



SANDAG C-PeMS Project

Integrating ICMS with PeMS

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Status Update, Jan 22nd, 2014

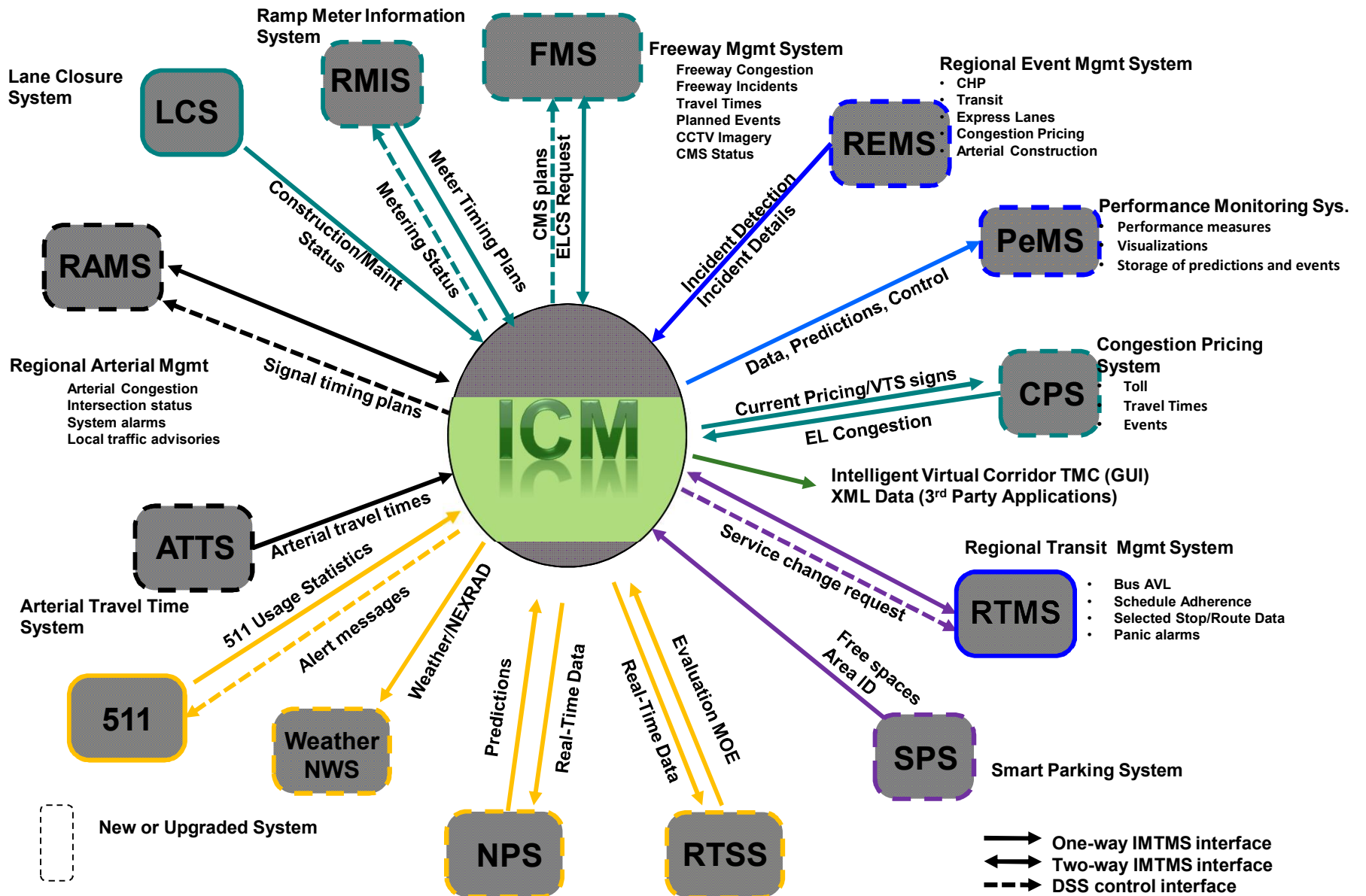


Project Goals

1. Computation of corridor performance across modes
 - Multi-modal performance measures
2. Visualization of performance
 - Highlight performance issues
3. Ability to “replay” events and responses
 - Useful as a training platform to look back at what happened

All done by integrating data into PeMS and then extending PeMS to have additional features

ICMS Context



Progress

- Configured SANDAG ICMS GIS network into PeMS
- Collected and aligned many, many different data sources
- Computed additional performance measures on top of new GIS network
- Implemented full “Corridor PeMS”
- Captured the predictions coming out of the ICMS system
- Captured the response plans coming out of the ICMS system
- Visualized the response plans

