

# *From Performance Measures to Performance Management of our Arterial Systems*

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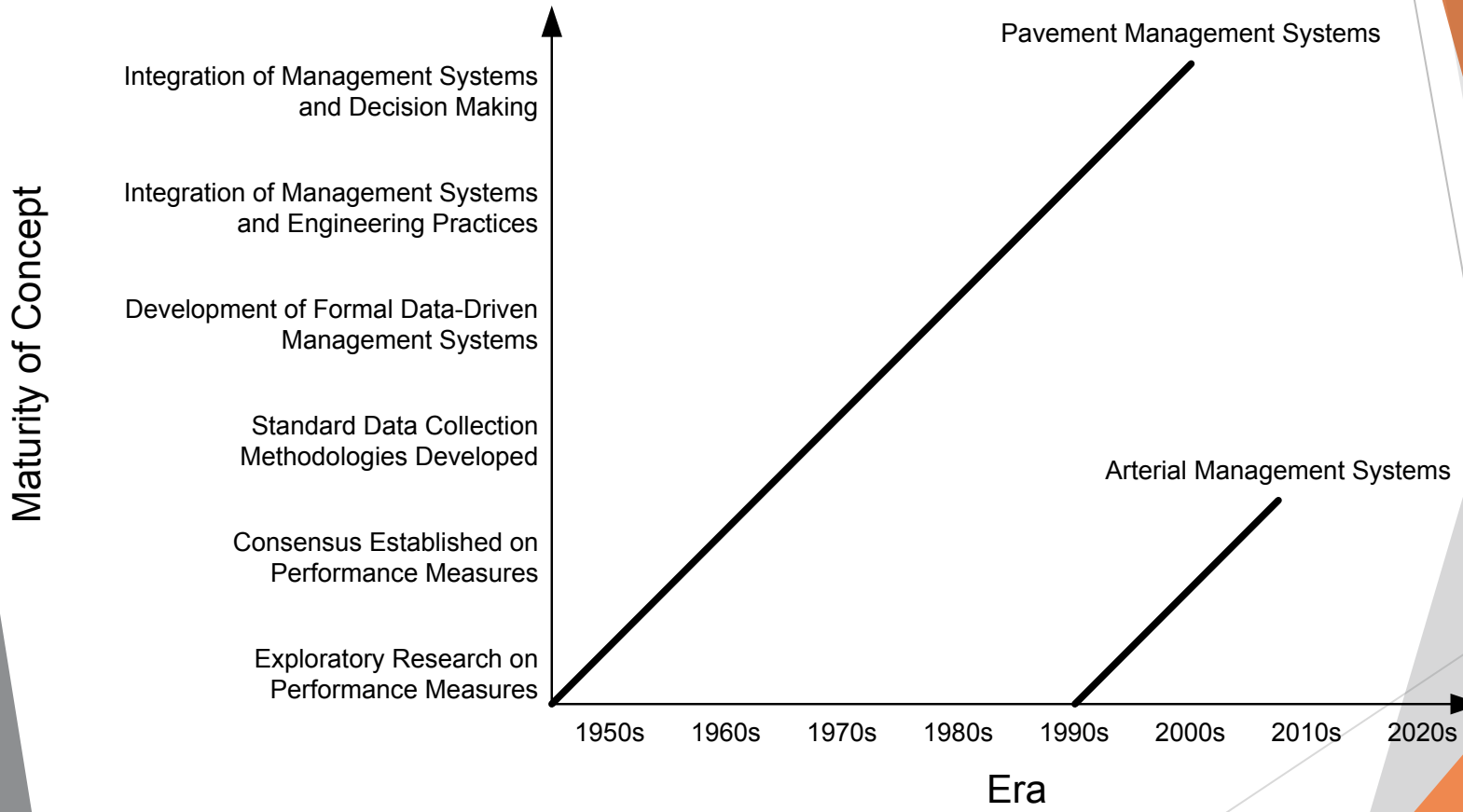
Center for Advanced Transportation Technology

Traffax Inc.

