GATEWAY CITIES TECHNOLOGY PLAN FOR GOODS MOVEMENT

Summary of Materials and Notes from the January 10 and 11, 2012 and April 4, 2012 Vendor Showcase

VENDOR SHOWCASE

DATE: May 3, 2012
PRESENTED FOR: Gateway Cities Council of Governments
Los Angeles County Metropolitan Transportation Authority

PRESENTED BY: Cambridge Systematics, Inc.
Arellano Associates
# Table of Contents

1.0 Introduction ......................................................................................................... 1-1  
   1.1 Objectives ......................................................................................................... 1-1  
   1.2 Format for the Vendor Showcase ................................................................ 1-2  
   1.3 Technology Overview ................................................................................ 1-2  
   1.4 Participant List ............................................................................................ 1-5  

2.0 Vendor Overview ................................................................................................ 2-8  
   2.1 Description and Relevance ........................................................................ 2-9  

3.0 Vendor Presentations and Discussion Notes .............................................. 3-13  
   Vendor Showcase Day 1 ................................................................................... 3-14  
      3.1 Volvo ......................................................................................................... 3-14  
      3.2 INRIX ...................................................................................................... 3-19  
      3.3 Sensys ...................................................................................................... 3-26  
      3.4 NAVTEQ .................................................................................................. 3-30  
   Vendor Showcase Day 2 ................................................................................... 3-34  
      3.5 Perceptics/Mettler Toledo .................................................................... 3-34  
      3.6 Advent ...................................................................................................... 3-38  
      3.7 TomTom .................................................................................................... 3-41  
      3.8 Telvent ..................................................................................................... 3-45  
   Vendor Showcase Day 3 ................................................................................... 3-49  
      3.9 SouthWest Research Institute (SwRI) ................................................... 3-49  
      3.10 Intelligent Imaging Systems (IIS) ......................................................... 3-55  
      3.11 ParkingCarma ......................................................................................... 3-59  
      3.12 Iteris ...................................................................................................... 3-64  
      3.13 Transcore ............................................................................................... 3-68  

4.0 Appendices ......................................................................................................... 4-71  
   4.1 Summary of Key Questions ....................................................................... 4-72  
   4.2 Summary of Review Panel Discussion ...................................................... 4-77  
   4.3 Vendor Presentations and Collateral Days 1 and 2 .................................. 4-80
List of Tables, continued

(under separate cover) .......................................................................................... 4-80
4.4  Vendor Presentations and Collateral Day 3 ............................................. 4-81
(under separate cover) .......................................................................................... 4-81
List of Tables

Table 4.1 Summary of Key Questions ................................................................. 4-72
Table 4.2 Summary of Review Panel Discussion ........................................... 4-77
List of Figures

Figure 1.1 Technology Overview Days 1 and 2 ...................................................... 1-3
Figure 1.2 Technology Overview Day 3 ............................................................. 1-4
Figure 2.1 Vendor Description and Relevance ................................................. 2-9
Figure 3.1 Volvo Profile .................................................................................... 3-14
Figure 3.2 INRIX Profile .................................................................................. 3-19
Figure 3.3 Sensys Profile .................................................................................. 3-26
Figure 3.4 NAVTEQ Profile ............................................................................. 3-30
Figure 3.5 Perceptics Profile ............................................................................ 3-34
Figure 3.6 Advent Profile ................................................................................ 3-38
Figure 3.7 TomTom Profile ............................................................................... 3-41
Figure 3.8 Telvent Profile ............................................................................... 3-45
Figure 3.9 SwRI Profile .................................................................................. 3-49
Figure 3.10 Intelligent Imaging Systems Profile ............................................ 3-55
Figure 3.11 ParkingCarma Profile ................................................................. 3-59
Figure 3.12 Iteris Profile ................................................................................. 3-64
Figure 3.13 TransCore Profile ......................................................................... 3-68
1.0 Introduction

The Gateway Cities Technology Plan for Goods Movement will provide a blueprint for an end-to-end information support system that can improve the efficiency of goods movement in Southern California through the integration of traditional real-time road and traveler information technologies, along with intermodal freight, port and truck technologies. The Plan is being developed by the Gateway Cities Council of Governments (GCCOG) and the Los Angeles County Metropolitan Transportation Authority (LA MTA) with input from the Ports of Long Beach and Los Angeles, Caltrans, and many other key stakeholders.

The Technology Plan will include:

- Detailed research on the latest applicable trends, practices and regional priorities in technology applications for goods movement and other transportation needs;
- Feasibility studies of several project areas for new and expanded technology applications for Gateway Cities identified by the 2008 ITS Integration Plan for Goods Movement (the earlier phase of this project);
- Exploration of technologies supporting emerging alternatives for I-710 corridor improvements; and
- A detailed concept of operations and a business plan to ensure that real-world projects for implementation are the outcome of the Plan.

As part of the planning process, Vendor Showcases were conducted on January 10 and 11, and April 4, 2012.

1.1 Objectives

The objective of the Vendor Showcase was to provide the agencies and ITS Working Group with a window into the current state of the practice for relevant ITS/advanced traveler information as well as commercial vehicle technology vendors.

The Vendor Showcase provided the vendors with an opportunity:
• to present an overview of their current products (e.g. software, hardware or service);
• to discuss where they believe their technology and market is going in the next ten years (i.e. the latest big leap recently has been the exploding potential of the mobile platform; going forward, what do they see as the next big thing); and
• to provide information on capital costs and projected ongoing operating/ and maintenance costs.

Ultimately, the key was to gain a better understanding of the technologies available to support the Gateway Cities Technology Plan projects and what the each technology brings to the business process.

1.2 FORMAT FOR THE VENDOR SHOWCASE

Each vendor was invited to present their products/services to the participants representing the various stakeholder agencies and the ITS Working Group. This included informal question/answers as the presentations proceeded.

1.3 TECHNOLOGY OVERVIEW

Fourteen (14) critical projects will be included in a feasibility analysis as part of the Gateway Cities Council Technology Plan for Goods Movement. The table below matches the technology firms that participated in the VS with these critical projects.
**Figure 1.1  Technology Overview Days 1 and 2**

<table>
<thead>
<tr>
<th>PROJECTS</th>
<th>ADVENT</th>
<th>INRIX</th>
<th>NAVTEQ</th>
<th>PERCEPTICS/METTLER TOLEDO</th>
<th>SENSYS</th>
<th>TELVENT</th>
<th>TOMTOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREEWAY DETECTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PERFORMANCE MANAGEMENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRUCK PLATOONING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRUCK INFO INTEGRATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARTERIAL TRAVEL TIMES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRUCK FLEET COMMUNICATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEDERAL PROGRAMMING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUEUE DETECTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCHEDULING SYSTEM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRANSPORTATION MANAGEMENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRUCK PARKING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRUCK ENFORCEMENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-710 OPPORTUNITIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Figure 1.2 Technology Overview Day 3

<table>
<thead>
<tr>
<th>PROJECTS</th>
<th>VENDOR SHOWCASE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VOLVO</td>
</tr>
<tr>
<td>FREEWAY DETECTION</td>
<td></td>
</tr>
<tr>
<td>PERFORMANCE MANAGEMENT</td>
<td></td>
</tr>
<tr>
<td>TRUCK PLATOONING</td>
<td></td>
</tr>
<tr>
<td>TRUCK INFO INTEGRATION</td>
<td></td>
</tr>
<tr>
<td>ARTERIAL TRAVEL TIMES</td>
<td></td>
</tr>
<tr>
<td>TRUCK FLEET COMMUNICATION</td>
<td></td>
</tr>
<tr>
<td>FEDERAL PROGRAMMING</td>
<td></td>
</tr>
<tr>
<td>QUEUE DETECTION</td>
<td></td>
</tr>
<tr>
<td>SCHEDULING SYSTEM</td>
<td></td>
</tr>
<tr>
<td>TRANSPORTATION MANAGEMENT</td>
<td></td>
</tr>
<tr>
<td>TRUCK PARKING</td>
<td></td>
</tr>
<tr>
<td>TRUCK ENFORCEMENT</td>
<td></td>
</tr>
<tr>
<td>I-710 OPPORTUNITIES</td>
<td></td>
</tr>
</tbody>
</table>
1.4 PARTICIPANT LIST

Vendors

**Tuesday January 10, 2011**
Jan Hellaker, Volvo  
Pete Costello, INRIX  
Ted Lepantier, INRIX  
Bob Driggers, Sensys  
Ray Schreiber, Sensys  
Keith Hangland, NAVTEQ

**Wednesday, January 11, 2011**
Rob Boback, Perceptics  
Mike Sanz, Perceptics  
Mike Mayhew, Advent  
JP Cabalar, Advent  
Nick Cohn, TOMTOM  
Lisa Woodward, Telvent  
Rick White, Regional Director, West Region, Telvent  
Tip Franklin, Director Business Development, Telvent  
Marcelino Romero, Lead Engineer, Telvent

**Wednesday April 4th, 2012**
Jan Hellaker, Volvo  
Tammy Duncan, Southwest Research Institute  
Gary Hamrick, Iteris, Inc.  
Rob Hranac, Iteris, Inc.  
Rick Warner, ParkingCarma  
Dr. Elliott Martin, UC Berkley Transportation Sustainability Research Center  
Kelly Gravelle, TransCore  
Paul Washicko, TransCore  
Thomas L. Sheehy, Intelligent Imaging Systems  
Brian Heath, Intelligent Imaging Systems
ITS Working Group January 10th and January 11th
Edward Fok, FHWA-USDOT
Bruce Wargo, FHWA-USDOT
Randy Butler, FHWA-USDOT
Alan Hicks, Federal Maritime Administration (MARAD)
Mike Williams, Executive Director, IWLA
Ken Coleman, LA MTA
Jackie Tan, Caltrans District 7
Allen Chen, Caltrans District 7
Michael Ippoliti, CALTART

ITS Working Group April 4th, 2012
Jackie Tan, Caltrans District 7
Allen Chen, Caltrans District 7
Randy Butler, FHWA-USDOT
David Roseman, City of Long Beach
Ron Castaneda, LA County Department of Public Works
(representing Jane White)

Review Panel January 10th and January 11th:
Chris Hedden, Cambridge Systematics, Inc.
Mark Jensen, Cambridge Systematics, Inc.
Jerry Wood, Gateway Cities Council of Governments (GCCOG)
Susan DeSantis, Arellano Associates
Steven Gota, LA County Metropolitan Transportation Authority
Reinland Jones, LA County Metropolitan Transportation Authority
Jesse Glazer, ITS Engineer for Southern California, Federal Highway Administration

Review Panel April 4th, 2012:
Chris Hedden, Cambridge Systematics, Inc.
Mark Jensen, Cambridge Systematics, Inc.
Jerry Wood, Gateway Cities Council of Governments (GCCOG)
Susan DeSantis, Arellano Associates
Steven Gota, LA County Metropolitan Transportation Authority
Reinland Jones, LA County Metropolitan Transportation Authority
Jesse Glazer, ITS Engineer for Southern California, Federal Highway Administration
Support Team:
Samuel Van Hecke, Cambridge Systematics, Inc.
Martin Schilling, Cambridge Systematics, Inc.
Raul Velazquez, Arellano Associates
Nelson Lee, Eiger Technologies
Barry Mason, BGM Consulting
Maria Yanez-Forgash, Arellano Associates
Gina Ulloa, Arellano Associates
2.0 Vendor Overview
## 2.1 Description and Relevance

### Figure 2.1 Vendor Description and Relevance

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Description and Relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>INRIX</td>
<td>INRIX is the leading provider of traffic information, directions and driver services, as well as apps and tools all designed to get your traffic-powered solutions to market rapidly. They fuse traffic data from a variety of sources (DOT sensors, truck fleet GPS devices, and cell phones).</td>
</tr>
<tr>
<td>NAVTEQ</td>
<td>NAVTEQ is the leading global provider of maps, traffic and location data (digital location content) enabling navigation, location-based services and mobile advertising around the world. They are similar to INRIX in that they fuse data to then sell to providers/DOTs etc. They also have a Smart Parking deployment we would like to hear about from them.</td>
</tr>
<tr>
<td>Perceptics, LLC</td>
<td>Perceptics, LLC has more than 20 years experience in the Security and Traffic Management and Machine Vision industries. Perceptics leads the industry in providing port, border, container, and transportation lane security solutions to a variety of commercial, federal, and government agencies. At this showcase, Perceptics will demonstrate the following equipment:</td>
</tr>
<tr>
<td></td>
<td>- Commercial License Plate Readers – automatically capture and translate all types of commercial vehicle plates.</td>
</tr>
<tr>
<td></td>
<td>- Commercial DOT number reader – automatically capture the DOT, VIN and other data on the sides of trucks.</td>
</tr>
<tr>
<td></td>
<td>- Container code reader – automatically capture the container codes on shipping containers.</td>
</tr>
<tr>
<td></td>
<td>- Scene camera – capture an overall scene image of the vehicle</td>
</tr>
<tr>
<td></td>
<td>- Driver Side Camera – Capture an image of the driver, regardless of tint and fog (very cool technology)</td>
</tr>
<tr>
<td></td>
<td>- Under Vehicle Inspection System (UVIS) – capture one seamless image under a truck and immediately identify code enforcement opportunities and contraband. Usually, a precursor to crawling under the truck.</td>
</tr>
<tr>
<td>Sensys Networks</td>
<td>Sensys Networks provides the networked wireless sensors, continually measuring the vital signs of the existing surface transportation network—and providing the analytical foundation for:</td>
</tr>
<tr>
<td></td>
<td>- Performance measures to guide policy and investment decisions</td>
</tr>
<tr>
<td></td>
<td>- Real-time traffic and infrastructure monitoring to optimize mobility</td>
</tr>
<tr>
<td></td>
<td>- Accurate and reliable traveler information systems</td>
</tr>
<tr>
<td></td>
<td>- Enhanced incident response</td>
</tr>
<tr>
<td></td>
<td>- Informed decision making</td>
</tr>
<tr>
<td></td>
<td>They are one of the few vendors who have really tried to tackle getting accurate travel times on arterials. This “type” of technology may be an early winner if getting high quality arterial travel time information along known significant freight corridors becomes an early project.</td>
</tr>
<tr>
<td>TELVENT</td>
<td>Telvent is a dominant information systems provider in several key industries. Around the world, their intelligent transportation systems control traffic at 9,000 intersections used by 195 million drivers per day; and manage the journey of over 2.5 billion passengers per year on train and metro networks; and ensure the safe and efficient departure and arrival of more than 700 million airline passengers annually.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| TomTom | TomTom is the world’s leading provider of in-car location and navigation products and services focused on providing all drivers with the world’s best navigation experience. This vendor states the following facts on their website:  
- Since 2004 they sold over 55 million Portable Navigation Devices  
- Since 2009 they sold over 2 million in dash navigation systems to the Automotive industry  
- Their Traffic services uses a pool of over 80 million probes and is currently available in 23 countries  
- Their Maps cover over 100 countries reaching more than 3 billion people  
Their Fleet Management solutions service is used daily by over 150,000 professional drivers. |
| Volvo | The Volvo Group is a world-wide industry leader in the field of wireless communications on trucks. Having pioneered this field in the early 90s, today’s Volvo vision of a truck turns it into nothing less than a mobile communication hub that can communicate via DSRC 5.8 GHz, and support multiple in-vehicle sensors and devices. (Volvo is part of the Gateway Cities Project Team.) |
| Southwest Research Institute (SwRI)’s Intelligent Systems Department (ISD) is involved with numerous CVO/ITS projects including CVO, intelligent/connected vehicle systems including CV Retrofit Safety Device (RSD), Vehicle-to-Vehicle (V2V), Vehicle-to-Infrastructure (V2I), Vehicle Infrastructure Integration (VII), Commercial VII (CVII), Intelligent Vehicle Initiative (IVI), platooning, and autonomous vehicles. |
| Intelligent Imaging System (IIS) specializes in imaging and electronic screening systems that are designed to enhance commercial vehicle enforcement. IIS is currently deploying a next generation Truck Bypass Program called Drivewyze™. The Drivewyze™ system is based on applications for smart phones. The system incorporates a completely hands free application connecting pre-registered carriers to the Smart Roadside system to screen and bypass compliant vehicles. |
**ParkingCarma** has focused on smart urban parking for 10 years. The ParkingCarma Open Parking Network provides a managed service that makes parking in urban areas easier for the driver and more lucrative for the parking manager. ParkingCarma is at the forefront of Smart Truck Parking (STP) which has enabled truck stop operators, fleet managers, and truck drivers to connect and improve their parking experience.