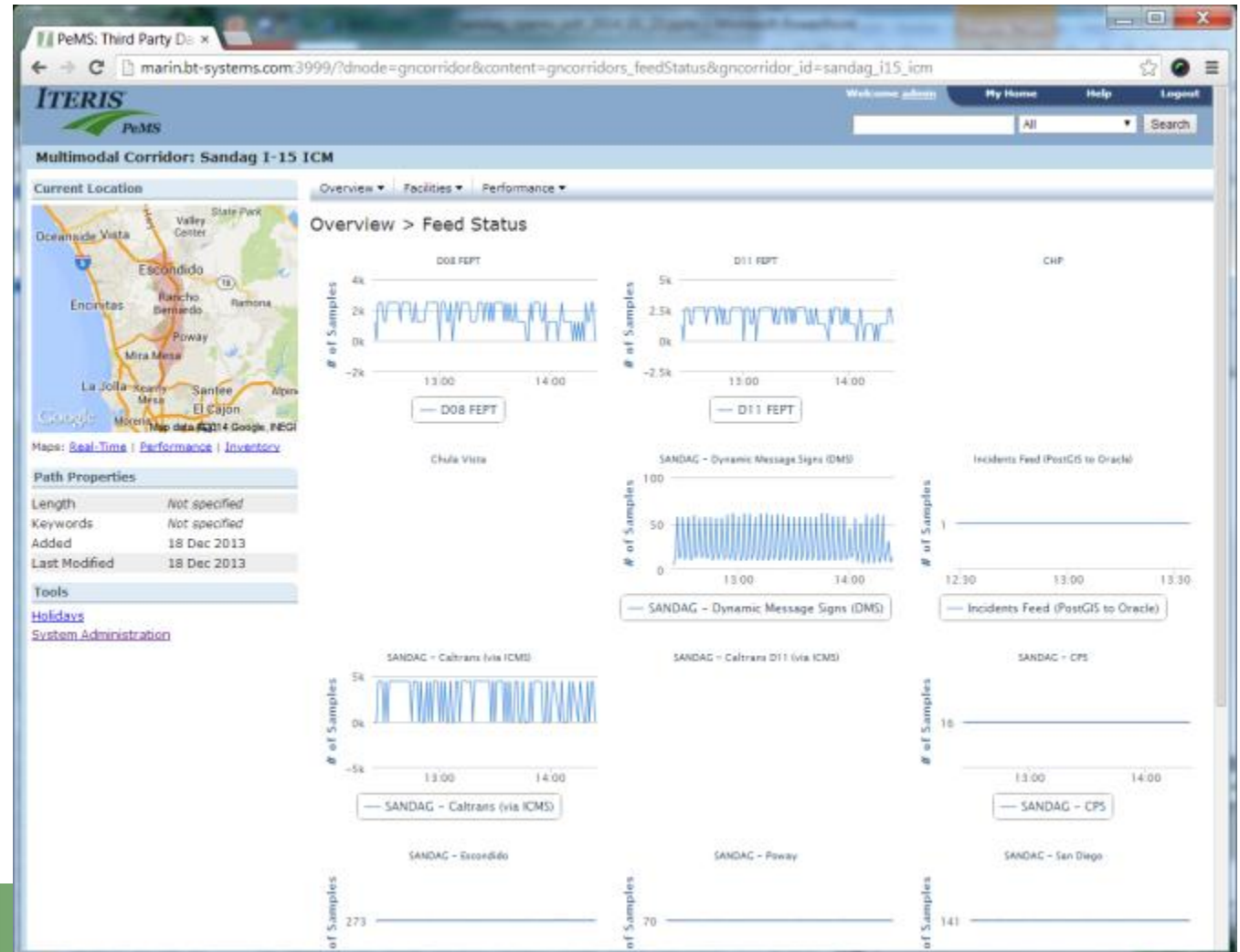
Data Collection – many types of feeds

Data Feed Name	Organizational IDs	Observed update Frequency	Data Feed Description
bus_location	MTS-SD,NCTD	2 min	real-time location of buses
bus_passenger	MTS-SD,NCTD	1 hr	passenger count data - used for t-pems functionality
detector_data	ATTS, Caltrans, Carlsbad, ChulaVista, EICajon, Encinitas, Escondido, LaMesa, NationalCity, Oceanside, Poway, SanDiego, SanDiegoCounty, SanMarcos, Santee, Vista, CPS, Caltrans-D11	1 min	standard arterial and freeway detector data
detector_inventory	ATTS, Caltrans, Carlsbad, ChulaVista, EICajon, Encinitas, Escondido, LaMesa, NationalCity, Oceanside, Poway, SanDiego, SanDiegoCounty, SanMarcos, Santee, Vista		location of detectors
dms	CPS,Caltrans,SANDAG	1 min	DMS text with markup language
dms_inventory	CPS,Caltrans,SANDAG	Static	location of DMS
incident	CHP-SD, CPS, Caltrans, ICMS, LCS-SD, MTS-SD	1 min	incidents
link_prediction	SANDAG	5 min	prediction of flow, occupancy, speed on links
managed_lane	CPS	2 min	status of reversible lanes
parking_data	ParkingCarma,SANDAG	2 min	should have # of spaces available but counts are currently not changing
parking_inventory	ParkingCarma,SANDAG	Static	location and size of lots
ramp_meter	Caltrans,SANDAG	1 min	status of ramp meters
ramp_meter_inventory	Caltrans,SANDAG	Static	location of ramp meters
response_plan	ICMS	1 min	response plans and action items proposed/implemented to deal with events
signal_inventory	Caltrans, Carlsbad, ChulaVista, EICajon, Encinitas, Escondido, LaMesa, NationalCity, Oceanside, Poway, SANDAG, SanDiego, SanDiegoCounty, SanMarcos, Santee, Vista	Static	location of signals
signal_status	Caltrans, Carlsbad, ChulaVista, EICajon, Encinitas, Escondido, LaMesa, NationalCity, Oceanside, Poway, SANDAG, SanDiego, SanDiegoCounty, SanMarcos, Santee, Vista	1 min	status of signals - which timing plan is in effect
signal_timing_plan	Caltrans, Carlsbad, ChulaVista, EICajon, Encinitas, Escondido, LaMesa, NationalCity, Oceanside, Poway, SANDAG, SanDiego, SanDiegoCounty, SanMarcos, Santee, Vista	Static	timing plan details
travel_time	ATTS	1 min	travel time on arterial links - sparse data
weather_data	WeatherBug	5 min	unknown blob format representing weather
weather_inventory	WeatherBug	Static	location of 17 environmental sensors



Monitoring the Feed Status

- Need to monitor all of the feeds flowing in
- Under the corridor in PeMS users can see the samples received over time



