



Connected Corridors Face-to-Face Meeting

Tuesday, Sept 12th, 2017 – 1:30 – 3:30 pm
District 7 - Downtown

Sept 12th, 2017



Agenda

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- **Introduction and Review**
- **Outreach**
- **Org Roles and Responsibilities**
- **Communications**
- **ITS Elements**
- **C2C**
- **Data Hub**
- **Data Quality and Estimation**
- **Modeling and Response Planning**
- **Action Items and Closing**



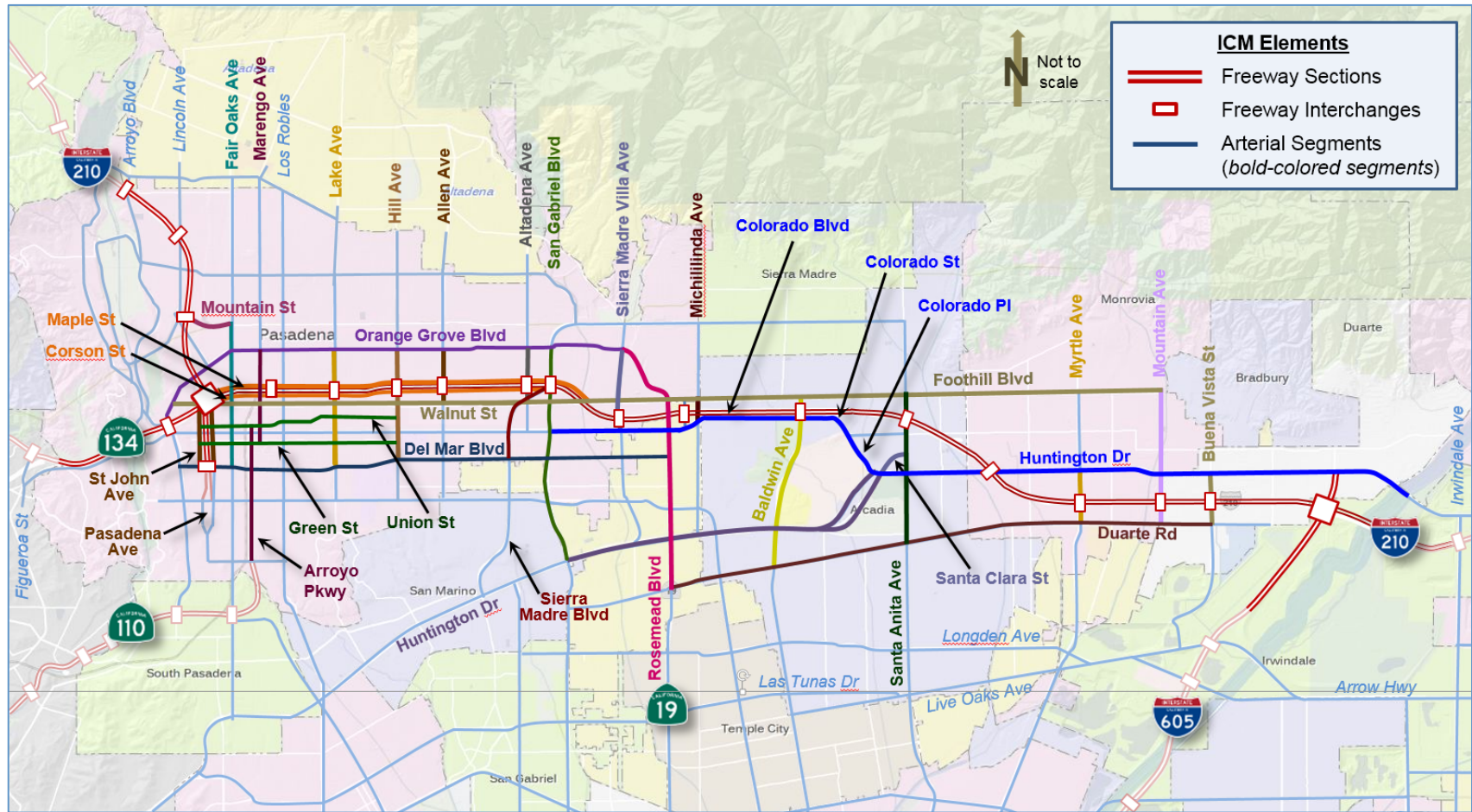
Lisa has taken a new job

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- "It's been a pleasure to work with all of you and I want to thank you for being good, responsible partners! It made my job much easier."
- "Also, if there is ever a press event or something like that for the I-210 Pilot, I would really like to attend."



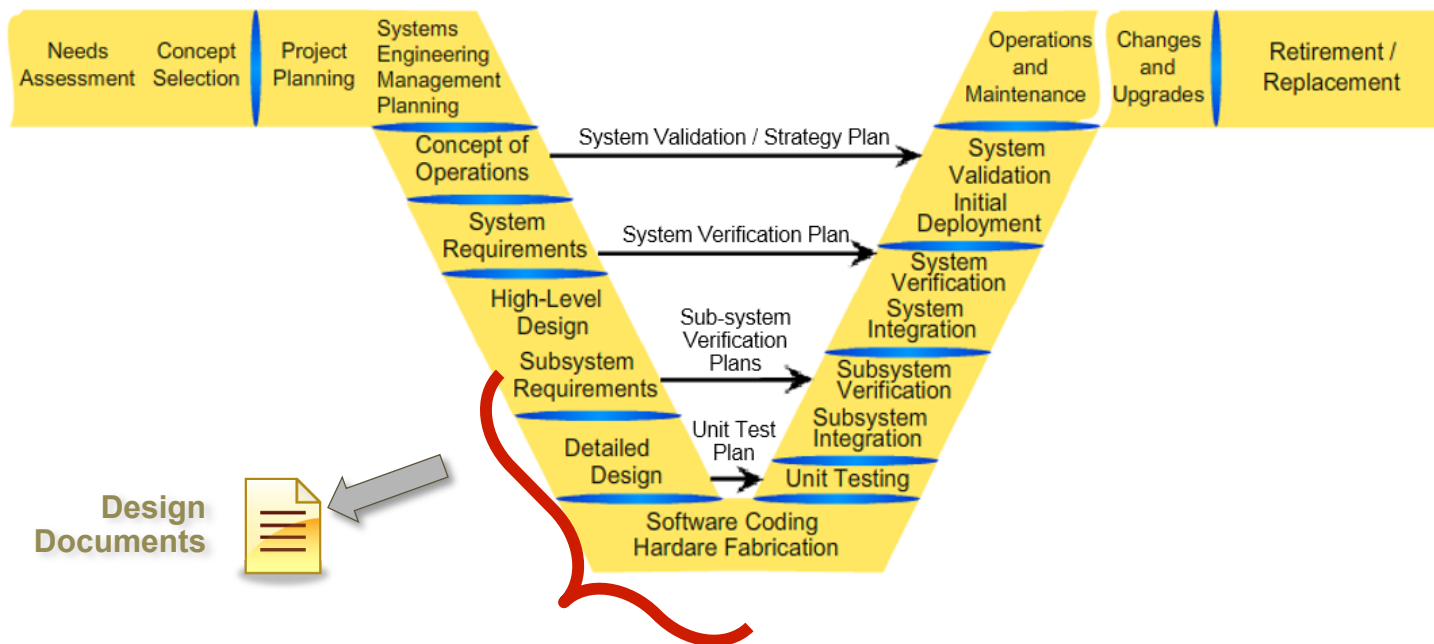
Our Corridor: The I-210



Systems Engineering Next Steps

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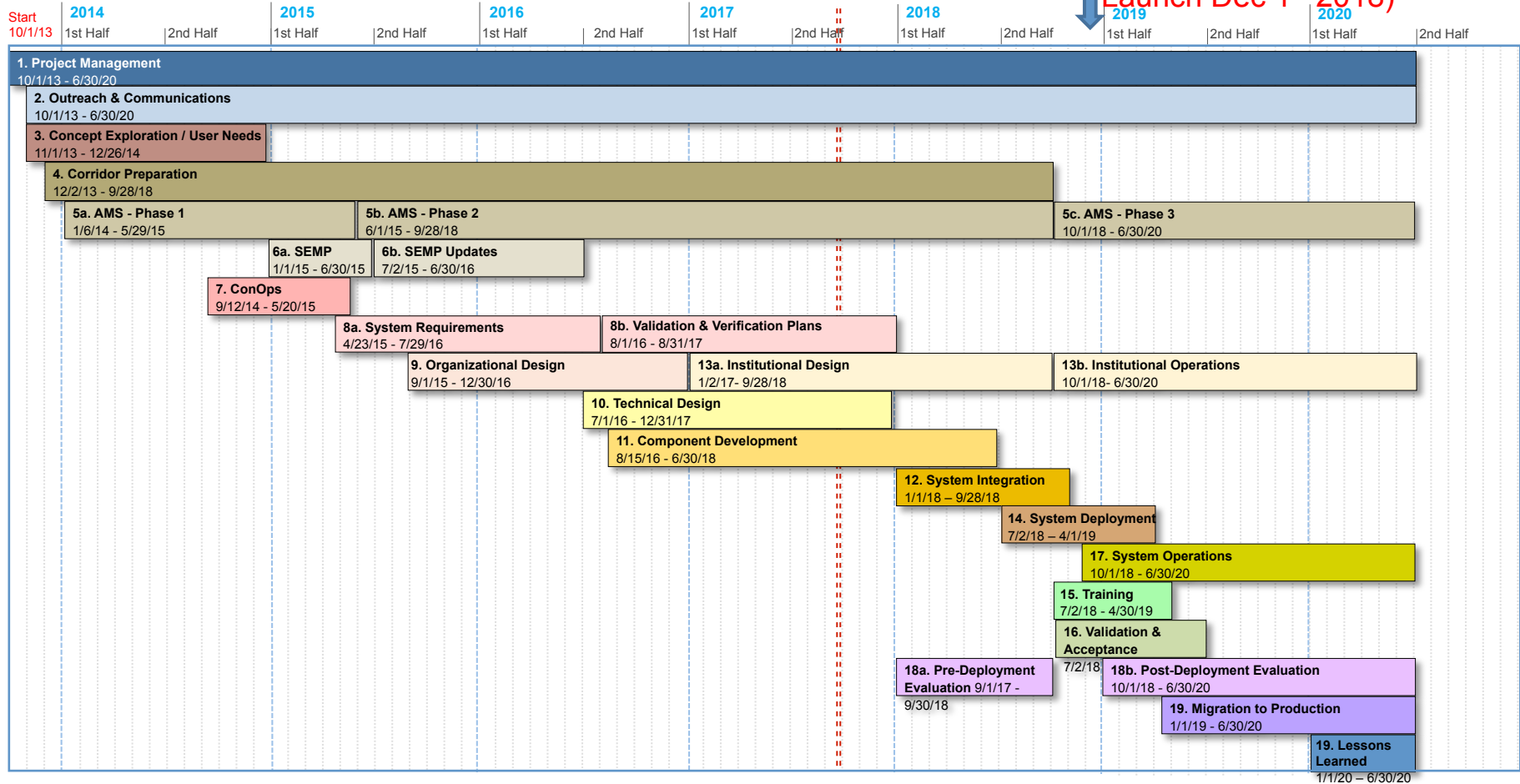
- **Design Documents – How will the requirements be met**
- **Hardware and Software – Building the system**



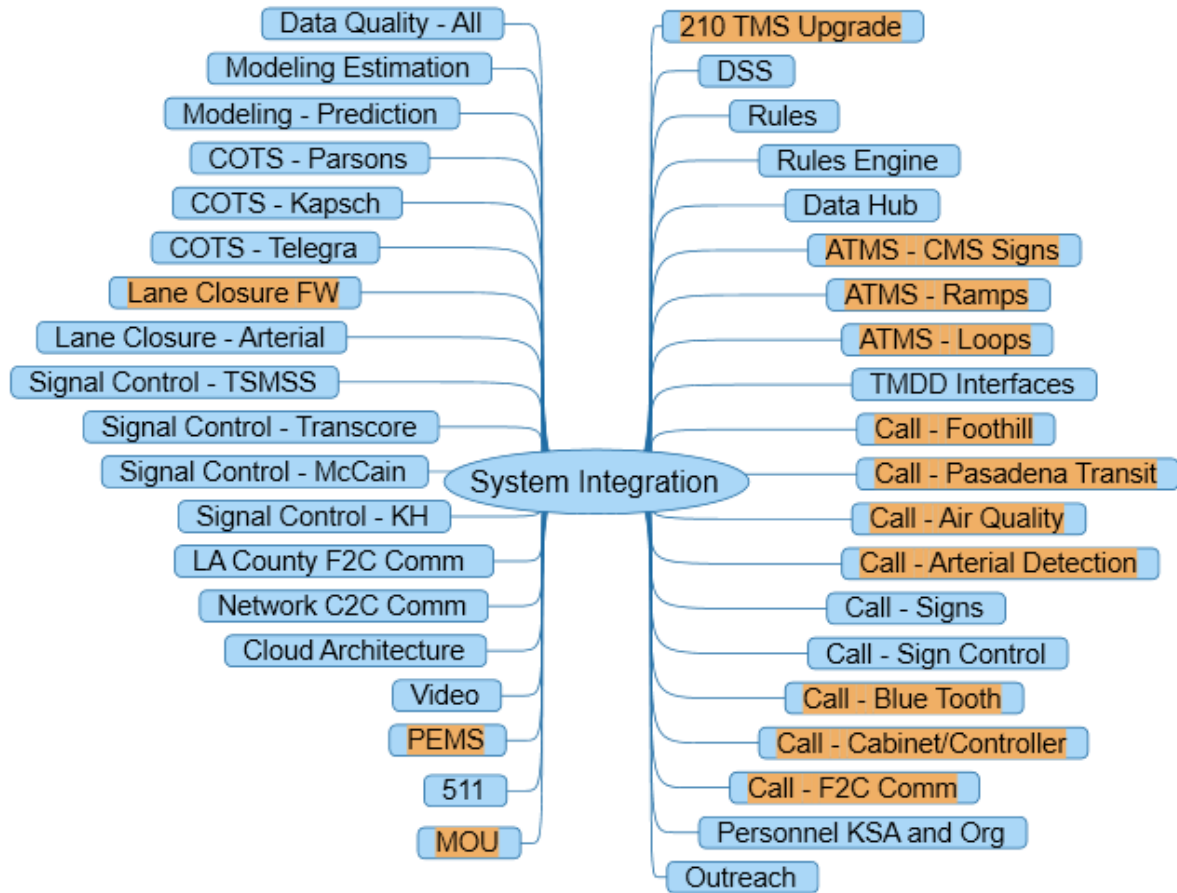
Schedule

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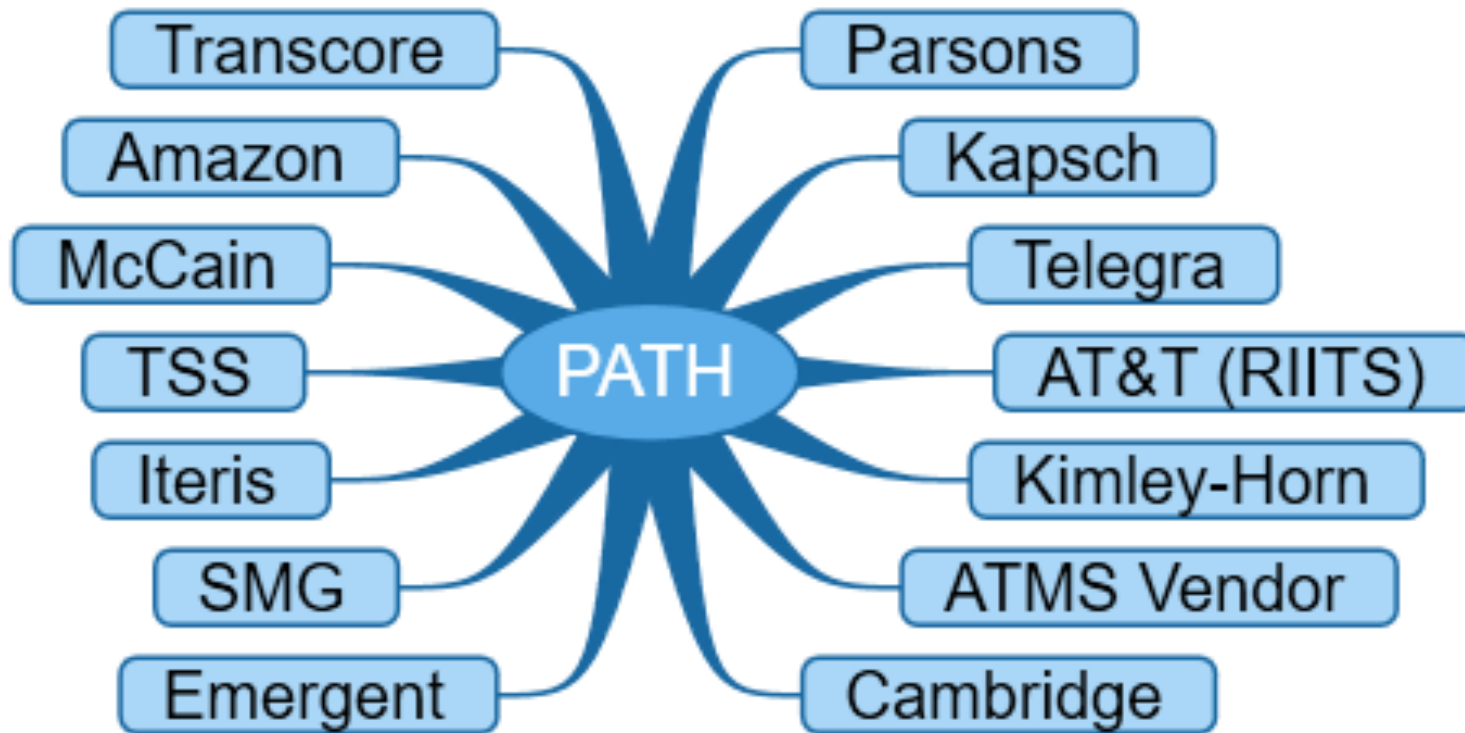
Launch Dec 1st 2018)



