

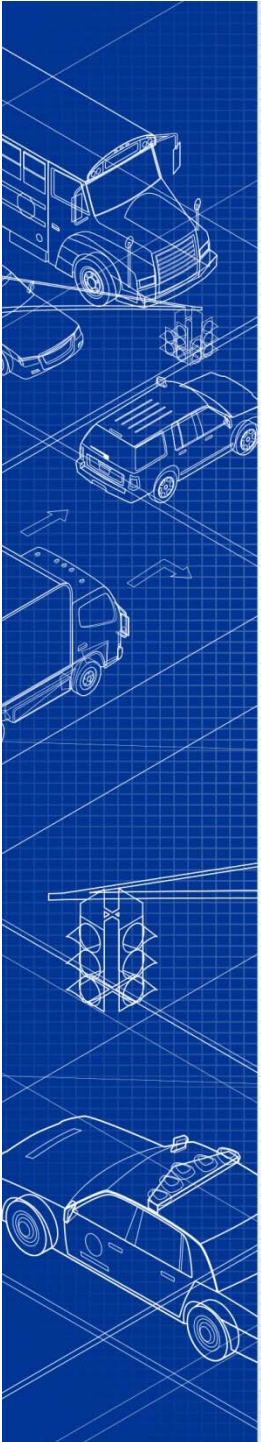


Expand the Capabilities of your Traffic Signal Management System by Centralizing EVP & TSP

Presented by: Ryan Saville

Rocky Mountain ITS and CO/WY ITE Joint Conference
October 5, 2017

Trusted Transportation Solutions





Traffic Signal Management Systems provide a powerful tool to monitor and operate an agencies traffic signals

Traffic Signal Management Systems

- Abilities of a system
 - Monitor
 - Control status
 - Communications
 - Error checking
 - Control
 - Central
 - Local time of day
 - Manual
 - Traffic Responsive
 - Traffic Adaptive
 - Manage
 - Upload/download controller databases
 - Manage timing schedules
 - Reports
 - Alerts
- Required Components:
 - Intersection infrastructure
 - Communications network
 - Central Server hosting the management system software

