Signal Connectivity
Bringing Data Back

December 12th, 2019

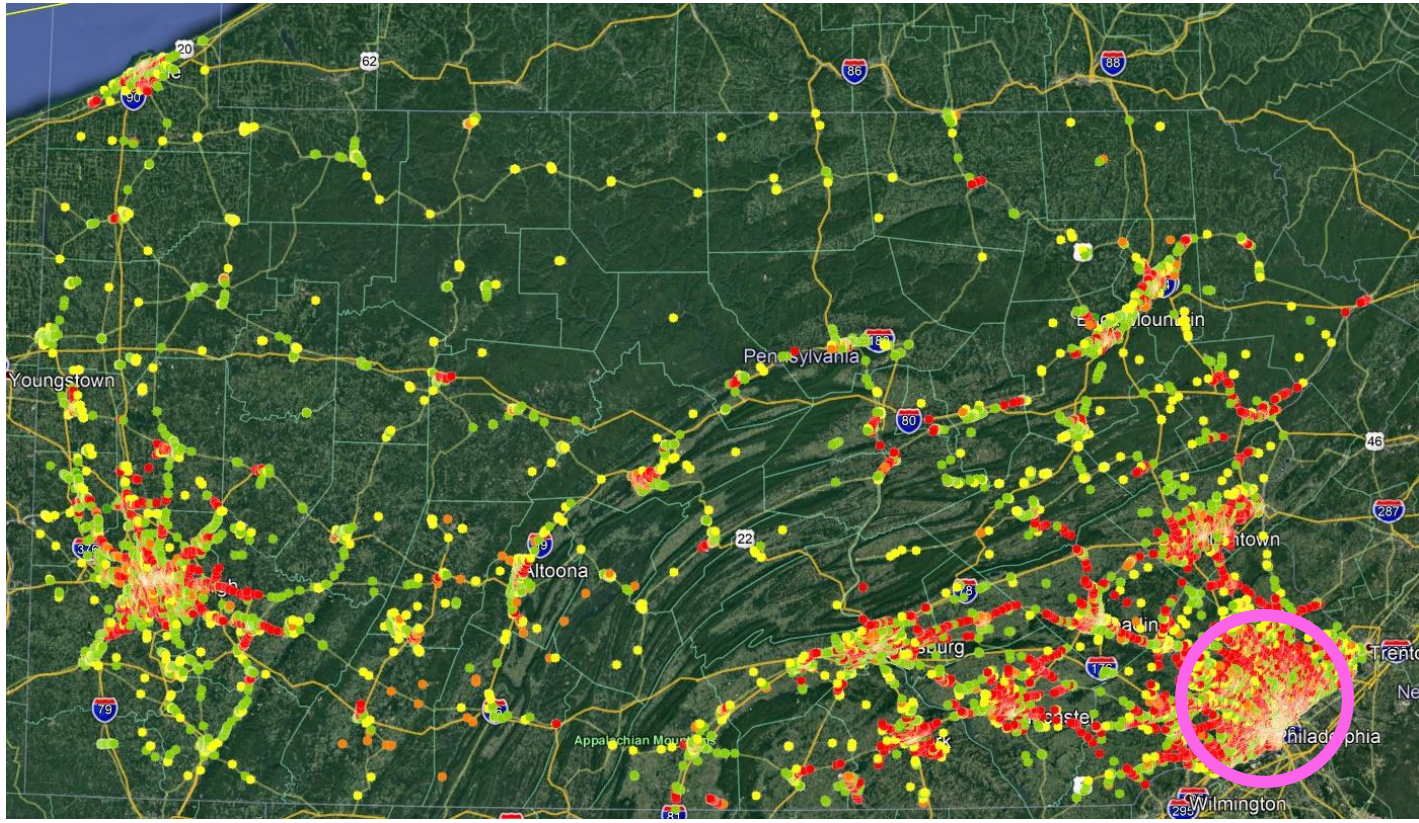
Presenters:
Gunnar Rhone
Steve Gault, PE, PTOE

Agenda

- Introduction
- Opportunities
- Prioritizing Signals
- Challenges
- Next Steps

Introduction

- Over 14,000 signals
- Identify barriers for bringing data from the signalized intersections in the field to the PennDOT network.
- Scope:
  - Planning
    - Uses cases
    - Requirements
  - Design
    - Field - Communication equipment
    - Backoffice
    - Backhaul communication methods
    - Potential cost (capital and recurring)



Opportunities

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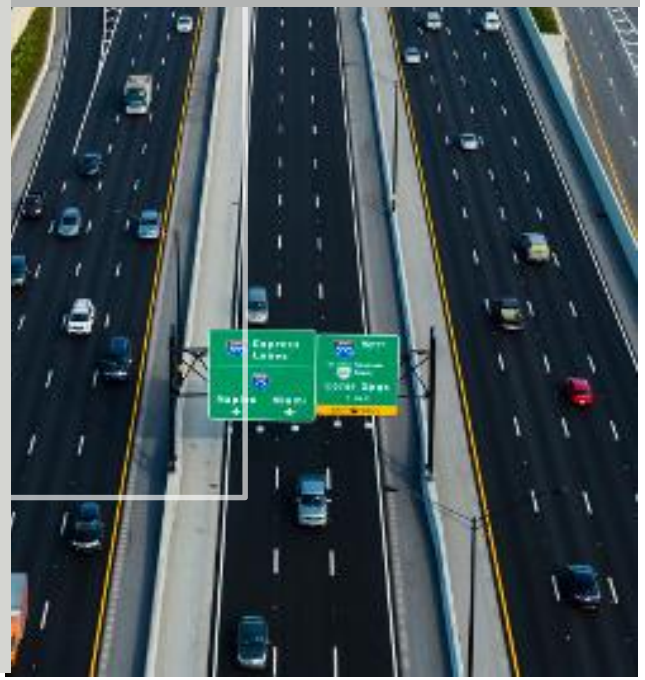


