Driving Operational Excellence with OSIsoft' s Connected Services in Real-Time Freight Application DOT V2I Integration

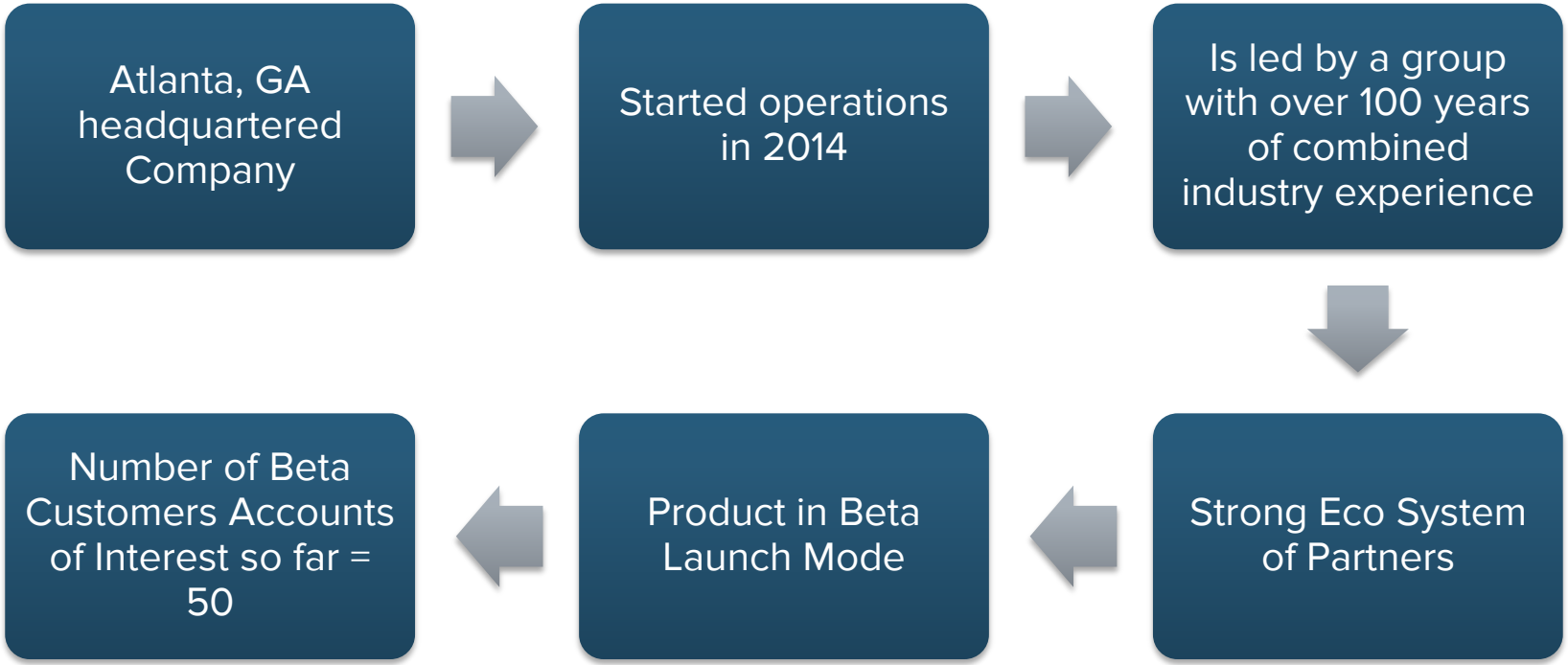
Presented by

Michael Treasure

What we will cover in thi presentation

- About TIEMAC
- Freight Industry
- USDOT Connected Vehicle Plans for the Freight Industry
- TIEMAC's Work with the DOT
- OSIsoft System proposed use by TIEMAC with the DOT
- Demo
- Questions & Answers

ABOUT TIEMAC



TIEMAC® Global Alliance Partners

Cloud Infrastructure & Technology Building Block - Partner

Big Data, Visualization, Analysis, Historization - Partner

Communications 4G LTE - Partner

Communications 4G LTE - Partner

Processor & Systems Chipsets - Partner

GIS & GPS Technology - Partner

4G Chipset - Partner

Device - Partner

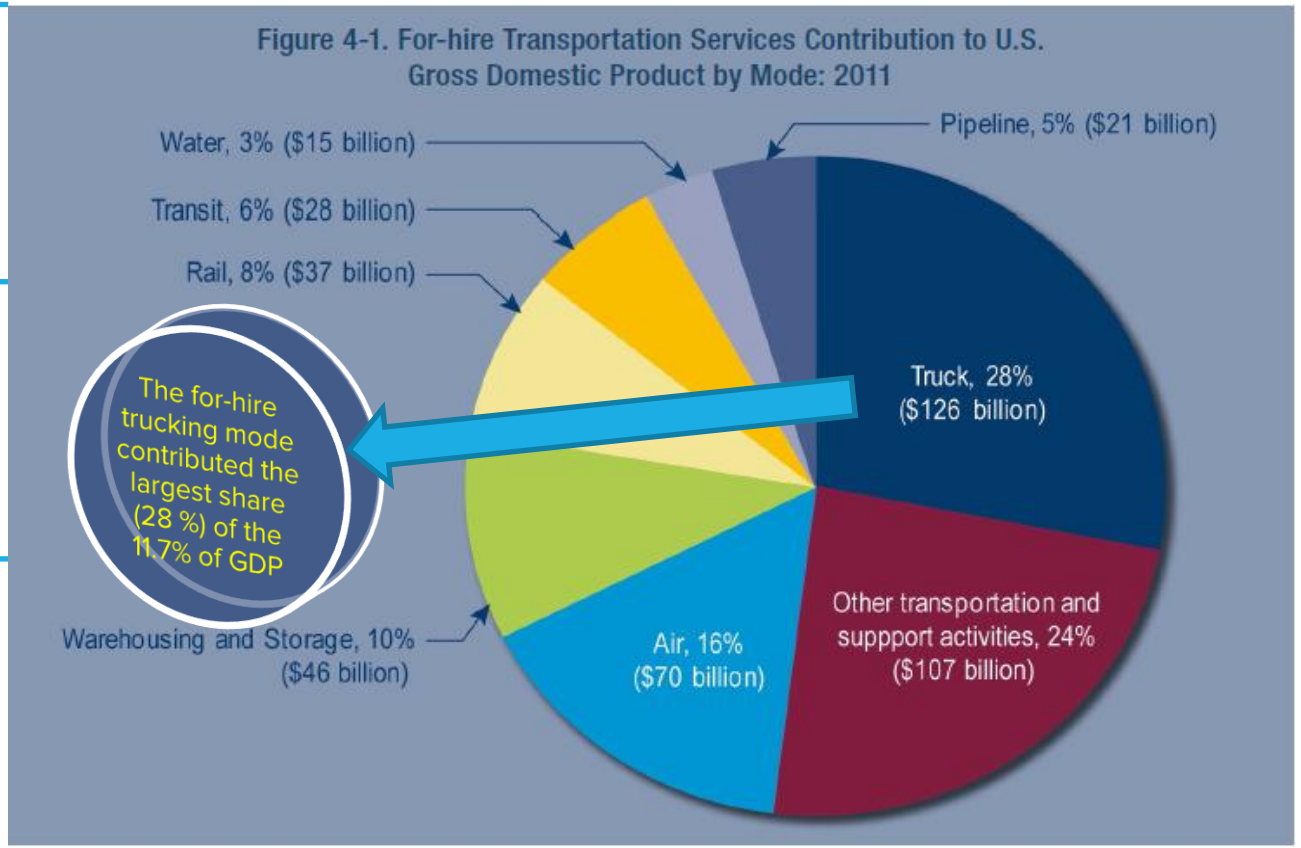
DOT - Government

Freight Importance to the USA Economy

118.7 million households, 7.4 million businesses, and 89,004 governmental units demands the efficient movement of freight.