Iteris’ recent purchase of Berkeley Transportation Systems (BTS) greatly enhances the firm’s expertise in the area of performance measurement and monitoring. BTS manages the statewide traffic monitoring program (PeMS) for Caltrans and has provided the City of Los Angeles with a comparable arterial traffic monitoring program (A-PeMS) linked to the City’s ATSAC system.

TransCore has its roots in the tolling industry; today it offers the full spectrum of hardware and software necessary to operate toll collections and violations processing.
3.0 Vendor Presentations and Discussion Notes
VENDOR SHOWCASE DAY 1

3.1 VOLVO

Figure 3.1 Volvo Profile

CONTACT
Jan Hellaker, Vice President | Business Development & Government Programs, Volvo Technology North America | 575 Anton Blvd, Suite 860 | Costa Mesa, CA 92626 | (949) 288-3216 Office | (757) 338-1237 Cell | jan.hellaker@Volvo.com

PARTICIPANTS
Jan Hellaker joined Volvo in 1986 and has held a variety of positions within the Groups since then, most of them strongly related to telematics and ITS. He is currently the Vice President of Business Development & Government Programs with Volvo Technology North America.

PROFILE
The Volvo Group is one of the world’s leading manufacturers of trucks, buses and construction equipment, and is the owner of several well-known brands such as Mack Trucks, Renault Trucks, UD Trucks, Nova Bus, and Prevost, in addition to the family of Volvo branded vehicles.

The Volvo Group employs about 100,000 people worldwide and has about 10,000 employees in the US. In 2010 annual sales of the Volvo Group amounted to about USD 40 billion. The Volvo Group is a publicly-held company, headquartered in Gothenburg, Sweden. Volvo has been a very active player in the ITS market for over 25 years, and has launched several world-class ITS products and services.

Volvo Technology of America, Inc. is a member of the Volvo Group, one of the world’s leading providers of Commercial Transport Solutions. Volvo owns and manufactures several brands of trucks (including MACK), buses (including Prevost) and construction equipment, drive systems for marine and industrial applications, aerospace components and services, and is one of the world’s leading producers of heavy-diesel engines 9- to16-liter.

Volvo Technology is the center for innovation, research, and development in the Volvo Group. The mission of the company is to develop a lead in existing and future technology areas of high importance to Volvo. The range of areas where they do advanced research is very broad and includes telematics, ITS, logistics, ergonomics, electronics, combustion, and mechanics. Simulation, modeling, and systems engineering are important tools.

One key activity of Volvo Technology is a systems development group that combines
VOLVO PRESENTATION DAY 1

The Volvo Group is the second largest manufacturer of heavy-duty trucks in the world, and the only one that manufactures all its US sold trucks in the United States. Through brands such as Volvo, Mack and Renault, trucks constitute more than half of the Volvo Group’s operations. The company’s vision is to develop sustainable transport solutions, pioneering products and services for the transport and infrastructure industries while holding to their core values of quality, safety and environmental care.

Volvo offers a telematic service similar to Onstar through its “Wireless Car” division. This technology is installed under a variety of names in Volvo construction vehicles and trucks, and in several brands of passenger cars. Recently manufactured Volvo trucks are equipped with “Volvo Link” technology, which connects trucks and drivers to their fleet managers. Information on vehicle miles traveled, drive and idling time, fuel efficiency and “driving incidents” such as when a truck deploys its stability and traction control or ABS breaking system are transmitted back to fleet managers. Fleet managers can customize the information they would like to view from among the data collected. Truck error codes are also transmitted to notify fleet managers of vehicles’ repair and maintenance needs. This technology has not been applied to monitoring how long a truck idles in relation to an intermodal transportation center such as a port; however, the data collected to answer this question can be extracted from the current information reported.

One potential barrier to applying this technology is that Volvo does not currently sell this as a product separate from their line of trucks, and drayage carriers typically have fleets consisting of more than one original equipment manufacturer. In addition, different brands of telematic services are not compatible with one another; for example, “Connected Drive,” a Volvo product used by BMW, is not compatible with Onstar used by GM. Telematic companies have their own back office servicers and communication must go through the call center specific to that telematic service. Because these technologies and services are proprietary, different drayage carrier companies and even vehicles within the same fleet may not have compatible systems. The Ports of Long Beach and Los Angeles cannot mandate one telemetric service over another; therefore, under the current configuration, the terminal operators would not be able to communicate with all of the trucks in line for entry into the Port. However, Volvo was able to decrease the wait time for trucks by 25% at the port in Gothenburg, Sweden. They did so by eliminating paperwork and automating the information exchanged between terminal operators and drayage carriers during the check in...
and clearance process. This system was developed specifically for this port and required the cooperation of all parties involved, which was challenging at times.

Despite these current barriers, Volvo is playing a central role in preparing for a future in which all vehicles will communicate with one another. Within the next few years, all vehicles may be required by NHTSA to have digital short range communication (DSRC) capability to enhance safety. Volvo is leading a team that is developing DSRC-compliant Commercial Vehicle Infrastructure Integration (CVII) systems. The first, Information to Vehicle (I2V) will convey transportation information such as speed limits, construction zones and oversize/overweight (OS/OW) restrictions to construction, maintenance and commercial vehicles while they are en route. The second, Vehicle to Vehicle (V2V), will enable these vehicles to send out “heartbeat” signals conveying their vehicle type and directional heading to each other and to passenger vehicles within close proximity. These signals will be picked up and used to alert other drivers to potential blind spots, passing and lane change clearance and hard breaking events. It is possible that CVII could be useful for trucking in the port areas if it could be used to alert drivers to backups, lines and stopped traffic. Also pertinent to trucks is “Trusted Truck®,” Volvo’s and NTRCI’s wireless roadside truck inspection concept designed to eliminate the need for weigh station stops by transmitting the vehicle’s weight and related information to enforcement authorities at highway speeds. This technology has completed the demonstration stage and a pilot project is being planned.
In the future, all types of vehicles will employ some elements of automated driving; the question remains precisely how it will be deployed. DSRC is guaranteed to be an integral part of the futures of the commercial transportation and vehicle manufacturing industries, and V2V assumes that in the future all vehicles including passenger will be equipped with some kind of ITS device. In addition, Volvo anticipates that eventually telematic services will have to be compatible with one another in order to really be useful. The shape and specifications of the devices: tablet, dash mounted, audio and/or visual displays, are all part of what remains to be seen; however, they are moving towards operating on an open, compatible platform so that applications can run on a variety of devices.

VOLVO PRESENTATION DAY 3

Volvo predicts that vehicle platooning will be commercially available within the next ten years and can benefit both trucking operators and the larger public. On the public side, platooning can increase lane capacity because the distance between vehicles can be reduced, perhaps down to six meters or less. It may also improve safety because automated vehicle systems can avoid human error. In addition, because the platooning technology requires no changes in existing infrastructure, government agencies are increasingly receptive to discussing implementation. The trucking industry is moving towards automated vehicles because of the benefits in fuel efficiency and safety.

Platooning requires a combination of manual and automated vehicle control systems. A platoon-ready vehicle's automated system relies heavily on radar and cameras to maintain awareness of its position in relation to the other vehicles in its queue. When joining a platoon, a driver is guided by the vehicle's on-board navigation device to a nearby group were the driver releases control to the automated vehicle system. Once it has joined the platoon, the vehicle is controlled by the platoon's lead vehicle, which is driven by a specially trained driver and equipped with additional sensors and communication capabilities that enables it to send signals to the vehicles following behind. Vehicles in the platoon follow the lead vehicle using their automated driving capacity, matching its speed and position (longitude and latitude) and maintaining the prescribed distance between vehicles. When exiting the platoon, the driver resumes manual control of the vehicle in order to complete the trip.

Volvo is developing this technology through their work on SARTRE (Safe Road Trains for the Environment). This demonstration project began in 2009 and has been funded by the European Union; it will be wrapping up in October of 2012. The technology developed and tested in the SARTRE Project is intended for use on major freeway corridors. While one of the Project's main goals is to identify the optimal length of a road train, the current project has been limited to include two heavy trucks and three passenger vehicles. Automated driving research is also conducted at the Institute for Transportation Studies at UC Berkeley as part
of the California PATH Program has led to a variety of automated test vehicles including heavy trucks, passenger cars and transit buses. In addition to their research into automated driving systems, ITS is seeking to demonstrate the feasibility of highly accurate vehicle control and to show consumers that automated driving can be pleasant rather than threatening.

Public implementation of automated vehicles and platooning will require a standardization of automated systems design. Vehicles will need to be equipped with V2V (vehicle to vehicle) communication and Cooperative ACC (Adaptive Cruise Control). Currently there are also startup companies, designing an aftermarket system with wireless V2V communication and radar to enable them to form close-following drafting pairs, which demonstrates the interest in automated technology that will increase fuel efficiency and improve safety.

While vehicle manufacturers recognize the benefits of autonomous driving, there are still market and legislative questions that must be addressed before automated driving and platooning can be fully implemented. In addition, consumers may not yet be ready to embrace the technology; therefore implementing the technology incrementally will give consumers time to adjust to the coming changes. While the underlying technology is largely the same, deploying limited platooning on dedicated lanes for trucks only (e.g. on I-710) would of course be less of a challenge than also involving passenger cars in any given traffic environment.
3.2 INRIX

Figure 3.2 INRIX Profile

INRIX is the leading provider of accurate real-time, historical and predictive traffic information. INRIX delivers the broadest coverage, exceptional accuracy, innovative technologies and a unique approach to ensuring the success of our customers’ navigation and traffic-enabled solutions.

INRIX is the exclusive beneficiary of intellectual property that represents years of research and millions of dollars of development by Microsoft Research into the statistical inference of traffic patterns, predictive analysis and mobile-based visualizations of real-time systems. The company has developed a portfolio of patented, proprietary technologies to enable the delivery of next generation traffic information services.

The INRIX Smart Driver Network represents a traffic technology breakthrough that dramatically improves the accuracy, quality and coverage of traffic information and provides businesses, government agencies and consumers with the information they need to avoid gridlock and save time and money. It works by combining anonymous, real-time GPS probe data from over 30 million commercial fleet, delivery and taxi vehicles, as well as consumer cellular floating vehicle data and GPS-based devices including the BlackBerry, Windows Phone 7, iPad, iPhone, Android phones and Ford SYNC, Toyota Entune and Audi Connect with traditional real-time traffic flow information and hundreds of market-specific criteria that affect traffic—such as construction and road closures, real-time incidents, sporting and entertainment events, weather forecasts and school schedules.
INRIX’s proprietary Traffic Fusion Engine uses sophisticated Bayesian modeling and proprietary error correction technology to process over 400 sources of data aggregated by the INRIX Smart Driver Network and generates accurate traffic and other location-relevant content data. INRIX has a broad range of real-time, predictive and historical traffic flow services, including INRIX Nationwide Traffic Alerts, providing alerts on over 200,000 miles of freeways and the entire Interstate highway system. Additionally the company has the most extensive traffic incident information available, via its partnership with Clear Channel Total Traffic Network.

INRIX also recently introduced INRIX Total Fusion, the first traffic data service that intelligently combines real-time, predictive and historical traffic information for over 1 million miles of roadways across the U.S., Canada and the EU, including 28,572 centerline miles in California. INRIX Total Fusion is the ideal solution for a rich connected navigation experience, providing speed information for busy city streets and congested arterials.

INRIX leads the market with over 200 customers and industry partners internationally including Ford, Toyota, BMW, Audi, TomTom, Navigon, Motorola, MapQuest, the Texas Transportation Institute, Microsoft, Clear Channel Radio’s Total Traffic Network, TeleNav, the I-95 Corridor Coalition, Garmin, Tele Atlas, deCarta, ITIS Holdings, Mio, Navigon, Telmap, ANWB, ARC Transistace, TNO and many state Departments of Transportation. INRIX is a privately held corporation based in the Seattle area and was founded in 2005 by former Microsoft executives Bryan Mistele and Craig Chapman.

INRIX PRESENTATION

INRIX is the leading provider of traffic data services in the United States. They serve clients in the public and private sectors who purchase their data for a variety of uses including infrastructure planning and web and mobile apps. Current applications of their data include the ITS systems installed in the Toyota Entune, Ford Sync, and several BMW models. Mobile device applications using INRIX data include Google’s European navigation applications, Motion X and INRIX’s own traffic application. Recently INRIX has started marketing the use of their products to smaller fleets, delivery vehicles (UPS) and taxicabs as well as additional automotive OEMs. Other uses of their data include traffic map overlays used to predict on demand travel times for specific routes accessed on websites such as Map Quest. Public sector users include many 511 travel information services and dynamic freeway signs displaying the times to next highway interchange or exits. INRIX has also made their real time traffic data available via a website to public sector agencies such as FEMA and state DOTS for incident and emergency management. All public sector agency staff may register and use for free at INRIXTraffic.US.

INRIX obtains their real time data on traffic speeds from a variety of sources; the largest one is crowdsourcing using the GPS and cell phone signals of users currently running navigation devices and smart phone applications that are powered by INRIX data. Each individual device serves as a data point and sends back information on its current speed, direction and position to INRIX. (Individual devices are assigned a randomized session code, which insures users’
INRIX combines this data with other public data sources such as roadside sensors and traffic alerts and uses it to calculate traffic speeds in real time on most major freeways and arterials in the United States. Traffic speeds are updated every minute. They also use this real time data to predict travel times between points. By combining real time data with known variables such as holidays, special events and road closures, INRIX is able to calculate travel time on demand. These predictions are passed on to navigation devices and smart phone applications that provide routing and travel time services to users. Using their aggregated data, INRIX also develops a “speed profile” for roadway segments, also called traffic management channels (TMC), in their coverage area. Using these speed profiles, INRIX is able to calculate real time speed and to predict travel time even when there are fewer data points; i.e., vehicles running INRIX apps, on those roadways. (TMCs are industry defined segments of roadway that begin and end at driver decision points such as freeway entrances and exits and arterial intersections.

In the past, most of INRIX’s real time data came from commercial vehicles since they were the majority of vehicles using GPS location devices. As the market for passenger car navigation devices and cell phone applications has expanded, so has INRIX’s source of non-truck data, greatly improving its travel time predictions for all vehicles. INRIX does have the capacity to produce freight only data by separating fleet vehicles from other data sources; however, because the data from each individual vehicle is sent anonymously, it cannot be used to track
individual trucks. According to INRIX, the most valuable information it can offer commercial drivers is: (1) the general speed at which traffic is moving and (2) the location of any major traffic incidents including the reason for the backup; i.e. will it be cleared quickly. This information can help truckers decide when to begin their trips and which routes to take. INRIX also sees possibilities to contribute to this project by using its aggregated data to help in planning the changes needed to address the challenges faced by the Port and trucking communities, and to develop performance measures to continually improve the process.