Integration – Subsystems and Subefforts

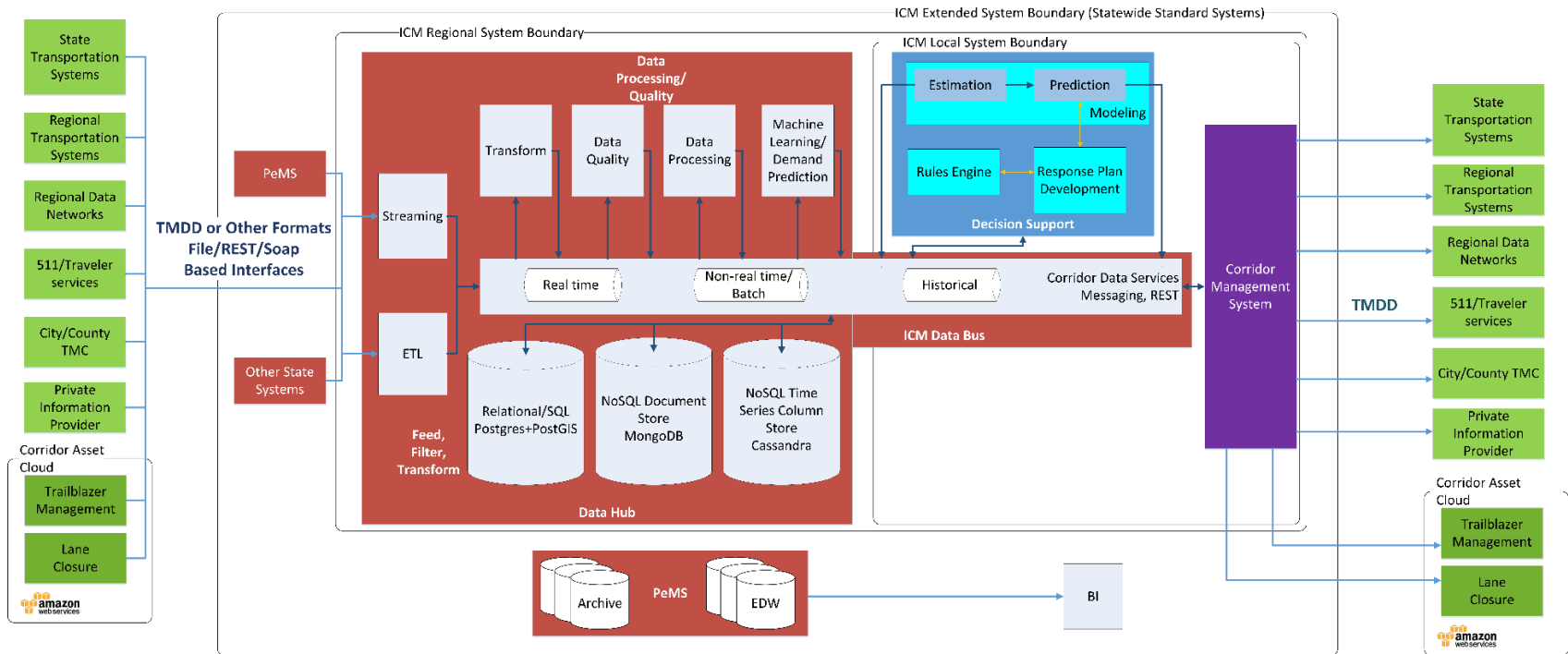


Integration

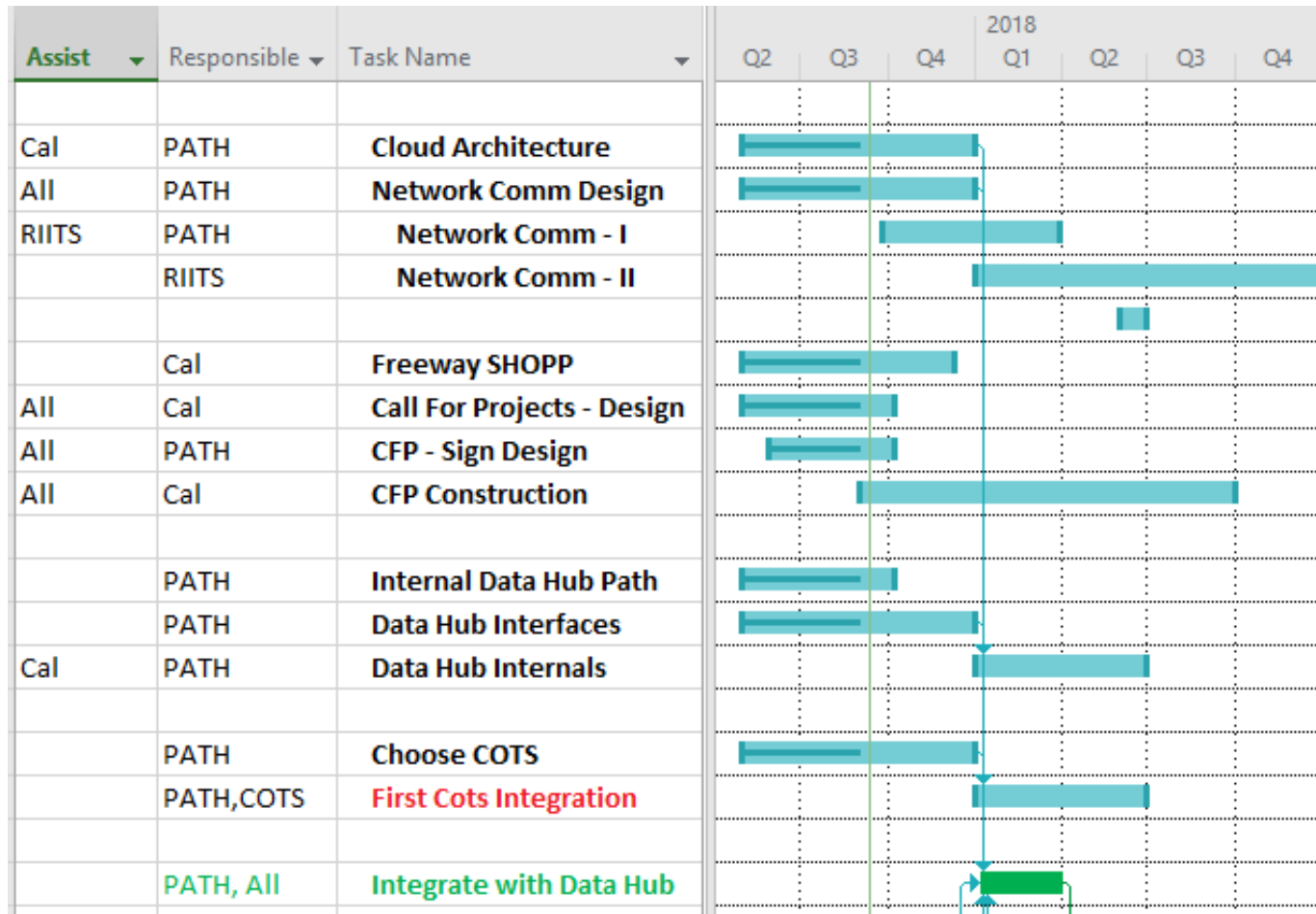


Technical Architecture and Components

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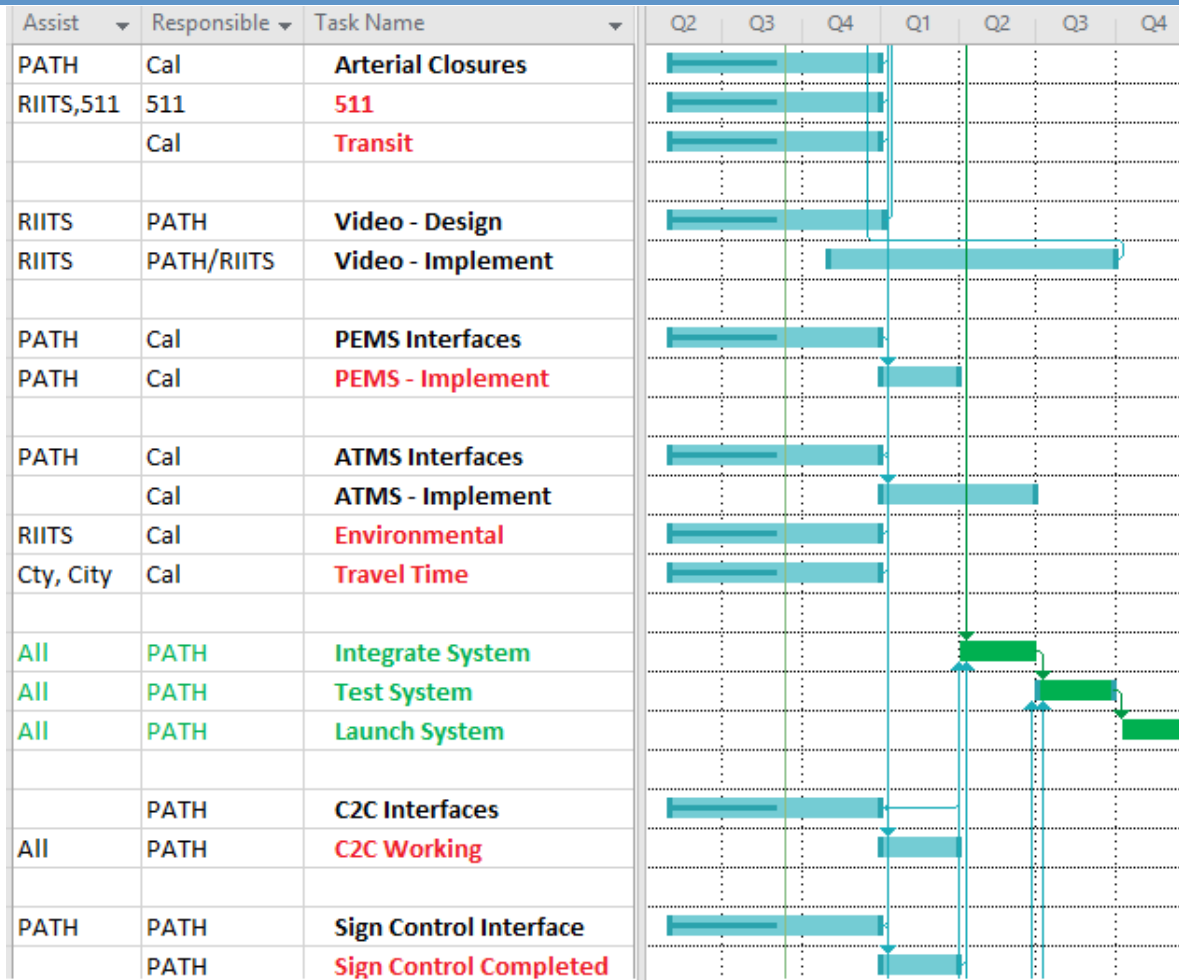


Gantt Chart – 1 of 3



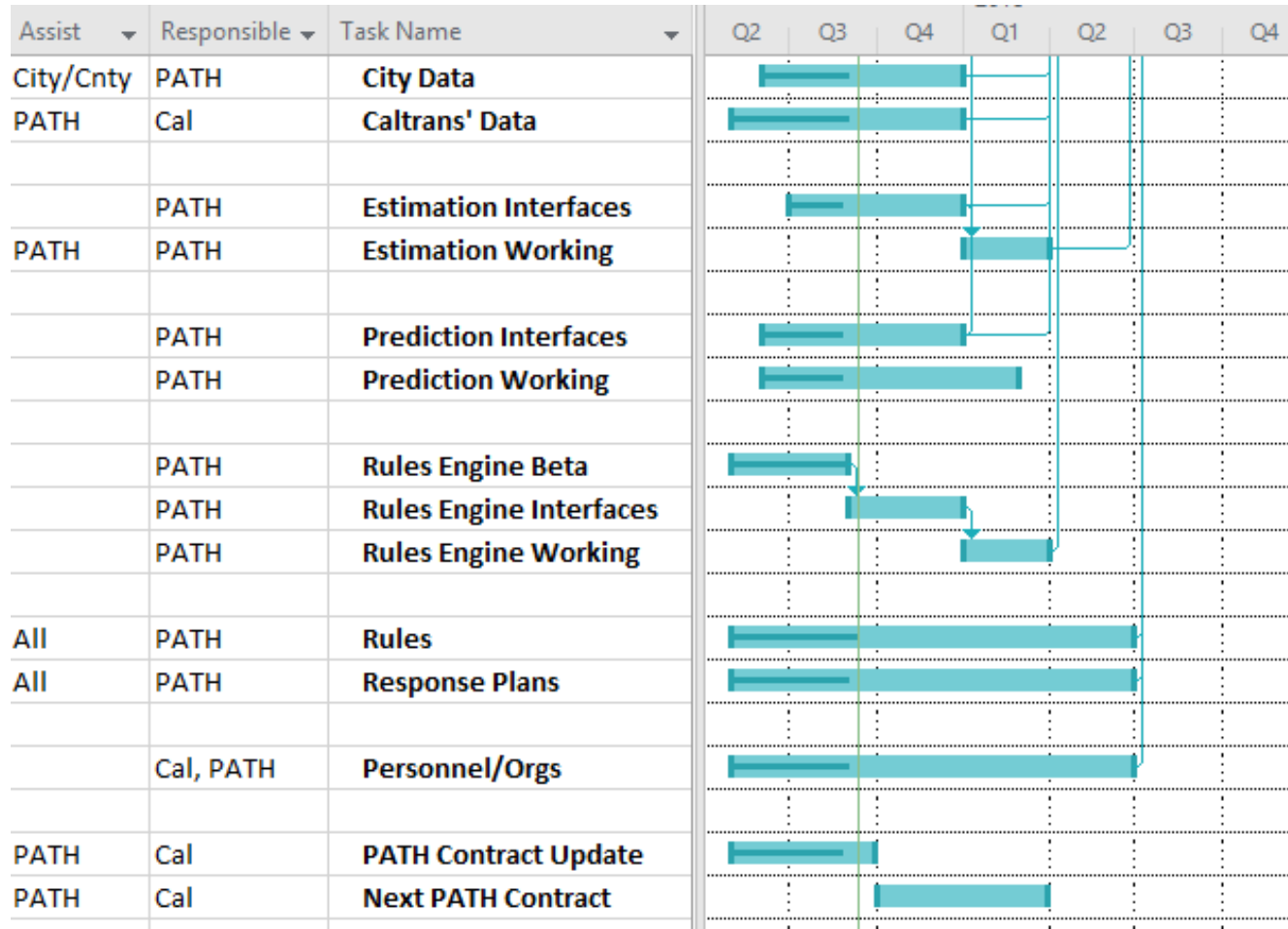
Gantt Chart – 2 of 3

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Gantt Chart – 3 of 3

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Prioritized Subtasks

	Essential for Launch		Not Sure		4 Months after Launch
PATH	Data Quality - Non Real Time	CT/PATH	Pems	CT	Air Quality
PATH	Rules	PATH	511	CT	Arterial Detection
CT	210 TMS Upgrade	CT/PATH	KH or McCain	CT	Full Outreach
CT	ATMS	PATH	LA County F to C	CT	Personnel fully trained
CT	Cabinets and Controllers			CT	Ramp Signs
CT	Lane Closure Freeway			CT	Transit
PATH	Cloud Architecture			PATH	Arterial Estimation
PATH	Data Hub (All things in there)			PATH	Data Quality - Real Time
PATH	DSS Build 1			PATH	Freeway Estimation
PATH	Integration			PATH	DSS Build 2
PATH	One COTS system			PATH	Lane Closure Arterial
PATH	Rules Engine			PATH	Machine Learning
PATH	TMDD Interfaces			PATH	Prediction
CT/Path	C2C Comm Phase 1			PATH	Video
CT/PATH	KH or McCain				
CT/PATH	TMC to Cloud				
CT/PATH	TSMSS				
PATH	Arterial Signs				
CT	MOU				
PATH	Personnel in place				
PATH	Project Management				
PATH	Reduced outreach				
PATH	Sign Control				

Based on launching with rules based DSS

Then moving to model enhanced DSS 4 months later



Risks - Summarized

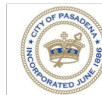
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□ Significant Risks

- C2C TMDD interface implementation timing
- Timely integration of purple box vendors

□ Secondary Risks

- Network Communication
- Corridor wide data quality
- Travelers following reroutes
- Construction on the I-210
- Software development schedule under pressure due to UC facilities issues



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Outreach and Communications

Outreach

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- **Project Charter Amendment**
 - Awaiting comments from RIITS
 - Have received comments from 511 and will make minor modifications to their responsibilities

- **MOU**
 - Update by Caltrans

- **Please work with Michelle on the next set of articles for the Connected newsletter**

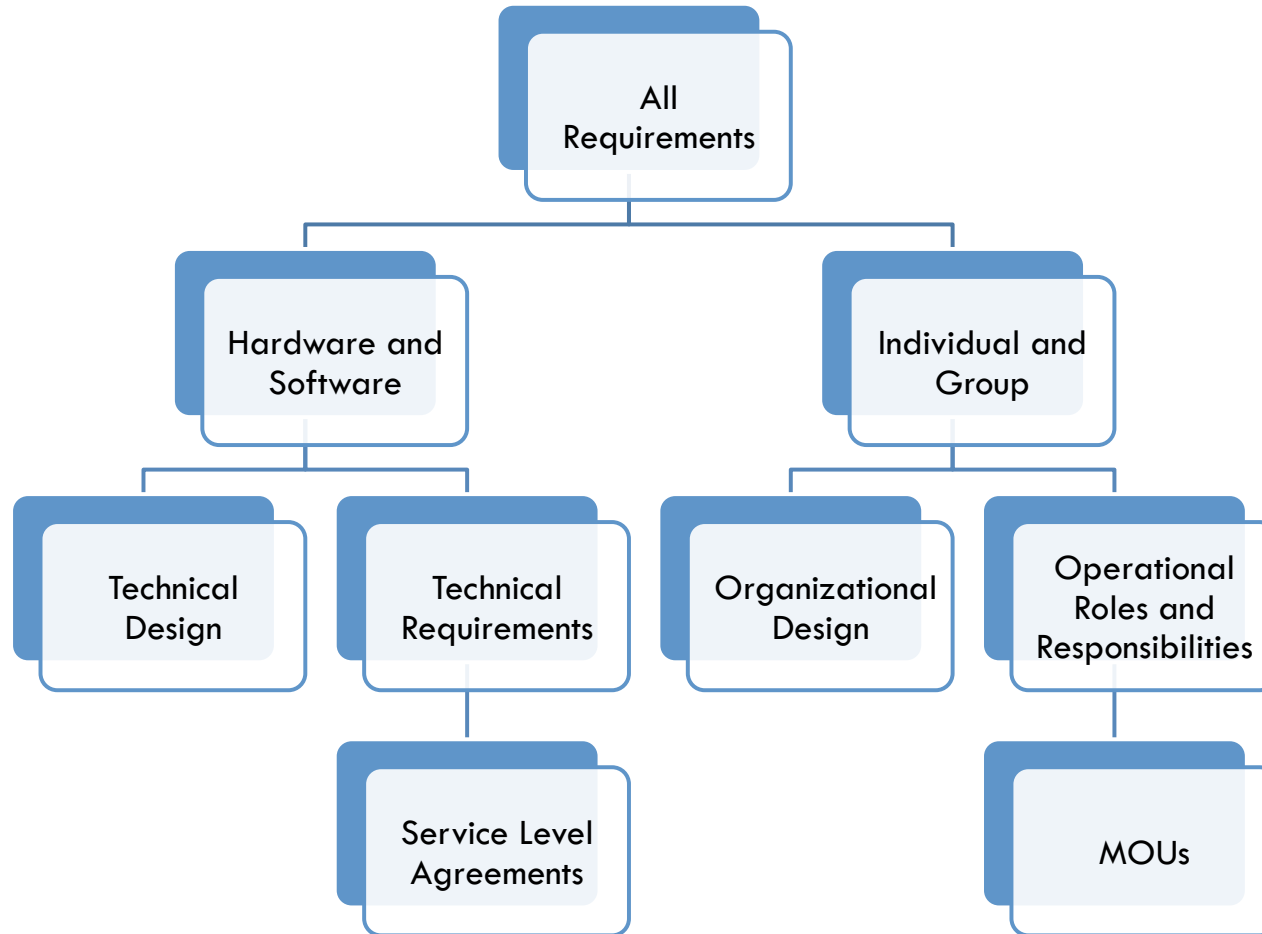
- **ITS Presentation on CC Cloud and CC ability to reduce barriers to entry for ICM efforts across the state**
 - Nick, is the Caltrans web site available for reference in that presentation





Design

Design



Note from Jesse on Architecture

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- “I (finally!) do have comments on the 210-CC Project Architecture, which I must write up.”
- “Overall, very good!”

KSAs and Organizational Design



Org Roles and Responsibilities (SMG)

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- Kicked off the effort with a day-long workshop at Caltrans
 - Discussed requirements document and ramifications with Caltrans
- Agreed to identify the most critical roles for Caltrans to commit to.
- Preliminary criteria for evaluating roles include:
 - Is the role critical for re-routing activation?
 - Would the lack of the role possibly lead to losing partner participation?
 - Does the role impact ICM development in a timely manner?
 - Will the lack of the role lead to reduced system performance?
 - Will the lack of the role affect public perception?



Org Roles and Responsibilities

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- Caltrans has met to go through roles one more time using these and other criteria as appropriate
 - Results discussed by Caltrans
- Next step
 - Review Caltrans findings
 - Agree on framework for interviewing D4 and D11
 - Set up interviews

Proof of Concept



Proof Of Concept – COTS (Purple Box)

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- **The following companies have been selected to participate in the pilot**
 - Kapsch
 - Parsons
 - Telegra

- **We believe we have legal understandings with everyone**

- **We met with Kapsch for a full day to discuss system integration**
 - They will be getting back to us later this week with their schedule
 - They again validated our design and provided positive feedback

- **Based on Kapsch's schedule we will be approaching other vendors**

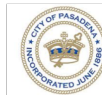


Proof of Concept Dates

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- **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
- **Dec 2018** – Launch pilot utilizing COTS software of first vendor
- **May 2019** – Complete Integration of second vendors COTS software
- **Aug 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



Network Communication

Jesus and Erlan



Phased Approach

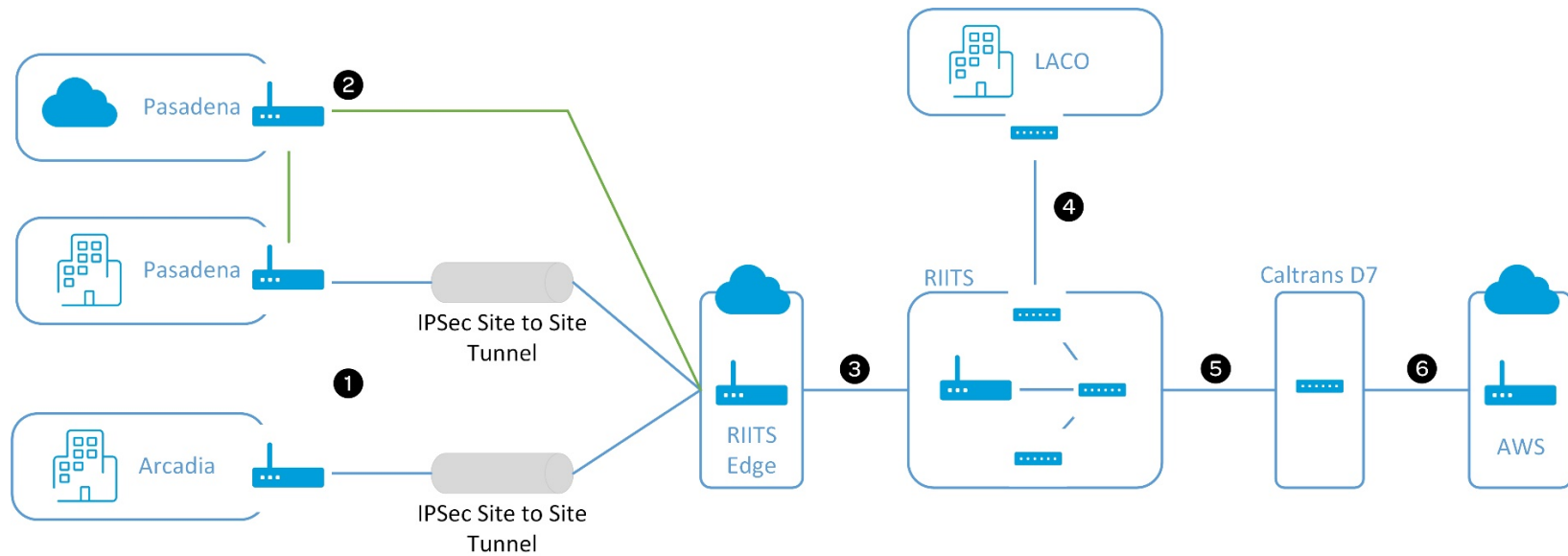
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- **Phase 1 – Transmit traffic data only (no video data)**
 - Site-to-site VPN over the Internet
 - Arcadia
 - Pasadena
 - Current RIITS connection to Caltrans D7
 - LACO
 - Obtained agreement from Arcadia, Pasadena and LACO personnel on approach and configuration parameters

- **Phase 2 – Transmit traffic data over fiber network**
 - 10 Gbps fiber network
 - Video distribution

