Overview of Real-World Pilots/Deployments

Mark Rogers
Worldwide Connected Vehicle lead projects using Siemens technology

- UK CITE
- Newcastle Gosforth Corridor
- simTD
- C-ITS CORRIDOR: Netherlands
- C-ITS CORRIDOR: Austria - Eco-AT
- THEA CV Pilot (USDOT)
- Columbus, Ohio (ODOT)
- Michigan
- Las Vegas
- Anaheim
- NYC CV Pilot (USDOT)
- Volkswagen - Wolfsburg
- Green4Transport – Hamburg Port Authority
- Komo:D - Düsseldorf
- KorA9 – Autonomous driving testfield
- Autonomous driving testfield Karlsruhe

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DOT Projects – United States

Columbus, OH
Siemens is a partner in the winning team for the USDOT SmartCities Challenge with Columbus, OH, as well as developing solutions for 17 other cities that entered into this grant competition.

Ann Arbor, MI
USDOT Safety Pilot in Ann Arbor MI, consisting of Siemens central software and controllers communicating to 2,000 equipped vehicles, as well as interoperability demonstration with another controller manufacturer installed in 2012.

Las Vegas, NV
Siemens deployed a Connected Infrastructure showcase with five RSUs as part of the 2018 Consumer Electronics Show.

New York, NY
USDOT Safety Pilot in New York City, consisting of Siemens Roadside Units and software to communicate to more than 7000 and deploying more than 15 safety applications to provide in-vehicle warnings to motorists behind the wheel. To be installed in 2018.

THEA – Tampa Hillsborough Expressway Authority
Siemens is a major partner in one of the three winning projects to bring the next level of Connected Vehicle technology to fruition. In cooperation with the Tampa Hillsborough County Expressway Authority, new Connected Vehicle solutions are being created, implemented, and tested, with far-reaching consequences for Siemens’ clients and partners.

San Antonio, TX
USDOT Connected Vehicle Plugfest 2017: Siemens takes part in interoperability and bench testing with RSU.

Anaheim, CA
Siemens has deployed a 6 intersection pilot outside of the Disneyland including Wrong Way Entry, Forward Collision Warning, Count Down Timer, Intersection Movement Assist, Variable Speed Limit use cases.

Oakland County, MI
USDOT Connected Vehicle Test Bed consisting of 75+ intersections broadcasting Signal Phase and Timing to Crash Avoidance Metrics Partnership test vehicles.
Siemens Connected Vehicle Deployments

2008: USDOT Test Bed, 75+ Intersections in Oakland Co. MI and Telegraph Road

Predictive SPAT

RSU
Siemens Client

J2735
CAMP
OBE

USDOT

USDOT
Connected Vehicle Deployments

2011: World Congress, Orlando FL

Technology Showcase

- SCOOT Adaptive Corridor on International Drive
- SPAT Broadcast from 10 Intersections
- Tactics Central Traffic System
- Virtual Tolling Zone on International Drive
- Emergency Preemption on Universal Drive
- Bus Rapid Transit on Universal Drive
Connected Vehicle Deployments

2011: World Congress, Orlando FL
Connected Vehicle Deployments

2014: ITSA World Congress Detroit

Two Corridors Front of COBO Center

- Connected Vehicle has been standard Siemens product since 2013
- NEMA TS 2 Controllers
- Roadside Units broadcasting SPAT and MAP
- Retained as Affiliated Test Bed
- Weekly USDOT Plug-Fests to test interoperability
Pioneering by merging (Applications, Use Cases, and Locations)
Example: THEA Connected Vehicle Pilot
Solving real world problems
THEA – Project Summary
Participants

1,600 Privately Owned Vehicles
500+ Pedestrian Smartphones
10 TECO Line Streetcars
10 Hillsborough Area Regional Transit (HART) buses
46 Roadside Units
Example: THEA Connected Vehicle Pilot
Solving real world problems

Our successful process with our customer and partners: from design to deployment

**Content**
- 44 RSUs
- 1600 equipped passenger vehicles
- 10 equipped transit buses
- 10 equipped street cars/trolleys
- 5 V2I apps
- 4 V2V apps
- 4 Mobility and Agency apps
- 500 Personal Safety Devices
- RSU Central Management System

**System approach**
- CMS to manage RSUs
- Overt-the-Air OBU updates
- Data logging
- Travel time/Speed measurements
- Communication between CMC and controllers over RSUs

**Learn**
- Do not rely on unpublished standards in progress
- If a USA standard does not exist, use international standard
- Continuous alignments between stakeholders
- Certification process lagged design process
- System and interoperability tests

Team Commitment
The NYCDOT CV Pilot Deployment project area encompasses three distinct areas in the boroughs of Manhattan and Brooklyn.