Beyond the calculations of real time speed and predicted travel time, INRIX considers traffic management to be the next best application of their data. With it, traffic planners can identify congested segments of roadways that slow freight movement and flag them as places needing additional capacity or ITS solutions. INRIX also sees their data as useful for optimizing the existing roadway infrastructure by suggesting alternate routes around road segments that are constrained and even developing a multimodal application showing alternative ways to reach a destination during peak travel periods. Their future business plan is to continually improve their product by updating the mathematical models and algorithms used and capitalizing on the continually expanding pool of data. To that end, INRIX is pursuing additional sources of information from agencies that are collecting real time data feeds and seeking to integrate it into their system. Using this expanded data set, including the lane-by-lane freeway speeds collected in real time by DOT roadside sensors, INRIX hopes to eventually calculate two speeds for each TMC. (At present, they are only able to calculate one speed, which is an average of all the data points collected. The ability to calculate two speeds would be based on a bi-modal distribution of the data (i.e. the ability to identify two values (speeds) around which data points are clustered.) INRIX is also looking to find ways to use user-contributed data for real time traffic incident reporting, which may be faster than some traffic alerts.

INRIX data, both real-time and historic, is now available as a subscription service bundled with state of the practice analytics and visualization tools. INRIX has partnered with the University of Maryland to expand the Vehicle Probe Project Analytics Suite currently in use by the I-95 Corridor Coalition to provide national coverage. The Suite provides a real-time dashboard as well as instant access to historical data and the ability to compute common mobility performance measures on demand along with visualization tools. An overview of the VPP Analytics Suite is available in the form of a short video tutorial at: http://vpp.ritis.org/suite/screencast/

The analytics suite includes:

- A System Dashboard indicating current congestion levels and bottlenecks
- Raw data query tool for instant access to archived data based on user specified locations and date ranges
- Historical Analytic Tools to instantly calculate common performance measures for user defined corridors and date ranges, including:
• Average Speed
• Travel Time Index
• Travel Time
• Buffer Index
• Buffer Time
• Planning Time Index
• Planning Time

- Visualization Tools for defined performance measures, including: charts, contour plots, and tabular summaries
- Bottleneck Ranking Tool to identify system bottlenecks for user defined date ranges

INRIX Analytics - System Monitoring Dashboard
Gateway Cities Technology Plan for Goods Movement

INRIX Analytics - Example of Historic Data Contour Plot

INRIX Analytics - Example of Historic Data Chart
The future of the industry will be to provide consumers with a more complete user experience. INRIX anticipates that in two to three years, almost every vehicle manufactured, commercial and passenger, will be equipped with voice-activated integrated ITS systems. These systems will require better location awareness to be able to notify drivers of weather-related road conditions and predict travel times. These ITS systems may also anticipate traffic conditions and make travel time predictions that can be synced with users’ calendars for “never late again” applications. For INRIX, the future will bring increased demand for their data and the services that use it as more consumers begin using ITS applications. INRIX’s plans to continually improve their product to meet this demand.
3.3 **SENSYS**

**Figure 3.3  Sensys Profile**

Sensys Networks is the world’s leading provider of wireless traffic detection and integrated traffic data systems. Their universal platform delivers the most dependable, flexible, and cost-effective solution on the market today; and, their patented, wireless magnetic sensors install in a fraction of the time, with far less disruption to traffic than traditional detection technologies. Deployed in more than 45 U.S. states and 20 countries, the Sensys Networks wireless vehicle detection system is the technology standard for the world’s largest traffic data systems.

Sensys Networks’ provides turnkey, wireless detection solutions that are revolutionizing how transportation agencies obtain and utilize accurate, real-time data. Unlike inductive loops, VDS240 requires no trenching, and can be installed wherever detection is needed. Their technology has an unprecedented 10+ year battery life, installs in minutes, has near-zero maintenance requirements, has universal inductive loop replacement technology, remote management, configuration, and diagnostics, and upgradable firmware. The Sensys Networks VDS240 can be deployed across the enterprise in a matter of hours. The VDS240’s universal platform enables its use in a wide range of detection applications including:

- Freeway traffic monitoring and operations
- Traffic signal control
- Adaptive/responsive traffic signal control
- Integrated Corridor Management (ICM)
- Arterial performance measurement
- Traveler information systems
- Red light and speed enforcement
- Light rail detection

Sensys Networks is a pioneer in the use of wireless sensor networks for vehicle detection applications and is the world’s leading supplier of these products. With six US-issued patents, and an additional six patent applications pending in the US and overseas (covering various innovations developed for Sensys Networks’ vehicle detection and arterial travel time system), Sensys Networks own the fundamental intellectual property in the field, and maintain an active program of developing and protecting their
Sensys Networks technology help cities address worsening traffic congestion—and the serious challenge of optimizing the performance of their existing surface transportation networks due to population explosion, and exponential increases in individual travel and freight shipment. Today, these vital networks are all bone and muscle—roadways, bridges, tunnels, parking structures, traffic signals, etc. Sensys Networks provides the “nervous system” of networked wireless sensors measuring the vital signs of this critical infrastructure and providing the analytical foundation for:

- Performance measures to guide policy and investment decisions
- Real-time traffic and infrastructure monitoring to optimize mobility and safety
- Accurate and reliable traveler information systems
- Enhanced incident response
- Informed decision making

SENSYS NETWORKS PRESENTATION

Sensys Networks is the leading implementer of wireless traffic detection and information systems in the world. The company began seven years ago when Caltrans approached a group of engineers at U.C. Berkeley for help with the on-going problem of replacing inductive loops along freeways. In response to Caltrans’ problem, Sensys developed a wireless “magnetometer,” a wireless sensor embedded in the roadway that can identify the individual vehicles that pass over it. These magnetometers have been nicknamed “Pucks”.

Each puck's resale price is approximately $400 and contains a lithium thionyl battery that lasts 10+ years. The main function of these wireless magnetometers is for basic signal control functions at an intersection. They seamlessly replace inductive loops in any of these applications and provide immediate cost savings to agencies that standardize on this 21st Century technology. The pucks install in 1/10th the time of a typical inductive loop that simplifies the whole signal control process from the beginning. These same wireless sensors also can collect a wide variety of data and performance measures for an agency.

One of these performance measure applications is called Arterial Travel Time. Utilizing a patented technique called magnetic re-identification this solution is able to anonymously identify and re-identify vehicles as they make their way down a signalized corridor. The output of the System is a complete distribution
of travel times, Levels of Service and a host of other meaningful measures like vehicle counts, speeds. All of this data is generated and collected in real time that allows agencies to use these travel times on changeable message signs for traveler information and active traffic re-routing applications. A few future applications using this technology will produce GhG and emissions measurements along a corridor as well as the ability to produce accurate ‘predictive’ travel times up to 60 minutes prior to the actual timeframe. The System is 97% accurate and has been independently studied and verified by a number of universities and research institutes. Sensys patented wireless technology operates differently than probe data. While probe data gives an average speed based on the feedback signals from GPS and mobile device applications, Sensys Networks Arterial Travel Time System is able to re-identify approximately 50-70% of the total number of vehicles that pass over the sensor arrays. The System is 97% accurate and has been ground trothed many times. Using probe data, a server is waiting to receive signals from GPS units, which are sent back at different rates depending on the telemetric service provider. Sensys’ magnetometers are tracking vehicles in real time, allowing vehicle speeds, occupancy and traffic counts to be calculated instantaneously and travel times to be updated more quickly. Probe data can only provide average speed data. Sensor data is more accurate and complete and is therefore more effective as a performance measure.

Magnetometer sensor technology is also unique because the same device can be used for multiple applications. Individual sensors can be set into different modes depending on the data feed desired. While this wireless sensor networking technology was originally developed to replace inductive loops on freeways, it is now being used on arterials to actuate signals, calculate travel times, and even to map traffic congestion. The ability to obtain traffic counts along arterials is particularly useful because it can be used to identify the level of service at which a roadway is operating. This arterial data has evolved and now has uses in transportation and land use planning, speed monitoring, and traffic calming studies among others.

Sensys’ MicroRadar sensors can be used to detect the presence of bicycles in bike lanes and cars in parking spots. It could also be applied to help truck drivers locate available parking places.
Sensys has recently partnered with Siemens to install magnetometer sensors in the roadways leading up to port terminals at the Port of Long Beach. Given the unique magnetic fingerprint of every vehicle, it could also be possible to use the magnetometers to identify individual trucks. Using the magnetometer in conjunction with another device called an accelerometer, which detects the number of axles on individual trucks, Sensys is working on a wireless weigh-in-motion (WIM) system that could be used to monitor truck weights for compliance.

Other new technologies include the development of a wireless sensor that uses micro-radar to sense the presence of bicycles in bike lanes. This micro-radar technology can also be applied to on-street and open lot parking to help drivers locate open spaces more quickly. It is possible that this technology could be applied to truck parking as well. Lastly Sensys is working on a way to estimate air quality (CO, CO2 and NOx) for individual arterials and freeways by post-processing their sensors’ data. This wireless technology is being used around the country as a foundation for the data layer requirements to truly turn a city into a true Smart City.

Data streams today and in the future must be flexible and able to be accessed for a variety of applications and programs. To ensure that their data remains accessible, all of Sensys’ sensor technologies operate using Linux, a universal platform that provides an open data feed of vehicles logged. Each puck also has its own IP address and the software that accompanies the puck allows for remote management, configuration and diagnosis over the web to minimize the cost of maintenance. In addition to streaming its data, each magnetometer can send notification on battery life and signal strength via the web.

Sensys believes that the next generation of active transportation management will demand more accurate and reliable real-time data. Given the direct relationship between sampling size (i.e. the ability to re-identify individual vehicles) and the accuracy of data, future applications will not be satisfied with average speed calculations that are minutes old. They will require the complete data set for vehicles’ speed, traffic count and the full distribution of travel times. Sensys Networks is preparing for that future. Their innovation is inspired by the needs of their customers, which allows for some exciting, real world solutions to difficult real world problems faced by transportation professionals today.
### 3.4 NAVTEQ

#### Figure 3.4 NAVTEQ Profile

**CONTACT**

Keith Hangland, Enterprise Solutions | NAVTEQ | 425 West Randolph Street, Chicago, IL 60606-1530 | 303-974-8111 | www.NAVTEQ.com/enterpriseamericas

**PARTICIPANT**

Keith Hangland has more than 18 years of experience working with government on the implementation of geographic information system (GIS) technologies for transportation. His industry knowledge is backed by extensive experience as a transportation consultant and IT/GIS manager. As part of NAVTEQ’s Enterprise Solutions team, Keith helps package and deliver NAVTEQ’s solutions to support government initiatives related to transportation, public safety and GIS. Keith earned a Master’s in Engineering/GIS from the University of Colorado and a Bachelor’s degree in Environmental Economics from the University of New Hampshire.

**PROFILE**

NAVTEQ, the leading global provider of maps, traffic and location data enabling navigation, location-based services and mobile advertising around the world. The company has built one of the most robust and accurate geographic databases in the world.

- Virtually every major automobile manufacturer currently offering a navigation system in North America and Europe uses NAVTEQ® maps in one or more of their models
- NAVTEQ Maps power major internet mapping portals in North America and Europe
- The leading global wireless brand chooses NAVTEQ maps to help power their location-enabled devices
- The foremost PND manufacturers in the world choose NAVTEQ
- NAVTEQ Traffic™ is the only end-to-end, integrated traffic information solution that spans data gathering to direct-to-consumer delivery
- On average, there are 100 million uses of NAVTEQ data every day NAVTEQ leadership has been achieved through the integrity of the build processes that deliver a map database of unique quality to one worldwide specification.

**HISTORY**

From early on, the company has focused on creating fully navigable digital map databases which have been fundamental to growth in vehicle navigation, online mapping and location-enabled portable devices including personal navigation devices (PNDs), PDAs and mobile phones. NAVTEQ was a pioneer, investing in the development of a navigable map database well in advance of systems that could actually utilize them. While the company was founded in 1985, the first commercial
navigation applications appeared in 1994 and 1996 in Europe and North America, respectively. NAVTEQ's vision to revolutionize the way people use maps has become a reality. NAVTEQ maps are used to deliver millions of routes every day. Today NAVTEQ is headquartered in Chicago, Illinois, USA, with approximately 5,800 employees worldwide. With regional headquarters located in Veldhoven, Netherlands and Gateway East, Singapore, a major production facility in Fargo, North Dakota, USA, and support centers in Seoul, South Korea, Mexico City, Mexico, and in Yokohama, Japan, NAVTEQ is located in 200 offices in 54 countries.

**PROPRIETARY COLLECTION TECHNOLOGY**

NAVTEQ's advanced, proprietary GWS software is customized for the creation of one of the world's highest quality navigable map databases. NAVTEQ's data gathering technology is integrated with a GPS component, enabling real-time, on-the-spot collection and verification of attributes and data. With advanced peripheral integration such as video capture technology, high tech tablets and tablet pens, gyros and other sensors, this equipment assists the field team in collecting and verifying the critical information which contributes to the accuracy and detail of the NAVTEQ maps. NAVTEQ is ISO 9001: 2000 certified for all main operating locations, and ISO/TS 16949 certified for worldwide Distribution Services, marking the recognition of NAVTEQ's global standardized processes and consistent database specification. As an industry leader, NAVTEQ's global certifications demonstrate the company's strategic commitment to seeking and achieving external, industry support.

**NAVTEQ PRESENTATION**

NAVTEQ is the leading global provider of maps and digital location content, which form the basis of navigation and location-based services around the world. They are similar to INRIX in that both companies are data providers; they gather traffic data from a variety of sources, process it and then sell to navigation service providers. However, where INRIX's data has historically been drawn from heavy trucks, NAVTEQ has built their data network almost entirely on small fleet and consumer data sources. This difference is evident in the client profiles of both companies. Many of NAVTEQ's clients are automakers, which use its data in their built-in telemetric services. INRIX works with only a few automakers but is more heavily used by web and mobile application developers. NAVTEQ has recently been purchased by Nokia and will be renamed “Nokia Navigation.”

The foundation of all of NAVTEQ's services is their map database. The company devotes much of its resources to maintaining and updating their map data. In the past NAVTEQ gathered much of their data in the field, sending out people to drive and photograph regions. The company has now moved to gathering their data using LIDAR (light detecting and ranging), which is accurate to within one foot of true location. It is also able to accurately capture elevation levels even in dense areas. This LIDAR data is currently being used to build a 3D map in a joint venture between Nokia and Microsoft. Using its foundational map, NAVTEQ builds layers of information, cataloging everything from road
curvature to retail stores, organizes them into layers, and bundles them into product services. The products offered include navigation tools for vehicles and pedestrians, points of interest with dynamic information such as the prices of fuel and parking, advanced driver assistance systems (ADAS) for use in passenger vehicles, and real time traffic information.

The majority of NAVTEQ’s freeway traffic information is a combination of data from roadside sensors and GPS probe data. In some places, NAVTEQ maintains their own sensors along freeways in addition to accessing DOT sensor data shared with them by agreement with FHWA. Los Angeles freeways are well covered by Caltrans sensors, so the need for additional sensors here is minimal, but on average 25%-30% of the coverage of major metropolitan areas is done using NAVTEQ sensors.