Opportunities - Use Cases

Real-Time Signal Operations

Signal Performance

CV Applications

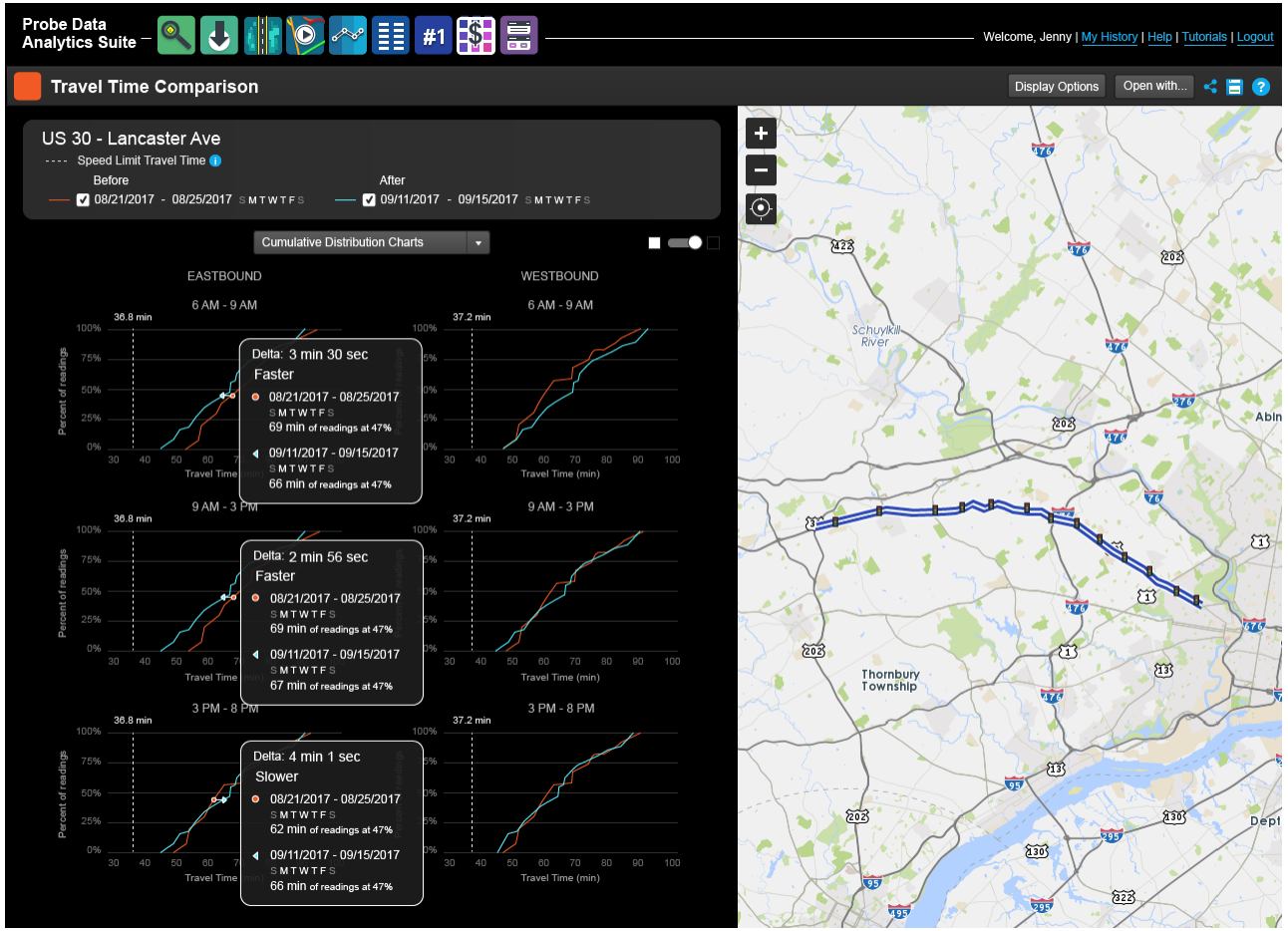
CV Research

Real-Time Signal Operations

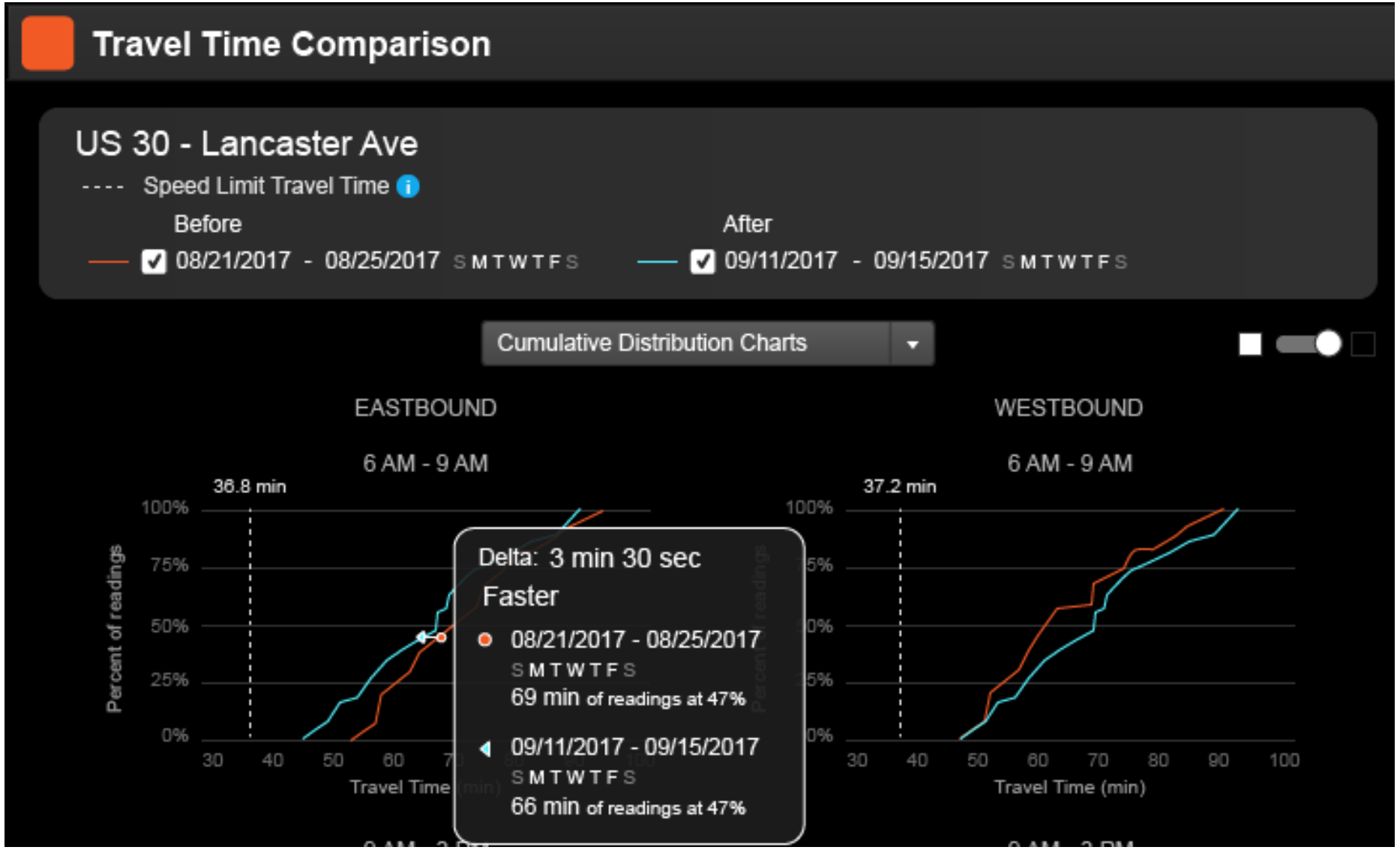
- Allows TMC operators to react to events in real time

Automated Traffic Signal Performance Measures

- Allows agencies to track signal performance using high-resolution data
- Allows agencies to adjust signal timings to achieve their agency goals
- Agency Goals:
  - Reducing delay, emissions, and fuel consumption
  - Reducing crashes and fatalities