# Background

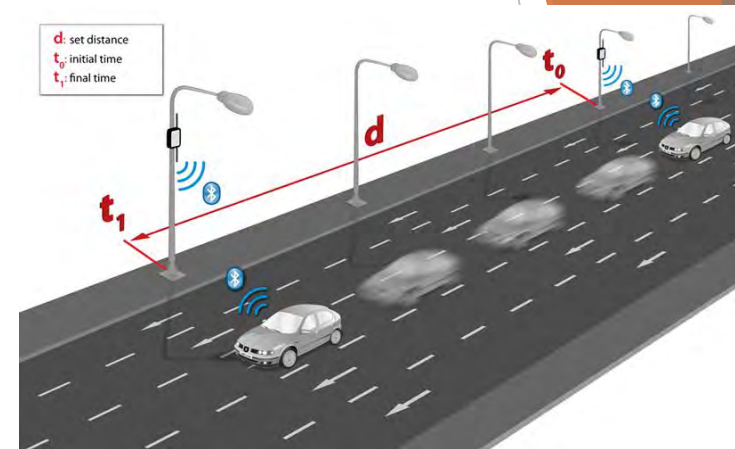
- ▶ Initiative resulted from FHWA Small Business Innovative Research (SBIR) partnership between Purdue University and Traffax Inc.
- ▶ Informed by extensive probe data validation at UMD with the I95 Corridor Coalition's Vehicle Probe Project (VPP)
- ▶ Goal is to create an operational framework for arterial performance management

# Current State of Arterial Management Systems (AMS)



# Re-Identification Data (Bluetooth)

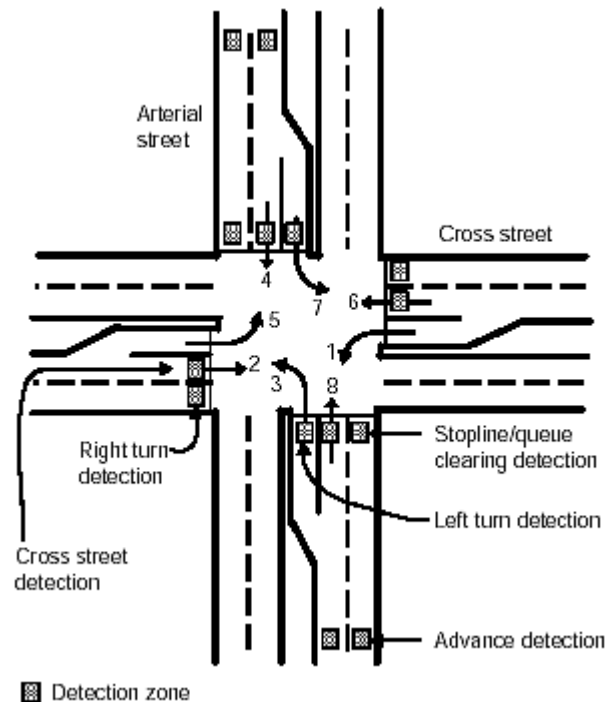
- ▶ Uses a ID unique to a vehicle (MAC ID of a Bluetooth device inside vehicle)
- ▶ An initial detector identifies when a vehicle enters a corridor by the vehicle's ID
- ▶ Another detector *re-identifies* the vehicle at the end of the corridor
- ▶ Travel time/ speed can be directly calculated from the entry and exit time



Car	MAC address	Entry Time hh:mm:ss	Exit Time hh:mm:ss
1	12-34-56-78-9A-BC	13:10:05	13:15:37
2	48-2C-6A-1E-59-3D	13:10:10	13:15:25

# High Resolution Signal Data

- ▶ Actuated signals adjust signal phasing based on the vehicles it detects in proximity of the intersection
- ▶ Modern actuated traffic signals record traffic data while they operate
- ▶ Time-stamped data can include signal phase lengths, occupancy/volume, % of vehicles arrive on a green, delay estimates