Probe data comes from GPS systems; each device periodically sends back information on its location, direction and speed. (Probe data is the same technology that INRIX referred to as “crowdsourcing.”) NAVTEQ gathers its probe data from GPS units used in livery and passenger vehicles, delivery services and telecom fleets and uses it to calculate average speeds on TMC segments. These average speed estimates are updated every minute. NAVTEQ does not use the GPS units in heavy trucks as a data source because truck speeds do not reflect the flow of traffic for passenger and light commercial vehicles. In general, probe data is most reliable during AM and PM peak travel periods; it becomes less reliable when there are fewer vehicles on the road. Coverage for arterial roads comes exclusively from probe data and provides mostly consistent coverage of all primary and secondary arterials particularly in densely populated areas. During off-peak travel times, real time probe data can be supplemented with aggregated historical data to produce estimated traffic speeds. NAVTEQ reports its speed estimates at confidence levels 1 through 5 to reflect the differences in the quality of the data depending on the time of day. NAVTEQ recently expanded their coverage of highways and arterials in the Los Angeles metro area, tripling the amount of roadway covered, by developing new capacity to analyze probe data in the L.A. Region.

To further support its traffic and navigation services, NAVTEQ also maintains traffic management field offices where staff monitors planned traffic disruptions like construction projects and unplanned incidents such as collisions or congestion. As a second source of information, NAVTEQ pulls data from Trapster.com, a social networking site and mobile device application consumers can use to enter the location of speed traps, vehicle collisions or other traffic incidents. NAVTEQ uses its traffic and navigation information to deliver services to vehicle GPS systems, web and mobile applications and also radio and television media.

NAVTEQ also has a product geared directly toward trucks and large vehicles called “NAVTEQ Transport.” It is based on NAVTEQ’s core map database and provides the real time traffic and route planning information discussed above as well as advanced content that pertains directly to trucks and drivers. For
roadways covered in its map database, NAVTEQ Transport includes hazmat and truck routes, size and weight limits, and roadway configurations that may make maneuvering difficult. It also contains points of interest including the location of truck parking and features available at individual truck stops. NAVTEQ has also applied their ability to map changing information to the problem of truck parking in the I-5 Corridor. In conjunction with ParkingCarma, a company that matches drivers with available parking spots using a mobile app or through the company’s website, NAVTEQ has equipped truck parking lots with sensors to track available parking spots.

In the future, NAVTEQ plans to add additional capabilities to their traffic and navigation products including the ability to predict traffic at specific times of the day. They are also refining their ability to track speeds on freeway entrance and exit ramps using GPS probe data. NAVTEQ agrees that probe data will be a significant source of traffic information in the future. Its availability is growing exponentially as more consumers use navigation devices. The amount of probe data available today makes it possible to calculate average freeway speeds at the “link” level, which is a finer grade than speeds calculated at the TMC level. This calculation would not have been possible in the recent past. NAVTEQ also foresees probe data adding value to its historical database, which is used by public agencies to test the accuracy of traffic models in their transportation planning. That is the role in which NAVTEQ may be best able to contribute to this project: as a partner bringing with it the data needed to answer questions posed by both public agencies and the freight industry. To that end, NAVTEQ plans to simplify its application-programming interface (API) so that outside users can better manipulate their data. At its core, NAVTEQ is a data company, and its future is in the relationships it builds with other companies and with public agencies that use that data.
VENDOR SHOWCASE DAY 2

3.5 PERCEPTICS/METTLER TOLEDO

Figure 3.5 Perceptics Profile

CONTACT

PARTICIPANTS
Robert Boback is Perceptics Business Development Manager based in Knoxville Tennessee. Mr. Boback has been working with Federal, State, and local governments throughout the United States for the past 12 years. This experience in working with government to find the best solution for their needs, spans from local law enforcement, to ITS way in motion, to Electronic Toll collection. Rob has been working with Perceptics for about 1 year now and covers the Western United States and Canada for all security needs, and is also focused on Business Development in the ITS world.

PROFILE
Detect. Inspect. Protect

For more than 30-years, Perceptics, LLC has developed and deployed the most accurate, reliable security imaging technology systems to U.S. Customs, Canadian Border Services and Mexico Border Control Agencies, leading the industry in port, border, container, and transportation lane security solutions to commercial, federal, and government agencies.

Deployed in more than 1,000 vehicle lanes worldwide, including the United States, Canada, United Arab Emirates, and Singapore, their License Plate Readers interpret license plates at an unprecedented 95% level and are the only systems that read state, province or country of origin. In 2009 Perceptics released a Color Arabic LPR for the Middle East, which is able to interpret a plate’s color to determine a vehicle’s origin. Along with our system technologies, Perceptics also provides a wealth of project management, technical expertise, customer service and industry knowledge.

TRUSTED PERCEPTICS SECURITY SYSTEMS:
- License Plate Reader Systems in mobile, fixed, gantry-mounted and handheld configurations
- Under Vehicle Imaging Systems in mobile and fixed configurations
- Driver and Scene Imaging Systems
- Container Code Reader Systems
- DOT Number Reader Systems
RELIABLE TECHNICAL EXPERTISE
During the past 10 years, Perceptics has supplied several hundred lanes of License Plate Readers across the northern and southern borders of the United States. Their technical staff seeks to build valuable relationships with their customers, developing a thorough understanding of installation and operational requirements. Building on this knowledge and these relationships, they have been able to maintain an open line of communication as a trusted advisor to the customer and deliver system enhancements as requested.

Additionally, their License Plate Reader systems are deployed along the Singapore and Malaysia border, and their Container Code Readers, integrated with their LPR systems, are currently in use in Korea. Perceptics also has approximately 100 LPR systems at 14 tolling points along the free-flow toll road of Melbourne City Link in Melbourne, Australia. These LPR systems provide complete coverage across all lanes and shoulders at each tolling point and provide license plate capture at highway speeds with real-time optical character recognition processing for toll violation enforcement.

PERCEPTICS CUSTOMERS:
- U.S. Customs and Border Protection Agency (CBP)
- Canadian Border Services Agency
- Mexico Border Control Agency
- U.S. Department of Defense with systems deployed at a multitude of military bases here and abroad

PERCEPTICS/METTLER TOLEDO PRESENTATION
Perceptics, LLC has more than 20 years of experience in the security, traffic management and machine vision industries. Perceptics leads the industry in providing port, border, and transportation security solutions to a variety of commercial and government agencies including U.S. Customs and Patrol and the Canada Border Security Agency.

At the center of their capabilities is an optical character recognition program that they have used to develop license plate recognition (LPR), container code reader (CCR), and DoT number reader equipment. The company prides itself on the levels of accuracy and reliability they are able to achieve with both of these devices. Using their high resolution LPR, Perceptics is able to read license plate characters and identify the state or province of 95% of commercial vehicles that pass their sensors at highway speeds up to 120 mph. The DoT number reader is used to read Federal and state DoT numbers and the CCR is used to quickly processes the universal ISO codes on containers for ownership, cargo origin and destination details and is 95% accurate at speeds of up to 40 mph. Using these technologies together, Perceptics is able to read and match the license plates of truck cabs and chasses with container codes. Partnering with Mettler Toledo, a leader in the provision of weigh-in-motion measures, Perceptics can deliver a product that combines license plate information, container codes and weight.
measures into a complete vehicle record for individual rigs. Once aggregated, this data can be reported out in a variety of formats including integration into new or existing databases.

In the near future, Perceptics expects to see an increase in the use of this identifying data for the enforcement of weight restrictions on commercial trucking vehicles. In some jurisdictions, it is already being transmitted to law enforcement officers in real time to enable them to intercept and issue citations to trucks that are out of compliance. Industry experts are currently working to standardize the practices for collecting weigh-in-motion measurements and to modify existing legislation so that the data can be used for enforcement. The company acknowledges that the quality and accuracy of their vehicle identification devices will enable companies like Mettler Toledo to perform complicated logistical analyses, which are the future of the industry.

Together Perceptics and Mettler Toledo offer equipment technology and database management that could be useful in optimizing terminal gate operations at the Port of Long Beach. Trucking company representatives have identified the inefficiency of the check-in process and trucks’ time spent idling in queues as significant barriers to improving their performance. Vehicle identification information collected by Perceptics’ equipment could be used to anticipate the arrival of individual vehicles at terminal gates. For example, a Longshoreman manning a terminal gate would see the specific truck displayed on a monitor along with the information stored in the database necessary to process that vehicle for entry into the terminal. Perceptics, along with Mettler Toledo, have already installed similar integrated LPR/DoT/WIM systems for Kentucky Transportation Cabinet and Florida DOT. The Company’s ability to
accurately capture fine levels of detail, identifying the truck cab, chassis and container, combined with Mettler Toledo’s weigh-in-motion capability may provide incentive for the Harbor Trucking Association to collaborate on a pilot project.

Perceptics’ Container Code Readers (CCR) have applications vital to commercial trucking including ISO Container Identification, Chassis Number Identification, Vehicle Identification and Asset Management.

Perceptics’ transaction sample of commercial vehicle data via DoT Reader.
3.6 **ADVENT**

**Figure 3.6 Advent Profile**

**CONTACT**

**Mike Mayhew**  |  Vice President of Business Development, Advent | 890 Mountain Ave  
|  Murray Hill, NJ 07974 | 908-795-3223 Phone | 908-795-3223 Phone | 732-778-0258 Mobile | mmayhew@adventinc.com

**PARTICIPANTS**

**JP Cabalar** is Advent's Program Manager. Mr. Cabalar has 25 years of experience in the Transportation industry, including M&R Shop Supervision, Transportation Operations, Train Management/Rail Ops, and General Management. Over the past nine years, Mr. Cabalar has been in General Management positions, setting local policy and designing work processes, and Chairing management level meetings setting terminal operations policy. At various points over the past 18 years Mr. Cabalar has been involved in several IT projects providing a user perspective, setting priorities for changes in main-frame reports, and making recommendations for system enhancements towards the end of improving staff productivity.

**Mike Mayhew** is Vice President of Business Development, Mr. Mayhew has over 12 years of experience in the transportation industry leading sales and marketing initiatives for Advent's suite of products and services.

**PROFILE**

Advent is a software and solutions provider catering to the ocean and intermodal transportation sectors. Advent has provided a number of solutions supporting numerous port entities with their traffic mitigation, clean truck, truck tracking and truck appointment initiatives. These solutions are supported in conjunction with our flexible and customizable product - the Advent Port Community System (PCS). Additionally, Advent's core offering includes the following products and services:

**PRODUCTS**

- Chassis.com - On-line portal for the reporting of chassis condition and repair so intermodal equipment providers can remain in compliance with federal roadability regulations enforced by the FMCSA (Federal Motor Carrier Safety Administration).
  - Back office operating systems for container and vehicle shipping lines
  - Marine Terminal Operating Systems
  - Intermodal Equipment Maintenance and Repair Systems
  - Container depot management systems

**SERVICES**

- Custom software development, EDI Integration and management
- Management consulting
In spring 2012 Advent and eModal merged to form Advent Intermodal Solutions.

ADVENT PRESENTATION

Advent specializes in software designed for marine sector industries. Their “Port Community System” (PCS) product is a modular system of software applications that can be assembled to meet the operational needs of individual ports and terminal operators. PCS is driven by Advent’s electronic data interchange system (EDI), a database that brings together information from different agents operating in a port community including port authorities, terminal operators, equipment suppliers, drayage carriers and labor managers. Each of these has their own distinct data formats; EDI enables them to communicate using a standardized code. PCS offers several applications designed to facilitate truck presence in the port including appointment systems that schedule and monitor truck trips in and out of terminals, applications that manage clean truck programs, and those facilitate terminal gate transactions all using the EDI truck identification and registry information.

PCS’s appointment system application coordinates the timing for container exchanges between terminal operators and trucks. The communication protocol is driven by the implementing party of the PCS. The PCS is a web based system and can operate “in the cloud” communicating via EDI or web services, as well. Advent works with its customers to determine the communication protocol based upon their native systems, and in a case like PierPASS with 13 terminals, communication with numerous TOS implementations. The communication protocol with the disparate systems can be whatever the customer deems appropriate. A common online user interface enables truck drivers or dispatchers to schedule pick up and drop off times at appointed intervals distributed throughout the day. Terminal operators see immediate benefit from a more even flow of truck traffic and the ability to better plan their storage yards, equipment use and labor schedules since they can anticipate a truck’s arrival.

Truck drivers may take longer to see the benefit, but they will see and reduction in the time spent waiting for the right container, thereby decreasing their turnaround time and enabling them to make more trips. Reducing trucks’ idle time also helps to reduce fuel emissions.
Advent’s appointment system could be of great use to this project because the Port of Long must improve efficiency in order to handle the projected increase in the number of containers moving through the Port in the future. Helping truck drivers to be more efficient in their pickups and deliveries is critical to optimizing the Port’s performance. However, implementing an appointment system requires collaboration between terminal operators and drayage carriers. Building these cooperative relationships takes time and requires outreach from the terminal operators to the trucking community and a willingness on both sides to negotiate.

In the future, Advent anticipates that even more terminal operators will begin working cooperatively to implement programs to improve port efficiency. Advances in technology will only hasten these improvements. Advent has the technology available to help with truck tracking and scheduling. The challenge is to gain access to the necessary data from the diverse groups working in the port so that it can be integrated into a common system; therefore, success is dependent on building effective working relationships between different terminal operators and with the trucking community to enable the sharing of this data. In addition, as more port operations are automated and integrated into PCS, it will be necessary to remain responsive to the concerns of labor organizations.
### 3.7 TomTom

**Figure 3.7 TomTom Profile**

<table>
<thead>
<tr>
<th>CONTACT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ken Clay</strong></td>
</tr>
<tr>
<td><strong>Nick Cohn</strong></td>
</tr>
</tbody>
</table>

**PARTICIPANT**

**Nick Cohn** is a Business Developer within the TomTom Licensing Business Unit. Mr. Cohn’s background includes a Master’s degree in Regional Science at the University of Pennsylvania; and more than 15 years of experience in travel behavior and choice modeling, working in the U.S. and Europe. At TomTom, he worked on the implementation of HD Traffic, TomTom’s real-time traffic information system for connected consumer navigation devices, in the first five countries where it was introduced. More recently, Mr. Cohn has been working to develop new applications and uses of both historical and real-time floating car data for traffic management and analysis in the government sector.

**PROFILE**

TomTom is the world’s foremost provider of navigation products. Our technology and content portfolio includes new components which are new to New York State and could provide real travel time and energy savings in the transportation sector. TomTom’s in-vehicle systems generate personalized trip advice, providing real-time information in a tailored, usable form for dynamic decision-making. The personalized trip advice allows individuals to save travel time, avoid congestion, reduce fuel consumption, costs and emissions. Safety features warn drivers about, for example, school zones and lane changes and help them navigate to emergency services if needed. The new EcoPLUS component provides fuel efficiency feedback to drivers as well as measurement reports to fleet managers, assisting with awareness that can result in more efficient driving and measurable fuel savings.

TomTom has technology for multiple platforms. These include ‘after-market’ consumer navigation devices, smart-phone applications, fleet management systems and in-dash solutions. Predictive (based on historical information) and real-time route information is also made available on TomTom’s web platform. All our systems are supported by a customer care division, which has won a series of JD Power awards in recent years.

TomTom’s back-office systems include our own data fusion technology and provide updated traffic information every minute. The data fusion uses anonymous crowd-sourced GPS speed measurements from devices and smart-phone applications as well as third-party information on road closures and accidents. Industry standards for data transmission are used and the traffic information can be provided to public and private entities using...
Individual privacy is of paramount importance in TomTom’s systems. Because a large proportion of real-time information is crowd-sourced, the crowd has to be able to trust that their information will not be misused or shared inappropriately. Protecting privacy goes beyond legal limitations: if the crowd does not perceive us as trustworthy, the crowd will no longer be a source. TomTom has developed methods of safeguarding the privacy of individuals and the information they provide. These continue to evolve as the number of channels providing crowd-sourced information grows.

