



Connected Corridors Face-to-Face Meeting

Tuesday, October 29th, 2019

1:30 – 3:30 pm

Duarte

October 29th
2019



Agenda

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- **1:30 - 2:00 – Program Review**
- **2:00 - 2:20 – Call for Projects Update**
- **2:20 – 2:40 – Kapsch update**
- **2:40 – 3:15 – DSS Test Launch Update**
- **3:15 – 3:20 – Closing**
 - ▣ Next Meeting at LA Metro – Tuesday December 10th
 - ▣ (Monrovia, Duarte, LA Metro, Caltrans, County, Arcadia, Pasadena)



New Schedule – Till Launch (Page 1 of 2)

3

- ❑ **ATMS Incident Management to Production** – **October 2019**
- ❑ **Complete Call for Projects Procurement** – **January 2020**
- ❑ **Deploy DSS Test System** – **January 2020**
- ❑ **Complete Deployment/Release Hardening** – **March 2020**
- ❑ **Complete ATMS Modifications** – **April 2020**
- ❑ **Prediction running in the cloud** – **May 2020**
- ❑ **Complete McCain C2C** – **June 2020**
- ❑ **Loop Data Received from ATMS** – **July 2020**
- ❑ **Rules Engine running in the cloud** – **August 2020**
- ❑ **All ITS Elements Installed in Field** – **September 2020**



New Schedule – Till Launch (Page 2 of 2)

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- **Integrate Lane Closure System** – **September 2020**
- **All data (sans signs) being received** – **October 2020**
- **Estimation running in Cloud** – **November 2020**
- **Complete C2C Sign Interfaces** – **December 2020**
- **Performance Management System Available** – **December 2020**
- **Complete Version 1.0 System Release** – **January 2021**
- **System Test and Validation** – **February/April 2021**
- **Before Study** – **March to April 2021**
- **Launch Pilot** – **April 2021**



New Schedule – Pilot Launch to Pilot Completion

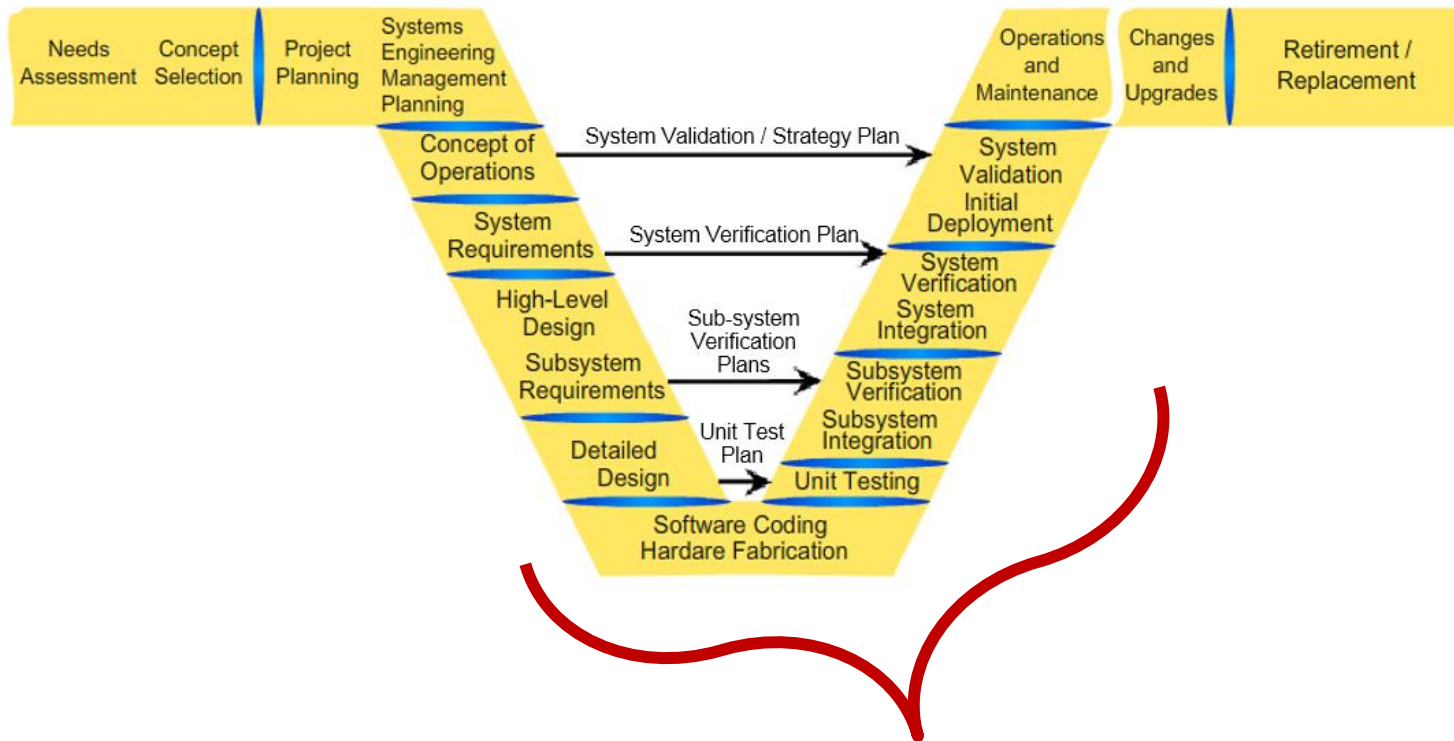
5

- **Before Study** – **March to April 2021**
- **Pilot Launch** – **April 2021**
- **Kapsch** – **April 2021 – August 2021**
- **Parsons** – **August 2021 – December 2021**
- **Interim Benefits Analysis** – **Dec 2021**
- **Telegra** – **Dec 2021 – April 2022**
- **After Study** – **March to April 2022**
- **Kapsch** – **May 2022 – August 2022**
- **Procurement of CMS system** – **July 2022**
- **Pilot complete** – **September 2022**



Systems Engineering Status

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I-210 Overall Summary

DSS Test Launch - Goals for January 2020

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- **Anthony to discuss in more detail later in presentation**
- **Expected outcomes**
 - ▣ Response plans and metrics for review by stakeholders
 - ▣ Metrics for use in benefits analysis
- **Functions running real-time 24/7**
 - ▣ Capture incidents and data on freeways and arterials
 - ▣ Requires ATMS in production and associated network updates
 - ▣ Requires working Kapsch CMS application
- **Response Plan generation on demand**
 - ▣ Response plan generation using rules engine, estimation and prediction
 - ▣ Historical and real-time modes



DSS Test Launch Summary

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□ **Nearing Completion**

- ▣ Test launch environment design
- ▣ ATMS migration to production
- ▣ Ability to generate text response plans and associated KML maps (from test launch development environment)
- ▣ Design/implementation of queue length forecast
- ▣ Bringing up the Production environment in the Amazon cloud (Caltrans, Amazon and PATH are working on this)

□ **Work progressing on**

- ▣ Network state estimation
- ▣ Automation of model prediction runs
- ▣ Automated metric calculations

Traffic System Performance Metrics

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- **We are also focusing on performance metrics**
 - ▣ We are working with Caltrans on the requirements for the Performance Management Subsystem
 - ▣ Weekly performance metrics call with Mort and Nick

- **Meeting with SMG (Tarek and Tom) and Caltrans (Nick and Mort)**
 - ▣ Calibration
 - ▣ Scenario Testing
 - ▣ How do you estimate the number of vehicles exiting freeway to divert (at different ramps)?
 - ▣ Freeway only impacts and relation to VHT
 - ▣ When will other parallel arterials become diversion routes, how will that work? What are the triggers?



Data Quality Metrics – Inventory and Values

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□ Freeway

- Sensors on freeway working at 95% but data is not reliably making its way to PEMS
- Caltrans is working on this

□ Arterial

- Arcadia is reworking its sensor ids, etc
- So no Arcadia quality metrics this month
- Now that the KITS sensors are coming on line we will begin to report metrics on those sensors
- It appears that the TSMSS system will also be coming on line and we will also begin to report metrics on those



Aimsun Model

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□ Some statistics:

- 2579 signal control plans
- 7312 detectors
- Over 1000 lane miles of roadway
- 4242 road sections
- 1748 nodes
- 395 trip origin / destination nodes



Ramp Metering Info Needed from Caltrans

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- **Waiting on updated information on ramp meters for the following freeway sections** *(Information at PATH for these generally date back to 2007-2009)*

- **I-210 Extension EB**

- Lincoln
- Mountain

- **I-210 EB**

- Vernon
- Azusa SB
- Azusa NB
- Citrus SB
- Citrus NB

- **I-210 WB**

- Citrus
- Azusa NB
- Azusa SB
- Vernon
- I-605 Connector
- Mountain
- Santa Anita SB
- Rosemead-Foothill
- Rosemead SB
- Walnut
- Mountain
- Lincoln

- **SR-134 EB**

- Orange Grove
- San Rafael
- Figueroa
- Colorado

- **SR-134 WB**

- Fair Oaks
- Orange Grove
- San Rafael



Communications

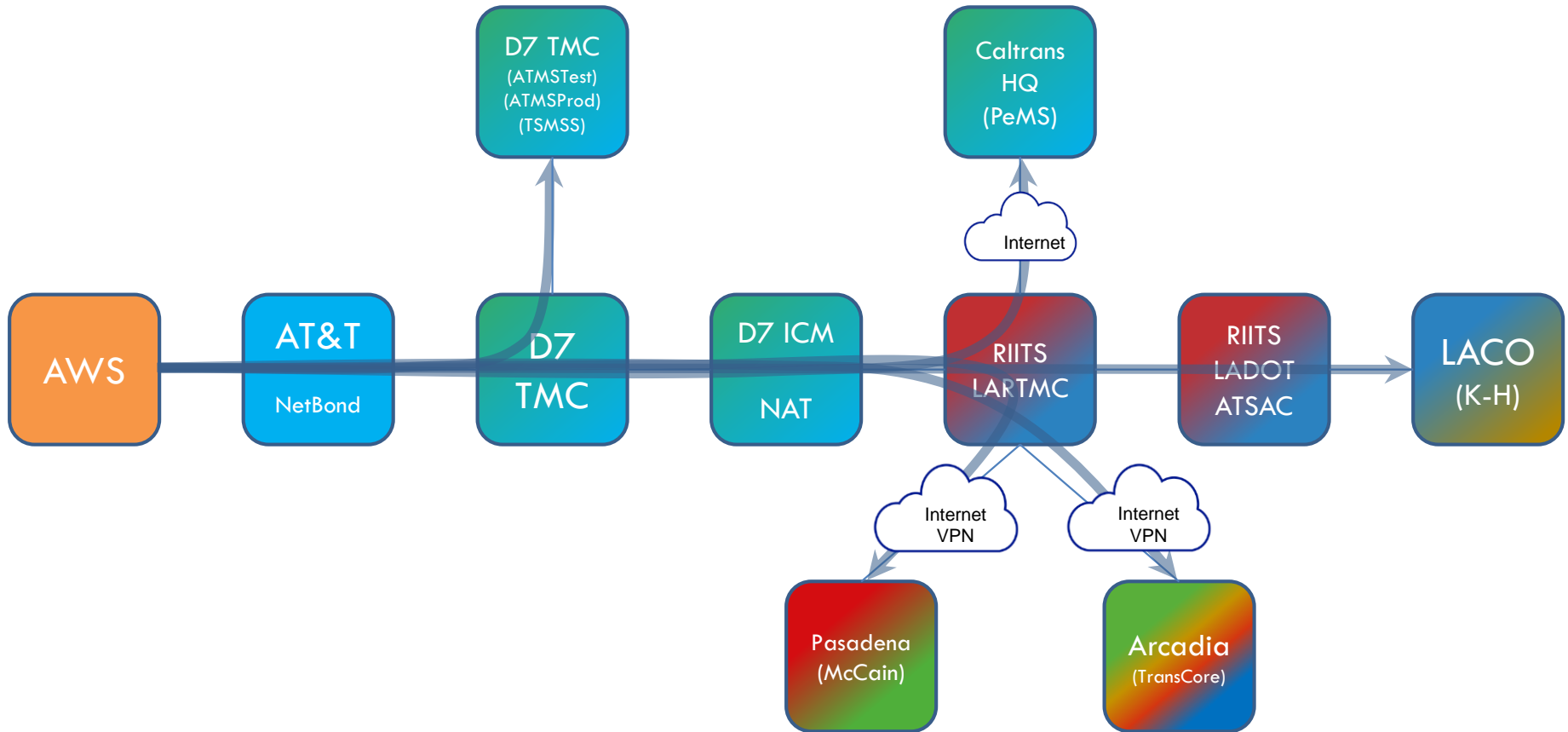
14

- **Monitoring**
- **Outages**
- **Quirky Behavior – “Noise”**
- **VPN Outages**
- **Network Flow Logs**
- **Connection to Kapsch Application**
- **Networking for connecting ATMS production to cloud production**

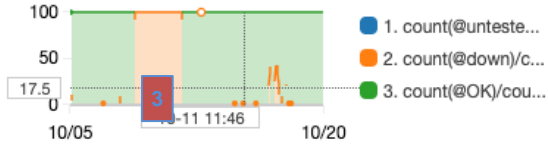


C2C Connectivity Checks

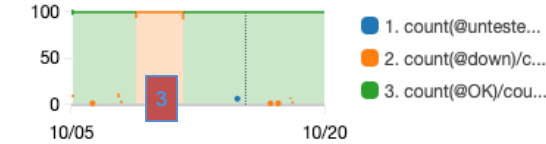
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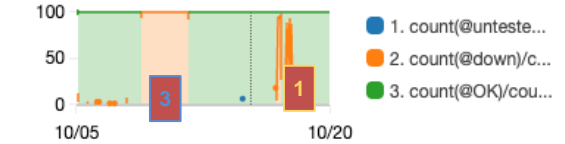
C2CNetwork_Dev_Jenkins_Arcadia



