



# VALIDATION AND MAINTENANCE OF A 24/7 REAL TIME SIMULATION MODEL

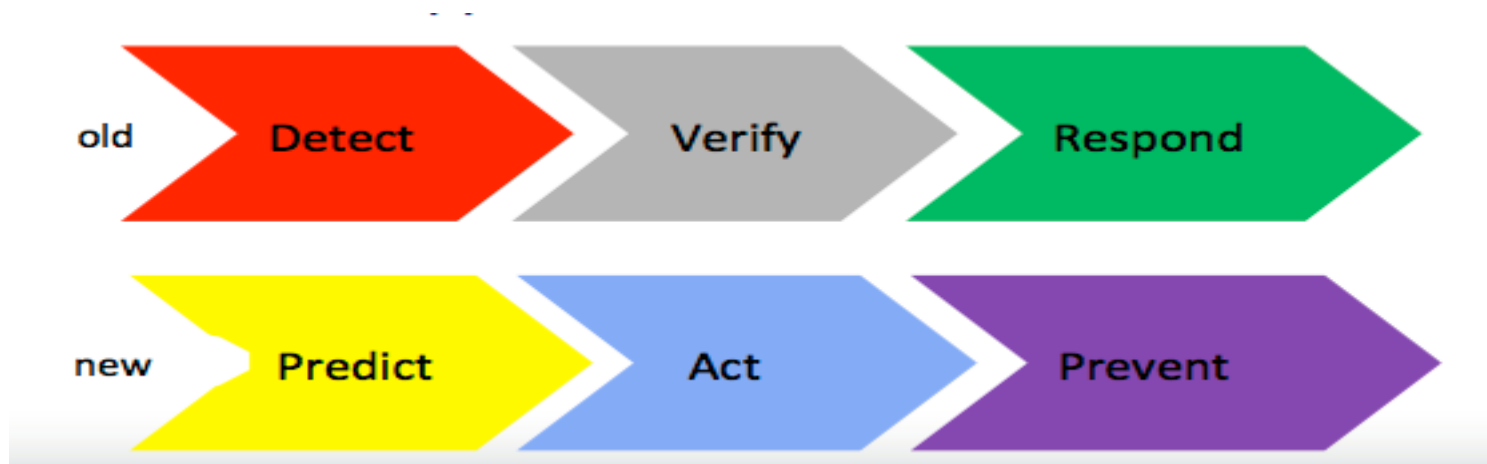
15<sup>th</sup> TRB Applications Conference

May 18th, 2015



# ICMS Innovation

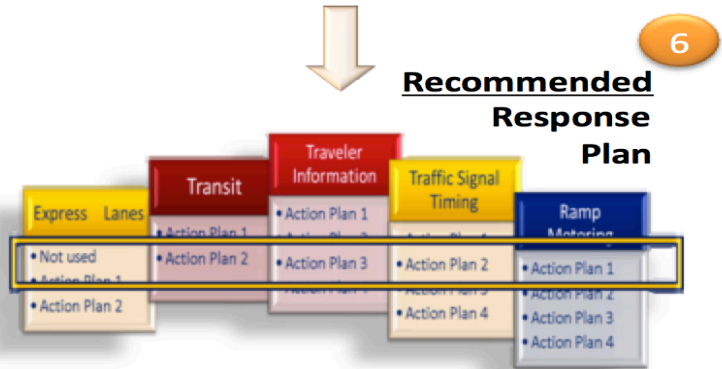
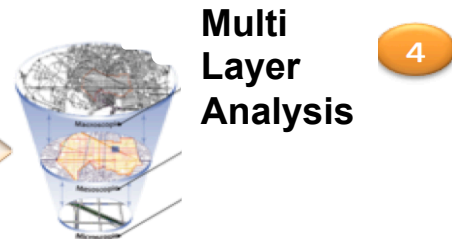
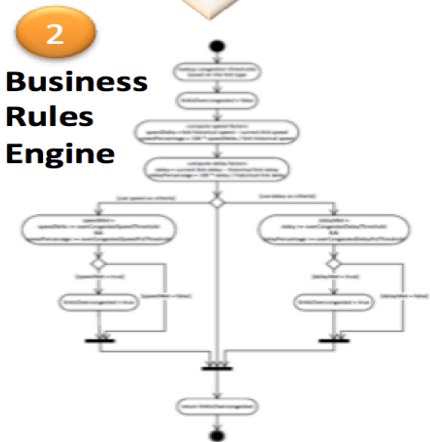
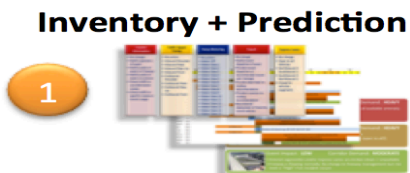
*Paradigm shift to more pro-active traffic management method, making use of prediction tools, on-line micro simulation and improved decision support*





