Preparing the Infrastructure for Connected Vehicle

ITSGA 2011 Annual Meeting

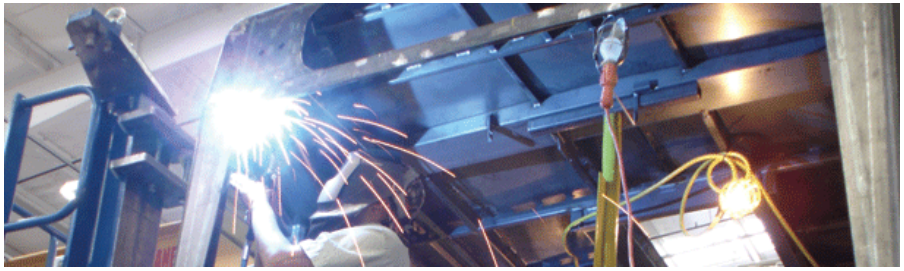
September 19, 2011 **Greensboro, Georgia**

Siemens Mobility Overview

- **Siemens Mobility Overview**
- Surface Transportation Standards
- Connected Vehicle Technology
- AASHTO Deployment Analysis
- USDOT Signal Phase and Timing Standard
- 20/20 Vision

Siemens Mobility

Siemens Mobility



USA Manufacturing

Sacramento, California

Light Rail Trains

Austin, Texas

Traffic Control Equipment

Surface Transportation Standards

- Siemens Mobility Overview
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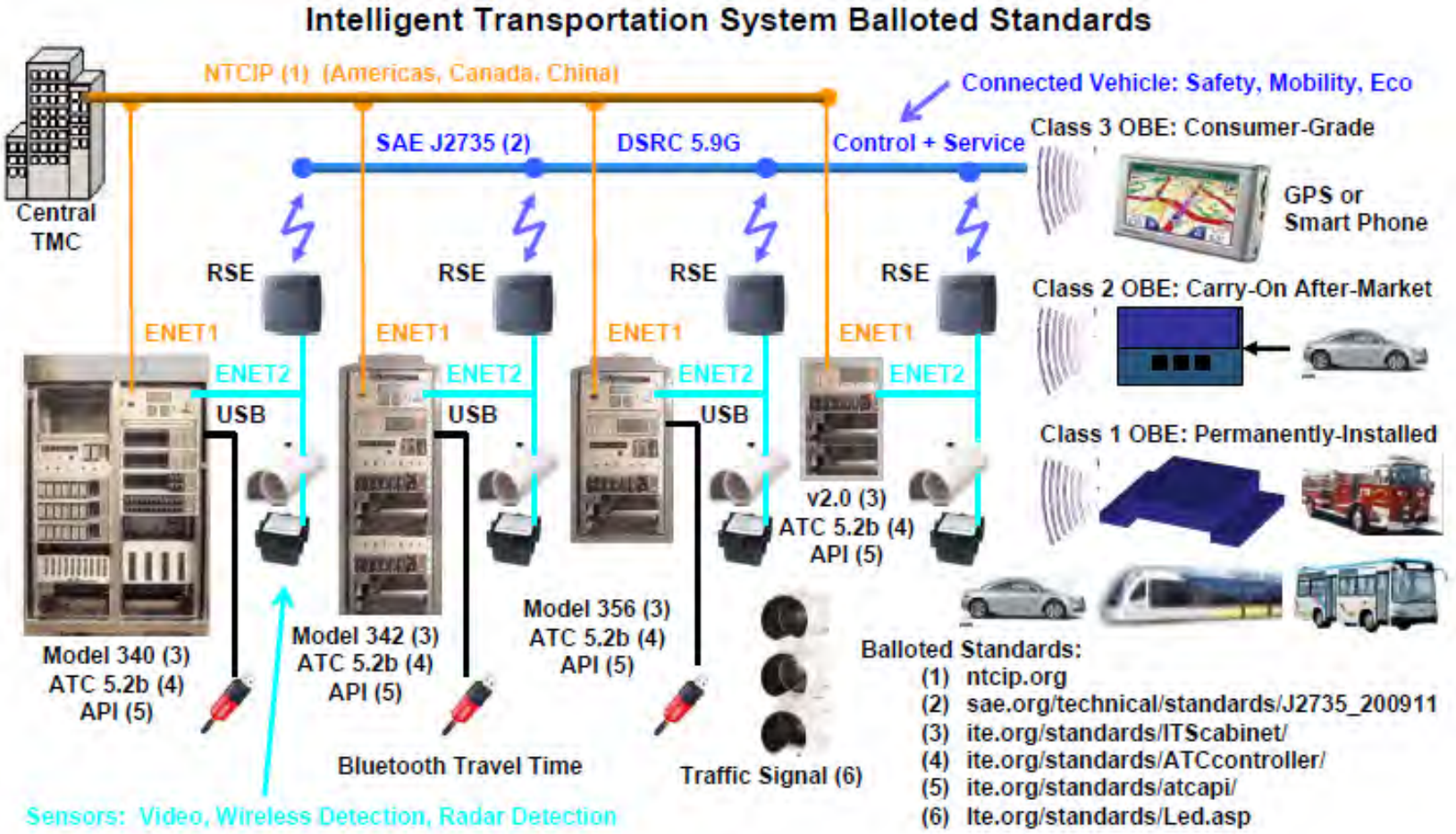
Surface Transportation Standards: *ITE Journal,* May 2010