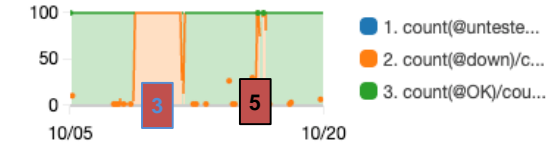
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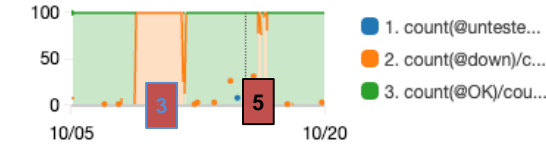
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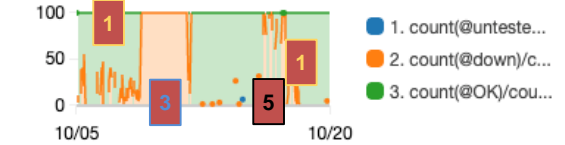
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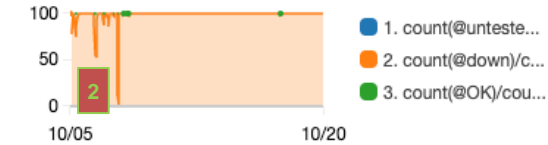
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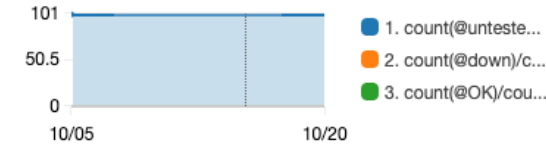
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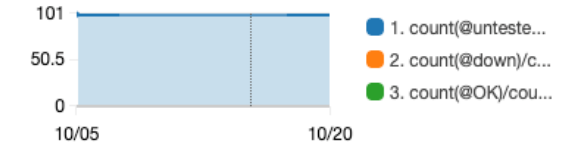
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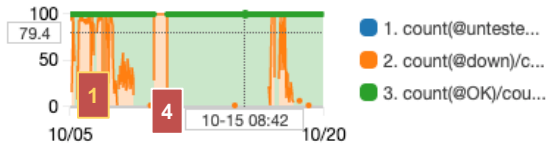
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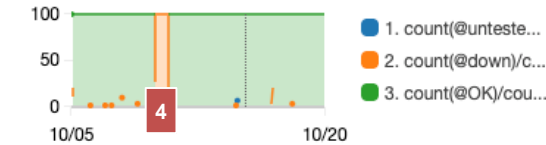
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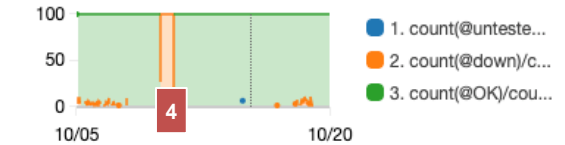
C2CNetwork_Dev_Jenkins_ATMSTest



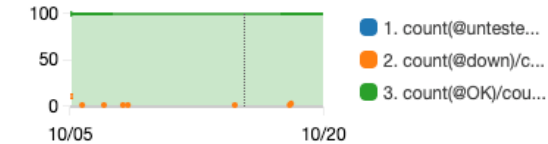
C2CNetwork_Dev_Reader_ATMSTest



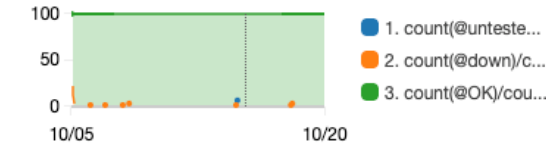
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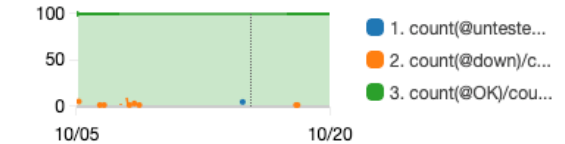
C2CNetwork_Dev_Jenkins_TSMSS



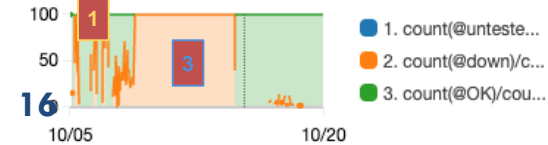
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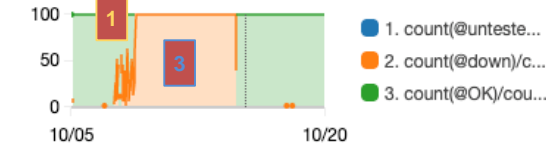
C2CNetwork_Dev_Reader_TSMSS2



C2CNetwork_Dev_Jenkins_PeMS



C2CNetwork_Dev_Reader_PeMS



1. Intermittent connectivity
2. Intermittent ghosting
3. RIITS outage
4. ATMS Test application off-line
5. LACO outage

Network Outages

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- **LACO fiber outage, September 16-17. Seen in alarms, confirmed with LACO personnel.**
- **RIITS network outage due to hardware failure; faulty fall-over to alternate pathway, due to misconfigured AT&T IPSEC VPN (Outage began October 8, final configuration corrections resolved October 14)**
- **ATMS Test server's C2C application was inadvertently stopped on October 10; Parsons restarted upon request**



C2C Networking – Quirky Behavior

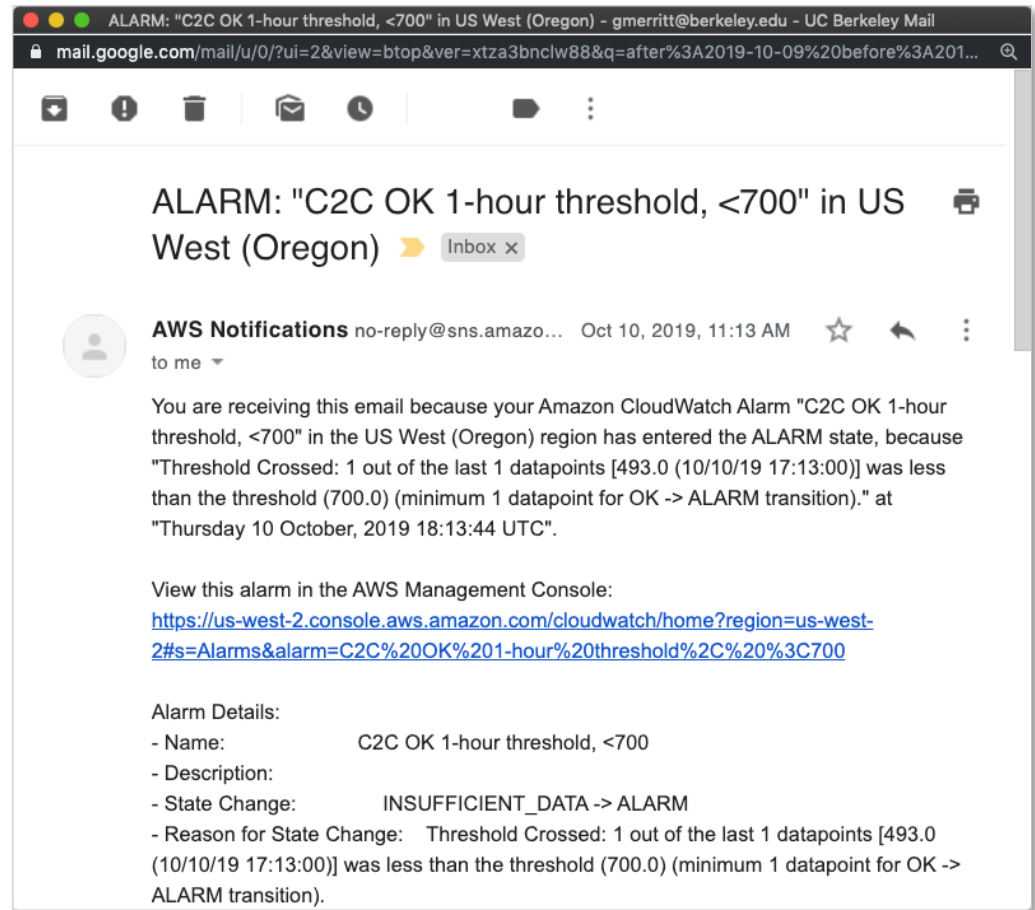
18

- **Intermittent connectivity, intermittent “ghosting”**
- **Hard to catch these intermittent problems by hand**
- **Seems to have been caused by faulty RIITS hardware**
 - After rerouting of traffic due to a RIITS hardware failure, most instances of intermittent connectivity and ghosting have inexplicably disappeared
- **D7 TMC IT staff installing an on premises computer for testing connectivity in a more localized way**

Communication E-Mail Alarms

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- **We've added e-mail notification alarms to alert us to larger connectivity outages**



D7 Developer Access VPN

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- **Developer Access VPN outages**
 - ▣ There have been occasional outages (e.g. July 11, July 22, October 21)
 - ▣ PATH, Kapsch developers cannot access the Amazon cloud development environment during an outage

- **Developer Access VPN monitor**
 - ▣ We have set up a very simple D7 VPN server monitor alarm to help alert us of “server down” outages

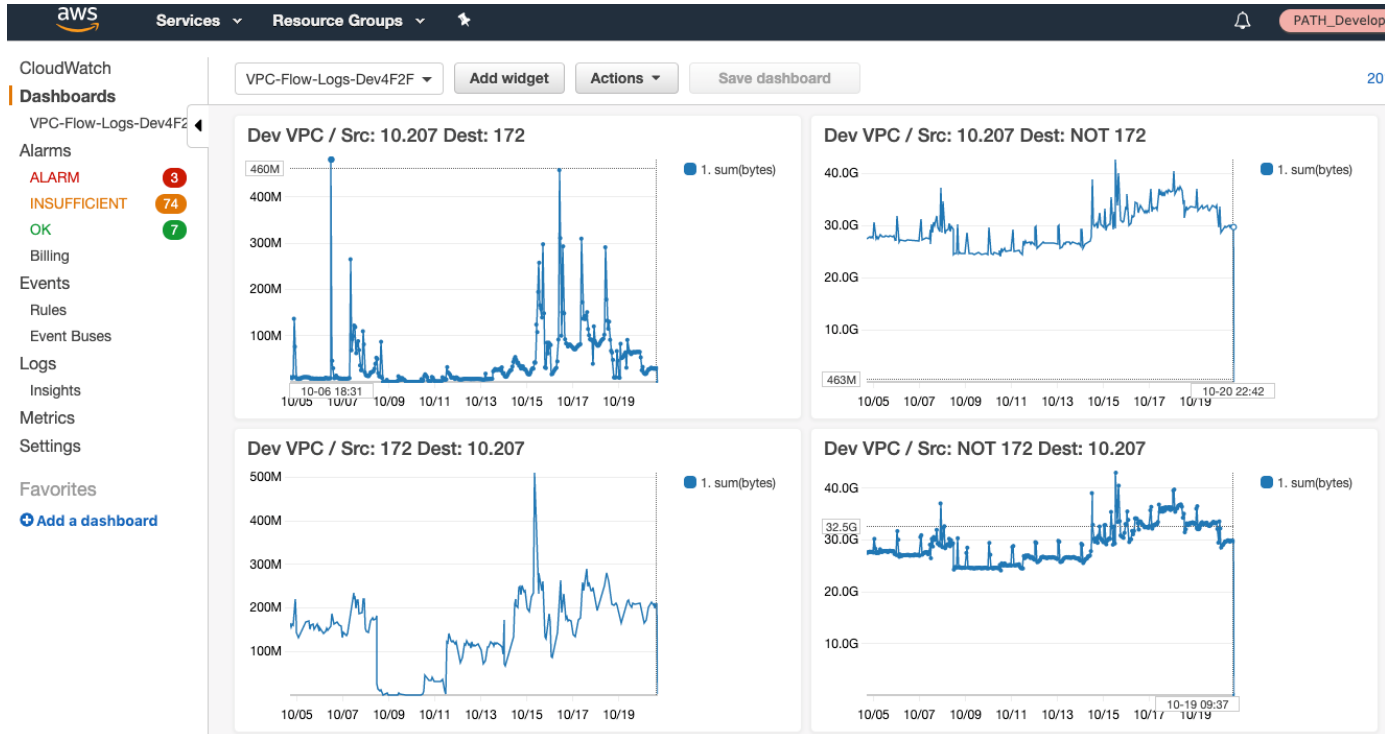
- **Should we have a backup for this VPN?**
 - ▣ What is the redundancy in our communication systems?



Network Flow Logs (Development VPC)

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- We've created dashboards for monitoring network traffic rates into and out of the Development VPC to provide further insights.