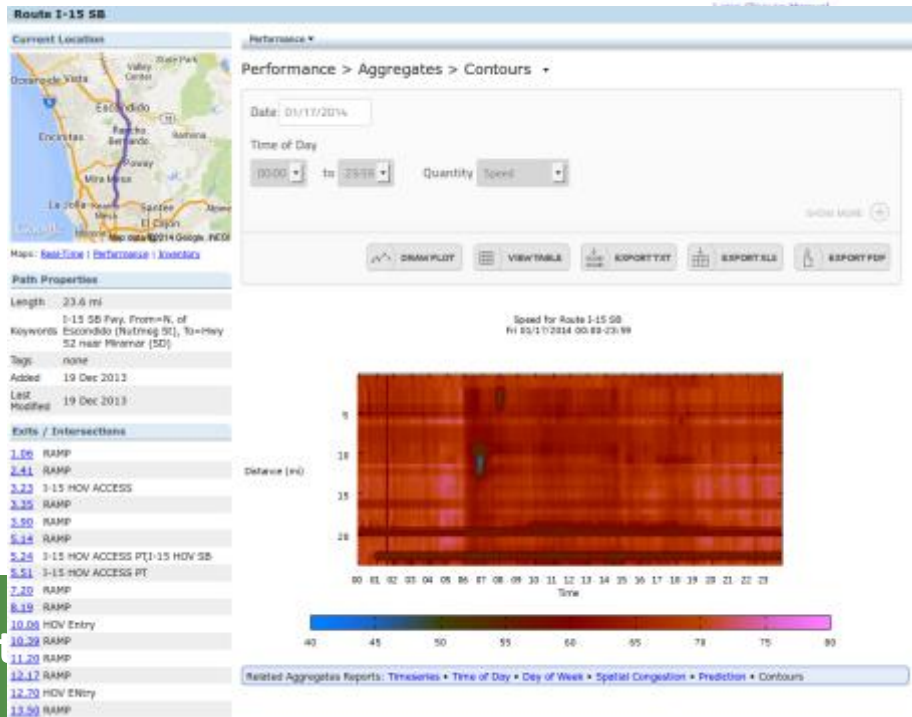
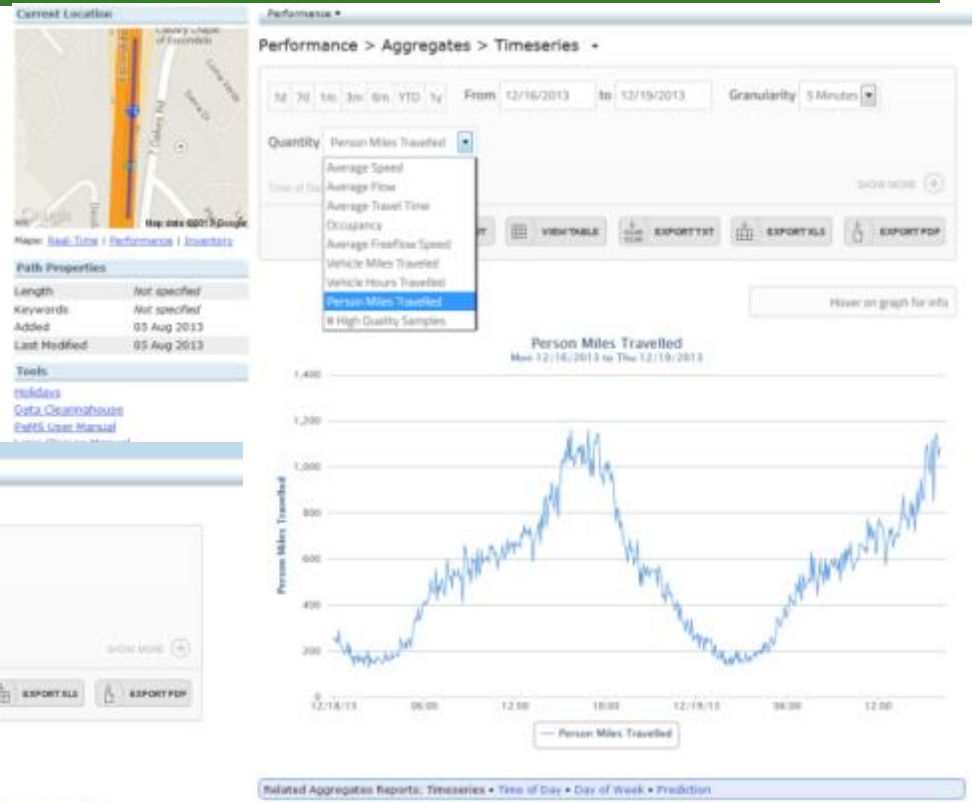
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Computing Measures

- Wanted measures on many different modes on top of the ICM GIS network
- Freeway link measures
- Arterial link measures
- Transit route measures
- Measures about events (eg: count of the number of incidents)
- Measures on routes across modes

Freeway Link Reports

- The user can specify the quantity, granularity and date range for the detailed link report
- Quantities are selected from the drop down list
- Contour plots over freeway sections