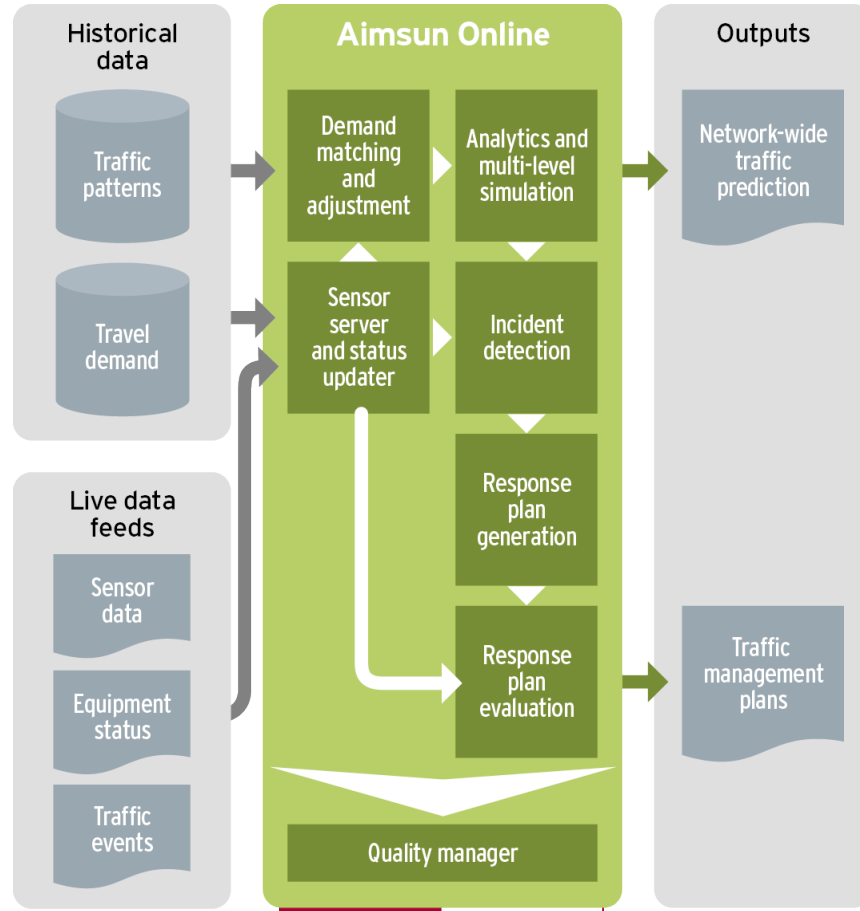
# Decision Support System Evolution

## Response Plan Evaluation



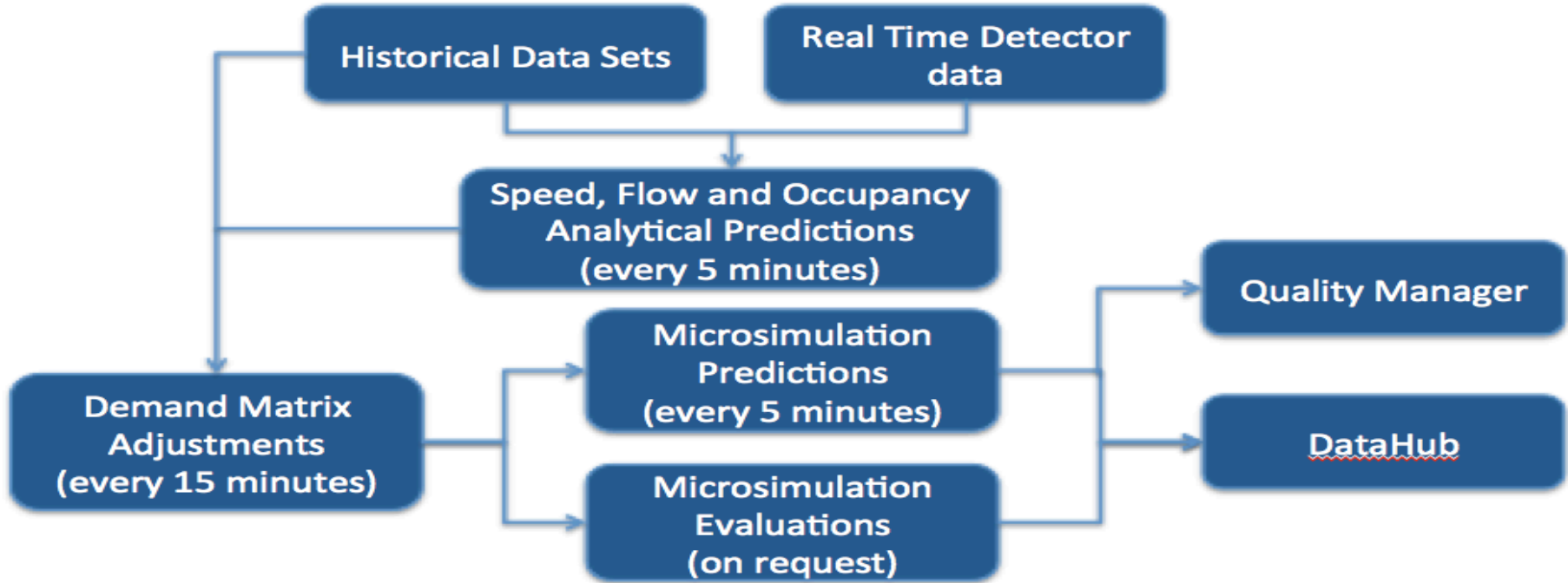


# Aimsun Online Architecture



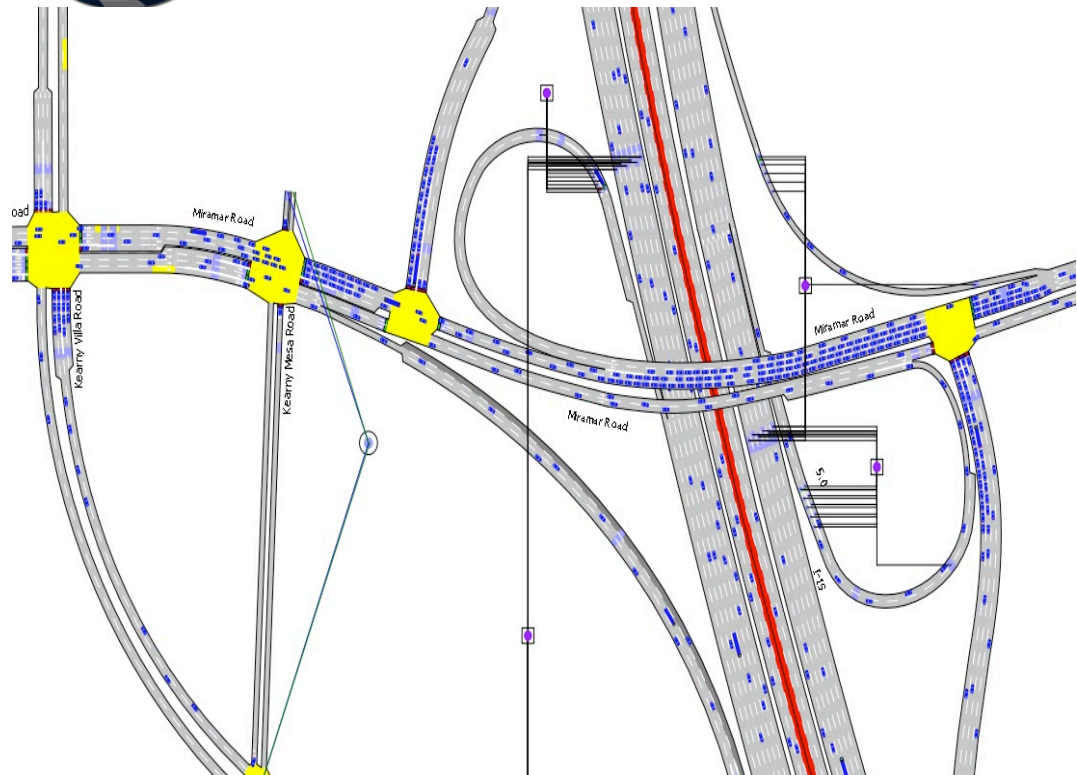