TOMTOM PRESENTATION

TomTom is the world’s leading provider of on-board vehicle location and navigation products and services. To date, the largest share of their business has been providing navigation and real time traffic information to users through the use of an onboard device they call a Personal Navigation Device (PND), which is installed in individual consumers’ vehicles. The map database that enables the integration of navigation and real time traffic information is called “Multinet.” TomTom is looking to expand their services to meet the growing needs of commercial users and public authorities. To that end, they have recently established three divisions within their company to serve consumers, commercial users and government; however, all three are backed by the same proven data services.

TomTom’s logistical data is directly available to commercial users through the use of the TomTom Pro 7150 Truck. Navigation and routing functions are supported by Multinet’s database containing the locations of hazardous materials and preferred truck routes as well as physical obstructions, construction zones, dimensional restrictions of overpasses, and size and weight limit on roads and bridges. The voice-activated Pro 7150 allows a driver to enter the destination, type, weight and dimensional specifications of his vehicle. The Pro then routes the trip avoiding complications such as restricted roadways, low clearance bridges, and sharp right and U turns. The Pro also gives the driver real time traffic speeds for roads in the region, calculates travel time and delays along specific routes and can reroute trips based on this data, which is continually updated to provide drivers with the latest information. TomTom’s extensive database covers all classes of roadways from major highways down to local roads. It is thereby able to provide goods movement operators with superior “last mile coverage” in the final segment of distributing goods to consumers.

The Pro can also be used for the management of a company’s entire commercial fleet. By installing the devices in their commercial vehicles, fleet managers are able to communicate directly with their drivers, send updates and corrections to delivery destinations and monitor driving events and behavior using an application-programming interface (API). TomTom’s future intelligent traffic systems (ITS) technology will bring even more functionality and flexibility to consumers and commercial users alike. TomTom is in the final stages of developing the SPITS (Strategic Platform for Intelligent Traffic Systems) tablet,
which uses Google’s open-platform operating system, Android. The functionality of this device is virtually unlimited because applications can be written by any number of external program developers. TomTom plans to include in the device’s tool kit the API information necessary access the routing and geographical data it maintains for use in outside applications.

TomTom’s Truck PRO 7150 enables drivers to enter their vehicle specifications and then provides routing information based on access restrictions and vehicle dimensions.

TomTom is also planning new technologies based on the expectation that in the future most consumers will have access to onboard real time traffic information in the same way that consumers currently have access to cellular phones. These driver-based technologies will enable onboard devices to share real time traffic information between vehicles and with roadside monitors. Developing a complete network of data requires consumers to become engaged; therefore, TomTom plans to offer drivers a new service that will save them time at an affordable price point.

TomTom real-time traffic product portfolio

TomTom provides real time traffic information for highways, arterials and secondary roads. Their on-board devices can calculate travel times and re-route drivers based on delays along specific routes.

TomTom’s services and technology are applicable to the current problem of optimizing port traffic in two ways. First, the SPITS tablet can be customized to send real time traffic and network performance data to an on-site server, which could then efficiently route pickups based on current conditions. This
technology and service is not currently available “off the shelf”, but the
technology necessary to build it is in place. Second, TomTom has proven
experience identifying consumers and successfully engaging them. Optimizing
port traffic will require participation by a variety of terminal operators, transport
companies and vehicle types. TomTom brings with it the ability to draw
together the diverse groups of participants necessary to achieve the desired level
of efficiency.
3.8 **TELVENT**

**Figure 3.8 Telvent Profile**

![Telvent Logo]

**CONTACT**

Lisa Woodward  |  818 W. 7th Street, Suite 720, Los Angeles, CA 90017 (USA)  |  Phone: 213.270.9967  |  Mobile: 818.419.7446  |  Fax: 213.270.9973  |  Lisa.Woodward@Telvent.com

**PARTICIPANTS**

Lisa Woodward is the Los Angeles Area Manager. She is an accomplished engineer with 16 years of hands-on design, implementation and maintenance of signalization projects throughout the U.S. As a project manager, Ms. Woodward has directed the efforts of Telvent personnel for signal systems deployment in Los Angeles. She has been involved in various transit related projects in New York, New Jersey, Connecticut, Jacksonville and Denver. Ms. Woodward has an extensive background in data analysis for transit trip planning applications from coast to coast. She studied mathematics at California State University Northridge.

Rick White is the Director of West Operations at Telvent and is responsible for the business development and financial success of the region. He has 21 years of experience in systems engineering and integration projects specifically, computer control systems for Intelligent Traffic and Transit Systems. Mr. White currently manages large scale projects for Operations Centers and Electronic Fare Collection and has been instrumental in the engineering of Communication and Security Systems, Closed Circuit Television (CCTV), and Traffic Management systems. As a Systems Engineer for Telvent, Mr. White is involved in the design, installation, integration, and testing of ITS computer systems around the country. This includes field device implementation and communication, database and system map development associated with the implementation of ITS systems.

Robert B. “Tip” Franklin, Jr. is the Director of Business Development. He has a BS and MBA from Ohio State University and joined the Intelligent Transportation Community in 1991 after a 27½ year career in the U.S. Army. He brought his experience to the Intelligent Transportation Systems field where he was the Program Manager for the Atlanta Regional Transportation Management System, NaviGAtor, put in place for the 1996 Olympics. Within the ITS Community, Tip was the Chairman of the ITS America Coordinating Council's Homeland Security Task Force and Public Safety Forum Liaison to the Information Program Section. He is a member of the ITE Transportation Security Evacuation Advisory committee (TSEAC) as well as the ITE Traffic Incident Management committee. He recently finished a nine-year assignment as a member of the Transportation Research Board's Freeway Operations Committee. He has written a number of papers discussing the interface of Traffic Management and Public Safety, the use of the Systems Engineering model for ITS system design and on the value added by ITS in support of Homeland Security. In 2006 Tip joined Telvent and now serves as the Director of Business Development for Telvent Transportation – North America.
Marcelino Romero was recently promoted to Area Manager for the Washington D.C. Region. Mr. Romero has extensive experience in transportation management, Incident Management and traffic operations. In his previous role as a Lead Engineer, Mr. Romero worked on Mega Projects as an Incident and ITS Manager. His duties included overseeing the Traffic Operations group during the construction of the High Occupancy Toll lane projects. This group reviews traffic control plans, ITS design plans and coordinates construction activities with emergency responders and regional traffic operations center. Mr. Romero also assists the Communication staff with outreach efforts.

PROFILE

Telvent is a global IT solutions and information services provider dedicated to improving the efficiency, safety and security of the world’s leading companies. They are engineers and technologists involved in developing and deploying cutting edge information management solutions in interdependent global industries like energy, transportation, agriculture and environmental services. Through the delivery and integration of real-time business intelligence, our solutions enable our clients to make better decisions as they manage vast infrastructure and complex daily operations.

Today, the road, rail, maritime and air transportation industries all over the world are facing the task of managing infrastructure that simply cannot expand rapidly enough to meet the growing transportation demand. Leaders must address that task with limited budget resources and balance their decisions with security, safety, energy efficiency and environmental impact concerns. To support these leaders and their operating teams, Telvent offers SmartMobility™, an integrated suite of software solutions that represent entirely new thinking in advanced intelligent infrastructure management for road, rail and maritime environments. Around the world today, Telvent’s intelligent transportation systems:

- Control traffic at 9,000 intersections used by 195 million drivers per day
- Manage the journey of over 2.5 billion passengers per year on train and metro networks
- Provide traffic information via phone and web to 56 million people every year.
- Ensure the safe and efficient departure and arrival of more than 700 million airline passengers annually
- Manage toll networks in handling 1.5 million vehicles per year

The Smart Mobility software can harness the flood of information from all over the transportation grid and convert it into compatible data that can be integrated into a single unified data repository. This data can then be shared and distributed across the transportation systems to enable individual transportation modes to be managed as one coordinated system rather than individual modes operating out of sync with one another.

Telvent brings with it the expertise gained through scores of successful installations in some of the most complex and congested markets in Europe, North and South America, Asia-Pacific and the Middle East. Their delivery and integration of real-time transportation intelligence enable their clients to make better decisions as they manage vast infrastructure and complex daily operations.
TELVENT PRESENTATION

Telvent offers products and services for use in all parts of the transportation industry. They have experience planning, building and operating transportation systems that encompass freeways, railways, ports and vessels, and public transit, including commuter rail and bus service. To optimize operations along the 710 Corridor, Telvent proposes to build an Integrated Corridor Management System (ICM), which brings together data from a variety of transportation modes including freeway monitoring, public transit authorities and trucking operations and integrates it into a common database. This database becomes the basis of a traveler information portal through which all aspects of transportation information for the metropolitan area can be accessed. Telvent's ICM system supports several of the 511 Traveler Information Systems (TIS) for metropolitan areas in the U.S. Users of this information portal include car commuters, public transit riders and commercial trucking operators and dispatchers. They access it through a variety of applications created by developers using ICM’s open network. Information can be personalized to the needs of individual users and provides them with real time, predictive information with which to make decisions.

In the near future, Telvent plans to marry their Management and Information Systems for Ports (MISP) product with their ICM system to enable coordinated management of shipping vessels moving in and out of port and trucks coming to pick up or drop off containers. The critical factor in coordinating these meetings is timing; it will require the shipping companies to share vessel schedules and manifests with trucking companies so that trucks are parked at the port only for the time it takes to pick up or drop off their loads. The goal is a continuous stream of truck traffic through the port.

In the future, Telvent envisions that transportation management will be merged with city management in large metropolitan areas. Integrated city management will use the data gathered by ICM type systems, along with other relevant city
data, to prioritize problems and enable decision makers to effectively manage transportation networks as a complete entity rather than in their individual “stove pipes” of freeway, public transit, and commercial freight. This future network will use an open architecture to take advantage of the latest in emerging communications technologies as well as following the trend toward providing users with increasingly personalized information.

Building and implementing a management system for an entire transportation network is dependent upon building cooperative relationships across jurisdictions, industries and individual companies. Before they will share their data, the desired participants must believe that their autonomy, authority and competitive advantage will remain intact while their liability and any adverse impacts will be limited. These challenges may mean that Telvent’s network is too comprehensive to create an intelligent traffic system for goods movement along the I-710 Corridor. For example, Telvent’s proposal to predict real time traffic patterns on the I-710 and adjacent arterials using the schedules of ships entering the Port may not be feasible if the shipping companies will not disclose the number of containers unloading from their vessels.

Telvent’s Traffic Management Plans include ITS components such as cameras, message signs and Highway Advisory Radio. They help prepare for known traffic incidents using their Lane Closure and Management System to prevent conflicts between maintenance projects.
VENDOR SHOWCASE DAY 3

3.9 SOUTHWEST RESEARCH INSTITUTE (SWRI)

Figure 3.9 SwRI Profile

CONTACT
Tammy Duncan | Principal Analyst, Southwest Research Institute | 6220 Culebra Road (78238-5166) | P.O. Drawer 28510 (78228-0510) | San Antonio, TX | (210) 522-3927 Office | (210) 522-2477 Fax | Tammy.Duncan@SwRI.org

PARTICIPANT
Tammy Duncan is a Principal Analyst with Southwest Research Institute (SwRI). Tammy has more than 26 years of experience with software and systems engineering, project and program management, data acquisition and analysis, planning, operating, and managing various studies and tests. In the Commercial Vehicle Operations (CVO) arena, Tammy has multiple state and local clients, managing two federal projects (primed by Cambridge Systematics), the USDOT-FHWA’s Commercial Vehicle Retrofit Safety Device (CV RSD) and Freight Advanced Traveler Information Systems (FRATIS), Texas’ Commercial Vehicle Information Systems and Network (CVISN) Program and TxCVIEW development and maintenance, Alaska Intelligent Transportation Systems (ITS)/CVO consulting program to include development and support of a Bridge Analysis System and Alaska’s Commercial Vehicle Information Exchange Window (CVIEW) Data Exchange (AKCDE), and Independent Technical Review/consulting services for the Texas SH130 toll road extension. In these roles, she also provides oversight and architectural/engineering guidance to technical staff and subcontractors, and technical consulting services to diverse and distributed stakeholder agencies. Tammy also is involved with New York State DOT’s Commercial Vehicle Infrastructure Integration (CVII), SwRI’s intelligent/autonomous vehicle, and Texas’ Border Safety Inspection Facility (BSIF) and Border ITS programs.

PROFILE
SwRI is one of the oldest and largest independent, nonprofit, applied Research and Development (R&D) organizations in the U.S. SwRI was founded in 1947 and offers a wide range of technical competencies and currently employees approximately 3,000 people including software, electrical, chemical, and other types of engineers. SwRI can assemble a multidisciplinary team of experts for a wide variety of technical projects. SwRI has 11 technical divisions responsible for research, development, engineering, and testing services in vehicle emissions, applied physics, automation, robotics, bioengineering, chemical engineering, simulation, performance, and more. The Institute conducts projects for both private industry and government agencies, supporting more than 3,000 client projects each year.
SwRI is headquartered in San Antonio, Texas, where it has state-of-the-art equipment and facilities on a 1,200 acre campus and over 2 million square feet of laboratories, offices, and test facilities. SwRI has satellite offices throughout the U.S. and the world. SwRI strives to implement optimal systems that will maximize flexibility for new technologies as they emerge.

The Intelligent Systems Department (ISD) is involved with numerous CVO/ITS projects including CVO, intelligent/connected vehicle systems including CV Retrofit Safety Device (RSD), Vehicle-to-Vehicle (V2V), Vehicle-to-Infrastructure (V2I), Vehicle Infrastructure Integration (VII), Commercial VII (CVII), Intelligent Vehicle Initiative (IVI), platooning, and autonomous vehicles. Other systems and projects involve Traveler Information Systems (TIS), Freight ATIS (FRATIS), Advanced Transportation Management Systems (ATMS), CVISN, Smart Roadside, 511, Amber Alert, ITS standards and product certification testing, national freight corridors, safety inspections and screening at border and inland facilities, and other ITS/CVO programs and technologies. SwRI served as the technology demonstrations chair for the 2011 World Congress in Orlando, Florida.

SOUTHWEST RESEARCH INSTITUTE (SwRI) PRESENTATION

Southwest Research Institute® (SwRI®) is one of the oldest and largest independent, not-for-profit, applied research and development science and engineering organizations in the United States. SwRI is focused on applied research and the development of technologies and products for use in government, military, and commercial ventures. SwRI’s funding comes from its government and commercial clients. The Institute is unique because, unlike a research university, SwRI seeks to develop solutions for its clients; however, profits are reinvested and used to support further research. The Institute has eleven technical divisions working in all areas of science and technology. Within the Automation and Data Systems division is an Intelligent Vehicle Systems section (http://www.swri.org/4org/d10/isd/ivs), which is doing research on both unmanned and cooperative intelligent vehicle systems. SwRI has worked on several commercial vehicle projects that are directly applicable to commercial trucking.

Autonomous Vehicles

SwRI’s unmanned vehicle research program, Mobile Autonomous Robotics Technology Initiative (MARTI), has culminated in an autonomous vehicle, a green Ford Explorer affectionately known by the same name. MARTI uses GPS, cameras, sensors, Vehicle-to-Vehicle (V2V) and Vehicle to Infrastructure (V2I) technology to drive itself. It circumnavigates obstacles and can navigate in both urban and rural traffic environments without any prior knowledge of the road network. MARTI has been demonstrated at numerous industry and government showcases. Another unmanned vehicle technology developed by SwRI is a
SwRI developed several Cooperative Systems including a Cruise Control system that uses DSRC and GPS to manage a platoon (string) of vehicles. It can be used with fully autonomous, throttle controlled, and human operated vehicles in mixed traffic scenarios.