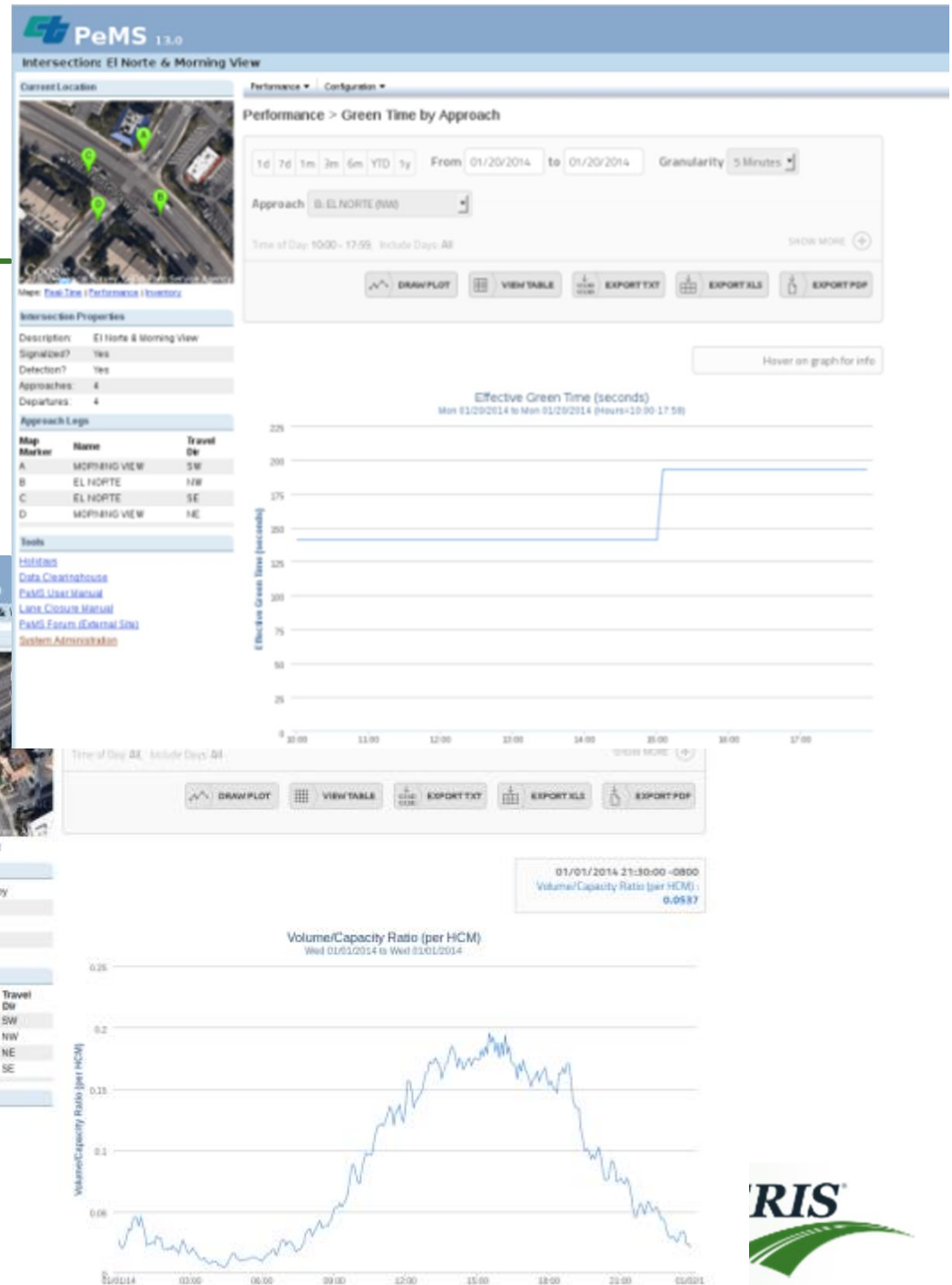


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Arterial Measures

- We're receiving real-time flows from some arterial links
- We know the currently-applied static timing plan for some signals
- When available, the combination of these allows us to estimate link performance
- Top plot is showing the green time by approach for a link
- Bottom: V/C ratio on link




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Transit Routes

- One can see transit routes listed by transit agency (MTS)
- This is throughout the region

Transit Agency MTS

Current Location: 

Schedule | Performance | Data Quality

Performance > Route Reliability

From: Dec 15 2013 8 To: Dec 19 2013 18
 Min Range: 1 day Max Range: 1 year

Include Days: Su Mo Tu We Th Fr Sa Holidays

Time Period: Total Statistic: Sum

[VIEW TABLE](#) [EXPORT TEXT](#) [EXPORT TO XLS](#)

Route	Scheduled Trips	Stops							Boardings	Passenger Miles Traveled
		Scheduled	Measured	% Stops Measured	% On Time	% Late	% Early Departs			
1	512	30,564	1,878	6	90	10	42	1,203	232	
2	612	25,708	1,387	5	99	1	30	964	129	
3	500	28,504	0	0	0	0	0	0	0	
4	272	16,288	1,194	7	86	14	15	668	123	
5	500	12,248	1,249	10	90	10	23	1,360	244	
6	472	10,824	1,786	17	91	9	39	994	139	
7	832	43,288	860	2	84	16	37	740	139	
8	376	8,836	328	4	100	0	65	190	37	
9	324	8,620	343	4	92	8	23	200	39	
10	540	14,304	1,219	9	90	10	29	1,792	614	
11	584	55,468	2,609	5	88	12	42	1,758	304	
13	500	25,604	1,115	4	61	39	24	1,510	465	
14	124	4,008	518	13	98	2	34	196	57	
15	612	12,828	924	7	93	7	29	1,389	502	
18	92	1,840	0	0	0	0	0	0	0	
20	392	14,028	594	4	89	11	41	735	836	
25	104	5,652	0	0	0	0	0	0	0	
27	244	7,576	0	0	0	0	0	0	0	
28	316	5,688	0	0	0	0	0	0	0	
30	540	36,764	3,081	8	90	10	33	1,785	892	
31	120	3,540	150	4	85	15	15	71	19	
35	320	7,520	0	0	0	0	0	0	0	
41	596	21,580	1,563	7	85	15	23	1,283	263	
44	560	23,792	867	4	87	13	33	553	111	
50	188	6,580	35	1	71	29	3	23	2	

Agency Details: Week Of: 12/15/2013 Routes: 104 Service Patterns: 432 Stops: 4,705 Average Daily Trips: 5,760 Average Daily Vehicle Trip Length: 54,612 mi Average Daily Vehicle Hours: 4,094

Quick Links: [Holidays](#) [Data Clearinghouse](#) [PeMS User Manual](#) [Lane Closure Manual](#) [PeMS Forum \(External Site\)](#) [System Administration](#)