USDOT Connected Vehicle Initiative

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Connected Vehicle Technology

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Connected Vehicle

32,788

2013

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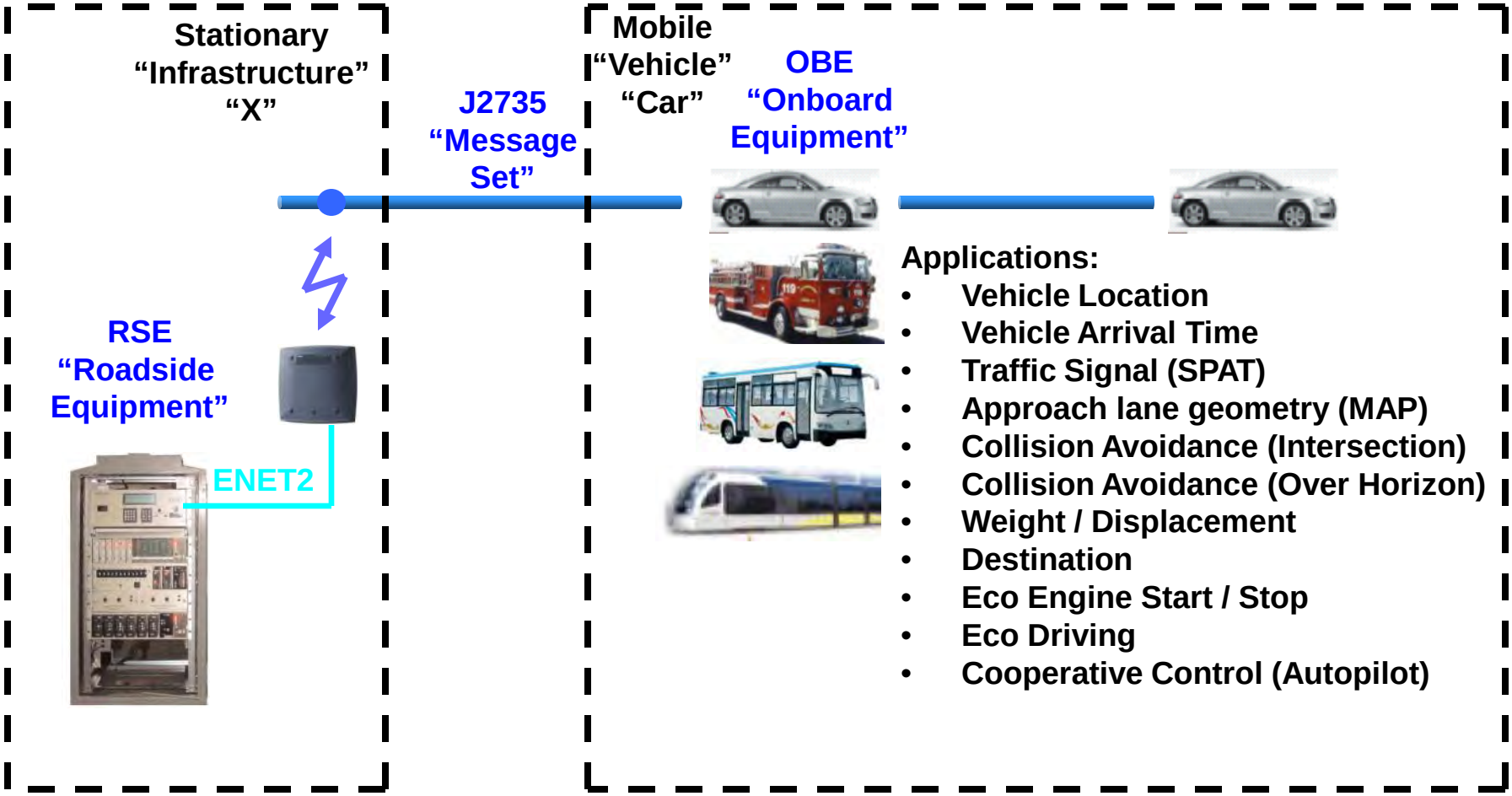
Connected Vehicle Basic Elements