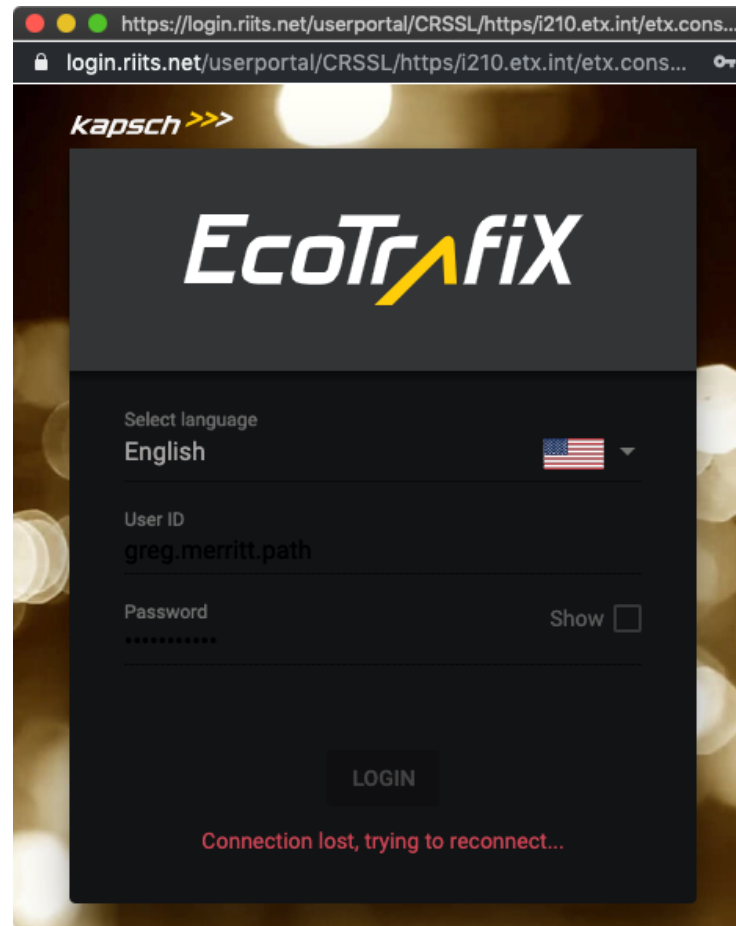
ICM User Secure System Access

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- **User access pathway #1: VPN Client**
 - ▣ Local user software & host configuration required
 - ▣ Made to work once in testing via a “non-ideal” network pathway and “non-ideal” full-tunnel configuration
 - ▣ Set aside in favor of clientless access (see #2 below)

- **User access pathway #2: clientless access**
 - ▣ Secure access via browser connection to RIITS security device
 - ▣ The “laundered-through-an-intermediary” connection is not naturally compatible with the Kapsch application configuration
 - ▣ Kapsch is exploring application configuration modifications to support clientless access
 - ▣ May not be able to make this work

EcoTrafix Login by Stakeholders – Our Goal



Connecting to ATMS Production Server

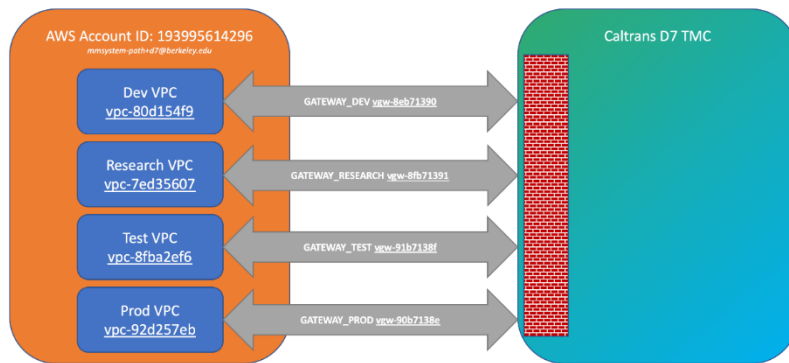
24

- **Setting up separate Amazon account for production**
 - Currently one Amazon account for production, integration, testing and development environments
 - More granular security
 - More granular resource management
 - October 23: Direct Connect reconfiguration working session request sent to D7 TMC IT to support isolation of Production VPC
 - Caltrans has contacted AT&T for assistance
- **Firewall update**
 - October 9: firewall permissions requests sent to D7 TMC IT to allow access from Production VPC
- **High Priority – Networking updates required for PATH to connect to ATMS production server**

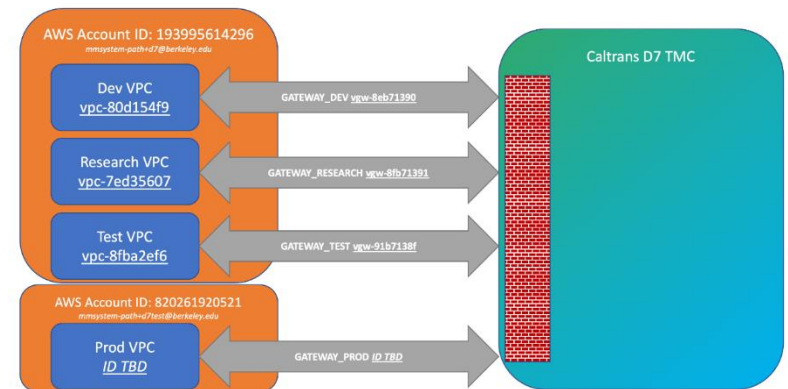


Separate Amazon Account for Production

Current Direct Connect (NetBond) Config:

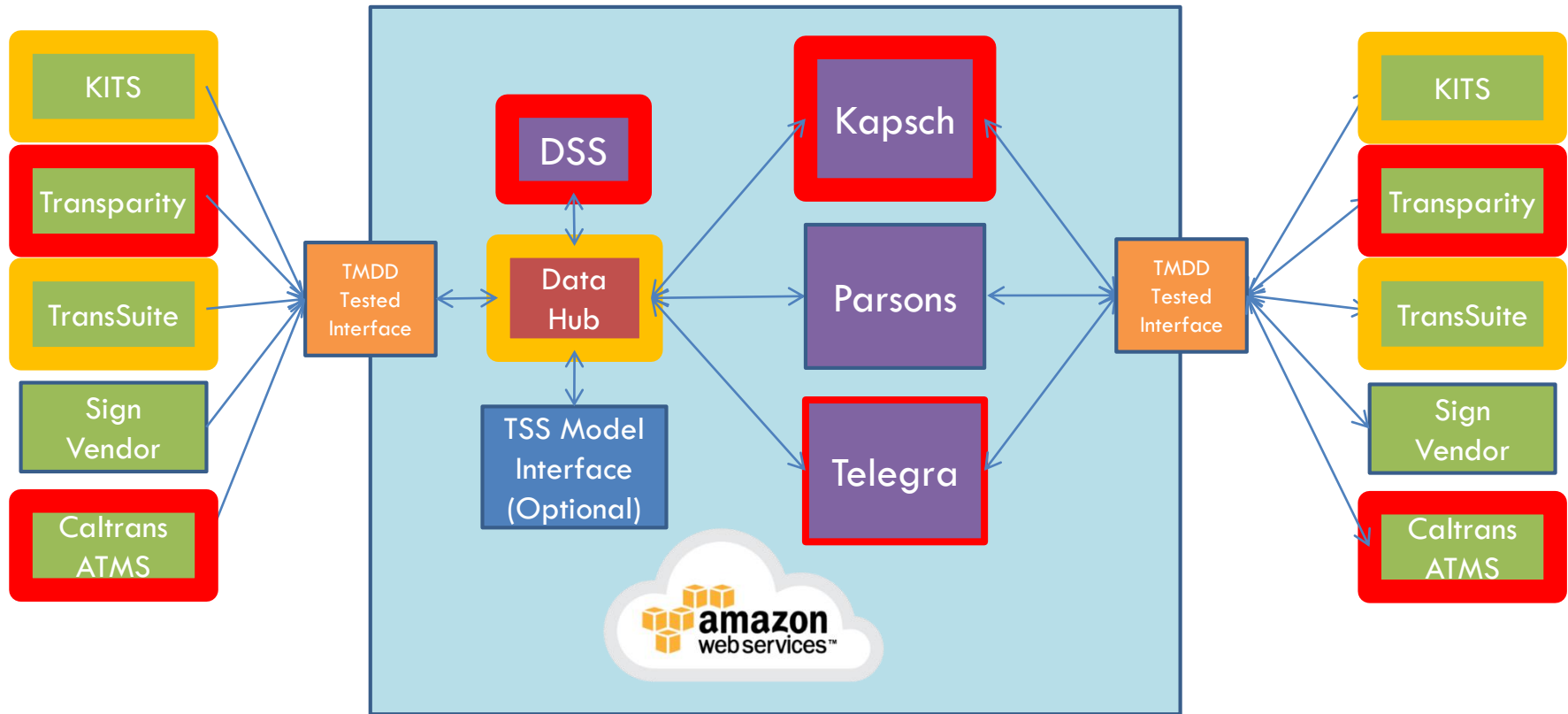


Change to Isolate Prod VPC:



C2C Interface Implementations - Status

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KITS C2C – Phase 1 Completed!

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- **We have completed the Phase 1 KITS interface**
 - ▣ We can receive data from and send control requests to the KITS system
 - ▣ We can select signal plans to run on a given controller (tested on bench controller)
 - ▣ All 21 crucial intersections required for control are visible in the C2C interface
 - ▣ Not everyone is perfectly providing data yet, but this is great progress

Name	External ID	Aimsun ID
Foothill & Michillinda	CO 1852	3419
Colorado & Michillinda	CO 1936	3312
Colorado & Rosemead	CO 3373	3336
Del Mar & Rosemead	CO 3374	3465
California & Rosemead	CO 3375	3375
Huntington & Rosemead	CO 3376	3320
Huntington & Mountain Vista Plaza	DU 5089	3340
Huntington & Buena Vista	DU 5090	3446
Huntington & Highland	DU 5091	3447
Huntington & Pops	DU 6112	3943
Huntington & Mount Olive/I-605	DU T-005	3443
Mountain & Best Buy/BMW	DU T-010	3944
Huntington & 5th	MO 3910	3355
Huntington & Monterey	MO 5083	3342
Huntington & Highway Esplanade	MO 5084	3945
Huntington & Mayflower	MO 5085	3407
Huntington & Magnolia	MO 5086	3451
Huntington & Myrtle	MO 5087	3428
Huntington & Mountain	MO 5088	3445
Huntington & Shamrock	MO 8804	3442
Huntington & California	MO 8805	3441



Arcadia C2C Testing

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- We tested the ability to set a signal plan and terminate a signal plan on the bench controller
- Kevin states:
 - “I consider the test a complete success. Gary was able to send a request to change to response Plan 31 (135 sec. cycle length) and it remained. Then he sent a request to change to Response Plan 32 (150 sec. cycle length). He then sent a request to change to Plan 0 which is typically free mode in D4 but TransSuite responded by going back to Local TOD mode.”
 - Kevin has now tested the C2C interface and deployed the signal timing plans to his controllers. Next up is a live system test.



Systems Integration – C2C Update

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- **Pasadena - McCain**
 - ▣ Received updated detail design, verification plan, high-level design
 - ▣ Received test endpoint
 - ▣ Documents in review, testing to begin this week.

- **ATMS**
 - ▣ Continuing testing of changes to accommodate arterial incidents.
 - ▣ Continue to identify and correct issues with Parsons.
 - ▣ Updated incident data to include post mile – Thanks Ning
 - ▣ Timeline to deploy on the production server – by the end of Oct 2019
 - ▣ Note that networking updates are needed to access the production server

- **Corridor Management System - Kapsch**
 - ▣ Provided new datahub and DSS release to integration environment for Kapsch. Completed full environment refresh.



Systems Development Priorities

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- **Improve system operation**
 - ▣ Workflow processing improvement tests completed.

- **Improve release frequency – goal is new release to test every few days**
 - ▣ Began prototype of containerization strategy and use of AWS Elastic Container Service using data hub processors as first launch candidate. Will improve developer speed, release quality, and system failure recovery time and resilience.
 - ▣ Completed refactoring of dependencies in system components to allow breakup of deployments into smaller, independent elements. Effort now in test.
 - ▣ Began prototype of service configuration modifications to support containerization strategy. This will allow deployments to be more generic with regards to environment.

Systems Development Priorities (Continued)

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- **Support AMS efforts for January launch**
 - ▣ Designed implementation of data hub, estimation, prediction and rules engine interfaces
 - ▣ Supporting development of launch

- **Backfill Cloud Engineer position – New cloud engineer will begin in January**





I-210 Connected Corridors Face-to-Face Meeting

City of Duarte, Community Center,
1600 Huntington Drive, Duarte, CA 91010
Tuesday, October 29, 2019
1:30 – 3:30 pm

Oct. 29, 2019



Agenda

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- **I-210 CC Arterial Systems Improvement Project System Consulting Services – Scope**
- **Expected Timeline**
- **Status of 9 procurement package**
- **Next Steps**





I-210 CONNECTED CORRIDORS ARTERIAL SYSTEMS IMPROVEMENT PROJECT SYSTEM CONSULTING SERVICES

SCOPE OF WORK

Oct. 29, 2019



Project Objective

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- Assist Caltrans D7 to manage the execution of the 9 arterial ITS improvement projects

#	Package Description	Contract #	Contract Status
1	Bluetooth – Iteris Velocity	07A4470	Completed
2	Bluetooth – BlueToad	07A4477	Awarded, in Progress
3	New Controller Cabinets	07A4761	Advertised on 9/26/19
4	Communication Upgrades	07A4479	Awarded, in Progress
5	Firmware/Timing Plan Updates/Controller Upgrades	07A4480	Awarded, in Progress
6	Video Detection System	07A4481	Awarded, in Progress
7	Data Communication Module and Video Detection Software Upgrade	07A4601	Under DPAC Review
8	Advanced Traveler Information Systems	N/A	DMS – Advertised 10/25/19 (Infra. Installation) – in Progress Integration - Under DPAC Review Static Signs – Caltrans, in Progress
9	Environmental Stations with Air Quality Sensors and Open Data Systems	07A4388	Awarded, in Progress