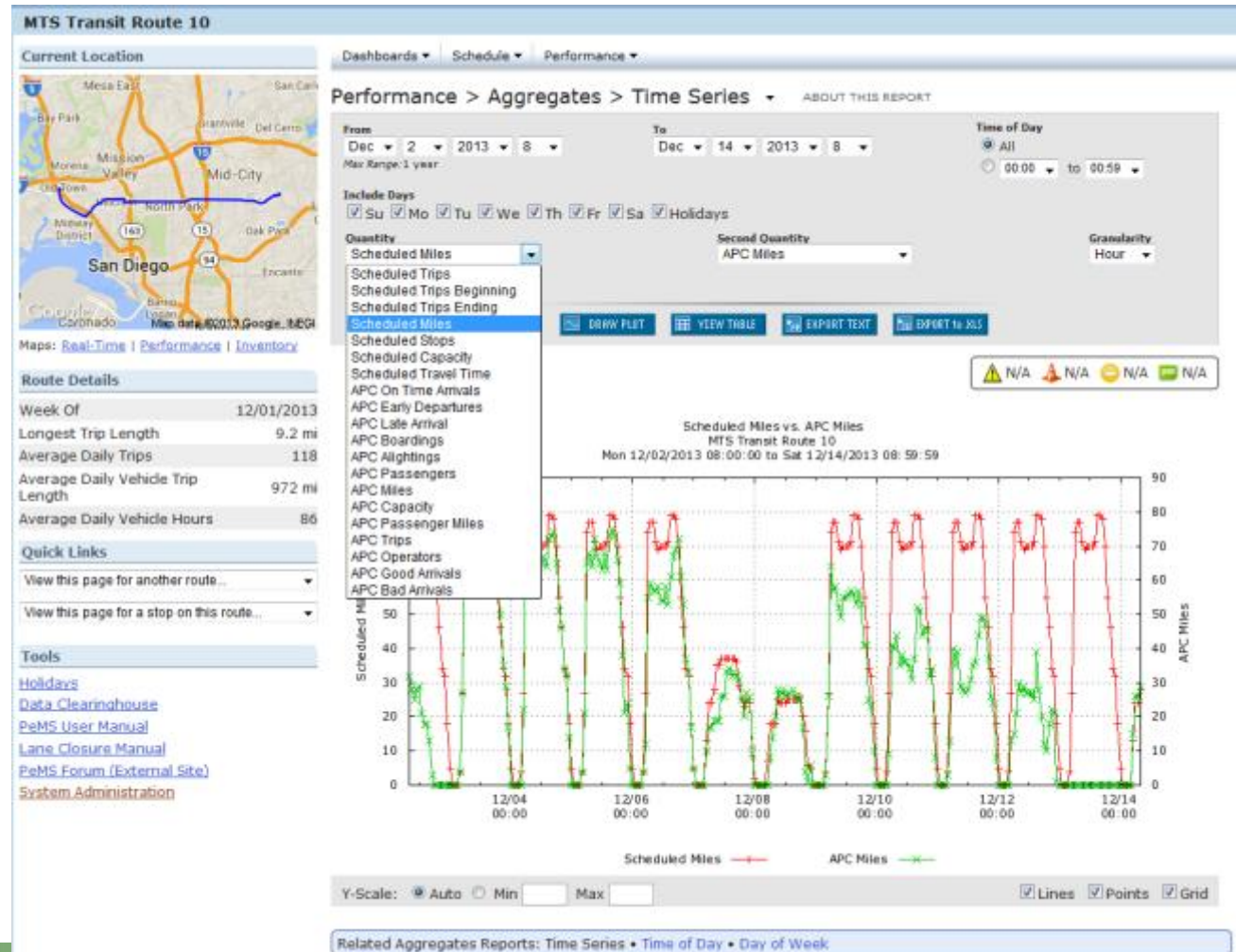
Tools: [Holidays](#) [Data Clearinghouse](#) [PeMS User Manual](#) [Lane Closure Manual](#) [PeMS Forum \(External Site\)](#) [System Administration](#)

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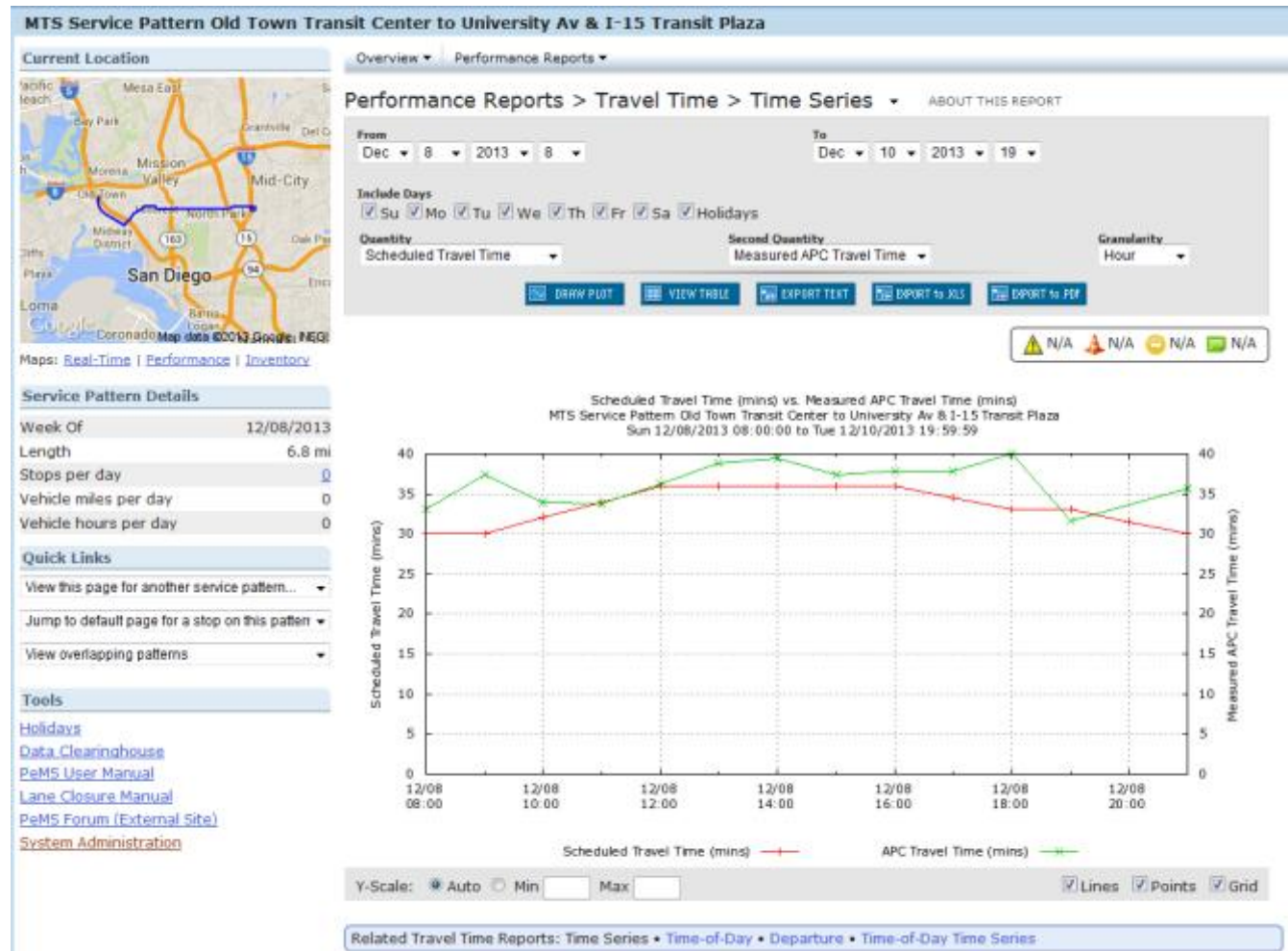
Transit Route Report

