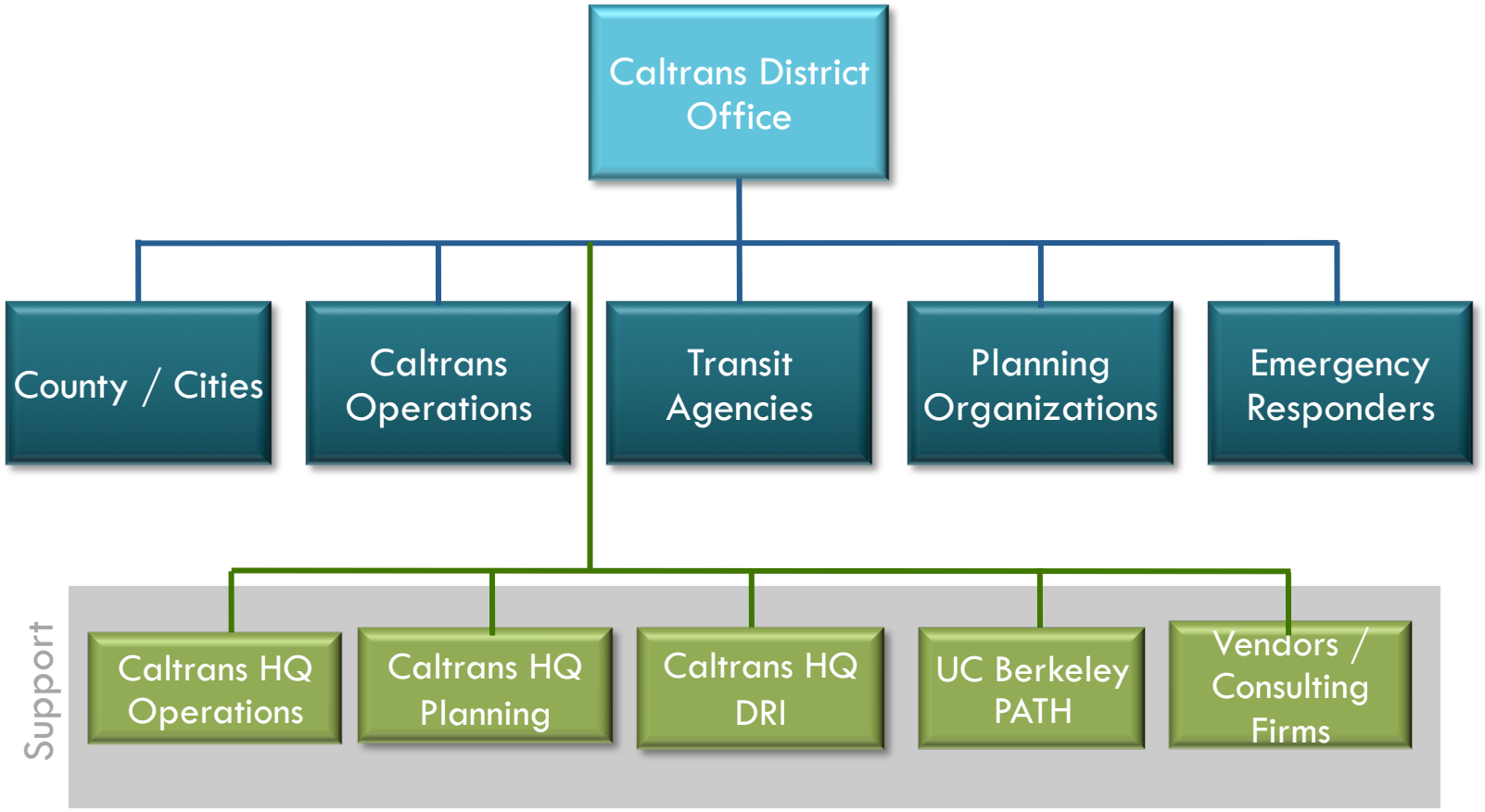
Operational Integration

Multi-agency and cross-network operational strategies to manage the total capacity and demand of the corridor.