sae.org/technical/standards/J2735_200911 "Message Set for Commercial Vehicles"

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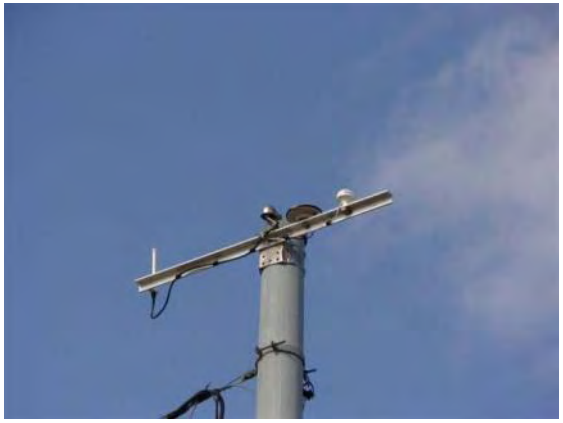
72 Intersection USDOT Test Bed in Oakland County, MI



GPS and RSE Antennas

AASHTO Deployment Analysis

- Siemens Mobility Overview
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AASHTO Connected Vehicle Deployment Analysis

Analysis by Mixon-Hill, Inc.

- Submitted by ATC Joint Committee
- Anti-trust guidelines followed:
  - No vendor information collected
  - No cost information collected
  - No market share information collected
- Data from NEMA Distribution Channels
- Total Number of Signalized Intersections
- Categorized by Technological Readiness
- Upgrade Cost for Connected Vehicle

SIEMENS IntelliDrive Deployment Assessment

IntelliDrive℠ Deployment Assessment

Rev 1

For Mixon-Hill, Inc.

