Connected Corridors
Face-to-Face Meeting

Tuesday, July 25th , 2017 – 1:30 – 3:30 pm
Arcadia

June 25th, 2017

Agenda

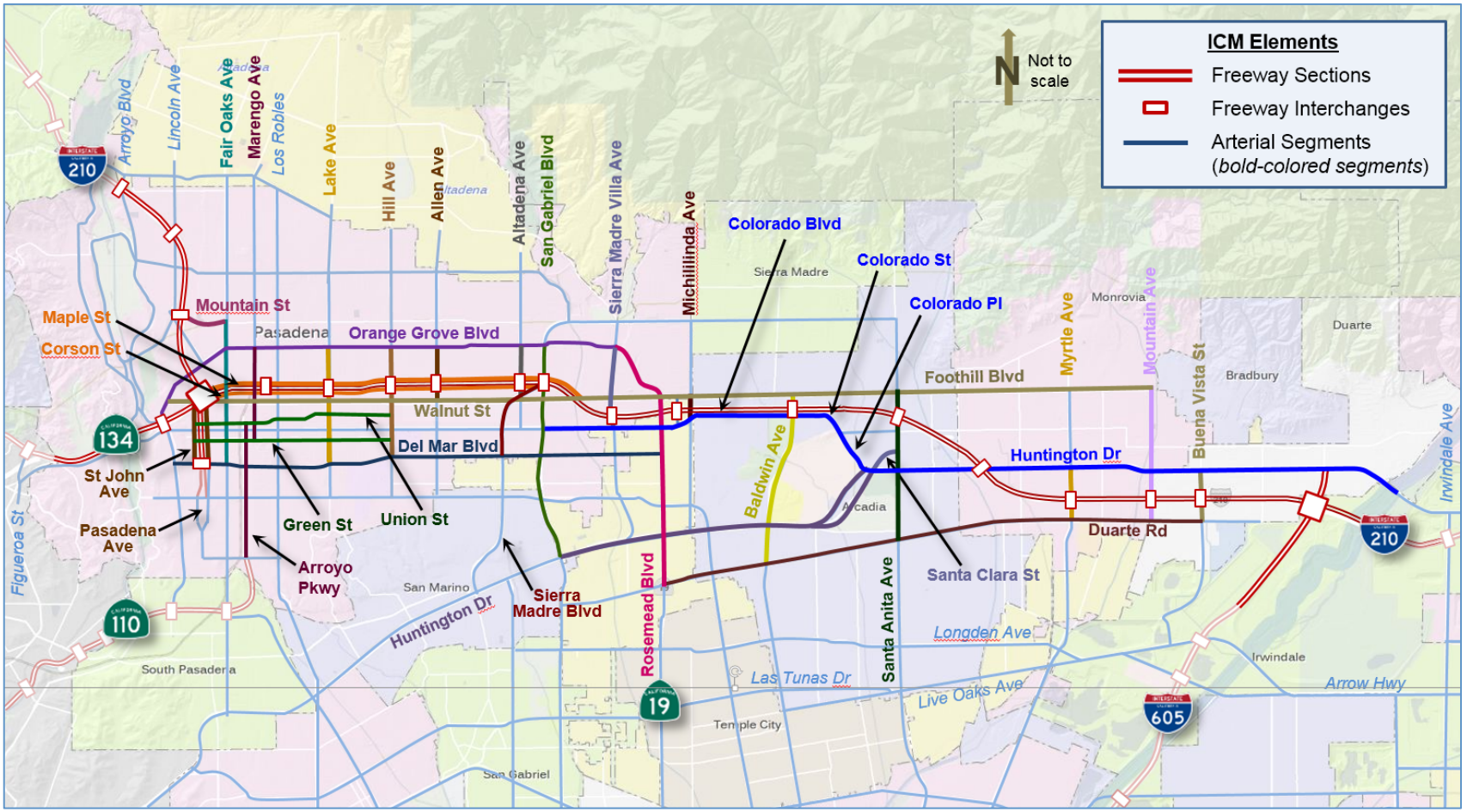
- Introductions
- Schedule Review
- Outreach
- High Level Design and Implementation
- Communications Network
- Data Quality and Estimation
- Modeling and Response Planning
- Action Items and Closing

New Faces

- Mr. Ken Young
  - Office Chief of Corridor Management (North)
  - (213) 897-6091
  - Amongst other areas, Mr. Young is the new office chief responsible for the safety and operations for the San Gabriel Valley.

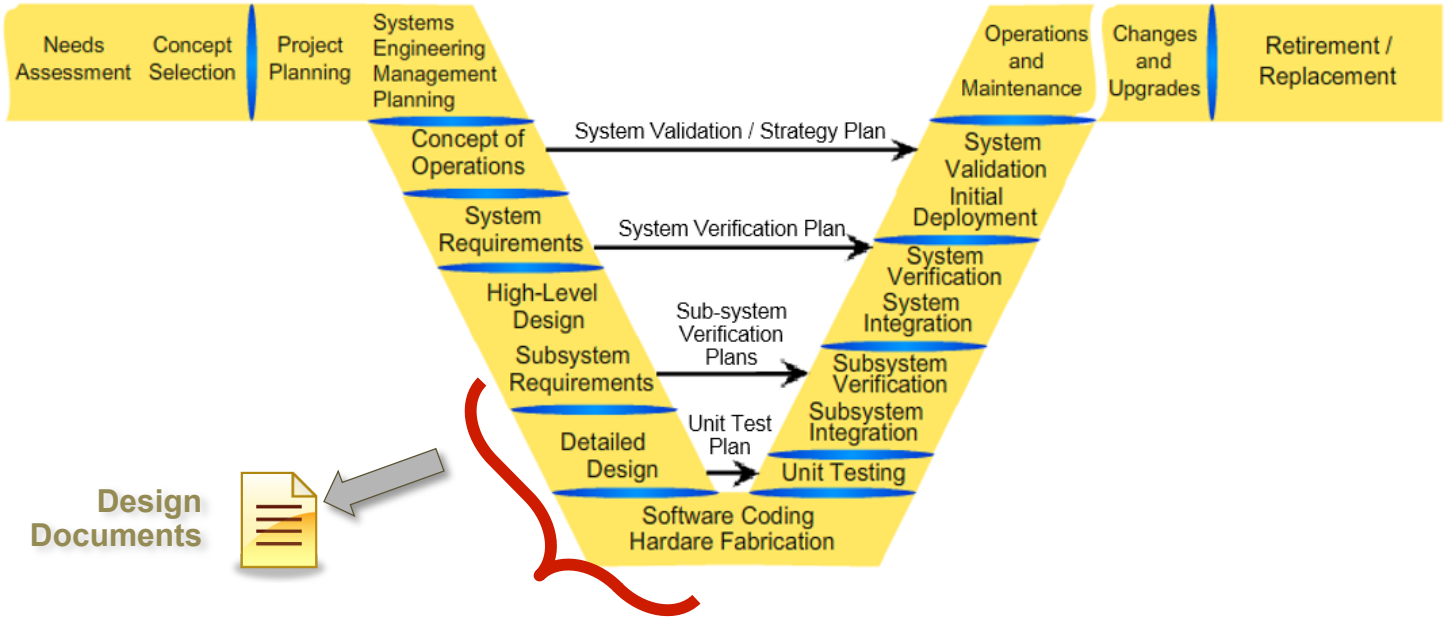
- Mr. Farid Nowshiravan
  - Corridor Manager, I-210, I-10 and I-605
  - (213) 897-4655
  - Mr. Nowshiravan has assumed the day to day corridor manager responsibilities previously handled by Mr. Samson Teshome for the 210 project.

Our Corridor: The I-210

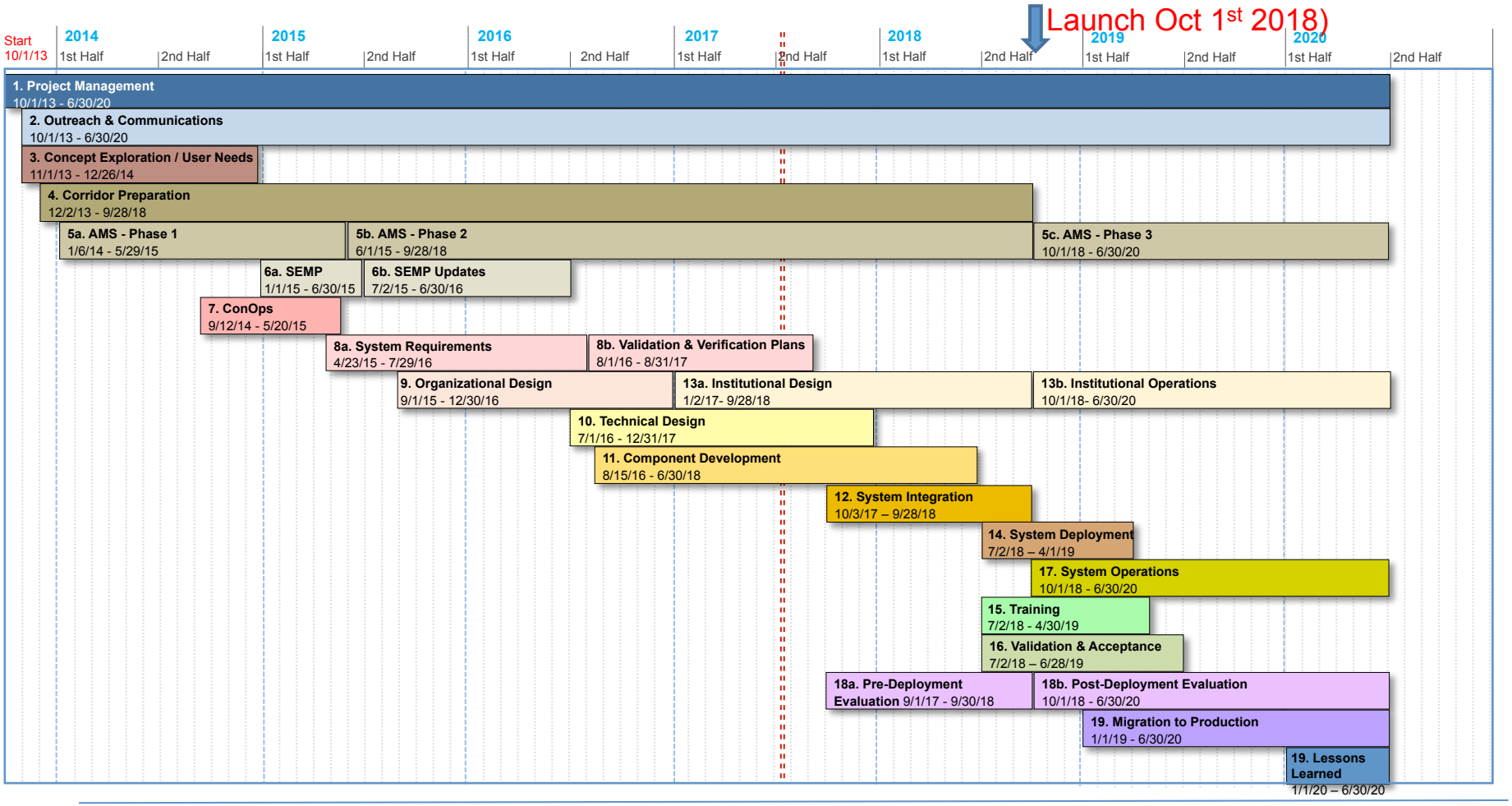


Systems Engineering Next Steps

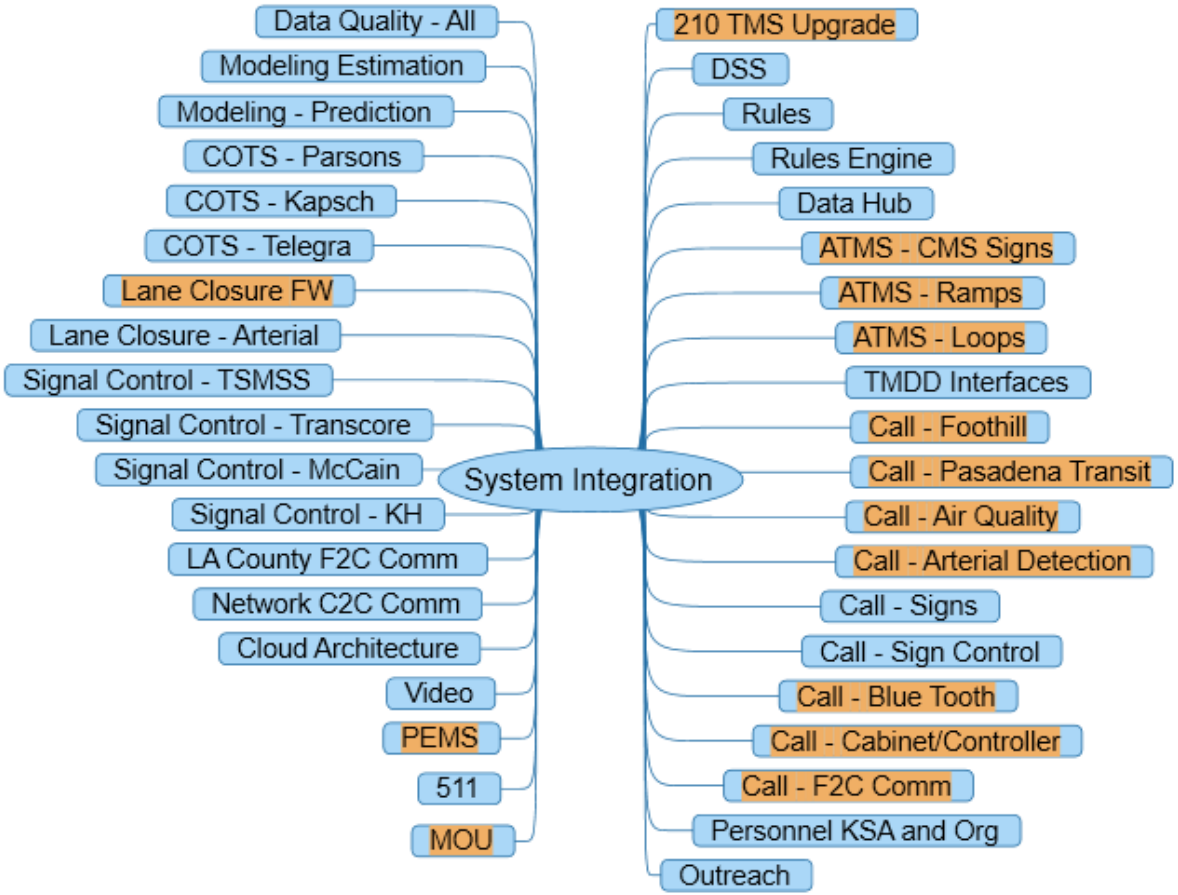
- **Design Documents – How will the requirements be met**
- **Hardware and Software – Building the system**



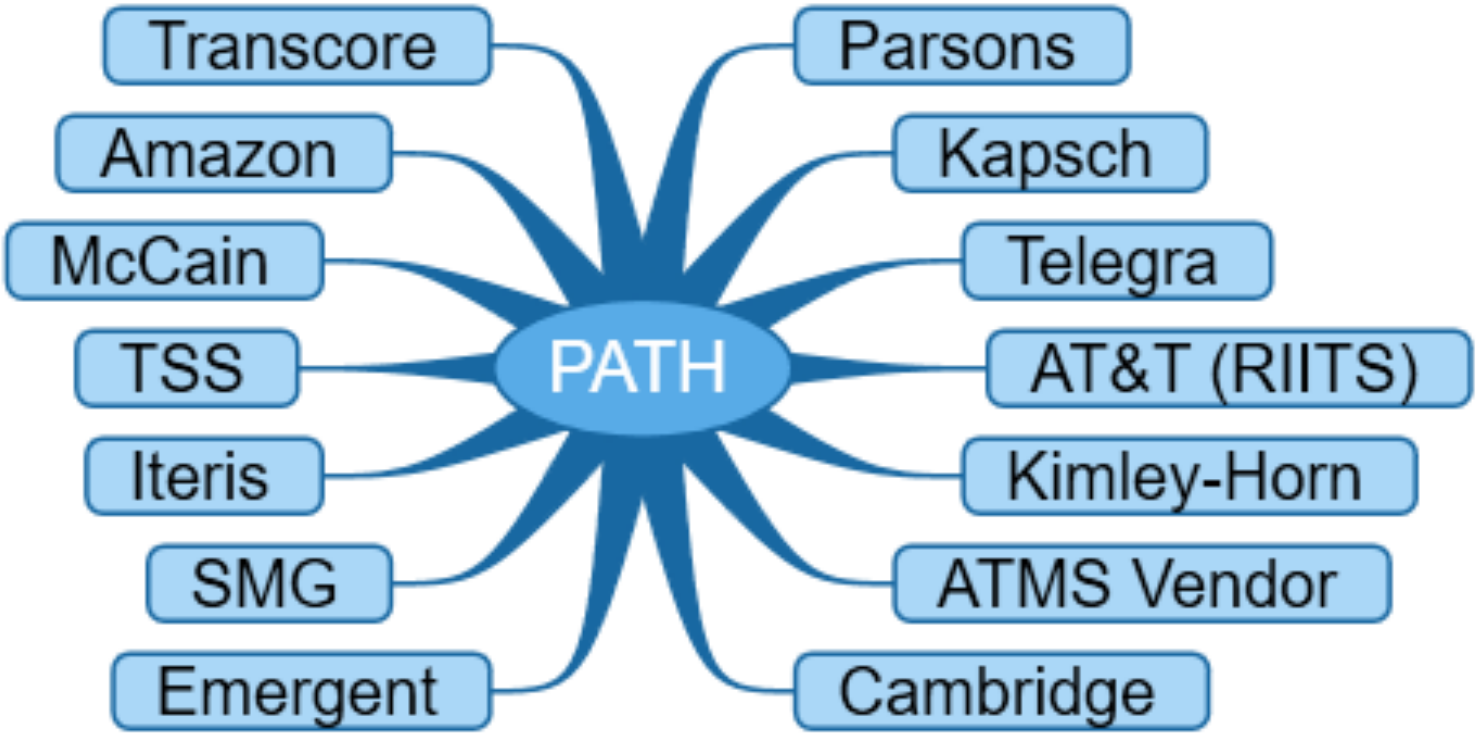
Schedule


Launch Oct 1st 2018)
Start 10/1/13
2014
1st Half
2nd Half
2015
1st Half
2nd Half
2016
1st Half
2nd Half
2017
1st Half
2nd Half
2018
1st Half
2nd Half
2019
1st Half
2nd Half
2020
1st Half
2nd Half
1. Project Management 10/1/13 - 6/30/20
2. Outreach & Communications 10/1/13 - 6/30/20
3. Concept Exploration / User Needs 11/1/13 - 12/26/14
4. Corridor Preparation 12/2/13 - 9/28/18
5a. AMS - Phase 1 1/6/14 - 5/29/15
5b. AMS - Phase 2 6/1/15 - 9/28/18
5c. AMS - Phase 3 10/1/18 - 6/30/20
6a. SEMP 1/1/15 - 6/30/15
6b. SEMP Updates 7/2/15 - 6/30/16
7. ConOps 9/12/14 - 5/20/15
8a. System Requirements 4/23/15 - 7/29/16
8b. Validation & Verification Plans 8/1/16 - 8/31/17
9. Organizational Design 9/1/15 - 12/30/16
13a. Institutional Design 1/2/17- 9/28/18
13b. Institutional Operations 10/1/18- 6/30/20
10. Technical Design 7/1/16 - 12/31/17
11. Component Development 8/15/16 - 6/30/18
12. System Integration 10/3/17 – 9/28/18
14. System Deployment 7/2/18 – 4/1/19
17. System Operations 10/1/18 - 6/30/20
15. Training 7/2/18 - 4/30/19
16. Validation & Acceptance 7/2/18 – 6/28/19
18a. Pre-Deployment Evaluation 9/1/17 - 9/30/18
18b. Post-Deployment Evaluation 10/1/18 - 6/30/20
19. Migration to Production 1/1/19 - 6/30/20
19. Lessons Learned 1/1/20 – 6/30/20