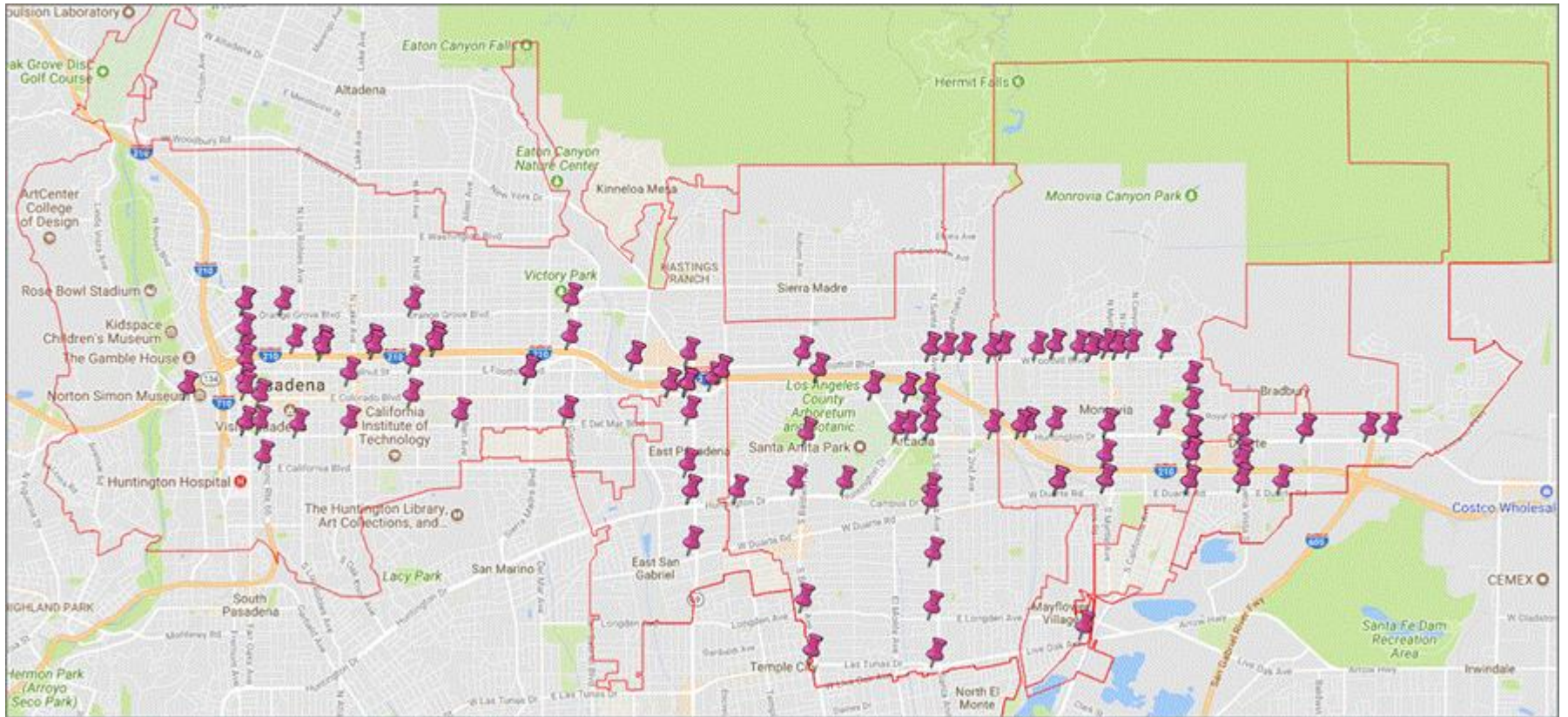


Project Area

#	Package Description	Contract #	Metro & Caltrans	City of Pasadena	City of Arcadia	City of Monrovia	City of Duarte	LA County
1	Bluetooth – Iteris Velocity	07A4470	√		√			
2	Bluetooth – BlueToad	07A4477	√	√		√	√	√
3	New Controller Cabinets	07A4603	√	√	√			
4	Communication Upgrades	07A4479	√		√	√	√	√
5	Firmware/Timing Plan Updates/Controller Upgrades	07A4480	√	√	√	√		√
6	Video Detection System	07A4481	√	√	√	√	√	√
7	Data Communication Module and Video Detection Software Upgrade	07A4601	√	√	√	√	√	√
8	Advanced Traveler Information Systems	N/A	√	√	√	√	√	√
9	Environmental Stations with Air Quality Sensors and Open Data Systems (ODS)	07A4388	√					

Project Area (cont.)

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UPDATE ON PACKAGES 1-9

Oct. 29, 2019



Target Timeline - P1, P2, P4, P6, P9

Year	2018							2019																		
Month	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12							
Prepare Submittal		█																								
Equipment Procurement & Delivery								█																		
Test Plan/Procedure										█																
Installation										█																
Testing & Acceptance														█												
Training																█										



I-210 CC: System Testing to begin in Jan 2020.

Soft Launch of I-210 CC System (Est.)

Target Timeline - P3, P5, P7, P8

Year	2019												2020											
Month	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12					
Prepare Submittal																								
Equipment Procurement & Delivery																								
Test Plan/Procedure																								
Installation																								
Testing & Acceptance																								
Training																								

- P3: Advertised by DPAC, to be awarded
- P5: To be approved by stakeholders
- P7: Being Reviewed by DPAC
- P8: DMS procurement – advertised by DPAC, to be awarded
- DMS design & installation – handled by stakeholders, in progress
- DMS integration – being reviewed by DPAC
- Static Sign – handled by Caltrans, in progress

April 2021,
Hard Launch
of I-210 CC
System (Est.)



Update on 9 Packages

Pkg. #	Pkg.	Contract #	Project Status
1	Bluetooth – Iteris Velocity	07A4470 PTM	<ul style="list-style-type: none"> • NTP: 7/10/2018 • Kick-off Meeting: 7/30/2018 • Submittal Approved: 8/16/2018 • Installation & Testing Completed on 5/29 & 5/30/2019 • Accepted by Arcadia, Documents Submitted • Completed

Update on 9 Packages

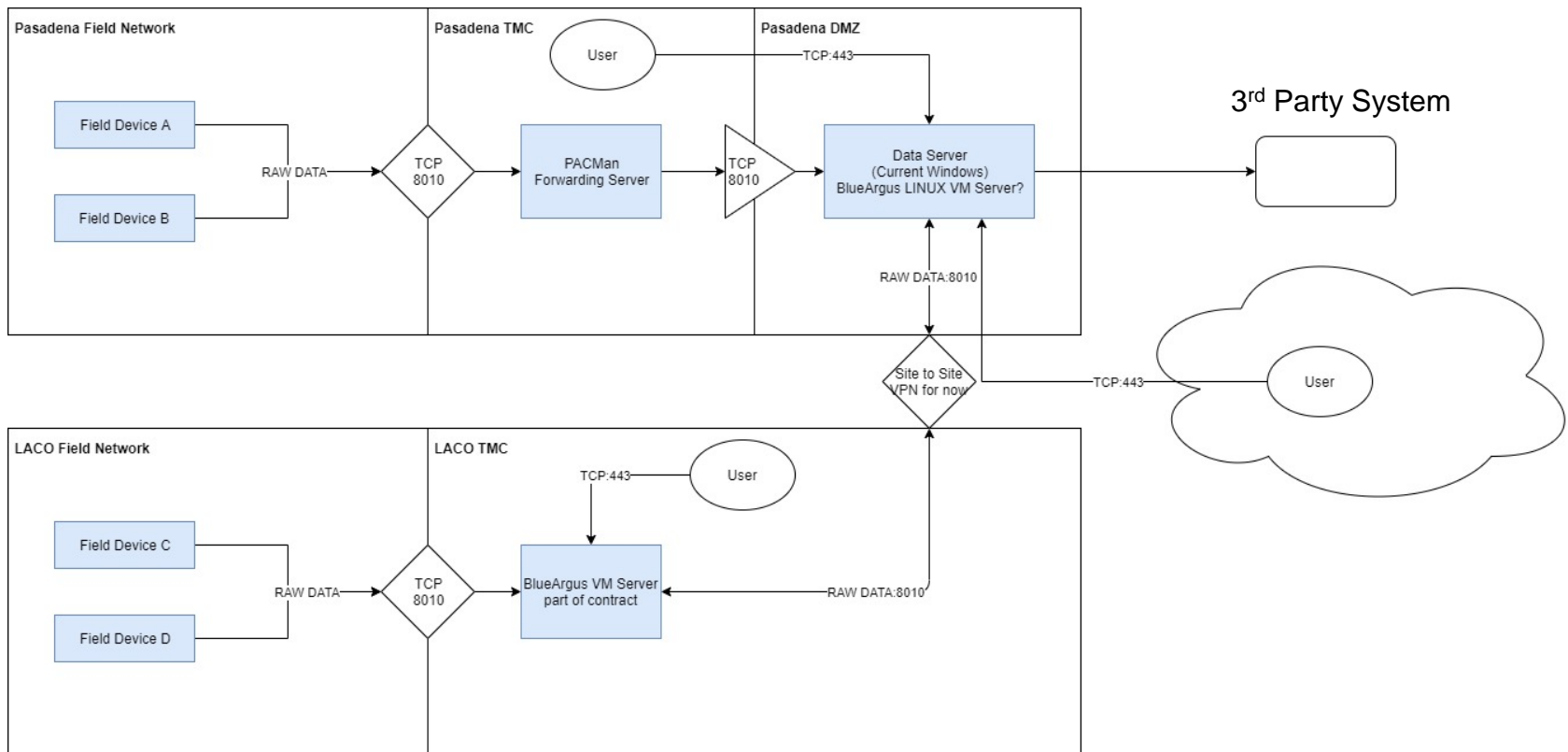
42

Pkg. #	Pkg.	Contract #	Project Status
2	Bluetooth – BlueToad	07A4477 DBX	<ul style="list-style-type: none"> • NTP: 7/10/2018 • Kick-off Meeting: 7/30/2018 • Submittal Approved: 10/12/2018 • Installation: <ul style="list-style-type: none"> • Field: 11 out of 22 locations done; remaining 11 locations in Pasadena to be scheduled • Server: LA County VM server configured on 5/15/19; architecture agreed on 10/9/19, <ul style="list-style-type: none"> • Stakeholders: (1) Pasadena review hardware/software specs (2) Pasadena & LA County: set up VPN connection (3) Caltrans: evaluate cost change; • Contractor: schedule TMC installation upon approval • Test reports: to be submitted after installation • Expected to be completed: December 2019 (90%)

Update on 9 Packages

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□ P2 - BlueToad Travel Time System – Comm. Architecture



Update on 9 Packages (cont.)

Pkg. #	Package Name	Contract #	Project Status
3	New Controller Cabinets	07A4603	<ul style="list-style-type: none"> Disqualified: Bids came above the SB limit (314k). Procurement Package revised per Stakeholder comments on Pkg. 5 Cancelled by DPAC in the week of 3/15/19 Advertised: 9/26/19 Expected to be awarded by: 11/18/19 Expected to be completed: 1st Quarter, 2020
4	Communication Upgrades	07A4479 Kanaan Construction	<ul style="list-style-type: none"> NTP: 7/13/2018 Kick-off Meeting: 7/30/2018 Submittal & RFI Approved: 5/6/2019 Equipment procured Installation: in-progress <ul style="list-style-type: none"> Status Tracking: https://airtable.com/shrRq9JBFpftRKBgq 4 LA County, 20 Monrovia, 2 Arcadia, 8 Duarte: done 1 Duarte: in-progress Testing Reports: to be submitted Expected to be completed: December 2019 (90%)

Update on 9 Packages (cont.)

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Pkg. #	Package Name	Contract #	Project Status
5	Firmware/Timing Plan Updates/Controller Upgrades	07A4480 CPE, Inc	<ul style="list-style-type: none"> • NTP: 7/17/2018 • Kick-off Meeting: 7/30/2018 • Submittal Reviewed but Required Equipment changed per Stakeholder Comment • Contractor revised price estimate (\$115,695.80) lower than original amount (\$171,600.00) – reviewed by stakeholders with minor changes in hardware/firmware required • Contractor revised price estimate (<u>\$116,506.50</u>) lower than original amount (\$171,600.00) • Final scope of work & cost to be reviewed & approved by stakeholders • Expected to be completed: 2st Quarter, 2020



Update on 9 Packages (cont.)

46

Pkg. #	Package Name	Contract #	Project Status
6	Video Detection System	07A4481 Traffic Loops Crackfilling, Inc	<ul style="list-style-type: none"> NTP: 7/10/18 Kick-off Meeting: 7/30/18 10/9/18: Conducted Site Survey 10/18/18: Submittal approved Installation: <ul style="list-style-type: none"> 21 out of 22 installations are completed (2 LA County, 5 Monrovia, 3 Arcadia, 8 Pasadena, 3 in Duarte) 1 location in Pasadena: conduit too small. Proposed action is approved. Installation: waiting on the schedule for the boring company. Testing Reports – to be submitted Expected to be completed: November 2019 (90%)
7	Data Communication Module and Video Detection Software Upgrade	07A4601	<ul style="list-style-type: none"> Disqualified: Bids came above the SB limit (314k). Originally cancelled by DPAC; Revised Package being reviewed by DPAC Expected to be advertised by: early Nov. 2019 Expected to be awarded by: Nov. – Dec. 2019 Expected to be completed: 2nd Quarter, 2020

Update on 9 Packages (cont.)

47

Pkg. #	Pkg.	Contract #	Project Status
8	Advanced Traveler Information Systems	N/A	<ul style="list-style-type: none"> • DMS Procurement (21 locations) <ul style="list-style-type: none"> • Advertised 10/25/19 • To be awarded (est.): Nov 2019 • Integration <ul style="list-style-type: none"> • To be Advertised (est.): Early Nov. 2019 • To be awarded (est.): Nov. – Dec. 2019 • DMS Design & Infrastructure Installation (21 Locations) <ul style="list-style-type: none"> • Handled by stakeholders • 17 Pasadena – in progress (\$13K – 14K per location) • 2 Caltrans – in progress • 2 LA County – 1 year backlog (Oct. 2020, \$120K) • Alternative Plan Discussion: Interim Static Sign ? • Static Sign Procurement <ul style="list-style-type: none"> • Ordered by Caltrans Maintenance Group: Jul. 2019 • may take up to 6 months • Expected to be completed: 2nd Quarter, 2020

Update on 9 Packages (cont.)