Automated Traffic Signal Performance Measures

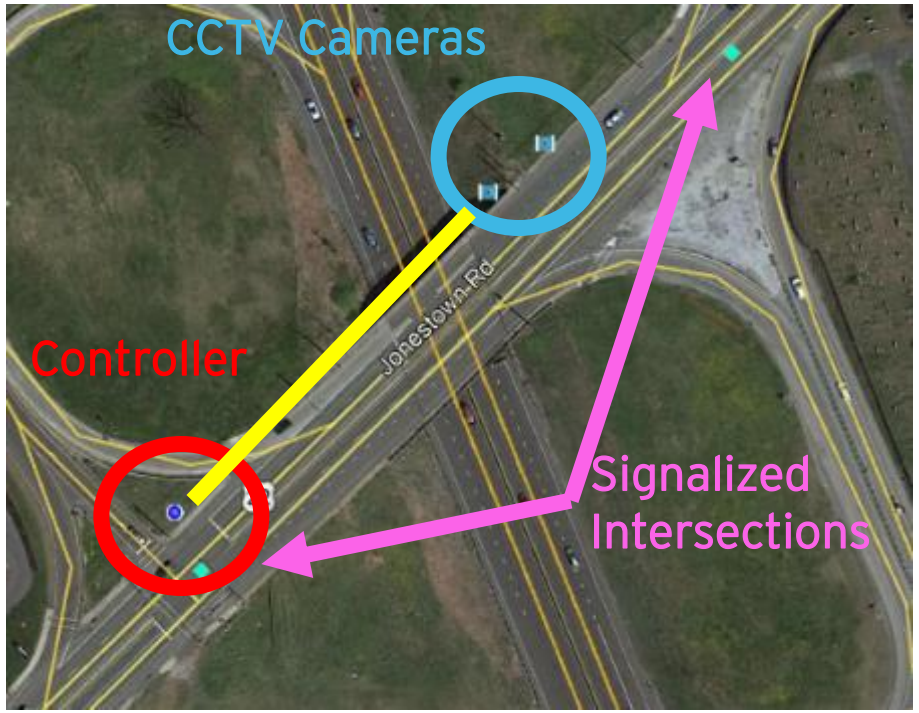


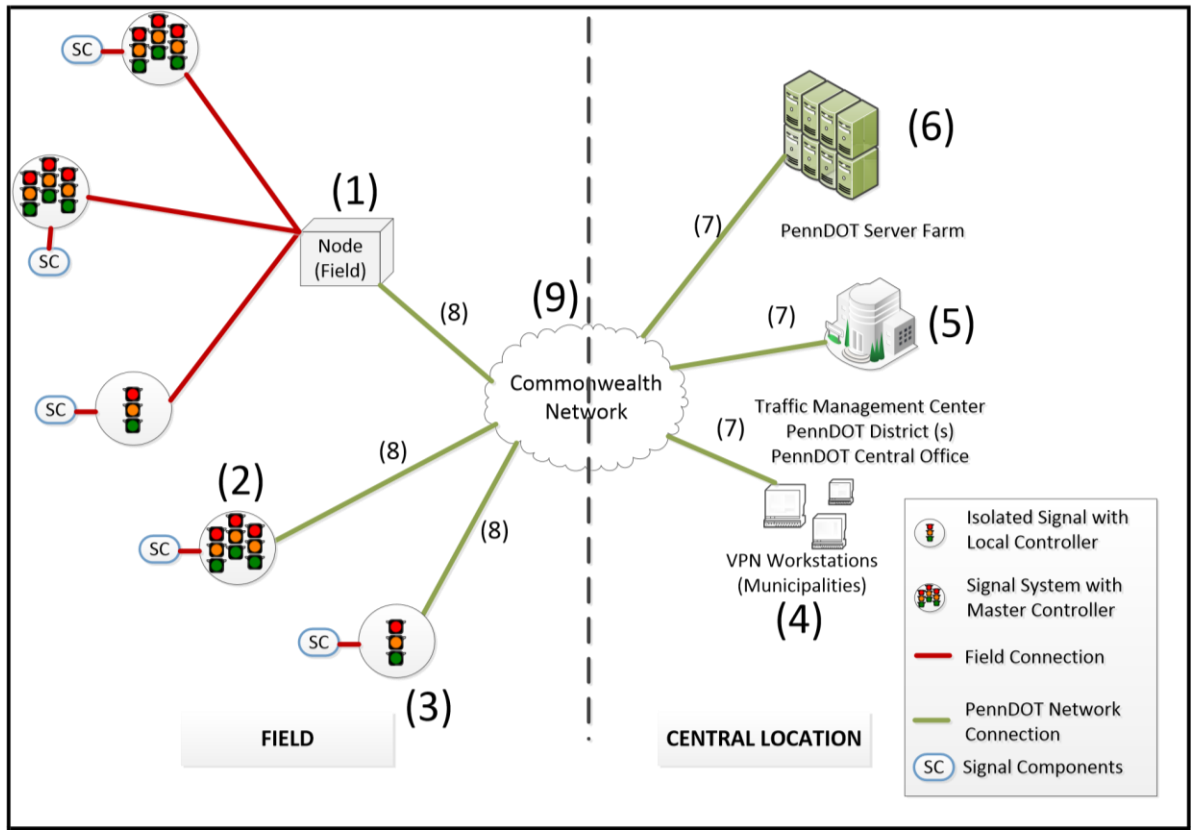
Connected Vehicle Use Cases

- Enables CV apps for signals
  - CV Traffic Signal System
  - Transit/Freight Signal Priority
  - Emergency Vehicle Preemption
  - Eco-Traffic Signal Timing
  - Eco-Approach and Departure at Signalized Intersections
  - Pedestrian and Cyclist Safety
  - Intersection Safety Warning and Collision Avoidance
  - Infrastructure Enhanced Cooperative Adaptive Cruise Control
  - Other CV applications not specific to signals

Commonwealth Network

- The Commonwealth Network is what connects PennDOT's central systems to the field systems
- All PennDOT ITS devices are currently already connected to the Commonwealth Network





Prioritizing Signals

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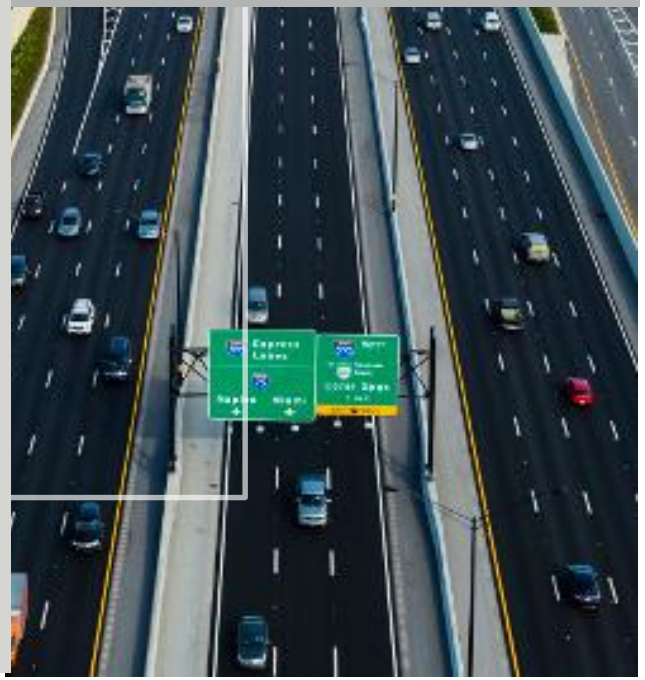


ATSPM/CV-Ready Controllers

Econolite Cobalt: Any version **ECO-127P, 128P & 129P**
Econolite ASC3 NEMA: v2.50+ & OS 1.14.03+ **ECO-116P**
Econolite 2070 w/ 1C CPU: v 32.50+