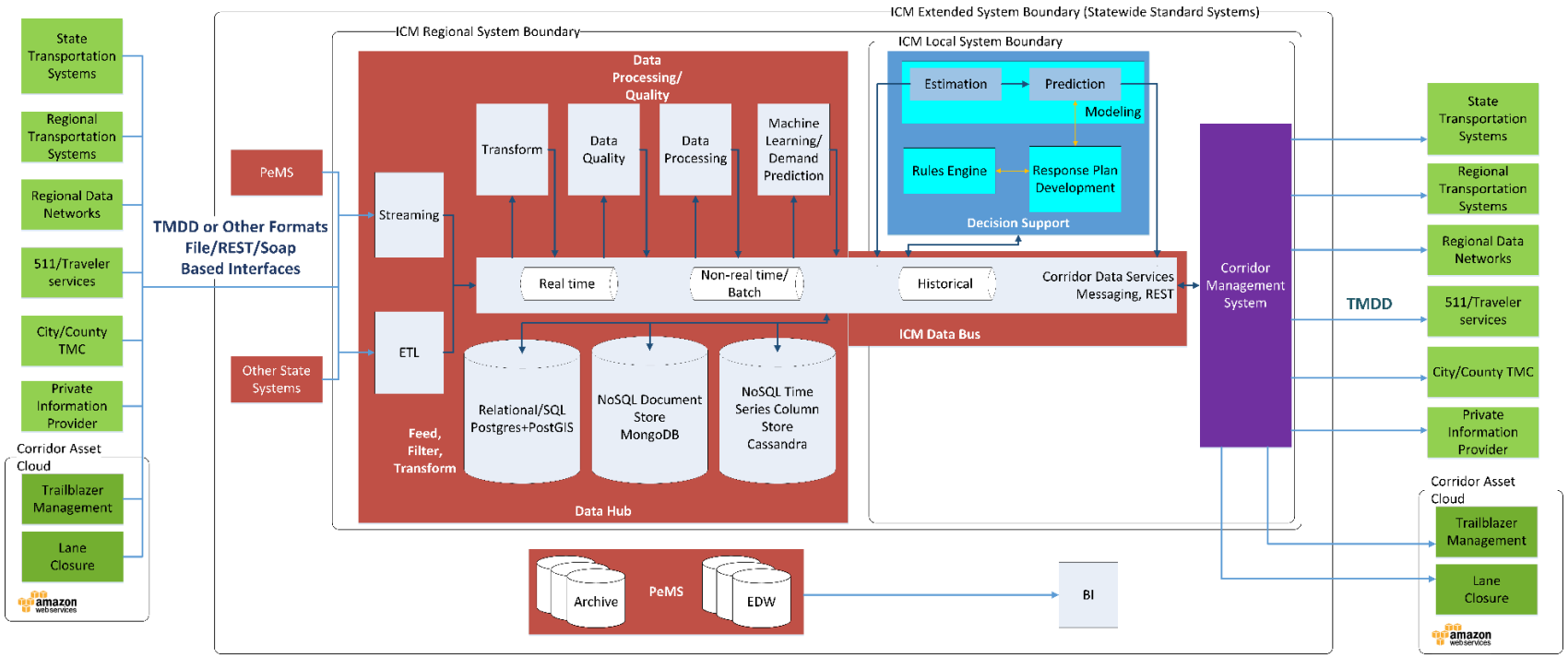
Integration – Subsystems and Subefforts



Integration



Technical Architecture and Components

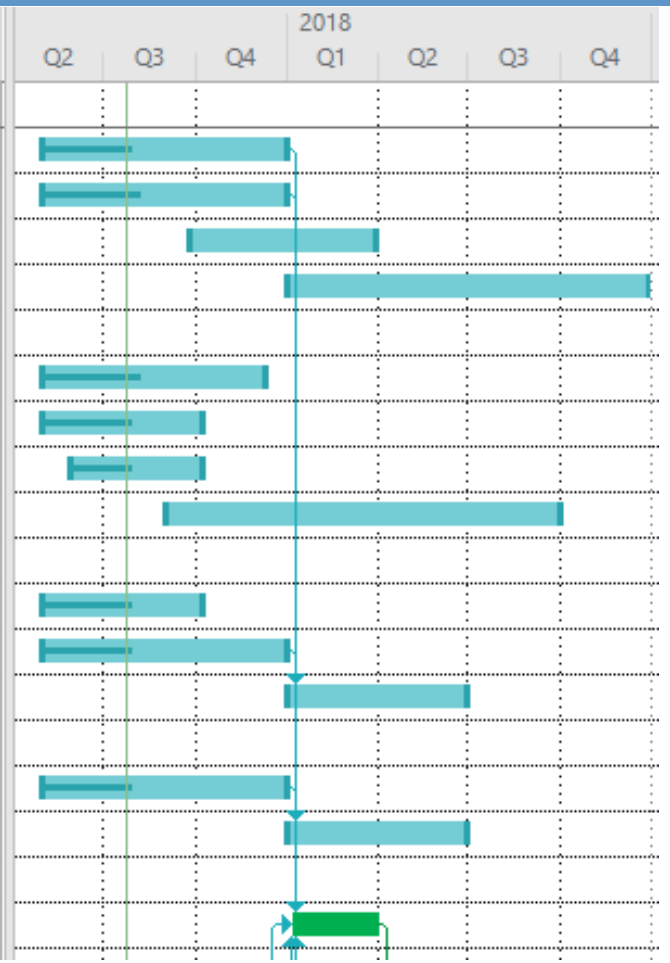


Replicable to other corridors and districts

- 1) Start with standards and cloud based Data Hub tuned for real-time operational data and scalability
- 2) Add open source rules engine designed for flexibility
- 3) Add modeling if desired
- 4) Add in ICM system vendors that meet standards. Currently working with Kapsch, Parsons, Telegra.
- 5) Add in TCS vendors that meet standards. Currently working with McCain, Transcore, Kimley-Horn
- 6) Add in sign vendors that meet standards. TBD
- 7) Add in interface to ATMS using vetted TMDD interface
- 8) Add in PEMS for long term metrics
- 9) Add in interfaces to transit, 511, air quality using predefined interfaces
- 10) Utilize predefined KSAs and organizational structures for staffing
- 11) Utilize existing system engineering documents, MOUs and funding mechanisms

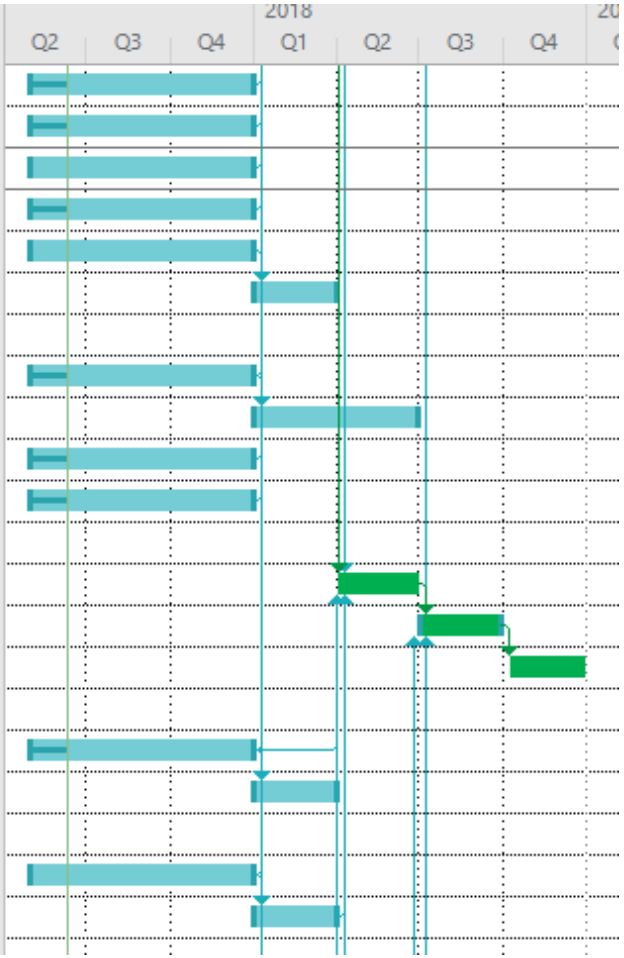
Gantt Chart – 1 of 3

Assist	Responsible	Task Name
Cal	PATH	Cloud Architecture
All	PATH	Network Comm Design
RIITS	PATH	Network Comm - I
	RIITS	Network Comm - II
	Cal	Freeway SHOPP
All	Cal	Call For Projects - Design
All	PATH	CFP - Sign Design
All	Cal	CFP Construction
	PATH	Internal Data Hub Path
	PATH	Data Hub Interfaces
Cal	PATH	Data Hub Internals
	PATH	Choose COTS
	PATH,COTS	First Cots Integration
	PATH, All	Integrate with Data Hub



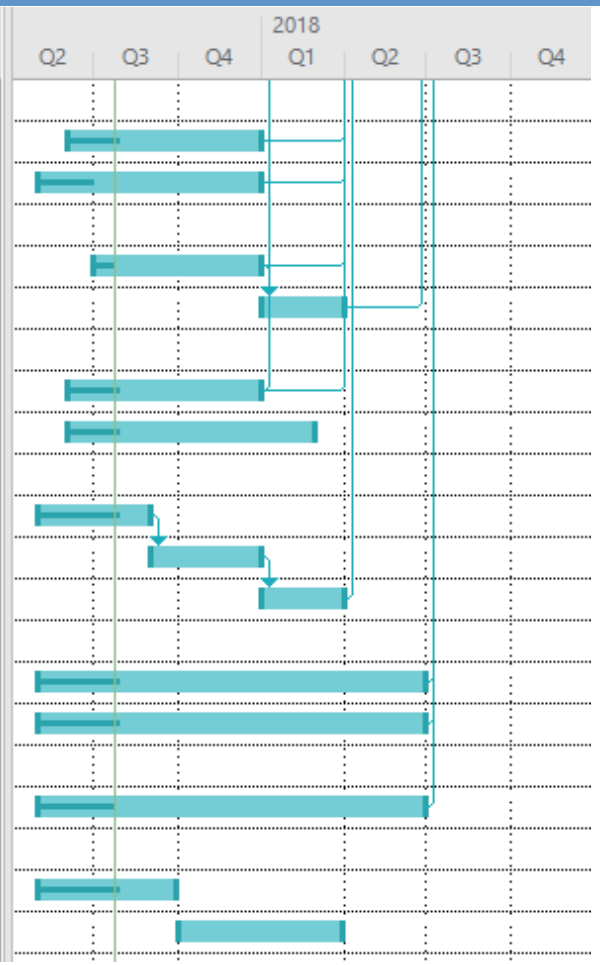
Gantt Chart – 2 of 3

	Assist	Responsible	Task Name
21	PATH	Cal	Arterial Closures
22	RIITS,511	511	PATH
23	RIITS	Cal	Transit
24	RIITS	PATH	RIITS Video
25	PATH	Cal	PEMS Interfaces
26	PATH	Cal	PEMS
27			
28	PATH	Cal	ATMS Interfaces
29		Cal	ATMS Functional
30	RIITS	PATH	Environmental
31	Cty, City	PATH	Travel Time
32			
33	All	PATH	Integrate System
34	All	PATH	Test System
35	All	PATH	Launch System
36			
37		PATH	C2C Interfaces
38	All	PATH	C2C Working
39			
40	PATH	PATH	Sign Control Interface
41		PATH	Sign Control Completed



Gantt Chart – 3 of 3

Assist	Responsible	Task Name
City/Cnty	PATH	City Data
PATH	Cal	Caltrans' Data
	PATH	Estimation Interfaces
PATH	PATH	Estimation Working
	PATH	Prediction Interfaces
	PATH	Prediction Working
	PATH	Rules Engine Beta
	PATH	Rules Engine Interfaces
	PATH	Rules Engine Working
All	PATH	Rules
All	PATH	Response Plans
	Cal, PATH	Personnel/Orgs
PATH	Cal	PATH Contract Update
PATH	Cal	Next PATH Contract



Risks - Summarized

- **Significant Risks**
  - C2C TMDD interface funding, contracting, development and installation
  - Wayfinding signs
  - Network Communication
  - Call for Projects on time completion
  - Overall integration of a large system composed of hardware, software and personnel
- **Secondary Risks**
  - Integration of Corridor Management Subsystem systems
  - Corridor wide data quality
  - Travelers following reroutes
  - Construction on the I-210

15

Outreach and Communications

Outreach

- **Project Charter Amendment – have not received any comments; moving forward**
- **MOU – Outline and background information sent to Caltrans D7 who will manage the process**
- **Updates on SB 1 funding (Metro and Caltrans, in particular)**
  - Workshops are underway for the different funding categories
  - Who is taking the lead on this re: ICM and future Connected Corridors?

Amazon awards CC 10K in funding

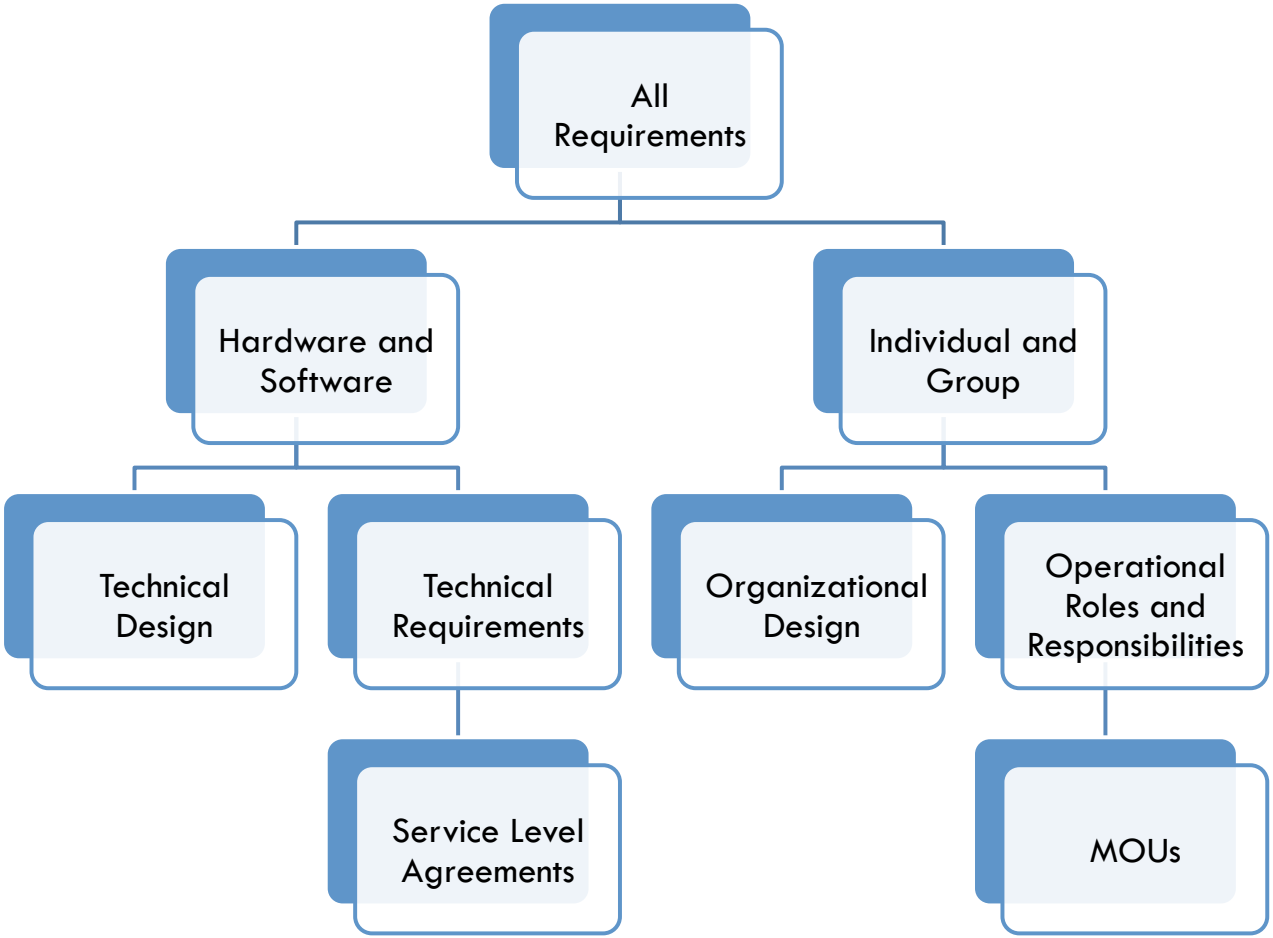
- **Amazon awarded CC 10K in funding as part of the City on the Cloud's Innovation Challenge**
- **Greg developed and submitted the application in both Caltrans and PATH's name**

AWS Amazon Cloud Training

- We suggest Tuesday August 15th
- Mike and Greg for sure
- Possibly others including Amazon
- At the TMC or ???
- Anyone interested is invited

Technical Design

Design


All Requirements
Hardware and Software
Individual and Group
Technical Design
Technical Requirements
Organizational Design
Operational Roles and Responsibilities
Service Level Agreements
MOUs

Design Document – In Progress

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

Connected Corridors: I-210 Pilot
Integrated Corridor Management System

Core System High-Level Design

June 9, 2017

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.