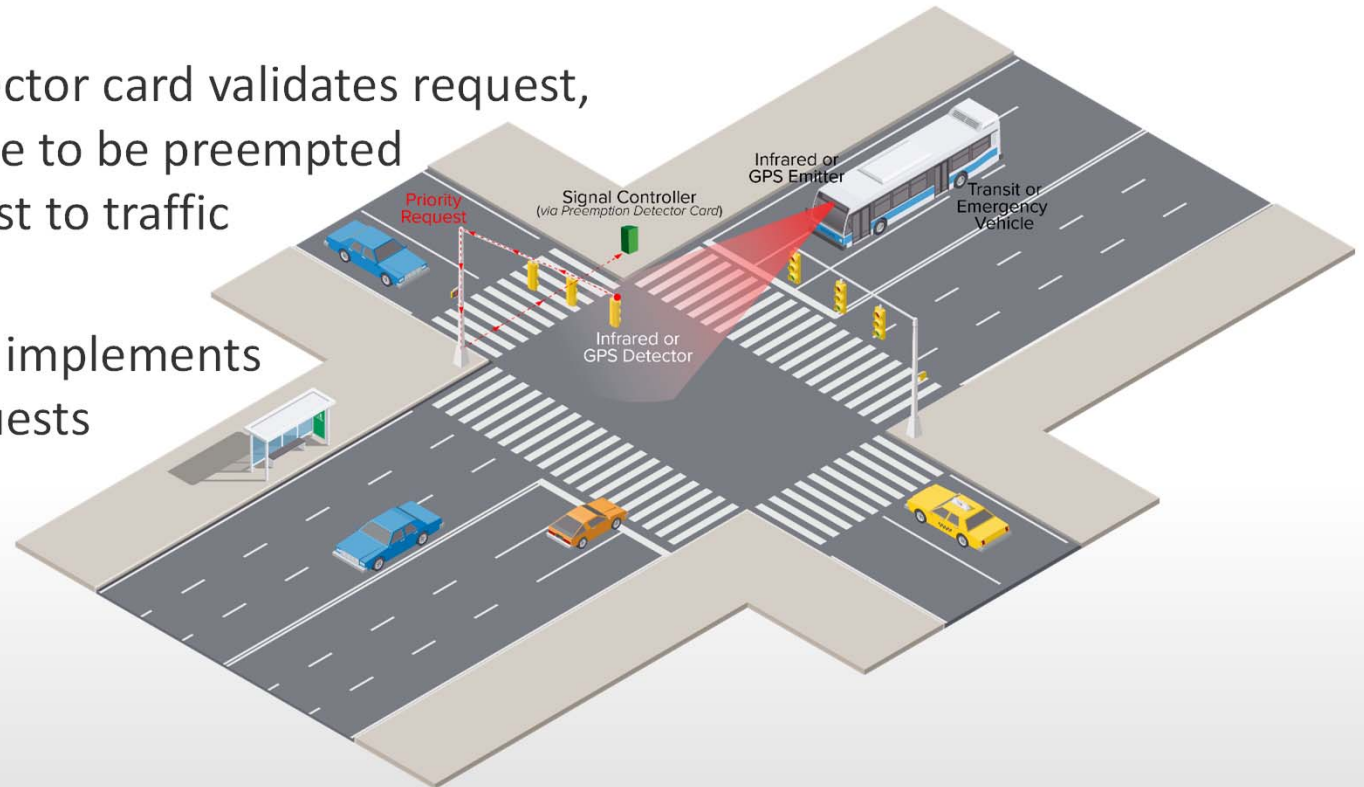
**But can it
do more?**

Enhanced Capabilities

- TransCore has embarked on 2 projects that leverage existing traffic signal management systems and expand their capabilities to provide new functionality
 - Central Transit Signal Priority (TSP)
 - New York City
 - Central Emergency Vehicle Preemption (EVP)
 - San Jose, CA

Traditional Operations

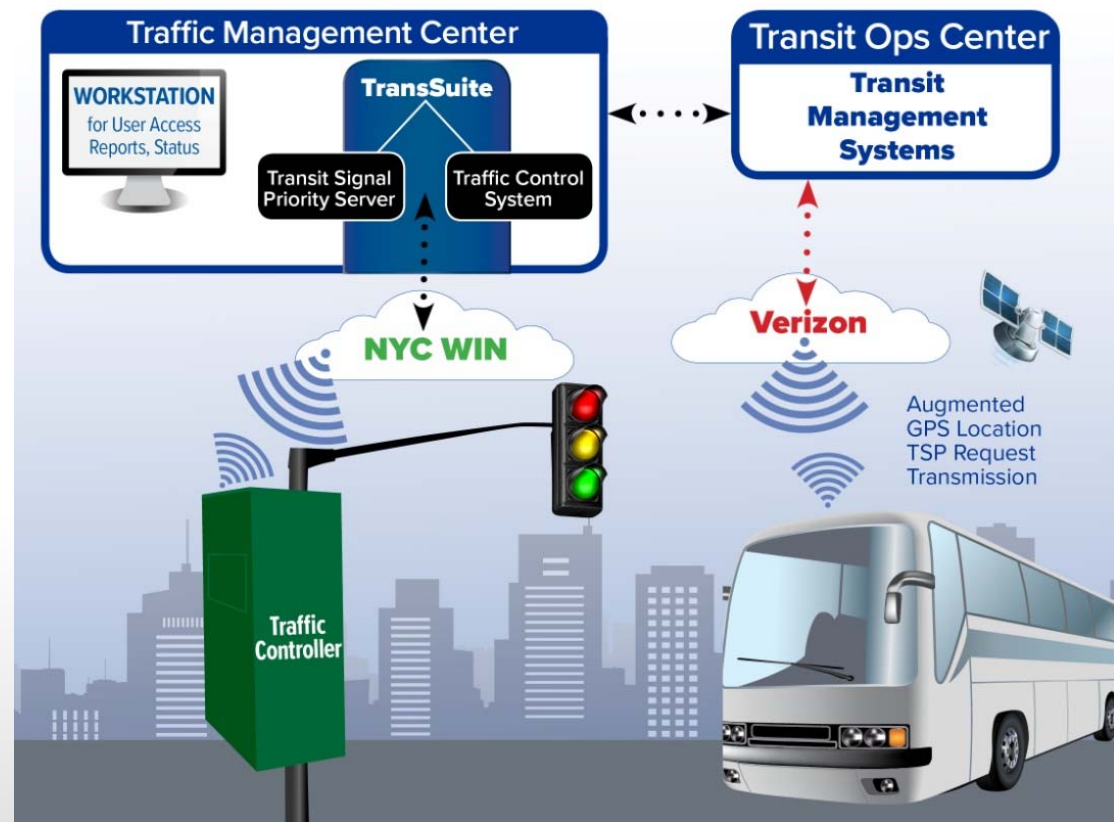
- Transit and Emergency vehicles are outfitted with emitter equipment (either infrared or GPS based)
- Intersections are outfitted with receiver equipment (either infrared or GPS) that receives the preemption request and relays to the preemption detector card.
- Preemption detector card validates request, determines phase to be preempted and sends request to traffic controller
- Traffic controller implements preemption requests