12980 Metcalf Avenue, Suite 470
Overland Park, KS 66213-2620

March 28, 2011

Submitted by:

Dave Miller

Chair,
Advanced Transportation Controller Joint Committee

Siemens Industry, Inc.
Mobility Division
Intelligent Traffic Solutions
8004 Cameron Road
Austin, TX 78754
Tel: (512) 837 -8323
Fax: (512) 837 -8439

Intelligent Traffic Solutions Page 1 of 14 March 28, 2011

Advanced Transportation Controller Membership

Advanced Transportation Controller Joint Committee Membership

December 8, 2010

NEMA Members:

1.	Dave Miller	Siemens ITS, JC Committee Chair
2.	Ray Deer	Peek Traffic
3.	Craig Gardner	Intelight-ITS
4.	Scott Evans	Eberle Design
5.	Kleinjan Deetlefs	McCain
6.	Jon Wyatt	Intelligent Devices, Inc

ITE Members:

1.	Ed Seymour	Texas Transportation Institute
2.	Andrew Mao	Harris County, TX
3.	Robert Rausch	Transcore
4.	Mohamad Talas	New York City DOT
5.	John Thai	City of Anaheim
6.	Vacant	<Replaces Doug Tarico, McCain>

AASHTO Members:

1.	Dave Holstein	Ohio DOT
2.	Guillermo Ramos	New York DOT
3.	Ken Montgomery	Georgia DOT
4.	Jeff McRae	CALTRANS
5.	Vacant	<Replaces Al Kosik, Texas DOT>
6.	Vacant	<Replaces Jack Brown, Florida DOT>

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Deployment Analysis Findings: Controller Types by Technology

Line	Controller Type	Speed	Comm	OS	API	In Service
1	ATC 5.2b	Yes	Yes	Yes	Yes	8,000
2	Model 2070LX	Yes	Yes	Yes	Yes	0
3	Model 2070E	Yes	Yes	Yes	No	0
4	Model 2070L	Yes	Yes	Yes	No	52,000
5	NEMA, Modern	Yes	Yes	33%	No	36,000
6	NEMA, Legacy	No	Adaptor	Yes	No	91,000
7	Type 170, Modern	Yes	Yes	No	No	12,000
8	Type 170, Legacy	No	Adaptor	No	No	102,000
9	Electromechanical & Other	No	No	No	No	6,000
					Total:	**307,000**

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Deployment Analysis Findings: Controller Upgrades for CV

Line	Controller Type	Upgrade Necessary for RSE
1	ATC 5.2b	None
2	Model 2070LX	None
3	Model 2070E	None
4	Model 2070L	None
5	NEMA Modern	Standard OS (33%): None Non-Standard OS (67%): Port App, Cross-compile, Test
6	NEMA Legacy	Replace Controller
7	Type 170, Modern	Port App, Cross-compile, Test
8	Type 170, Legacy	Replace Controller
9	Electromechanical controllers	Replace Controller

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Deployment Analysis Findings: Controller Upgrade Cost for CV

Line	Controller Type	Replaced	Cost EA	Cost Total
1	ATC 5.2b	0	$ 0	$ 0
2	Model 2070L	0	$ 0	$ 0
3	NEMA TS-2 Ethernet (modern)			$ 0
	Standard OS (33%)	0	$ 0	$ 0
	Non-Standard OS (67%)	0	$ 0	
4	NEMA TS-1 (legacy shelf)	91,000	$ 1,350	$ 122,850,000
5	Type 170 controllers (modern)	0	$ 0	$ 0
6	Type 170 controllers (legacy rack)	102,000	$ 2,200	$ 224,400,000
7	Electromechanical controllers	6,000	$ 900	$ 5,400,000
			Totals:	**$ 352,650,000**

Notes:

1. **2009 costs shown**
2. **Costs from publically-available high-volume contract awards**
3. **Total cost decreases each year as new controllers are installed**
4. **Excludes cost of RSE and apps**

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Deployment Analysis Findings: Controller Cost for CV

The Total Cost of Ownership per intersection is calculated as follows:

$ New controller (if needed)
+ $ Controller installation (zero if done during routine maintenance)
+ $ RSE
+ $ RSE Installation
+ $ Connected Vehicle Software Application License Fee
- $ Proprietary Emergency Vehicle Transponders
- $ Proprietary Transit Signal Priority Transponders
- $ Video Detection Equipment and Maintenance
- $ Loop Detection Equipment and Maintenance
- $ A portion of Accident Investigation and Litigation

= $ Total Cost of Ownership

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USDOT Signal Phase and Timing Standard

- Siemens Mobility Overview
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- AASHTO Deployment Analysis
- **USDOT Signal Phase and Timing Standard**
- 20/20 Vision

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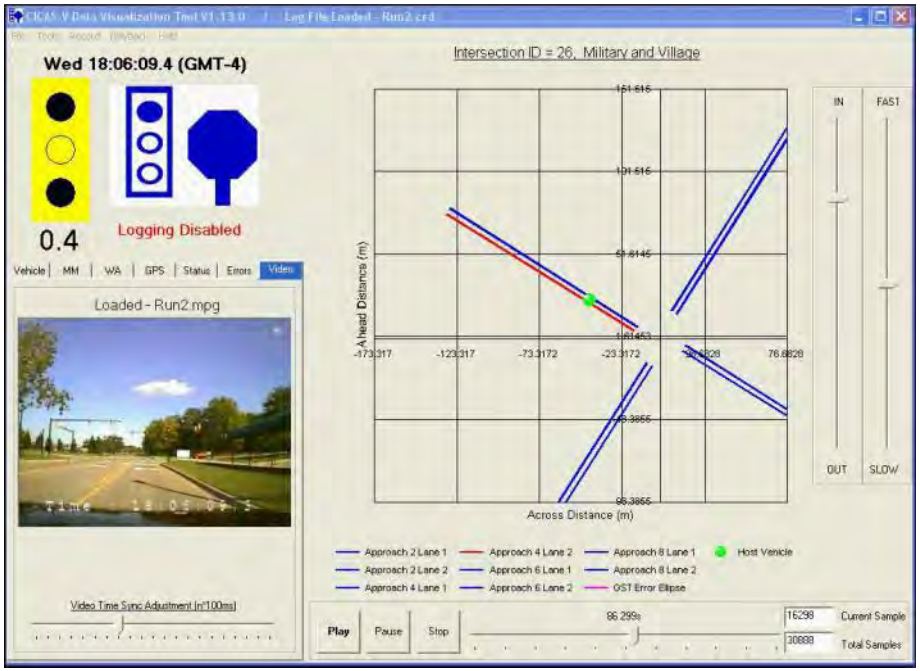
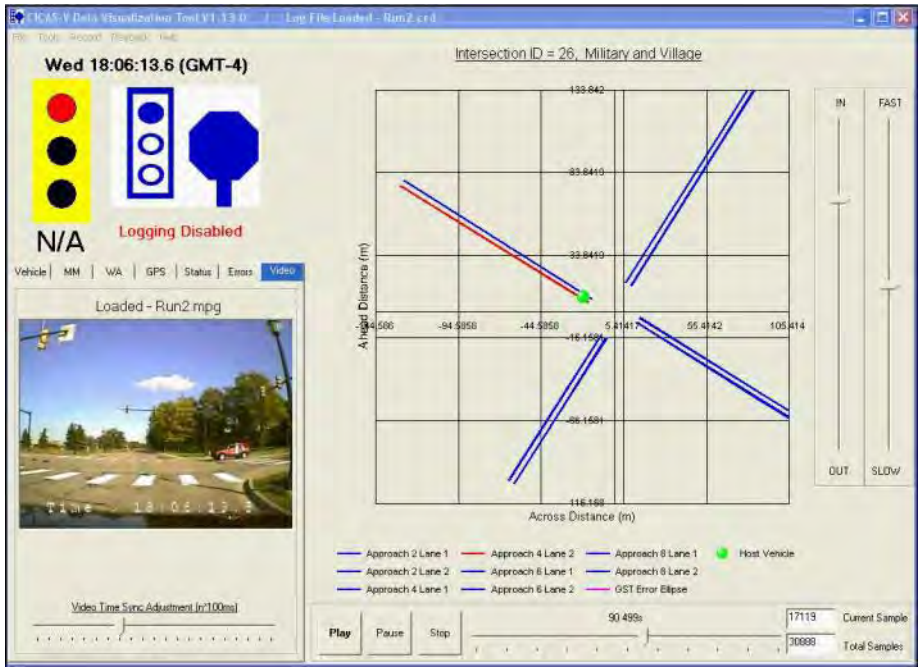
What is SPAT? Verification Test in Oakland County, MI