Picture Source: FHWA

# Comparison

## Re-Id (Bluetooth)

<Available Now - Cost Effective>

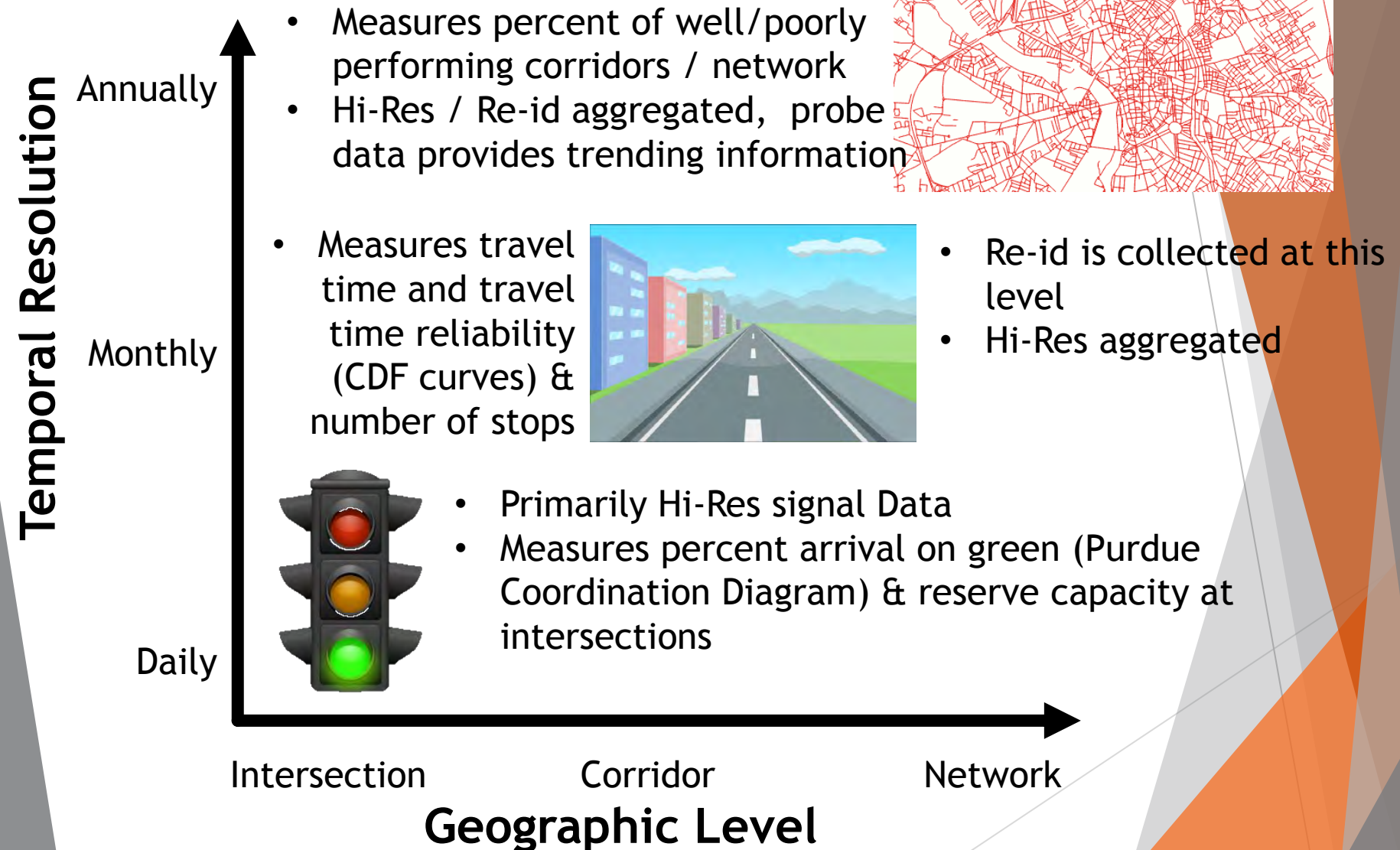
- ▶ Captures *some* vehicle trajectories (5% for BT)
- ▶ Assess Travel Time
  - \* Corridor Efficiencies
- ▶ Independent of Signal Systems