Central TSP – NYC Deployment

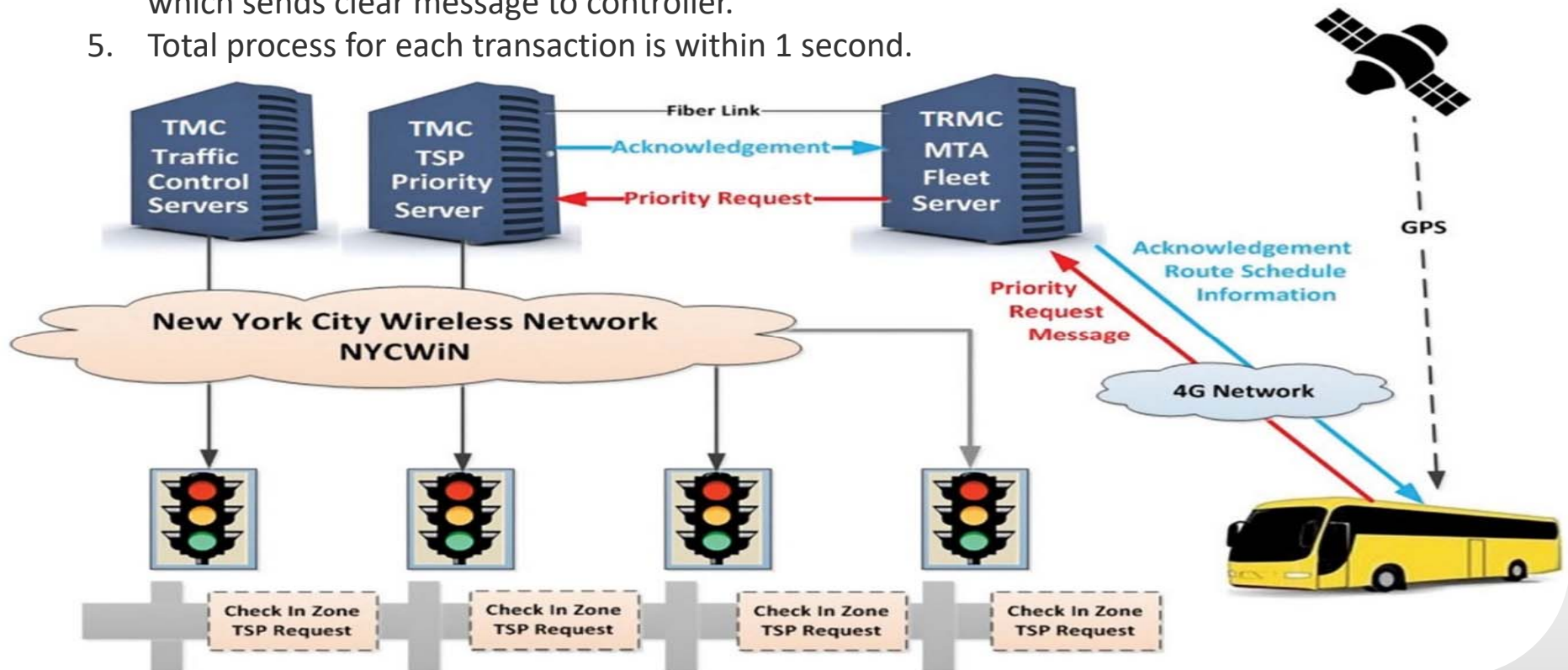
Four main components of the system

- GTT-Opticom Transit System
- TransSuite TCS
- NYC WIN – wireless network
- Signal Controller