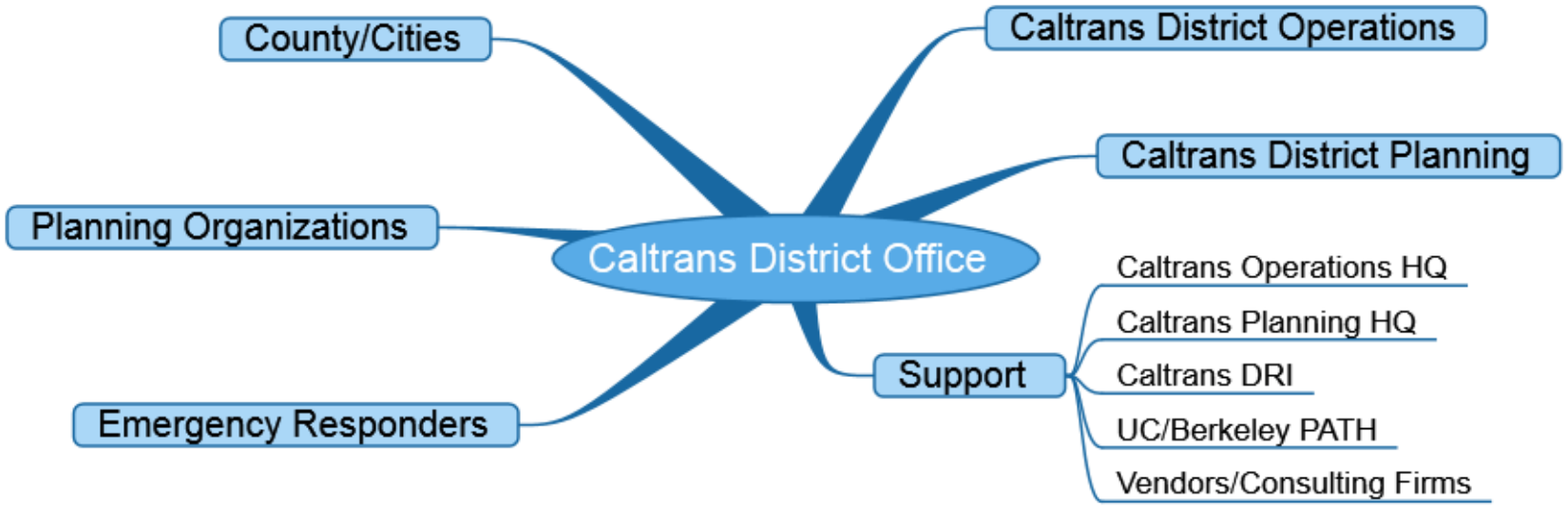
Technical Integration

Sharing and distribution of information, and system operations and control functions to support the immediate analysis and response.