48

Pkg. #	Pkg.	Contract #	Project Status
9	Environmental Stations with Air Quality Sensors and Open Data Systems (ODS)	07A4388 Cal Poly Pomona	<ul style="list-style-type: none"> • NTP: 6/29/18 • Kick-off Meeting: 7/12/18 • Environmental stations <ul style="list-style-type: none"> • Roadside study done • Field installation done – 6/7/19 • Collect data and analyze data - ongoing • ODS <ul style="list-style-type: none"> • Face-to-Face Meeting w/ Foothill Transit & Pasadena Transit on 10/10/19 • Meeting w/ PATH on 10/22/19 • CPP continuously coordinates with PATH <ul style="list-style-type: none"> • Data Specification • Sample Response Plan • Inventory of Road Network, Signal ID • CPP to be coordinated w/ Caltrans <ul style="list-style-type: none"> • Communications Architecture • Expected to be completed: 1st Quarte, 2020 (80%)

Next Steps

49

- Package 2: Get Pasadena's approval on the materials to be installed at TMC; Start field unit installation & server installation in Pasadena;
- Package 3, 7, 8: Tracking status
- Package 4: Complete installation
- Package 5: Stakeholders to approval final cost estimate
- Package 6: Schedule installation at 1 location in Pasadena
- Package 9: Support coordination



Thank You and Questions?

Oct. 29, 2019



I-210 CALTRANS Pilot, October 29, 2019

Kapsch TrafficCom

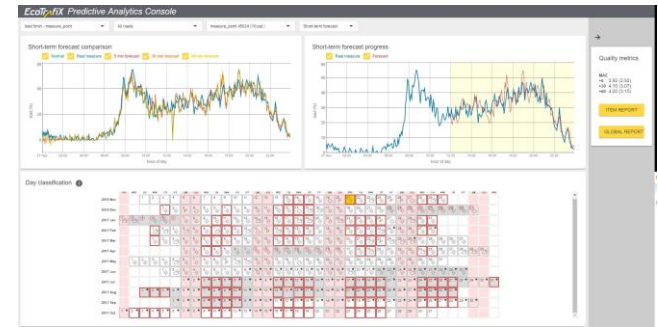
Integrated Corridor Management

EcoTrafIX Product Status

52

■ In progress:

- Product upgrade completed
 - Agency Response Plan Voting
 - Configure Ramp Meter icons
 - Handle unexpected inventory/status ordering
 - Handle full device inventory messages (vs. one-at-a-time)
- Provide import/export access to EcoTrafIX Response Plans
- Associate incidents with multiple ICM links/lanes and arterial movements (major product update scheduled December 2019)

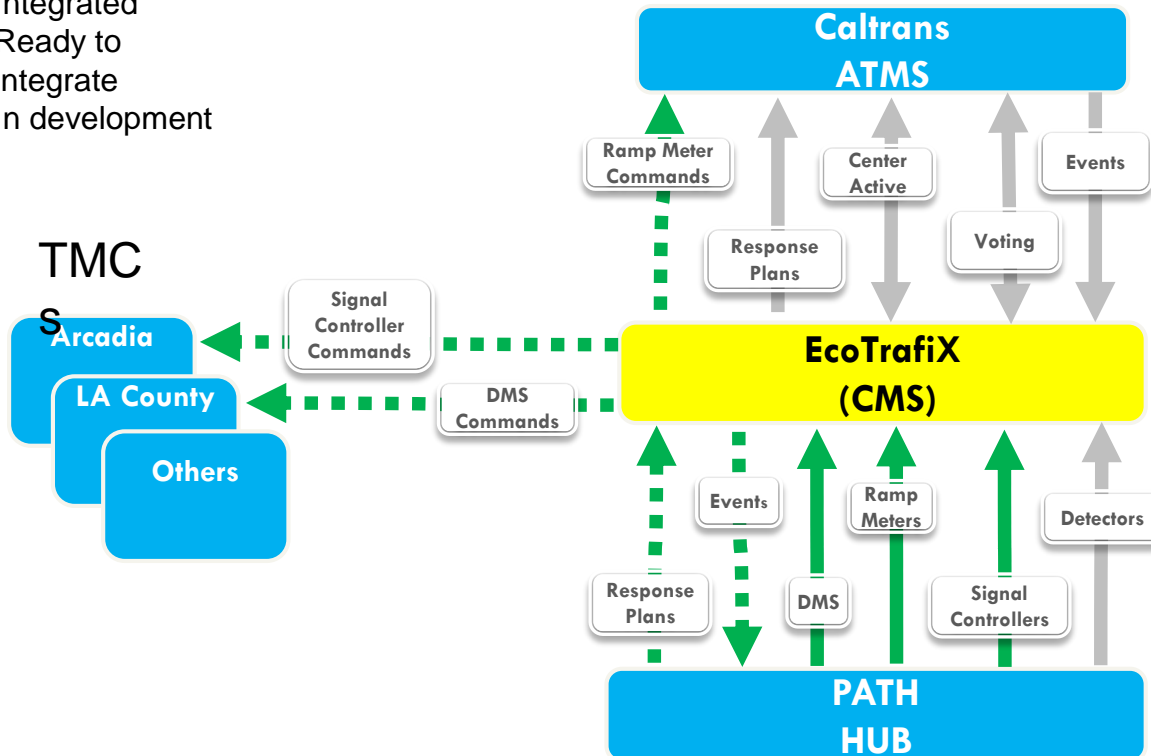


EcoTrafIX Interface Status

- > Publish Events to Hub – ready to integrate with DSS
- > Receive Events – simulated until ATMS is available in AWS
- > Response Plans – ready to receive from DSS
- > Traffic Signals live from Arcadia & some LA County signals
- > DMS – receiving from Hub
- > Ramp Meters – receiving from Hub (simulated from ATMS)
- > Response Plan Item Execution – ready to integrate with TMCs