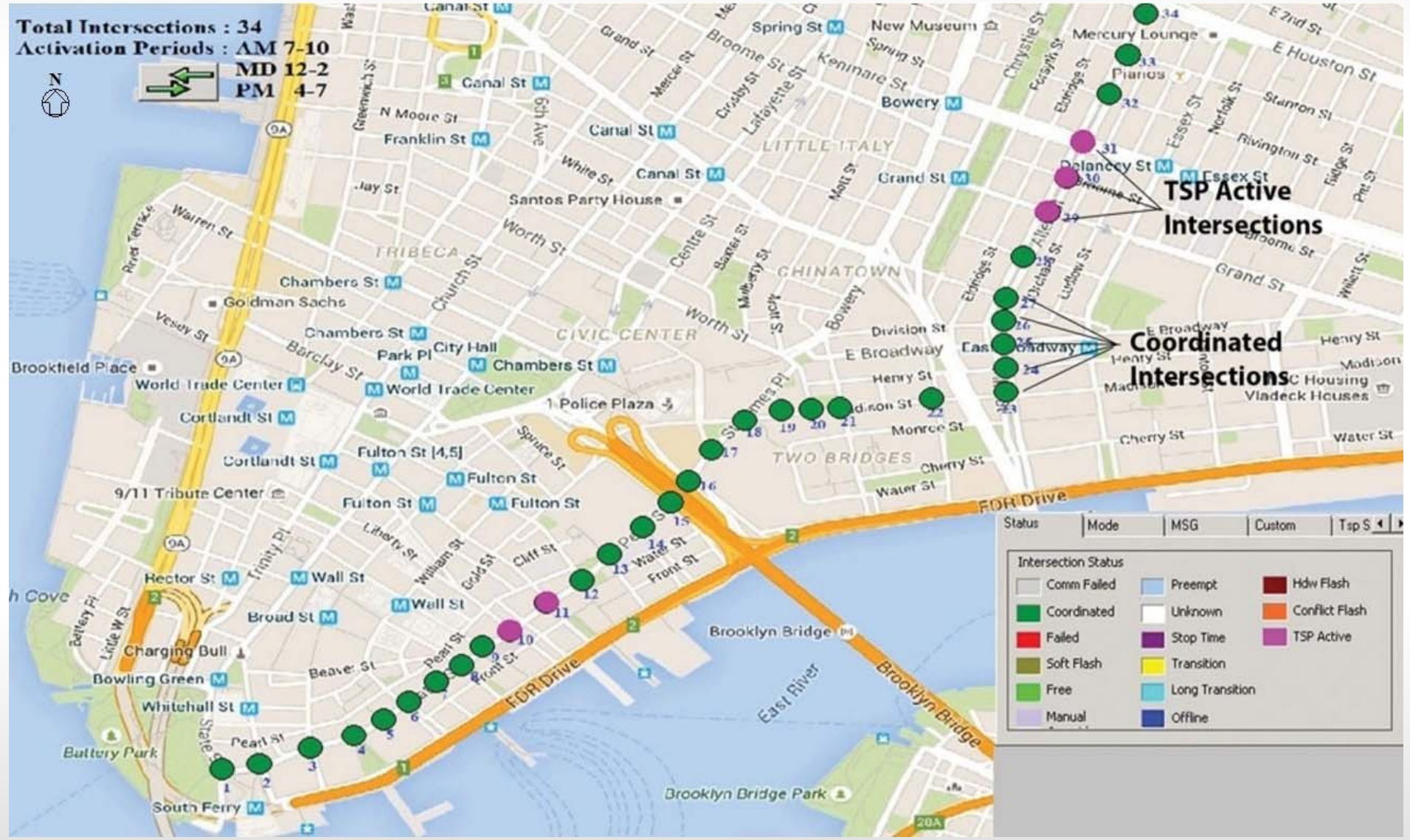


Central TSP – NYC Deployment

1. Before approaching intersection, bus sends “request” through Verizon 4G to MTA Transit Management Center (TRMC) Server.
2. MTA server processes request and validates if TSP request is warranted (i.e. behind schedule, bus occupancy, etc.) forwards this request to NYCDOT TSP server in Traffic Management Center (TMC).
3. Server in TMC evaluates request by granting or not granting TSP request, sending TSP request to controller.
4. After bus passes intersection, a “clear” message is sent to MTA server which is passed to TMC which sends clear message to controller.
5. Total process for each transaction is within 1 second.