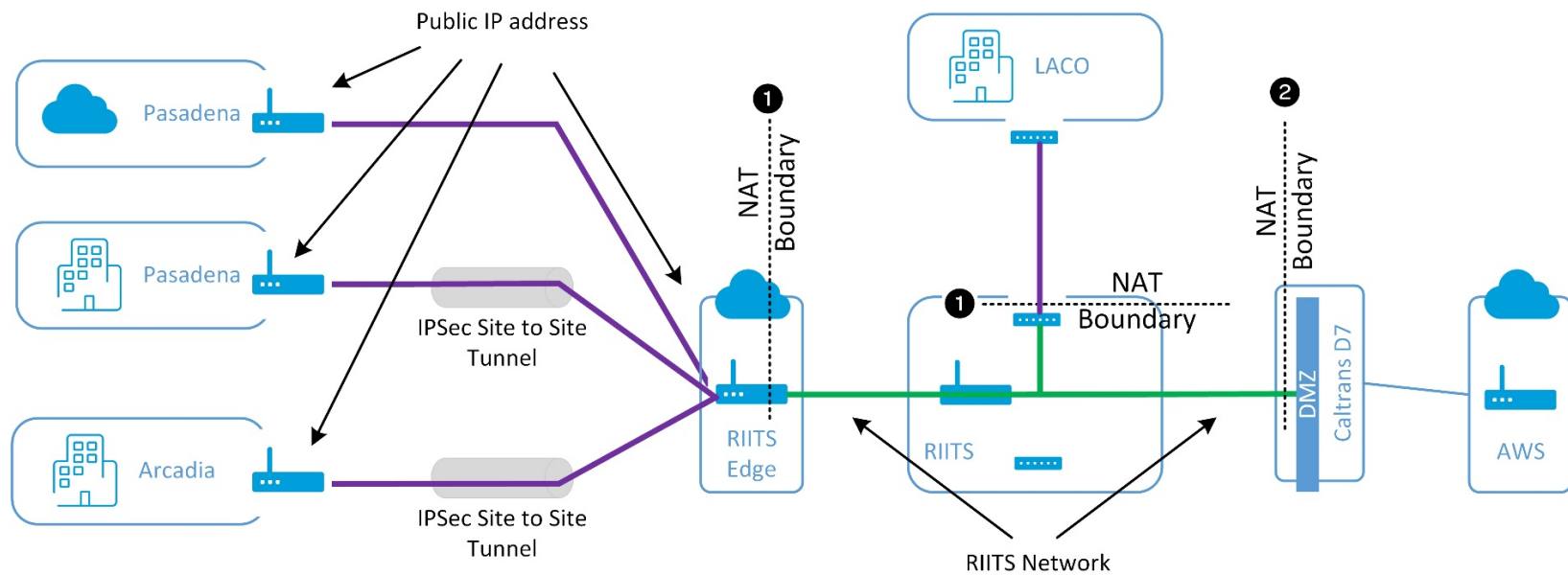


Phase 1 Overview



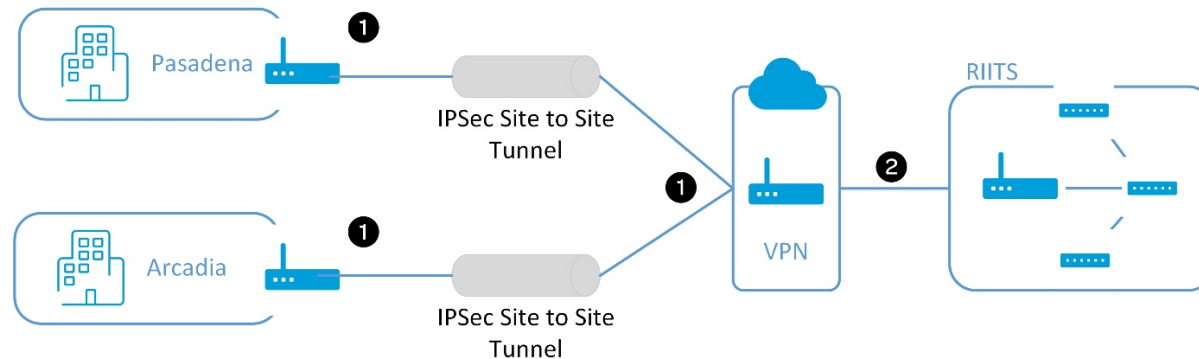
Phase 1 Logical Network

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Site to Site VPN Parameters

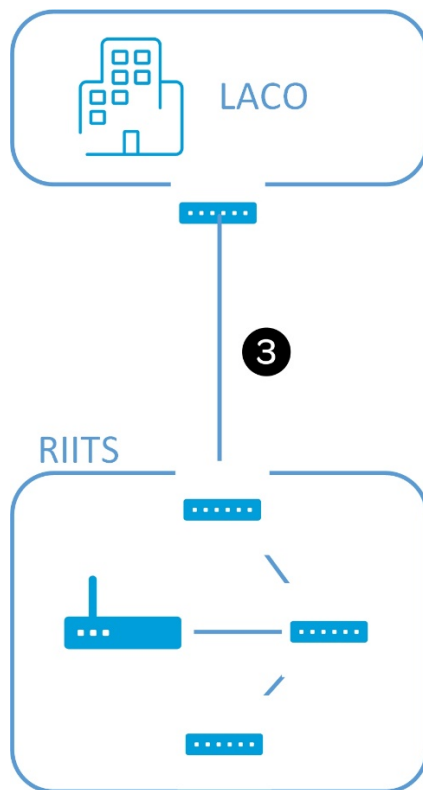
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- ❑ Create Site to Site VPN tunnels over existing Internet circuit
- ❑ VPN tunnels will terminate at RIITS VPN gateways
- ❑ Requires public IPv4 address that is not behind NAT
- ❑ VPN devices needs to be compatible

LACO Connection High Level Steps

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- Use existing connection between LACO and RIITS
- Create new VLAN ID and IP network for ICM data traffic
- Configure current interface as a trunk port to support multiple VLANs
- Requires non-overlapping VLAN ID and IP address range

Timeline

Aug	Sep	Oct
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Identification of element, service and separation requirements (1 month)

Identification of hub and node locations (1 month)

Phase 1 – Establish temporary connection to ICM (2 months)

Detail design of Phase2 network infrastructure (2 months)

Aug	Sep	Oct
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Highlights

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- **Joint collaboration between Arcadia and RIITS to define scope of work and responsibilities to extend fiber connection from Arcadia fiber to I-210**
- **RIITS assessing feasibility to share Caltrans video feed via current TrafficLand partnership**



Next Steps

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- **Begin Phase 1 implementation**
 - Verify VPN equipment and configuration compatibility
 - Provide change request to RIITS
 - Provide change ticket to RIITS contractor
 - Schedule agency availability

- **Continue with Phase 2 and video portion of the ICM fiber network**



Appendix



Site to Site VPN Configuration Parameters

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Configuration Parameters

Pre-shared key	Pre-establish between RIITS and agencies
IKE encryption algorithm	AES 256
IKE integrity algorithm	SHA 256
Diffie Hellman group	Group 2
IPSec encryption algorithm	AES 256
IPSec integrity algorithm	SHA 256
Perfect Forward Secrecy (PFS) Group	PFS2
Security Association (SA) Lifetime	27000 seconds
Public IP address	TBD
Local TMC IP address range	TBD
Route based VPN	Static routes



VPN Configuration Sample (Cisco ASA)

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```
object-group network RIITS-NETWORKS
description RIITS networks via Azure
network-object X.X.X.X 255.X.X.X

object-group network TMC-NETWORKS
description Networks used for the ICM
network-object X.X.X.X 255.X.X.0

access-list RIITS-VPN-ACL extended permit ip object-group TMC-NETWORKS object-group RIITS-NETWORKS

crypto ipsec ikev1 transform-set ESP-AES-256-SHA esp-aes-256 esp-sha-hmac
crypto ipsec security-association lifetime seconds 27000

crypto map RIITS-CRYPTO-MAP 1 match address RIITS-VPN-ACL
crypto map RIITS-CRYPTO-MAP 1 set peer X.X.X.X
crypto map RIITS-CRYPTO-MAP 1 set ikev1 transform-set ESP-AES-256-SHA
crypto map RIITS-CRYPTO-MAP interface outside

crypto ikev1 enable outside
crypto ikev1 policy 5
authentication pre-share
encryption aes-256
hash sha
group 2
lifetime 28800

tunnel-group X.X.X.X type ipsec-l2l
tunnel-group X.X.X.X ipsec-attributes
ikev1 pre-shared-key XXXX

interface X/X
switchport mode trunk
switchport trunk allow vlan XXX - XXX
```



LACO Configuration Parameters

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Configuration Parameters

VLAN ID	900
IP Address Range	10.90.1.0/24
Interface trunk standard	802.1Q

Interface Configuration Sample (Cisco)