Job Descriptions, KSAs, etc.

- We will setup a meeting with Caltrans, PATH and SMG to:
  - Determine how to prioritize and categorize personnel requirements
  - Determine what information to gather from D4 and D11
- Hold future meetings to:
  - Review information from D4 and D11
  - Perform prioritization
  - Develop justifications for additional resources

Proof of Concept

Proof Of Concept – COTS (Purple Box)

- **The following companies have been selected to participate in the pilot**
  - Kapsch
  - Parsons
  - Telegra
- **We are working on legal agreements**
- **We have also requested technical requirements from the vendors (beginning of the integration effort)**

Proof of Concept Dates

- June 2017 – Choose vendors who will participate in pilot
- August 2017 – Complete agreements with vendors as needed
- Sept 2017 – Begin integration planning with vendors
- Nov 2017 – Begin integration of vendor COTS products
- Oct 2018 – Launch pilot utilizing COTS software of first vendor
- Feb 2019 – Complete Integration of second vendors COTS software
- May 2019 – Complete Integration of third vendors COTS software

- The anticipated schedule for Caltrans procurement is:
-
- May 2018 – Caltrans will begin internal procurement process
- Oct 2019 – Procurement document released
- April 2020 – COTS vendor chosen
- July 2020 – Complete contractual negotiations
- Nov 2020 – Install production software

Call for Projects

I-210 Connected Corridors Procurement Support Tasks

- Meet with project stakeholders to confirm scope and installation needs of the service contracts.
- Develop contract needs documents based upon meeting with cities and other project stakeholders.
- Develop high level work plans and bid specifications for the installation/configuration work that is required.
- Confirm cost estimates along with any additional add-on
- Develop quantities estimates for all of the installations
- Develop typical installation details
- Identify communications methods for communicating with field components and include typical communication installation details
- Assist in procurement preparation including selection/purchasing equipment
- Prepare and support RFI process
- Document all interfaces with stakeholders.

Procurement List & Quantity

Number	Description	Pasadena	Arcadia	Monrovia	Duarte	County of LA
#1	Bluetooth (Velocity)		5			
#2	Bluetooth (BlueMac)	12		6	3	5
#3	New Cabinets	7	1			
#4	Communication Upgrade			15	5	2
#5	2033 McCain firmware/timing plan updates/controller update	8	6	3		
#6	Video Detection System	9	3	5	3	2
#7	Data Comm Module and Video Detection Software Upgrade	11	13	2	1	4

Timeline

- Coordinate Needed Preliminary Information 8/15/2017
- Review Lists with Stakeholders and Caltrans 8/18/2017
- Procurement Package Support and Development 8/21/17 - 1/31/18
- Develop Specification and Standard Details 8/21/17 - 1/31/18

Arterial Wayfinding Signs

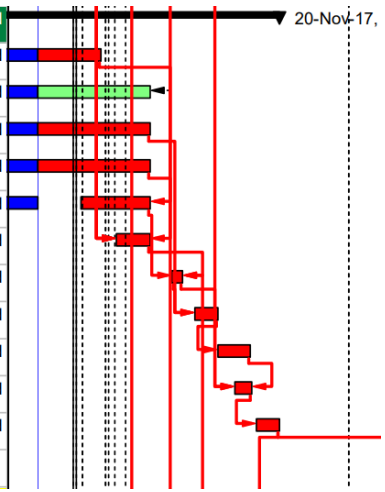
- Detailed sign location suggestions will be discussed with stakeholders in the near future – Power and Communication
- Signs will be 3 x4 or 4 x5 and full color matrix (unless something else is specifically recommended
- Concrete poles cannot be used
- Wind standards are either 85 or 100 mph gusts
- Need to understand the importance of O&M (pay more for less O&M?)
- Starting to work with Caltrans

Sign Locations

FOOTHILL at BALDWIN (WEST)
Both locations are at existing advance loops

I-210 SHOPP Project – Year end delivery

Stage 1 Wide		189d	105d	15-Dec-16 A	20-Nov-17	211d
A1110	Install Innerduct - Stage 1 Wide	20d	28d	23-Jan-17 A	31-Jul-17	55d
A2500	Set CCTV Poles - Stage 1 Wide	5d	51d	21-Feb-17 A	31-Aug-17	265d
A2510	Configure CCTV Cameras - Stage 1 Wide	10d	51d	17-Apr-17 A	31-Aug-17	37d
A2550	Install Flashing Beacon Foundations - Stage 1 Wide	5d	51d	21-Feb-17 A	31-Aug-17	19d
A2560	Install Flashing Beacons - Stage 1 Wide	5d	33d	21-Feb-17 A	31-Aug-17	19d
A1120	Pull Cable - Stage 1 Wide	16d	16d	10-Aug-17	31-Aug-17	32d
A1150	Install Loops - Stage 1 Wide	5d	5d	14-Sep-17	20-Sep-17	19d
A1130	Splice Mainline Cable - Stage 1 Wide	10d	10d	28-Sep-17	12-Oct-17	19d
A2380	Splice Breakouts and Terminate Fiber - Stage 1 Wide	15d	15d	13-Oct-17	02-Nov-17	19d
A1140	Fiber Integration (HUB and LARTMC) - Stage 1 Wide	10d	10d	23-Oct-17	03-Nov-17	18d
A2360	Test Period / Documentation - Stage 1 Wide	10d	10d	06-Nov-17	20-Nov-17	18d
A2490	Install CCTV Pole Foundations - Stage 1 Wide	5d	0d	15-Dec-16 A	29-Mar-17 A	



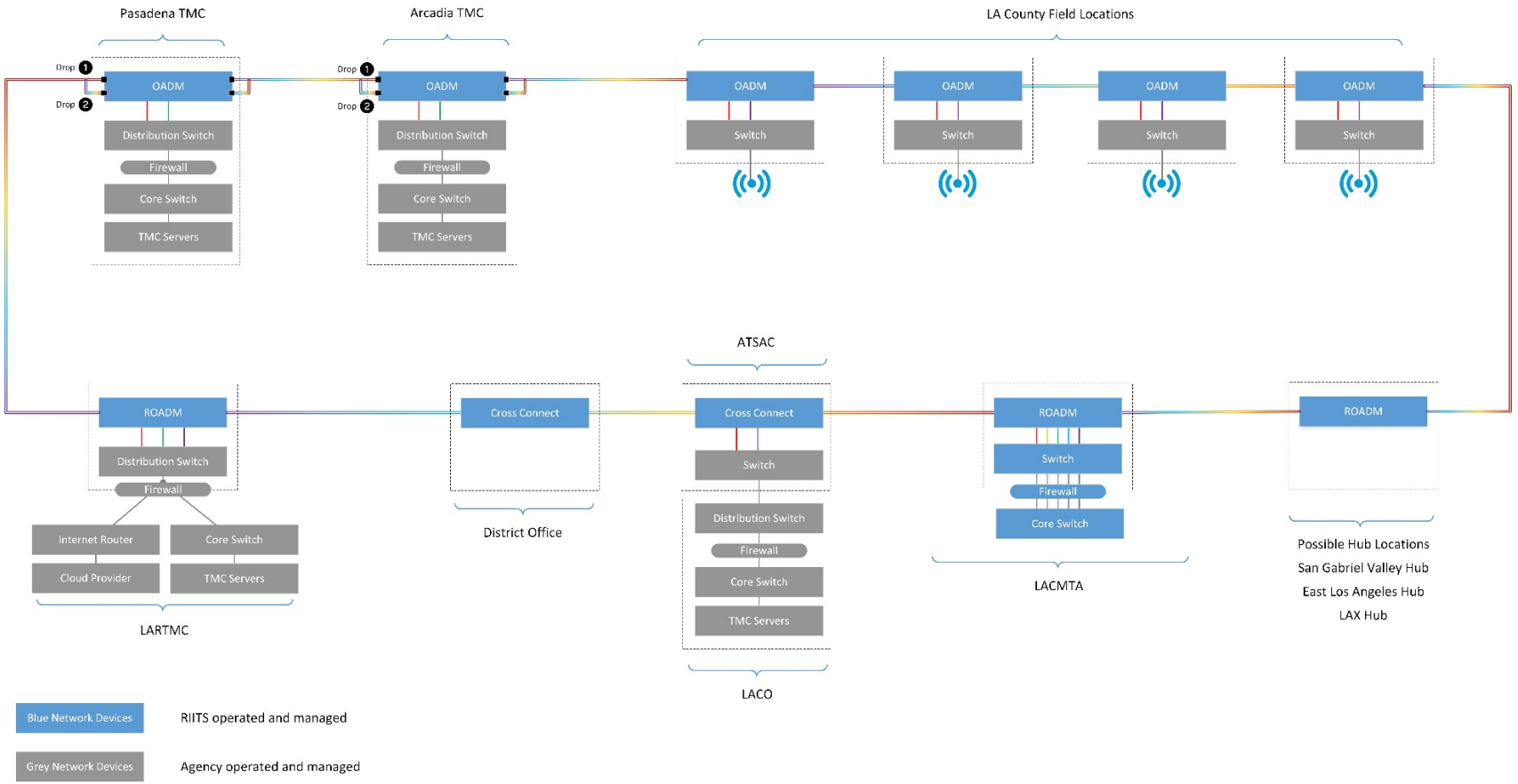
Network Communication

Jesus and Erlan

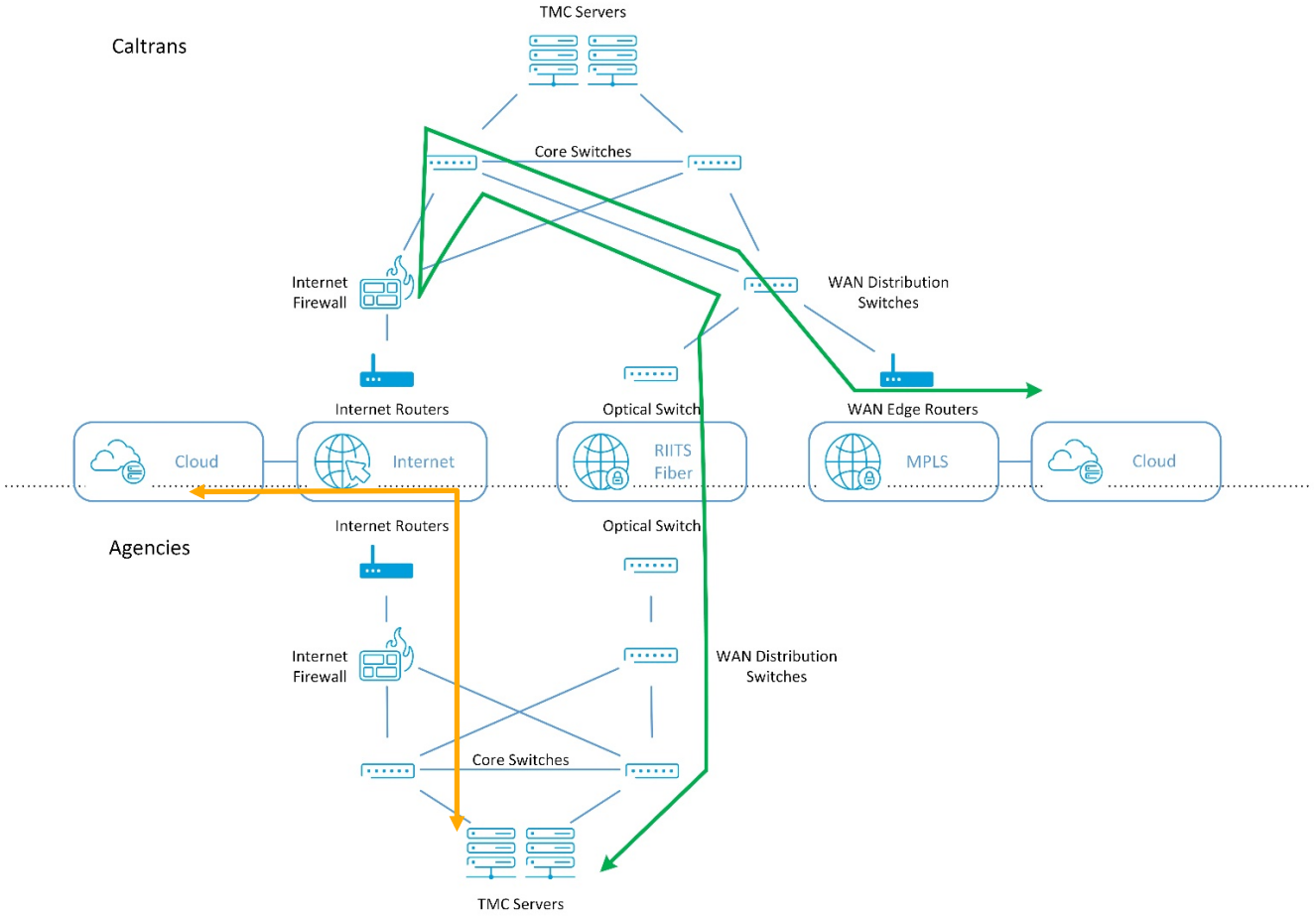
Network Discovery

- **Individual meetings were held with LACO, Pasadena and Arcadia, to conduct network discovery**
  - The goal of the meetings was to gather information from agencies utilizing existing network documentation as well as interviews to gain an understanding of the current state of the infrastructure
  - The team analyzed the discovery information and compared the current environment with business needs and technical requirements
- **Meetings provided the information necessary to recommend a high level network architecture and provide the timeframes required to execute the final solution**

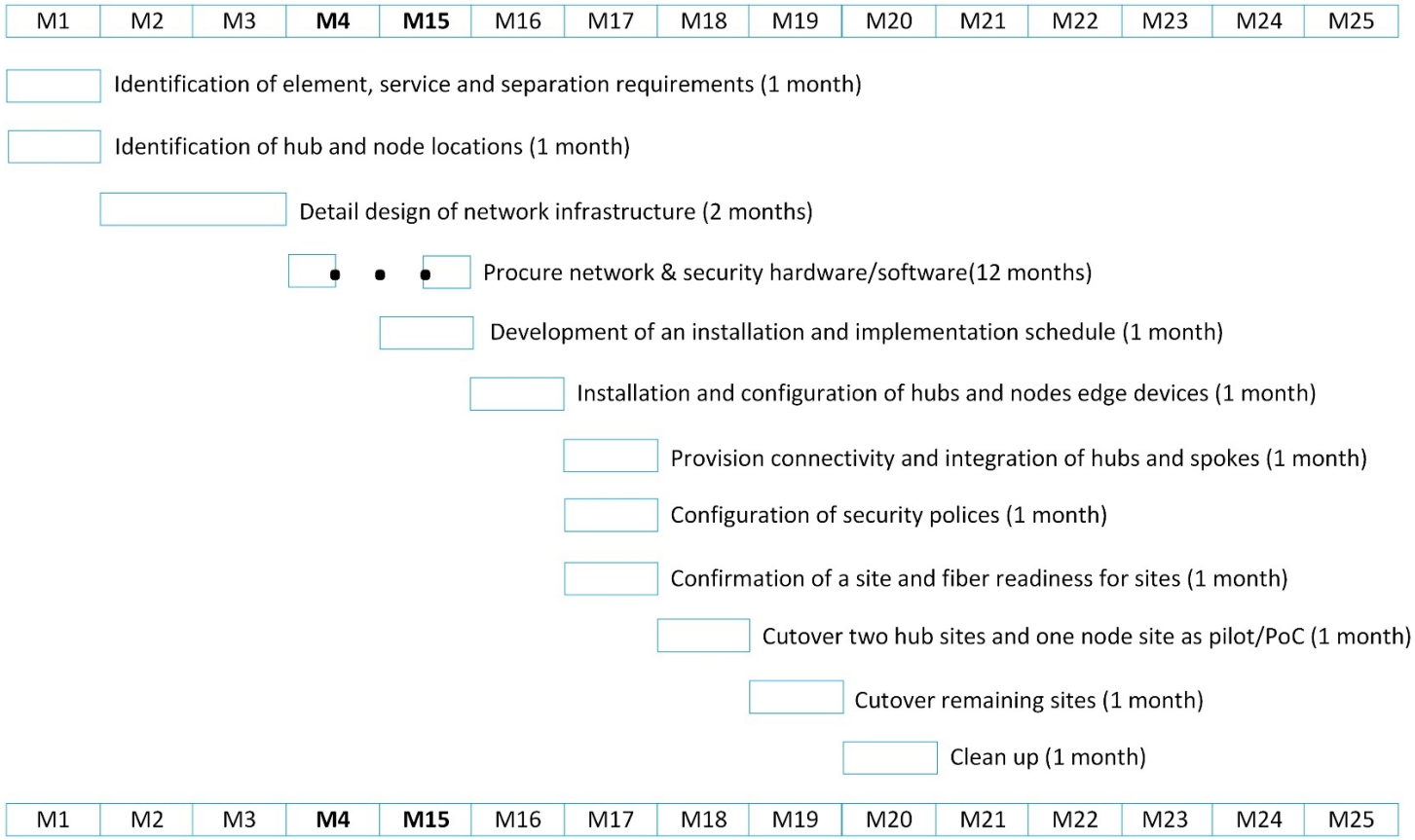
Network Components for the Fiber Infrastructure