- Each transit route has a detailed reporting, where 1 or 2 quantities can be displayed for comparison (scheduled vs measured)
- These quantities can be selected from drop down lists
- Currently showing scheduled vs actual miles for Route 10



Transit Route Travel Time

- Each transit route has one or more service patterns
- Travel time is reported by service pattern
- Scheduled travel time can be compared with the measured one



Route Reports

- Routes span links: either freeways or arterials or both
- Route details are specified on the left panel, including the route map
- Reporting quantities are to be selected from the drop down list
- Granularity and date range can also be specified
- Top: Travel time versus time
- Bottom: Travel time versus time of day

Current Location

Oceanside Vista Valley Center
Esccondido Rancho Bernardo Rancho Santa Fe
Encinitas Poway Mira Mesa San Marcos Escondido
La Jolla Poway San Marcos Escondido
Map: Real Time | Performance | Inventory

Path Properties

Length: 23.5 mi
Keywords: I-15 NB Fwy, From=Hwy 52 near Miramar (SD), To=N. of Escondido (Nutmeg St)
Tags: none
Added: 19 Dec 2013
Last Modified: 19 Dec 2013

Exits / Intersections

0.39	I-15 HOV NB
1.64	I-15 HOV NB/N-Exit-1
1.99	I-15 HOV NB/N-Entry-1
2.08	RAMP
3.04	RAMP
3.85	N-Entry-2,RAMP
4.66	RAMP
5.17	N-Entry
6.13	RAMP
7.01	RAMP
7.94	RAMP
9.38	HOV Entry
9.47	RAMP
10.72	RAMP
11.49	HOV Entry
11.82	RAMP
12.53	RAMP
14.45	HOV Entry
14.80	RAMP
15.84	RAMP
16.43	S CENTRE CITY

Performance > Aggregates > Timeseries

Quantity: Average Speed (selected)