EcoTrafix Status



EcoTrafIX Status

>Next Steps

>Integrate with PATH's Hub

>EcoTrafIX send Events to HUB

>DSS send Response Plans to EcoTrafIX

>Integrate with CALTRANS ATMS

>ATMS send Events to EcoTrafIX/HUB

>EcoTrafIX exchange Voting with ATMS

>EcoTrafIX send Response Plans to ATMS

>EcoTrafIX exchange Center Active with ATMS

Kapsch TrafficCom

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Summary of AMS Activities

57

- **Test Launch**
 - ▣ Overview of scope
 - ▣ How AMS components will work

- **Data Quality**
 - ▣ Freeway report
 - ▣ Arterial data advancements

- **AMS System Components**
 - ▣ Progress on Rules, Prediction and Estimation



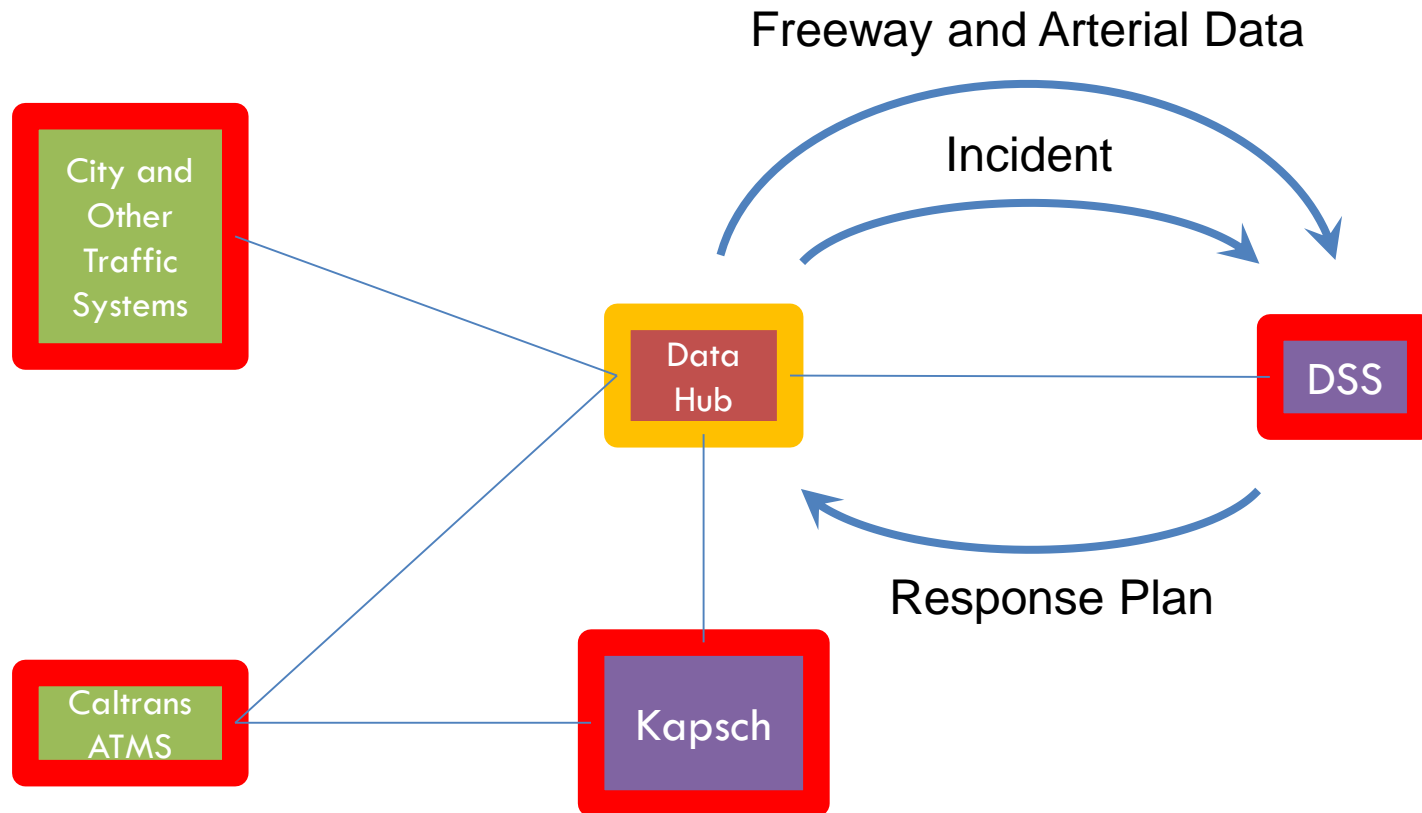
58

Test Launch

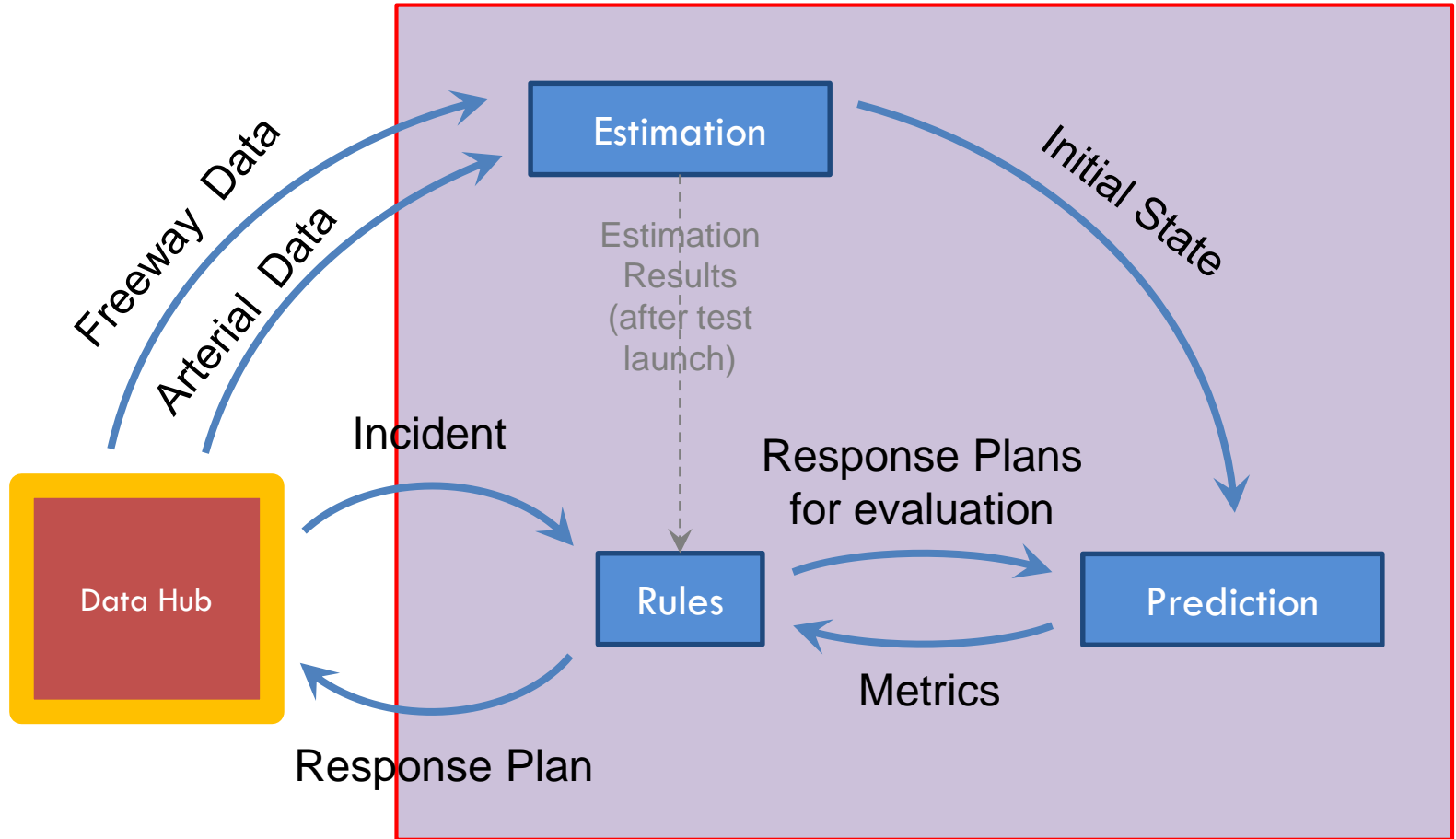
January 2020

C2C Interfaces – Simple Version

59

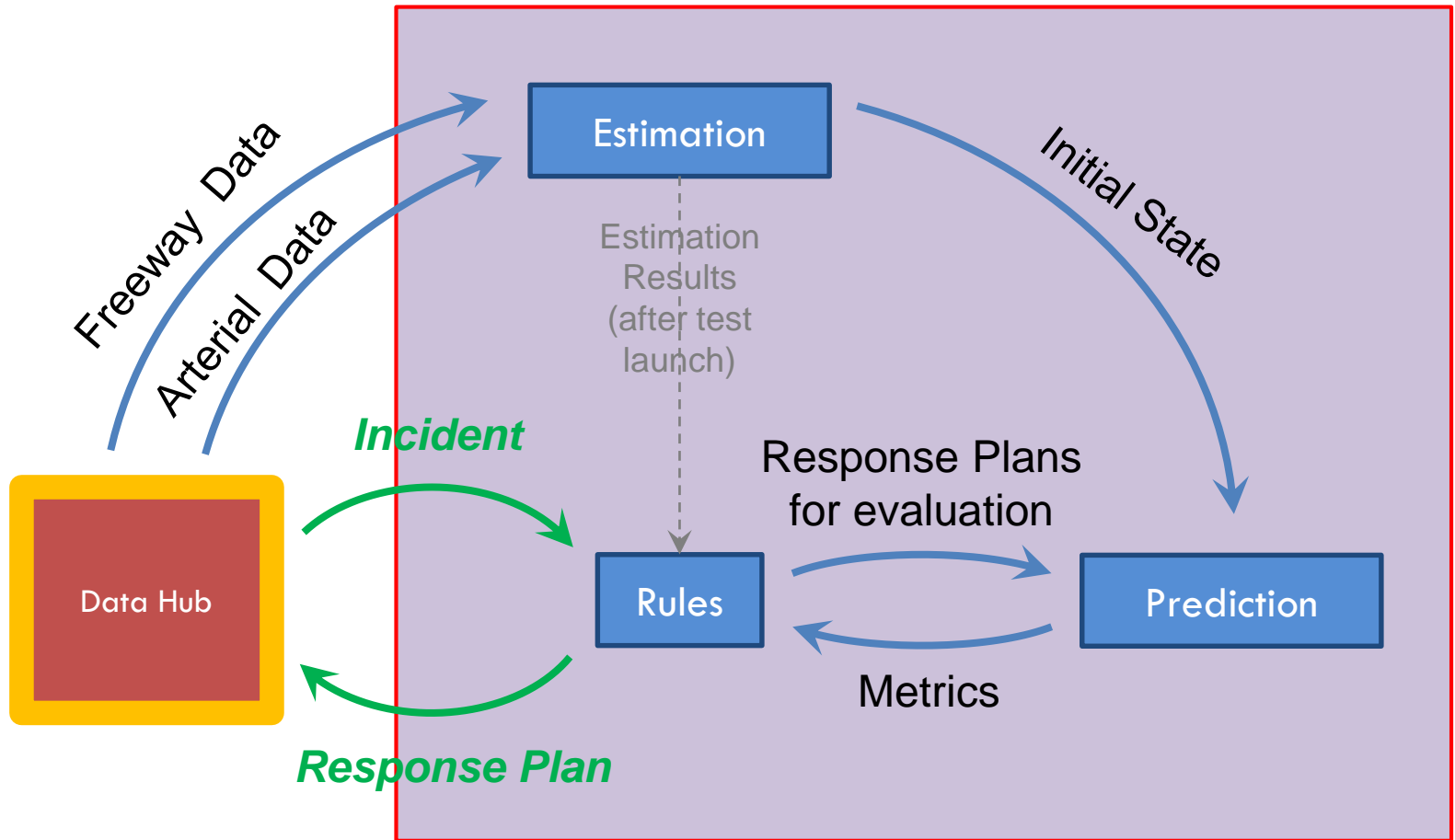


Test Launch DSS



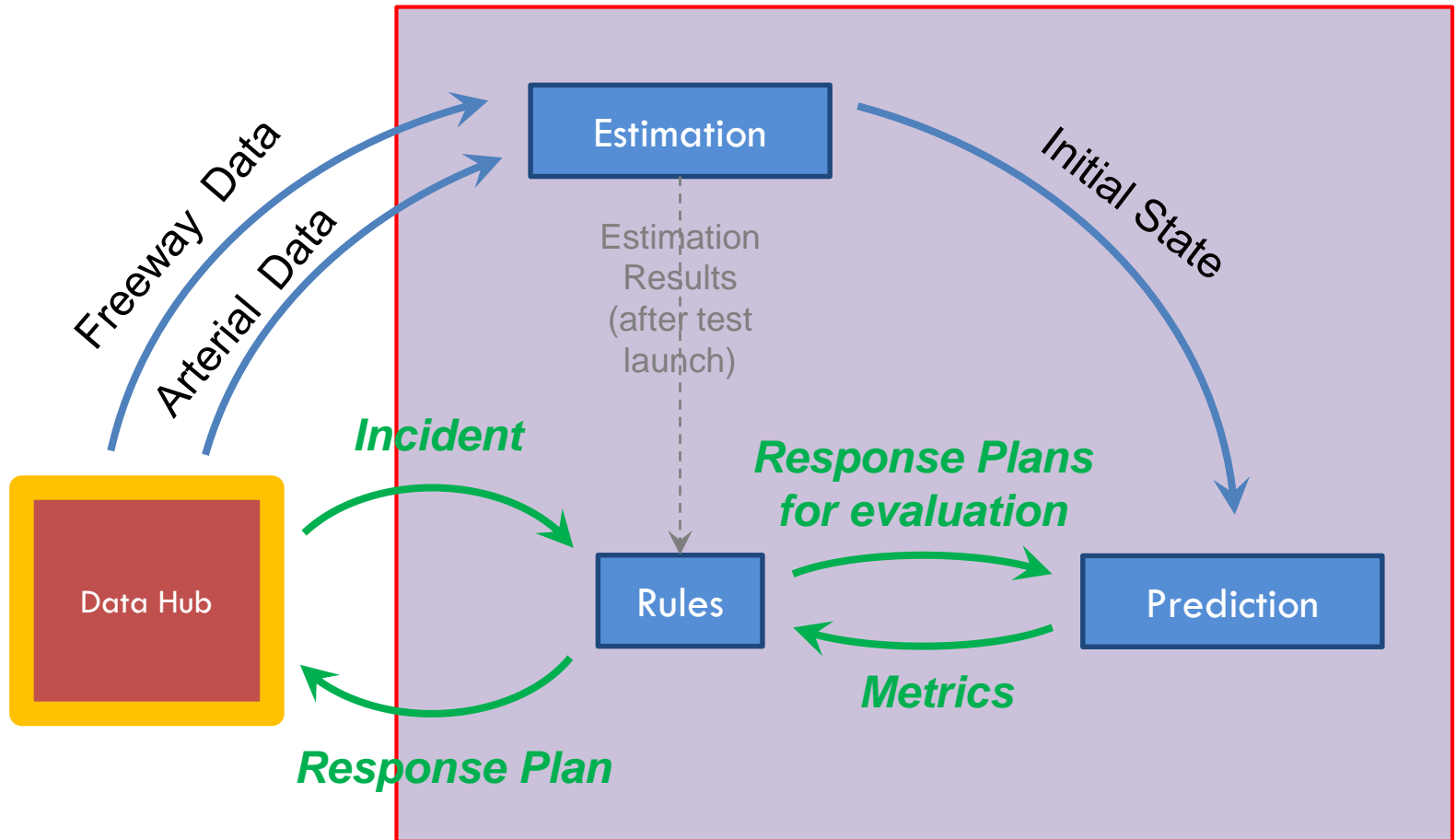
Workflow 1 – Immediate Response

61



Workflow 2 – Prediction In Loop

62



Test Launch Goals for January 2020

63

- **Functions running real-time 24/7**
 - ▣ Capture incidents
 - ▣ Capture data on freeways and arterials

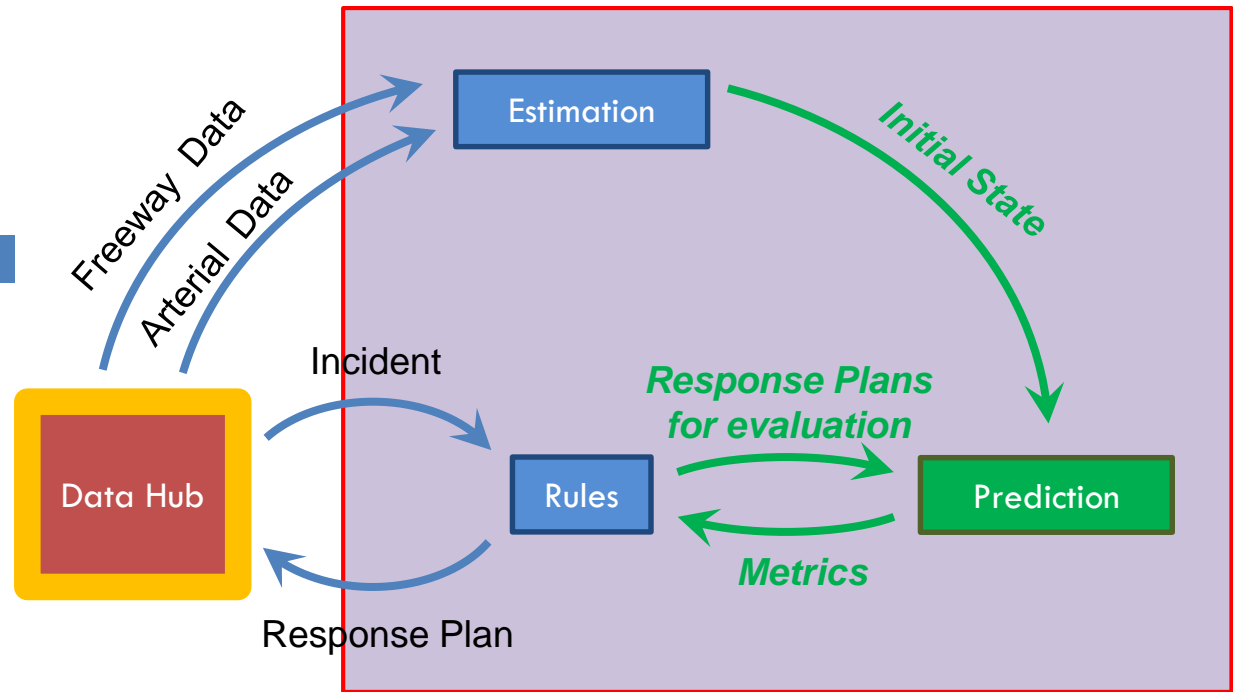
- **Functions running on demand**
 - ▣ Estimation, Prediction, and Rules
 - ▣ Historical and real-time modes

- **Expected outcomes**
 - ▣ Response plans and metrics for review by stakeholders
 - ▣ Metrics for use in benefits analysis
 - ▣ Ability to demonstrate operation
 - ▣ Find and fix bugs
 - ▣ Move forward with system integration



Prediction

64



Inputs

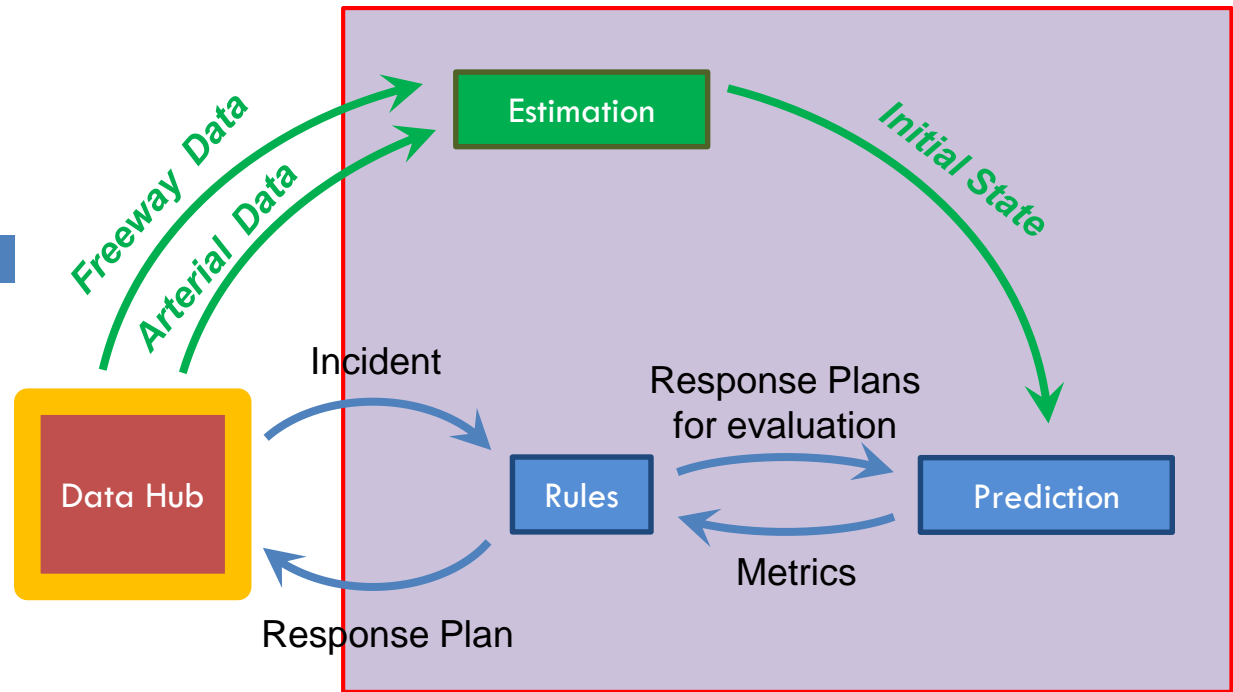
- Response plan (via queue from Rules)
- Initial state (via queue from Estimation)