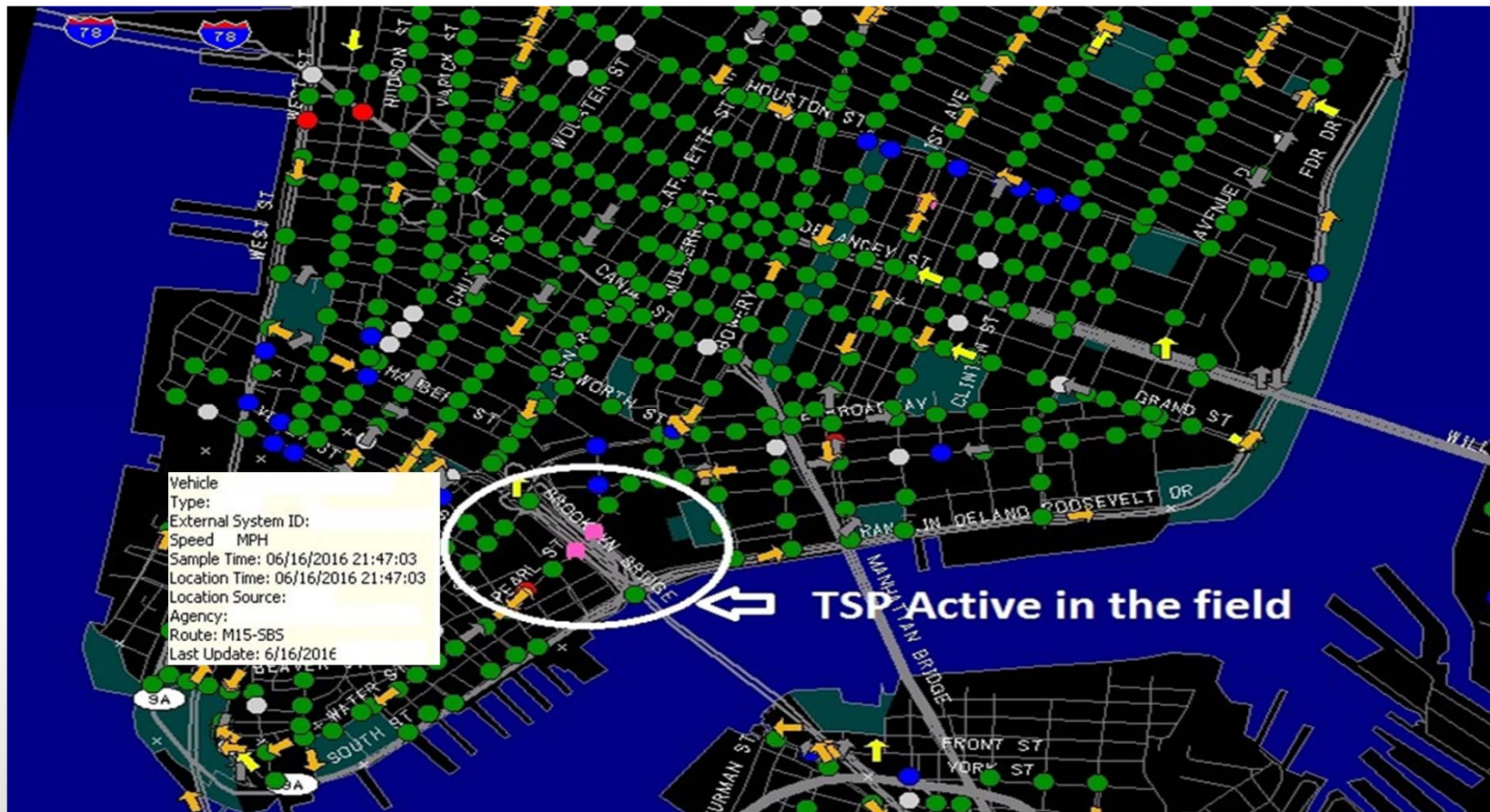
Real-time Monitoring Tools - Explorer Map



Automated Vehicle Location (AVL) Map

Dynamic field information

- Each arrow represents one bus in NYC
- Demonstrates Bus location accurately
- Controller changes to bus shape when TSP is active
- Detailed information available – speed, time, update time...



TSP Reporting

- TSP database stores all data about TSP operations, allows for reporting tools to be used
- Provides varied Measure of Effectiveness (MOE) based on different types of field data
- Allows DOT to use data to fine tune the TSP operations

Search Date: Corridor:

Start Time: Bus Number:

End Time:

Search Criteria

Active Summary

Report Run Date: 06/16/2016 22:55:08 Page 1 of 2

TSP Report - Bus Direction and Travel Time

Corridor Name: M15 SBS Search DateTime range: 05/16/2016 06:00:00 ---- 05/16/2016 10:00:00

Bus Number: NYCT1242

Bus Direction	Corridor Name (or Route Name)	Total Intersections per Corridor	Active Intersections per Corridor	Bus Travel Time (TT) (sec)	Average TT per Intersection (sec)	Total Requests	Total Clearances	Total Updates
BB	M15 SBS	33	24	1,017	42	24	31	6