Time of Day: From 12/17/2013 to 12/19/2013 Granularity: 5 Minutes

12/18/2013 01:40:00-0800
Average Speed (mph): 68.53

Average Speed (mph)
Tue 12/17/2013 to Thu 12/19/2013

Related Aggregates Reports: Timeseries • Time of Day • Day of Week • Prediction

Average Speed (mph)
Tue 12/17/2013 to Thu 12/18/2013

16:00
Minimum: 62
Mean: 68
Maximum: 77

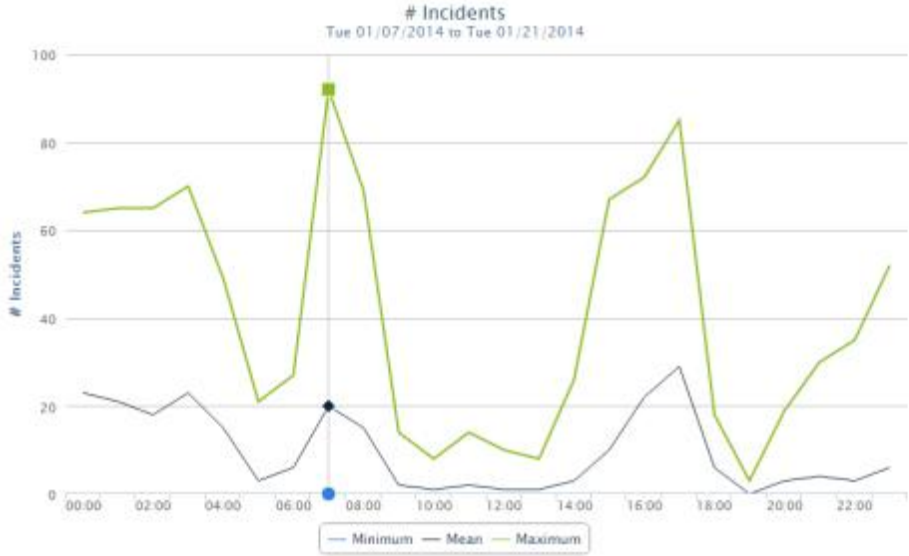
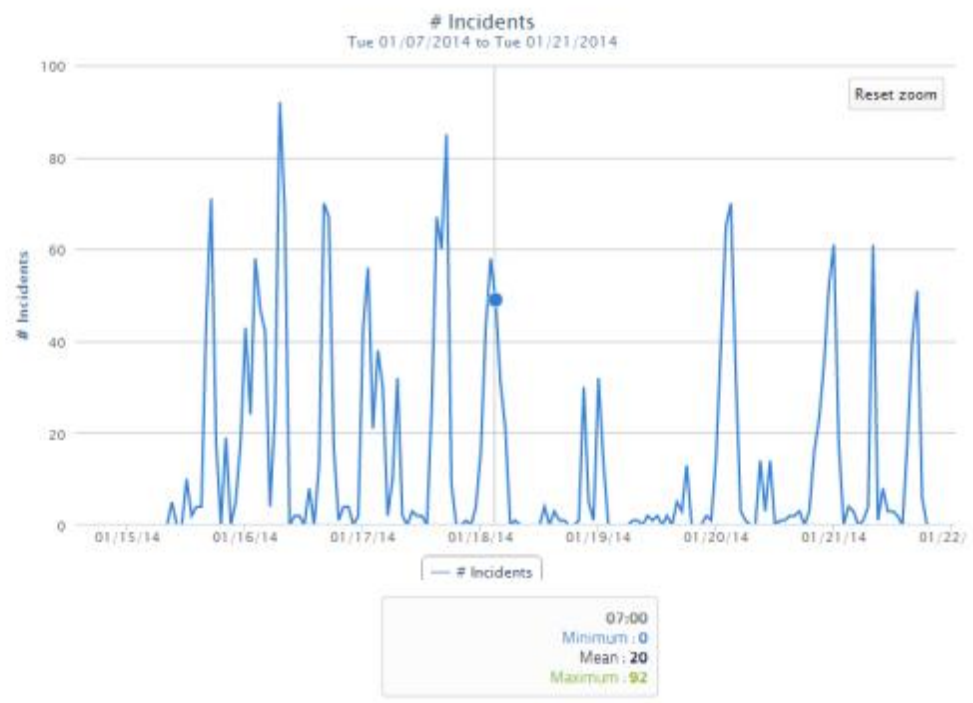
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01/18/2014 03:00:00 - 0800
Incidents : 49

Incident Reports

- Standard reports of different types of events
- Broken down by organizational ID
- Here we're just counting incidents
- Top: versus time
- Bottom: versus time of day



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Corridor PeMS

- Define multi-modal corridors in PeMS
 - Database entity in PeMS to define parts of the transportation system to measure
- Enable the ability to navigate to a “corridor” to see performance measures
- Soon to have it’s own performance dashboard

PeMS: Third Party De x
marin.bt-systems.com:3999/?dnode=State&content=gncorridors_list