Platooning and Cooperative Convoy Systems (CCS)

SwRI’s cooperative vehicle technology enables vehicles to perform a range of “cooperative” functions, from sharing sensor information to driving as a cohesive unit following one lead vehicle, also known as “platooning.” Vehicles’ ability to share sensor information can improve safety in a dynamic traffic environment by alerting drivers to pedestrians and other obstacles out of view. The next step towards platooning is a cooperative “cruise control” which allows vehicles to adjust their speed in relation to one another to manage the distance between them. This information is shared between the vehicles using dedicated short range communication (DSRC). This capability was demonstrated using a group of vehicles in which one was fully autonomous, one was throttle controlled, and the third was controlled entirely by the driver.

SwRI has enabled automated platooning using their Cooperative Convoy Systems (CCS), which allows groups of UGVs (unmanned ground vehicles) to drive together using GPS and low latency communications. Using this system, a lead vehicle is able to change and maintain the “longitudinal spacing”, the distance between vehicles, as well as the “lateral offset,” how in-line a vehicle is with the vehicles ahead and behind. SwRI also developed a human interface for use in manned vehicles that can be displayed on a smart phone, tablet or on-board touch screen. This interface displays the order of the vehicles in the platoon and identifies the command vehicle. The interface also enables the drivers in individual vehicles to notify the lead vehicle of their desire to change order, enter and leave, or assume command of the platoon.
Cooperative Convoy Systems (CCS) enable an even greater level of cooperation between vehicles. SwRI developed a touch screen interface that can be used to manage individual vehicles within a platoon. Using this system, a command vehicle acts as the leader while subsequent vehicles take their direction on when and where to go and how much distance to leave between vehicles from the command vehicle. Drivers in individual vehicles can take command, leave, and rejoin the platoon using the touch screen interface pictured above.

Commercial Fleets and Retrofit Safety Devices

Building upon these intelligent vehicle systems, SwRI is developing new devices and technologies that will improve safety and optimize transportation operations. SwRI played an integral role in the V2V (Vehicle to Vehicle), V2I (Vehicle to Infrastructure) and CVII (Commercial Vehicle Infrastructure Integration) technology developed in conjunction with Volvo. (Note: Volvo presented their work on this project at a previous Vendor Showcase.) CVII integrates multiple intelligent vehicle functions into commercial trucks including wireless roadside inspection, driver credential identification, fleet management communications, travel advisories, unsafe-to-merge and unsafe-to-pass, blindspot detection, and tailgate and hard braking warnings. SwRI is now taking this technology further and designing retrofit safety devices (RSDs) for use in vehicles that do not come to market with V2V and V2I capabilities. RSD applications include reduced speed curve warnings, emergency electronic brake lights to warn drivers of hard breaking events ahead, and forward collision
warnings that allow the driver to react sooner and may enable airbags to deploy faster. In addition to designing their own RSD devices, SwRI acts as an independent verifier of other V2V and V2I enabling devices to certify that they comply with USDOT requirements as well as SAE and IEEE standards. SwRI also tests after-market devices designed to achieve full integration to ensure that they function as designed. These RSDs may be of use to commercial trucks working in secured port areas because most drayage carrier vehicles in use today are not equipped with intelligent vehicle systems technology. The challenge is to develop a device that will allow trucks to acquire enough intelligent vehicle technology necessary to enable platooning or other transportation management functions but still be operated by drivers.

Freight Advanced Traveler Information Systems
In conjunction with Cambridge Systematics, SwRI is developing a standard set of capabilities that can be used by shipping, rail and trucking operators to support intermodal goods transportation. FRATIS (Freight Advanced Traveler Information Systems) will provide drayage operators with freight-specific dynamic travel planning capabilities and operations optimization. SwRI is acting as the systems architect for the FRATIS project and developing the systems requirements necessary to implement this program.

Commercial Vehicle Information Systems and Networks (CVISN)
Working together with the Federal Motor Carrier Safety Administration (FMCSA) of USDOT and other State CVISN systems architects, SwRI assisted with recent modifications of the systems architecture for Commercial Vehicle Information Systems and Networks (CVISN), an FMCSA program focused on improving highway safety and roadside operations through enhanced credentials administration, safety data exchange, and roadside electronic screening. Using RFID transponder tags, vehicle identifiers are transmitted to roadside systems that perform a compliance check of carrier and vehicle credentials and safety information, which may include integrated weigh-in-motion (WIM) and other sensor readings, enabling law enforcement to better focus limited resources on those vehicles in need of inspection, while allowing those in compliance to continue traveling. This technology is particularly useful for truck clearing at the nation’s borders and is being implemented at border safety inspection facilities along the Texas-Mexico border.

Technologies to reduce Vehicle Emissions
SwRI has developed technologies that can be applied to reduce emissions and improve air quality. Their algorithms for traffic signal phasing and timing can be used to reduce the time that vehicles spend idling at red lights. They have also demonstrated the ability to capture and display vehicle emissions information
that could be used by traffic management centers to optimize traffic flow thereby reducing emissions.
3.10 INTELLIGENT IMAGING SYSTEMS (IIS)

Figure 3.10 Intelligent Imaging Systems Profile

<table>
<thead>
<tr>
<th>CONTACT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brian Taylor</strong>, P.E.</td>
</tr>
<tr>
<td>Office</td>
</tr>
<tr>
<td><a href="mailto:BTaylor@IntelligentImagingSystems.com">BTaylor@IntelligentImagingSystems.com</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PARTICIPANTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brian Heath</strong> is the President of Intelligent Imaging Systems. Brian is a Smart Roadside Technology Subject Matter Expert with over 7 years of experience in the planning, design, development, and deployment of ITS Commercial Vehicle Operations (CVO) integrated technologies. Brian has been involved in the deployment of integrated roadside technologies in over 25 states and provinces in North America. He has a deep understanding of the workings and applications of roadside enforcement technologies within CVO agency operations, many with whom he shares strong relationships. He specializes in the application of integrated technologies to save time and labor at the roadside for both industry and government. His user-based approach to technology application has driven the successful implementation of many CVO technology deployments around the continent. He specializes in the use of non-obtrusive inspection and identification technologies to automate traditional screening processes and improve the efficiency and effectiveness of roadside operations. Brian has been instrumental in the drive to make roadside technologies “smarter” by enabling back-end information system connectivity across multi-agencies and multiple levels of government. He is a proponent of a programmatic approach to technology deployment, and works closely with many lead agencies to support the successful adoption of new technologies to improve existing practices and processes.</td>
</tr>
</tbody>
</table>

| **Brian Taylor** is a Professional Civil Engineer and currently Director of ITS Sales with Intelligent Imaging Systems. Brian has worked 25 years in the area of Intelligent Transportation Systems (ITS) in the area of commercial vehicles. He has extensive experience in Canada and the United States in developing programs involving the use of ITS in the areas of Commercial Vehicles Clearance at inspection facilities, border crossings, and safety warning systems such as rollover and downgrade warning. A recognized specialist in this area, Brian has worked with numerous roadside, and in-vehicle technologies, including image capture identification (License Plate, USDOT, HazMat and Safety Decals), RFID for pre-clearance, Weigh In Motion, Dimension in Motion, Smart Phone Applications, and in-vehicle monitoring and warning systems. Brian sits on a number of technical and industry committees, including the Transportation Research Board (US), and the Commercial Vehicle Safety Alliance and ITS America. |

<table>
<thead>
<tr>
<th>PROFILE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligent Imaging System (IIS) specializes in imaging and electronic screening systems that are designed to enhance commercial vehicle enforcement. The company is based in Edmonton, Alberta, with operational facilities in Louisville, KY, and Albuquerque, NM.</td>
</tr>
</tbody>
</table>

Cambridge Systematics, Inc.
INTELLIGENT IMAGING SYSTEMS PRESENTATION

Intelligent Imaging Systems (IIS) is a Canadian company whose primary focus has been developing imaging technology for truck identification at weigh stations and the software necessary to connect those images to vehicle records databases for roadside electronic screening. Their hardware and software have proven useful to law enforcement, commercial vehicle regulatory authorities, and state DOTs including Caltrans. IIS’s imaging technology has been designed to identify commercial vehicles that are out of compliance and therefore may pose a risk to public infrastructure, safety or security.

IIS’s sensor technology includes overview cameras, license plate readers, and USDOT number readers. Their cameras are also able to read the hazmat, flammable, or other warning stickers located on the sides and backs of containers as well as Commercial Vehicle Safety Alliance stickers as another way to identify commercial vehicles. IIS has also developed embedded roadway sensors that can read an individual vehicles unique magnetic signature to identify them and track their movement in and out of weigh stations. In addition to their own sensor information, IIS’s Smart Roadside Inspection System (SRIS) platform is able to receive inputs from existing weigh-in-motion and static scales as well as DSRC. SRIS then integrates the images and weight information into the existing commercial vehicle records from state and federal authorities in order to flag for inspection vehicles that may be out of compliance. Using the their license plate

DRIVEWYZE is a trademark of Intelligent Imaging Systems Inc.
The Drivewyze toll collection application running on a driver’s smart phone enables payments to be processed regardless of the toll operator’s back office software.

The Drivewyze truck bypass application is an improvement on existing truck information transmission systems because it eliminates the need for costly roadside infrastructure such as receivers or antennae that are necessary when using transponder technology. The bypass application is fully automated and requires no input from the truck’s driver while the truck is moving. It uses the phone’s existing GPS to pinpoint its location. The program is awakened when the truck enters a geofenced area on approach to a weigh station. The program then transmits the driver’s credentials and truck safety information. (Truck information is preprogrammed by the driver, and the driver simply selects the appropriate rig before beginning each trip.) The weigh station sends back a signal to enter or bypass the weigh station. There are geofenced areas within the

reader in conjunction with their USDOT number reader, IIS’s system is able to identify over 95% of the vehicles that pass through weigh stations that use their technology.

IIS’s newest technology is called “Drivewyze;” it is a weigh station bypass and tolling application designed for use by commercial drivers to transmit their credentials to inspection authorities and toll collectors. The tolling application can also be used by drivers of passenger vehicles to transmit their payment information to toll operators. Both applications rely on the existing GPS and transmission capacities already present in smart phones and will run on phones including Apple’s iPhone, Google’s Android and Blackberry platforms. The toll application’s system architecture can be configured to transmit vehicle information to different tolling authorities in a format that is consistent with their individual back office systems.
The Drivewyze Truck Bypass Application relies upon a geofencing signal to begin transmitting the driver’s credentials and truck safety information. The weigh station then notifies the driver to bypass or to pull off for inspection. There are geofencing areas beyond the weigh station that receive the application’s signal and monitor compliance.

Drivewyze is undergoing trials in 14 states. IIS is using this time to identify geographic areas that lack adequate cell phone and GPS coverage and to troubleshoot these issues. The company is also working with state and federal transportation authorities to ensure that the Drivewyze program is implemented in compliance with hands-free and distraction-free driving requirements.
3.11 PARKINGCARMA

Figure 3.11 ParkingCarma Profile

CONTACT

Rick Warner, Chief Executive Officer, ParkingCarma | 100 McMorran Pl, Room 412 | Port Huron, MI 48060 | (206) 309-7494 Office | Rick.Warner@ParkingCarma.com

PARTICIPANTS

Rick Warner is the Chief Executive Officer of ParkingCarma. As a seasoned start-up veteran, Rick brings extensive experience in transportation, wireless communications, and information technologies. Rick is also the founder of Action Engine and ParkingCarma and has raised capital and led the development of innovative technologies. His work has been publically recognized. Rick has received the ComputerWorld Smithsonian Laureate Award. Rick currently serves on the Transportation Research Board’s new Transportation Systems and Technology Committee and has extensive relationships throughout the parking and technology industries.

Elliot W. Martin, PhD is an Assistant Research Engineer at UC Berkeley’s Transportation Sustainability Research Center (TSRC). Elliot has been with UC Berkeley’s TSRC since 2005. His research experience includes transportation energy, public and freight transportation, choice modeling and life-cycle assessment. Additionally, he has been involved in research with carsharing, ecodriving, alternative fuels, advanced vehicle drive-trains and parking and truck transportation.

PROFILE

ParkingCarma has focused on smart urban parking for 10 years. The ParkingCarma Open Parking Network provides a managed service that makes parking in urban areas easier for the driver and more lucrative for the parking manager. ParkingCarma is at the forefront of Smart Truck Parking (STP) which has enabled truck stop operators, fleet managers, and truck drivers to connect and improve their parking experience. The STP system addresses a serious safety issue under Jason’s Law, in which inadequate or insufficient knowledge of availability of legal and safe parking contributes to unsafe parking decisions by truckers. STP is designed to provide actionable information to truck drivers on available parking, amenities (e.g. showers, food, fuel, anti-idling locations, etc.) and guidance. There are two types of information that the STP system is designed to provide to truck drivers and fleet operators. One is parking availability and the other is truck stop attribute information, both of which are currently unavailable. ParkingCarma’s strengths include its fully operational technology platform; positive client relationships and brand awareness; strong domain experience; patent licenses in
Parking Carma’s successes include:

- Processing of over $15 million of BART reserved parking
- 70,000 registered customers in the ParkingCarma system
- 50,000 mobile app users
- two major and eight regional parking management companies embracing the ParkingCarma service
- six major federal contracts collectively valued at $3 million
- various awards including the ITS Innovation Award, Dell NFIB Small Business Award, and Red Herring Top 100 North America: Best Disruptive Technology

**University of California Berkeley Transportation Sustainability Research Center (TSRC)** was formed in 2006, the Center combines the research forces of six groups at UC Berkeley: the University of California Transportation Center, the University of California Energy Institute, the Institute of Transportation Studies, the Energy and Resources Group, the Center for Global Metropolitan Studies, and the Berkeley Institute of the Environment. Since its inception, TSRC has been a leading center in conducting timely research on real-world solutions for a more sustainable transportation future. The Center primarily focuses its research efforts in six key areas, including, advanced vehicles and fuels, energy and infrastructure, goods movement, innovative mobility, mobility for special populations and transportation and energy systems analysis.

TSRC uses a wide range of analysis and evaluation tools, including questionnaires, interviews, focus groups, automated data collection systems, and simulation models to collect data and perform analysis and interpretation of the data. The Center then develops impartial findings and recommendations on key issues of interest to policymakers, which subsequently aid in decision-making. TSRC has assisted in developing and implementing major California and federal regulations and initiatives for sustainable transportation. These include the California Global Warming Solutions Act (AB 32), the Low Emission Vehicle Program and Zero Emission Vehicle Mandate, the Pavley Law, Low Carbon Fuel Standards policies, CA SB 375 and the Federal Energy Independence and Security Act of 2007.

**PARKING CARMA PRESENTATION**

ParkingCarma was founded on the idea that using the internet to match people with parking spots can improve the urban driving experience for consumers as well as bring business to registered parking facilities. For drivers, it assures them a space and saves time spent circling in search of parking; for parking facility managers, it enables them to capitalize on their available spaces that may otherwise go unfilled.

The key to matching drivers with available parking is the Online Parking Network (OPN), a platform designed by ParkingCarma to enable consumers to reserve available spaces in registered parking facilities. Registering a facility on the OPN network is free and enables managers to immediately begin taking reservations. Managers can also update their rates, availability and hours of
operation at any time. Users can create a profile, access parking availability and make reservations on ParkingCarma’s website or from their smart phones. ParkingCarma collects a percentage of the user fee drivers pay to make reservations. This business model has proven effective in urban downtowns and at transit (BART) locations where drivers are often left fighting for parking spots. ParkingCarma is now working to bring this type of functionality to commercial drivers, helping them to locate and reserve truck parking.