Date and Time	Latitude	Longitude	Request ID	Intersection (Cabinet ID)	Message Type	Time to Apply	Reply Status	Time of Service Desired	Time of Estimated Departure	Initial Apply Time	Final Clear Time	Time to Live	Total Service Time	Processing Filename
5/16/2016 08:00:52.073	40722401	-73989019	41	DF1F	request	8:00:53 AM EDT	accepted	12	0	8:00:57 AM EDT	8:01:19 AM EDT	22	22	2016-05-16-basicCommRpt.csv
5/16/2016 08:01:04.910	0	0	41	DF1F	clearance		received	0	0			0	0	2016-05-16-basicCommRpt.csv
5/16/2016 08:01:11.947	40721103	-73989521	42	DF48	request	8:01:13 AM EDT	accepted	6	0	8:01:17 AM EDT	8:01:33 AM EDT	16	16	2016-05-16-basicCommRpt.csv
5/16/2016 08:01:18.950	0	0	42	DF48	clearance		received	0	0			0	0	2016-05-16-basicCommRpt.csv
5/16/2016 08:02:05.970	40719505	-73990299	43	DF5D	request	8:02:07 AM EDT	accepted	9	0	8:02:11 AM EDT	8:05:03 AM EDT	19	172	2016-05-16-basicCommRpt.csv
5/16/2016 08:02:23.143	40719478	-73990306	43	DF5D	update	8:02:24 AM EDT	received	11	0			40	0	2016-05-16-basicCommRpt.csv
5/16/2016 08:03:01.597	40719434	-73990344	43	DF5D	update	8:03:02 AM EDT	received	13	0			118	0	2016-05-16-basicCommRpt.csv
5/16/2016 08:03:34.093	0	0	43	DF5D	clearance		received	0	0			0	0	2016-05-16-basicCommRpt.csv
5/16/2016 08:03:34.170	0	0	43	DF5D	clearance		received	0	0			0	0	2016-05-16-basicCommRpt.csv
5/16/2016 08:03:50.677	40719731	-73992446	44	DFA6	request	8:03:51 AM EDT	accepted	101	0	8:03:54 AM EDT	8:05:46 AM EDT	111	111	2016-05-16-basicCommRpt.csv
5/16/2016 08:05:25.087	0	0	44	DFA6	clearance		received	0	0			0	0	2016-05-16-basicCommRpt.csv
5/16/2016 08:05:25.133	0	0	44	DFA6	clearance		received	0	0			0	0	2016-05-16-basicCommRpt.csv
5/16/2016 08:05:29.063	40718972	-73990653	45	DF6D	request	8:05:30 AM EDT	accepted	17	0	8:05:33 AM EDT	8:06:21 AM EDT	27	48	2016-05-16-basicCommRpt.csv
5/16/2016 08:05:55.287	40718445	-73990876	45	DF6D	update	8:05:55 AM EDT	received	19	0			23	0	2016-05-16-basicCommRpt.csv
5/16/2016 08:05:57.080	0	0	45	DF6D	clearance		received	0	0			0	0	2016-05-16-basicCommRpt.csv
5/16/2016 08:06:05.893	40717847	-73991238	46	DF7A	request	8:06:05 AM EDT	accepted	6	0	8:06:08 AM EDT	8:06:24 AM EDT	16	16	2016-05-16-basicCommRpt.csv
5/16/2016 08:06:15.467	0	0	46	DF7A	clearance		received	0	0			0	0	2016-05-16-basicCommRpt.csv
5/16/2016 08:07:49.210	40714707	-73992846	47	DF7A	request	8:07:50 AM EDT	accepted	4	0	8:07:53 AM EDT	8:08:07 AM EDT	14	14	2016-05-16-basicCommRpt.csv
5/16/2016 08:07:54.110	40714380	-73992854	48	DFAA	request	8:07:55 AM EDT	accepted	8	0	8:07:58 AM EDT	8:08:16 AM EDT	18	18	2016-05-16-basicCommRpt.csv
5/16/2016 08:07:56.183	0	0	47	DFAA	clearance		received	0	0			0	0	2016-05-16-basicCommRpt.csv

TSP Deployment Process

NYC DOT and MTA will:

- Accelerate its implementation of TSP
- Expand the network by an additional 550 intersections (10 routes) by end of 2020, in concert with MTA's new bus technology. (1,000 intersections in total)