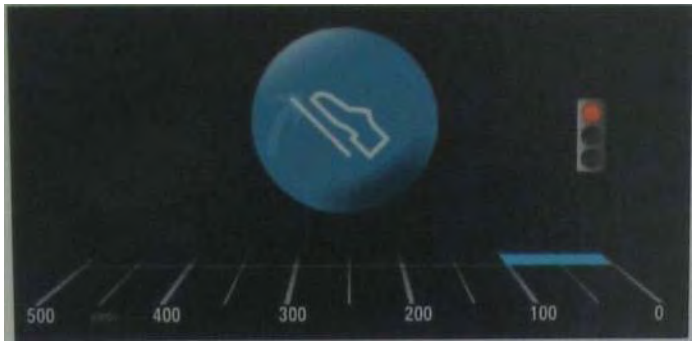




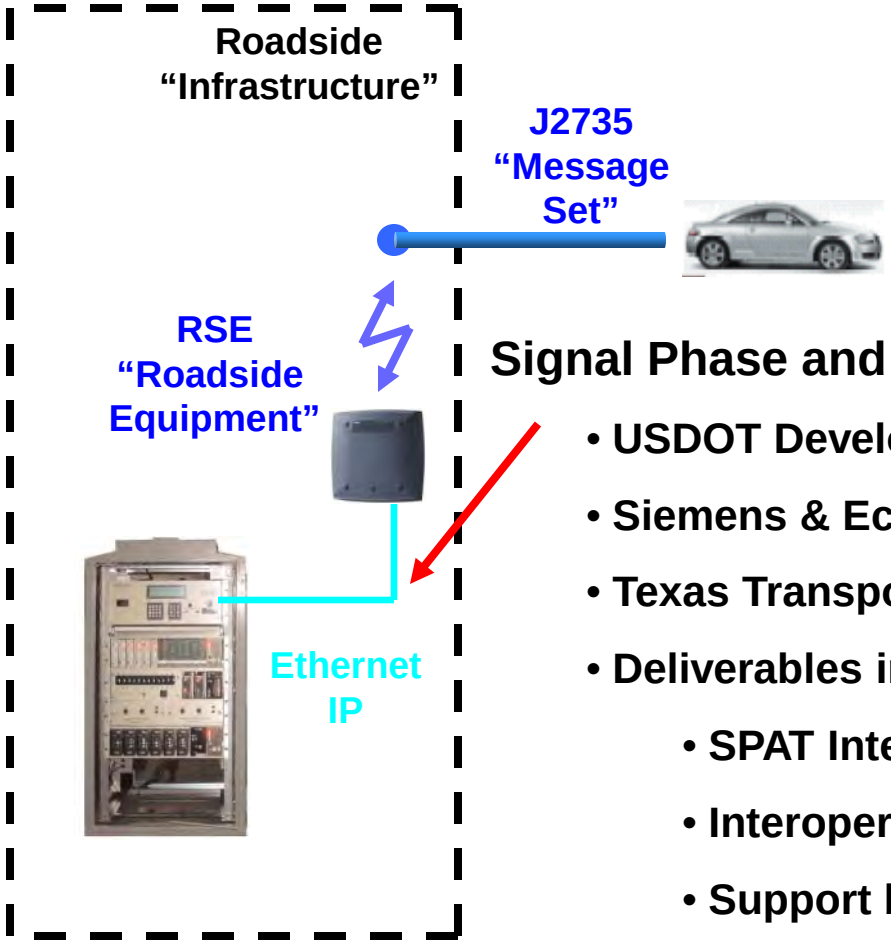
Courtesy of CAMP

Active Safety

SPAT Eco-Drive Demonstration, AASHTO 2009



Signal Phase and Timing (SPAT) Compatibility



Signal Phase and Timing (SPAT) Standard

- USDOT Development Contract to Battelle
- Siemens & Econolite: Controller Subject Matter Experts
- Texas Transportation Institute: Project
- Deliverables include:
  - SPAT Interface Standard Documents
  - Interoperability verification with Siemens & Econolite
  - Support by NEMA controller manufacturers

IntelliDrive Case Study

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- Siemens Mobility Overview
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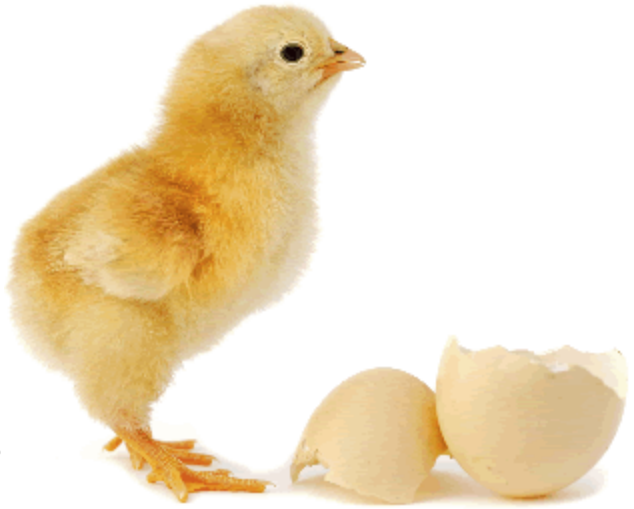
- **20/20 Vision**

20/20 Vision: Moving Forward Now

Keys to Becoming "Connected Vehicle-Ready":



- Avoid $352M "Chicken or Egg", use existing budgets
- Replace non-standard controllers with:
  - 2070 & TS-2 for SPAT, Preempt, Transit
  - ATC 5.2b for multiple apps i.e. Travel Time
- Phase out special-purpose Roadside Equipment
- Cost-share CV Roadside Equipment among agencies
  - Emergency Preemption app
  - Bus Rapid Transit app
  - Truck / Automatic Vehicle Location app
- Consider total cost of ownership in long-term planning:
  - Fewer collisions and litigation
  - Installation and maintenance of single standard roadside device
  - Migration away from loop, magnetic and video detection to CV apps
  - Signal control based on vehicle priority and arrival, not signal timing

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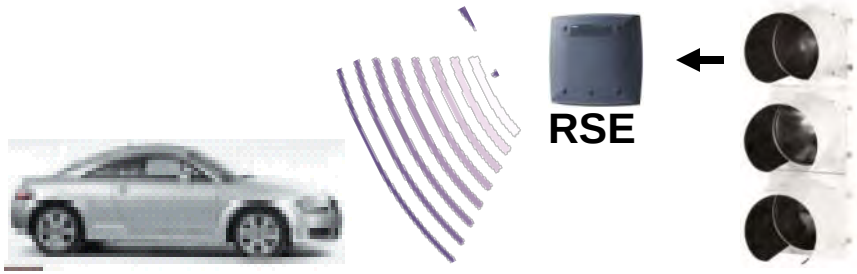
Example CV Application: World Congress 2011

Fully-Integrated CV System:

- Adaptive System for GREEN optimization
- Central Traffic Management System
- Traffic Signal Control with SPAT
- Emergency Preemption via RSE & J2735
- 3-sec “Pre-Yellow” for collision avoidance