The deployment will include approximately 310 signalized intersections for vehicle-to-infrastructure.

Current number of RSUs: 10 prototype and 390 production RSUs.

Savari and Danlaw supply total of 8000 ASDs (Aftermarket Safety Devices).
Interoperability in United States USDOT pilot projects and device certification

OmniAir Certification

- Contact OmniAir
- Conformance Testing
- Trademark Licensing Agreement
- Certification
- Interoperability Testing

USDOT ITS Joint Program Office

- V2V Safety
  - LED Light Vehicle Identification
  - Curve Speed Warning
  - Left Lane Departure Warning
  - Spot Weather Impact Warning
  - Reduced Speed/Work Zone Warning
  - Dead Zone in Signalized Crosswalk Warning
- V2I Safety
  - Emergency Electronic Brake Light (EEBL)
  - Forward Collision Warning (FCW)
  - Intersection Movement Assist (IMA)
  - Left Turn Assist (LTA)
  - Blind Spot Zone Change Warning
- Do Not Pass Warning (DNPW)
  - Vehicle Turning Right in Front of On-Coming Traffic Warning
- Agency Data
  - Probe-Based Pavement Maintenance
  - Probe-based Traffic Monitoring
  - Vehicle Classification Based Traffic Studies
  - Optimized Traffic Management & Interaction Analytics
  - Optimized Driver Evaluation Studies
- Certification Mark Issued

Environment

- Multi-Path" Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing
- Eco-Traffic Signal Priority
- Connected Eco-Driving
- Vehicle Infrastructure
- Coordinated Adaptive Urban Control

Mobility

- Advanced Vehicular Information System
- Intelligent Traffic Signal System (ITSS)
- Signal Priority (RTMS, STMS)
- Mobile Accessible Pedestrian Signal System (MAPPSS)
- Emergency Vehicle Preemption
- Queue Warning System
- Cooperative Adaptive Cruise Control (CACC)
- Incident Source Pre-Arrival Warning

Open Source Application Development Portal

- Explore Applications
  - Application Categories
  - Functionality
  - Development
  - Deployment
  - Security
  - Contact

Next step: Focus on Apps
Siemens Connected Vehicle Deployments

2013 – 2016: Cooperative ITS Corridor Joint Deployment, Vienna to Rotterdam

Use Cases
- Transit Signal Priority
- Emergency Preemption
- Red Light Warnings
- Probe Data
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### Description
- The UK CITE program will create the UK’s first fully connected infrastructure, using a globally unique combination of wireless technologies, which can enable real-world testing in a safe and managed way. The project is funded by the Government’s £100 million Connected and Autonomous Vehicle fund, delivered by Innovate UK. The project is worth a total of £7.1 million including investment from the Government and Highways England.

### Siemens Scope
- In the Newcastle project, Siemens is primarily responsible for the roadside units and the exchange of data between cars and the traffic control center. This includes integrating the roadside units with the app, the on-board unit and the traffic control software.

### CV Application
- Countdown to Green, Vehicle Priority, Green Light Optimal Speed Advisory (GLOSA), Road Hazard Warning

### Siemens CV deployment
- RSUs, Stratos Traffic Management System
### Newcastle Gosforth Corridor
Newcastle, UK

<table>
<thead>
<tr>
<th>Description</th>
<th>Siemens Scope</th>
<th>CV Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Led by Newcastle University in collaboration with Siemens and Newcastle City Council, the aim of the project is to use Infrastructure to Vehicle (I2V) communications technology to create energy-efficient junctions and help motorists drive more efficiently, improve road safety, increase energy efficiency and reduce levels of congestion and pollution</td>
<td>• In the Newcastle project, Siemens is primarily responsible for the roadside units and the exchange of data between cars and the traffic control center. This includes integrating the roadside units with the app, the on-board unit and the traffic control software.</td>
<td>• Countdown to Green, Vehicle Priority, Green Light Optimal Speed Advisory (GLOSA), Road Hazard Warning</td>
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### Siemens CV deployment