Peek ATC: Greenwave 03.05.0528+ **PTS-042P**

McCain ATC Omni eX 1.6+ **MCC-018P**

Trafficware Model 980**ATC:** v 76.10+ **TFW-011P**
Trafficware ATC Controller: v76.10+

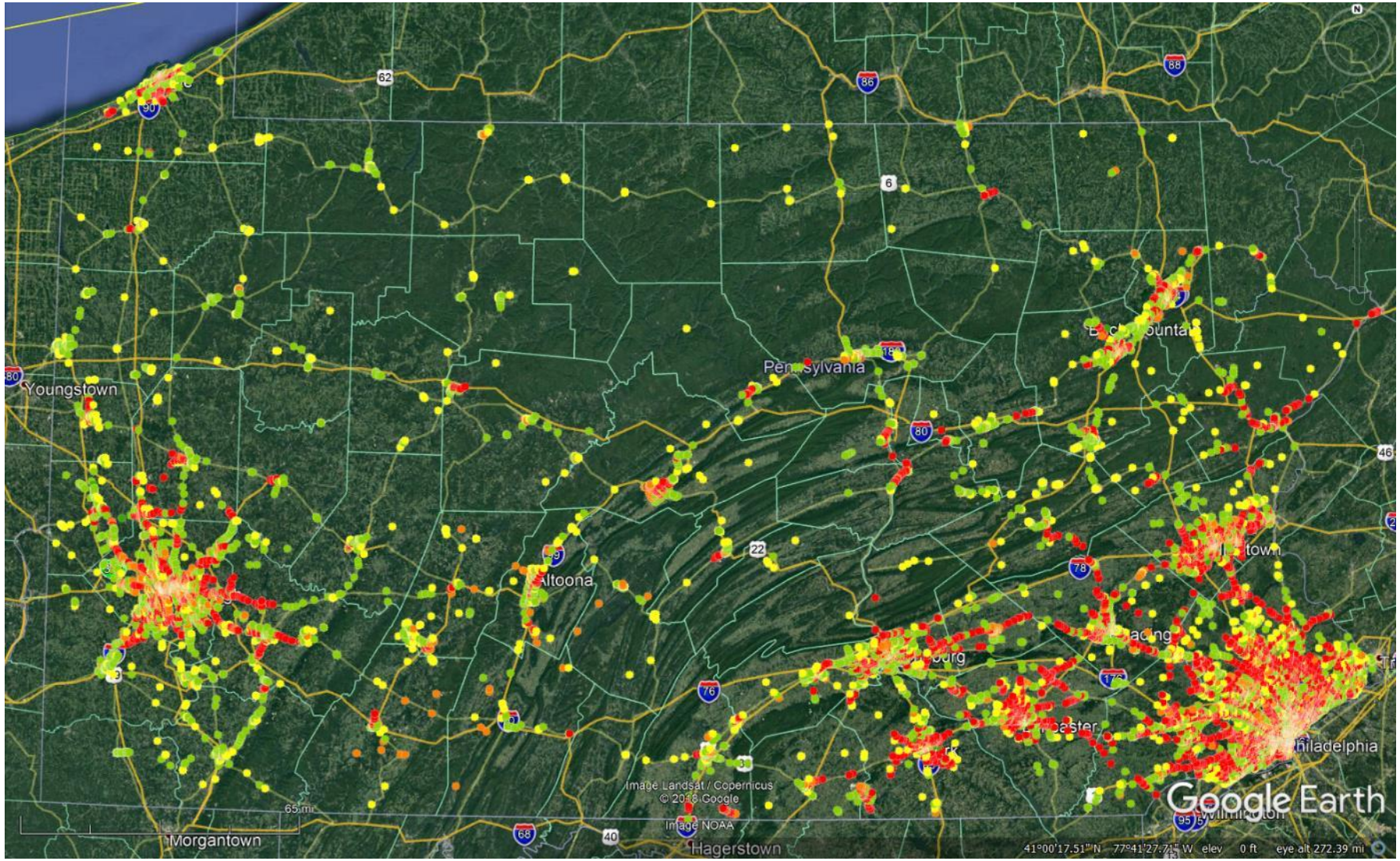
Intelight: Maxtime v1.7.0+ **INT-009P, 010P & 011P**

Siemens M50 *Linux*
Siemens M60 ATC **SMS-231P**
ECOM v 3.52+
NTCIP v 4.53+

Mapping

- Created a Google Earth file
  - Obtained TSAMS data from PennDOT
  - Mapped in ArcGIS
  - Created filterable map
  - Refined
- Allows filtering by corridor priority (based on ADT), distance to nearest ITS device, signal controller, signal connection