The freight transportation industry comprises 11.7 percent of the GDP

In 2011, for-hire transportation contributed $448 billion to U.S. GD P.



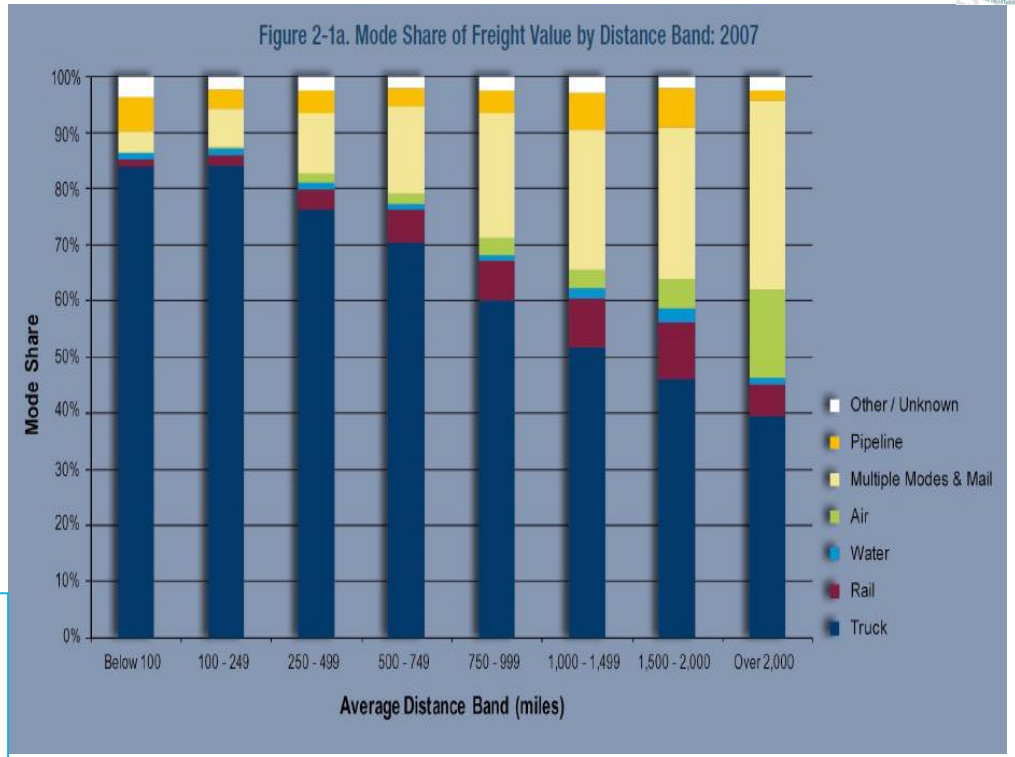
Source: http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/13factsfigures/pdfs/fff2013_highres.pdf

The Role of Trucking in the USA Freight Economy

- In 2011 there were 3,929,425 miles of infrastructure attributed to public roads and route miles

Freight travels over an extensive network of highways, railroads, waterways, pipelines, and airways.

By value, trucks move the largest percentage of goods across all distance bands



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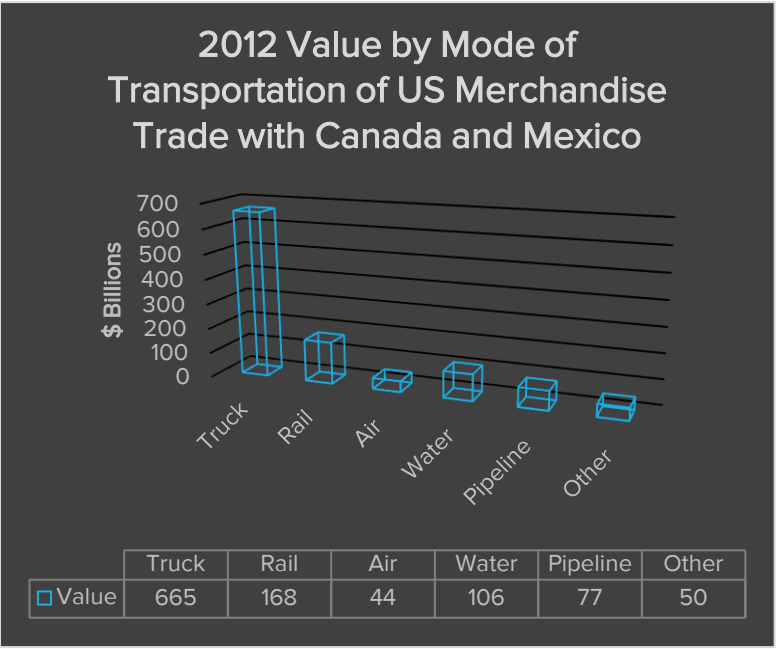
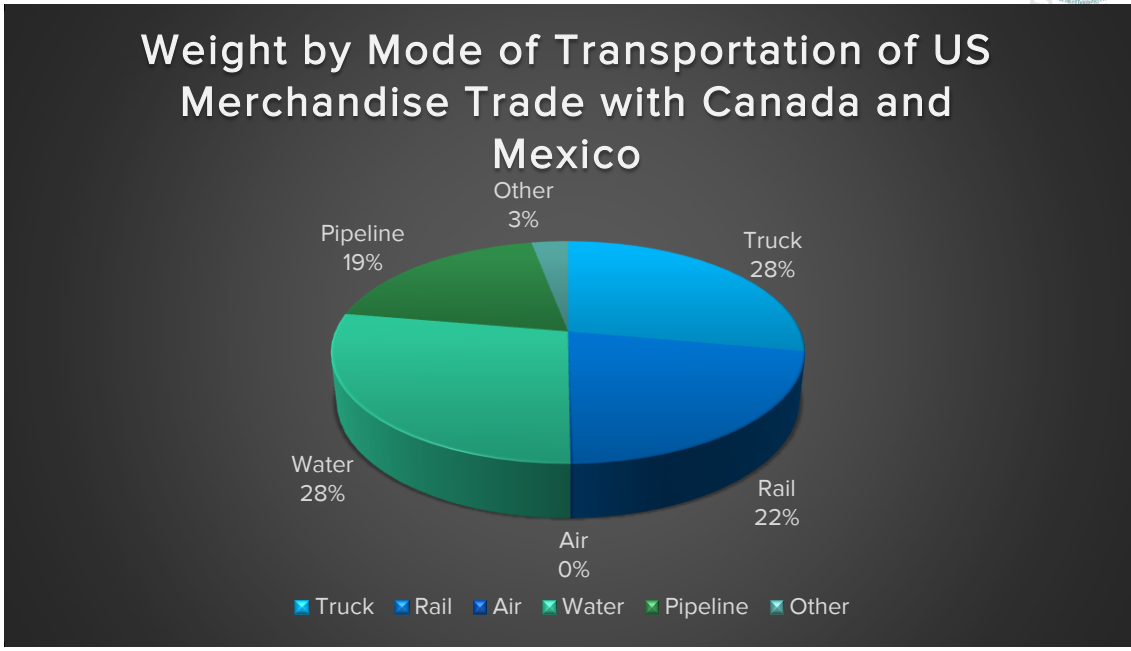
The Role of Trucking in the USA Freight Economy