Final Solution



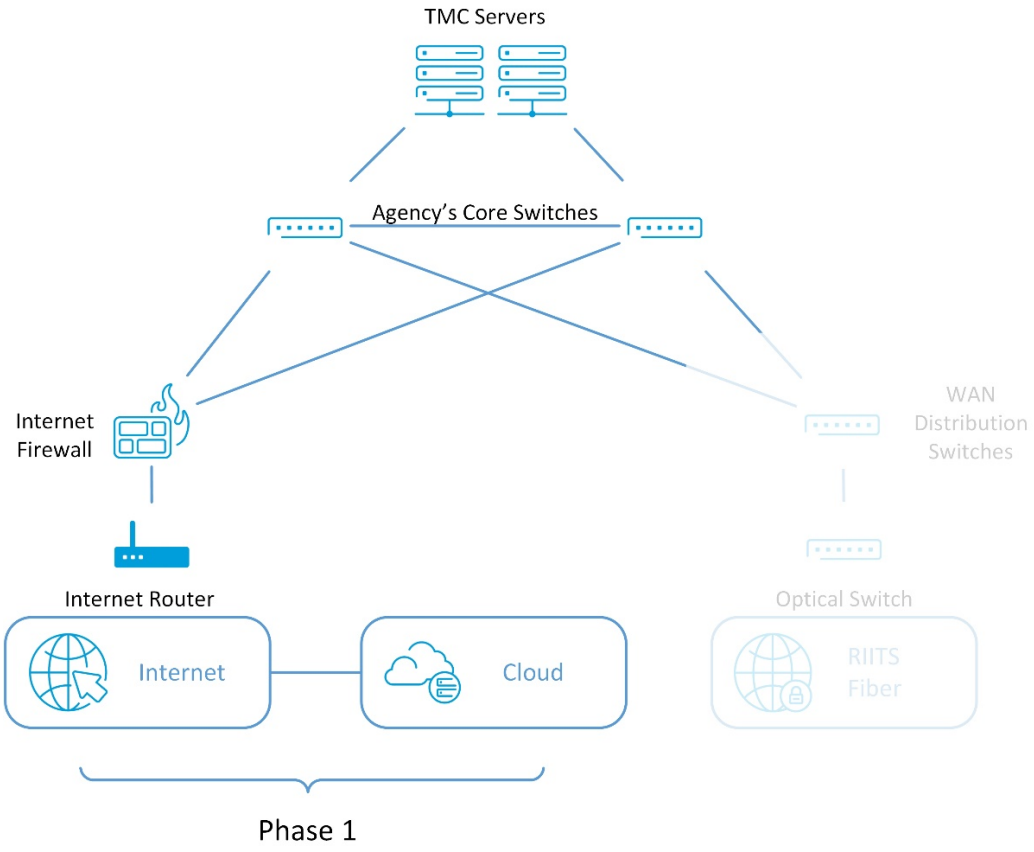
Timeline


M1
M2
M3
M4
M15
M16
M17
M18
M19
M20
M21
M22
M23
M24
M25
Identification of element, service and separation requirements (1 month)
Identification of hub and node locations (1 month)
Detail design of network infrastructure (2 months)
Procure network & security hardware/software(12 months)
Development of an installation and implementation schedule (1 month)
Installation and configuration of hubs and nodes edge devices (1 month)
Provision connectivity and integration of hubs and spokes (1 month)
Configuration of security polices (1 month)
Confirmation of a site and fiber readiness for sites (1 month)
Cutover two hub sites and one node site as pilot/PoC (1 month)
Cutover remaining sites (1 month)
Clean up (1 month)
M1
M2
M3
M4
M15
M16
M17
M18
M19
M20
M21
M22
M23
M24
M25

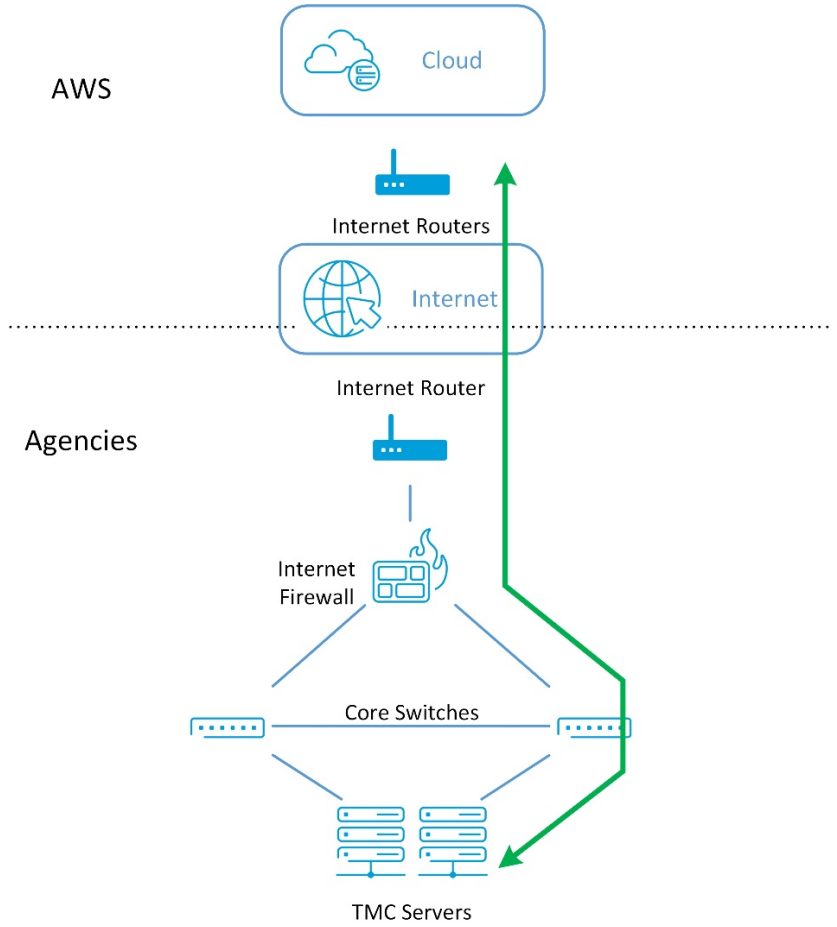
Phased Approach

- **Use existing connections to transmit traffic data to Caltrans Amazon Cloud (AWS)**
- **Phase 1 – Transmit traffic data only (no video data)**
  - Site-to-site VPN over the Internet (Recommended Solution)
    - Caltrans Amazon Cloud
    - RIITS
    - Caltrans
  - MPLS VPN with Netbond
- **Phase 2 – Transmit traffic data and video**
  - 10 Gbps fiber network

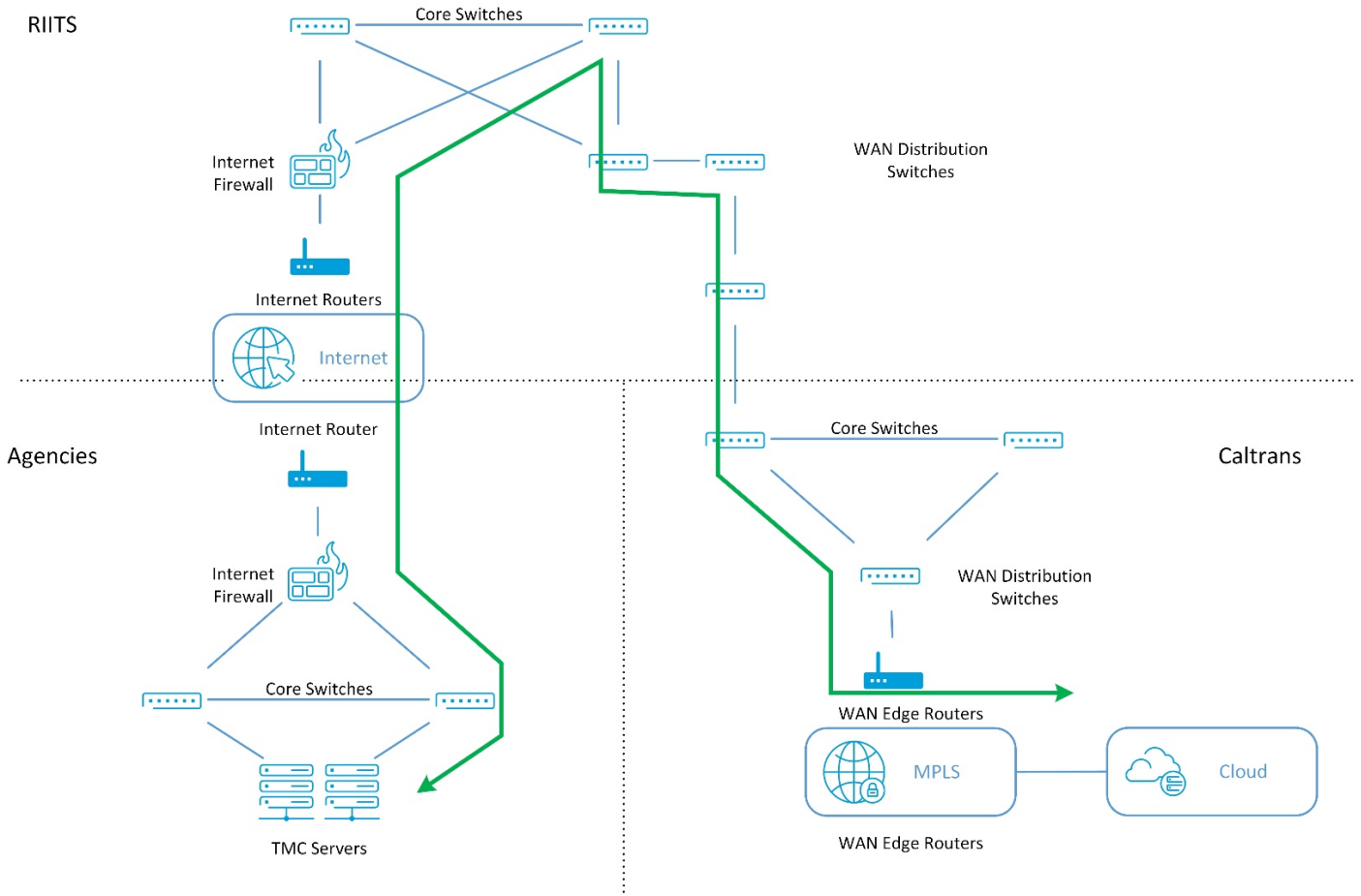
Phase 1 – Site to Site VPN



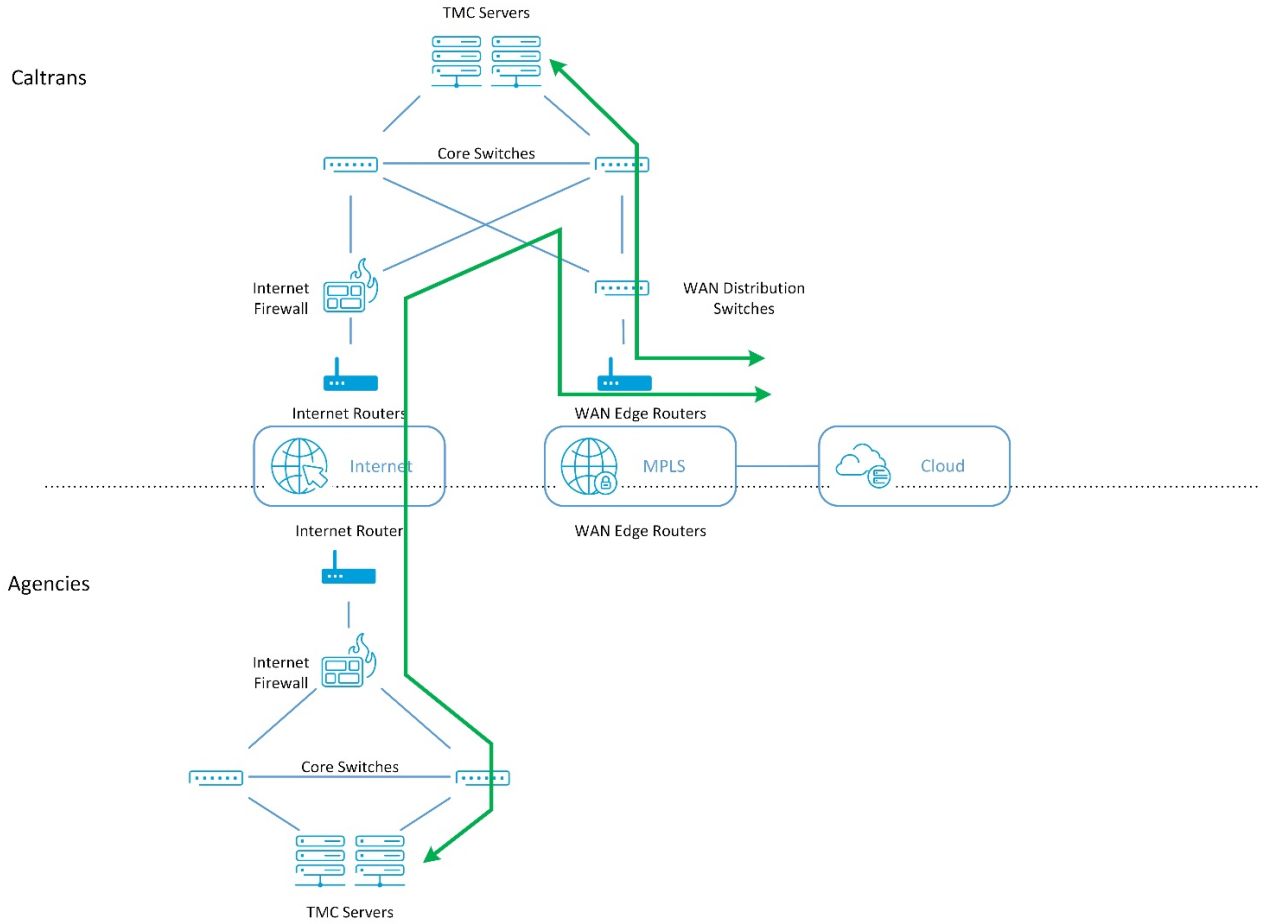
Traffic Flow – Phase 1 (VPN to AWS)



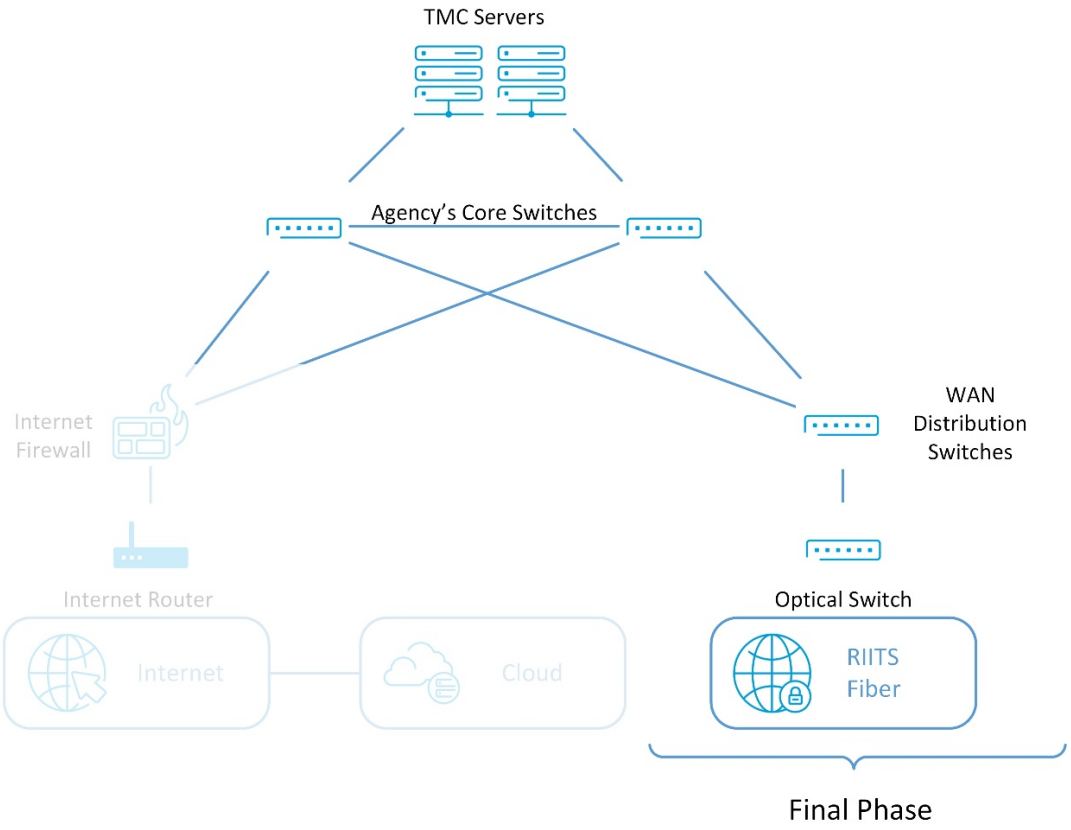
Traffic Flow – Phase 1 (VPN to RIITS)