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<td>• RSU</td>
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## KoMoD
Düsseldorf, Germany

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<th>Description</th>
<th>Siemens Scope</th>
<th>CV Application</th>
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<td>Testfield for automated and connected driving. The test field looks at driving in urban space on complex main routes connecting the city centre with the adjacent motorway network. This offers a wide range of driving situations in which the interaction of several driver assistance situations can be tested.</td>
<td>In the Düsseldorf test field, SIEMENS is testing pioneering technologies for the automated and autonomous traffic of the future with three main focuses. A special communication unit, the so-called Road Side Unit (RSU), enables information exchange between vehicles and infrastructure in almost real time. For the intersection as a safety-critical network element, Siemens determines switching states at four of its traffic lights for forecasting green and red time and transmits these to vehicles via RSU. Siemens is realizing a telematics unit for vehicle-to-infrastructure communication for public transport in the cooperative test field with 16 vehicles of the Rheinbahn. Another self-sufficient unit will test a preferential public transport system based on satellite positioning in the Rheinbahn vehicles.</td>
<td>Time-To-Change, Truck Convoy Priority</td>
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### Siemens CV deployment
- RSUs,
- Concert Traffic Management System
### Description

- "The smartPORT Traffic Light was realized by the HPA in conjunction with its partners NXP, Siemens, Heusch/Boesefeldt, and Hamburg Verkehrsanlagen. With the intelligent traffic light, trucks are guided around the port more quickly to thereby also help reduce CO2 emissions. An approaching line of vehicles can communicate with the intelligent traffic light to turn it green or keep it green, allowing the vehicles to pass the light without stopping."

### Siemens Scope

- Siemens was responsible for the connection to the traffic light and traffic engineering modifications.

### CV Application

- Time-To-Change, Public Transport Priority, Probe Vehicle Data, SPaT Prediction

### Siemens CV deployment

- RSUs
- Concert Traffic Management System
**Description**
- “The central topic of the project is the research, adaptation and transmission of automotive radar applications in the field of infrastructure sensors, as well as their testing in the complex field of application of motorways. Another focus is the aggregation, processing and transmission of sensor data to the vehicle using DSRC Roadside Units.”

**Siemens Scope**
- Siemens provides both the radar technology for the obstacle detection as well as the RSUs for infrastructure to vehicle communication

**CV Application**
- Sensor data aggregation (obstacle on the road warning)

**Siemens CV deployment**
- RSUs
- Smart Radar
Interoperability in Europe
C-Roads is focused on Application Interoperability: Day-1 Application

- **C-Roads Platform** is a joint initiative of European Member States and road operators

- Commonly agreed list of C-ITS applications (services)

- **Implemented in** pilots by C-Roads Member State

- The national pilot initiatives will move on to **cross-site testing**

<table>
<thead>
<tr>
<th>Application</th>
<th>Emergency electronic brake</th>
<th>Emergency vehicle</th>
<th>Traffic jam ahead warning</th>
<th>Hazardous location</th>
<th>Weather Conditions</th>
<th>In-vehicle signage</th>
<th>In-vehicle speed limits</th>
<th>Probe vehicle data</th>
<th>Shockwave damping</th>
<th>Green Light Speed Advisory/Time to Green</th>
<th>Signal violation</th>
<th>Traffic signal priority request</th>
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Connected Vehicle Technology is ready to go!

With Car2x we...
- improved traffic safety
- improved traffic efficiency
- create less traffic jam and less emissions

Car2x technology is ready to go!
- functions confirmed by pilots
- full developed infrastructure components
- worldwide standards

With WLAN 802.11p we have...
Contact

Mark Rogers, Smart Cities Focused Account Manager

Siemens Mobility, Inc.
Intelligent Traffic Systems

9225 Bee Cave Road
Building B, Suite 101
Austin, Texas 78733

Rogers.mark@siemens.com
678.296.7481

www.usa.siemens.com/intelligenttraffic