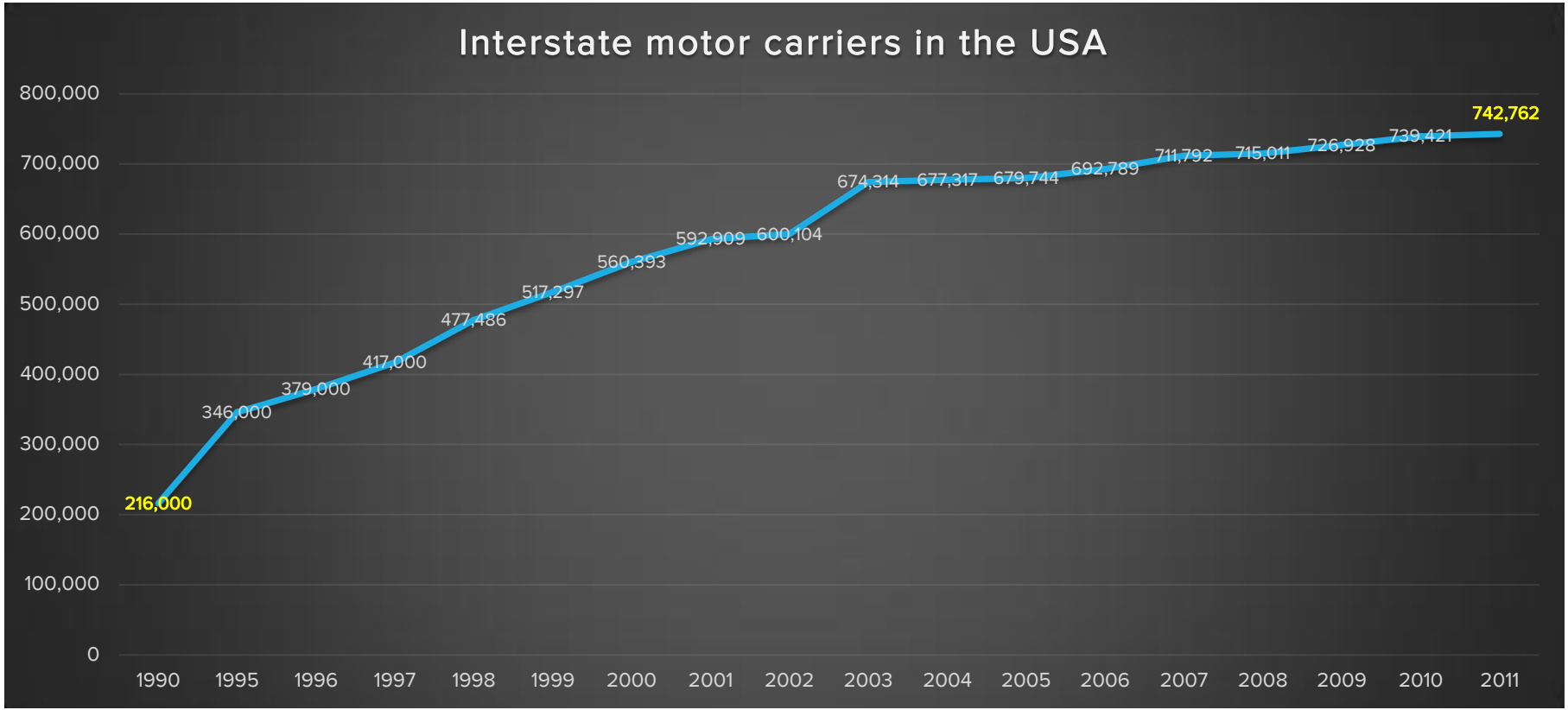
	Truck	Rail	Air	Water	Pipeline	Other
Value	665	168	44	106	77	50



- In January 2015
  - Trucks carried 62.3 percent of U.S.-NAFTA freight and are the most heavily utilized mode for moving goods to and from both U.S.-NAFTA partners.
  - Trucks accounted for $27.4 billion of the $47.5 billion of imports (57.7 percent) and $28.2 billion of the $41.8 billion of exports (67.6 percent).

Source: http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/13factsfigures/pdfs/fff2013_highres.pdf

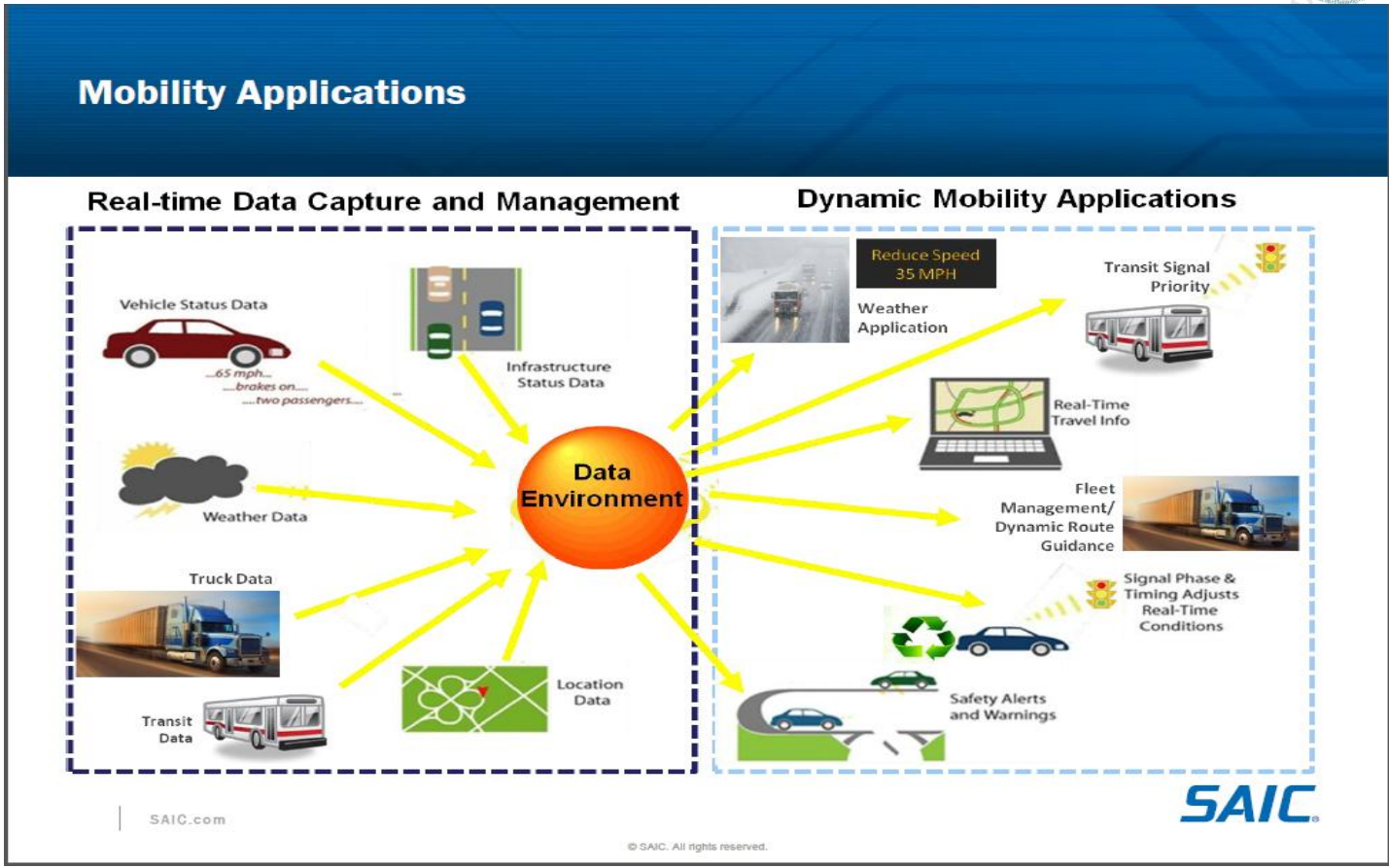
The Growing OTR Motor Carrier Sector



Source: http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/13factsfigures/pdfs/fff2013_highres.pdf

USDOT Plan for Freight and the Commercial Vehicle Sector

DOT has setup the Southeast Michigan Test Bed to support research and development of concepts, technologies, services and applications supporting Connected Vehicle Deployments.