Initial Map



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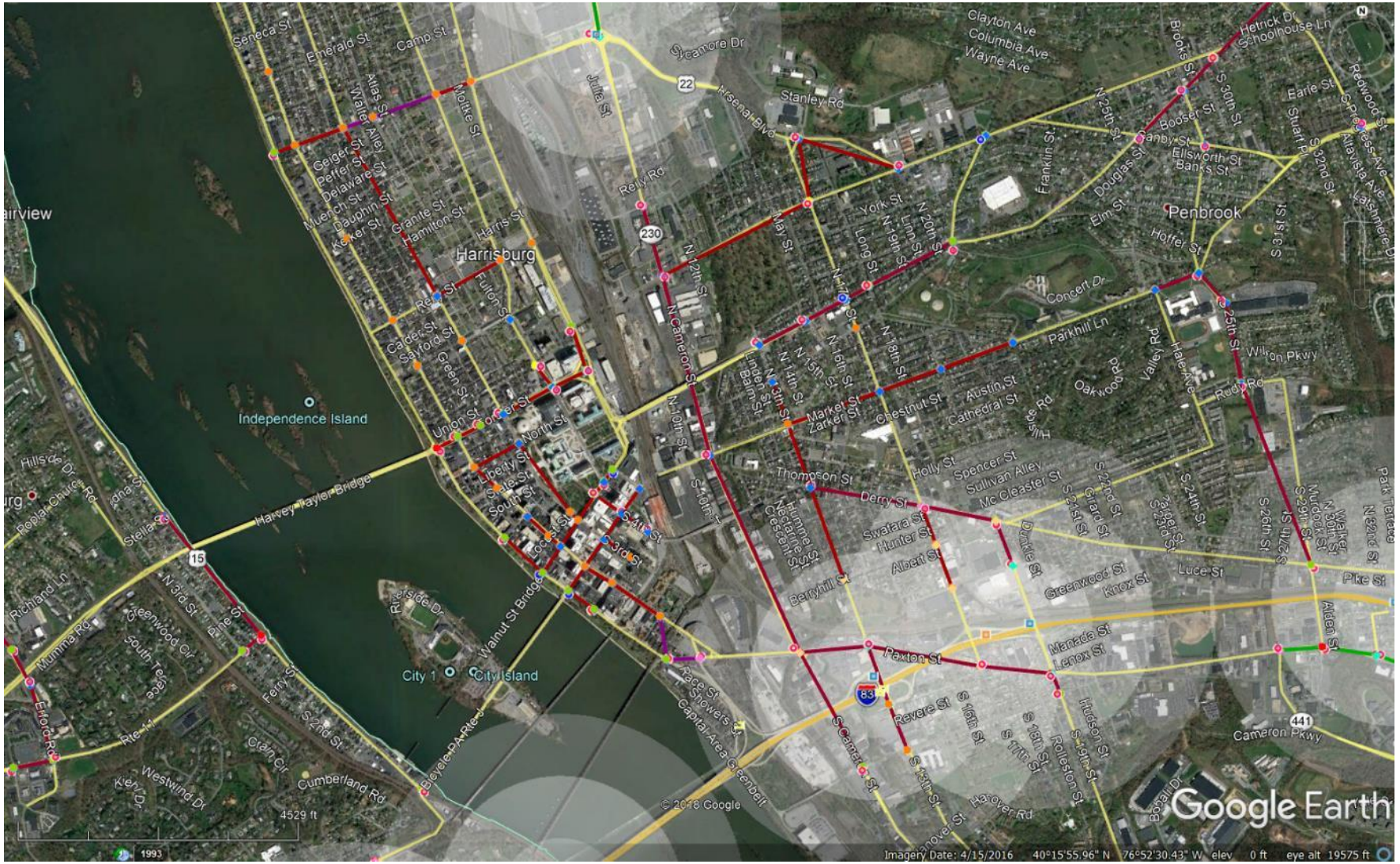
Map with Additional Information



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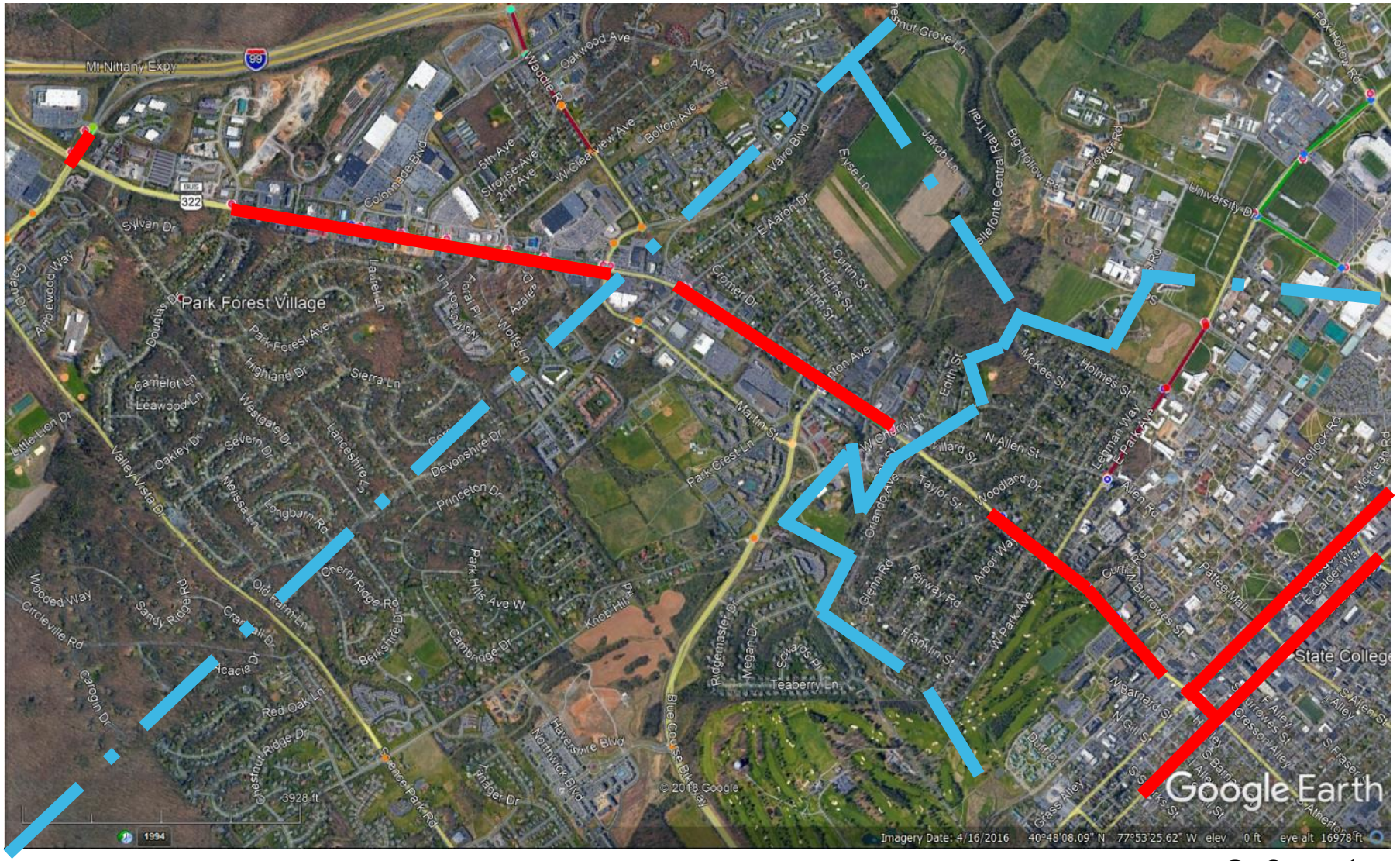
Municipal Boundary Challenges