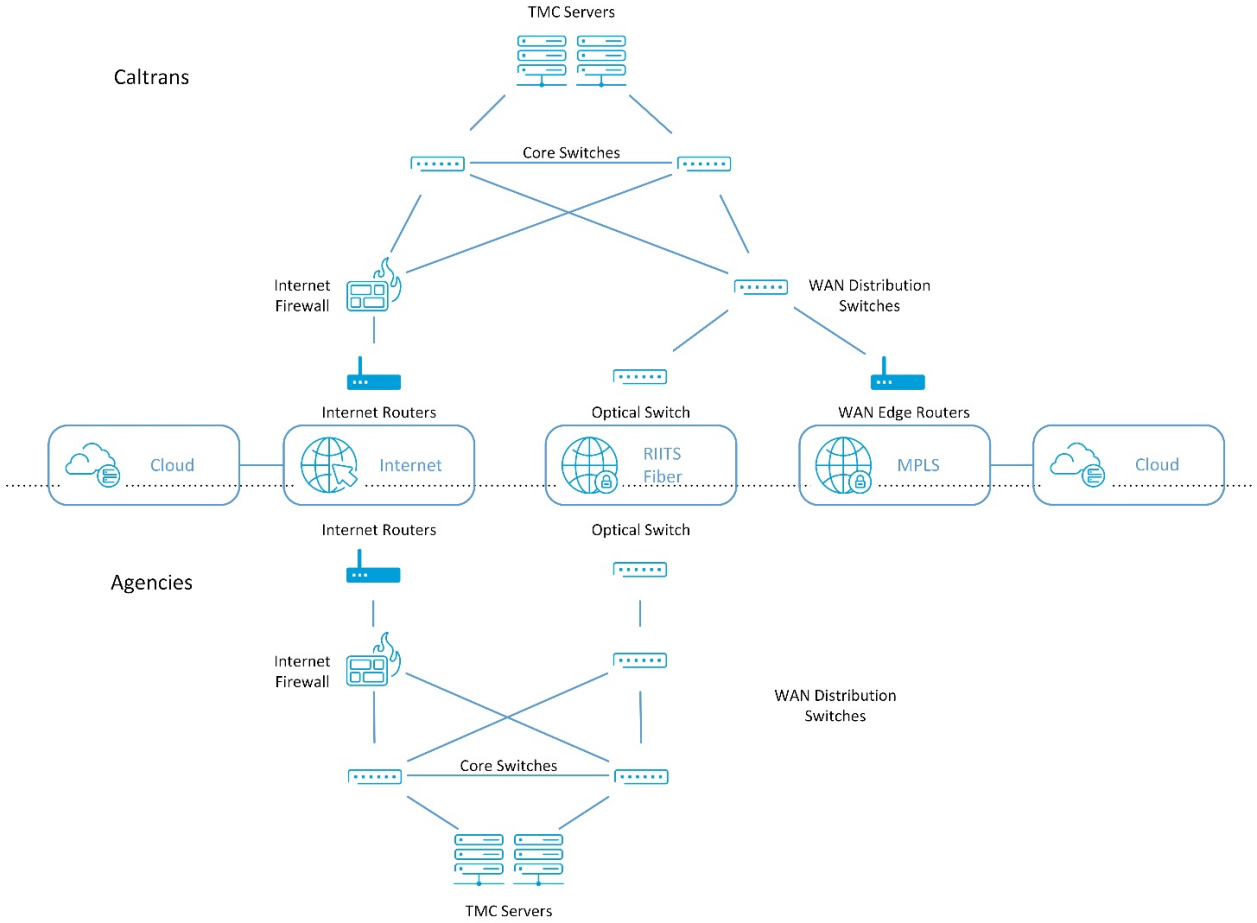
Traffic Flow – Phase 1 (VPN to Caltrans)



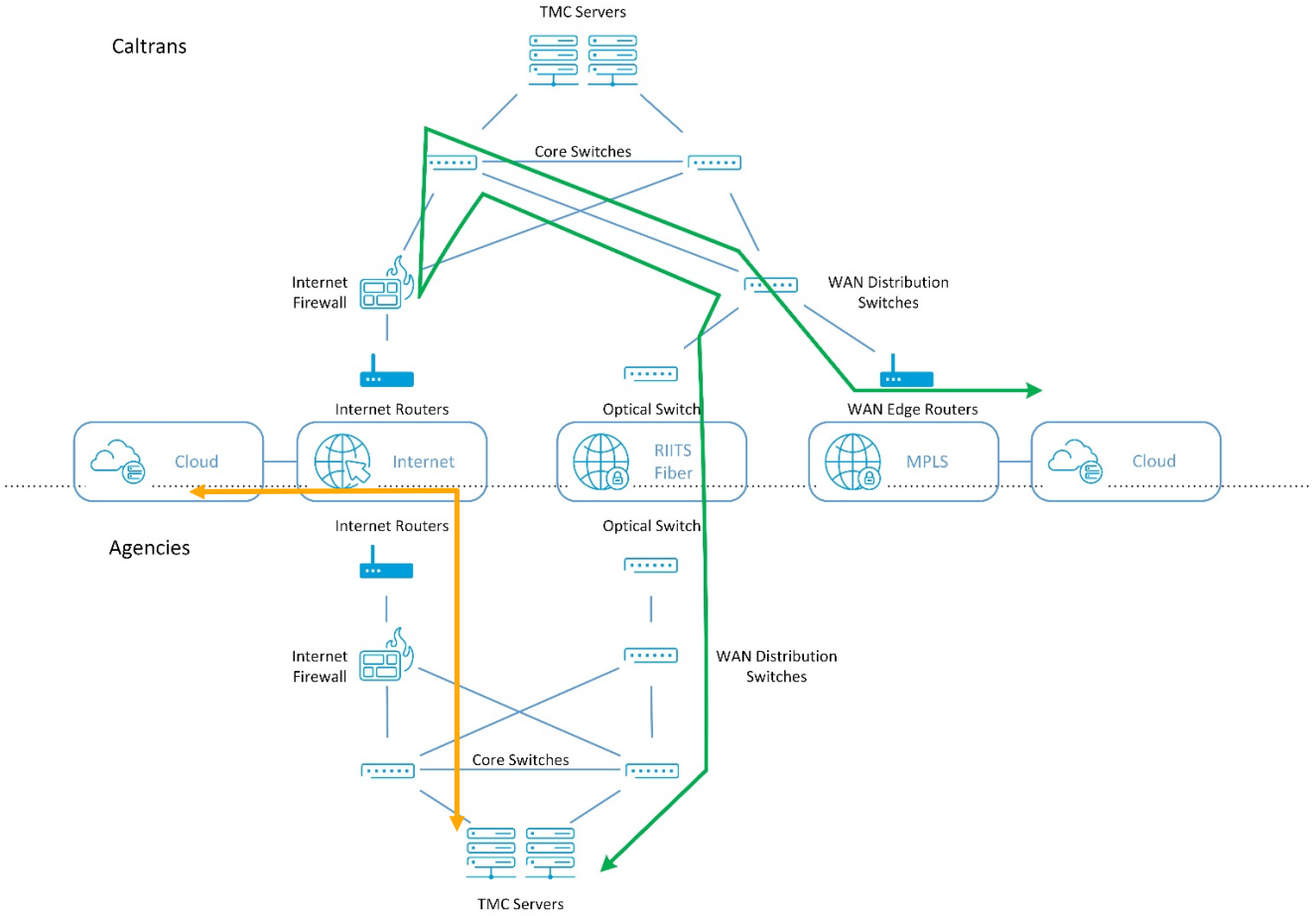
Phase 2 – Fiber Network



Transition Phase



Traffic Flow – Phase 2



Bandwidth Consumption

- **Traffic Signals**
  - **Arcadia** communicates with approximately 59 intersections
    - Bandwidth consumption was observed at ~ 1 Mbps
  - **Pasadena** operated approximately 340 traffic signals
    - Traffic signal data is low and we can anticipate Pasadena's consumption based on Arcadia's data flow
      - 340 intersections / 59 intersections ≈ 6 x 1 Mbps ≈ 6 Mbps
      - 100 intersections / 59 intersections ≈ 2 Mbps x 1 Mbps ≈ 2 Mbps
  - **LACO** operates approximately 500 intersections on their KITS system
    - 500 intersections / 59 intersections ≈ 8.5 x 1 Mbps ≈ 8.5Mbps
    - 56 intersections / 59 intersections ≈ 1 Mbps x 1 Mbps ≈ 1 Mbps

Bandwidth Consumption

- **Video Streaming**
  - After discussing anticipated usage with all agencies the following assumptions were agreed upon
    - Typical Camera utilization = 4 – 8 cameras
    - Max Camera Utilization = 12
  - CCTV camera bandwidth consumption can be configured
    - Assuming each camera requires 4 Mbps
      - Typical bandwidth = 16 Mbps - 32 Mbps
      - Max bandwidth = 48 Mbps
  - Video sharing, however, is typically not distributed at such high bandwidth
    - LACO streams video at 256 kbps which is a fraction of the calculated bandwidth shown above
  -

Center to Center Data Exchange

C2C Updates

- **Transcore**
  - Ryan has provided a good quote. A few more items to discuss.
- **Kimley Horn**
  - Received proposal – Negotiations continuing
- **McCain**
  - Awaiting proposal
- We need to identify additional funding to complete C2C contracts for Kimley Horn and McCain.
- Caltrans is providing funding for Transcore

TMDD Updates

- PATH has completed recommendations for updates toTMDD
- It is vital that all vendors use same TMDD format
- Mike Jenkinson carrying them forward to ITE and the TMDD standards board
- **From:** Siva Narla [mailto:snarla@ite.org]
  Sent: Monday, July 24, 2017 6:16 AM
  To: Nicola Tavares <ntavares@ite.org>; Jenkinson, Mike M@DOT <mike.jenkinson@dot.ca.gov>
  Cc: Rausch, Robert <robert.rausch@transcore.com>; patrick.chan@consystec.com
  Subject: RE: TMDD C2C Comments
  Importance: High
  - Mike: Please continue to send us the comments on TMDD. We shall collect your comments and have our steering and its consultant review these comments and get back to you. We would also like to welcome you to our national TMDD steering committee meetings and like to have you present and contribute to the discussion. You shall receive responses correcting the TMDD as well.
  - Nicola will send you the invite for the next web/tele conference of the TMDD steering committee this Friday, July 28.
  - Once again your comments and participation is most valuable as you are deploying TMDD.

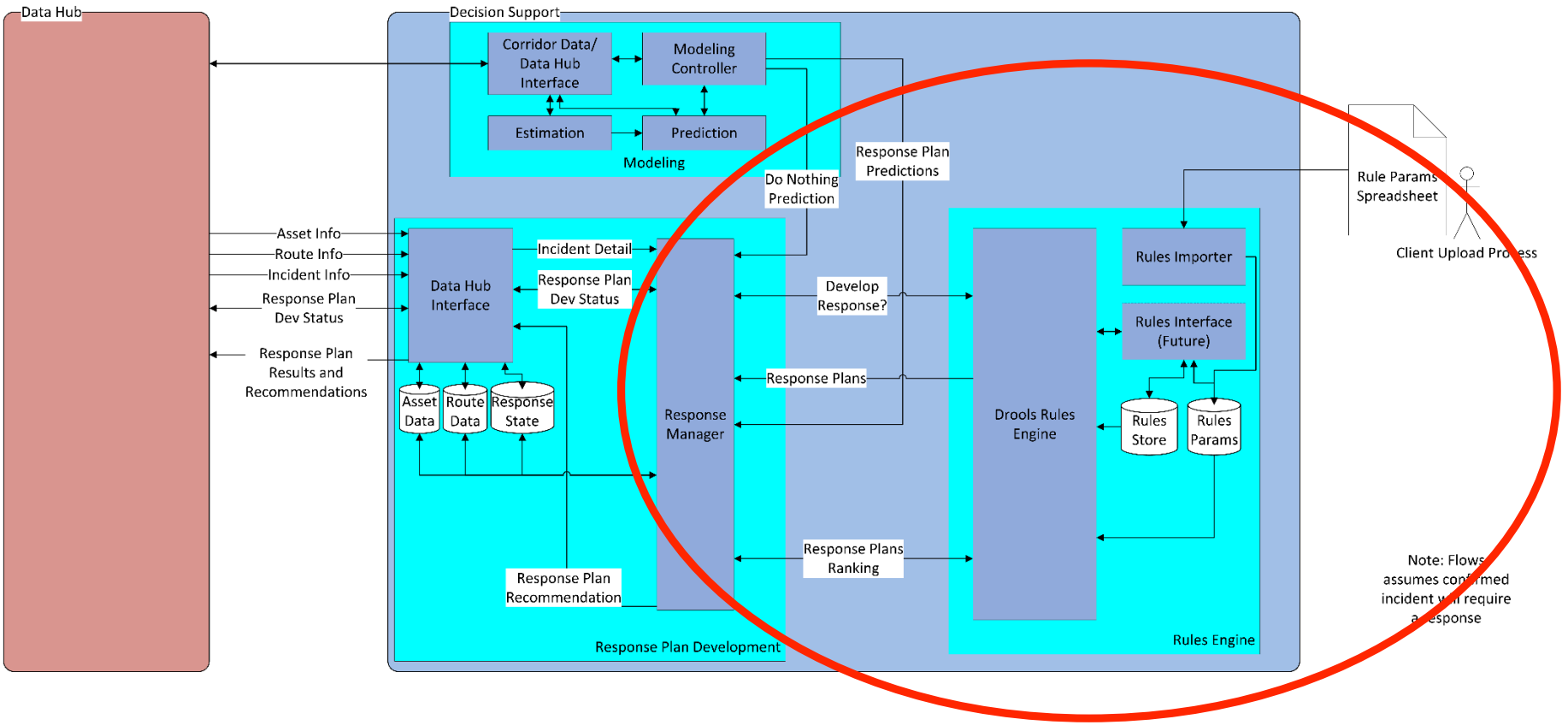
TMDD - McCain and Transcore and

- McCain
  - …just spoke with Kevin. After our call last week, he talked some more with his team, someone at Sensys, and Delcan. He stated that .NET was more forgiving of the issues in the spec, which is what they use, but in talking with Delcan, found that they had raised the same issues in the past. … he stated he'll support the change to TMDD..
  - He also asked that we provide at some point some sample code for both ends of the transaction and that a combination of their .NET code and our Java code may be used for others who wish to use the standard.
- Transcore
  - Also held phone meeting with Transcore devlopers.
  - They stated similar thoughts to McCain and will support