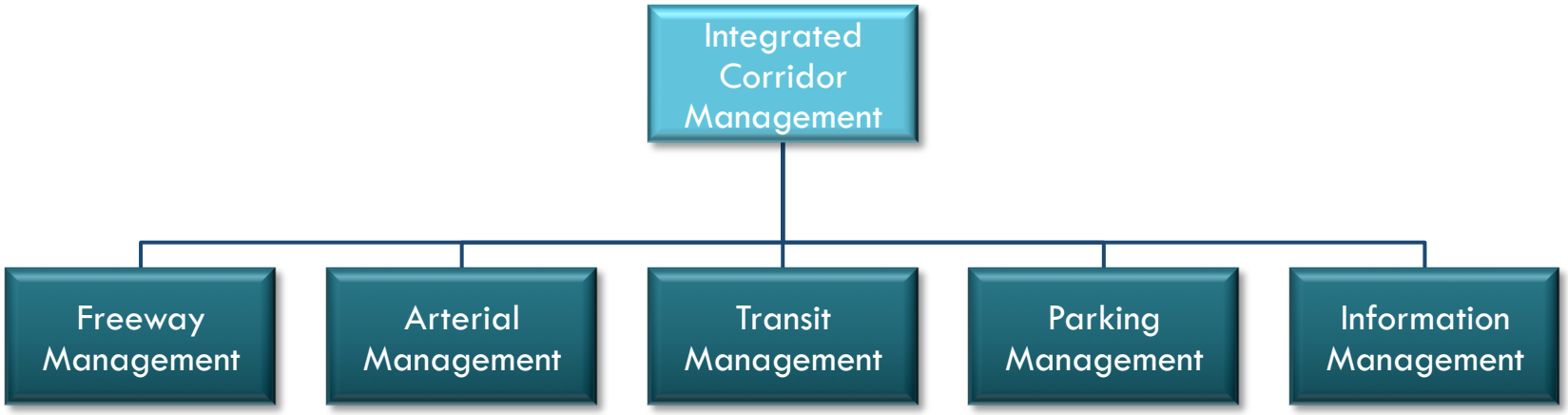
Institutional Integration



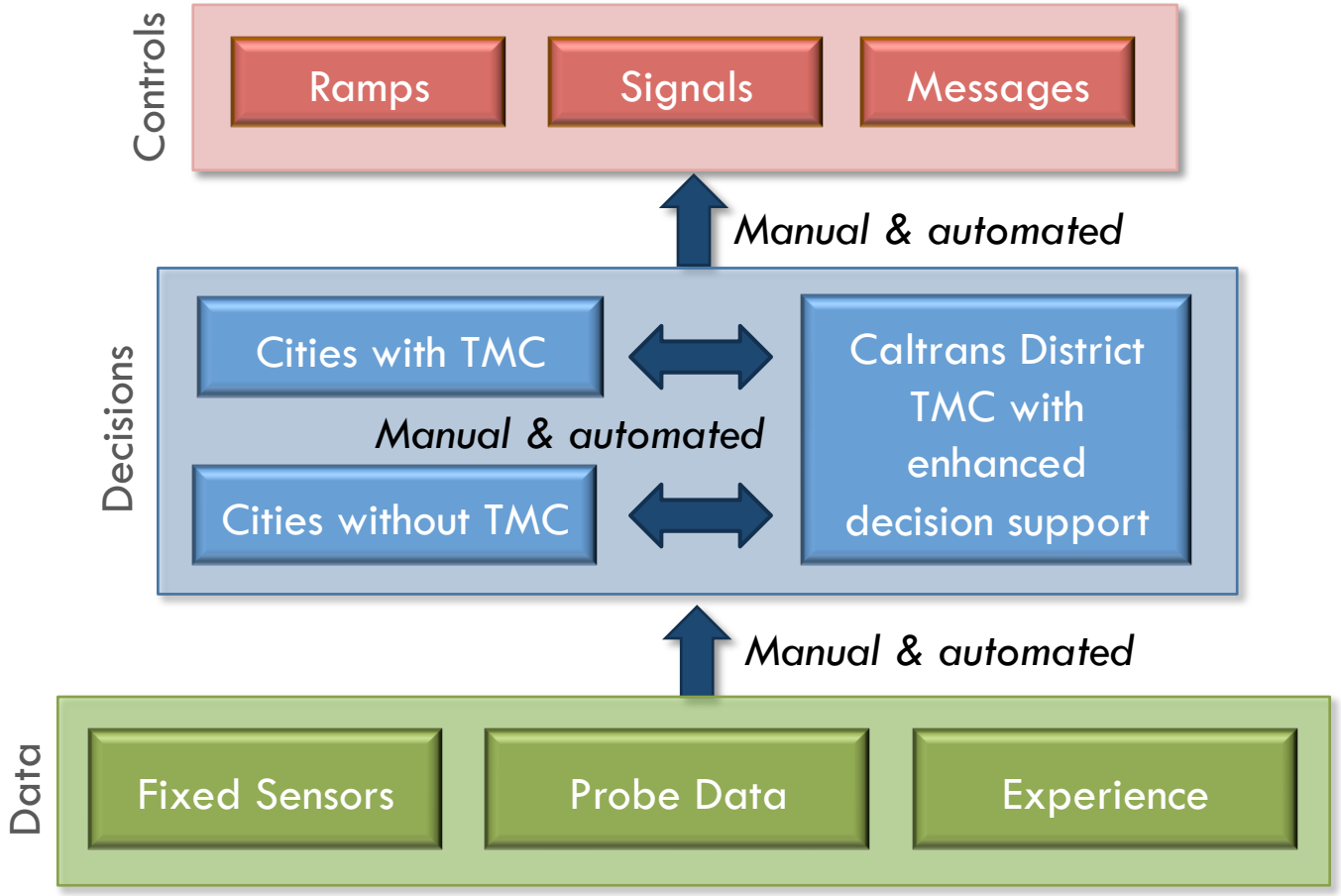
Institutional Integration



Operational Integration



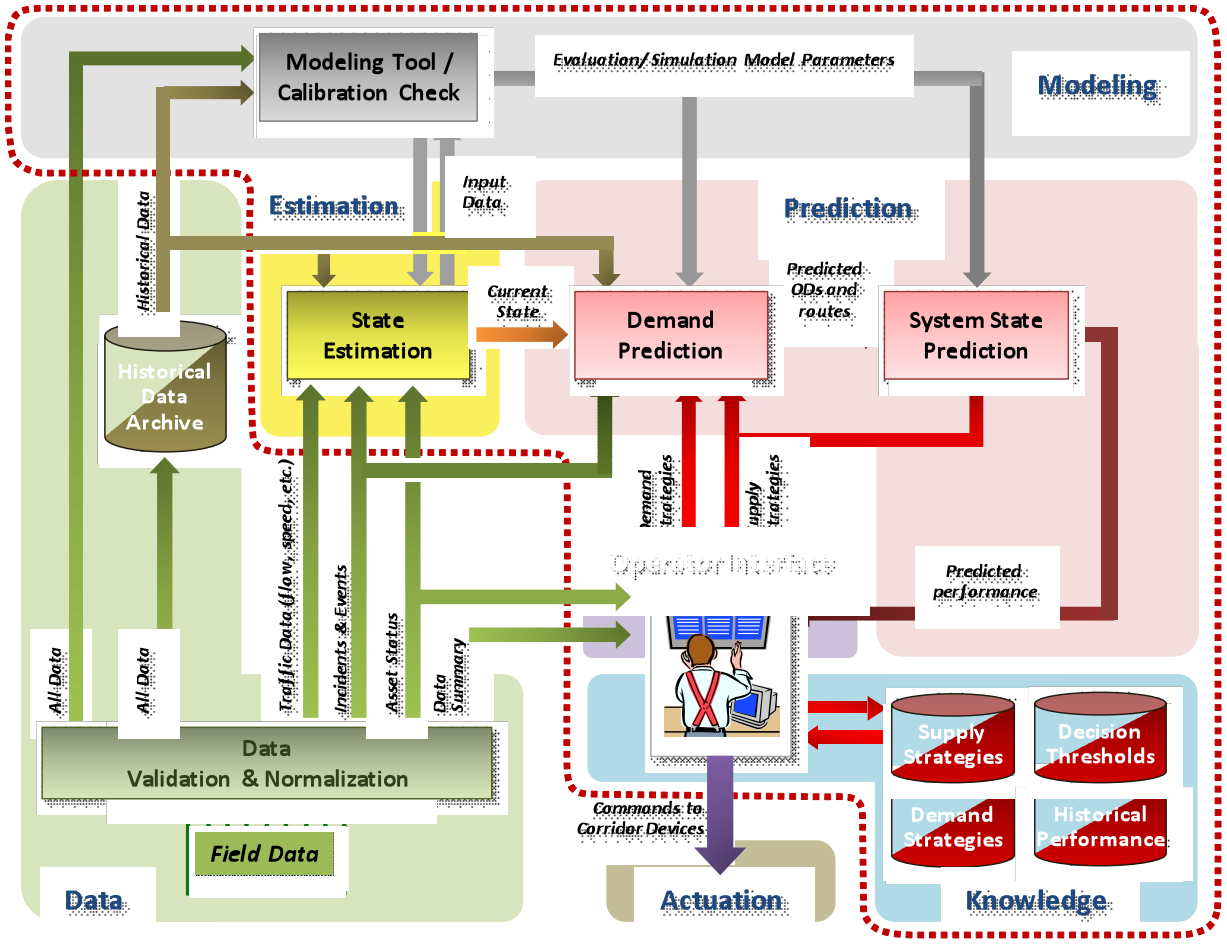
Architectural Integration



Technologies

- **Decision Support System (DSS)**
  - Provides an accurate estimate of the current state of a traffic corridor
  - Quickly performs predictions of its future performance under multiple scenarios
  - Sounds alarms of potential trouble spots
  - Evaluates different traffic management strategies, and provides the traffic manager with the most likely management strategy to improve mobility and safety on the network
- **Tools:**
  - Fast, self-calibrated, self-diagnosed and self-repairing traffic models
  - Traffic state estimation using real time heterogeneous traffic data
  - Filtering, analytics and statistical inferring techniques to predict future demands on the traffic corridor

Decision Support System



TOPL – Tools for Operations Planning

Development of tools to analyze and design:

- **Major traffic corridor operational improvements**
  - ramp metering, incident management, traveler routing and diversion, toll and commuter lane (HOT) management, arterial signaling control, demand management, pricing, etc.
- **Major traffic corridor infrastructure improvements**
  - Additional lanes, extend ramps capacity, HOT, etc.

Quickly estimate the benefits of such actions:

- **TOPL is based on macro-simulation freeway and arterial models that**
  - Are easily assembled
  - Self-calibrated and self-diagnosed using traffic data,
  - Run much faster than real time

TOPL – Tools for Operations Planning

Development of tools to analyze and design:

- **Major traffic corridor operational improvements:**
  - ramp metering; incident management; traveler routing and diversion; toll and commuter lane (HOT) management; arterial signaling control; demand management; pricing; etc.
- **Major traffic corridor infrastructure improvements:**
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  - self-calibrated and self-diagnosed using traffic data,
  - run much faster than real time.