ITERIS PeMS
Welcome admin My Home Help Logout

State of California

Current Location

Overview Facilities & Devices Performance Data Quality Events

Facilities & Devices > Multimodal Corridors

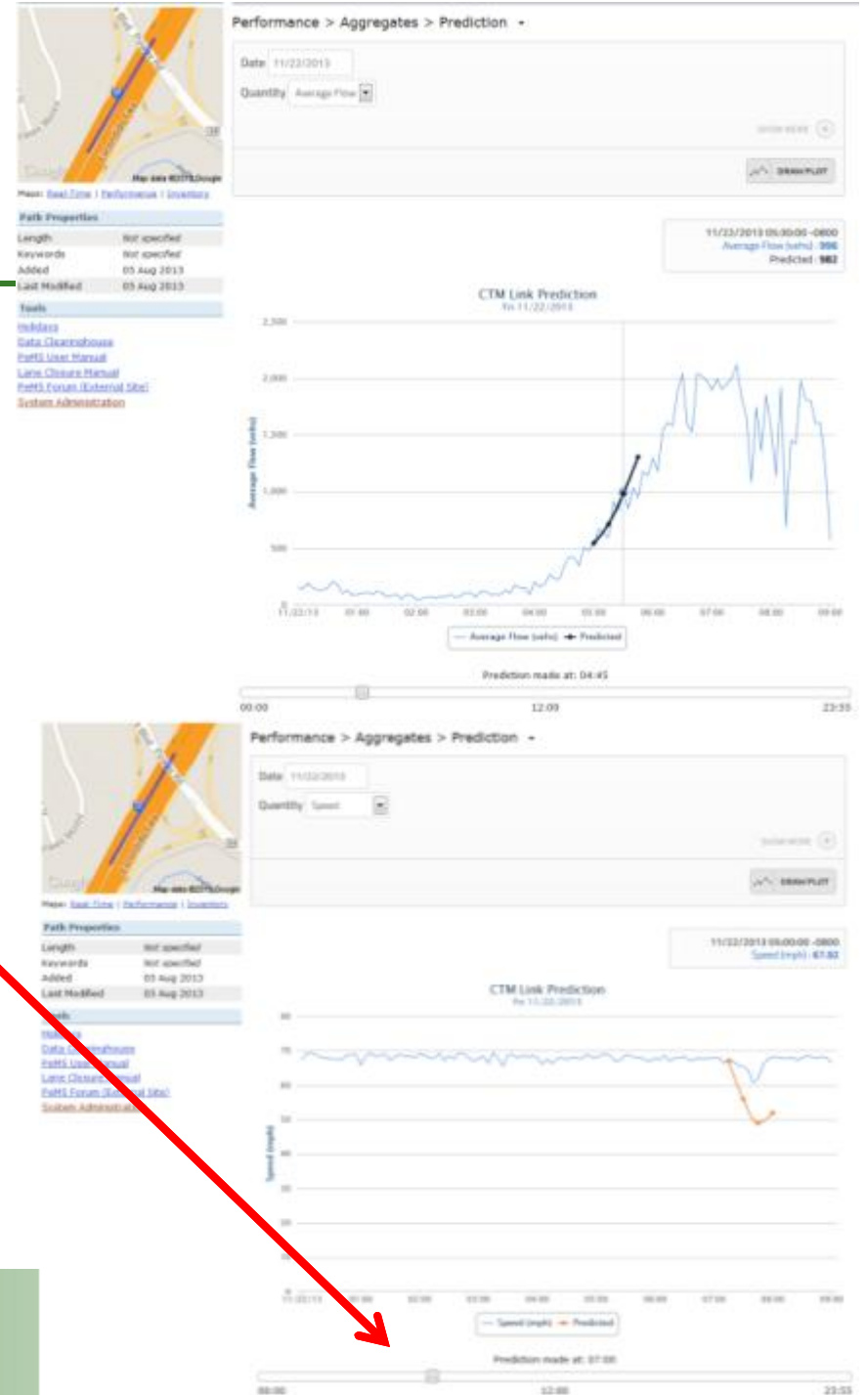
Keyword Apply Clear

Name	Freeways				Arterial and Other Highways				Local Roads			
	Distance (mi)	Miles Monitored	% Monitored	# Links	Distance (mi)	Miles Monitored	% Monitored	# Links	Distance (mi)	Miles Monitored	% Monitored	# Links
Sandag I-15 ICM	107	91	85	548	309	83	27	2,569	35	5	13	251

Map data ©2014 Google, INEGI
Maps: Real-Time | Performance | Inventory

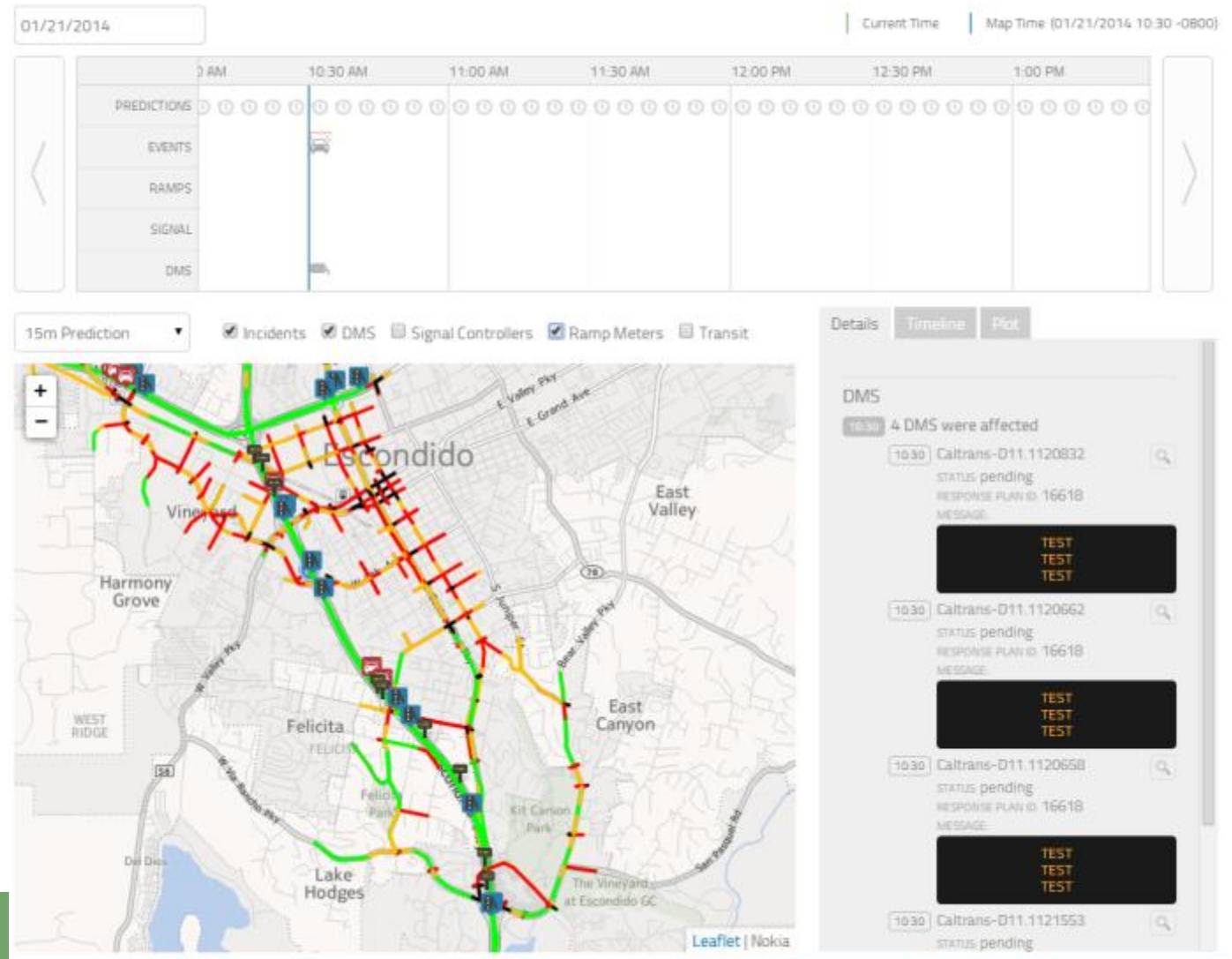
Capturing Predictions

- We're capturing and storing the predictions that are made every 5 minutes (for 15,30,45,60 minutes out)
- Users can show those predictions for any day in the past against the measurements on the link (if available)
- Here we view predictions and compare them with the measured data
- Time slider at the bottom allows the user to specify the time of the prediction
- Bottom plot compares the flow prediction made at 7am on 11/22/2013 for the next hour with the flow measured on that day



Response Plan Capture and Visualization

- Ribbon on top shows timeline
- Users can select a day and time
- Events during that time period show up on map
- DMS, signals, ramp meters can be toggled to be displayed on the map
- Details of ITS element configuration and status are displayed in the information panel on the right



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Executive Summary

- Status
 - Working on features with Peter and Alex now
 - Beta will be available on Caltrans' instance of PeMS soon
- Features still in progress
 - Computation of corridor-wide performance measures
 - Computation of simulation “quality” performance measures (ability to track final differences over time)
 - Finishing visualization of response plans