```
interface X/X
  switchport mode trunk
  switchport trunk allow vlan XXX - XXX|
```



Call for Projects



PARSONS

PARSONS

Caltrans D7 I-210 Connected Corridors

Procurement Support

Dan Lukasik
Vice President



delivering a better world

delivering a better world

Agenda

- Timeline / Current Status
- Equipment by Jurisdiction
- Equipment by Package
- Next Steps

Timeline

- Met Face-to-Face with Stakeholders Aug 2 - 21
- Distributed Updated Equipment List Sept 1, 2017
 - CALL to CONFIRM by Sept 7
 - Confirmation from Arcadia
 - Confirmation from Monrovia
- Distributed Procurement Packages to Stakeholders Sept 7, 2017
 - CALL to CONFIRM by Sept 21
- Update Procurement Estimate Sept 15, 2017
- Procurement Award Dec 29, 2017

Package 4 – Details to Resolve

Finalize procurement details for Fiber Drop

Address connectivity challenges in Monrovia and Duarte, with LACO's assist

LA COUNTY

	Equipment To Be Installed	#2 Bluetooth (BlueMac)	#4 Communication Upgrade	#6 Video Detection System	#7 Data Comm Module and Video Detection Software Upgrade
		Antenna & Module Mounted on Pole Cable POE Injector Plugs into unused Port Installation	Radio - Proxim 5GHz (Tsunami 10150 BS) MIMO 2x2, 22 dBI panel antenna Surge Arrestor POE Injector Ethernet Switch (Layer 2) Cables Installation	Vantage Vector EdgeConnect Modules (4 Cameras Capable) Cables Installation	Edge Connect Modules Cables Installation
#	Location				
1	Colorado Blvd/Lotus Ave		Qty 1	Qty 1	
2	Colorado Blvd/Rosemead Blvd	Qty 1			Qty 1
3	Rosemead Blvd/Foothill	Qty 1			
4	Rosemead Blvd/Del Mar Blvd				Qty 1
5	Rosemead Blvd/California Blvd				Qty 1
6	Rosemead Blvd/Huntington Dr	Qty 1			Qty 1
7	Rosemead Blvd/Duarte Rd	Qty 1			
8	Colorado Blvd & Merlon Ave		Qty 1		
9	Colorado St/Michillinda Ave		Qty 1	Qty 1	
10	Myrtle Ave/Peck Rd	Qty 1			
	Los Angeles County TMC				
		5	3	2	4

Monrovia

#	Location	#2 Bluetooth (BlueMac) Antenna & Module Mounted on Pole Cable POE Injector Plugs into unused Port Installation	#4 Communication Upgrade Radio - Proxim 5GHz (Tsunami 10150 BS) MIMO 2x2, 22 dBI panel antenna Surge Arrestor POE Injector Ethernet Switch (Layer 2) Cables Installation	NEW QTY#4 New Qty	#5 2033 McCain 2070 Advanced Traffic Contrtollers (ATC) Latest D4 Firmware Timing Plan Updates Installation	#6 Video Detection System Vantage Vector EdgeConnect Modules (4 Camera Capable) Cables Installation	#7 Data Comm Module and Video Detection Software Upgrade Edge Connect Modules Cables Installation
1	Foothill Blvd/5th Ave	Qty 1	Qty 1	x			
2	Foothill Blvd/Madison Ave		Qty 1	x			
3	Huntington Dr/5th Ave	Qty 1		1		Qty 1	
4	Foothill Blvd/Violet Ave		Qty 1	x			
5	Foothill Blvd/Mayflower Ave		Qty 1	x	Qty 1		
6	Huntington Dr/Mayflower					Qty 1	
7	Duarte Rd/Mayflower Ave		Qty 1	1	Note - 5-3 Upgrade Firmware Only	Qty 1	
8	Foothill Blvd/Magnolia Ave		Qty 1	x			
9	Foothill Blvd/Primrose Ave		Qty 1	x	Qty 1		
10	Foothill Blvd & Myrtle Ave	Qty 1	Qty 1	x			
11	Foothill Blvd/Ivy Ave		Qty 1	x	Qty 1		
12	Foothill Blvd/Canyon Blvd		Qty 1	x			
13	Myrtle Ave & Central Ave		Qty 1 - Note - 4-1	1			
14	Huntington Dr/Myrtle Ave	Qty 1				Qty 1	
15	Duarte Rd/Myrtle Ave		Qty 1	3	Note - 5-3 Upgrade Firmware Only		Qty 1
16	Foothill Blvd/Shamrock Ave		Qty 1	x			
17	Foothill/Mountain (access point)	Qty 1		x			
18	Mountain Ave/Lemon Ave		Qty 1	1			
19	Mountain Ave/Royal Oaks Ave		Qty 1	1			
20	Huntington Dr/Mountain Ave			2		Qty 1	
21	Duarte Rd/Mountain Ave		Qty 1	2	Note - 5-3 Upgrade Firmware Only		Qty 1
22	Duarte Rd/California				Note - 5-3 Upgrade Firmware Only		Qty 1
23	Central / Mountain Ave (new)			1			
		5	24 (16 + 8)		7	5	3
			Note 4-1 Remove Existing Radio Install (Upgrade) Radio Old Equip to Contractor		Note 5-3 Upgrade Firmware Only		

Duarte

	Equipment To Be Installed	#2 Bluetooth (BlueMac)	#4 Communication Upgrade		#6 Video Detection System	#7 Data Comm Module and Video Detection Software Upgrade
#	Location	Antenna & Module Mounted on Pole Cable POE Injector Plugs into unused Port Installation	Radio - Proxim 5GHz (Tsunami 10150 BS) MIMO 2x2, 22 dBI panel antenna Surge Arrestor POE Injector Ethernet Switch (Layer 2) Cables Installation	NEW QTY #4	Iteris Vantage Vector EdgeConnect Modules (4 Camera Capable) Cables Installation	Iteris Edge Connect Modules Cables Installation
1	Mountain Ave/BMW Dwy		Qty 1	1		
2	Huntington Dr/Buena Vista St	Qty 1			Qty 1	
3	Buena Vista St & Central Ave		Qty 1	1		
4	Buena Vista St & Evergreen Ave		Qty 1	2		
5	Buena Vista/Duarte		Qty 1	2		Qty 1
6	Duarte/Hope		Qty 1	1		
7	Huntington Dr/Highland			1	Qty 1	
8	Huntington Dr/Mt. Olive/605	Qty 1		1		
9	Huntington Dr/Las Lomas				Qty 1	
10	Huntington & 210 EB (new)			1		
11	Huntington & Crestfield (new)			1		
	City of Duarte TMC					
		2	11 (5 + 6)		3	1

PASADENA (p1 of 2)

PASADENA		Equipment To Be Installed	#2 Bluetooth (BlueMac)	#3 New Cabinets	#5 2033 McCain	#6 Video Detection System	#7 Data Comm Module and Video Detection Software Upgrade
		Antenna & Module Cabinet Mounted Cable POE Injector Plugs into unused Port Installation	332 Cabinet 2070 Controller Installation	2070 Advanced Traffic Conrtrollers (ATC) Latest D4 Firmware Timing Plan Updates Installation	Iteris Vantage Vector Iteris EdgeConnect Modules (4 Camera Capable) Cables Installation	Iteris Edge Connect Modules Cables Installation	
Location							
1	622	Orange Grove Blvd/Colorado Blvd	1			Qty 1 - New VDS - Fiber	
2	127	Orange Grove Blvd & Fair Oaks Ave	1			Qty 1 - New VDS - Fiber	
3	141	Fair Oaks Ave/Villa St					Media Converter (Serial to Enet)
4	610	Fair Oaks Ave/ Corson St	1				
5	163	Walnut St & Fair Oaks Ave				Qty 1 - New VDS - Fiber	
6	197	Fair Oaks Ave/Union St				Qty 1 - New VDS - Fiber Note 6-4	
7	215	Fair Oaks Ave/Colorado Blvd					Media Converter (Serial to Enet)
8	276	Del Mar Blvd/Fair Oaks Ave	1			Qty 1 - New VDS - Fiber Note 6-4	
9	626	Arroyo Pkwy/Green St					Media Converter (Serial to Enet)
10	628	Arroyo Pkwy/Del Mar Blvd					Media Converter (Serial to Enet)
11	629	Arroyo Pkwy/California Blvd					Media Converter (Serial to Enet)
12	354	Orange Grove Blvd/Garfield Ave				Qty 1 - New VDS - Fiber	
13	153	Maple St/Los Robles Ave	1				
14	280	Los Robles Ave/Del Mar Blvd					Comm Module & SW (Econolite)
15	154	El Molino Ave/Maple St		Qty 1 - TWP	Qty 1 Note 5-1		
16	158	El Molino Ave/Corson St		Qty 1 - TWP	Qty 1 Note 5-1		
17	207	Lake Ave/Union St					Comm Module & SW (Econolite Hub)
18	283	Lake Ave/Del Mar Blvd				Qty 1 - New VDS - Fiber Note 6-4	
19	155	Wilson Ave/Maple St		Qty 1 - TWP	Qty 1 Note 5-1		