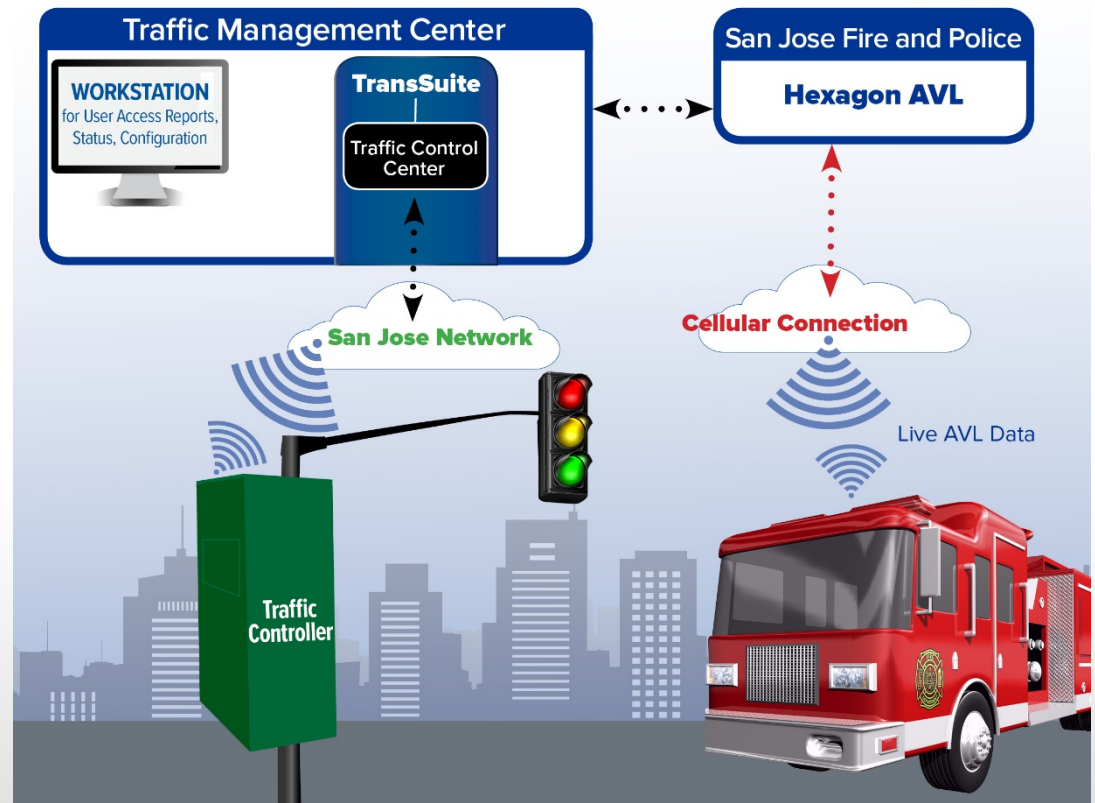


Central EVP – San Jose Deployment

Four main components of the system

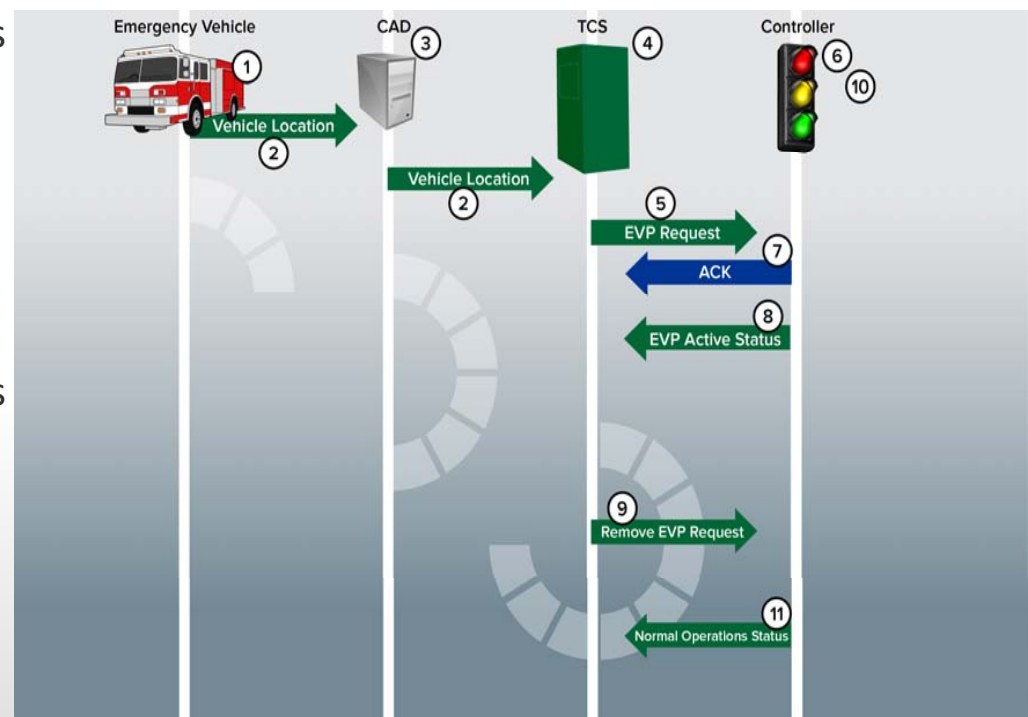
- Hexagon AVL System
- TransSuite TCS
- San Jose Communication System
- Traffic Controller