DSS, Rules and Response Plans

Greg

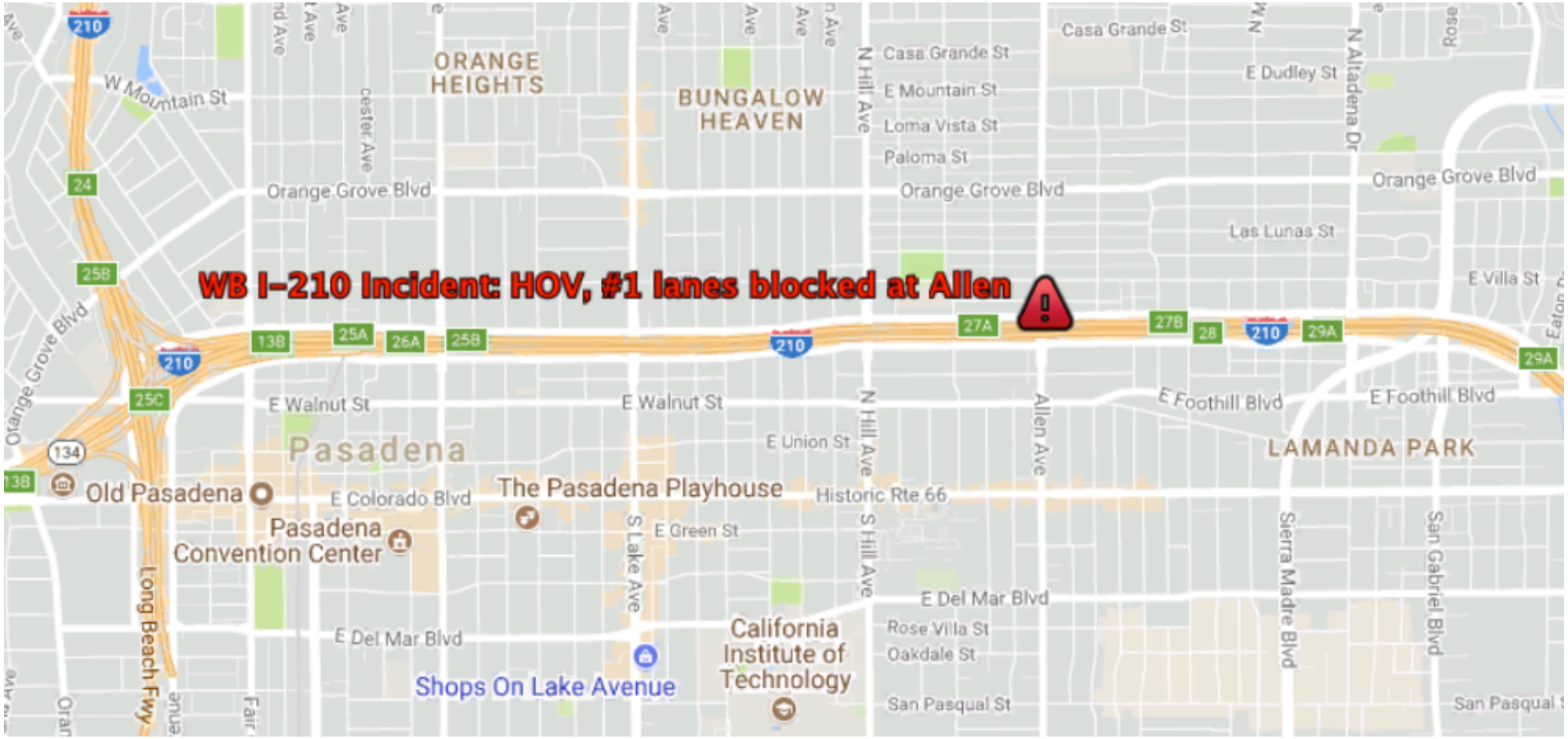
DSS – Design Detail



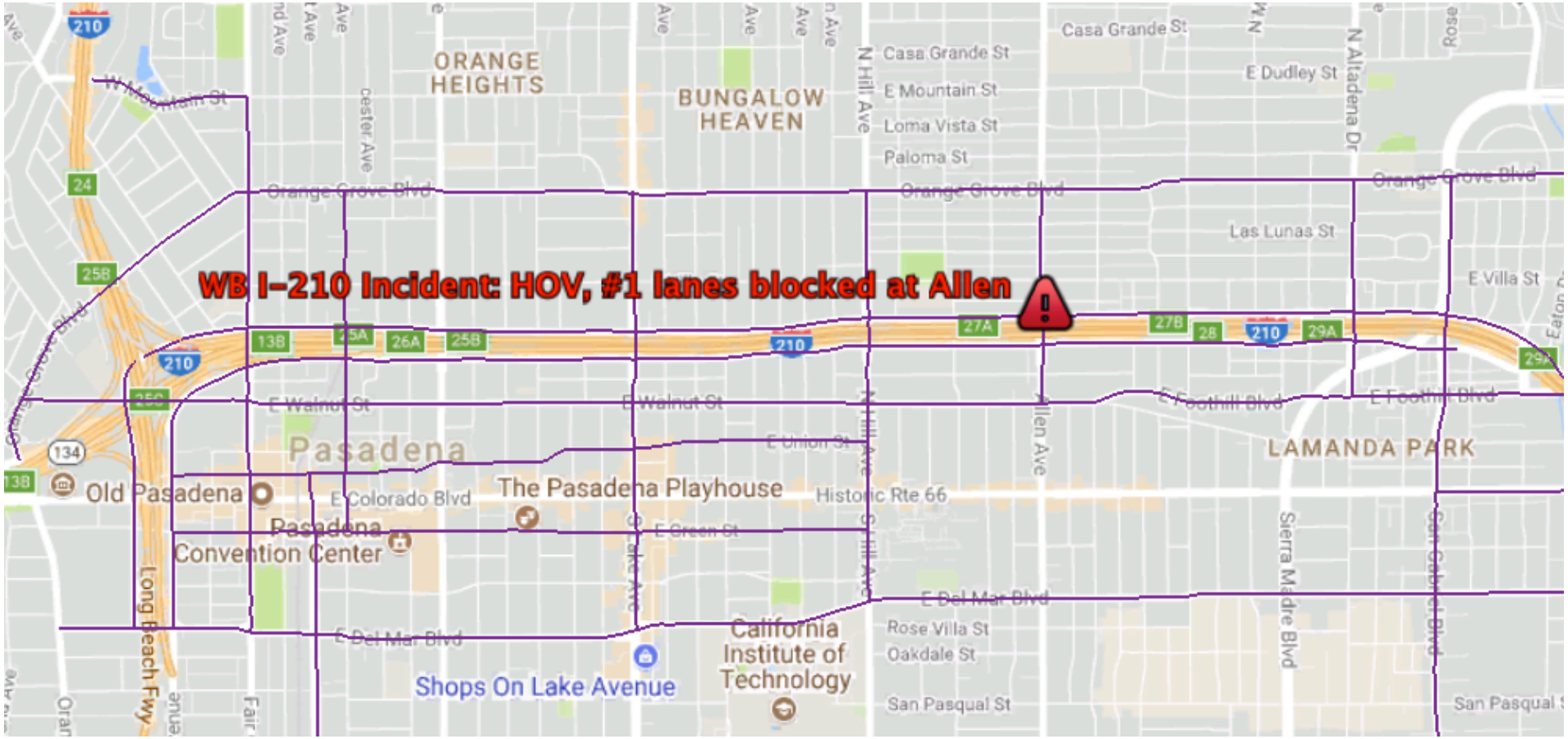
Response Plans

- **Responding to an incident**
- **A tool for building response plans from response plan elements**
- **Next step: using and expanding the tool**

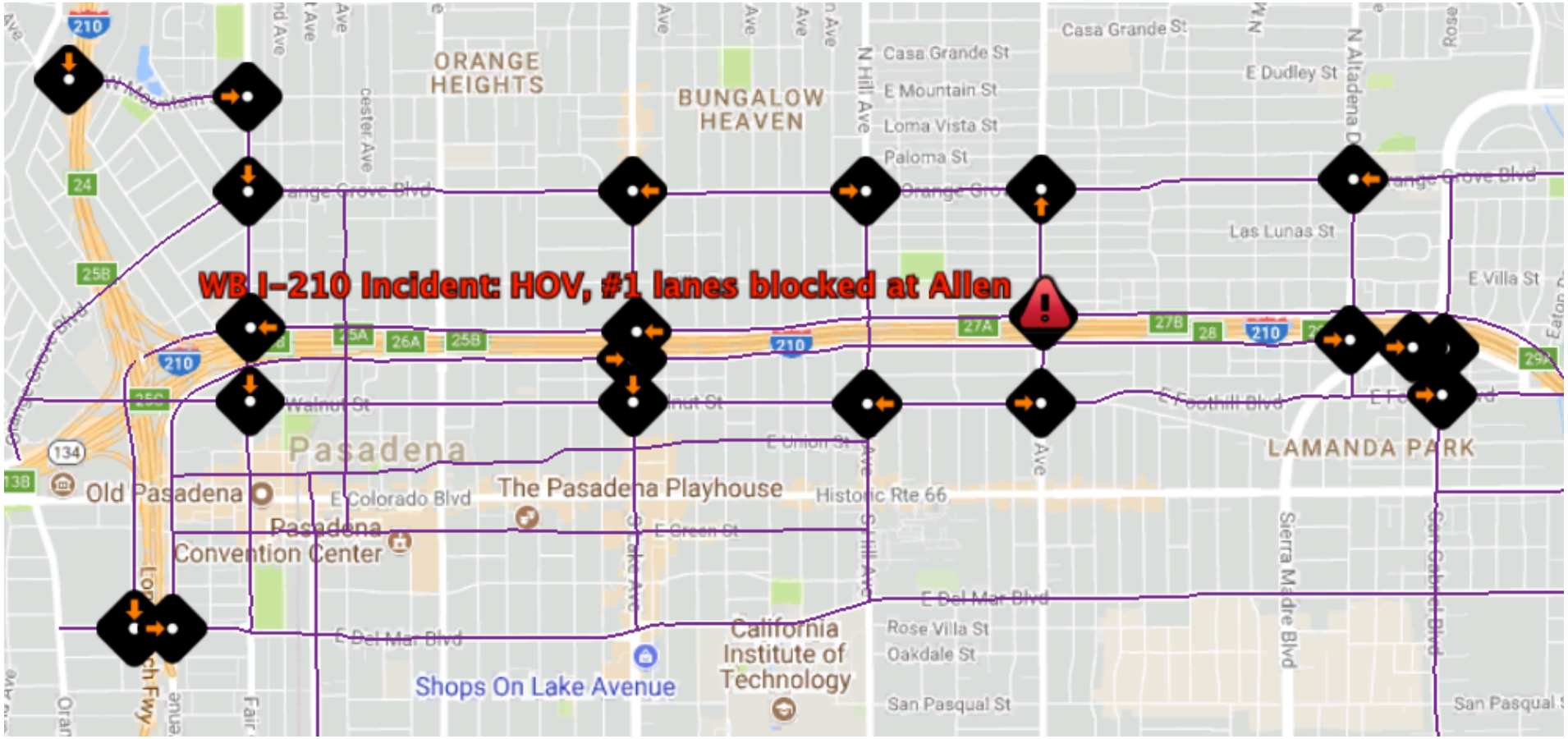
Responding to an incident:



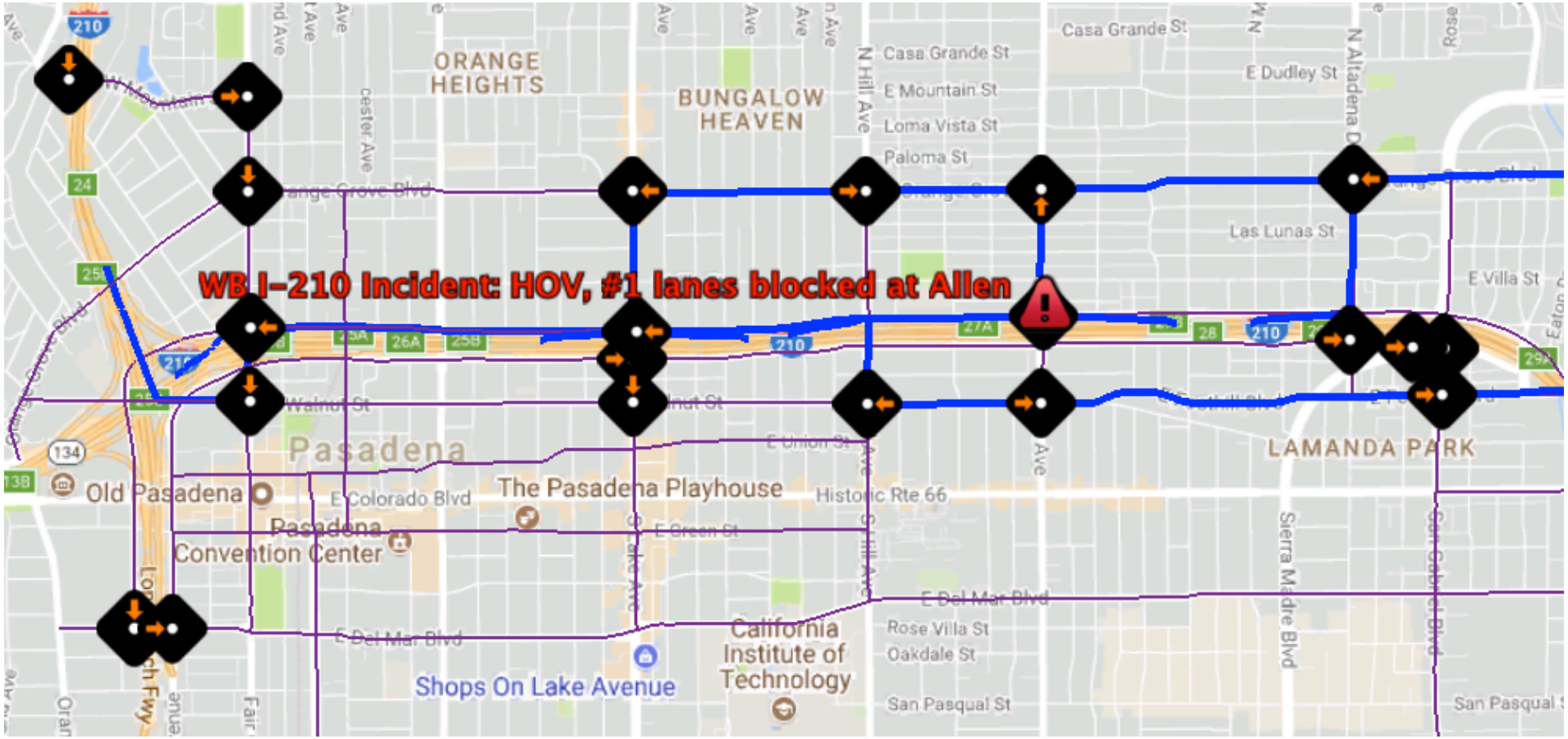
Responding to an incident: arterials…



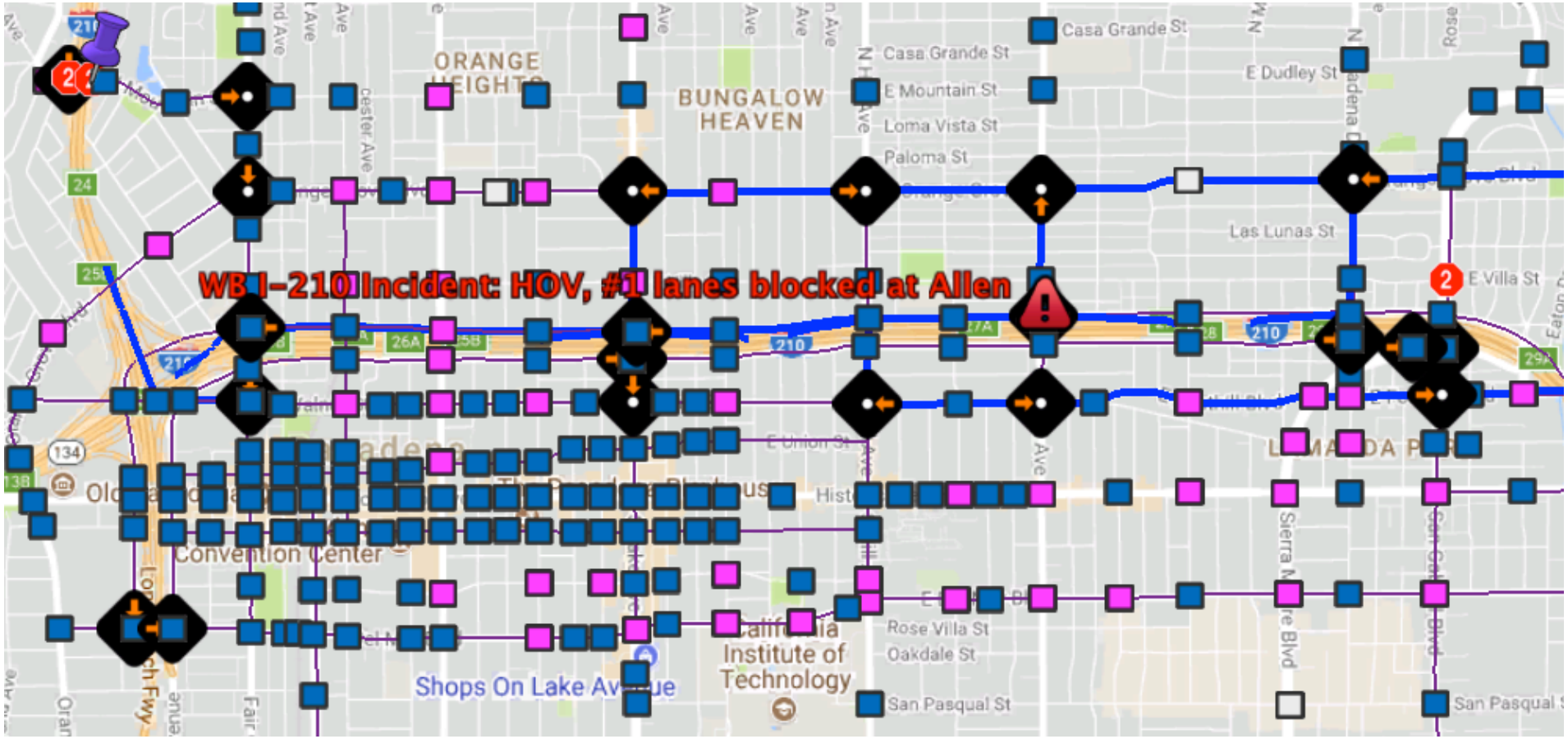
Responding to an incident: wayfinding…



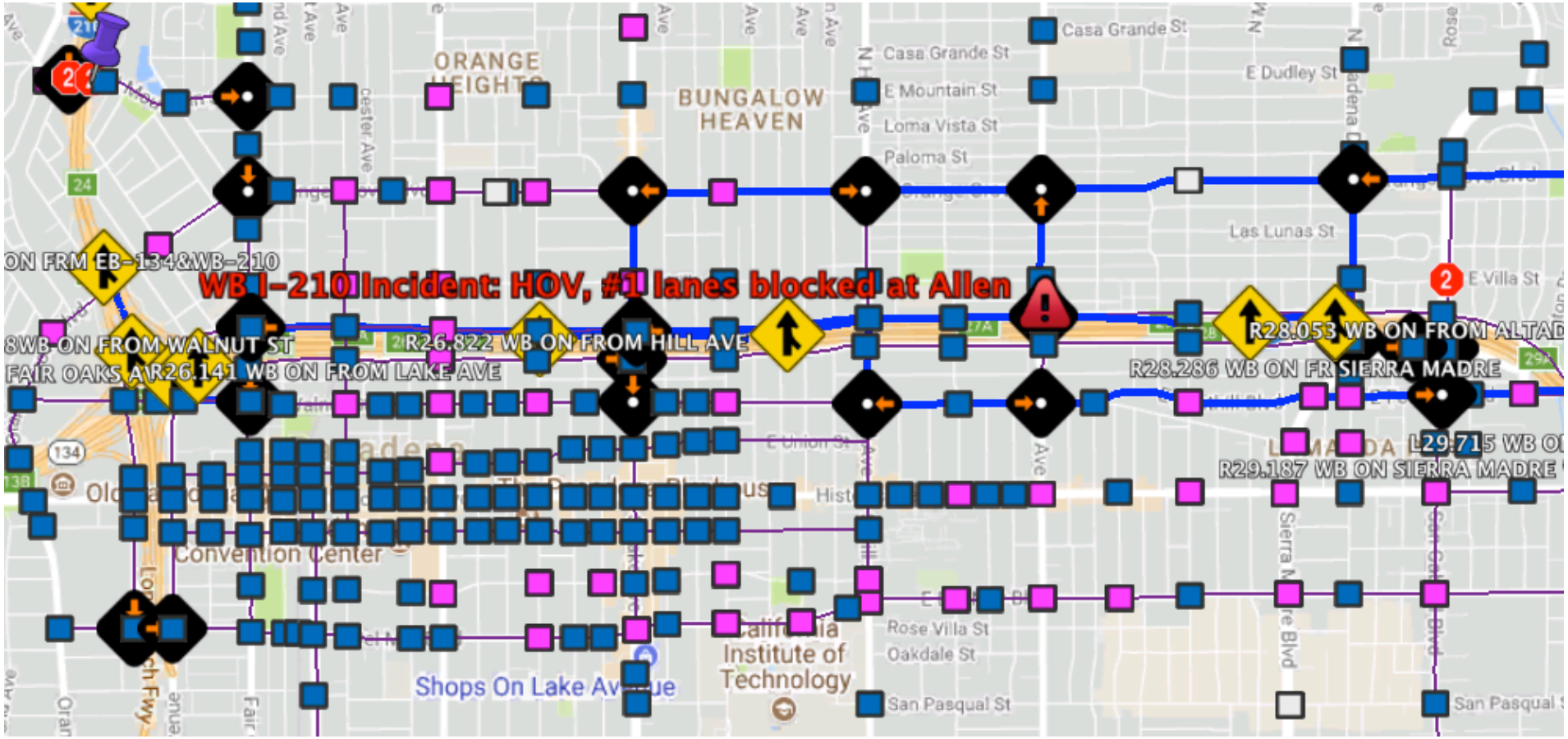
Responding to an incident: routes…



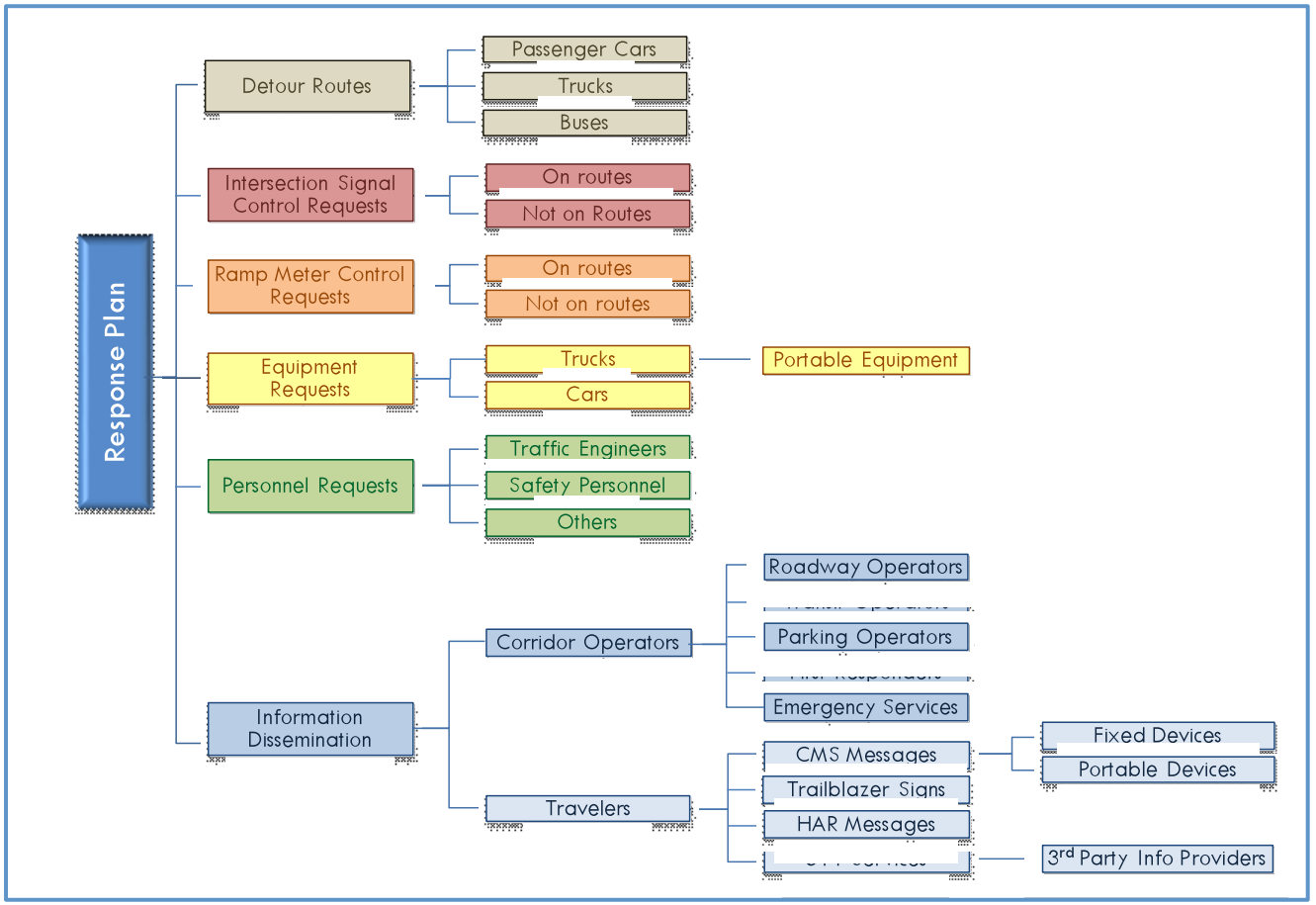
Responding to an incident: signals…



Responding to an incident: ramp meters…

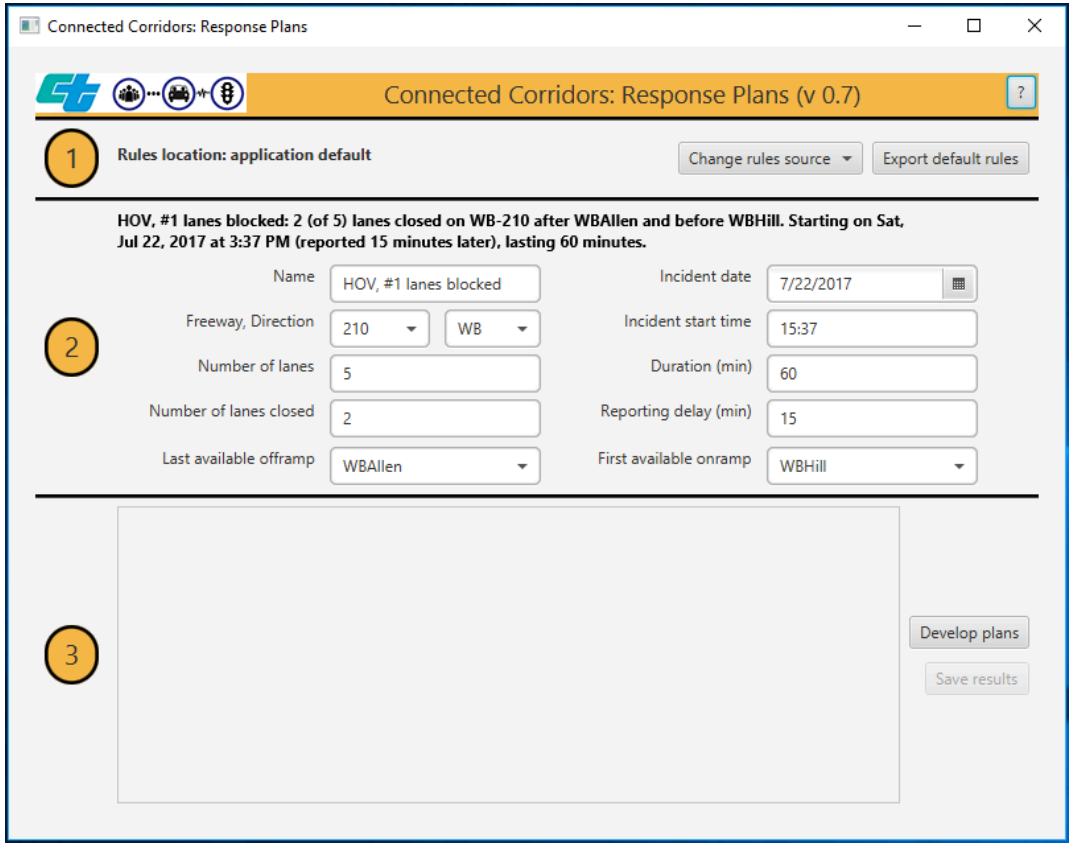


...and more:

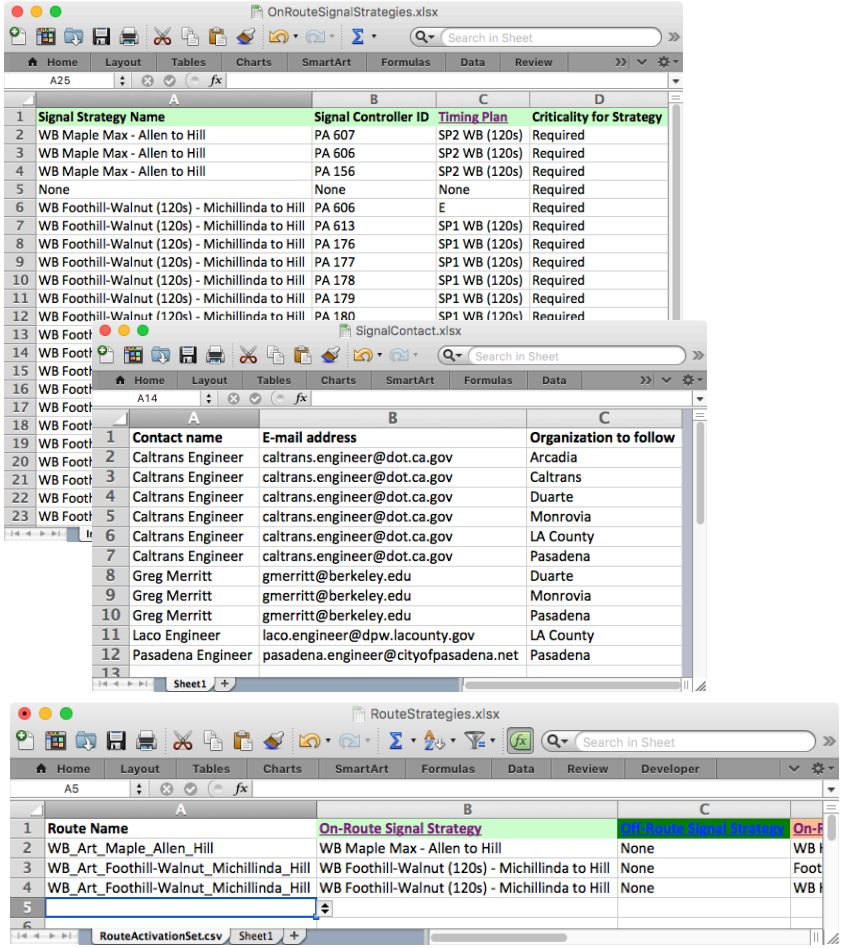

Response Plan
Detour Routes
Passenger Cars
Trucks
Buses
Intersection Signal Control Requests
On routes
Not on Routes
Ramp Meter Control Requests
On routes
Not on routes
Equipment Requests
Trucks
Cars
Portable Equipment
Personnel Requests
Traffic Engineers
Safety Personnel
Others
Information Dissemination
Corridor Operators
Roadway Operators
Parking Operators
Emergency Services
Travelers
CMS Messages
Fixed Devices
Portable Devices
Trailblazer Signs
HAR Messages
3rd Party Info Providers

Tool for building response plans

- **Desktop app**
- **Plan element data managed in Excel**
- **Incident parameters entered in app**
- **App's rules build plans for the incident**
- **Plan files can be saved**



Tool for building response plans from control strategy elements



Demonstration

(run demo)

Route Strategy

- **A set of coordinated control strategies to support specific use of an alternate route:**
  - A route
  - A set of specific signal timing plans for signals along the route
  - A set of specific signal timing plans for signals not on the route
  - A set of ramp meter plans/rates along the route
  - A set of ramp meter plans/rates not on the route

Simple network representation.

- **The application uses a minimal network representation sufficient to support alternate routes for freeway incidents**
- **Spreadsheet-based; no model**

Next steps: Workflow, Validation, and Rules

- **Supporting spreadsheets contain details of Route Strategy elements and their relationships.**
  - Workflow
    - How do people prefer to approach working with this data?
  - Validation
    - What types of data validation / data entry restriction are desired?
- **Rules - for next time**
  - Rules restricting asset availability
  - Rules that flesh out response plans based on elements of Route Strategy

Next Steps

- **Who would like to work with Greg to build response plans and refine the application?**
- **Who would like to get a copy to explore?**

ATMS, PEMS, 511, Lane Closure

ATMS, PEMS, 511, Lane Closure

- **ATMS Upgrades**
  - Vendor under contract – Excellent work by Caltrans
  - Kick off meeting held
- **PEMS**
  - Design meetings held with Caltrans, Iteris and PATH
  - Awaiting updated design and quote from Iteris
- **511**
  - RIITS and PATH need to schedule design reviews
- **Arterial Lane Closure**
  - Mike Jenkinson has provided the lane closure system
  - I will demonstrate

Lane Closure System

Home | Road Closures | Closures by Category | Enter Road Closure | Help

Home » Road Closures

Road Closures

Export to CSV

Cones Down
Start date

Apply Reset

E.g., Jul 23 2017
End date

E.g., Jul 23 2017

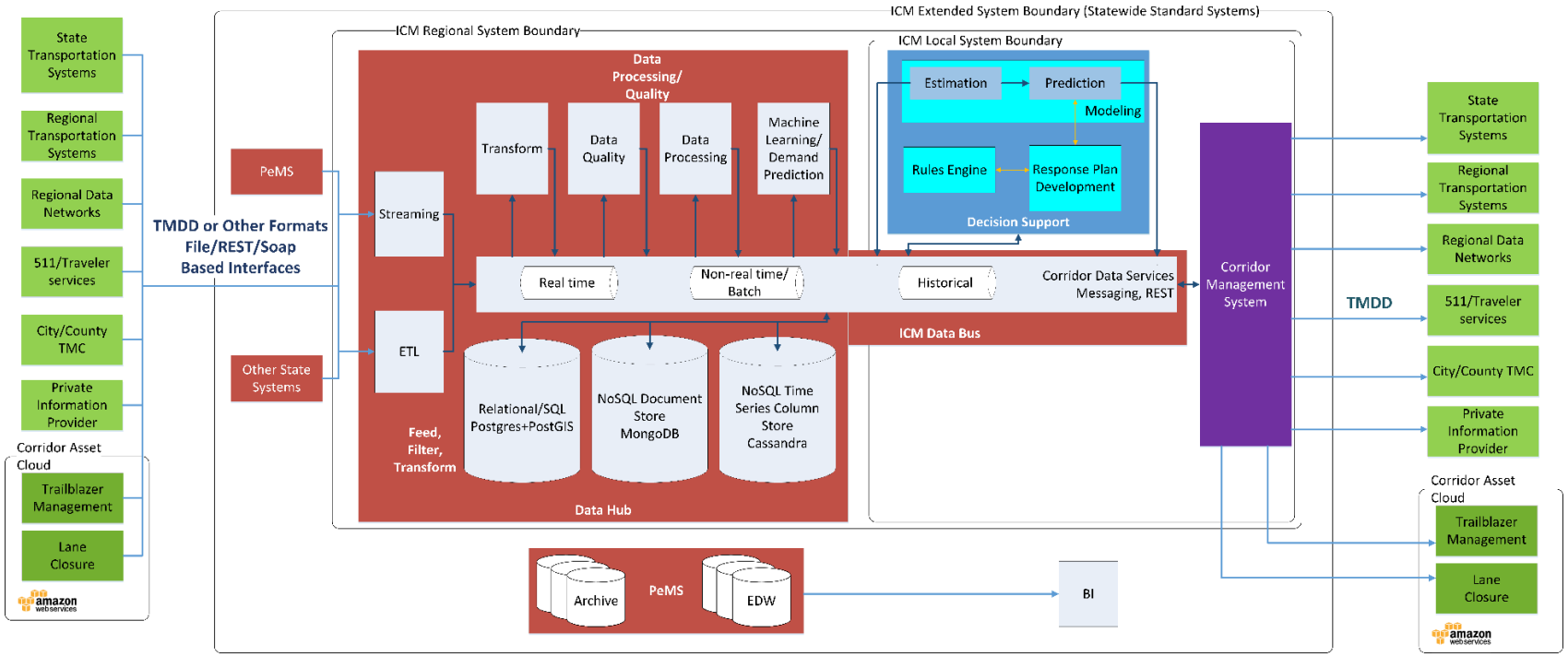
Direction	Facility	Street Name	Begin Description	End Description	Closure Type	Estimated Delay	Lanes Closed	Total Lanes	Expected End	Cones-Down Date	Cones-Up Date
EB	Local Road	Colorado Blvd	Intersection of Colorado Blvd and Madre Street, Pasadena, CA 91107, USA	Intersection of Colorado Blvd and Rosemead Blvd Pasadena, CA 91107, USA	Lane	15 minutes non Peek, 30 minutes Peek	1	2	06/30/2017 22:30	06/22/2017 16:30	06/22/2017 16:30

Using the lane closure system

- Link https://210lcstest.dot.ca.gov/
- Mike approves new users
- Please try it out and see if it is acceptable for CC

Data Hub and Cloud

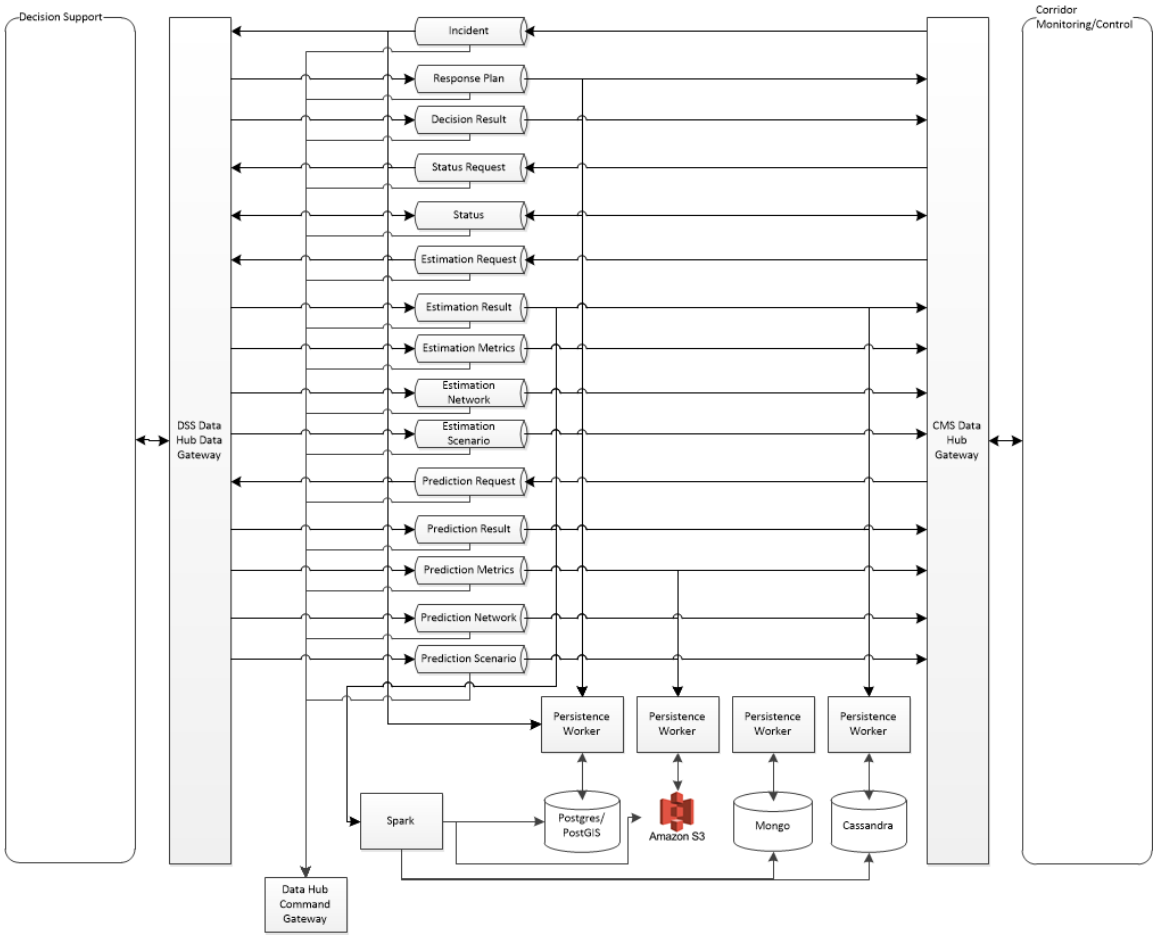
Data Hub and Internal Command and Control



System Development Status

- **Met with Caltrans HQ IT Infrastructure and Solutions Groups**
- **Continuation of efforts**
  - DSS/DH integration and data interface
  - TMDD WS-I issues regarding TMDD subscriptions
  - Design specifications
- **Setting up DSS/DH integrated *test* environment with new VPC configuration**
- **Develop "desktop" rules engine for rules experimentation**
- **Met with Dr Kristen Tufte who works on the USDOT Open Data Exchange in order to review our data hub. She thought it was well done**

Design – DSS/CMS Data Hub Pipelines



Next steps

- **Data Hub Command Gateway Interface**
  - Control center for data hub pipelines
    - Processes command controls for start, stop, status of data pipelines
  - Control management of DSS – Data Hub – Corridor Management System
    - Controls and routes commands between DSS and CMS
    - Ensures capture of events between DSS/CMS/Data Hub
  - Will set up prototype for data hub pipeline control first
- **Create environment for modeling to run Aimsun model in cloud at scale and test AWS/Aimsun configuration for speed**

Data Quality and Estimation

Freeway Sensor Availability

Weekly Average Sensor Availability
Hover over cells to view units in detector-days.