USDOT Plan for Freight and the Commercial Vehicle Sector

The Concept of Operations (ConOps) of the proposed system for the Southeast Michigan 2014 Project provides for a Project System Architecture in accordance with the Connected Vehicle Reference Implementation Architecture (CVRIA) adopted by the USDOT as the standard process and development guideline for the Connected Vehicle system developments.

CVRIA is made up of several elements:

- Application objects,
- Information flows, flow characteristics,
- Flow state transitions,
- Message sequence,
- Message definitions that support Physical Architecture.

United States Department of Transportation

Office of the Assistant Secretary for Research and Technology
Intelligent Transportation Systems
Joint Program Office

For purpose of this presentation we will review the 9 application objects but will concentrate on only one of them

The Object Registration and Discovery Service (ORDS)

- physical object is supported by a single application object, the Object Registration and Discovery (ORD). It provides a registration service to the Southeast Michigan Test Bed objects for advertising their existence, service, and cyber location to other Test Bed objects. It also provides a query-based discovery service to Test Bed objects for looking-up available services.

Security Credential Management Services (SCMS)

- physical object provides one of the needed 2014 Project functionalities for guarantee of secure data transmission. It enables each Test Bed object to request security credentials which can be subsequently used to sign or/and encrypt the information flows exchanged between Test Bed objects and to have knowledge of those security credentials that have been revoked. This SCMS physical object is supported by the following application objects:
  - 1. Certificate Retrieval
  - 2. Decryption Key Retrieval
  - 3. Certificate Revocation List (CRL) Retrieval
- These application objects provide peer-to-peer (P2P) data exchange features for supporting security certificate, decryption key, and CRL retrievals between the SCMS and a security credentials requesting Test Bed object.

The Southeast Michigan Situation Data Clearinghouse (SDC):

- is a transportation information center that provides Local-Current Enhanced Vehicle Data (EVSD) collection and delivery functions, and Hyper-Local Intersection Situation Data (ISD) collection and distribution functions for transportation data that was in the immediate past and in a specific geographic region. The EVSD is aggregated vehicle-based safety, weather, mobility or commercial data generated and transmitted by the Connected Vehicle OBEs, and deposited into a Southeast Michigan 2014 Project Situation Data Clearinghouse (SDC) in bundles.

The Southeast Michigan Situation Data Warehouse (SDW)

- is a central-based service that provides warehouse functions for collection, distribution and delivery of the Local-Current (LC) and Regional-Historic (RH) Traveler Situation Data (TSD) and intersection Situation Data (ISD). The TSD message is either a regional historic advisory message such as static traffic regularity or advisory signs or a local-current advisory situation message such as a traveler information message for a temporarily stop-and-go bottleneck or road restrictions.

The Southeast Michigan Situation Wide Area Information distributor (WAID)

- is a center based object built and operated by the Southeast Michigan Test Bed. It receives processed Local-Current Traveler Situation Data (TSD) bundles distributed by the Situation Data Warehouse (SDW) and broadcast or multicast the data to the subscribed Connected Vehicle OBEs and Traveler Equipment (TE) via a regional wide area network such as commercial satellites.

The Southeast Michigan Situation Data Processing Center (SDPC)

- is a center based object built and operated by the Southeast Michigan Test Bed. It provides operational support for processing incoming and outgoing various situation data flows. The SDPC interfaces with the Situation Data Clearinghouse (SDC), Situation Data Warehouse (SDW), Security Credential Management Service (SCMS), and Object Registration and Discovery Service (ORDS) for providing needed functions.

The Southeast Michigan Test Bed Roadside Equipment (RSE)

- is a collection of Connected Vehicle roadside devices that are used to collect and distribute the Southeast Michigan 2014 Project specific data bundles and the Third Party application data. The RSE broadcasts messages to and receives messages from nearby CV-equipped vehicles using the Dedicated Short Range Communications (DSRC) 5.9GHz spectrum and IEEE 1609 based communications protocols. It also transmits and receives messages via a peer-to-peer message exchanges with Test Bed objects and the Third Party applications

The Southeast Michigan Test Bed Onboard Equipment (OBE)

- are Connected Vehicle onboard devices that are used to generate individual vehicle status information and receive messages from other near-by OBEs, RSE, or Wide Area Information Distributor (WAID) using the 5.9GHz DSRC or satellite broadcasting. In addition, the OBE collects and receives the Southeast Michigan 2014 Project specific data bundles and the Third Party application data. It interfaces with the ORDS for object registration and look-up, the SCMS for needed security credentials, the Southeast Michigan Situation Data Clearinghouse (SDC) for deposit of the Local-Current Enhanced Vehicle Situation Data (EVSD) bundles

The DOT Object layer that will drive TIEMAC's OSIsoft's Connected Services

The Third Party Application Center (TPAC)

- Represents the private portion and infrastructure of the Southeast Michigan 2014 project.
- TPAC is an object where the third party software applications are anticipated to develop, maintain, and host for interacting with and providing "for-profit" information to other Test Bed objects.
- There will be multiple Third Party Application Centers owned and operated by different enterprises due to its commercial potential, and for the most part, each of these enterprises will own and operate "peer" applications running on their Third Party Connected Vehicle OBEs.

Where does PI Systems Fit In?

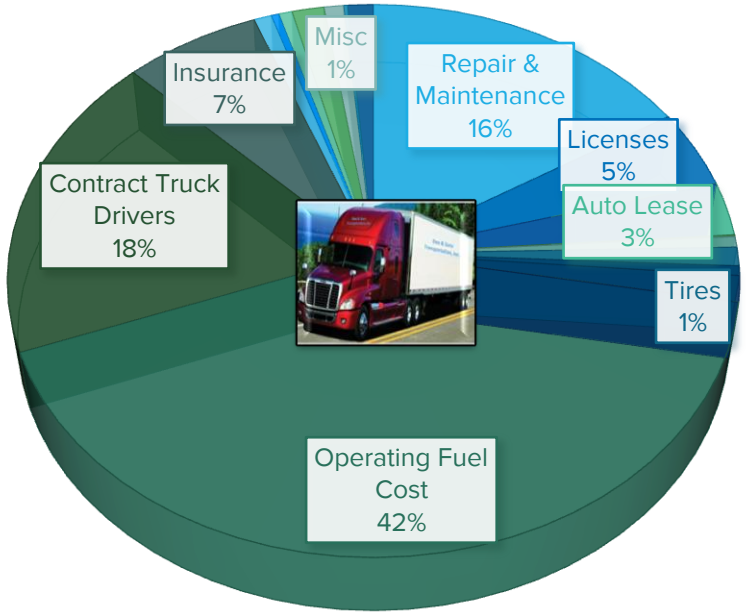
The Journey with PI System began in 2014 when I spoke then of TIEMAC's vision to build an advanced telematics solution built on OSIsoft's PI System technology stack

Mobilizing the Power of Data Enabling On Highway Truck Vehicle Connections to a Cloud Infrastructure