## High-Res (Signal Data)

- ▶ Logs *all* actuation and phasing information
- ▶ Counts Vehicles
  - \* Signal/Timing Efficiency
- <No need to model>
- ▶ Integrated with Signal System

**Not one or the other... but both!**

# Scalable Performance Measures



# Real-Time APMs

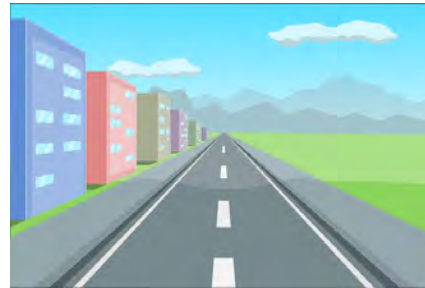
Temporal Resolution

Hourly

- Similar to highway operations, extended to primary arterial network, incident identification / management & traveler info



- Change signal plans to adjust to irregularities



- Advise traffic engineering of timing deficiencies

Minute  
-by-  
Minute



- Impact of diversions
- Volume fluctuations
- Adjust phase lengths

Intersection

Corridor

Network

Geographic Level



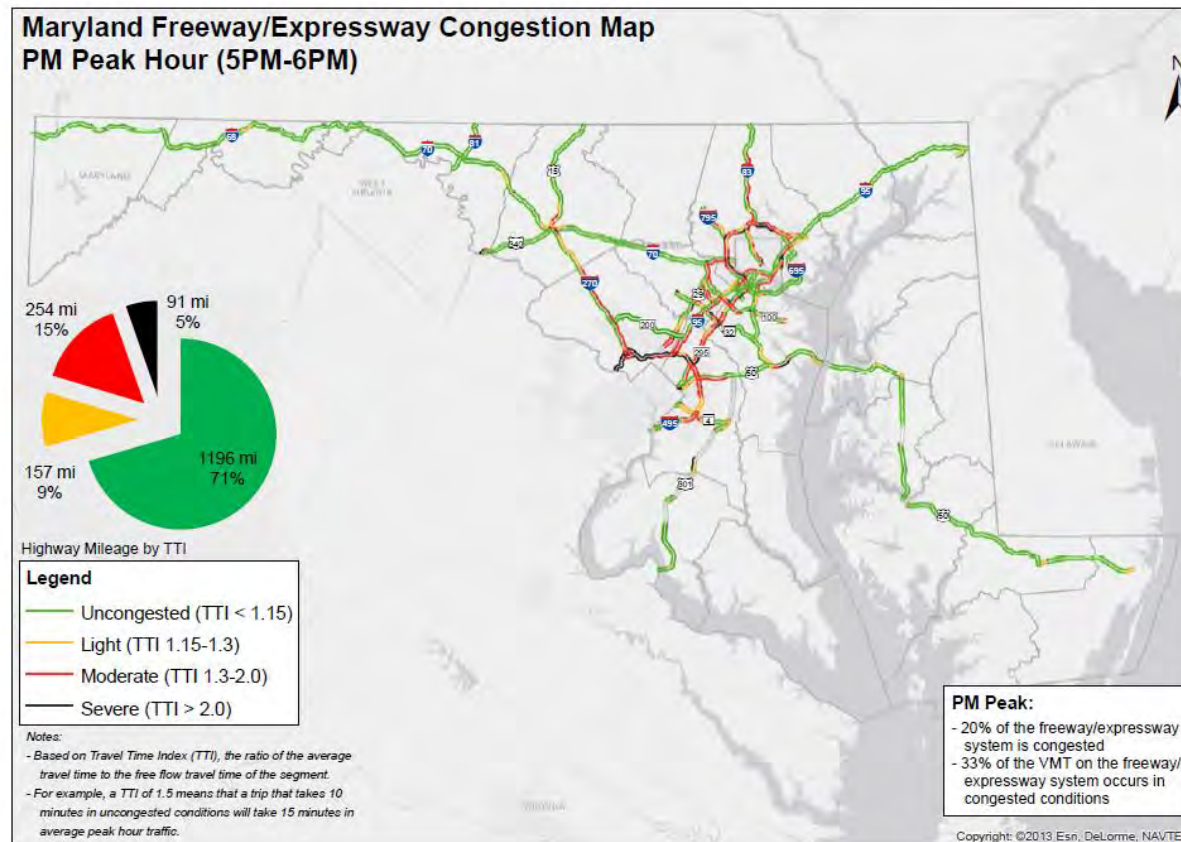
# Scalable Performance Measures

- ▶ Intersection Level
  - ▶ Percent Arrival on Green (Purdue Coordination Diagram)
  - ▶ Volumes and Reserve Capacity at Intersections
  - ▶ Data collected via advanced signal control system
- ▶ Corridor Level
  - ▶ Travel time & Travel time reliability (CDF Curves)
  - ▶ Number of stops / quality of progression
  - ▶ Data collected via re-identification data
- ▶ Network Level
  - ▶ Percent of well/poorly performing corridors
  - ▶ Data Collected via broad-based probe data

# Sample Metric - Network Level Percentile Based Performance Measures

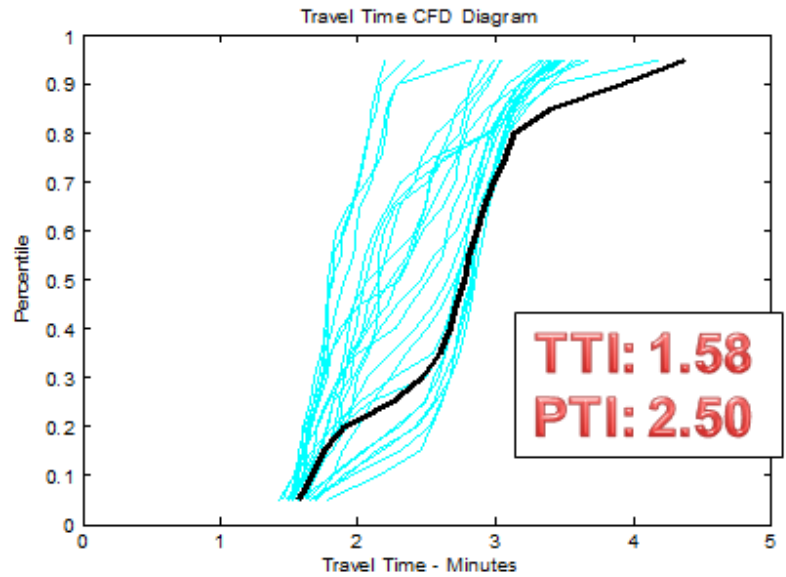
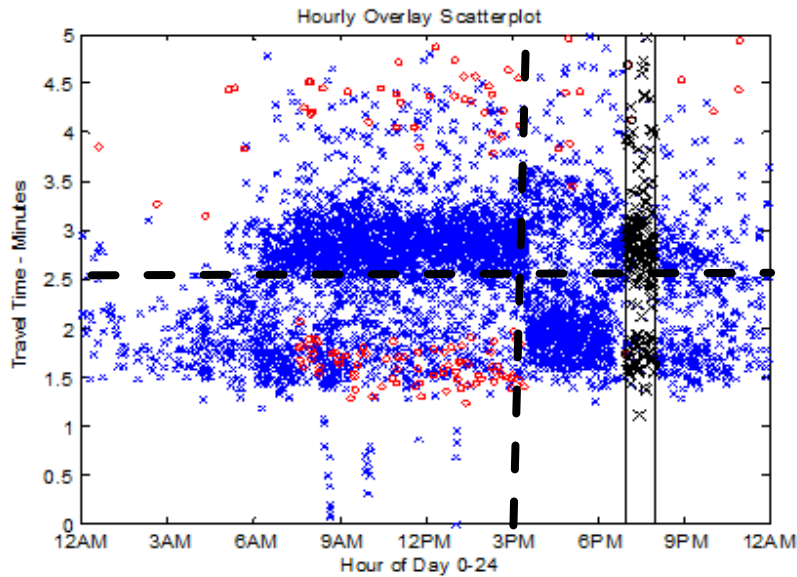
## 2013 *Maryland* State Highway Mobility Report