20	159	Wilson Ave/Corson St		Qty 1 - TWP	Qty 1 Note 5-1		

PASADENA (p2 of 2)

PASADENA		Equipment To Be Installed	#2 Bluetooth (BlueMac)	#3 New Cabinets	#5 2033 McCain	#6 Video Detection System	#7 Data Comm Module and Video Detection Software Upgrade
		Antenna & Module Cabinet Mounted Cable POE Injector Plugs into unused Port Installation	332 Cabinet 2070 Controller Installation	2070 Advanced Traffic Controllors (ATC) Latest D4 Firmware Timing Plan Updates Installation	Iteris Vantage Vector Iteris EdgeConnect Modules (4 Camera Capable) Cables Installation	Iteris Edge Connect Modules Cables Installation	
Location							
21	134	Orange Grove Blvd/Hill Ave	1				
22	176	Walnut St/Hill Ave	1				
23	265	Green St/Hill Ave	1				
24	156	Sierra Bonita Ave/Maple St		Qty 1 - TWP	Qty 1 Note 5-1		
25	160	Sierra Bonita Ave/Corson St		Qty 1 - TWP	Qty 1 Note 5-1		
26	289	Del Mar Blvd/Allen Ave					Edge Connect Module
27	210	Walnut St/Sierra Madre Blvd		Qty 1 - Fiber	Qty 1 Note 5-1	Qty 1 - New VDS - Fiber	
28	139	Orange Grove Blvd/Sierra Madre Blvd	1				
29	609	Maple St & Sierra Madre Blvd	1				
30	294	Del mar Blvd/San Gabriel Blvd	1				
31	188	Foothill Blvd/Sierra Madre Villa Ave			Qty 1 Note 5-2	Qty 1 - New VDS - Fiber Note 6-4	
			11	7	8	9	8
			Action - Need to address Bluetooth Server Requirements		Note 5-1 Paired with LI #3 Requires Timing Signal Update	Note 6-4 Remove Existing VDS Replace with New VDS Old Equip to Contractor	Note 7-3 Existing Conf A - Existing Econolite Solo Pro - Fiber Update with Axis 241Q Serial to ENET server
					Note 5-2 Current 332 Cabinet Requires 2070 Controller, Firmware		Note 7-4 Existing Conf B - Existing Econolite Solo Terra - Fiber Update with Axis 241Q Serial to ENET server
							Note 7-5 Existing Conf C - Existing Econolite Solo Mini Hub -
							Note 7-6 Existing Conf D - Existing ITERIS Vantage Edge - Fiber

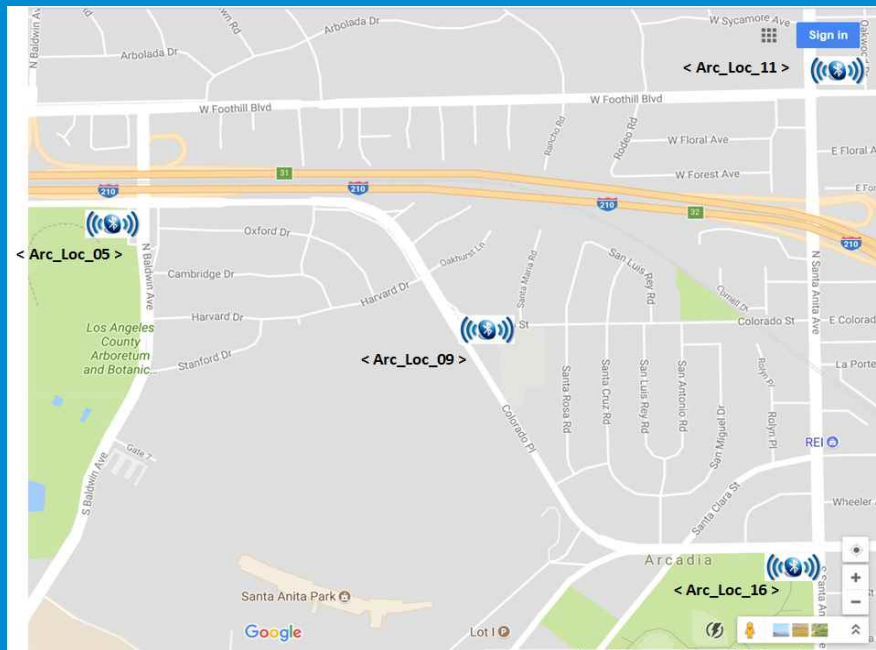
ARCADIA (p1 of 2)

	Equipment To Be Installed	#1 Bluetooth (Velocity)	#3 New Cabinets	#4 Communication Upgrade	#5 2033 McCain	#6 Video Detection System	#7 Data Comm Module and Video Detection Software Upgrade
	Location	Bluetooth/Wi-Fi Module (Rack-Mounted) Surface Mount Multiband GSM/CDMA or WIMAX, WIFI & GPS Antenna (Cabinet-Mounted) Attenuator Cable Accessories Bluetooth Installation(Brackets Mounting, Cabling & Hookup) Bluetooth Configuration & Turn-On Support	New Tessco Cabinet 2018 KClip McCain 2070 ATC Controller 5GHz Wireless Radio Clary Battery Backup SNMP/HTTP Adapter Installation Removal of Old Cabinets	Radio - Proxim 5GHz (Tsunami 10150 BS) MIMO 2x2, 22 dBI panel antenna Surge Arrestor POE Injector Ethernet Switch (Layer 2) Cables Installation	2070 Advanced Traffic Conrtollers (ATC) Latest D4 Firmware Timing Plan Updates with Progression Installation	GridSmart VDS Performance Module Fisheye Camera System Swivel Bracket for dual plane Quick Connect Junction Box 58" Mounting Arm with 90 deg bend Astro-Brac Tenon Cables Installation	Firmware Upgrade to existing processor and Configuration Labor No HW Module
1	Huntington Dr/Sunset Blvd					Qty 1 - Note 6-1	
2	Baldwin Ave/Foothill Blvd						Qty 1 - Note 7-1
3	Colorado Blvd/Baldwin	Qty 1			Qty 1 - Note 5-1		
4	Huntington Dr/Baldwin Ave						Qty 1 - Note 7-1
5	Baldwin Ave/Camino Real Ave						
6	Baldwin Ave/Longden Ave				Qty 1 - Note 5-1		
7	Baldwin Ave/Las Tunas Dr				Qty 1 - Note 5-1		
8	Huntington Dr/Holly Ave					Qty 1 - Note 6-2	
9	Colorado Blvd/Colorado Pl	Qty 1			Qty 1 - Note 5-1		
10	Huntington Dr/Colorado Pl						Qty 1 - Note 7-1
11	Foothill Blvd/Santa Anita Ave	Qty 1					Qty 1 - Note 7-1
12	Colorado Blvd/San Antonio St		Qty 1	Qty 1	Qty 1 - Note 5-1		
13	Colorado Blvd/Santa Anita Ave			Qty 1			Qty 1 - Note 7-1
14	Santa Anita Ave & Santa Clara St						Qty 1 - Note 7-1
15	Huntington Dr/Santa Clara St						Qty 1 - Note 7-1
16	Huntington Dr/Santa Anita Ave	Qty 1					Qty 1 - Note 7-1
17	Santa Anita Ave/Campus Dr						Qty 1 - Note 7-1
18	Santa Anita Ave/Duarte Rd						Qty 1 - Note 7-1
19	Santa Anita Ave/Longden Ave						Qty 1 - Note 7-1
20	Santa Anita Ave/Live Oaks Ave						Qty 1 - Note 7-1
21	Santa Anita Ave/Camino Real Ave						Qty 1 - Note 7-1

ARCADIA (p 2 of 2)

Equipment To Be Installed	#1 Bluetooth (Velocity)	#3 New Cabinets	#4 Communication Upgrade	#5 2033 McCain	#6 Video Detection System	#7 Data Comm Module and Video Detection Software Upgrade
<p>Bluetooth/Wi-Fi Module (Rack-Mounted) Surface Mount Multiband GSM/CDMA or WiMAX, WiFi & GPS Antenna (Cabinet-Mounted) Attenuator Cable Accessories Bluetooth Installation(Brackets Mounting, Cabling & Hookup) Bluetooth Configuration & Turn-On Support</p>	<p>New Tessco Cabinet 2018 KCLip McCain 2070 ATC Controller 5GHz Wireless Radio Clary Battery Backup SNMP/HTTP Adapter Installation Removal of Old Cabinets</p>	<p>Radio - Proxim 5GHz (Tsunami 10150 BS) MIMO 2x2, 22 dBi panel antenna Surge Arrestor POE Injector Ethernet Switch (Layer 2) Cables Installation</p>	<p>2070 Advanced Traffic Controller s (ATC) Latest D4 Firmware Timing Plan Updates with Progression Installation</p>	<p>GridSmart VDS Performance Module Fisheye Camera System Swivel Bracket for dual plane Quick Connect Junction Box 58" Mounting Arm with 90 deg bend Astro-Brac Tenon Cables Installation</p>	<p>Firmware Upgrade to existing processor and Configuration Labor No HW Module</p>	
Location						
22 Baldwin/Gate 8					Qty 1 - Note 6-3	
22 Foothill Blvd/First Ave/Highland Oaks Dr						Qty 1 - Note 7-2
23 Foothill Blvd/Second Ave.						Qty 1 - Note 7-2
N/A 'Delivered SPARE'				Qty 1 - Note 5-2		
	4	1	2	6	3	15
				<p>Note 5-1 With Latest D4 Firmware 3 Timing Plan & 2 Progression</p>	<p>Note 6-1 Includes Removing old VDS, Installing new VDS, Camera - Qty 2 Old Equip to Contractor</p>	<p>Note 7-1 Iteris Processor and Edge Connect Firmware Upgrade Zoning Integration Support Labor Current HW in place</p>
				<p>Note 5-2 Spare Unit - No Install</p>	<p>Note 6-2 Camera - Qty 2 w/ VDS module</p>	<p>Note 7-2 Zoning Integration Support to Vantage Live Labor Current HW in place</p>
					<p>Note 6-3 Camera - Qty 1 w/ VDS module</p>	

Package 1 – Bluetooth Travel Time

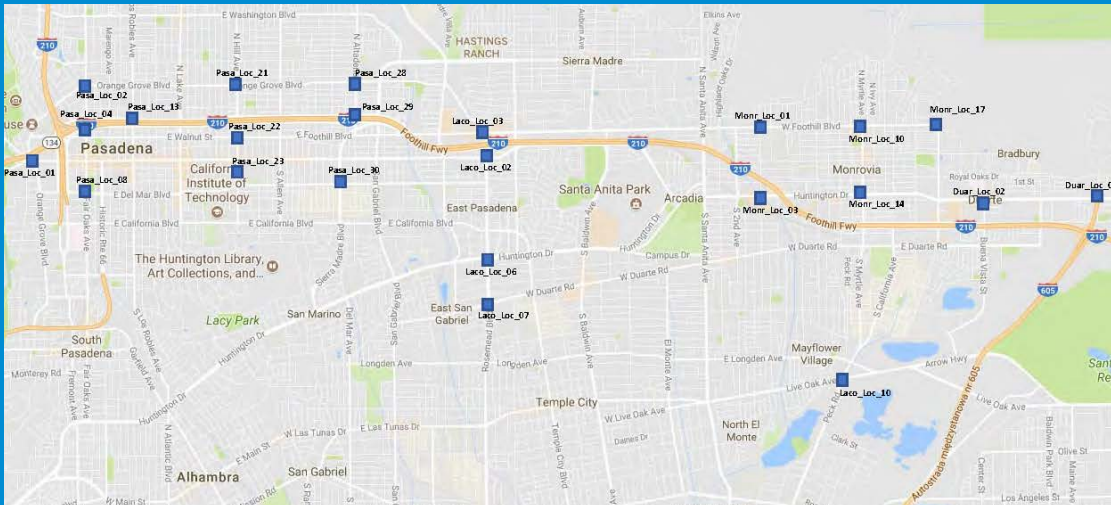


Based on Velocity product

4 Locations in Arcadia, supplementing currently deployed system

Equipment
Installation
Warranty

Package 2 – Bluetooth Travel Time

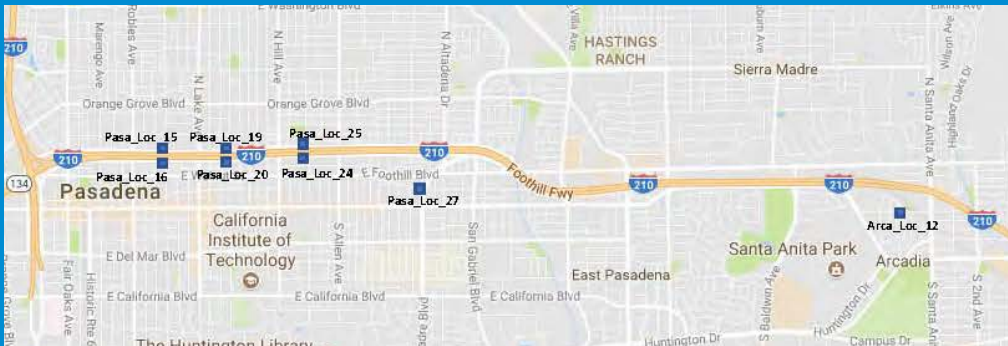


22 Locations in LA County,
Monrovia, Duarte and Pasadena

Centralized data aggregation

Equipment
Installation
Warranty