# Network Prediction System





# Corridor Performance Needs

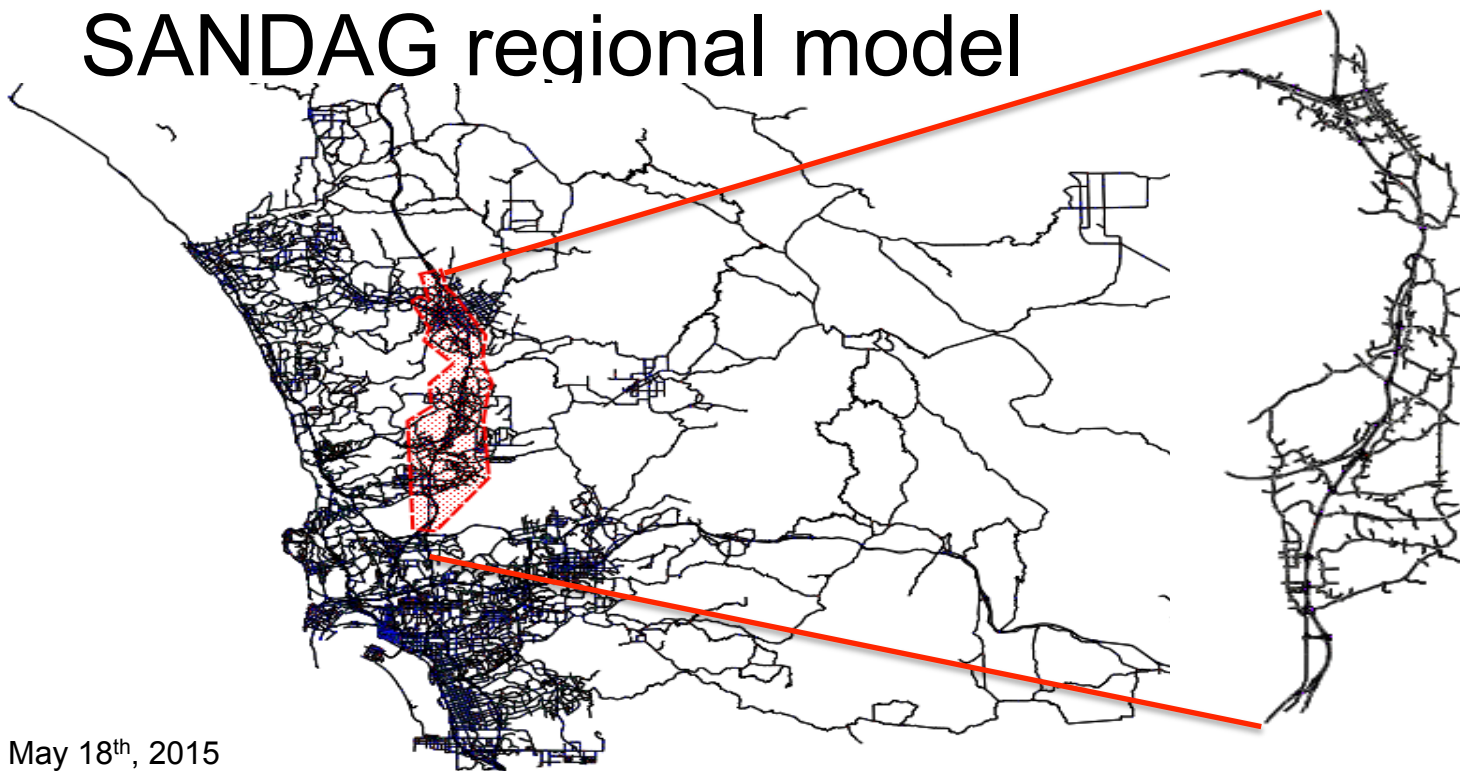


- **Measures**
  - Intersection
  - Ramp Meter
  - Express Lanes
  - Sections
  - Transit
  - Routes