Presented by **Michael Treasure**

OSIsoft. USERS CONFERENCE 2014 @OSIsoftUC | #UC2014

ONE OF TIEMAC'S BETA COMMERCIAL TRUCKING CUSTOMER 2014 MAJOR COST DRIVERS



Top Challenges in Achieving Sustainable Operational Excellence

Source: LNS research

Today, TIEMAC has a cloud infrastructure that is built and is in Beta operational mode using some of the PI System major technology components

TIEMAC CrewAccount High Level Architecture - SaaS Cloud (Azure) and User Interface

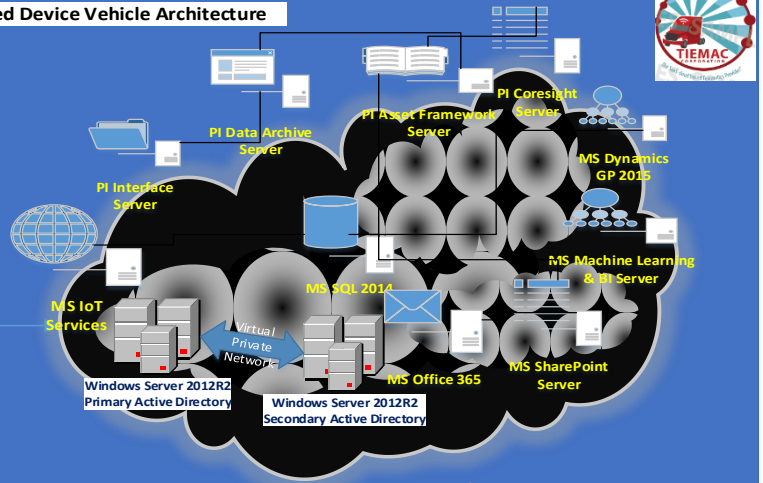
TIEMAC's IoT Connected Device Vehicle Architecture

CAN BUS 2.0 – J1939

TIEMAC IoT Connected Device

Connected Device OS = Windows 8.1 Embedded Enterprise + Web Services + Microsoft IoT Services

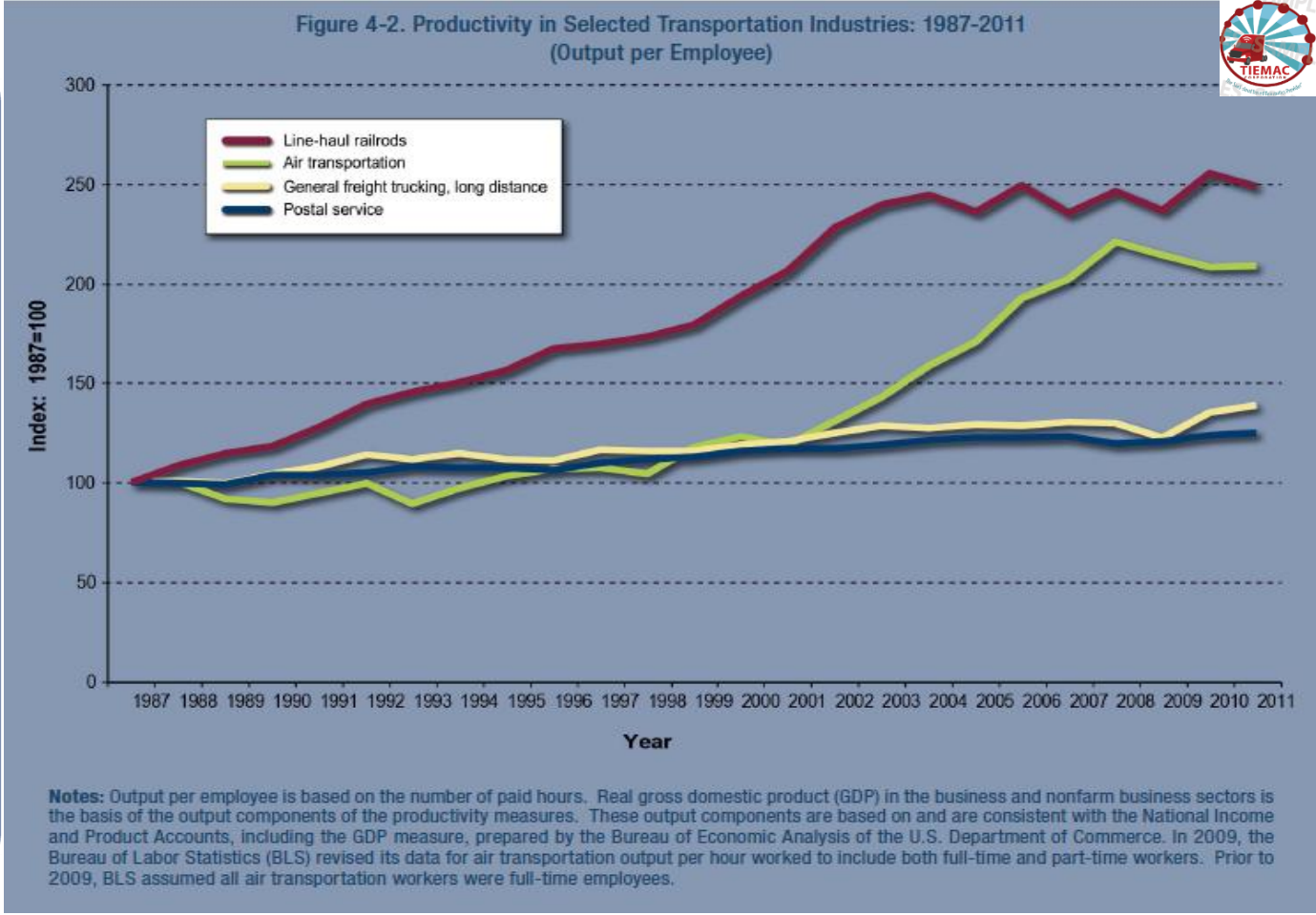
Verizon Wireless and AT&T 4G LTE/3G Connection Provided through the Connected Vehicle Device



Wi-Fi connection when Tablet is physically within the radius of the Wi-Fi feed from the in Vehicle Connected Device

LTE/4G/3G connection when Tablet is physically outside of the radius of the Wi-Fi Feed from the in Vehicle Connected Device

In the Freight Transportation Space Where does the greatest opportunity lies for achieving significant gains in Operational Excellence?



Source: http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/13factsfigures/pdfs/fff2013_highres.pdf

Next Step in the Journey

- Integration of the TIEMAC's OSIsoft Data Infrastructure with the DOT
- TIEMAC, has a proposal in to the DOT:
  - To provide its Cloud based infrastructure as an Information Center in developing an OTR commercial vehicle pilot program as part of the DOT's V2I test bed pilot program particularly relating to two DOT pilot categories, namely,
    1. Mobility – Freight Advanced Traveler Information System (FRATIS). This is an initiative that the Federal Highway's Office of Freight Management is currently working on with the USDOT's RITA ITS Joint Program Office to improve the freight transportation network.
    2. Smart Roadside and linked to The Safety and Fitness Electronic Records (SAFER) System. SAFER according to the website http://safer.fmcsa.dot.gov/about.aspx offers company safety data to industry and the public over the internet. It provides Company Snapshot, a concise electronic record of a company's identification, size, commodity information, and safety record, including the safety rating (if any), a roadside out-of-service inspection summary, and crash information.