Package 3 – Traffic Control Cabinet

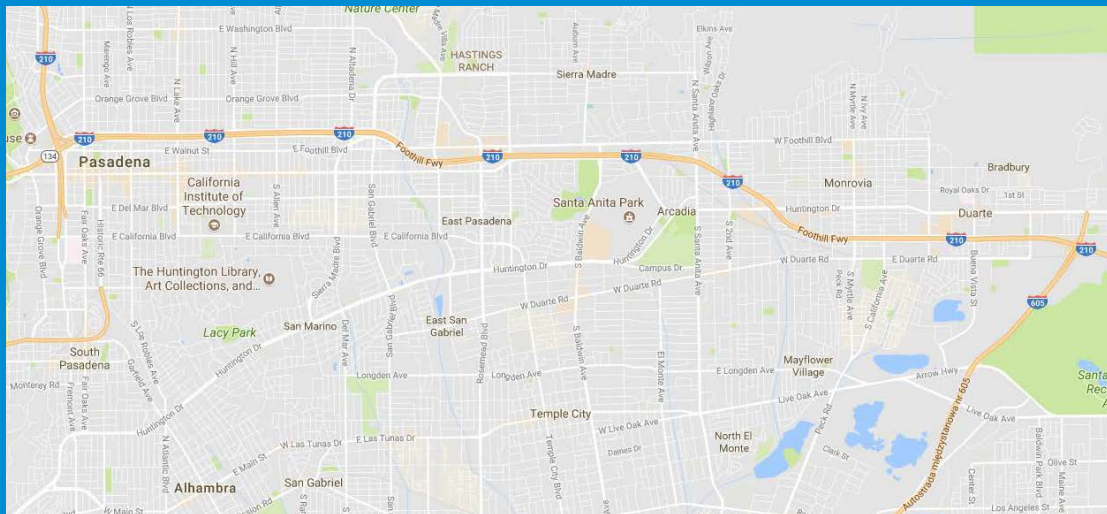


7 Locations in Pasadena
1 Location in Arcadia

Demo / Replace

Equipment
Installation
Warranty

Package 4 – Communication Upgrade

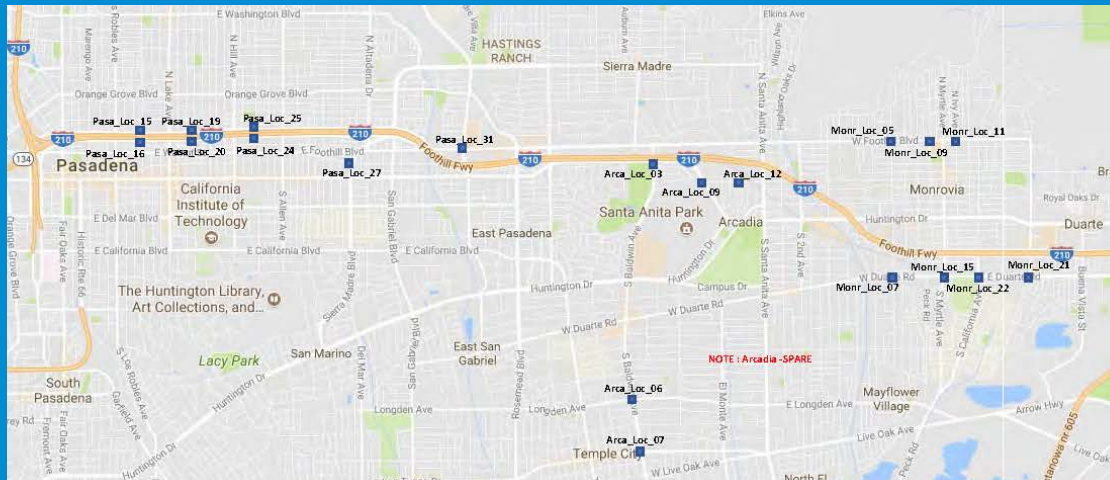


40 Radio Installs / Upgrades
34 Locations

Within LA County, Monrovia,
Duarte and Arcadia

Equipment
Installation
Warranty

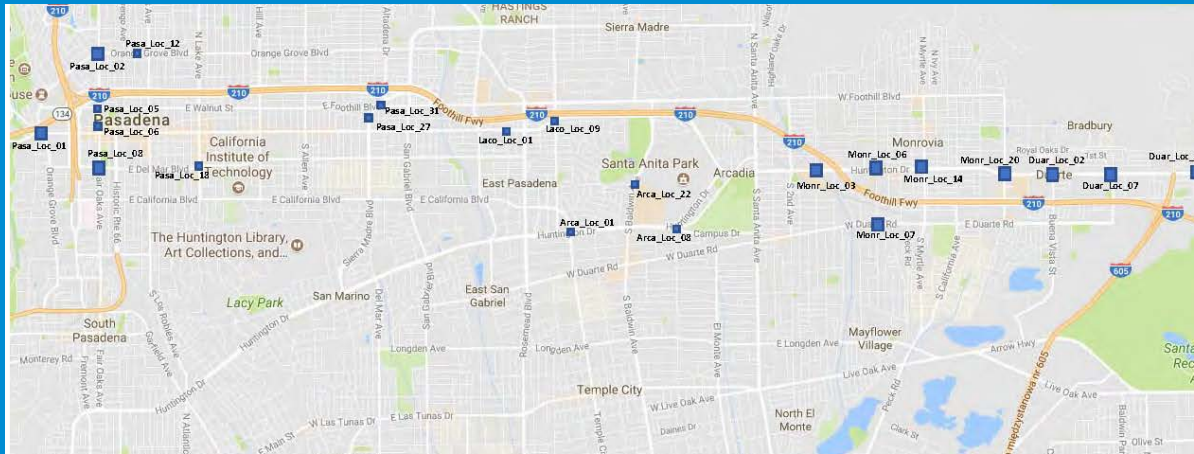
Package 5 – Controller



21 Locations
Within Monrovia, Pasadena and
Arcadia

Equipment
Installation
Warranty

Package 6 – VDS

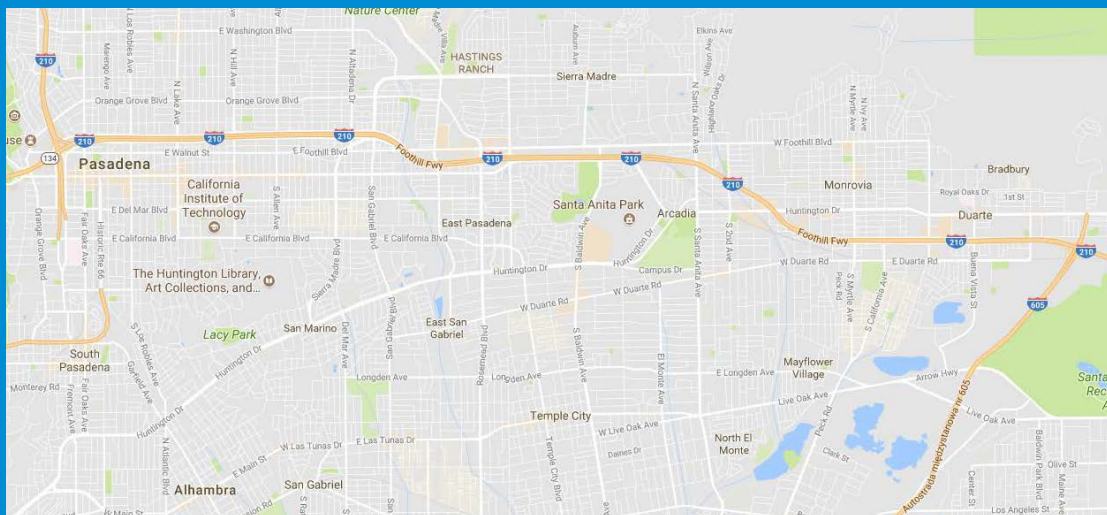


22 Locations

Within LA County, Monrovia
Duarte, Pasadena and
Arcadia

Equipment
Installation
Warranty

Package 7 – Data Comm Module / SW Upgrade



31 Locations

Within LA County, Monrovia,
Duarte, Pasadena, Arcadia

Equipment
Installation
Warranty

Next Steps

Review / Align Procurement Packages

Prepare for Installations commencing in early 2018



REROUTE SIGNAGE

SIGN LOCATIONS

SIGN SELECTION

PRELIMINARY ESTIMATE



Sign Locations

- **Reviewed and Defined Sign Locations with all stakeholders**
- **Major Concerns: Availability of Electricity and Communication**
 - LA County (4 Locations), includes Duarte
 - Pasadena (16 Locations)
 - Arcadia (6 Locations)
 - Caltrans District 7 (17 Locations)

 - Still a work in progress on some Caltrans Locations
 - Need to finalize Monrovia (6 Locations), although locations already reviewed with LA County
- **Stakeholders are now reviewing for power and comm**



Sign and Software Requirements

▣ Sign

- Pixel Pitch [15 to 20 MM]
- 3' x 4'
- Can resist AASHTO wind load of >100 mph wind gust
- MUTCD text requirements (colors and height)

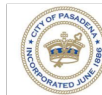
▣ Software

- Sign to TMC connectivity
 - NTCIP connectivity with existing traffic software programs (NTCIP)
 - Signs come with basic software
- C2C Connectivity
 - TMDD based from TMC to CC Data Hub



Pole Requirements

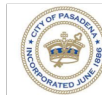
- 2 different Poles required
 - 1 Pole 10' in height for non solar power
 - 1 pole 30' feet in height for solar power/wireless
- 12' sq. ft sign
 - Remain standing during 100 mph winds
- Weight
 - Up to 150 lbs of weight for heaviest potential sign
 - Additional weight for solar and wireless cabinet
- Looking at three designs
 - Caltrans' design for I-80 San Pablo corridor – needs update
 - Caltrans' design for San Mateo corridor – needs update
 - 3rd Party design in the works due Thursday – Just short sign pole



Preferred Sign Selection (10')

- **Modified / Shortened VDS**
 - Standard Plan ES-16D

- **San Mateo Smart Corridor**
 - 200 lb limit at maximum height 10'
 - Sign 4' x 2'8" = 10.67 sq. ft
 - Would need to recalculate for 12 sq. ft and additional weight



Preferred Sign Selection (30')

- **Standard Type 15TS**
 - Standard Plan ES-7A

- **I-80 ICM Corridor Pole**
 - 15TS designed to accommodate CMS
 - 120 lb limit at maximum height of 10' for sign
 - 180 lb for solar panel batteries and panel limit at 4'
 - Sign 4' x 2'8" = 10.67 sq. ft
 - Would need to recalculate for 12 sq. ft and additional weight



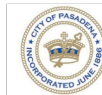
Preliminary Sign Estimate

- **CMS (\$10,000)**
- **Pole (\$3,500)**
- **Pull box (\$1,300)**
- **Solar -**
- **Wireless (\$5,000 x 2 = \$10,000)**
- **Cable; Service and Communication (\$500 per sign, \$450 for extender)**
- **About 26K per sign installed without solar**
- **Excluding the signs related to Caltrans the estimate is approximately \$832,000 for 32 signs**



Next Steps

- **October 1 Deadline**
- **Confirmation of Municipal Locations**
 - Municipalities need to review and approve second round of discussion
- **Confirmation of Caltrans Locations**
 - Ramp Locations (8 Locations)
 - Frontage Roads (9 Locations)
- **Confirm or establish final pole design**
- **Confirm Estimate is Within Budget**
- **Prepare Bid Documents for Procurement**



Center to Center Data Exchange



C2C Updates

68

□ **Transcore**

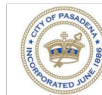
- Awaiting go ahead from Caltrans to let contract.
- Progressed through University purchasing

□ **Kimley Horn**

- Received proposal
- Reviewed by County
- Awaiting updates to proposal
- Caltrans has started procurement process

□ **McCain**

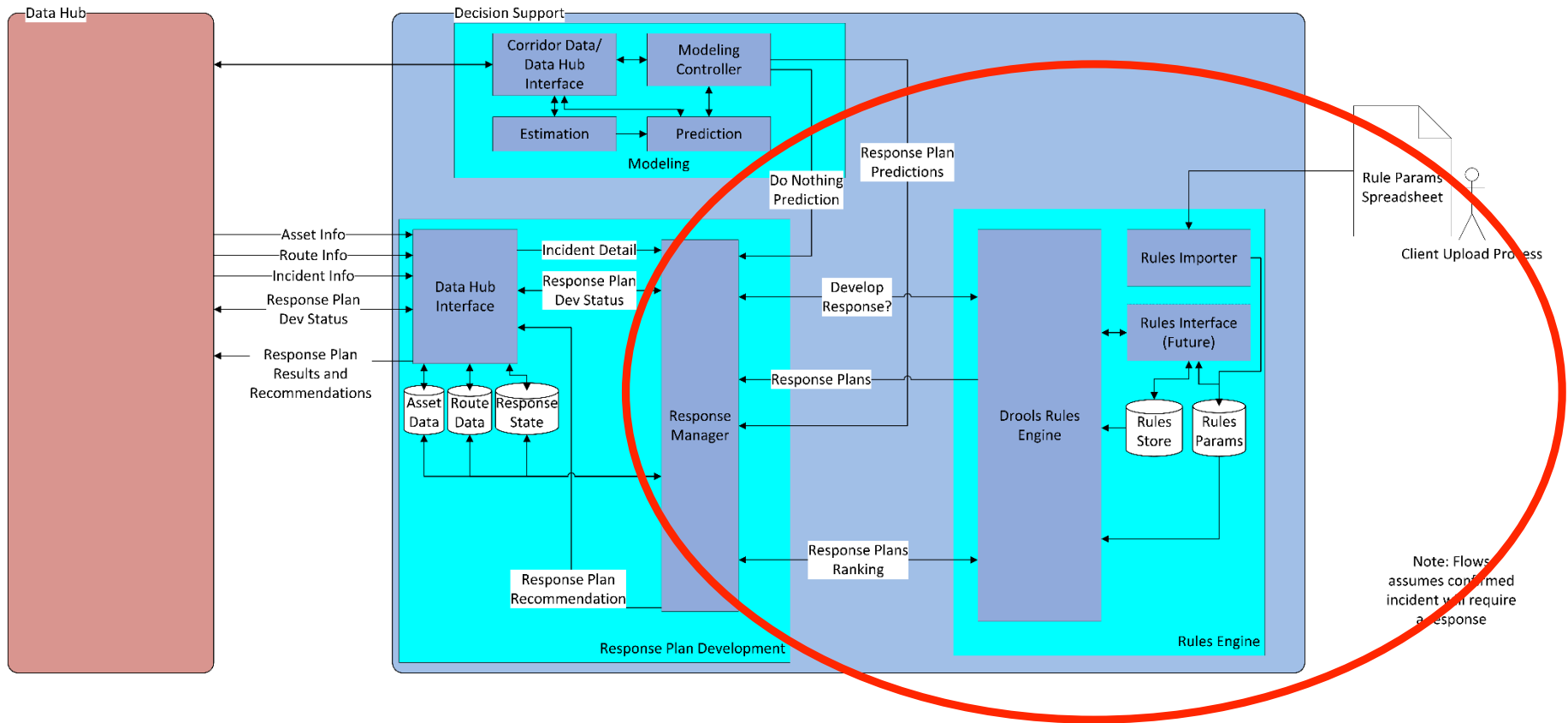
- In review by Pasadena and other stakeholders
- Caltrans has started procurement process



DSS, Rules and Response Plans



DSS – Design Detail



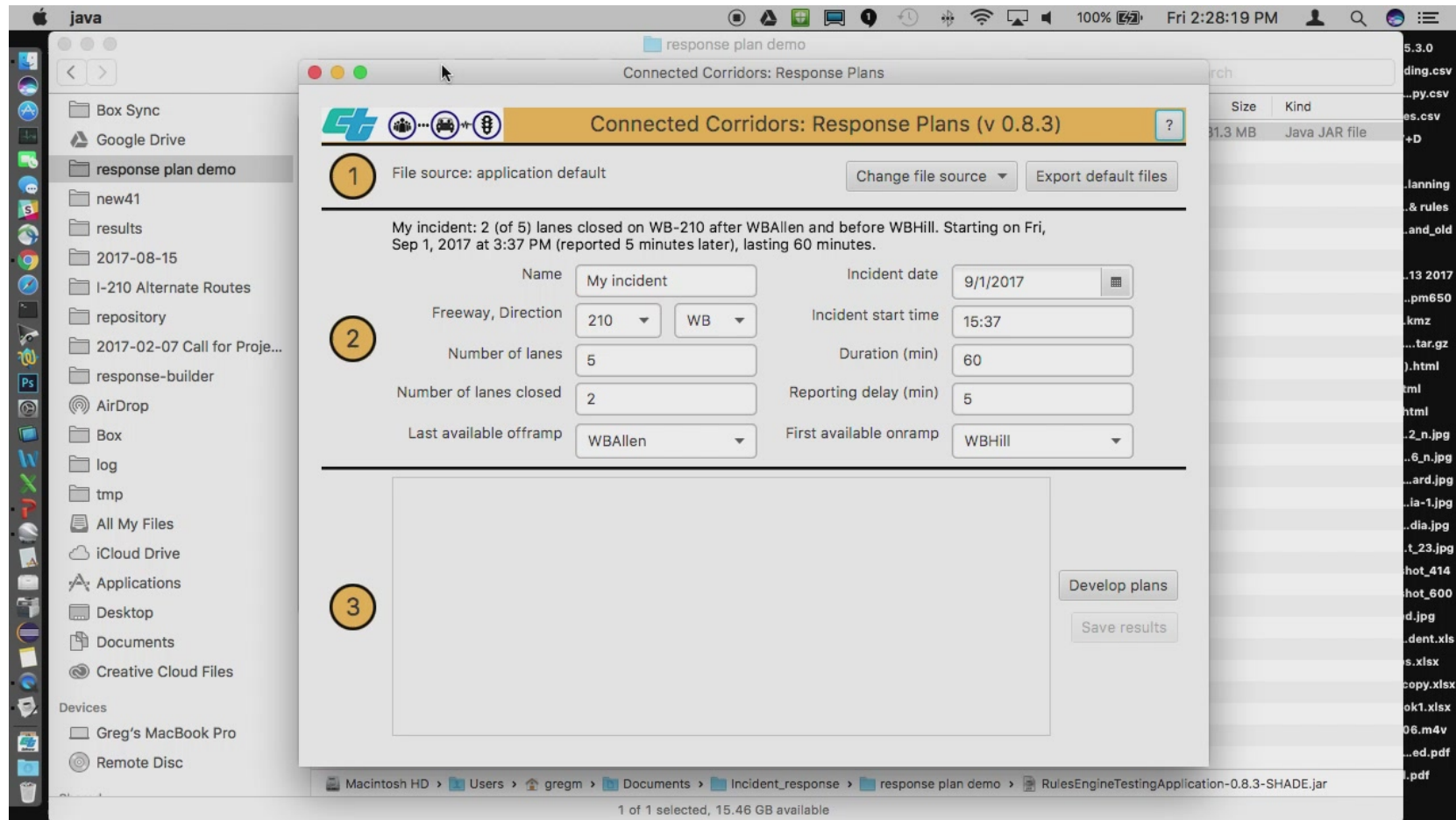
Response Plan Generation

71

- **Added timing offset to response plan components**
 - i.e – Execute plan component at $t + 1$ Minute
- **Continued to update smaller aspects of tool**
- **Complete adding in other response plan elements**
- **Build out additional routes**

Response Plan Generation Tool

72



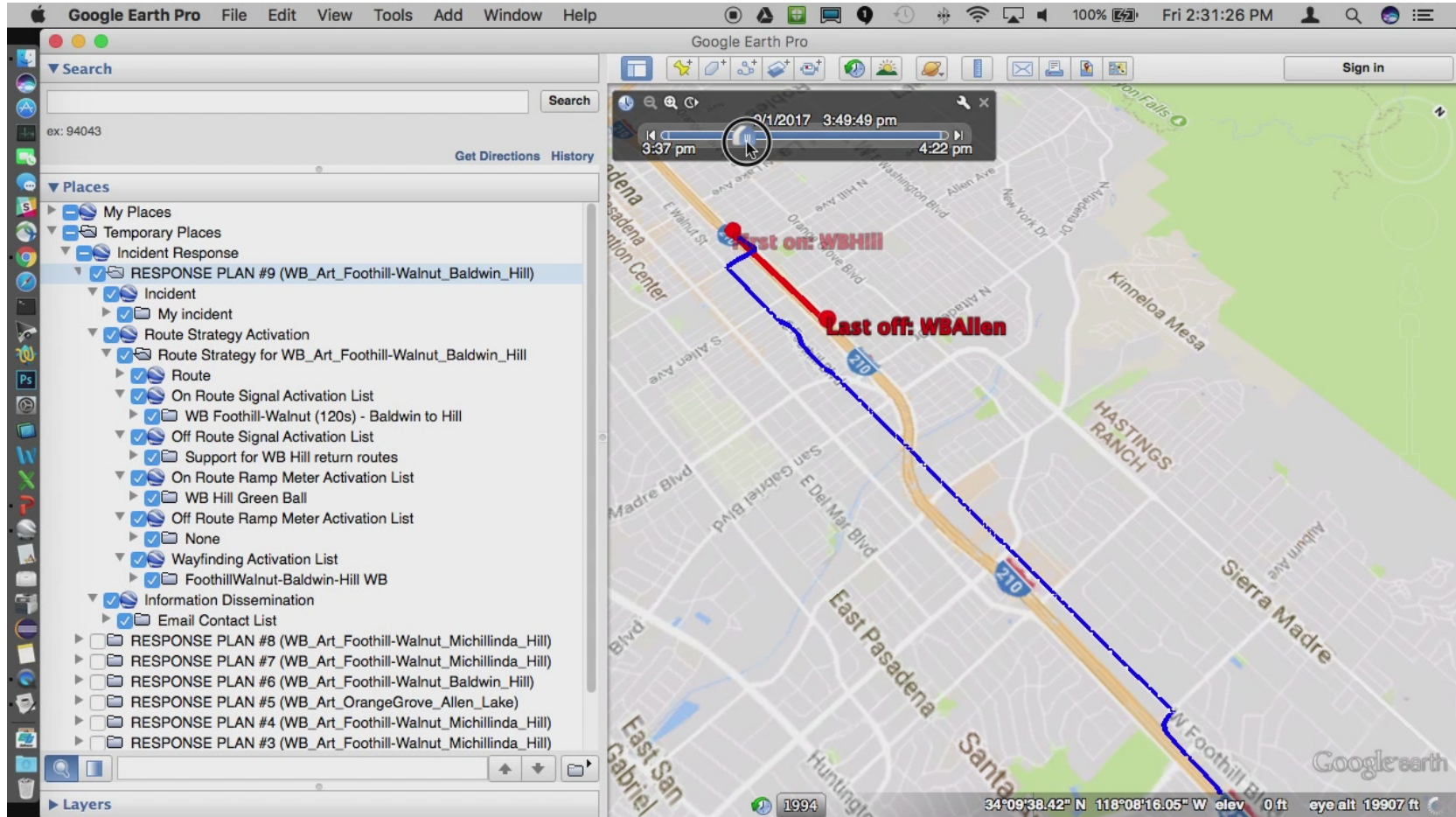
Addition of Start Delay Column

73

Wayfinding Strategy Name	Wayfinding Name/ID	Wayfinding Message	Start delay (seconds)	Criticality for Strategy	status
FoothillWalnut-Baldwin-Hill WB	Foothill Blvd & I-210 WB / Sears_WB	Through Arrow DETOUR I-210W Continue to Hill	25	Required	Availa
FoothillWalnut-Baldwin-Hill WB	Foothill Blvd & Rosemead Blvd_WB	Through Arrow DETOUR I-210W Continue to Hill	85	Required	Availa
FoothillWalnut-Baldwin-Hill WB	Foothill Blvd & Sierra Madre Villa Ave_WB	Through Arrow DETOUR I-210W Continue to Hill	145	Required	Availa
FoothillWalnut-Baldwin-Hill WB	Baldwin Ave & I-210 WB / Foothill Blvd_NB	Left Arrow DETOUR I-210W	205	Required	Availa
FoothillWalnut-Baldwin-Hill WB	Walnut St & Hill Ave_WB	Right Arrow DETOUR I-210W	265	Required	Availa
FoothillWalnut-Michillinda-Hill WB	Foothill Blvd & I-210 WB / Sears_NB	Left Arrow DETOUR I-210W	200	Required	Availa
FoothillWalnut-Michillinda-Hill WB	Foothill Blvd & Rosemead Blvd_WB	Through Arrow DETOUR I-210W Continue to Hill	200	Required	Availa
FoothillWalnut-Michillinda-Hill WB	Foothill Blvd & Sierra Madre Villa Ave_WB	Through Arrow DETOUR I-210W Continue to Hill	200	Required	Availa
FoothillWalnut-Michillinda-Hill WB	Walnut St & Hill Ave_WB	Right Arrow DETOUR I-210W	200	Required	Availa
Maple-Allen-Hill WB	Maple St & Allen Ave_WB	Through Arrow DETOUR I-210W	200	Required	Availa
None	None	None	200	Required	Availa

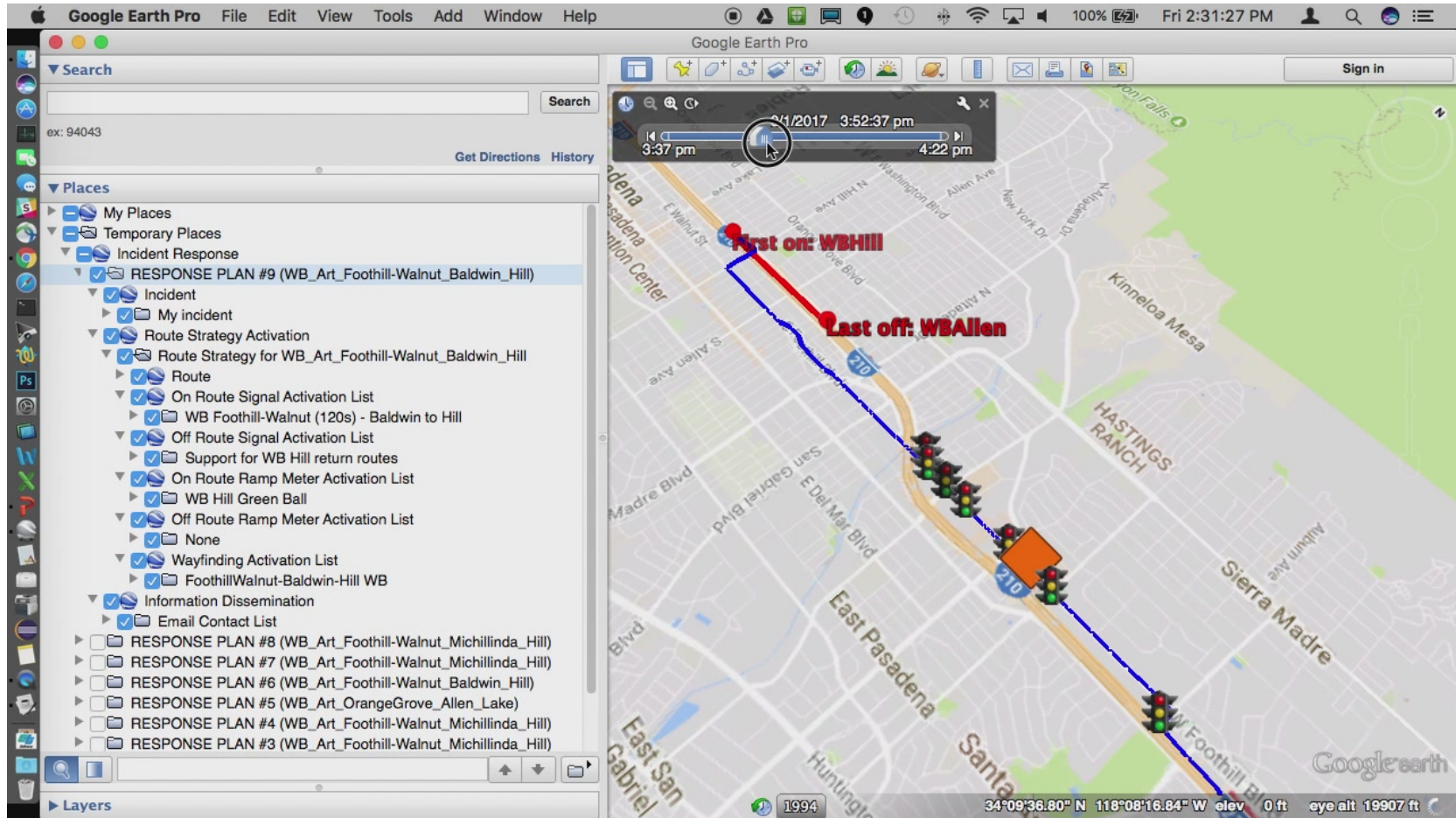


Time 0



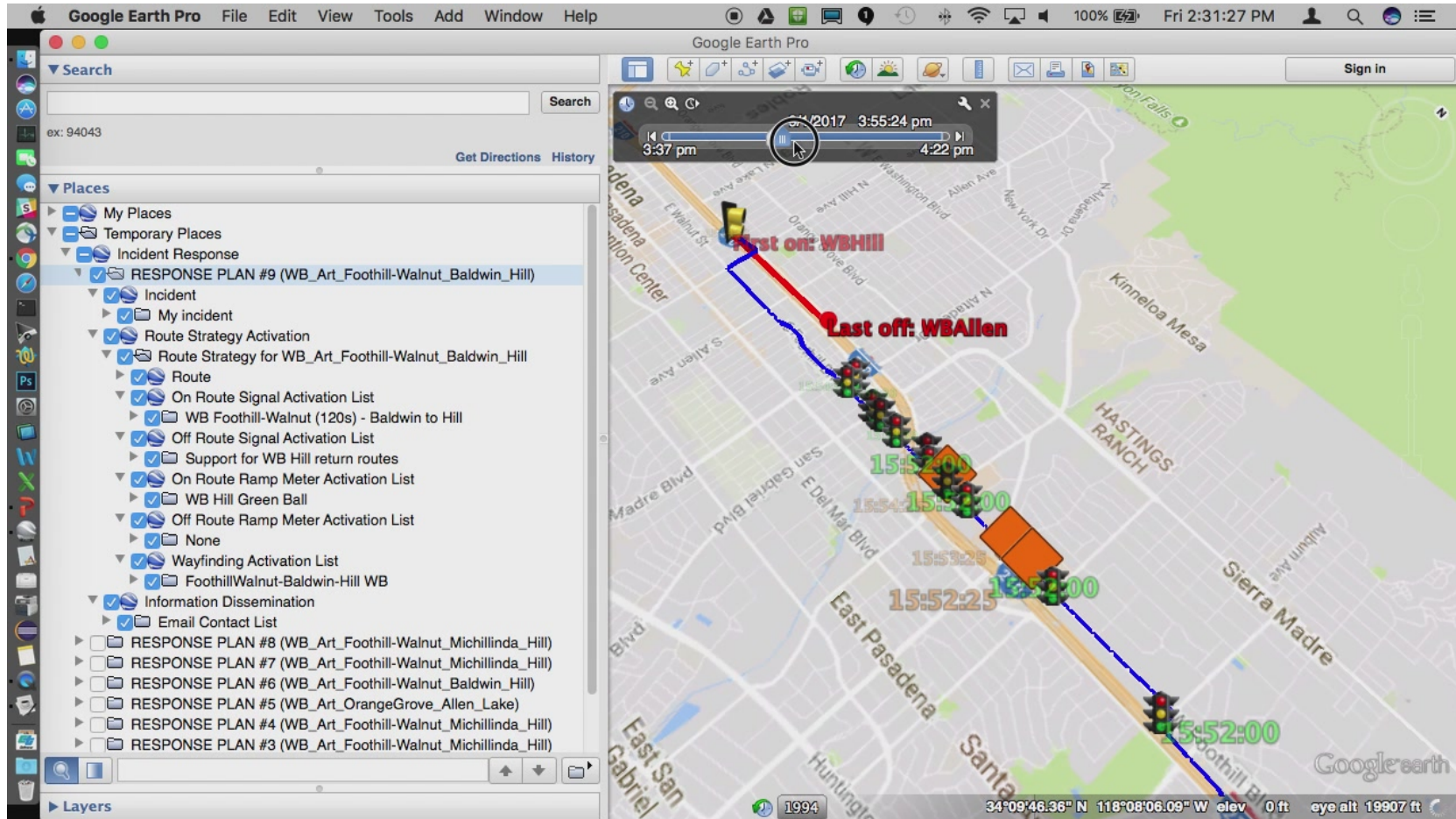
Time 0 + x

75



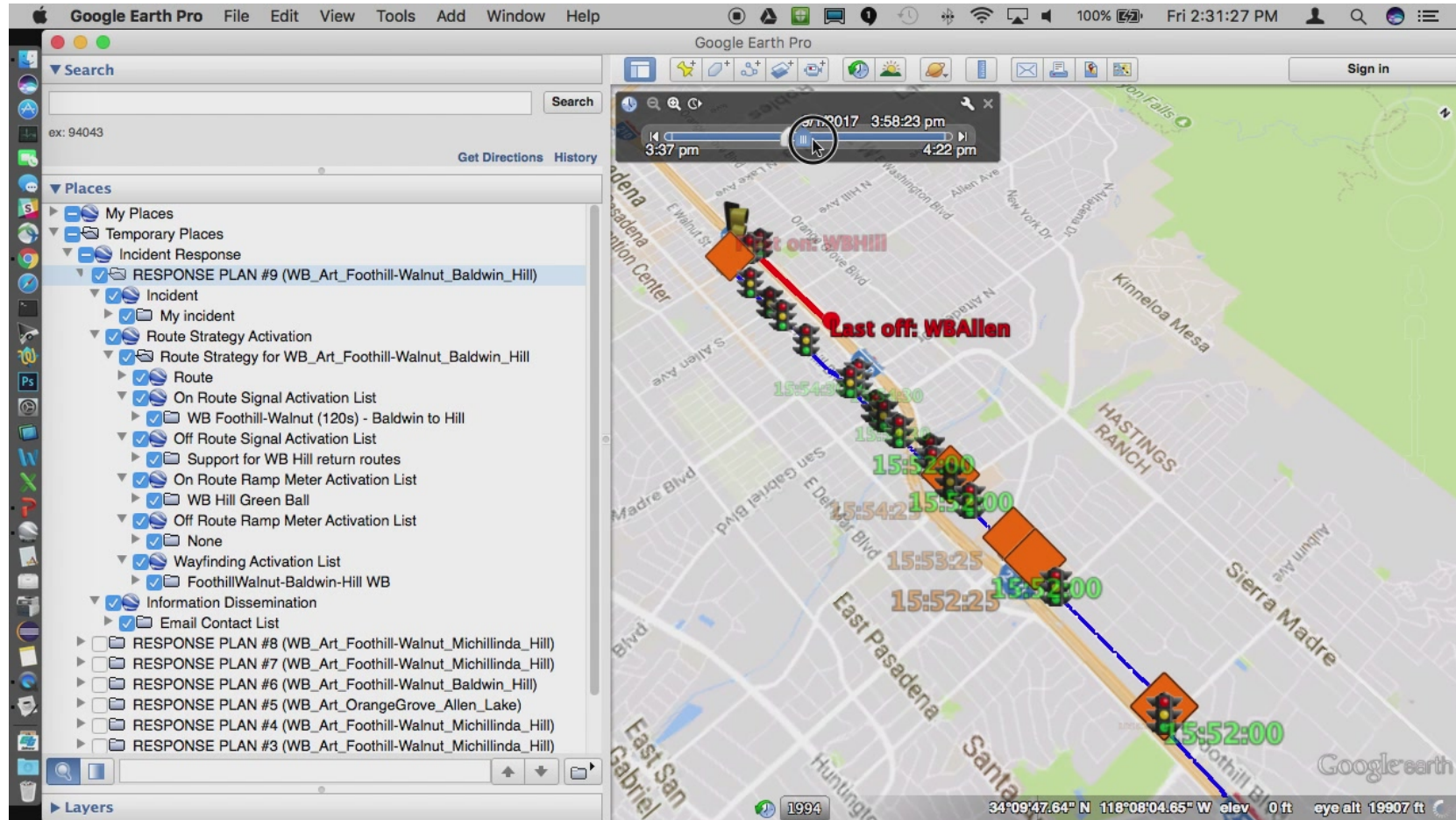
Time 0 + x + x

76



All element updates completed

77



78

ATMS, PEMS, 511, Lane Closure