System is still in development stage, will go live in early 2018



Central EVP – San Jose Deployment

1. Vehicle location/status tracking
2. Vehicle data sent to CAD/Traffic Management System
3. CAD monitors vehicle data, looking for ACTIVE VEHICLES ONLY
4. The traffic control system initiates EVP Request as a vehicle enters an activation zone.
5. EVP Request sent to local traffic signal controller
6. Local traffic signal controller processes EVP Request and adjusts signal operations accordingly.
7. Local Controller Sends Message Acknowledgement back to the TCS.
8. Local traffic signal controller sends status information to TCS showing it is in a Preemption state.
9. EVP Request Message is removed by TCS after emergency vehicle's location exits activation zone area.
10. Local traffic signal controller reverts to normal operation.
11. Local traffic signal controller sends status information to TCS showing it is in a Normal Operation.



EVP Deployment

San Jose DOT:

- Will make EVP available to all intersections connected to TransSuite TCS (916 intersections) once TransSuite update is completed

San Jose Fire Department:

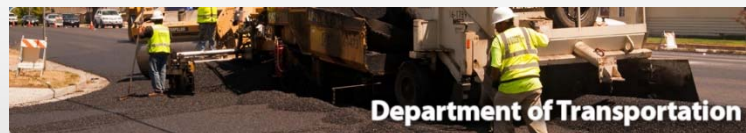
- Will utilize EVP on all vehicles with existing AVL
- In the process of deploying AVL equipment across entire fleet

San Jose Police Department:

- Will utilize EVP once police cruisers are equipped with AVL

Expansion to TSP:

- Once EVP is completed the City intends to work with the Santa Clara Valley Transit Authority (VTA) to implement Central TSP for VTA Buses and Light Rail



Cost Implications

- NYC
 - City declined to provide overall program costs, however they confirm cost is significantly less than traditional approach.
 - Intersection hardware procurement and installation was determined to be \$10,000/intersection in 2010 System Trials.
- San Jose
 - Ultimate city cost will be \$640,000 to implement Central EVP
 - Includes enhancements to TransSuite TCS, Hexagon and support for D4 firmware
 - 2016 RFQ revealed the cost to outfit every traffic signal with hardware at \$9 million (roughly \$10,000/per intersection) – Over 90% savings
 - Funds that would go to hardware maintenance can be directed to communications system maintenance and enhancements.

LESSONS
LEARNED

Partnership required

- To make the system work city departments have to work closely with each other to ensure all operational needs are met
- NYC
 - NYC DOT and TransCore – Traffic Signal Management System
 - MTA and GTT – Transit AVL
- San Jose
 - San Jose DOT and TransCore – Traffic Signal Management System
 - Fire and Police Department and Hexagon – Public Safety CAD/AVL
- TransCore
 - AVL Providers (GTT and Hexagon)
 - Providers need to work closely to ensure seamless integration

Technical Elements

- How good is your communication infrastructure
 - Highly reliable communications are required
 - Consider communications upgrades rather than outfitting traffic signals with hardware
- Traffic Signal Controller
 - Need to ensure that traffic signal controller can accept preemption request from a central system. Many controllers have preemption as a read only item for the central system.
 - NYC – Peek Traffic updated firmware to allow read/write capability
 - San Jose – D4 firmware still in testing to verify the read/write capability performs as expected.
- Traffic Signal Management System
 - Update of system to handle EVP/TSP functions from central
 - Require central system to have a lot more logic and processing capabilities to handle all required actions simultaneously.
- AVL Provider
 - Provide updates to system to share required data with Traffic Signal Management System



QUESTIONS?

Contact Information

Ryan Saville,
Senior Associate

TransCore

2940 South 300 West Unit D

Salt Lake City, UT 84115

Office: 801.886.9170x27

Cell: 801.808.5190

ryan.saville@transcore.com