Pilot Program Focus

- The focus of this proposed pilot program is related to a V2I approach in the context of the Over the Road (OTR) commercial trucking vehicle space.
- The key components that will be show cased in this V2I approach are:
  - Real-time data capture and management.
  - Creation and expansion of access to high-quality, real time, and OTR data from connected vehicles.
  - Provision of real time monitoring and management tools based on V2I connectivity.
  - Advanced Telematics Solution with back office operational excellence

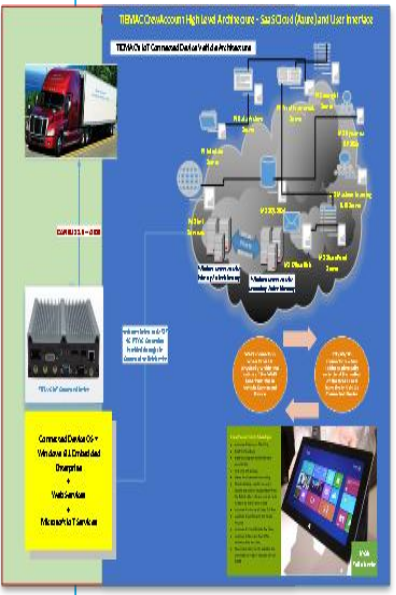
DOT's Information Needs for Commercial Vehicle

- The U.S. DOT under the Federal Highway Administration (FHWA) and the Federal Motor Carrier Safety Administration (FMCSA) is developing the "Smart Roadside" initiative as part of the V2I program with desired capabilities of:
  - Real-time traffic, weather, special event, truck parking information shared with drivers.
  - Vehicle sensor data collected at the roadside shared with private vehicle maintenance providers.
  - Unique vehicle identifier shared with enforcement agencies.
  - Routing clearance information shared with drivers.
  - Advanced logistics, including origin/destination information shared with stakeholders to determine routing information.
  - Real-time driver/carrier/truck information shared with enforcement agencies.

Building TIEMAC's Information Transportation Center Integrated into the DOT's CVRIA Framework

- TIEMAC proposal is to build and operate a virtual cloud base "Node" - TIEMAC's OSIsoft Microsoft Azure Cloud Infrastructure (TOMACI) Third Party Application Center (TPAC).
- This will be a transportation information center that provides
  - Over The Road (OTR) Enhanced Vehicle Data (EVSD) collection and delivery functions.
  - Fleet management and commercial vehicle services – freight and logistics management.
  - Commercial Vehicle Intelligent Parking Situation Data (CVIPSD).
  - Collection, streaming and distribution functions for commercial OTR trucking vehicle asset data that will include past as well as "present" data and meta data projections for maintenance, repairs and operations of commercial trucks operating across the country.

Building TIEMAC's Information Transportation Center Integrated into the DOT's CVRIA Framework

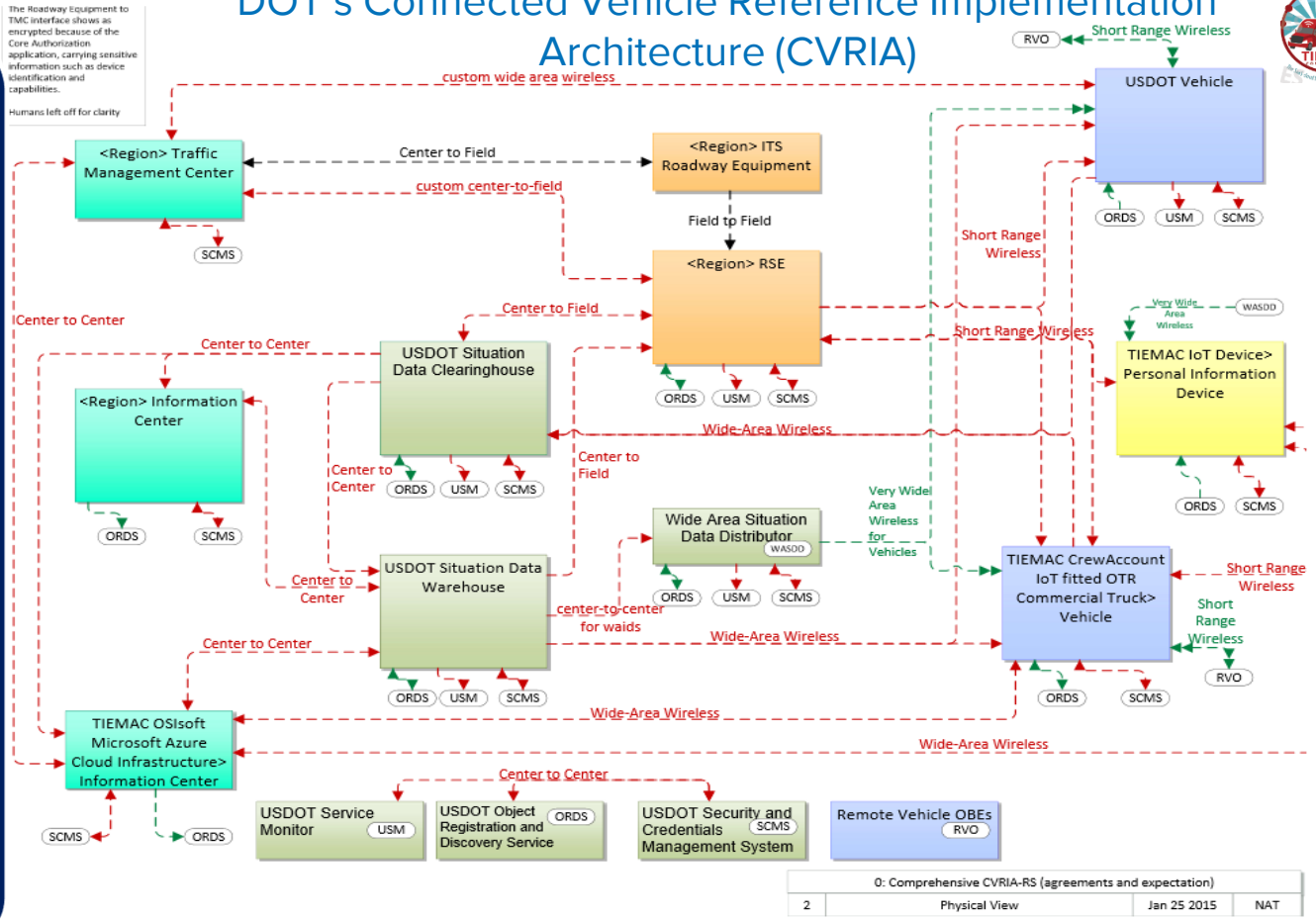


Additionally, TIEMAC operated virtual transportation information center would provide at core, a "peer-to-peer" (P2P) data exchange service in which its CrewAccount SaaS infrastructure, using P2P applications will generate and distribute the "on-demand" and "for-profit" information to "peer-to-peer" supported Road Side Equipment (RSE), other TPAC or directly streamed to subscribing consumers.