ATMS, PEMS, 511, Lane Closure

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- **ATMS Upgrades**
 - ▣ Provided extensive comments on requirements document
 - ▣ Next meeting planned for next Wed (Sept 20th)

- **PEMS**
 - ▣ Quote received and is being reviewed
 - ▣ Meeting held on August 28th
 - ▣ Statement of work to be generated

- **511**
 - ▣ RIITS and PATH need to schedule design reviews
 - ▣ Reviewing RIITS APIS

- **Arterial Lane Closure**
 - ▣ No one has requested to look at the Arterial Lane Closure tracing system



Lane Closure System



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[Road Closures](#)
[Closures by Category](#)
[Enter Road Closure](#)
[Help](#)

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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

81

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

Data Quality and Estimation

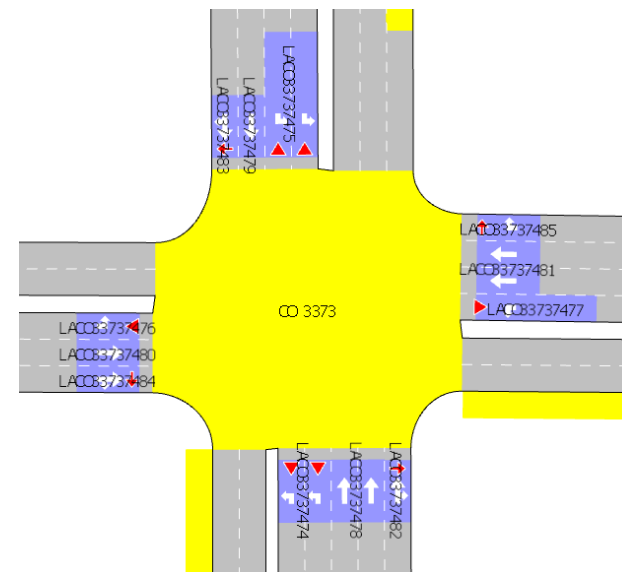


Data Quality

- I-210 Westbound PM 25 – PM 43.25 achieved 91.6% data availability due to new loops and improved communications

Caltrans (freeways)		Arcadia	Pasadena	Summary					
Weekly Average Sensor Availability		I-210		Westbound PM 25 - PM 43.25					
Hover over cells to view units in detector-days.		CD	CH	Fwy-Fwy	HOV	Mainline	Off Ramp	On Ramp	Total
August	6 7 8 9 10 11 12			100.0%	83.8%	80.0%	65.2%	78.6%	79.5%
	13 14 15 16 17 18 19			100.0%	84.6%	83.0%	82.4%	81.6%	83.7%
	20 21 22 23 24 25 26			100.0%	89.1%	92.6%	86.7%	91.8%	91.6%

- Beginning of work to evaluate LACO arterial loop detector data and to import into model



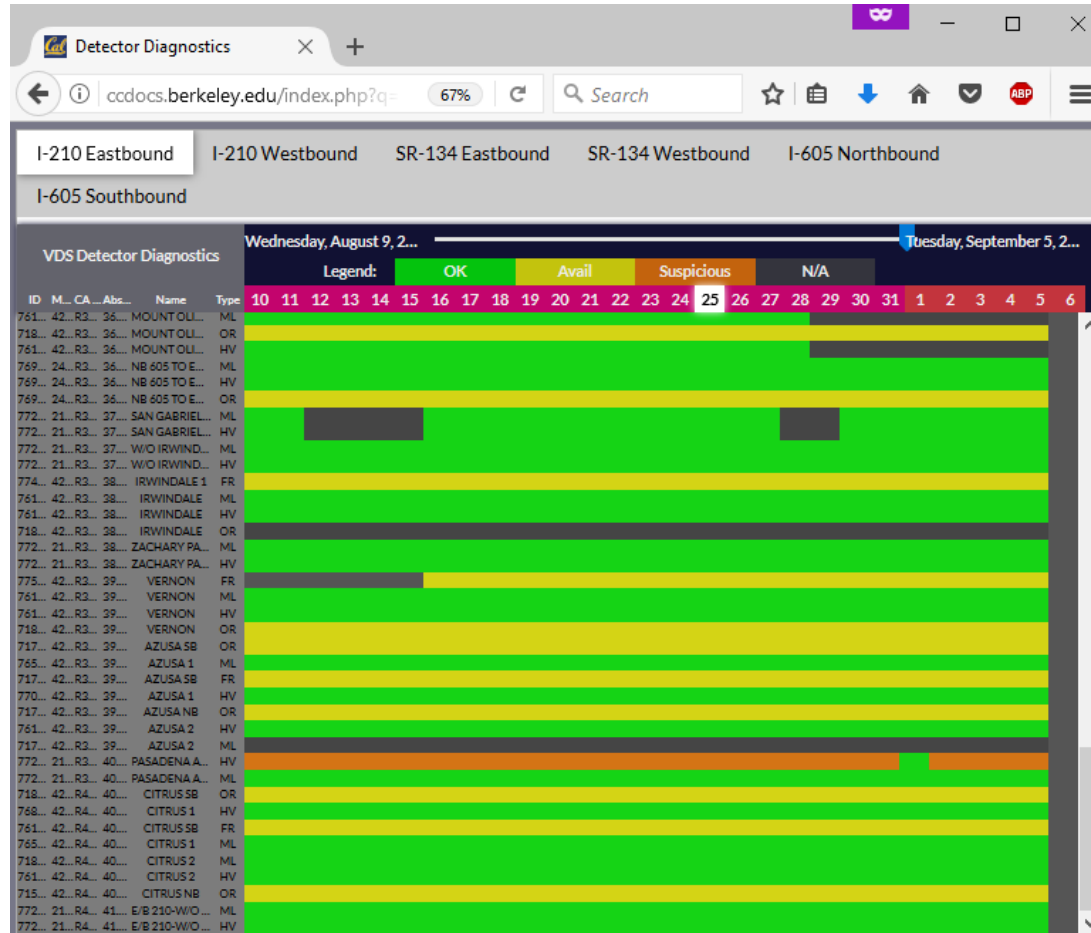
Freeway Sensor Availability

Weekly Average Sensor Availability				I-210	Eastbound PM 25 - PM 43.25				
Hover over cells to view units in detector-days.		CD	CH	Fwy-Fwy	HOV	Mainline	Off Ramp	On Ramp	Total
August	6 7 8 9 10 11 12			61.9%	76.7%	81.5%	73.2%	84.0%	79.5%
	13 14 15 16 17 18 19			66.7%	74.7%	81.5%	80.1%	84.6%	80.3%
	20 21 22 23 24 25 26			66.7%	75.1%	85.0%	85.3%	88.0%	83.5%
	27 28 29 30 31 1 2			66.7%	69.0%	76.9%	79.2%	80.6%	76.2%
September	3 4 5 6 7 8 9			66.7%	73.1%	80.2%	85.7%	84.0%	80.0%

Weekly Average Sensor Availability				I-210	Westbound PM 25 - PM 43.25				
Hover over cells to view units in detector-days.		CD	CH	Fwy-Fwy	HOV	Mainline	Off Ramp	On Ramp	Total
August	30 31 1 2 3 4 5			100.0%	84.6%	82.0%	60.5%	80.6%	80.5%
	6 7 8 9 10 11 12			100.0%	83.8%	80.0%	65.2%	78.6%	79.5%
	13 14 15 16 17 18 19			100.0%	84.6%	83.0%	82.4%	81.6%	83.7%
	20 21 22 23 24 25 26			100.0%	89.1%	92.6%	86.7%	91.8%	91.6%
	27 28 29 30 31 1 2			100.0%	84.2%	84.1%	76.2%	83.7%	83.8%

- This just in:
 - I-210 PM 25 - 43.25 WB has reached 90% again
 - SR-134 PM 11.4 - 13.5 WB is back up to 93%
 - I-605 PM 22.93 - 28 NB is at almost 95%
- This is the first time we have had such great data on I-605 since we started keeping track in January of 2016

Detector by Day Report – Trends and Details



- Green: Data appear usable
- Yellow: Available but unclassified
- Orange: Suspicious and outside expected pattern
- Black: Missing

Data Collection for cities and county

86

□ Arcadia

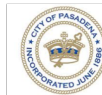
Weekly Data Quality (%)	Detour Routes		
	Good	Bad	No Data
	20-Aug-2017 To 26-Aug-2017	79.19	14.42
27-Aug-2017 To 02-Sep-2017	78.28	15.33	6.39

- **Pasadena – Good conversation with Pasadena and McCain. Working on weekly data feeds.**
- **County, Monrovia, Duarte – We are now collecting and processing data from the IEN**



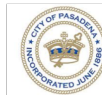
LACO August Summary - Connection

- **The connection for LACO was not very stable in the past weeks as the County was performing tests on the KITS server during that time period.**
- **We had another connection downtime on August 8th while fixing a bug at our end.**
- **The number of available detectors is about 9100 for LACO when the connection is good.**
- **The device update response time is about 25 to 40 seconds for LACO.**



Mapping of LACO detectors

- **According to the detector inventory information from the IEN, we were able to create the geometry mapping of 600 detectors at 56 intersections which are within the I-210 corridor.**
- **We also used Street View in Google Maps to obtain more detailed information of these detectors, which includes**
 - Detector type
 - Detected traffic movements
 - Detector length
 - Distance to stopbar
 - Number of lanes



Example: Intersection 330 -- Live Oak@Myrtle/Peck



Example of detailed detector information

Intersection Name	Intersection ID	County	Road Name	Direction	Sensor ID	Movement	Detector Length	Distance To Stopbar (ft)	Number Of Lane	Note
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Live Oak Ave	EB	7252	Advanced	24	235	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Live Oak Ave	EB	7253	Advanced	24	235	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Live Oak Ave	EB	7256	Left Turn	26	0	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Live Oak Ave	EB	7254	Through	39	0	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Live Oak Ave	EB	7255	Through	39	0	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Live Oak Ave	WB	7262	Advanced	24	270	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Live Oak Ave	WB	7263	Advanced	24	270	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Live Oak Ave	WB	7266	Left Turn	39	0	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Live Oak Ave	WB	7264	Through	26	0	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Live Oak Ave	WB	7265	Through and Right Turn	26	0	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Myrtle Ave	SB	7257	Advanced	10	245	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Myrtle Ave	SB	7258	Advanced	10	245	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Myrtle Ave	SB	7261	Left Turn	39	0	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Myrtle Ave	SB	7259	Through	39	0	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Myrtle Ave	SB	7260	Through and Right Turn	39	0	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Peck Rd	NB	2593	Advanced	10	285	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Peck Rd	NB	7248	Advanced	10	285	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Peck Rd	NB	7251	Left Turn	58	0	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Peck Rd	NB	7249	Through	26	0	1	NA
Live_Oak_Ave_at_Myrtle_Ave_Peck_Rd	330	LACO	Peck Rd	NB	7250	Through and Right Turn	26	0	1	NA



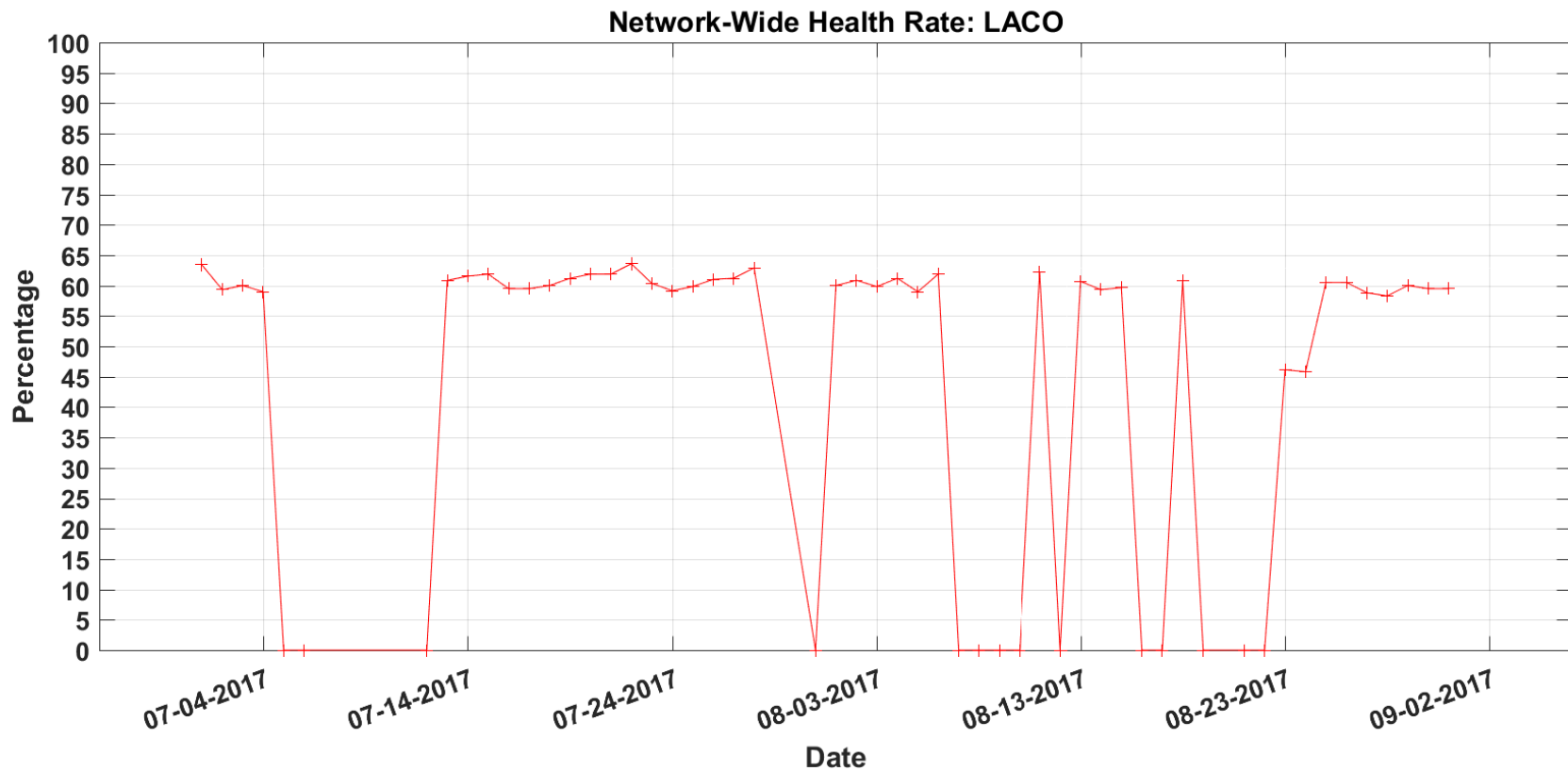
Analysis of detector data