3-Second SPAT at Acquisition by ABS + 4-Second SPAT at YELLOW

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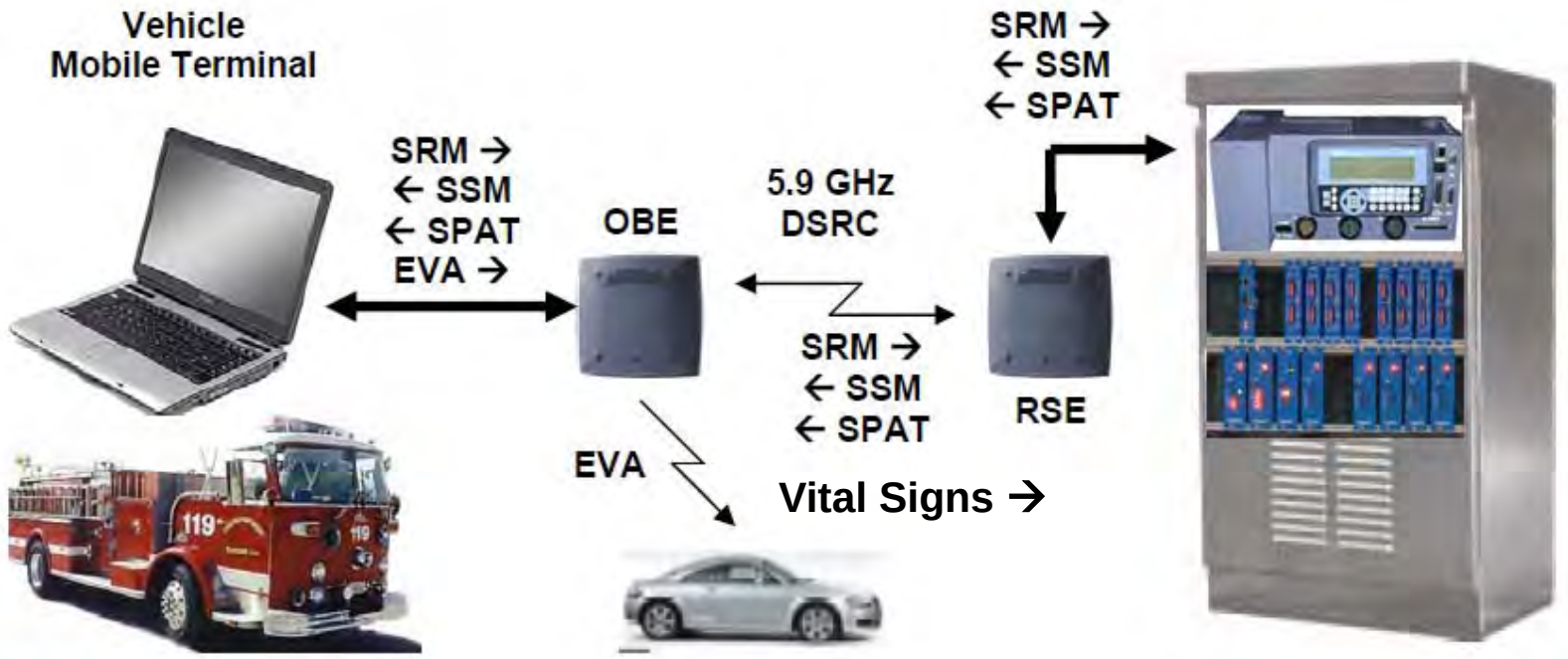
Example CV Application: Emergency Vehicle



38,000 Preempt Intersections

- $ Special Preemption Transponders
- $ Shared cost of RSE with emergency and transit apps
- $ Collisions, First Responders see SPAT and EVA
- $ Communications Subscription Fees (Public Backhaul)

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Thank you for your attention!

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