- **Targets (within 15%)**
  - 0-15 minutes 92%
  - 15-30 minutes 80%
  - 30-60 minutes 40%



# The integrated approach

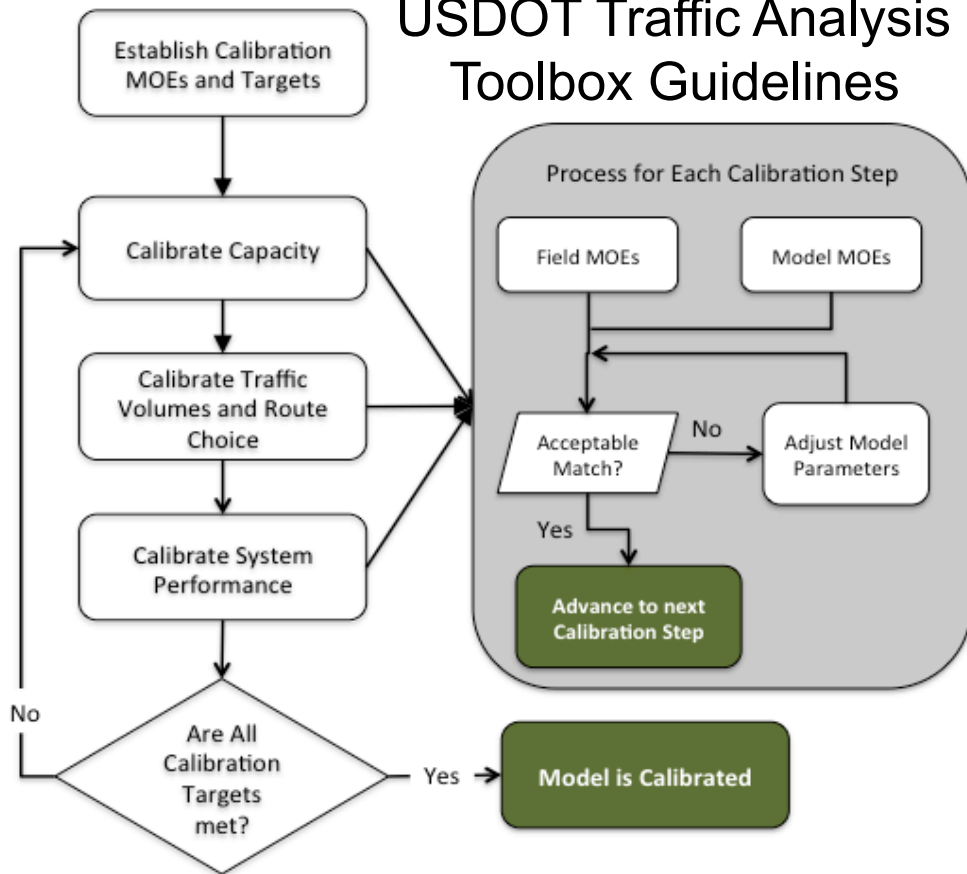
- I-15 ICM Macro model imported from SANDAG regional model