- **Diagnostic states (Detector errors)**
 - Missing data
 - Zero values
 - High values
 - Constant values
 - Inconsistent values (between flow and occupancy)
- **A detector is “Good” when the following criteria are met:**
 - Missing data $\leq 5\%$
 - Maximum length of “Zero values” ≤ 4 hours
 - High values $\leq 5\%$
 - No constant values
 - Inconsistent values $\leq 5\%$
- **System performance metrics**
 - Average health rate
 - Always working/failed



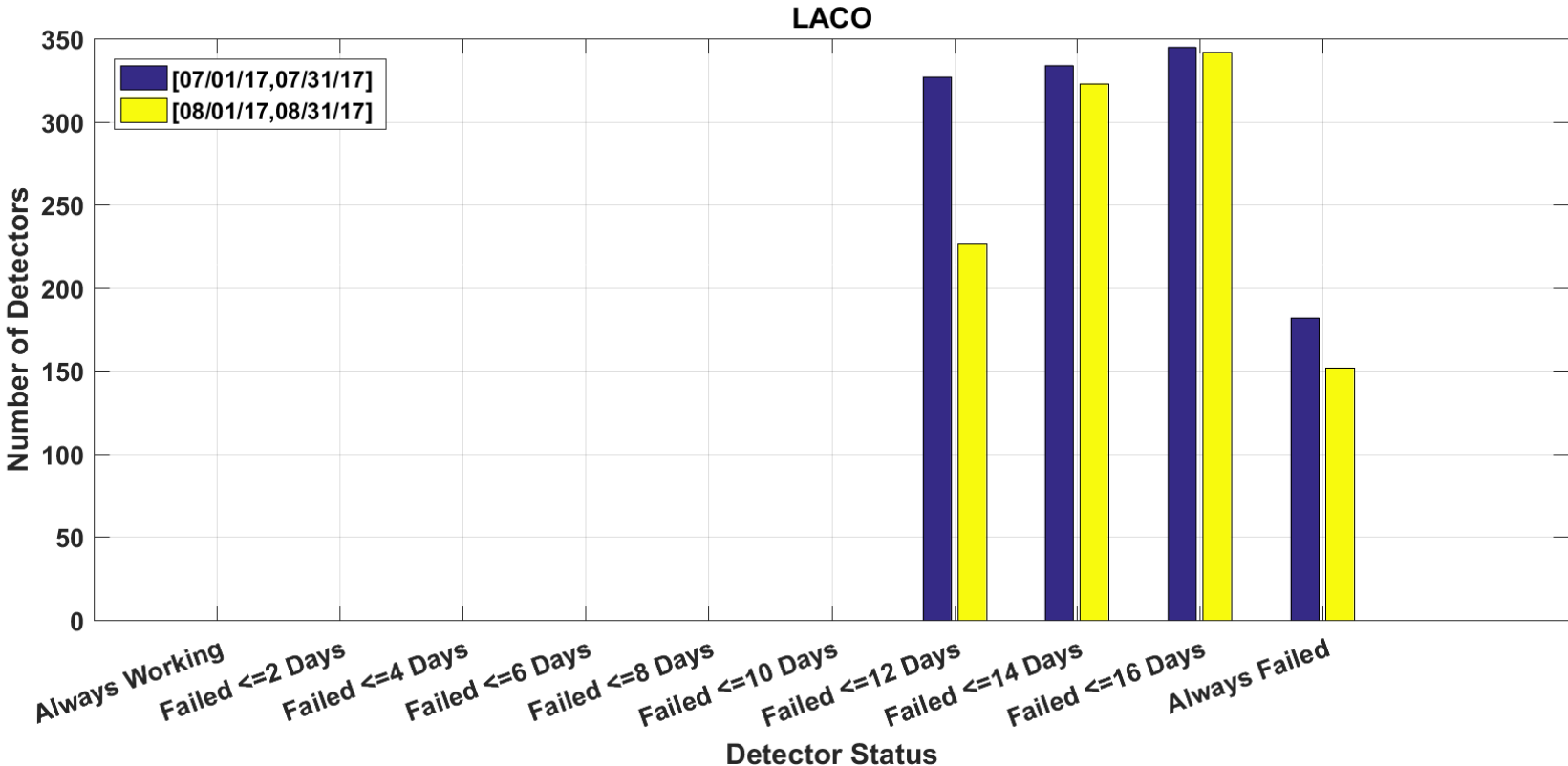
System Performance: Average health rate

The network-wide health rate was about 60% on a normal day.



System Performance: Always working/failed

- More than 150 detectors were always failed.
- All other detectors were failed for at least 12 days.



Available signal information

- We only get very limited signal information from the IEN for the intersections in LACO
 - E.g., Timing Plan, Desired Cycle Length, Desired Offset, and Control Mode

OrgID	DeviceID	LastUpdate	Date	Time	CommState	SignalState	TimingPlan	DesiredCycleLength	DesiredOffset	ActualOffset	ControlMode
'29:1'	'604'	"/2017.08.02/1...	'2017.08.02'	'16:38:12'	'GOOD'	'NORMAL_OP...	'3'	'120'	'112'	'0'	'ACTUATED'
'29:1'	'604'	"/2017.08.02/1...	'2017.08.02'	'16:38:12'	'GOOD'	'NORMAL_OP...	'3'	'120'	'112'	'0'	'ACTUATED'
'29:1'	'604'	"/2017.08.02/1...	'2017.08.02'	'16:38:12'	'GOOD'	'NORMAL_OP...	'3'	'120'	'112'	'0'	'ACTUATED'
'29:1'	'604'	"/2017.08.02/1...	'2017.08.02'	'16:41:53'	'GOOD'	'NORMAL_OP...	'3'	'120'	'112'	'0'	'ACTUATED'
'29:1'	'604'	"/2017.08.02/1...	'2017.08.02'	'16:41:53'	'GOOD'	'NORMAL_OP...	'3'	'120'	'112'	'0'	'ACTUATED'
'29:1'	'604'	"/2017.08.02/1...	'2017.08.02'	'16:41:53'	'GOOD'	'NORMAL_OP...	'3'	'120'	'112'	'0'	'ACTUATED'
'29:1'	'604'	"/2017.08.02/1...	'2017.08.02'	'16:41:53'	'GOOD'	'NORMAL_OP...	'3'	'120'	'112'	'0'	'ACTUATED'

LACO

- We can get the planned/actual phase times from the IEN for Arcadia, but not for LACO.

OrgID	DeviceID	LastUpdate	Date	Time	LastCycle	PhaseTime
'5:1'	'6082'	"/2017.08.02/0...	'2017.08.02'	'08:34:30'	'120'	'1:0;2:77;3:0;4:33;5:7;6:66;7:0;8:33;9:0;10:0;11:0;12:0;13:0;14:0;15:0;16:0;'
'5:1'	'6082'	"/2017.08.02/0...	'2017.08.02'	'08:35:00'	'120'	'1:0;2:77;3:0;4:33;5:7;6:66;7:0;8:33;9:0;10:0;11:0;12:0;13:0;14:0;15:0;16:0;'
'5:1'	'6082'	"/2017.08.02/0...	'2017.08.02'	'08:35:30'	'120'	'1:10;2:63;3:0;4:33;5:6;6:67;7:0;8:33;9:0;10:0;11:0;12:0;13:0;14:0;15:0;16:0;'
'5:1'	'6082'	"/2017.08.02/0...	'2017.08.02'	'08:36:00'	'120'	'1:10;2:63;3:0;4:33;5:6;6:67;7:0;8:33;9:0;10:0;11:0;12:0;13:0;14:0;15:0;16:0;'
'5:1'	'6082'	"/2017.08.02/0...	'2017.08.02'	'08:36:31'	'120'	'1:10;2:63;3:0;4:33;5:6;6:67;7:0;8:33;9:0;10:0;11:0;12:0;13:0;14:0;15:0;16:0;'
'5:1'	'6082'	"/2017.08.02/0...	'2017.08.02'	'08:37:01'	'120'	'1:10;2:63;3:0;4:33;5:6;6:67;7:0;8:33;9:0;10:0;11:0;12:0;13:0;14:0;15:0;16:0;'

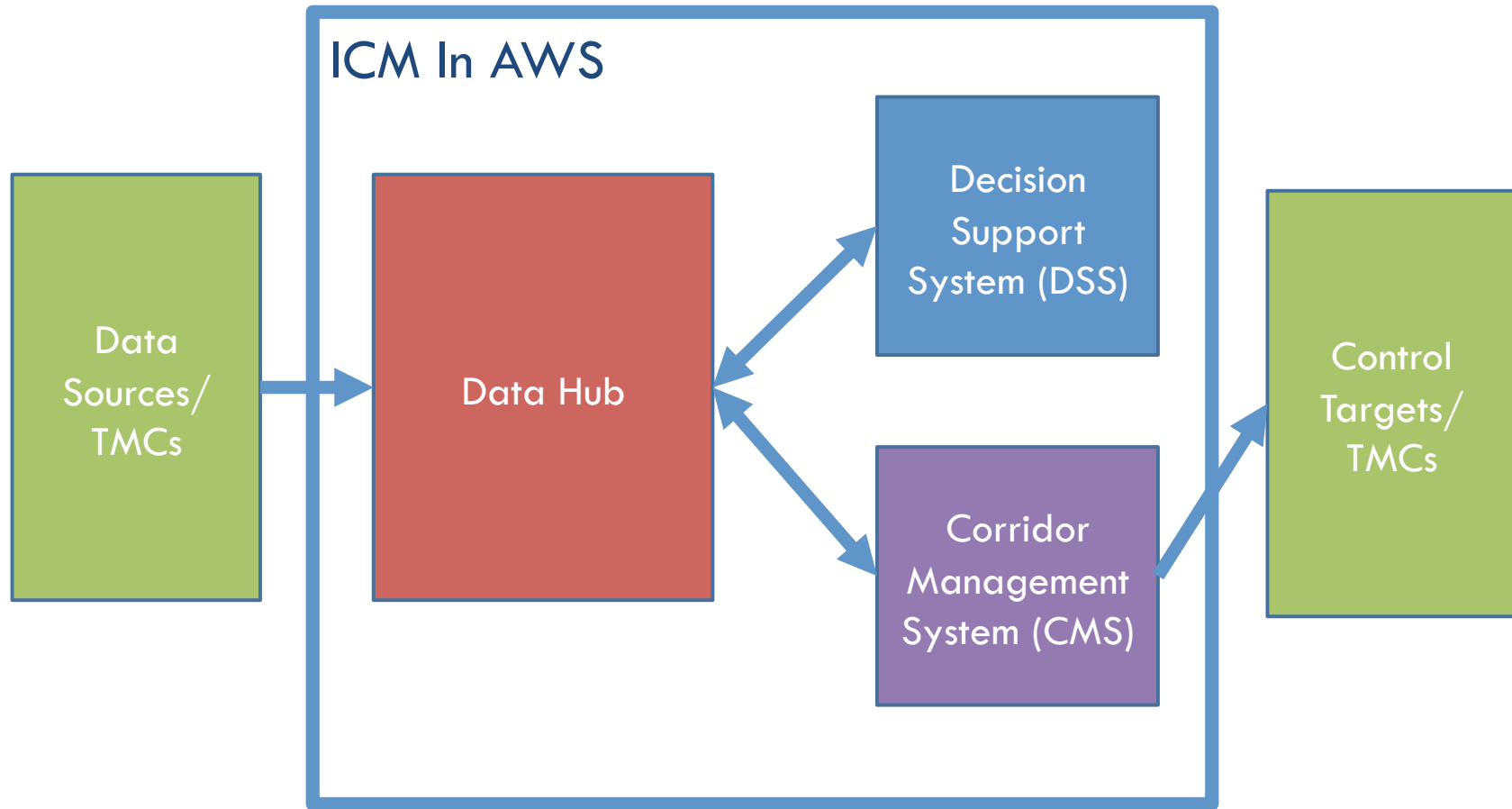
Arcadia



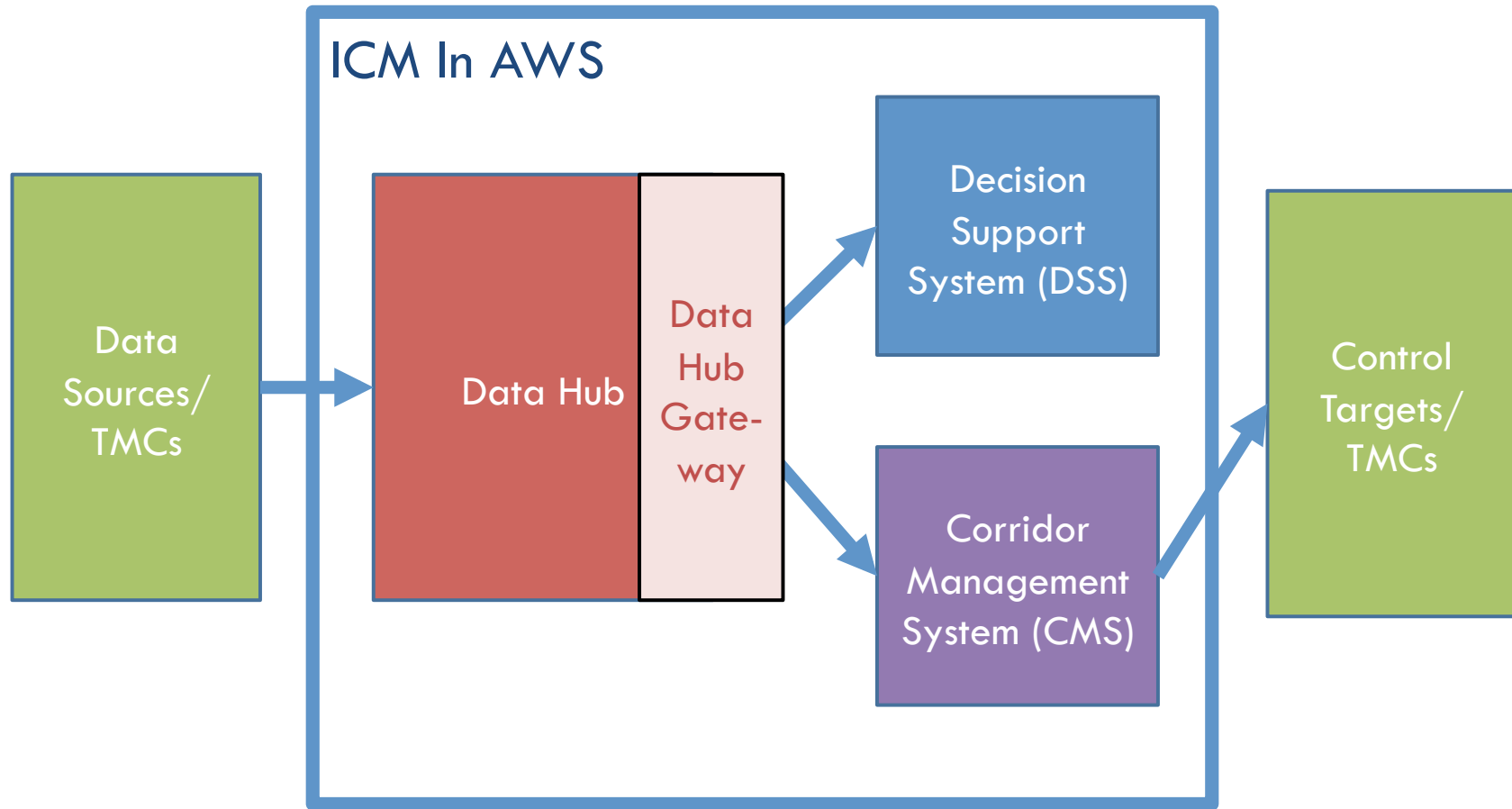
95

Data Hub and Cloud

ICM in AWS



ICM in AWS



How are pipelines and DSS/DH/CMS actions coordinated

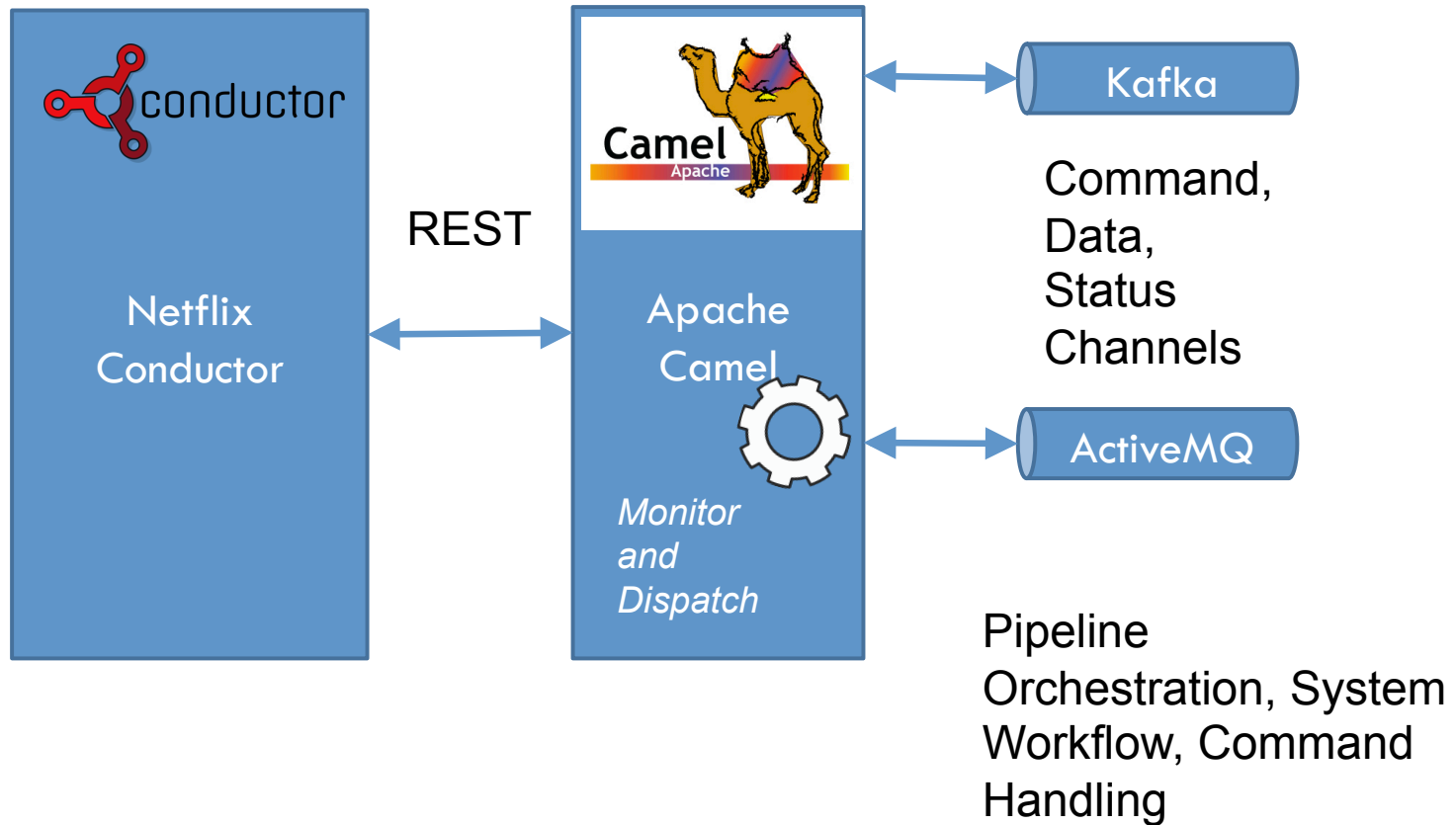
98

- **Data Hub Command Gateway**
 - Orchestration of pipelines – start, stop, status
 - Workflow management
 - Data hub
 - Manage requests from CMS
 - Manage CMS/DSS/Data Hub workflows
 - Incident management
 - Restart/Stop/Start service requests
 - Operational requests
 - SEDA – Staged Event Driven Architecture



Data Hub Command Gateway - design

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Other Activities Underway

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- ❑ **Successfully held Amazon cloud introductory meeting**
- ❑ **CloudFormation AWS deployment automation**
- ❑ **Testing – Jmeter automated testing being developed**
- ❑ **Security design and implementation activities**
 - ❑ Securely encrypt database privileges
 - ❑ IAM security roles – least privilege
 - ❑ Database roles/privileges specific to service requirements
- ❑ **Beginning discussions with vendors for C2C communications, TMDD modifications, interface definitions**



Corridor Model update



Modeling and Response Planning

- Inventory list completed: required flush plans enumerated for 80 reroute segments using 148 signalized intersections and about 274 plans
- AM simulation period extended to run from 6 am to 11 am
- Continued refinement of meso-model

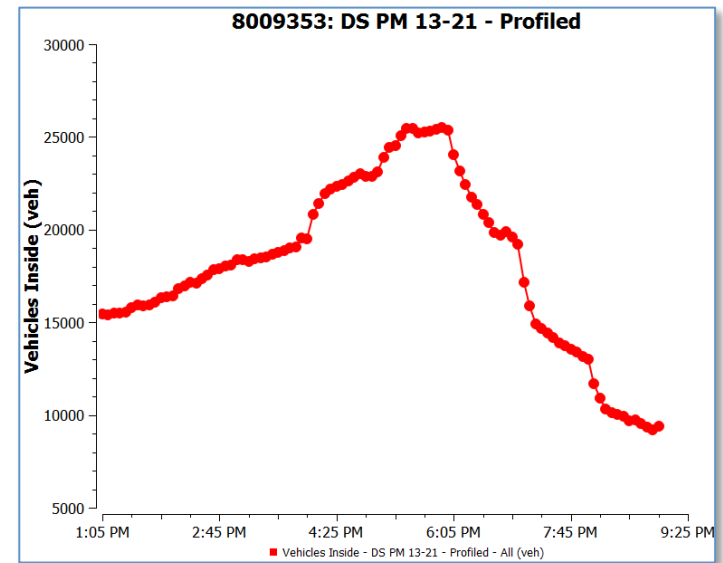


Simulation Calibration

103

- **Calibration mainly complete for afternoon peak (1 PM to 9 PM)**
 - ▣ Specific traffic demand profile for each one-hour period
 - Passenger cars
 - HOV vehicles
 - Medium and heavy trucks

- **Next stage: Complete calibration for 5 AM – 1 PM period**

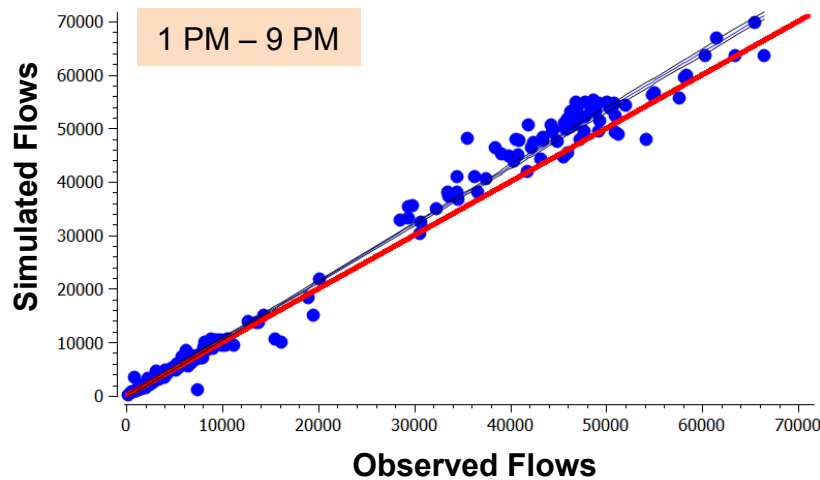


Simulation Calibration

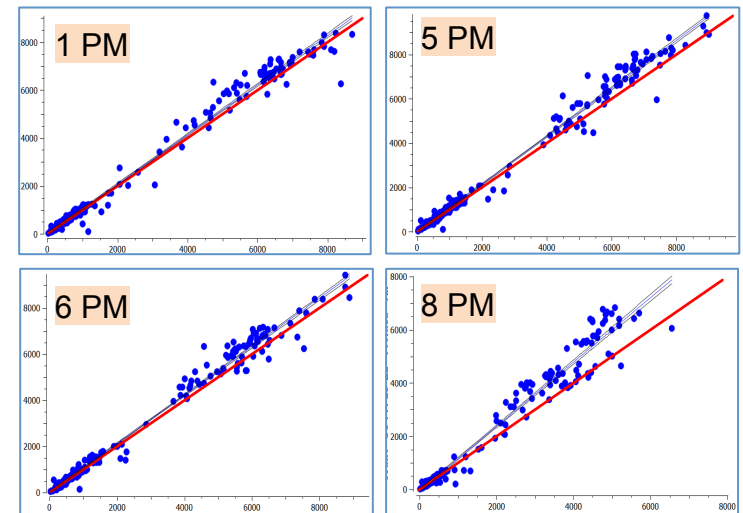
104

- Comparison of freeway mainline and ramps flows

Overall simulation

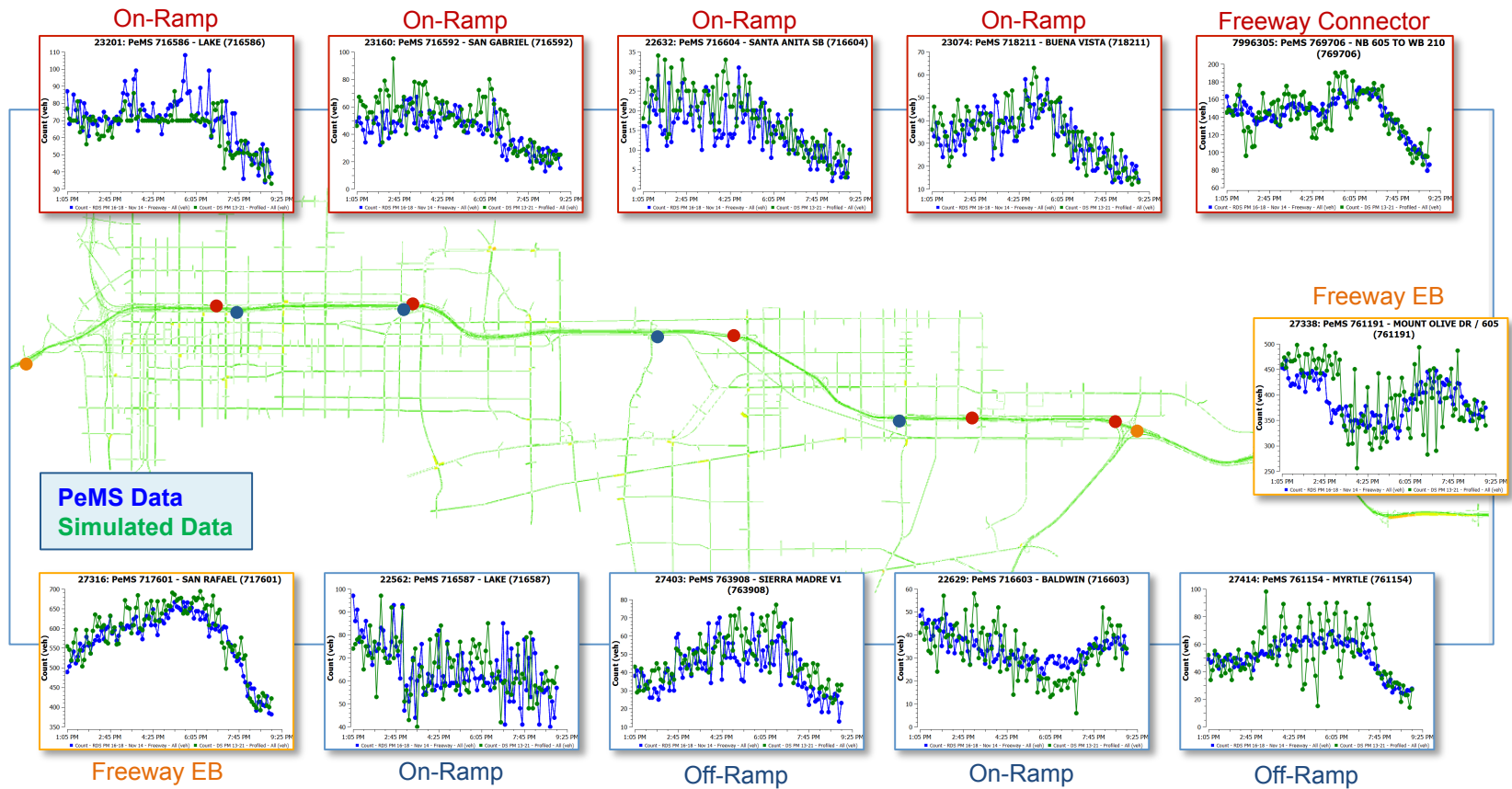


Specific 1-hour periods



Simulation Calibration

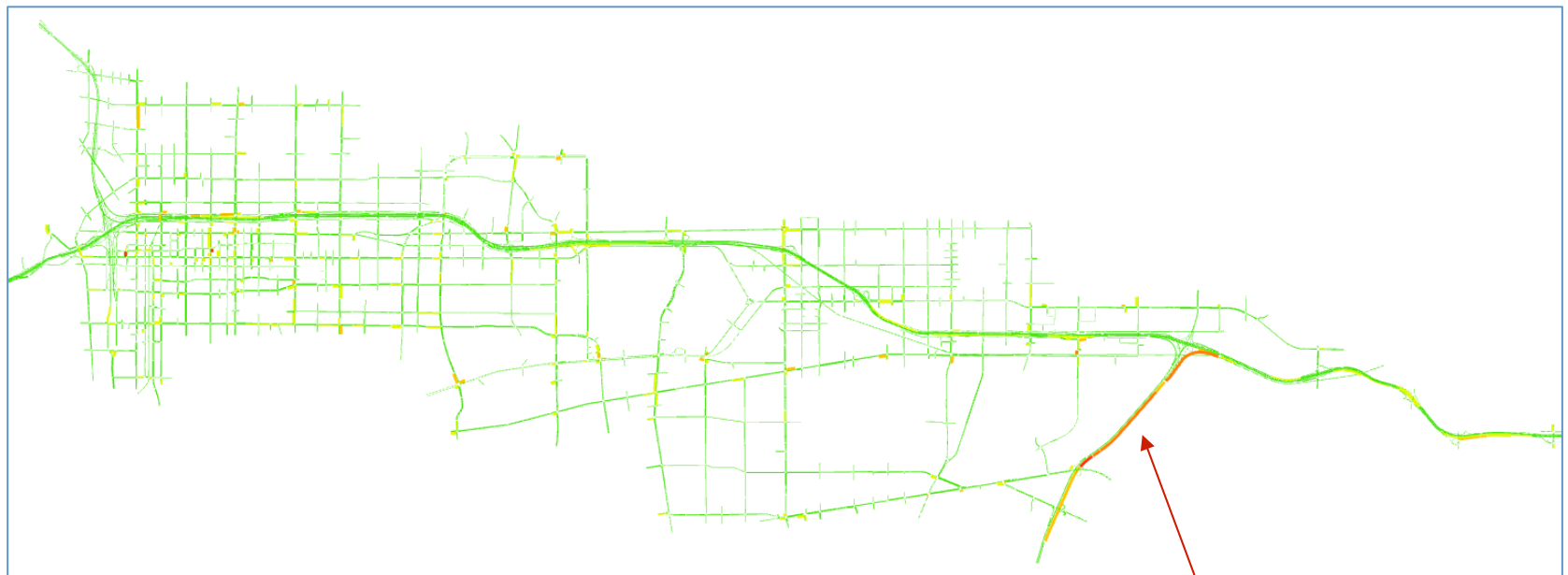
Specific flow profile comparison examples



Simulation Calibration

106

□ Simulation example: Traffic density – 2 PM



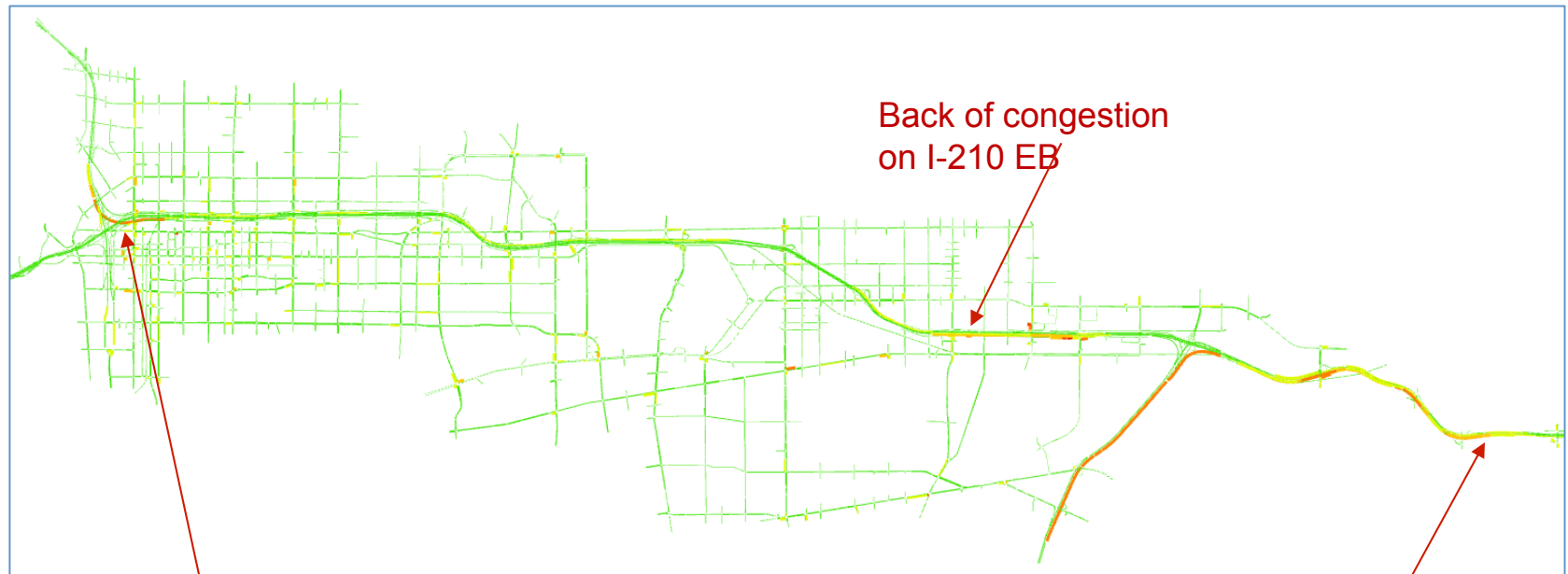
Correctly captures early congestion on I-605 NB



Simulation Calibration

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□ Simulation Example: Traffic density – 3 PM



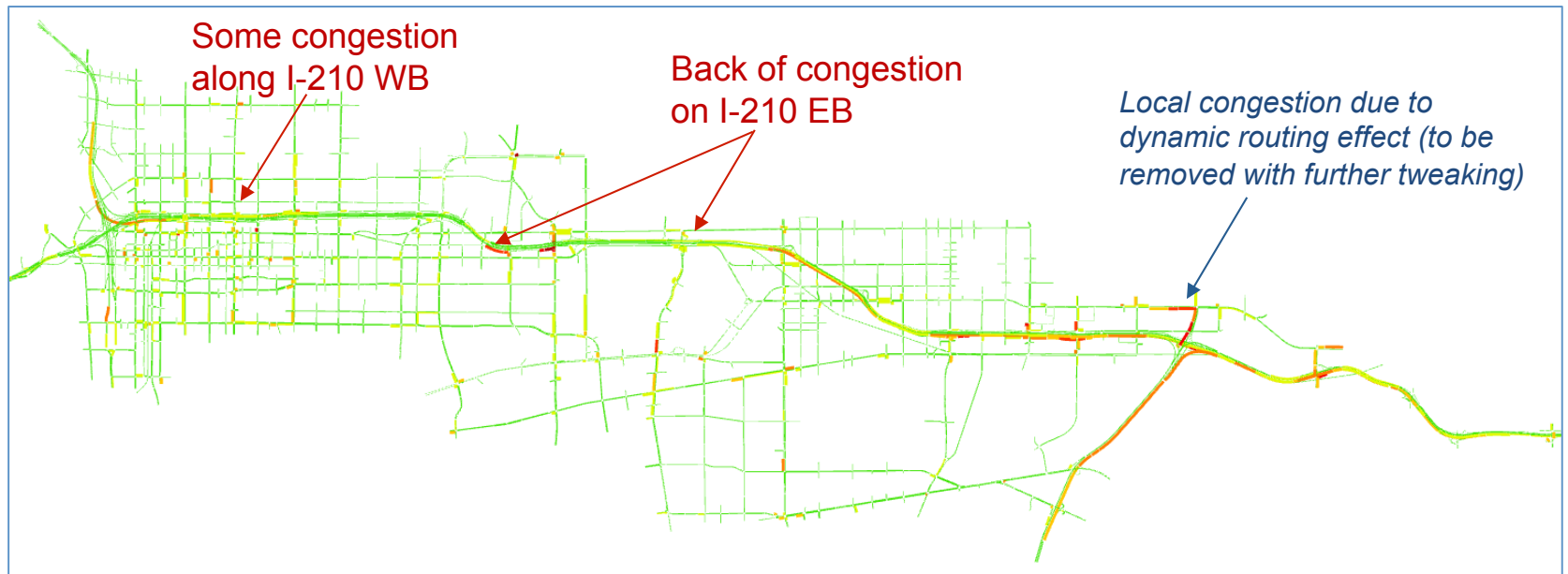
Congestion at the I-210
Extension / SR-134 interchange

Azusa bottleneck

Simulation Calibration

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□ Simulation example: Traffic density – 5 PM



Simulation Calibration

109

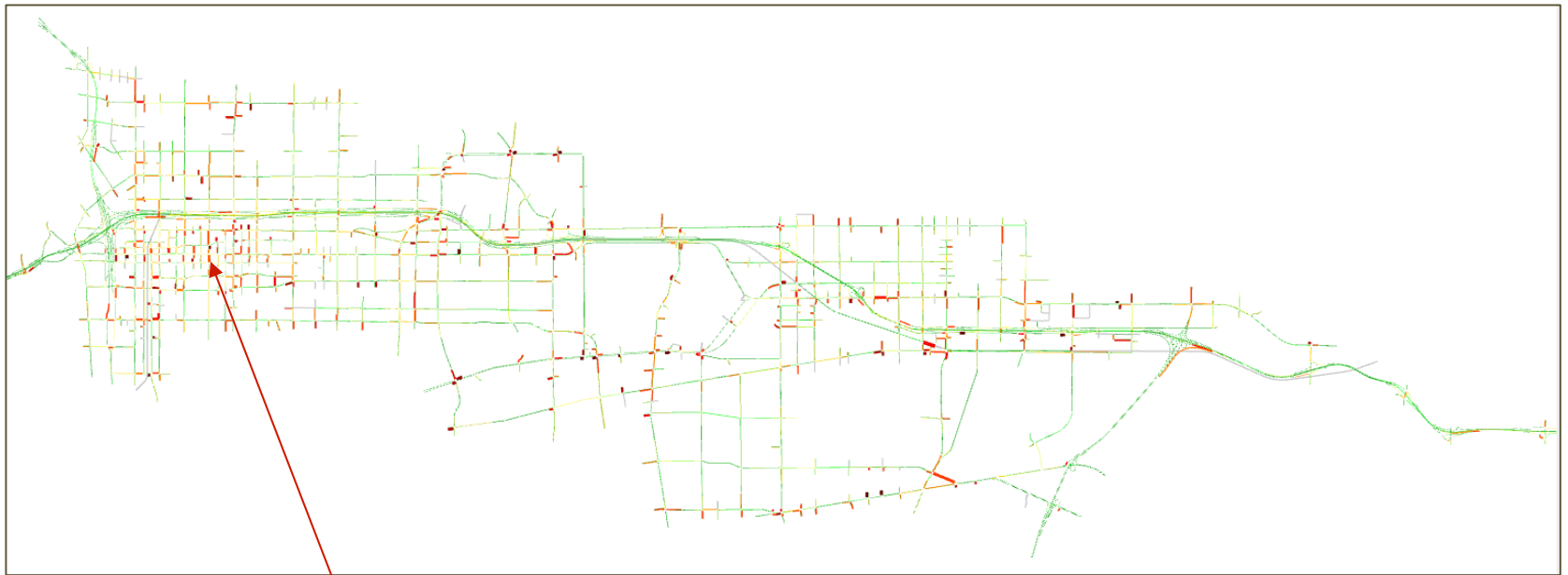
□ Simulation example: Traffic density – 8 PM



Simulation Calibration

110

□ Example 2: Speeds relative to speed limit – 1 PM



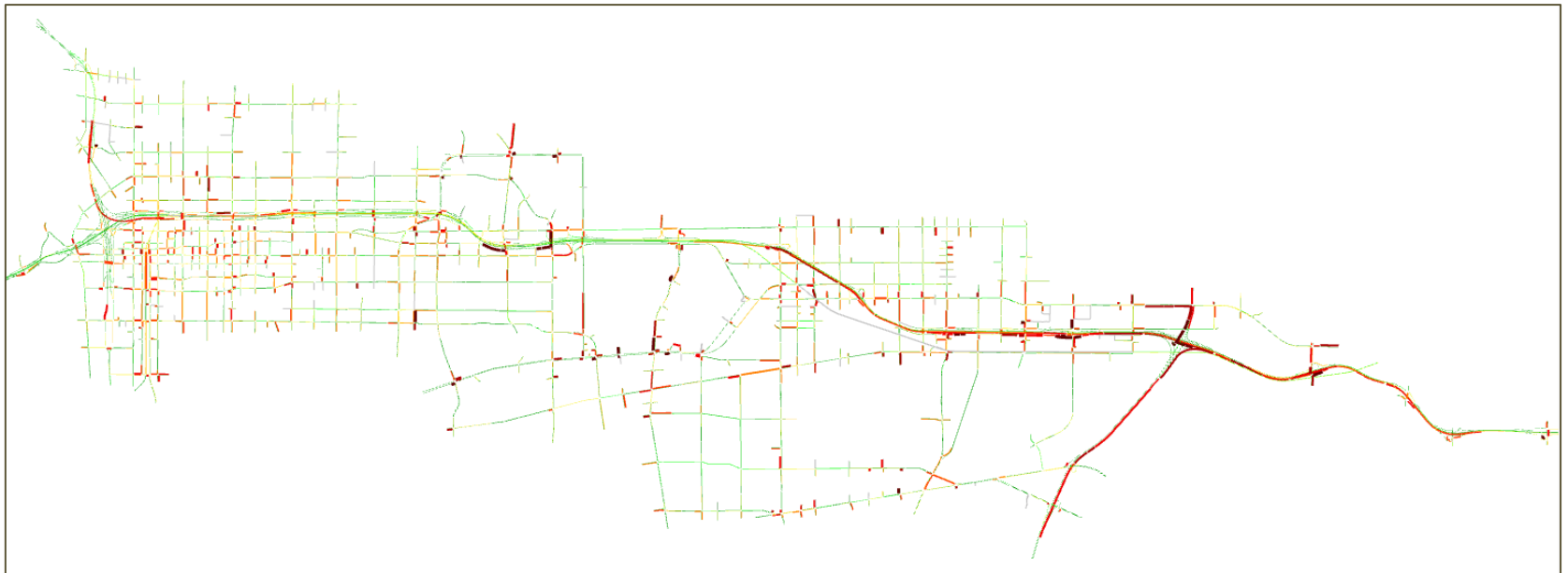
Traffic signal effects



Simulation Calibration

111

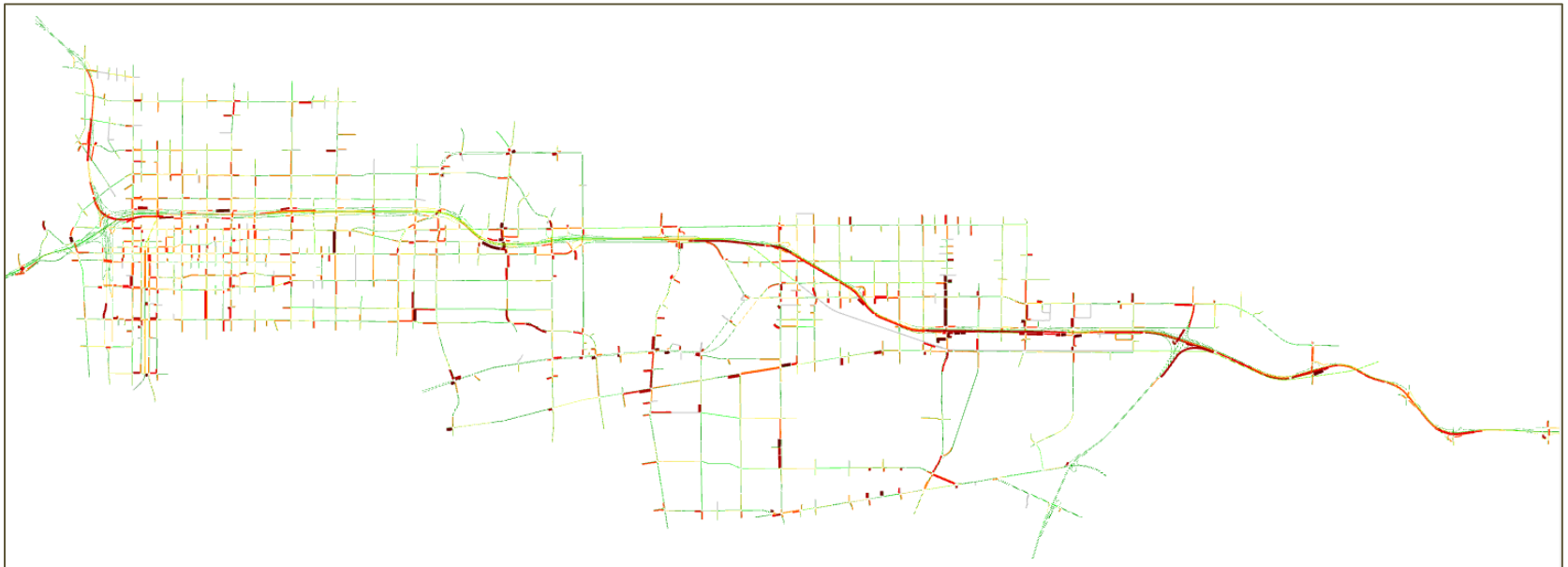
- **Example 2: Speeds relative to speed limit – 5 PM**



Simulation Calibration

112

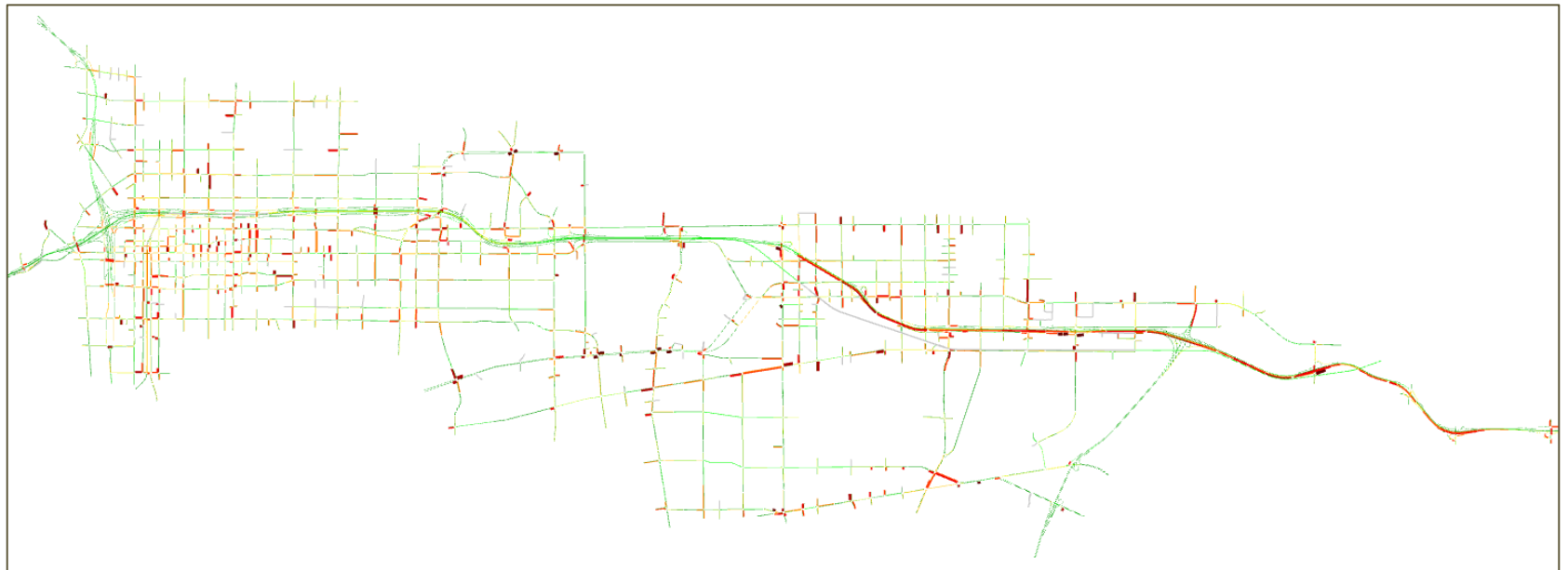
□ Example 2: Speeds relative to speed limit – 6 PM



Simulation Calibration

113

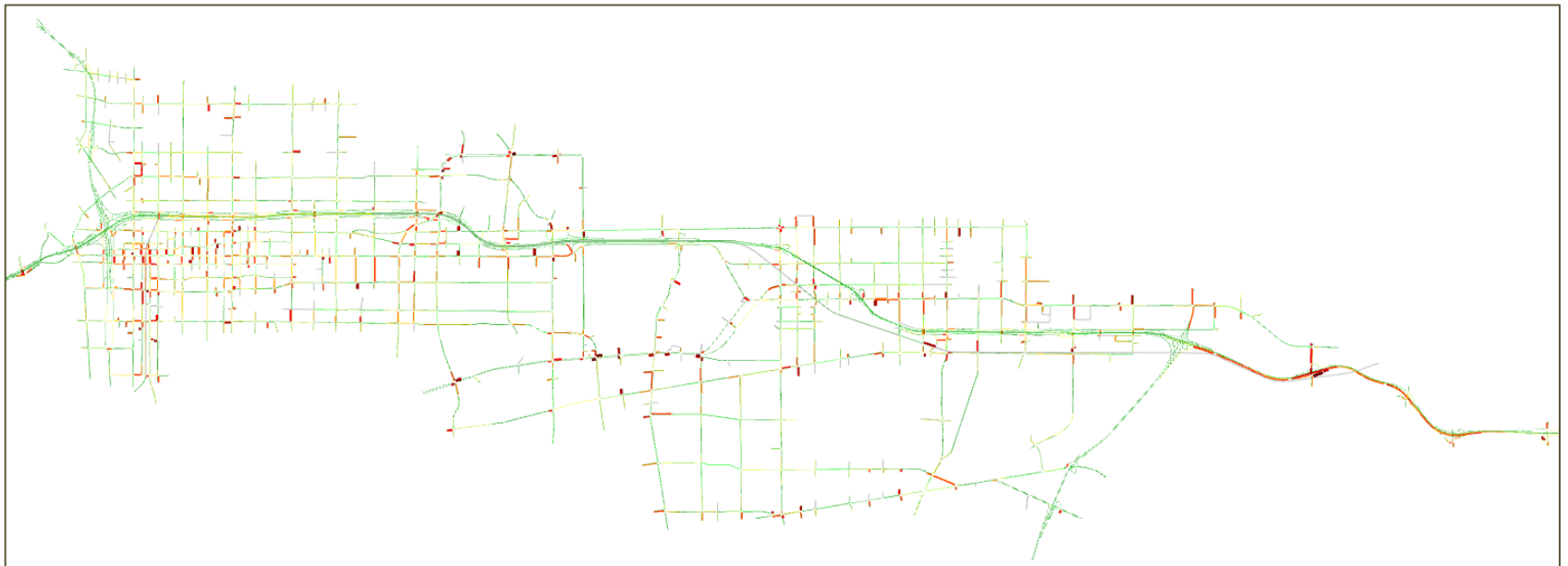
□ Example 2: Speeds relative to speed limit – 7 PM



Simulation Calibration

114

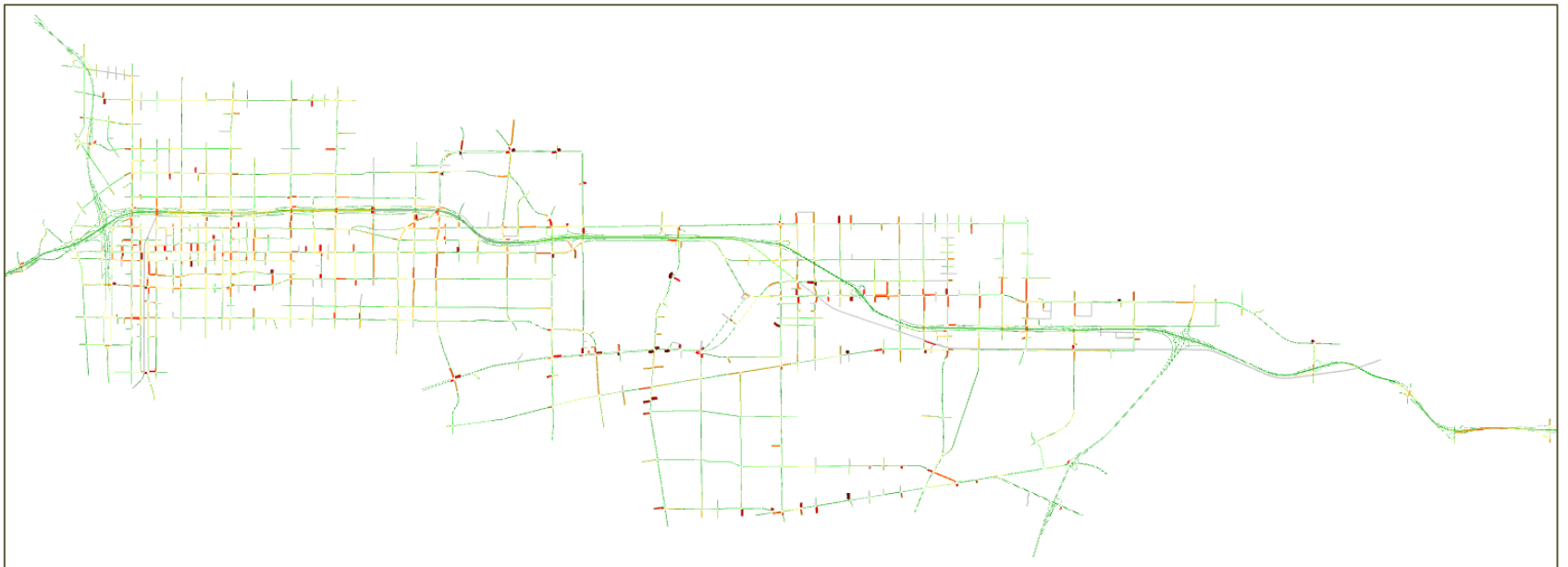
□ Example 2: Speeds relative to speed limit – 8 PM



Simulation Calibration

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□ Example 2: Speeds relative to speed limit – 9 PM



**Thank You
and
Next Meeting
(Suggest Oct 24th)
in Arcadia?)**