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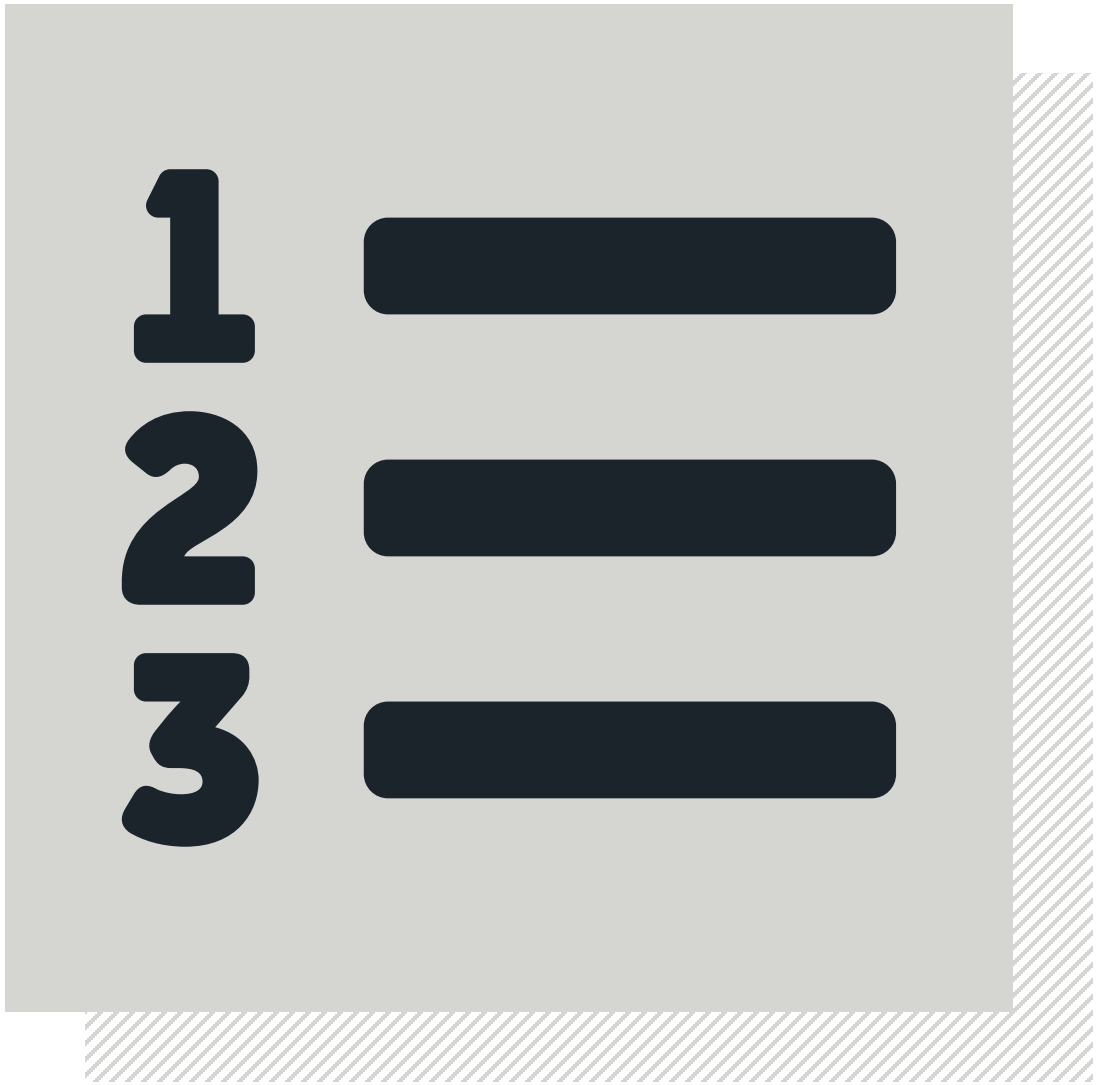
Prioritization Criteria