# Offline Model Calibration

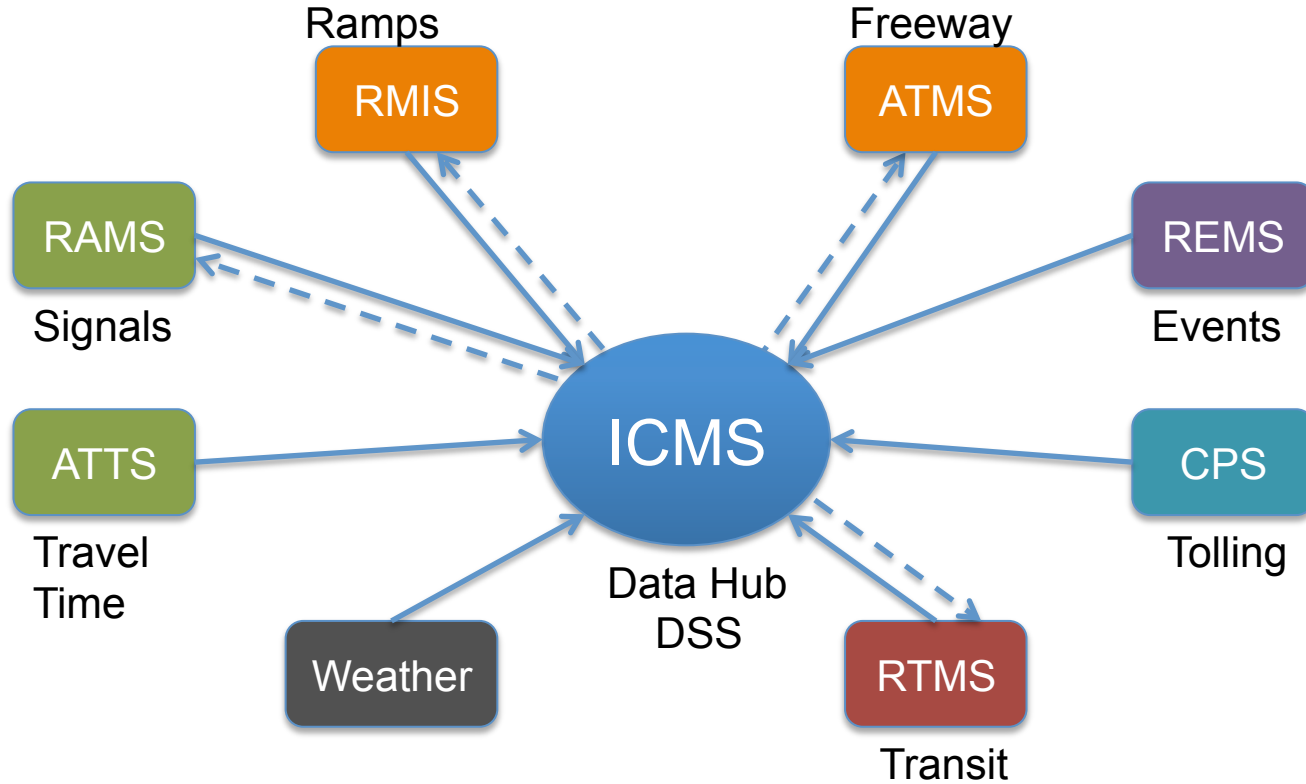
## USDOT Traffic Analysis Toolbox Guidelines