Mobile Millennium, TO1 /TO2: hybrid data

TO 1: Pilot Procurement of Probe Data

Purpose: How to purchase traffic data from vendors?

Scope of Work

- Assessment of current practices
- Traffic data purchase (RFI and RFP)
- Vendor data fusion and validation

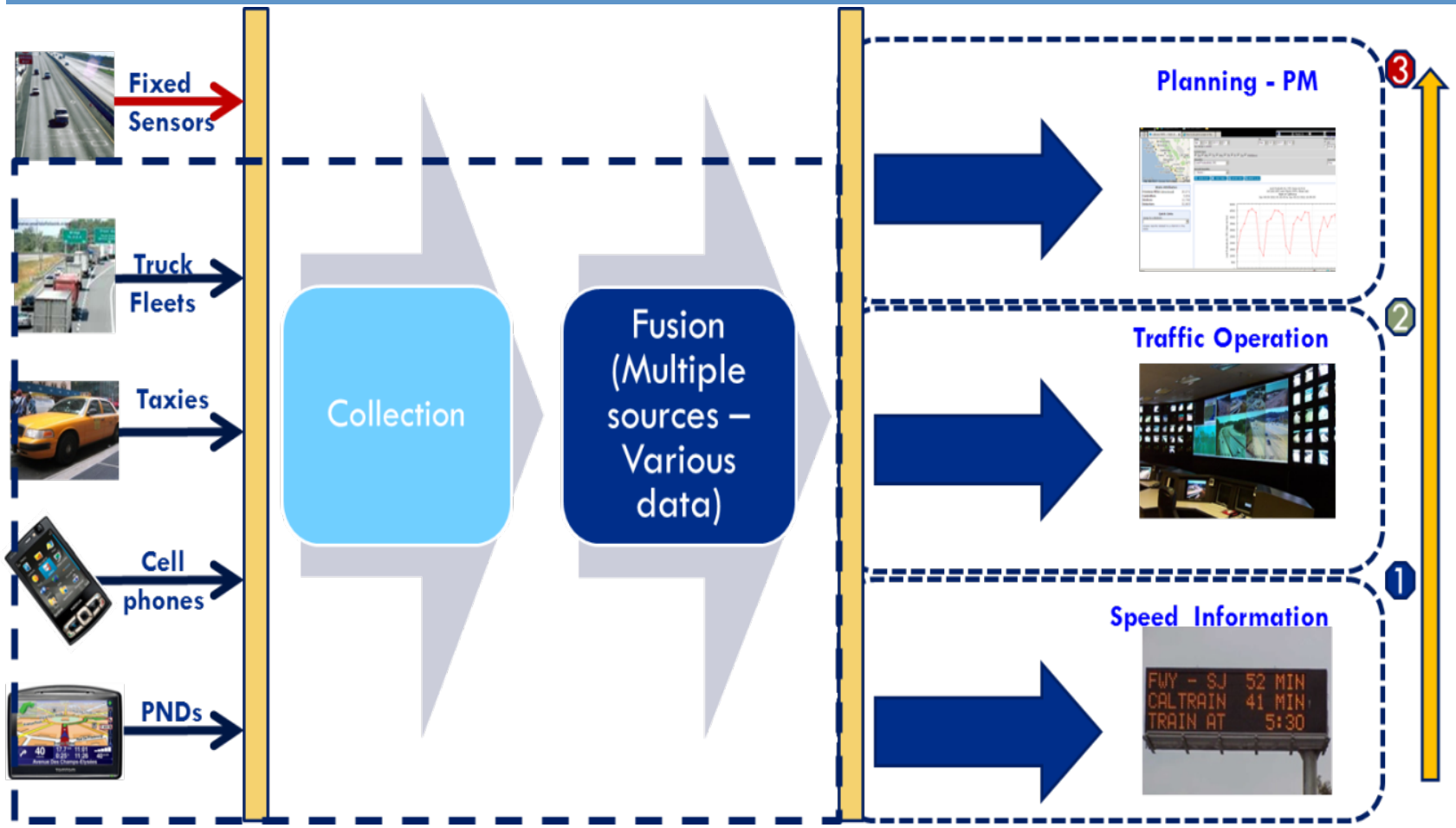
TO2: Objectives and Methods for Using Probe Data

Purpose: Determine why Caltrans should purchase traffic data from vendors

Scope of work:

- Assessment of current practices
- Data quality standards
- Data fusion methods
- Business analysis for buying traffic data