I-210 | Eastbound PM 25 - PM 43.25

		CD	CH	Fwy-Fwy	HOV	Mainline	Off Ramp	On Ramp	Total
July	2 3 4 5 6 7 8			66.7%	80.4%	80.4%	67.5%	73.1%	77.6%
	9 10 11 12 13 14 15			66.7%	68.2%	68.0%	40.7%	58.3%	63.4%
	16 17 18 19 20 21 22			66.7%	90.2%	87.0%	68.8%	88.6%	84.7%

Weekly Average Sensor Availability
Hover over cells to view units in detector-days.

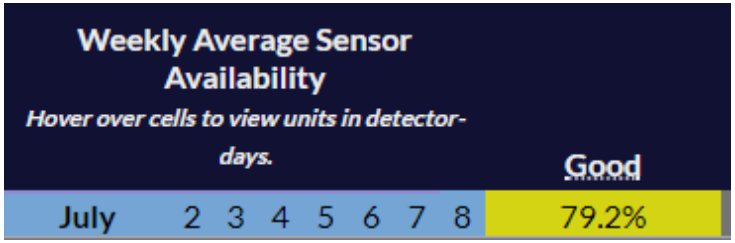
I-210 | Westbound PM 25 - PM 43.25

		CD	CH	Fwy-Fwy	HOV	Mainline	Off Ramp	On Ramp	Total
July	2 3 4 5 6 7 8			80.0%	77.8%	76.2%	75.2%	77.0%	76.6%
	9 10 11 12 13 14 15			66.7%	62.0%	61.5%	48.1%	53.1%	59.5%
	16 17 18 19 20 21 22			80.0%	83.5%	81.8%	66.2%	79.1%	80.0%

- Will refine the results to take into account planned construction events which can interrupt the ability to collect and process data
- The new IP network should raise overall data quality on the freeway

Data Collection for cities and county

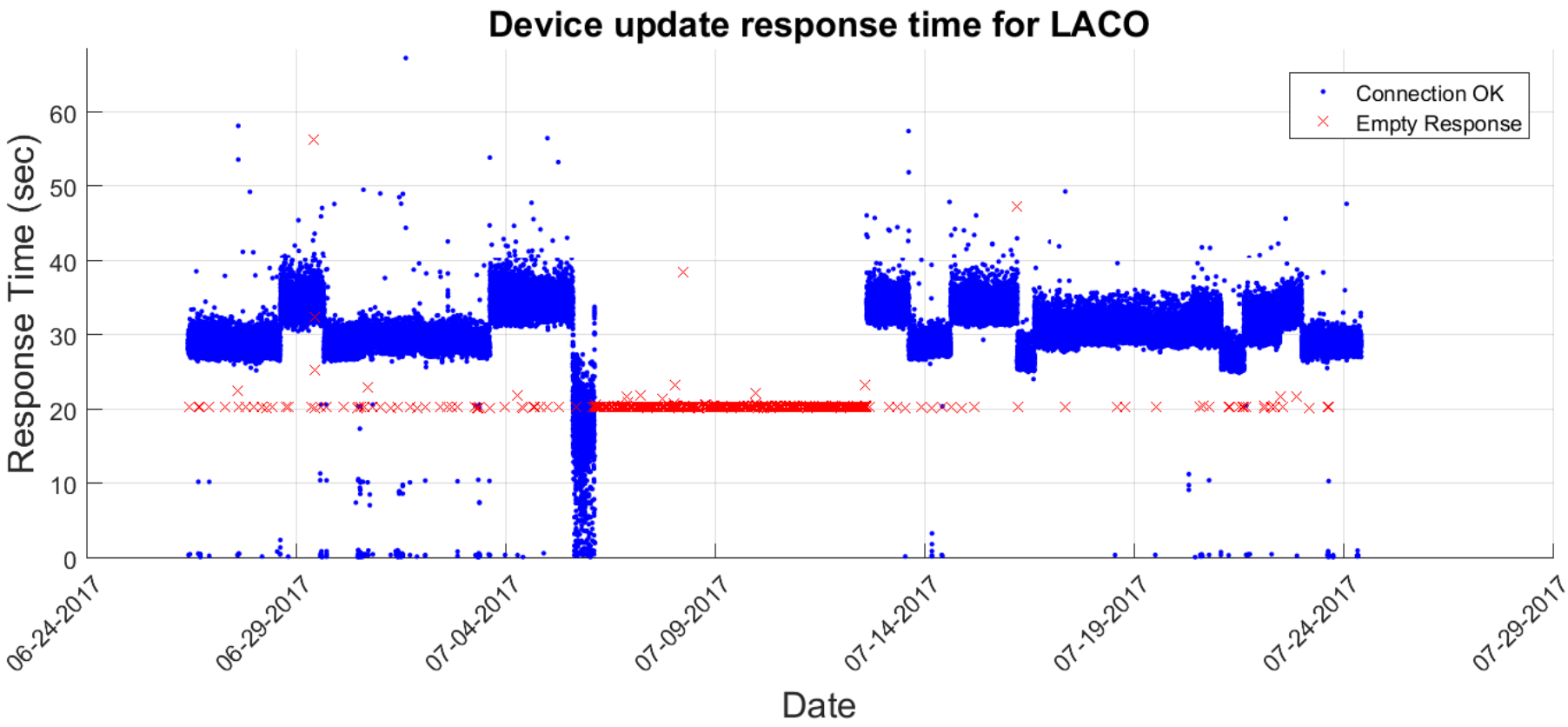
- **Arcadia**



- **County, Monrovia, Duarte – Working with IEN to obtain data**

- **Pasadena – PATH awaiting feedback on questions regarding the data provided**

Device Update Response Time: LACO



Corridor Model update

Aimsun on the Cloud

- **Able to run Aimsun model on Amazon Web Services**
- **Working with TSS to understand software challenges when running on a different environment**
- **Building tools to view and interpret model output when run without GUI on the cloud**

W/O Barranca	45	45	38	50	55	47	47	46	50	50	45	49	54	47	46	43	45	48	45	43	35	37	41	50
Citrus 2	46	42	43	49	50	40	45	47	45	47	45	46	51	42	38	42	45	48	42	35	29	45	42	40
Citrus 1	46	39	44	51	48	43	45	47	49	50	45	48	53	42	40	49	48	48	45	33	39	45	46	45
Pasadena Ave	22	29	25	19	19	21	21	19	23	25	19	22	20	23	24	23	20	26	26	25	21	23	23	23
Azusa 2	51	48	50	51	30	38	28	23	15	16	16	13	15	15	16	14	15	15	15	16	16	16	15	15
Azusa 1	56	51	54	56	49	53	43	45	22	16	21	14	15	16	15	14	14	14	16	16	17	16	16	16
Vernon	57	57	59	56	59	55	59	56	59	59	53	57	55	56	56	50	45	23	24	21	20	19	19	21
Zachary Padilla	61	64	61	58	62	61	61	58	61	59	59	62	60	62	59	60	56	58	53	59	62	63	55	59
Irwindale	52	59	49	55	57	52	52	48	52	53	56	53	55	55	46	48	50	49	45	54	58	53	47	55
W/O Irwindale	53	51	52	56	52	51	51	54	54	54	56	57	58	55	52	48	53	50	55	54	55	57	51	57
San Gabriel River	41	39	42	43	44	38	38	43	40	45	46	44	48	44	44	44	42	42	38	42	46	46	38	41	41
NB 605 to EB 210	17	13	14	13	13	14	13	13	14	13	13	14	13	14	14	14	13	15	13	14	13	14	14	13
Mount Olive Dr	61	56	18	14	15	14	15	15	13	15	15	14	13	13	16	14	14	15	15	15	13	14	15	15
Highland	59	61	60	49	22	16	16	18	16	17	18	15	16	14	17	15	17	18	19	15	15	15	17	17
Buena Vista	51	50	48	50	38	49	48	27	18	17	15	17	17	17	17	15	15	14	15	14	14	15	16	15
Mountain	48	48	32	39	35	46	38	42	28	14	25	26	24	18	19	18	15	24	22	18	26	23	23	26
Myrtle Av	46	44	48	52	52	46	47	47	43	39	41	19	18	16	14	15	15	12	12	14	14	13	13	15
Huntington 2	49	52	53	53	51	48	45	47	55	48	48	51	47	44	46	44	48	51	52	12	15	14	13	13
Huntington 1	50	54	57	55	55	50	49	53	55	52	52	53	51	46	49	45	50	56	62	31	16	15	14	13
East of Second	58	56	58	60	58	56	53	60	59	57	55	57	53	51	52	53	48	59	58	56	46	55	37	18
Santa Anita 2	45	42	44	52	41	39	42	47	49	44	42	41	38	41	36	37	33	49	45	39	42	49	46	51
Baldwin	46	47	42	37	42	39	45	53	45	43	46	42	38	36	37	46	40	44	40	41	48	45	48	42
Vaquero	50	50	49	47	47	47	51	52	50	48	46	46	45	42	49	47	49	47	52	51	49	52	49	52
Michillinda	38	36	30	29	30	32	33	29	30	30	28	30	28	28	27	27	29	32	35	34	31	33	32	30
Rosemead 1	39	32	29	29	30	30	32	24	23	25	23	19	17	21	20	22	28	32	34	33	33	31	28	32
Sierra Madre V2	31	34	33	38	34	30	27	20	18	18	18	16	18	19	16	17	16	17	17	17	16	17	16	16
San Gabriel	56	59	59	51	56	56	52	54	56	54	55	55	51	53	57	53	57	60	58	54	57	52	44	59
Allen	56	59	59	50	58	56	56	54	55	54	50	53	51	55	57	55	56	59	54	57	51	53	58	56
Hill 1	57	54	53	53	54	49	56	50	51	50	51	52	50	52	52	49	56	54	55	55	46	47	58	51
Lake 2	58	42	40	51	55	53	54	53	50	47	46	34	53	54	51	53	51	49	47	29	51	56	52	47
Marengo	49	50	52	50	51	52	51	50	50	50	51	48	51	53	50	51	50	52	51	49	51	53	52	48
Fair Oaks 1	60	59	62	59	58	64	59	57	58	58	58	60	58	59	59	62	62	56	61	60	62	59	57	61
Orange Grove	60	63	63	60	60	60	63	57	61	57	58	61	59	59	61	61	62	61	58	62	60	62	59	59	59
San Rafael	58	57	56	56	55	52	56	54	53	55	54	56	53	55	56	56	53	51	56	55	57	54	53	54
Colorado	64	65	64	64	64	64	63	62	63	65	66	63	63	62	64	64	64	64	63	64	64	64	64	64
Figueroa	68	67	68	67	67	67	66	67	67	68	68	69	67	67	66	67	67	66	66	68	68	68	69	66

Space time diagram, speeds in mph

Aimsun Meso-Model Calibration

- **Calibrating the meso-simulation model in Aimsun**
- **The meso-model will enable us to more effectively use features in Aimsun to improve:**
  - 24-hour demand profiles
  - Time-sliced demand matrices
  - Time-sliced vehicle path assignments
  - Day-of-week refinements

Inventory of flush plans at each signal

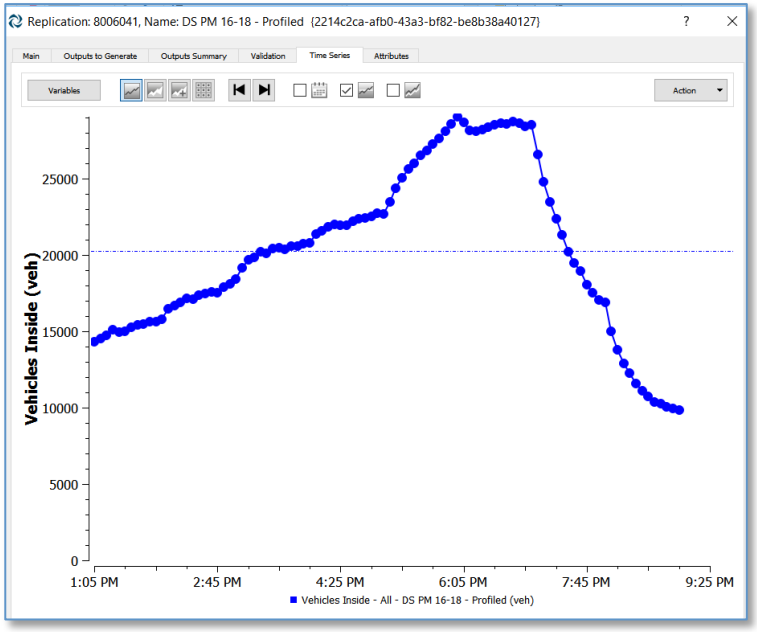
- **Building inventory of flush plans required at each signalized intersection to support the reroutes**

Reroute Name

Main Street	Cross Street	EB_Art_FarOaks_Mountain_Marengo	EB_Art_OrangeGrove_MountainStPA_Hill	EB_Art_210_Connector_DelMar	EB_Art_Corson_Lake_Hill	EB_Art_Walnut-Foothill_Lake_Allen	EB_Art_Corson_Lake_Allen	EB_Art_Walnut-Foothill_Lake_SanGabriel	EB_Art_Corson_Lake_SanGabriel	EB_Art_Walnut-Foothill_SierraM	EB_Art_Walnut-Foothill_Color	EB_
Walnut St	Lake Ave				SBL		SBL					
Walnut St	Mentor Ave				EBT		EBT					
Walnut St	Catalina Ave				EBT		EBT					
Walnut St	Wilson Ave				EBT		EBT					
Walnut St	Hill Ave				EBT		EBT					
Walnut St	Sierra Bonita Ave				EBT		EBT					
Walnut St	Allen Ave				EBL		EBT					
Walnut St / Foothill Blvd	Greenwood Ave						EBT					
Walnut St	Sierra Madre Blvd											
Walnut St	Altadena Dr											
Walnut St	San Gabriel Blvd											
Walnut St	Daisy Ave											
Walnut St	Kinneloa Ave											
Foothill Blvd	Craig Ave						EBT					
Foothill Blvd	Sierra Madre Blvd						EBT					
Foothill Blvd	Altadena Dr						EBT					
Foothill Blvd	San Gabriel Blvd						EBL		SBL	SBL		SBL
Foothill Blvd	Daisy Ave								EBT	EBT		EBT
Foothill Blvd	Sunnyslope Ave								EBT	EBT		EBT
Foothill Blvd	Kinneloa Ave								EBT	EBT		EBT
Foothill Blvd	PCC Driveway Entrance											
Foothill Blvd	Santa Paula Ave								EBT	EBT		EBT
Foothill Blvd	Sierra Madre Villa								EBR	EBR		EBT
Foothill Blvd	Halstead St											EBT

Micro Model Calibration

- **Continued development and calibration of demand profiles for:**
  - 4-hour AM peak simulation period (6-10 AM)
  - 8-hour PM peak simulation period (1-9 PM)



Arterial Traffic Estimation

- **Validation of the queue estimation algorithm**
  - We want to use the synthetic data from Aimsun to validate the accuracy of the queue estimates from our algorithm
  - We have found that:
    - The traffic profiles, especially detector outputs, from Aimsun are consistent with those from the field
    - Our proposed algorithm can be applied to the detector data obtained from Aimsun
    - More traffic states can be observed from the flow-occupancy data at advanced detectors: "Uncongested", "Congested", "Congested with downstream queue spillback"
    - The flow count at stopbar detectors is not reliable when traffic is very congested with small vehicle gaps.
  - We are currently working on:
    - Refining our queue estimation algorithm
    - Model development on the detection of lane blockages and downstream queue spillback using loop detector data

Thank You
and
Next Meeting
(Suggest Sept 12th)