# Data Inputs and Outputs





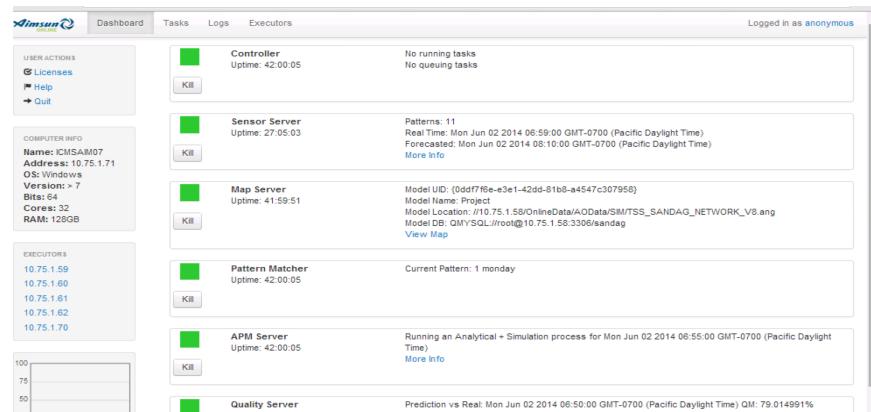
# Offline Model Validation

MOE Criteria	Calibration Acceptance Targets
<b>Capacity (Model versus Observed)</b>	
Lane Capacity (veh/hr)	Within 15% for >85%
Visual Audit	Visual acceptance of bottleneck development to analyst's satisfaction
<b>Hourly Traffic Volumes (Model versus Observed)</b>	
>2,000 veh/hr	Within 15% of field flow for >85% of all cases
750 – 2000 veh/hr	Within 15% of field flow for >75% of all cases
<750 veh/hr	Within 15% or under 150 veh/hr field flow for >75% of all cases
Sum of all link flows	Within 5% of sum of all link counts
<b>System Performance</b>	
Journey Times, Network	Within 15% of observed travel times for >85% of all cases
Speed Contours	Visually acceptable freeway based speed contour comparison to SANDAG's satisfaction
Individual Link Speeds	Visually acceptable speed-flow relationship to SANDAG's satisfaction
Bottlenecks	Visually acceptable queuing to SANDAG's satisfaction



# 24/7 Model

- 11 Day Patterns
  - Weekdays
  - Holidays
  - Rainy Days
  - Special events
- 15 – Minute data sets
- Runs every 5 minutes



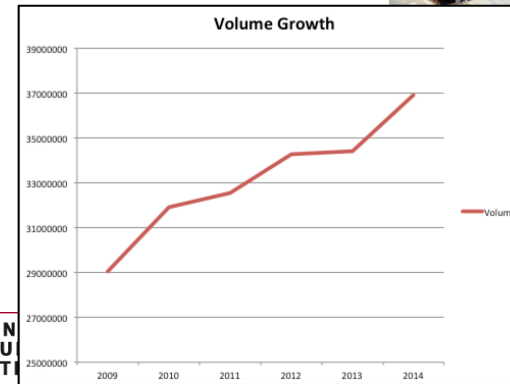
Aimsun Online Dashboard



# Maintaining the Model

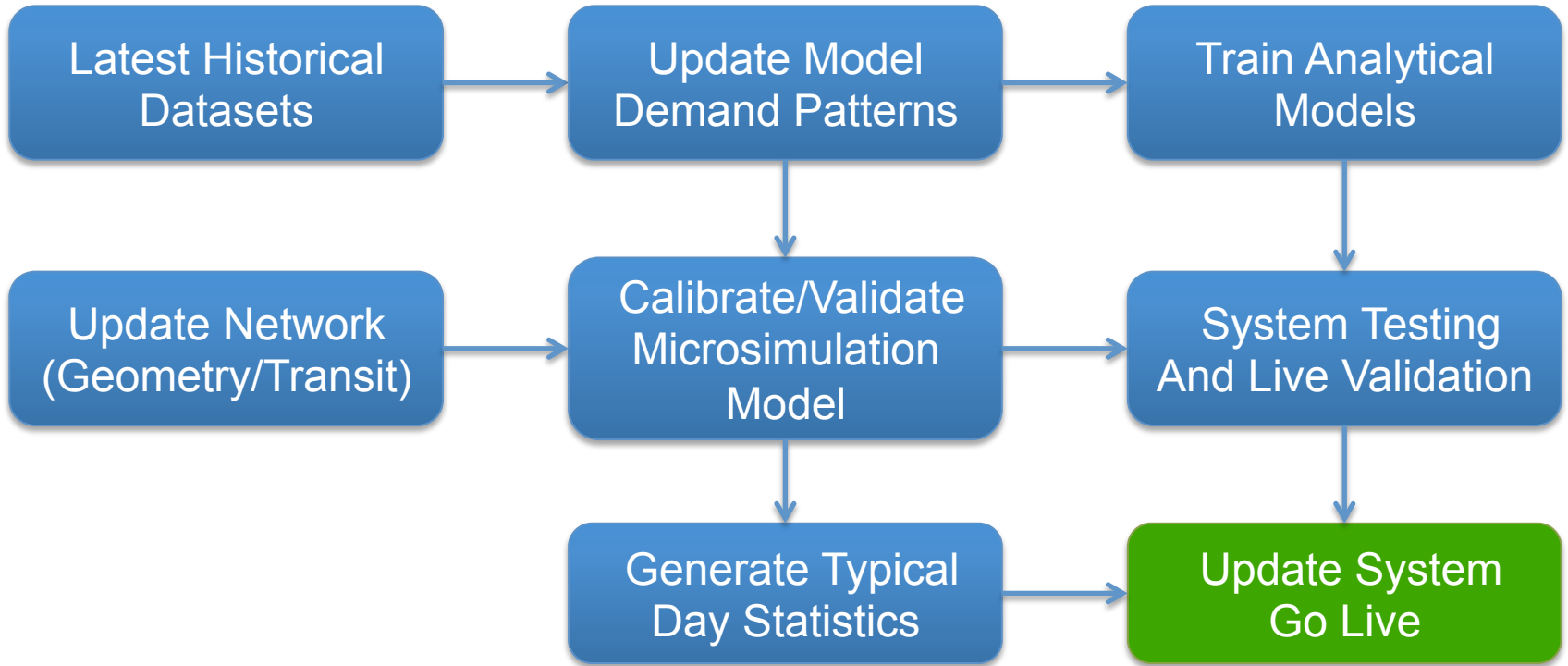
## Reasons for Model Updates

- Change in travel patterns and demands;
- New Infrastructure;
- New ITS systems;
- New Public Transit;
- New Developments;