Next Gen Model



I-210 "ICM California" Pilot Site

- **Site description**
- **Organizational Members**
- **Current progress**

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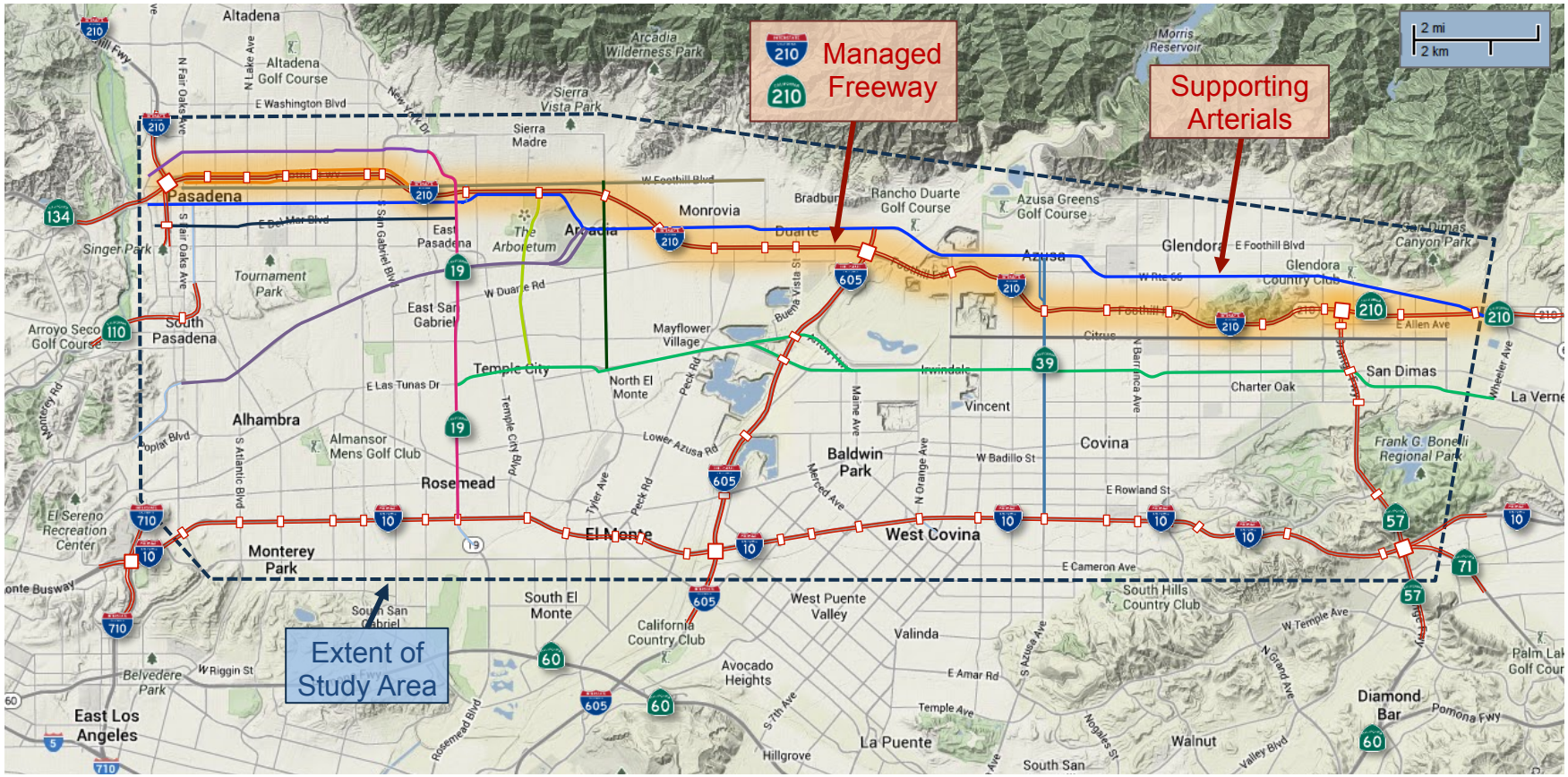
Important Notes

I-210 selection not official, as cities have not yet agreed!