In conjunction with the Federal Highway Administration, Caltrans, and the Transportation Sustainability Research Center (TSRC) at U.C. Berkeley, ParkingCarma developed a Smart Truck Parking system to provide commercial drivers with the location, real time availability, amenities and reservations at truck stop locations. Using routing data from Nokia (NAVTEQ) and Promiles (TomTom), ParkingCarma is working to create a smart phone application that will locate truck parking along a driver’s route. As the driver approaches the destination, the app will relay information about nearby parking availability and enable the driver to make a reservation using a voice-to-text user interface. A website interface will also enable fleet managers to reserve spaces on behalf of their drivers.

The Smart Truck Parking mobile app and website interface will enable drivers or their fleet managers to view real time parking availability and make parking slip reservations at truck stops registered with Parking Carma’s OPT. Truck facility managers can also enter the amenities available at their stop such as restaurant, shower, and laundry facilities as well as wifi.

The Smart Truck Parking project is still in the trial stage. It has been implemented at two truck facilities in Northern California and will be expanded to several more facilities along the I-5 Corridor beginning in June 2012. The
challenges associated with the project are twofold. First, developing a system to reliably count trucks, compute availability and disseminate that information is difficult. It involves not only installing accurate sensors, but also building an data analytics system that can recognize errors in the data and recalibrate itself to maintain accurate counts. Installing sensors at every truck parking facility is not feasible; however, crowd sourcing may be an additional source of data for smaller truck facilities once the Smart Truck Parking program is more widely used. Second, ParkingCarma’s information platform and business model is designed for use in urban parking environments. It needs to be refined in order to collect the revenue and control the costs associated with operating Smart Truck Parking on a larger scale.

Survey feedback collected by TSRC shows that Smart Truck Parking provides services that commercial drivers would find helpful and that they would be willing to pay a modest sum to use. Truck stop operators are also eager to capitalize on their parking availability; however, fear of losing fuel and food sales has prevented them from charging drivers for parking. ParkingCarma has partnered with other companies that are respected in the trucking industry and
has made progress achieving buy-in from commercial freight companies, drivers and truck facility operators who see value added in the Smart Truck Parking service.

The benefits of this system extend beyond the trucking industry. Helping drivers locate designated truck parking quickly and easily creates an alternative to parking on roadsides, exit ramps or other illegal places that can be hazardous to public safety. In addition, since most truck parking availability is privately owned property, implementing a system that identifies underutilized truck parking increases the inventory of available spaces without any investment in public infrastructure. According to TSRC, illegal truck parking is a national problem; therefore the public-private partnership entered into by ParkingCarma and government transportation agencies may prove to be an integral part of enabling Smart Truck Parking to move beyond California’s I-5 Corridor.
3.12 **ITERIS**

**Figure 3.12  Iteris Profile**

<table>
<thead>
<tr>
<th>CONTACT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gary Hamrick</strong></td>
</tr>
</tbody>
</table>

**PARTICIPANTS**

**Gary Hamrick** is a Vice President at Iteris, Inc. Gary has 28 of experience managing a wide range of transportation planning projects in the Gateway Cities and throughout southern California. He is based in Long Beach and has been working on Port related transportation issues for over 15 years. The range of projects he has participated in or managed within Gateway Cities includes subregional trucking studies, Port of Long Beach and Los Angeles transportation master plans, numerous Port traffic studies and environmental studies, the City of Long Beach Mobility Element, the City of Long Beach Downtown Strategic Plan, the I-710 Major Corridor Study and many other significant local transportation projects. For the past year and a half, Gary has managed the travel demand modeling and traffic operations analysis for the Gateway Cities/METRO SR-91/I-605/I-105 Feasibility Study and Strategic Transportation Plan project. He has also managed the detailed operations analysis of the freeway system within the Gateway Cities, as well as over 200 intersections throughout the area. In addition to his work in the Gateway Cities, he has managed many city-wide and area-wide master plans, freeway master plans, arterial master plans, corridor studies, bicycle plans, other non-motorized transportation plans, and traffic impact analyses for numerous development projects.

**Rob Hranac** is a Vice President in the iPerform business unit at Iteris and is focused on analytics for transportation agencies. His experience revolves around the connection between transportation systems and information technology. Rob has worked to deploy several Performance Measurement Systems (PeMS) with a variety of clients including Caltrans and City of Los Angeles. PeMS is a system that applies higher level mathematical and statistical principles to complex technical engineering problems related to traffic information to deliver automated data mining solutions. He participates in all phases of PeMS deployment, acting as a senior subject matter expert with emphasis on the planning, analysis, documentation, and presentation phases.

**PROFILE**

Iteris, Inc. (Iteris) is the market leader in providing traffic information management solutions to the intelligent traffic management industry. Iteris has decades of expertise in traffic management, along with superior services and patented products to help detect, measure, and manage traffic and vehicular performance; minimize traffic congestion; and empower clients with solutions to better manage their transportation networks. The firm is headquartered in Santa Ana, California with offices nationwide.
Iteris staff are experts in the fields of transportation planning, traffic engineering, and Intelligent Transportation Systems (ITS). Their knowledge of these practice areas enable them to provide comprehensive services ranging from initial traffic impact studies, transportation modeling, planning, systems engineering, and detailed design, through implementation and performance monitoring. They combine the talents of transportation engineers, systems engineers, system integrators, software engineers, and transportation planners to bring to the industry an unmatched combination of talents and experience. The innovative solutions we develop and apply assist public agencies reduce traffic congestion, enhance transit use, monitor and manage their transportation networks, and provide greater access to reliable traveler information.

Iteris’ recent purchase of Berkeley Transportation Systems (BTS) greatly enhances the firm’s expertise in the area of performance measurement and monitoring. BTS manages the statewide traffic monitoring program (PeMS) for Caltrans and has provided the City of Los Angeles with a comparable arterial traffic monitoring program (A-PeMS) linked to the City’s ATSAC system.

Iteris was founded based on the principle of providing quality solutions to clients, on time and within budget. Iteris staff is committed to the transportation industry, striving to apply their professional talents to solve the challenging problems of the movement of people and goods to enhance a growing economy. Quantification and validation of the inter-relationships of land-use, mobility/congestion and air quality is a technical area in which Iteris excels. Iteris promises principal-level commitment to all projects.

Iteris takes a disciplined approach to each system and software project based on ISO 9001 standards which starts with understanding the end-users’ needs. Iteris delivers precise solutions that meet customers’ needs and expectations based on their core competencies. They include Research and Education, System Integration, Traveler Information and Performance Monitoring and Management.

ITERIS PRESENTATION

Iteris’ company capabilities bring together traffic planning and engineering with the data systems and analytics necessary to enable intelligent transportation systems. Iteris predicts that future state DOT ITS intervention will focus on better management of existing infrastructure to improve traffic flow and make transit more efficient. These efforts must also be documented through the application of performance measures. According to Iteris, the greatest challenge for public sector agencies is to provide evidence of the positive impact that their interventions have made; therefore, Iteris seeks to bring to its public sector clients the same level of accuracy and cost control measures that are demanded in the private sector. Such efficiency is made possible through the implementation of automated data analysis.
In the past, public agencies had to buy their data and maintain a staff capable of processing the data before it was available to decision makers. Even then, the information was dated and its relevancy questionable. The rise in smart phones and GPS device use over the past ten years has created a new source of transportation data that is virtually free. The progress made in computing technology during those same 10 years means that automated data analysis can produce images of road conditions in real time.

Using roadside sensor data and GPS probe data streams fused with existing knowledge of work zones and other freeway conditions, Iteris’ system analytics can produce a real time visual display of speeds, congestions points, and locations of traffic incidents for freeways in the Los Angeles region. This continuous data feed also creates a moment-by-moment historical record of traffic and roadway conditions. Automated analysis of this record can determine the start and end time of delays related to traffic incidents within moments of their occurrence as well as the percentage break out of the causes of congestion. There is always percentage for which the cause will be unknown; however, this percentage is reduced as new data, such as weather or special events, is added to the fusion process. This process can also be applied to regional traffic monitoring using an analytics system that can account for the complexities of signalization on arterials.

Given the availability of continuous data streams and automated analysis, future transportation planning and traffic management will rely less on projected models and more on current data that is monitored and analyzed in real time. Iteris can help public sector agencies harness existing traffic data and apply performance measures to assess areas in need of freight management. As part of their Integrated Corridor Management Plan, the South Bay Council of Governments sought to examine the relationship between back-ups on the 110-405 interchange and the volume of truck traffic on city arterials. Iteris developed an algorithm to enable the existing roadside loop detectors on the 110 and 405 freeways to distinguish between commercial trucks and smaller vehicles. In addition, they worked with the City of Carson to deploy similar sensors along Carson Avenue to measure the volume of truck traffic along that arterial. Analysis of the two data streams revealed a correlation between the timing of freeway back-ups and increased truck traffic on arterials. This example demonstrates how Iteris was able to apply new analytics to the existing data and technology in order to help the South Bay COG assess the problem of cut-through truck traffic so it could be addressed in the Transportation Management Plan.

In a second example, Iteris undertook a study of freight movement through the Otay Mesa Border Crossing between the U.S. and Mexico near San Diego on behalf of the National Academy of Science. The project used third party GPS probe data to analyze the concentrations of trucks at the border crossing’s multiple gating areas to determine wait times at each gate. The “bread crumb” data came from Qualcomm, which provides support to logistics firms and
receives location data from each individual truck. Using their data analytics, Iteris was able to create a real time visual display of the truck concentrations at each gate and a record of precise wait times for each truck.

According to Iteris, the significant cost associated with using data analytics for ITS and freight management is the investment needed to develop the software systems that process and analyze the data. Iteris works with clients to develop an automated system using data currently available and applying performance measures needed to achieve their clients’ goals. Once this investment has been made, the ongoing cost to maintain these systems are minimal because data storage and computers are relatively inexpensive. Iteris’ experience implementing data management systems to measure queue times for freight trucks as well as commercial truck movement on highways and arterials would enable them to develop similar systems to assist in the Goods Movement Plan for the Gateway Cities Council of Governments.
3.13 **TRANSCORE**

**Figure 3.13  TransCore Profile**

<table>
<thead>
<tr>
<th>CONTACT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kelly Gravelle</strong>, Executive Vice President &amp; Chief Technical Officer, TransCore</td>
</tr>
<tr>
<td><strong>Thomas L. Sheehy</strong>, Government Affairs Director, Greenberg Traurig, LLP</td>
</tr>
</tbody>
</table>

**PARTICIPANTS**

**Kelly Gravelle** serves as TransCore's chief technical officer and executive vice president. Kelly oversees the research and development of TransCore products and technology initiatives, including the development of the next generation of GPS and RFID-based transportation applications and advanced toll collection or mileage-based user fee systems. During his 14-year tenure at TransCore, Kelly has led the effort to develop major toll systems in operation or deployed throughout the world. One of the most successful of these is the island-wide electronic toll collection system for the Commonwealth of Puerto Rico. This system employs groundbreaking concepts including the first implementation of a single chip integrated transponder on a flexible substrate, in combination with an innovative business approach to support unbanked customers. Kelly also led the development strategy for the groundbreaking series of multi-protocol reader systems.

**Thomas L. Sheehy** is the Government Affairs Director for Greenberg Traurig LLP. Tom has more than 22 years of experience in California politics and policy and is the former Acting Secretary and Undersecretary of the State and Consumer Services Agency.

**PROFILE**

**TransCore** – Driving inefficiencies out of surface transportation through innovative solutions

Over the past 75 years, TransCore has built a strong foundation in transportation services and technology, as well as a rich tradition of innovation and integrity. TransCore’s heritage in radio frequency identification (RFID) – a wireless data technology that allows communications between readers and electronic transponder devices attached to vehicles, equipment, and containers – has been a consistent thread throughout its transportation applications and product development. TransCore has built on its strengths to deliver a strong portfolio of transportation products including an extensive suite of enterprise software applications, business process outsourcing, system integration, and customer care and maintenance services to provide complete solutions, configurable to global customers’ requirements.
As the world’s largest manufacturer of transportation-based RFID technology with tags and readers deployed worldwide in various applications, TransCore has built on its strength to deliver a complete portfolio of intelligent transportation systems, products and solutions for advanced traffic management systems, electronic toll collection solutions, airport ground transportation management systems, Homeland Security systems, parking solutions and mass rail transit systems.

One of the most important factors in the evolution of TransCore products and services has been listening to the needs of their customers and seeing issues through their eyes. Today, TransCore has installations and products in 51 countries, more than 100 patents and their systems process more than 5 billion transactions annually. TransCore’s extensive experience includes the design, delivery, operation, and maintenance of North America’s first electronic toll collection system in Dallas, Texas (1989), the world’s first electronic border crossing system in Otay Mesa, CA (1995), the first electronic vehicle registration transponder system in China (2000), the world’s first reversible open road tolling bridge in Tampa, FL (2006), and the world’s widest open road tolling zone (seven ORT lanes) in Dubai, UAE (2006.) Their experience with tolling systems alone includes more than 7,400 installed electronic toll collection lanes worldwide and 27 customer service centers. In 2010, Engineering News-Record ranked TransCore No. 140 out of the Top 500 Design Firms. TransCore continues to dedicate significant resources and an unwavering focus to the future of transportation technology and creates new ways to make technology simpler for customers and the motoring public.

TransCore has been honored repeatedly for its outstanding work and for its quality in the workplace. Awards include the 2010 Best of ITS – Best New Innovative Practice, Sustainability in Transportation for their green tag and the International Customer Management Institute’s (ICMI) prestigious 2010 Global Call Center of the Year Award.

TRANSCORE PRESENTATION

TransCore has its roots in the tolling industry; today it offers the full spectrum of hardware and software necessary to operate toll collections and violations processing. The Company is a major manufacturer of RFID tags and readers and has installed its infrastructure and back-office systems at major toll roadways in the U.S. and abroad. TransCore has also expanded its software offerings and now provides software for traffic signal control systems and advanced traffic Information Systems (ATMS). TransCore was among the first to implement the advanced RFID technology necessary for express lane and open road tolling. The Company also applied RFID technology to “asset tracking,” providing tracking devices for large-scale equipment and rail cars. In recent years, TransCore developed a new asset tracking system called “Slap and Track” that uses GPS satellite communications to enhance tracking abilities beyond what was possible using RFID alone. As part of this expansion into GPS based technology, TransCore has recently developed a new product line called “Rover” that capitalizes on the improved accuracy and decreasing cost of GPS satellite communications.
Rover uses GPS and common carrier connections (GSM cell phone technology) to enable tolling operations without any of the infrastructure required in the past. The device itself is geo-referenced and has its own SIM card, which allows it to send both send and receive signals. This infrastructure-free tracking ability can provide public agencies the ability to implement systems such as high frequency tolling, HOV lane compliance, and congestion pricing for very little cost. Using its geo-referencing capabilities, Rover could signal a drivers’ use of a toll road or a congestion-priced lane and would contribute to the GPS probe data used in corridor management by transmitting real time location, speed and direction data to traffic management centers. The Rover can also support third party applications, and could be used as an onboard ITS device, providing drivers with traffic information using a simple interface with minimal driver distraction unlike smart phone interfaces which require more dynamic engagement from users. TransCore is currently working on integrating navigation capabilities into the applications supported by Rover.