# Maintenance Flow





# Aimsun Online Dashboard



Dashboard

Tasks

Logs

Executors

Logged in as anonymous

### USER ACTIONS

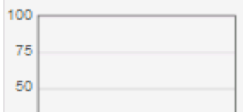
- Licenses
- Help
- Quit

### COMPUTER INFO

Name: ICMSAIM07  
 Address: 10.75.1.71  
 OS: Windows  
 Version: > 7  
 Bits: 64  
 Cores: 32  
 RAM: 128GB

### EXECUTORS

10.75.1.59  
 10.75.1.60  
 10.75.1.61  
 10.75.1.62  
 10.75.1.70



	<b>Controller</b> Uptime: 42:00:05	No running tasks No queuing tasks
<input type="button" value="Kill"/>		
	<b>Sensor Server</b> Uptime: 27:05:03	Patterns: 11 Real Time: Mon Jun 02 2014 06:59:00 GMT-0700 (Pacific Daylight Time) Forecasted: Mon Jun 02 2014 08:10:00 GMT-0700 (Pacific Daylight Time) <a href="#">More Info</a>
<input type="button" value="Kill"/>		
	<b>Map Server</b> Uptime: 41:59:51	Model UID: {0ddf7f6e-e3e1-42dd-81b8-a4547c307958} Model Name: Project Model Location: //10.75.1.58/OnlineData/AOData/SIM/TSS_SANDAG_NETWORK_V8.ang Model DB: QMYSQL://root@10.75.1.58:3306/sandag <a href="#">View Map</a>
<input type="button" value="Kill"/>		
	<b>Pattern Matcher</b> Uptime: 42:00:05	Current Pattern: 1 monday
<input type="button" value="Kill"/>		
	<b>APM Server</b> Uptime: 42:00:05	Running an Analytical + Simulation process for Mon Jun 02 2014 06:55:00 GMT-0700 (Pacific Daylight Time) <a href="#">More Info</a>
<input type="button" value="Kill"/>		
	<b>Quality Server</b>	Prediction vs Real: Mon Jun 02 2014 06:50:00 GMT-0700 (Pacific Daylight Time) QM: 79.014991%



# Status/Progress Tracker

Dashboard **Tasks** Logs Executors Logged in as anonymous

10 records per page Search:

**USER ACTIONS**

- Licenses
- Help
- Quit

**COMPUTER INFO**

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Address: 10.75.1.71  
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**EXECUTORS**

- 10.75.1.59
- 10.75.1.60
- 10.75.1.61
- 10.75.1.62
- 10.75.1.70

Pack	Name	Executor	Status
6802	Response Plan 0-625918	<a href="http://10.75.1.61:9065">http://10.75.1.61:9065</a> Log	<div style="width: 80%; height: 15px; background-color: #ccc;"></div>
6802	Response Plan 18791-625918	<a href="http://10.75.1.62:9065">http://10.75.1.62:9065</a> Log	<div style="width: 80%; height: 15px; background-color: #ccc;"></div>
6802	Response Plan 18790-625918	<a href="http://10.75.1.70:9065">http://10.75.1.70:9065</a> Log	Finished in 239 seconds
6802	Response Plan 18792-625918	<a href="http://10.75.1.59:9065">http://10.75.1.59:9065</a> Log	Finished in 265 seconds
6801	Response Plan 0-625929	<a href="http://10.75.1.60:9065">http://10.75.1.60:9065</a> Log	Finished in 265 seconds
6801	Response Plan 18786-625929	<a href="http://10.75.1.62:9065">http://10.75.1.62:9065</a> Log	Finished in 261 seconds
6801	Response Plan 18788-625929	<a href="http://10.75.1.61:9065">http://10.75.1.61:9065</a> Log	Finished in 272 seconds
6801	Response Plan 18787-625929	<a href="http://10.75.1.70:9065">http://10.75.1.70:9065</a> Log	Finished in 241 seconds
6800	Response Plan 18783-625919	<a href="http://10.75.1.60:9065">http://10.75.1.60:9065</a> Log	Finished in 257 seconds