Outputs

- Metrics (populating output queue for Rules consumption)
- Metrics to be reviewed

Estimation

65



Inputs

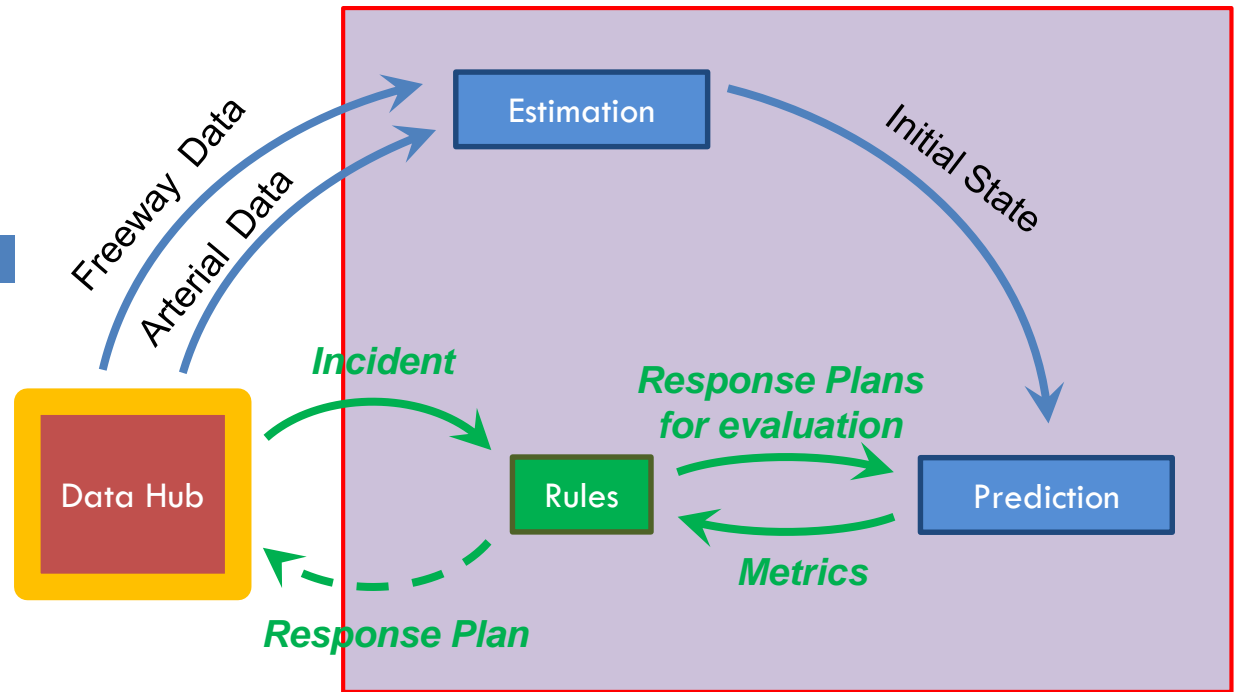
- Arterial data (via queue from Data Hub)
- Freeway data (via queue from Data Hub)

Outputs

- Initial States (populating queue for Prediction consumption)
- Estimation results to be reviewed

Rules

66



Input

- ❑ Incident data (via queue from Data Hub)
- ❑ Metrics (via queue from Prediction)

Outputs

- ❑ Response Plans (populating queue for Prediction consumption)
- ❑ Response Plan Ranking (TMDD)
- ❑ Response Plan Ranking to be reviewed

67

Data Quality

Meta-data

68

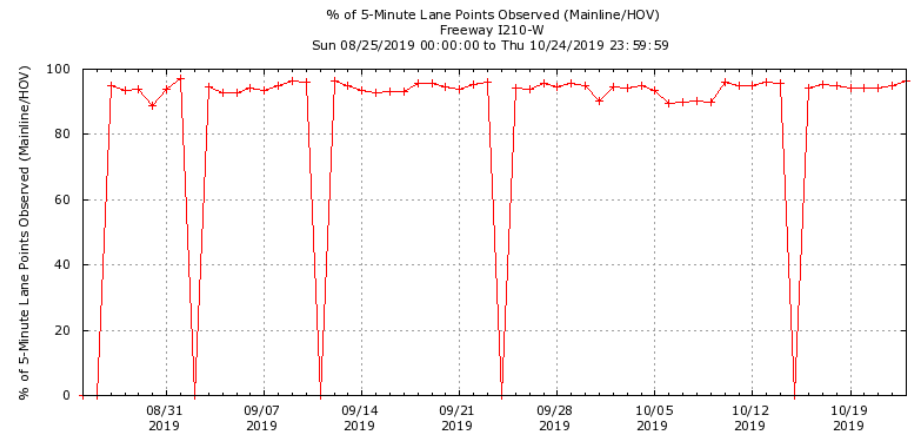
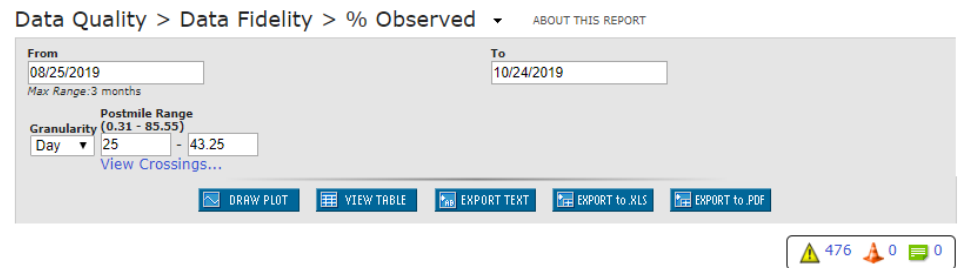
- **In order for sensor data to be useable, its meta-data must be complete and correct**
- **Meta-data includes information about the sensor type, lat-long location, network link location, lane coverage**
- **Freeway Data**
 - ▣ Meta-data in the corridor has been rigorously studied
 - ▣ Traffic data on freeways has also been rigorously studied
- **Arterial Data**
 - ▣ New sensors being installed
 - ▣ New meta-data not yet reviewed
 - ▣ Arterial traffic data not yet subjected to same scrutiny as PeMS



I-210 – Freeway Data Quality

69

- **Field elements working consistently at about 95%**
- **However intermittent data drops along the data pipeline cause PeMS to mark detectors as bad**



Arterial Data Quality

70

- **Arcadia**
 - ▣ Working with Arcadia regarding detector ID changes
 - ▣ Adding new detectors
 - ▣ Hired a student intern to review arterial detector meta-data

- **KITS**
 - ▣ Additional intersections added to data quality system



Success with KITS

- **KITS intersections now generating C2C data**
 - ▣ All 21 crucial intersections required for control are visible in the C2C interface
 - ▣ 15 intersections recently added

Name	External ID	Aimsun ID
Foothill & Michillinda	CO 1852	3419
Colorado & Michillinda	CO 1936	3312
Colorado & Rosemead	CO 3373	3336
Del Mar & Rosemead	CO 3374	3465
California & Rosemead	CO 3375	3375
Huntington & Rosemead	CO 3376	3320
Huntington & Mountain Vista Plaza	DU 5089	3340
Huntington & Buena Vista	DU 5090	3446
Huntington & Highland	DU 5091	3447
Huntington & Pops	DU 6112	3943
Huntington & Mount Olive/I-605	DU T-005	3443
Mountain & Best Buy/BMW	DU T-010	3944
Huntington & 5th	MO 3910	3355
Huntington & Monterey	MO 5083	3342
Huntington & Highway Esplanade	MO 5084	3945
Huntington & Mayflower	MO 5085	3407
Huntington & Magnolia	MO 5086	3451
Huntington & Myrtle	MO 5087	3428
Huntington & Mountain	MO 5088	3445
Huntington & Shamrock	MO 8804	3442
Huntington & California	MO 8805	3441

Arcadia updates and data improvement

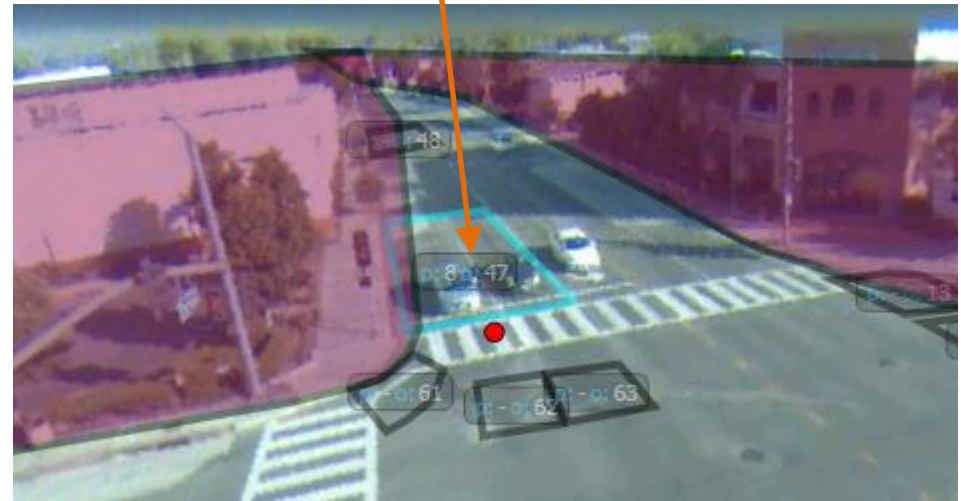
72

Updating ID to 309637



- Opportunity to verify detector meta-data
- Updating detector ID numbers
- Adding new detectors

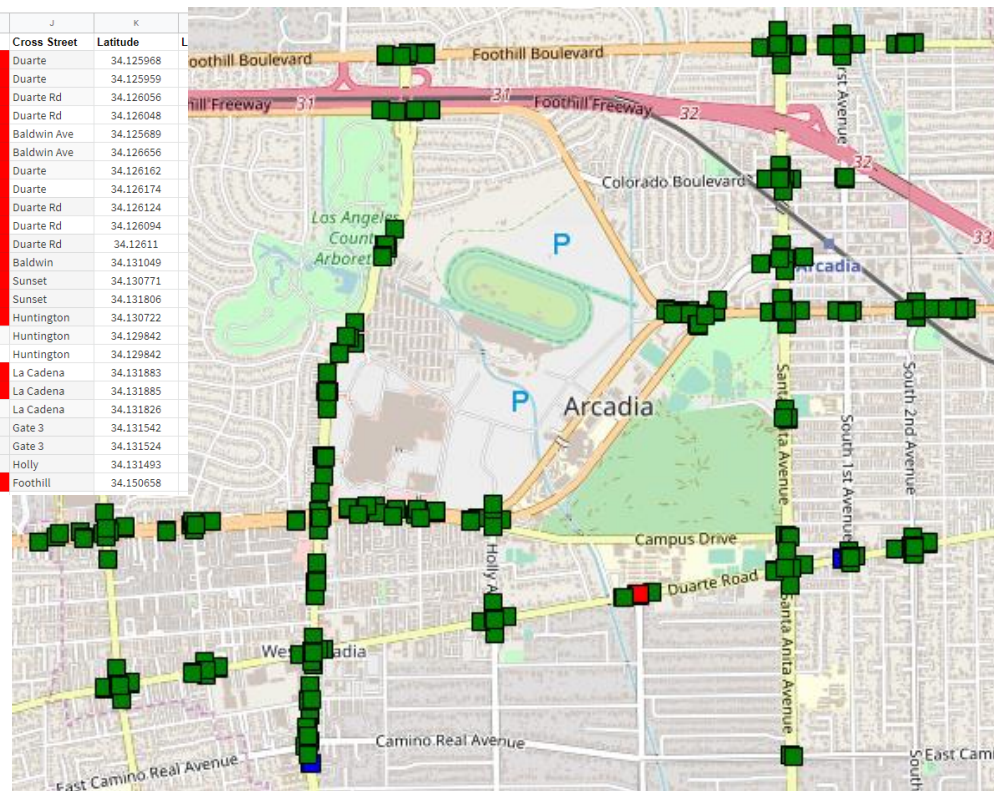
New video stop-bar detector 309647



Arcadia updates and data improvement

- ❑ Updating placement map in TransSuite
- ❑ Confirming labels and meta-information

ID	Status	Comm Mode	Description	Volume	Occupancy	Speed	Direction	Street	Cross Street	Latitude
310205	online	online	EB L1 Adv Baldw	153	3	23	East	Baldwin	Duarte	34.125968
310206	online	online	EB L2 Adv Baldw	433	16	14	East	Baldwin	Duarte	34.125959
310222	online	online	EB TH Duarte / B	142	76	1	East	Baldwin Ave	Duarte Rd	34.126056
310227	online	online	EB TH/RT Duarte	113	63	2	East	Baldwin Ave	Duarte Rd	34.126048
310210	online	online	NB LT Adv Duart	69	2	13	North	Duarte Rd	Baldwin Ave	34.125689
310212	online	online	SB LT Adv Baldw	311	40	13	South	Duarte Rd	Baldwin Ave	34.126656
310201	online	online	WB L1 Adv Baldw	281	4	22	West	Baldwin	Duarte	34.126162
310202	online	online	WB L2 Adv Baldw	249	6	21	West	Baldwin	Duarte	34.126174
310211	online	online	WB LT Adv Duart	78	2	14	West	Baldwin Ave	Duarte Rd	34.126124
310221	online	online	WB LT Duarte / B	93	79	1	West	Baldwin Ave	Duarte Rd	34.126094
310225	online	online	WB TH/RT Duarte	291	56	2	West	Baldwin Ave	Duarte Rd	34.12611
309222	online	online	NB Adv L1 Huntl	326	3	71	North	Huntington	Baldwin	34.131049
309621	unknown	online	NB LT Huntingto	0	0	0	North	Huntington	Sunset	34.130771
309622	unknown	online	SB Adv L1 Huntir	0	0	0	South	Huntington	Sunset	34.131806
309618	unknown	online	EB Adv L3 Hunti	0	0	0	East	Sunset	Huntington	34.130722
309606	unknown	online	WB Adv L2 Hunti	0	0	0	North	Sunset	Huntington	34.129842
309609	unknown	online	WB Adv L2 Hunti	0	0	0	North	Sunset	Huntington	34.129842
309408	online	online	SB LT at Mall Exit	136	57	2	South	Huntington	La Cadena	34.131883
309409	online	online	SB RT at Mall Exit	59	20	1	South	Huntington	La Cadena	34.131885
309405	online	online	WB SA ST Hunti	379	5	34	West	Huntington	La Cadena	34.131826
409117	online	online	EB Adv LT Hunti	1	1	1	East	Huntington	Gate 3	34.131542
409119	online	online	EB Adv LT Hunti	1	1	1	East	Huntington	Gate 3	34.131524
409101	online	online	SB L1 LS Hunti	113	2	20	East	Huntington	Holly	34.131493
307806	online	online	WB TH L1,L2 Foc	298	63	5	West	Baldwin	Foothill	34.150658