Figure 2



# Sample Metric - Corridor

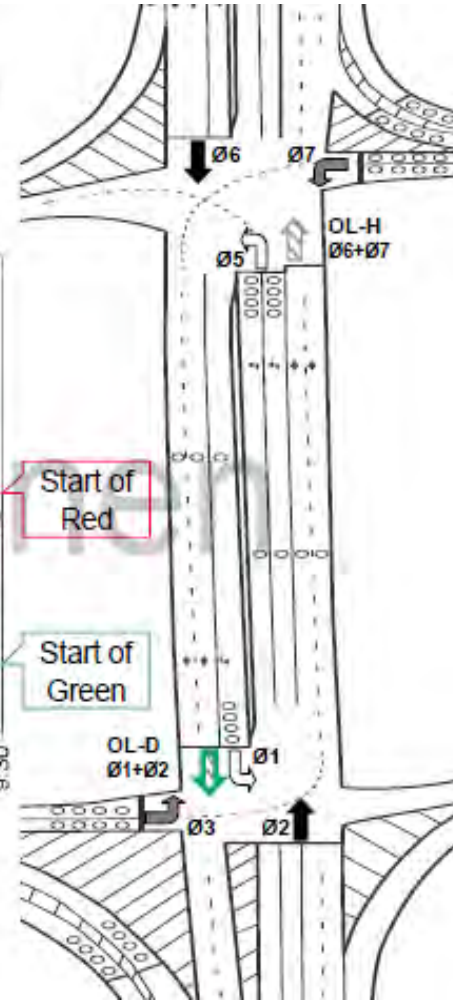
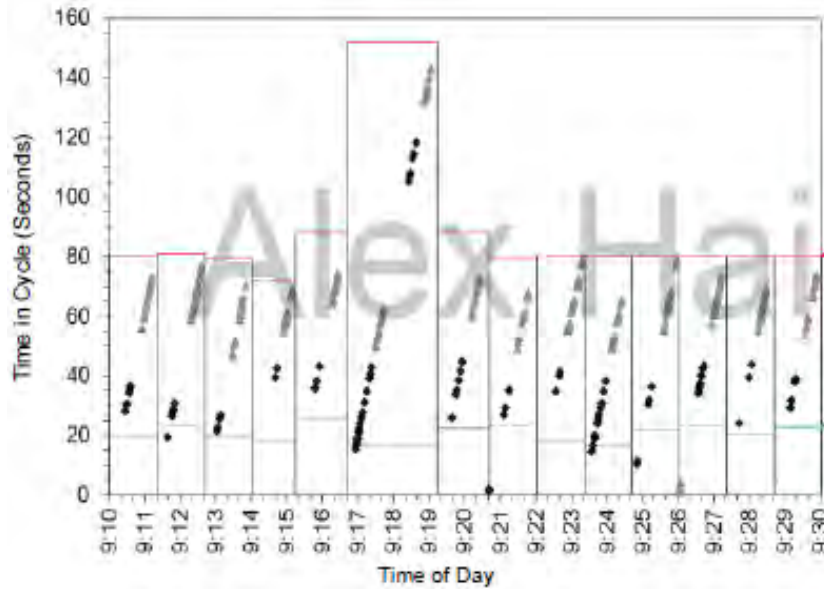
## Travel Time Distributions



# Sample Metric - Intersection Purdue Coordination Diagram

## Purdue Coordination Diagram

*Also Useful to Visualize Arrivals on Green*



# Benefits

- ▶ Created a language between traffic engineers and management to establish goals, measure performance, and manage the system
- ▶ Link performance to budget/funding
- ▶ Systematic approach to arterial management
  - ▶ Long term performance tracking
  - ▶ Better utilization of professional staff
  - ▶ Organizational maturity

# Contact

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