No external announcement yet

However, current partners believe there is a good chance of cities and county participation, assuming a balanced, corridor-wide approach is taken

Selected Corridor



Corridor Pros and Cons

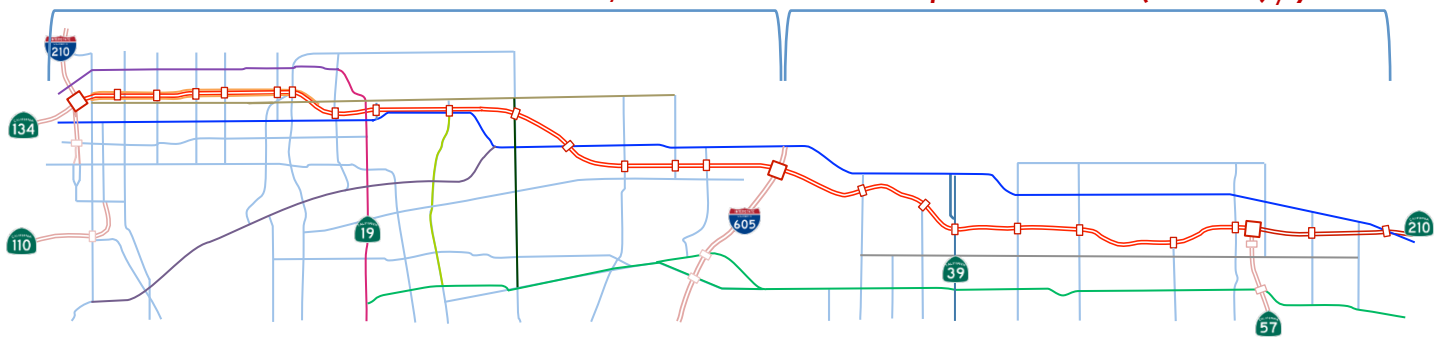
Item	Rating	Notes
Geometry	Excellent	Several Parallel arterials in close proximity of I-210; freeway frontage streets in Pasadena
Jurisdictional Environment	Good	Possibility of doing pilot deployment within one or two cities
Freeway Traffic Detection	Very Good	Sensors on mainline and most ramps.
Arterial Traffic Detection	Promising	Many intersections already equipped with traffic sensors
Traffic Demand Patterns	Very Good	Westbound traffic during AM peak; eastbound traffic during PM peak, average % of trucks
Existing Freeway Control	Excellent	Existing HOV lanes; ramps and freeway interchanges metered
Existing Arterial Control	Good	Traffic responsive system already in place on some arterials, participation of key cities in IEN.
Existing Transit Services	Very Good	Metro Gold Line running parallel to I-210, in close proximity
Park-and-ride capabilities	Uncertain	Many facilities exhibit high occupancy rates
ICM Opportunities – Peak Hour	Challenging	High congestion level on freeway; some arterials with limited extra capacities at some intersections; incident response needs; different traffic pattern on Fridays
ICM Opportunities – Off Peak	Excellent	Many large scale events; incident response needs

ICM is Needed

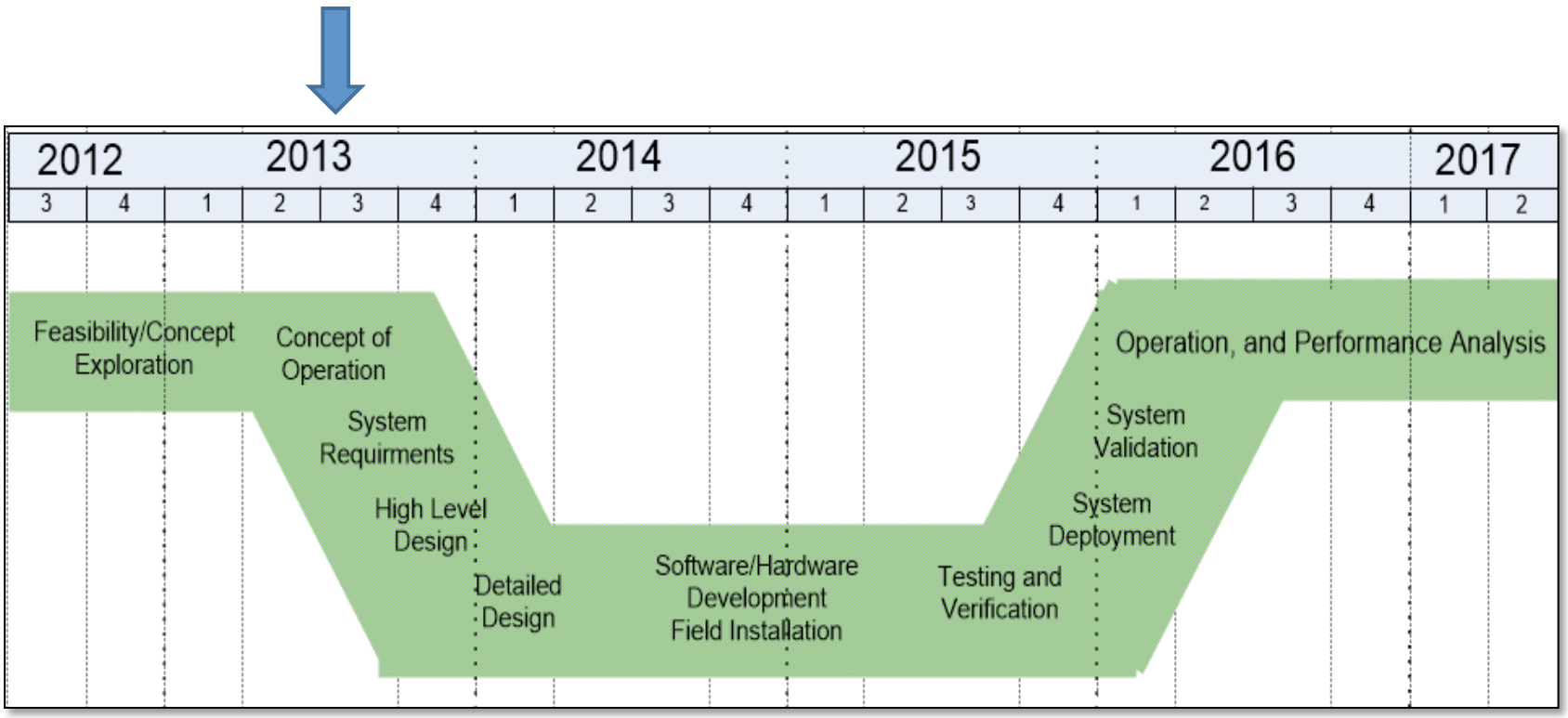
- **Corridor with**
  - significant congestion
  - Significant number of incidents and events (Rose Bowl)
  - Significant daily (Friday weekend traffic) and seasonal (Holidays) traffic pattern variability