Rover’s technology can also be applied to freight logistics, enabling communication between drivers and fleet managers. It can serve fleet managers by tracking drivers’ behavior and reporting any hazardous events such as excessive speed, hard breaking and near-rollovers. This capability is made possible by the internal accelerometer present in the Rover. According to TransCore, past tests of their device in which it was used to provide drivers a weekly “score card” evaluating their driving behaviors lead to a decrease in risk-taking behaviors and reduced the number of traffic incidents associated with the fleet. Lastly, Rover could be used to managing freight vehicles in the I-710 Corridor when combined with navigation capabilities. Rover devices could be pre-programmed with several routes between freight pick up and drop off points consistently used by drivers. Using information on real time traffic conditions, the Rover could assist drivers in selecting the most efficient route to move their containers to or from the Port.
4.0 Appendices
### 4.1 SUMMARY OF KEY QUESTIONS

**Table 4.1 Summary of Key Questions**

<table>
<thead>
<tr>
<th>What’s Next for Your Firm?</th>
<th></th>
</tr>
</thead>
</table>
| **Volvo**                 | - Dedicated Short-Range Communications (DSRC) 5.9 - enables short range communication (“here I am” data), plan to make mandatory in passenger cars by 2014, but trucks were left out  
  - Exploring applications based on DSRC communication (Vehicle to Vehicle, Infrastructure to Vehicle) - safety is driving force, collecting traffic data is secondary – display of static/stationary signs could communicate things like speed limit, height restrictions, etc.  
  - In Europe and North American - short range communication - Here I Am message - will become mandatory equipment - 2013 in vehicle cars, 2014 in heavy duty trucks  
  - USDOT - experiments and demonstrations  
  - A Connected Vehicle project is in NY DOT and I-95  
  - Driver distraction  
    - Roadside installed - sends dynamic information on truck - e.g. weight restrictions  
    - Safety is the driving force  
    - Collecting traffic information  
    - Static or stationary roadside signage information to the vehicle - e.g. speed limits would be on display |
| **INRIX**                 | - INRIX is developing more crowdsourcing of incidents, user contributed data for real time traffic incident reporting  
  - Capitalizing on the continually expanding pool of probe data from GPS devices and mobile apps.  
  - Pursuing additional sources of information from public agencies that are collecting real time data feeds; i.e. DOT sensors.  
  - Using this expanded data set, INRIX hopes to eventually calculate two speeds for each TMC. |
| **Sensys**               | - Looking into less caustic batteries  
  - Looking to add GHG emissions (through data post processing)  
  - Looking to add congestion maps  
  - Wireless WIM sensor; Error related to truck weight – group is looking for less than five percent error; Sensys to follow up.  
  - Coordinating with Sumitomo to estimate travel time 45 and 60 minutes out  
  - Opening an office in Southern California showing their commitment to the regions of Los Angeles and San Diego where they currently have projects underway |
<table>
<thead>
<tr>
<th>Company</th>
<th>Details</th>
</tr>
</thead>
</table>
| NAVTEQ | - Maintain commitment to high value items such as the map  
- New stuff includes predictive traffic, interstate to interstate ramp configurations  
- More work towards Application Programming Interfaces (API)  
- Focus has always been data, working with companies to generate solutions  
- Nokia will likely work with Microsoft to develop some solutions  
- NAVTEQ offers a dual channel, best window to device makers, fleets, data users  
- Not going anywhere, conservative company |
| Advent | - Making appointment system more presentable in response to feedback from trucking community that system needs to be more user-friendly |
| Telvent | - Plans to marry their Management and Information Systems for Ports (MISP) product with their Integrated Corridor management System (ICM) system to enable coordinated management of shipping vessels moving in and out of port and trucks coming to pick up or drop off containers. |
| TomTom | - Final stages of developing the SPITS (Strategic Platform for Intelligent Traffic Systems) tablet, which uses Google’s open-platform operating system, Android.  
- Applications can be written by external program developers using the routing and geographical data in TomTom database. |
| Perceptics | - Industry will see an increase in the use identifying data for the enforcement of weight restrictions on commercial trucking vehicles.  
- The accuracy of data will drive enforcement; therefore Perceptics need to continue improving the quality and accuracy of their vehicle identification devices  
- Future also in logistical analyses, companies like Mettler Toledo do; need to make their data flexible to work with |
| Volvo | - Volvo sees industry moving towards automated driving (AQA Automated Queue Assistance), still in research phase, some safety concerns (pedestrians, possibility of false pedestrian positives) – EU-funded pilot in Europe  
- GPS navigation devices will eventually become compatible with one another use an open platform so that outside applications can run on the devices no matter which OWM makes it. |

**What Does the Future Hold for the Industry?**

- Volvo VISION 2016/2023  
  - Platooning - Vehicle to vehicle versus vehicle to road approach  
  - Challenge - imbedded roadway vs. overhead catenary  
  - Can the truck change lanes?
- Volvo Platooning 2020
- 2030 Propulsion Power Train Expanding Cargo Area
- Running from track to ground
- Batteries
- Compact Combustion Engine
- Energy Recuperation – solar panels
- Power imbedded in the road – track two conductors in a row
- Above the pavement
- Technology is already being used in trams by French Company
- First demonstration in Sweden this year.

<table>
<thead>
<tr>
<th>INRIX</th>
<th>More robust data will be available in the future because consumers’ use of GPS and mobile apps will continue to increase (probe data)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- ITS of some kind in almost every vehicle in 2-3 years</td>
</tr>
<tr>
<td></td>
<td>- Key areas for ITS technology will be voice integrated features and more useful information for consumers; specifically,</td>
</tr>
<tr>
<td></td>
<td>- Ability to anticipate traffic, voice integrated (car will tell you)</td>
</tr>
<tr>
<td></td>
<td>- Both cars and trucks will be able to detect wheel slippage, advanced traction systems</td>
</tr>
<tr>
<td></td>
<td>- Never late again applications, better calendar incorporation, better location awareness, more multimodal opportunities</td>
</tr>
<tr>
<td></td>
<td>- Connected vehicle data points available, can share slickness of road, data on wipers, wiper speeds.</td>
</tr>
<tr>
<td></td>
<td>- Better performance measurement, better “in the cloud” services that are simple to operate, won’t be restricted to owners, ability to compare bottlenecks real-time across the nation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sensys</th>
<th>Potential applications for truck parking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Such as space occupancy detection – With micro radar sensor, can detect whether space is free or not (currently developing for electric vehicle charging station occupancy)</td>
</tr>
<tr>
<td></td>
<td>- Red light camera applications</td>
</tr>
<tr>
<td></td>
<td>- Wireless micro sensor can work for parking detection (bike lanes, proposing to work with Santa Monica)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceptics</th>
<th>Will see an increase in the use identifying data for the enforcement of weight restrictions on commercial trucking vehicles.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- In some jurisdictions, it is already being transmitted to law enforcement officers in real time to enable them to intercept and issue citations to trucks that are out of compliance.</td>
</tr>
<tr>
<td></td>
<td>- Industry experts are currently working to standardize the practices for collecting weigh-in-motion measurements and to modify existing legislation so that the data can be used for enforcement.</td>
</tr>
<tr>
<td></td>
<td>- Future use of logistical analytics driven by accuracy of data</td>
</tr>
</tbody>
</table>

| TomTom      | Expect that in the future most consumers will have access to onboard                                       |
real time traffic information
- New technology will enable onboard devices to share real time traffic information between vehicles and with roadside monitors to develop a more complete network of real time traffic information
- GPS devices will start to use open platforms, include information for outside programmers to write applications that can run on a variety of devices.

| Telvent            | Transportation management will be merged with city management in large metropolitan areas.
|                   | Transportation networks will be managed as a complete entity rather than in their individual “stove pipes” of freeway, public transit, and commercial freight.
|                   | Future ITS network will use an open architecture so applications can be written by outside developers
|                   | Follow the trend toward providing users with increasingly personalized information

| NAVTEQ            | GPS probe data (data sent back from on-board GPS and mobile device applications) will be a significant source of traffic information in the future. Its availability is growing exponentially as more consumers use navigation devices.

| Advent            | More terminal operators will begin working cooperatively to implement programs to improve port efficiency.
|                   | Advances in technology will hasten these improvements; more functions will become automated
|                   | Outreach and dialogue will be important to get terminal operators, shipping companies, trucking companies and unions to cooperate (give access to their data) to implement more efficient systems

<table>
<thead>
<tr>
<th>Where Do You See Yourself Fitting Into the Project?</th>
</tr>
</thead>
</table>

| Volvo               | Volvo is not a true ITS Vendor
|                     | It is exclusively a Volvo manufacturer
|                     | Gateway Cities would need to build backbone infrastructure, then Volvo would provide solutions

| INRIX               | Contributing data for planning and performance management (analytics package) (which helps support getting revenue when you can tell the story)
|                     | Traveler information website usage

| Sensys             | Sensys could provide detection on arterials at precise locations, can also use for multiple applications, look at developing solutions that fit, not all or nothing
|                     | For weigh-in-motion applications, need less than five percent error.

| NAVTEQ              | Build partnerships between multiple public agencies and authorities and the private sector
<table>
<thead>
<tr>
<th>Company</th>
<th>Features</th>
</tr>
</thead>
</table>
| Perceptics| - Can give accurate reading of license plates on cabs and chassis and container codes  
|           | - Can developing vehicle record and integrate/develop the database to be used by terminal operators  
|           | - Can also develop sticker/tag method to ID trucks in database  |
| Advent    | - Advent offers adaptable system that can evolve with customer needs  
|           | - Advent has technology to help from tracking standpoint  |
| TomTom    | - Opportunity to utilize open platform (such as SPITS project for Android tablet) to communicate, if you want participation, set up something that really is open but not chaotic to get to real value added service  
|           | - TomTom does is a lot of outreach and communication with customers, ability to build engagement and participation  |
| Telvent   | - Wants to build an ICM to manage the transportation network to manage the traffic that includes the 710  
|           | - Gives FHWA-sponsored freeway project in Dallas as an example of using ICM to manage traffic similar to this project  |
### 4.2 Summary of Review Panel Discussion

**Table 4.2 Summary of Review Panel Discussion**

<table>
<thead>
<tr>
<th>How applicable are the technologies to the needs of stakeholders in Gateway Cities?</th>
</tr>
</thead>
</table>
| **Volvo** | General consensus seemed to be that the technologies are very applicable. Participants were impressed by Volvo.  
- Volvo is truck company also looking at ITS/CV in an integrated way, is very helpful for what we’re trying to do  
- There’s an opportunity to assemble a Master Plan Demonstration Project – opportunity to put package together to allow system to grow in logical fashion. |
| **INRIX** | Not sure if there’s anything that ties in directly unless they provide a higher quality data feed than current information. 511 can’t provide arterial data now. |
| **Sensys** | Lots of potential applications, including tolling. Some overlap/competition with INRIX (especially related to travel time estimation. County might be interested in investment because of connection with signal system. |
| **NAVTEQ** | Similar to INRIX, could provide information, seems more consistent |
| **Perceptics** | Very applicable |
| **Advent** | Very informative  
- More optimistic about ability to package information in a usable format |
| **TomTom** | Very applicable with good focus on commercial vehicles |
| **Telvent** | Technologies do not appear to be particularly applicable as presented. |

<table>
<thead>
<tr>
<th>Which stakeholder needs would this technology address and how would it help?</th>
</tr>
</thead>
</table>
| **Volvo** | If we design a backbone, different vendors can fit in by using an Application Platform Integration (API) to connect to commercial vehicles.  
- Platooning – 710 concept may need progression process structured, encouraging to see they have solution independent of the load.  
- IWLA - application integration platform - standard platform - with plug ins  
- Trucking companies - truck specific standard? |
| **INRIX** | Potential for 511 system being augmented with additional, high resolution data  
- INRIX could help to create apps that support the local drayage community  
- Fixed point data (warehouses) could request data of INRIX.  
- INRIX data could also support performance measurement task. |
<p>| <strong>Sensys</strong> | Arterial travel times, gate queue detection, adaptive signal control, WIM, other potential uses |</p>
<table>
<thead>
<tr>
<th>Company</th>
<th>Arterial travel times, communication with truck fleet</th>
</tr>
</thead>
</table>
| Perceptics| - Like idea of taking video of the queues, providing information to truckers  
           - Paperwork aspect is important, WIM is valuable tool, if terminal operators can use to improve operations, that would be an efficiency boost  
           - Being able to get chassis, container, and truck is great information  
           - Sensys deployed as sensors (combined with cameras i.e. at gate queues is a strong possibility |
| Advent    | Drayage optimization                                  |
| TomTom    | - Lots of potential applications                      
           - Great capabilities with fuel economy  
           - Limited cost  
           - Being able to continue to use existing technology is an asset  
           - Takes it beyond INRIX/NAVTEQ  
           - May limit need for TMC  
           - Tablet device presents all kinds of opportunities (coupled with specific applications)  
           - True public/ private opportunities could await  
           - “Talking transponder” could be solution tablet with audio…can continue to evolve |
| Telvent   |                                                      |

**What obstacles do we need to recognize related to this technology?**

<table>
<thead>
<tr>
<th>Company</th>
<th>Obstacles</th>
</tr>
</thead>
</table>
| Volvo     | - Platooning strategy/vision presents issues with embedded roadway power source.  
           - Trucking community involvement will always be a challenge |
| INRIX     | - Recognize limitations of diversion routes…technology can dynamically reroute…but sometimes you’re stuck at a non-decision point  
           - Controlled loop problem. If data showing those three routes are good but events are not being actively harvested, but there may be a closure….  
           - Unsure if they do minute by minute algorithms |
| Sensys    | - Be wary of height issue related to battery life  
           - Crenshaw Boulevard install occurring  
           - Question of is this yesterday’s technology? |
| NAVTEQ    | - NAVTEQ pays limited attention to heavy trucks  
           - Latency can be an issue with NAVTEQ |
| Perceptics| - Word of caution is using these for congestion.  
           - There are also some questions of sophistication. Are these the latest technology |
<table>
<thead>
<tr>
<th>Company</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advent</td>
<td>- Challenge of terminal operators and coordination is still a problem</td>
</tr>
<tr>
<td></td>
<td>- Need a flexible architecture so a web services format is needed, Advent</td>
</tr>
<tr>
<td></td>
<td>is based in non-web services</td>
</tr>
<tr>
<td>TomTom</td>
<td>- Issue of how tethered we would be to TomTom</td>
</tr>
<tr>
<td></td>
<td>- Need to be aware of the latency issues</td>
</tr>
<tr>
<td>Telvent</td>
<td></td>
</tr>
</tbody>
</table>

**What is the recommended follow-up action?**

<table>
<thead>
<tr>
<th>Company</th>
<th>Follow-Up Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volvo</td>
<td>No significant action recommended follow-up at this time</td>
</tr>
<tr>
<td>INRIX</td>
<td>No specific actions recommended, but we may want to make everyone aware of this data resource.</td>
</tr>
<tr>
<td>Sensys</td>
<td>Monitor results of Crenshaw project</td>
</tr>
<tr>
<td>NAVTEQ</td>
<td>No recommended follow-up action.</td>
</tr>
<tr>
<td>Perceptics</td>
<td>No recommended follow-up action.</td>
</tr>
<tr>
<td>Advent</td>
<td>Possible technical tour of APM Terminals Pier 400 port scheduling system</td>
</tr>
<tr>
<td>TomTom</td>
<td>TomTom will follow-up with additional info (on pricing and some other issues).</td>
</tr>
<tr>
<td>Telvent</td>
<td>No recommended follow-up</td>
</tr>
</tbody>
</table>
4.3 **Vendor Presentations and Collateral Days 1 and 2**

*(under separate cover)*
4.4 **Vendor Presentations and Collateral Day 3**

*(under separate cover)*