AMS System Components

DSS functions and Response Plan generation

Response Plans – Stakeholder Progress

75

□ LA County

- ▣ 6 intersections are in play for use with Response Plans
- ▣ In process to revise coordinated timing sheets
- ▣ On track to complete revision and to implement in the field this year

□ Pasadena

- ▣ 80 intersections are in play for use with Response Plans
- ▣ 23 intersections are programmed with Connected Corridors flush plans



Response Plans – Stakeholder Progress

76

□ Arcadia

- 19 intersections are in play for use with a Response Plans
- 17 intersections are programmed with Connected Corridors flush plans on Huntington, Foothill, and Santa Anita
- 2 additional intersections awaiting installation of 2070 controllers on Colorado
- Completed bench testing on single test controller with success (both manual and C2C commands)



Response Plans – Stakeholder Progress

77

□ Caltrans

- Flush plans reviewed at the following intersections
 - LA 210 EB @ Huntington Dr:
 - LA 210 WB @ Huntington Dr:
 - LA 210 EB @ Santa Anita:
 - 210 EB @ Colorado and Merlon
 - 210 EB @ Baldwin
 - 210 WB @ Santa Anita
- Max Green time adjusted on one plan
- No outstanding challenges
- Flush plans reorganized to coordination patterns 11 and above
- Next steps
 - Updated signal plans to be sent from Caltrans to PATH
 - Signal plans to be loaded onto controllers



Rules – Summary of Initial Process

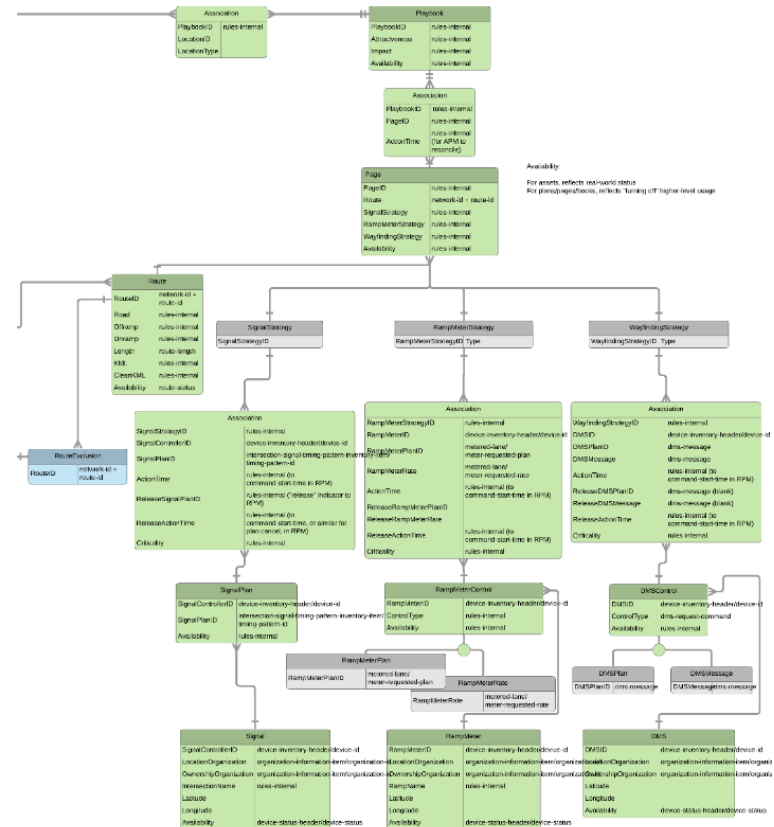
78

- **Decision whether to generate a response plan**
 - Based on incident characteristics, determine if queue forecast exceeds a threshold
- **Based on asset availability, or current status information, remove inappropriate plans from consideration**
- **Initial scoring**
 - Spatial decision: which route or routes?
 - Select number of routes based on queue forecast
 - Select route(s) with closest available on-ramp
 - Signal timing aggressiveness decision
 - We basically have two options to choose from depending on arterial demand at the time of day, day of week and the location of the route(s) in the corridor



Rules – Response Plan Generation

- ❑ On track to complete new data model into next version of rules engine this week
- ❑ Defined functionality to be included for Test Launch
- ❑ Refined usage specification for event (incident) TMDD data fields for freeway incidents from the ATMS



Rules – Initial Queue Forecast

- Purpose is to provide a preliminary impact categorization
- Calculates additional vehicle accumulation resulting from the reported lane blockage
- Calculates additional queue length (delta queue length) resulting from reported lane blockage

Direction	AbsPM	Day Type	Start Time	Duration	Lanes Blocked	Queue Length
EB	34	Weekday	20:00:00	30	1	0.65
EB	34	Weekday	20:00:00	30	2	1.81
EB	34	Weekday	20:00:00	30	3	2.76
EB	34	Weekday	20:00:00	60	1	0.80
EB	34	Weekday	20:00:00	60	2	3.09
EB	34	Weekday	20:00:00	60	3	4.79
EB	34	Weekday	20:00:00	90	1	0.81
EB	34	Weekday	20:00:00	90	2	4.18
EB	34	Weekday	20:00:00	90	3	6.55
EB	34	Weekday	20:00:00	120	1	0.38
EB	34	Weekday	20:00:00	120	2	4.80
EB	34	Weekday	20:00:00	120	3	7.93

Estimation – Progress

81

- **NetworkExporter completed to extract network, detector, and signal control information (JSON files) from Aimsun**
- **Estimation network and subnetworks (freeway and arterial) created**
- **Work underway to stand up the a PeMS filter to run in the data hub**



Prediction – Simulation Model

82

- **Detector mapping**
 - ▣ Received updated mapping of detector IDs in Arcadia

- **Input data**
 - ▣ Received a first set of average flow rates extracted from the detectors linked to Arcadia's TransSuite system

- **Demand modeling**
 - ▣ Updates in weekday/Saturday/Sunday traffic demands around Arcadia to reflect latest flow data collected from the city's TransSuite system
 - Better capture of traffic variations around Westfield Mall on weekends and week nights

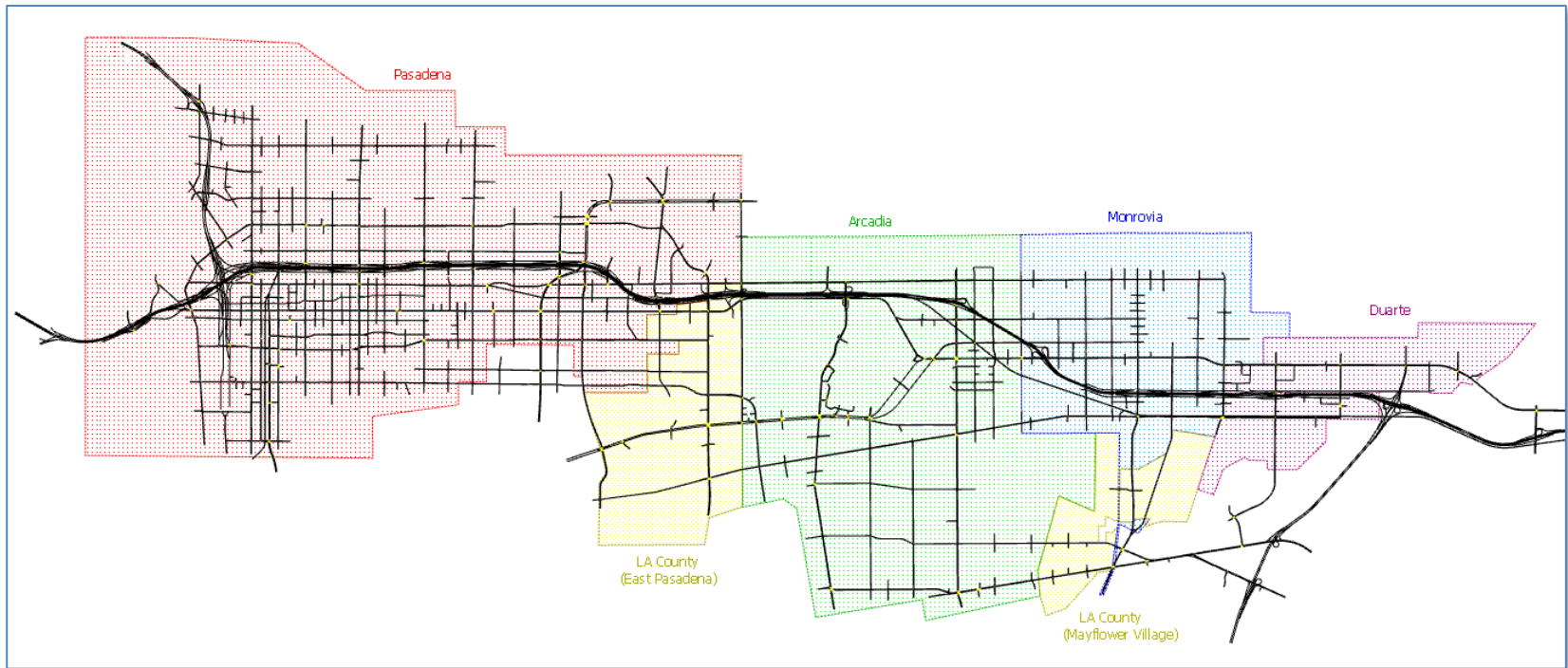
- **Driver response to incidents**
 - ▣ Updated driver response to incident to consider variable message signs that may be used on freeway and arterials
 - ▣ Addressed modeling issues regarding truck behavior at ramps where heavy truck restrictions exist (Myrtle, Mountain and Buena Vista)



Prediction – Incident Evaluation

83

- ❑ Previously produced metrics by zone
- ❑ Added ability to produce metrics automatically by city area



Prediction – Automation of process

84

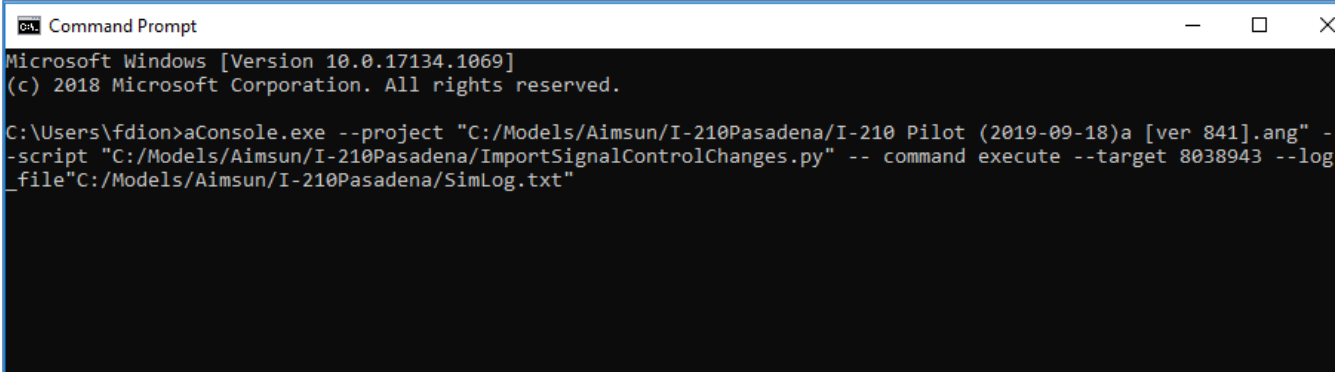
- **Streamlining and automating model running and metrics generation**
- **Developed sets of database analysis instructions to produce desired metrics for various groupings**
 - Statistics for all links in analysis zones / cities
 - Statistics for freeway links only
 - Counts for on-ramps/off-ramps
- **Response Plans**
 - Review and correction of JSON example response plans
 - Finished the Java Code that parses the JSON example and generates input files for Aimsun simulations



Prediction – Automation of process

85

- **Tested running Aimsun model from command line (*aConsole*)**
 - ▣ Ability to call specific model
 - ▣ Ability to provide specific instructions prior to model execution
 - Specific simulation period to run
 - Incident to implement (where, when)
 - Proposed signal/ramp metering changes to be activated (where, when)



```
ca. Command Prompt
Microsoft Windows [Version 10.0.17134.1069]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\Users\fdion>aConsole.exe --project "C:/Models/Aimsun/I-210Pasadena/I-210 Pilot (2019-09-18)a [ver 841].ang" -
-script "C:/Models/Aimsun/I-210Pasadena/ImportSignalControlChanges.py" -- command execute --target 8038943 --log
_file"C:/Models/Aimsun/I-210Pasadena/SimLog.txt"
```

Summary

86

- **Solid progress on AMS components and the glue that will hold them together**

- **Moving forward with a focus on**
 - ▣ Test Launch
 - ▣ Data Quality



**Thank You
and
Next Meeting
(Suggest Tuesday
December 10th at LA
Metro)**