3820 *accidents 2009-2012*
7.1 *accidents/mile/month*
6.75 *major incidents (2+ hrs)/year*

2603 *accidents 2009-2012*
5.5 *accidents/mile/month*
5.25 *major incidents (2+ hrs)/year*



Anticipated Timeline



Organizational Members

- **Core Organizational Members**
  - Caltrans D7 – Project Leader assigned and provided with resources
  - LA Metro – Assigned resources
  - LA County, Department of Public Works – Discussions started
  - Cities of Pasadena, Arcadia and Monrovia (possibly others) – Contact in September
  - Metrolink – Contact to be planned
  - Southern California Association of Governments – Contact to be planned
- **Organizational Support Members**
  - Caltrans HQ, Division of Traffic Operations - Resources assigned
  - UC Berkeley/PATH – Resources assigned
  - System Metrics Group – Resources assigned
  - SANDAG – In discussion
  - USDOT – In discussion

Working Committees

- **Existing committees**
  - Outreach and Communication (*D7 Lead*)
  - Performance Metrics (*D7 Lead*)
  - Data Needs (*PATH Lead*)
- **Future Committees**
  - To be determined based on project needs

Teams with Active participation from

Caltrans D7
Caltrans HQ
LA Metro
UCB PATH

Outreach and Communications Subcommittee

- **Drafting a Fact Sheet and Speaking Points for meetings with cities**
  - Important to outline benefits to the cities
- **Outreach Goals**
  - Educate and inform (internal partners; all levels of stakeholders, travelers)
  - Engage stakeholders
  - Implement ongoing communication strategies
  - Reach consensus on key corridor issues and strategies
  - Provide public relations component (announce project, partners, stakeholders)
- **Meetings with corridor cities to start in September**
- **Goal: Public announcement at ITS CA Oct 1st**

Performance Subcommittee

- Define performance metrics for effort
- Define performance goals
- Define evaluation methods
- Define data requirements for measuring and validating metrics
- Define level of Maturity Capability Matrix to be used
- Ensure effective use of System Engineering processes

Data Needs Subcommittee

- **Identification of data needs for**
  - Corridor operational evaluation
  - Simulation modeling of corridor
  - Feasibility of potential traffic/demand management strategies
- **Current data collection/analysis efforts**
  - Traffic flow data
  - Safety data
  - Transit operations data
  - Parking occupancy data
  - Inventory of traffic management assets (CMS, CCTV, HAR, signal controllers, etc.)

Summary

- Initial efforts going well
- Caltrans assuming responsibility for corridor wide transportation management
- Integration with Federal and State efforts proceeding
- Caltrans capable of world leadership in active traffic management
- However, still early days
- Your support and understanding is needed to ensure success

Thank you….

Questions?

Thoughts?