- Criteria:
  - Signal within 1000' of an existing ITS device
  - Super critical intersections (>20,000 AADT)
  - Existing signal controllers are ATSPM & CV ready
- About 30 signal networks identified as "quick wins"



Challenges

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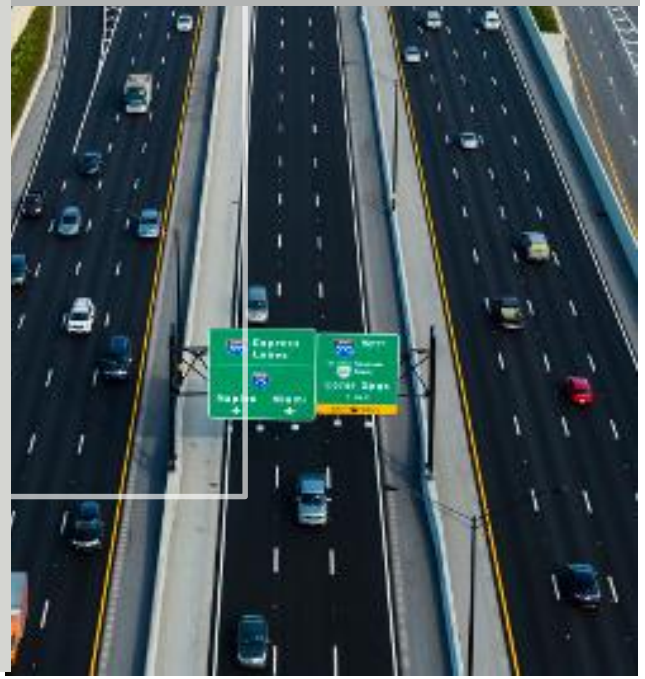

Challenges – Connection Logistics

Required Connection Type

- Determine bandwidth/frequency requirements
- Evaluate existing communication types

Municipal Agreements

- Connect Signals Over Municipal Boundaries

Required Hardware

- Determine signal hardware
- Determine network hardware and storage

Next Steps

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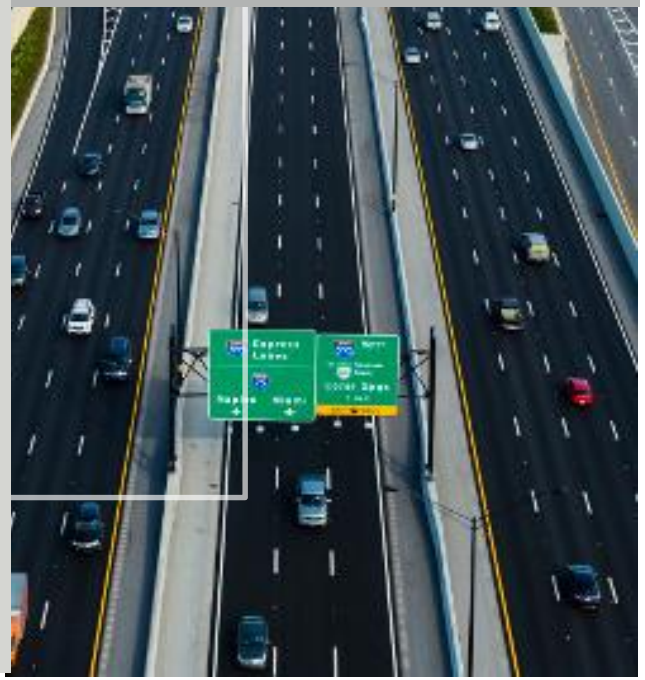
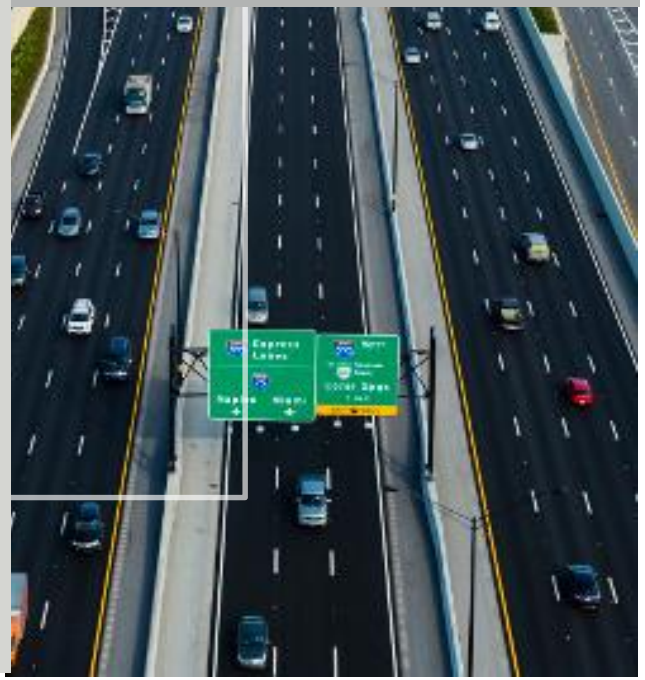


Next Steps

- Meet with PennDOT IT
- Finalize communication requirements
- Coordinate with municipalities
- Develop high-level design
- Develop tech memo

Steve Gault, PE, PTOE
Statewide Traffic Signal Operations Engineer
PennDOT
717-787-6988
sgault@pa.gov

Gunnar Rhone
Engineer II – ITS/Highway
HNTB
717-540-2675
grhone@hntb.com

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