# Real Time Validation Data

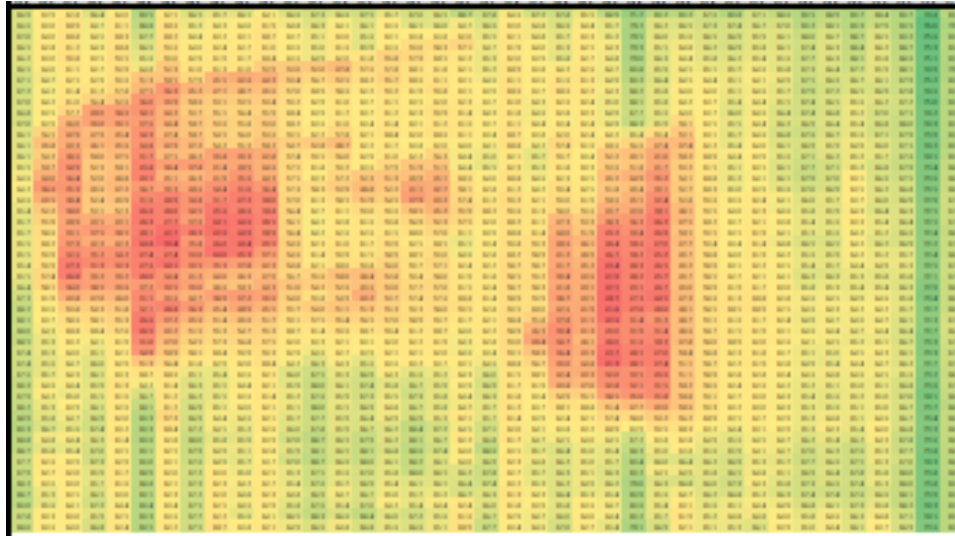
- Speed
- Count (with 15%; R<sup>2</sup>; Slope)

Simulation Time ▼	Global QM ↕	QM 15 minutes ↗	QM 30 minutes ↗
2015-05-11T15:05:00.000Z	68.034359	66.187873	74.41322
2015-05-11T15:00:00.000Z	66.058729	62.885971	70.875246
2015-05-11T14:55:00.000Z	66.479892	61.04637	66.763813
2015-05-11T14:50:00.000Z	67.594314	66.812881	67.1158
2015-05-11T14:45:00.000Z	66.077082	67.866841	64.101629





# Speed Contours



Real Data

VS



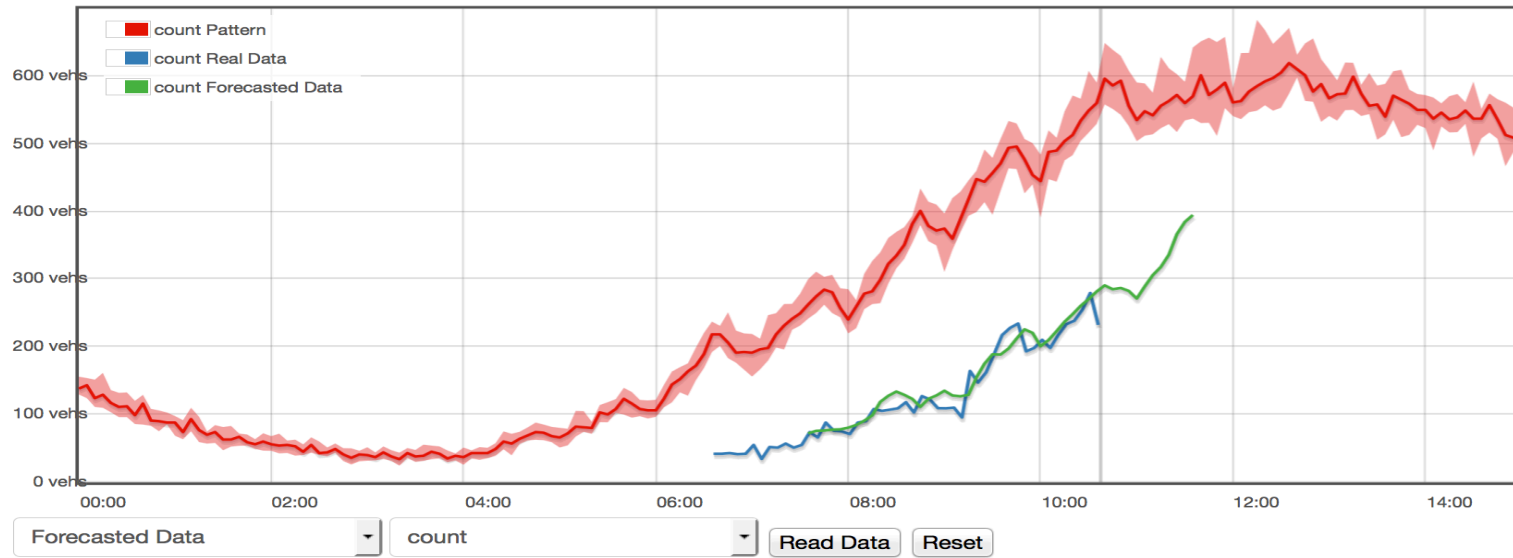
Predicted Data



# Real Time VDS Tracking

- Sensor Server – Live Detector Quality

243906





# Questions

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