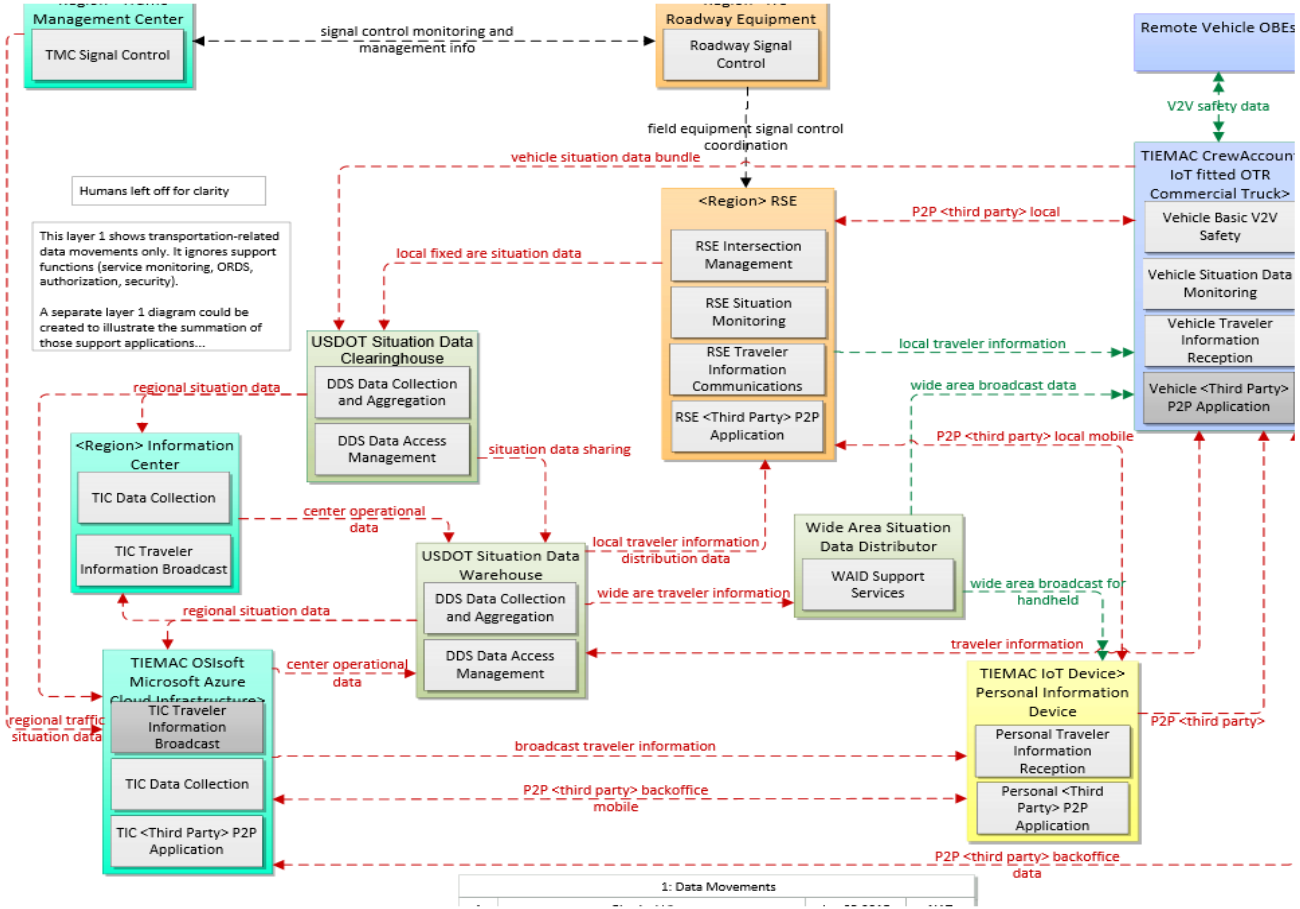
Connected Vehicle Reference Implementation Architecture (CVRIA)

DOT's Connected Vehicle Reference Implementation Architecture (CVRIA)

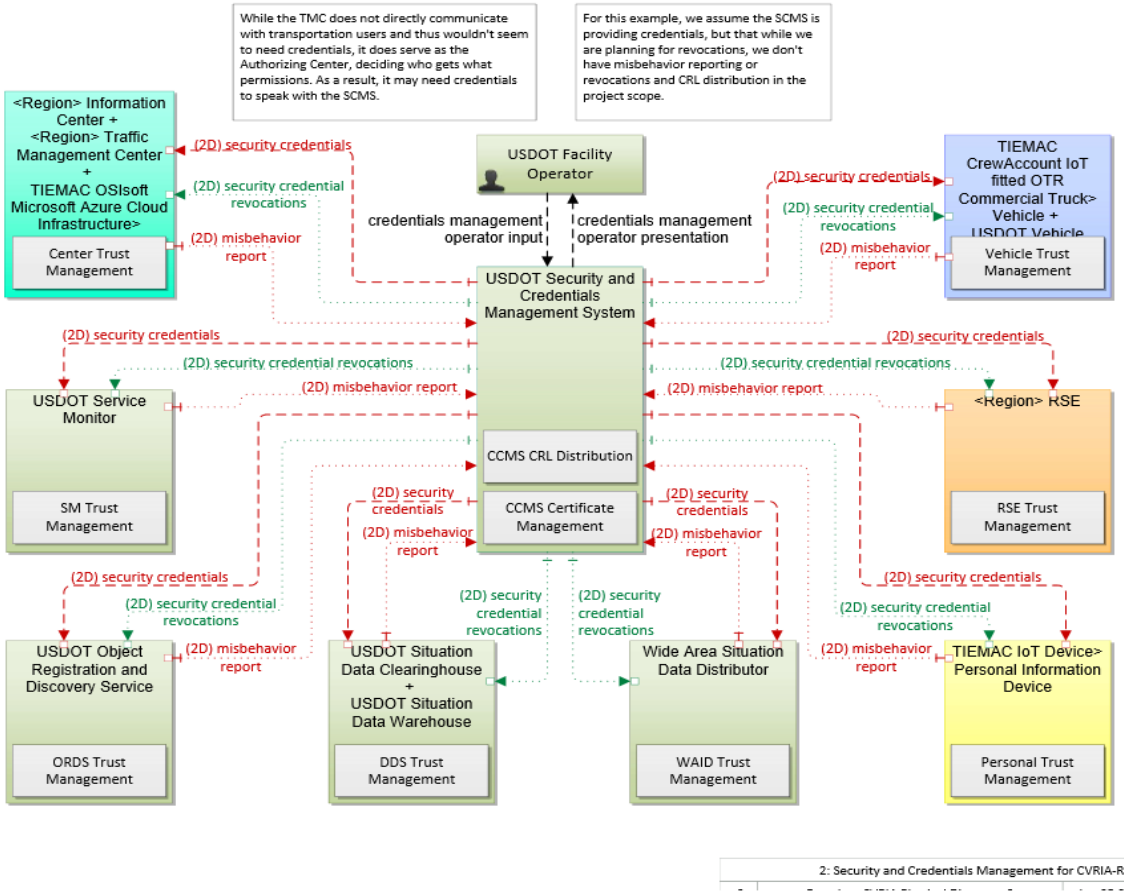
The integrated architecture shows the proposed TIEMAC OSIsoft Microsoft Cloud Information Center with legacy, trusted, and confidential information flows between an initiating 2014 DOT Project physical/application object and a receiving physical/application object. Each physical object is supported by one or more application objects



This diagram shows how Data will move from objects within the integrated TIEMAC TPAC and the DOT's CVRIA



This diagram shows how TIEMAC's proposed TPAC will interact with the Security and Credentials Manager for CVRIA



DEMO

- Freight & Logistics Management – Portal
- Real-time Data Management with the PI System
  - PI Server
    - Event Frames
    - Notifications
    - Asset Analytics
    - Asset Framework (AF)
  - PI ProcessBook
  - PI Coresight
  - PI Web Services
  - PI WebParts
  - PI Integrator for Esri ArcGIS
- Driver Uptime & Navigation – Windows 10 App show casing Surface Pro 3 as the in cabin device for driver interaction

Using the Infrastructure to Drive Operational Excellence

Hands on View of the Infrastructure operations from the vantage point of:

Freight

Driver

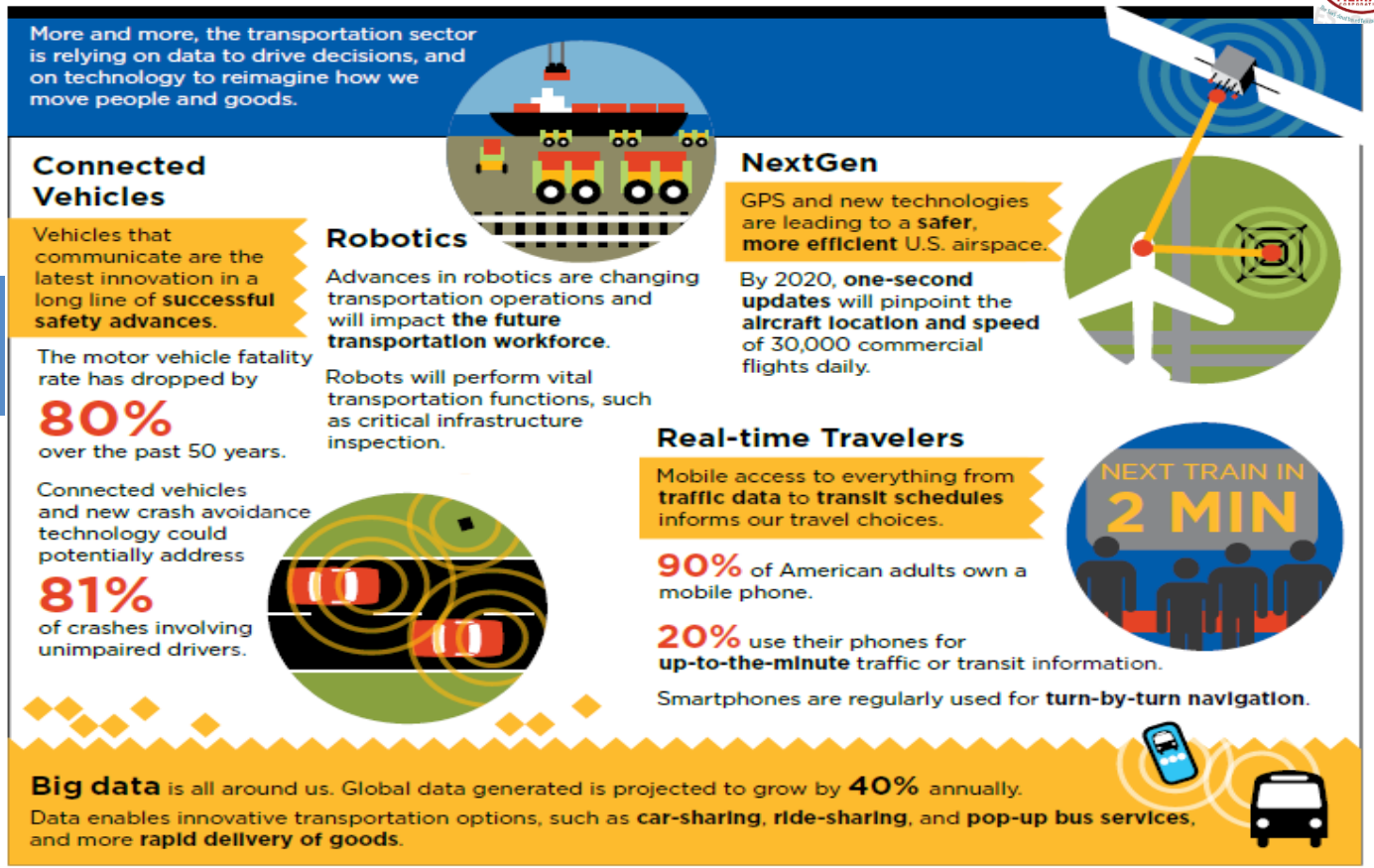
Fleet & Vehicle

Stakeholders

- Carriers
- Shippers
- Brokers
- Customers
- DOT & Other Regulatory Compliance bodies

How will we move better?

Somethings to Think About



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Mobile Asset Monitoring

- **TIEMAC chose the PI System for its CrewAccount solution to provide reliable real-time and high-fidelity forensic data for our SaaS on-highway truck fleet management solution.**

Challenges

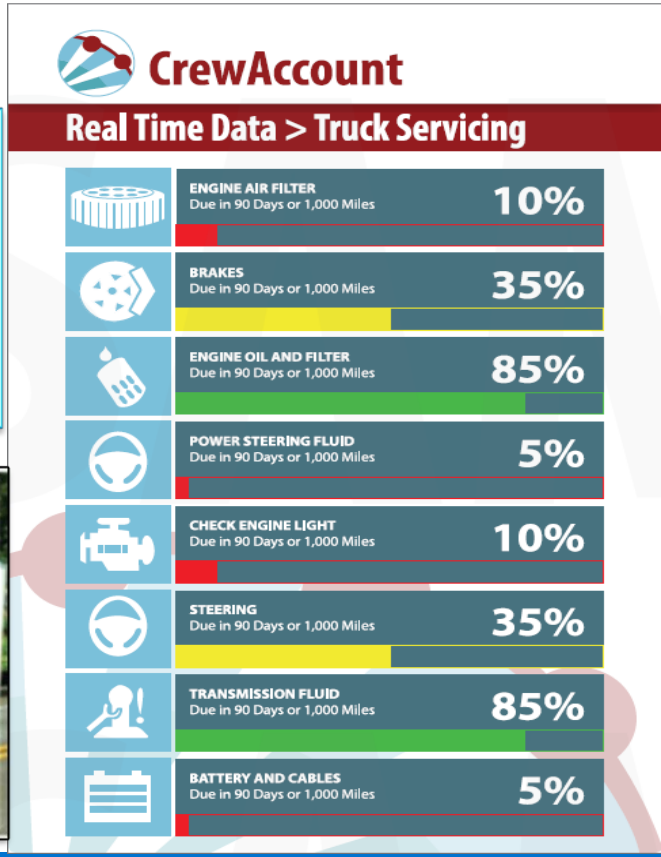
- Integrating to the DOT's Transportation grid of the connected vehicle future
- Large number of independent truck companies with Map21 requirements.
- No COTS finance integration
- Decrease downtime
- Reduce Operations & maintenance costs

Solution

- Integrating to the DOT's Transportation grid of the connected vehicle future
- Large number of independent truck companies with Map21 requirements.
- No COTS finance integration
- Decrease downtime
- Reduce Operations & maintenance costs

Results

- Data shadows are handled by PI System; no data lost
- Real-time analysis of events for in-time decision making
- Using familiar Microsoft tools instead of multiple, custom solutions saved time and training
- TIEMAC's CrewAccount – Advanced Telematics & Back office Solution for commercial fleets of any size



CrewAccount

- End to End Solution
- Superior Embedded Connected Device
- Advanced Telematics
- Full Suite of Fleet Operations Modules
- Full accounting, financials and back office Administration
- Predictive & Preventative Asset Maintenance
- Device Supplied out of the box with Certified LTE & WiFi modules for Verizon and AT&T networks
- Premier Real time Database-

Microsoft Azure + Intelligent Systems Service + Office 365

- Azure Integrated Cloud Infrastructure
- Azure Intelligent Services
- Office 365

OSISoft PI Systems Technology

- Big Data Pipe
- Unprecedented Analytics
- Visualization
- Historization

End to End Solution

- Proprietary OBDII J1939 Chipset
- Services

Dominance:

- Leverage Partners' Customers

Own the Customer Experience

- Back Office Operations with Micrososft Dynamcis GP 2015
- Integrated Banking and Payment Solution

TIEMAC's Market Segmentation

OTR Commercial Vehicle Space

Small Business - Owner Operator

(1 – 25 units)

Medium Business - Independents

(25 – 100 units)

Commercial Fleet –

(100 – 1,000 units)

Large Corporate Fleets

(1,000 – 50,000 units)

OEM Mfg.'s

(1,000 – Million units)

Questions

Please wait for the microphone before asking your questions

State your
name & company

THANK YOU

TIEMAC