

Regional Unified Model Architecture

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Strategic Priorities

- Two Strategic Priorities reflect a sense of where the bulk of transportation research and innovation is heading. These priorities are not exclusive of other technologies or research areas.

- ***Realizing Connected Vehicle Implementation***

- builds on the substantial progress made in recent years around design, testing, and planning for connected vehicles to be deployed across the nation.

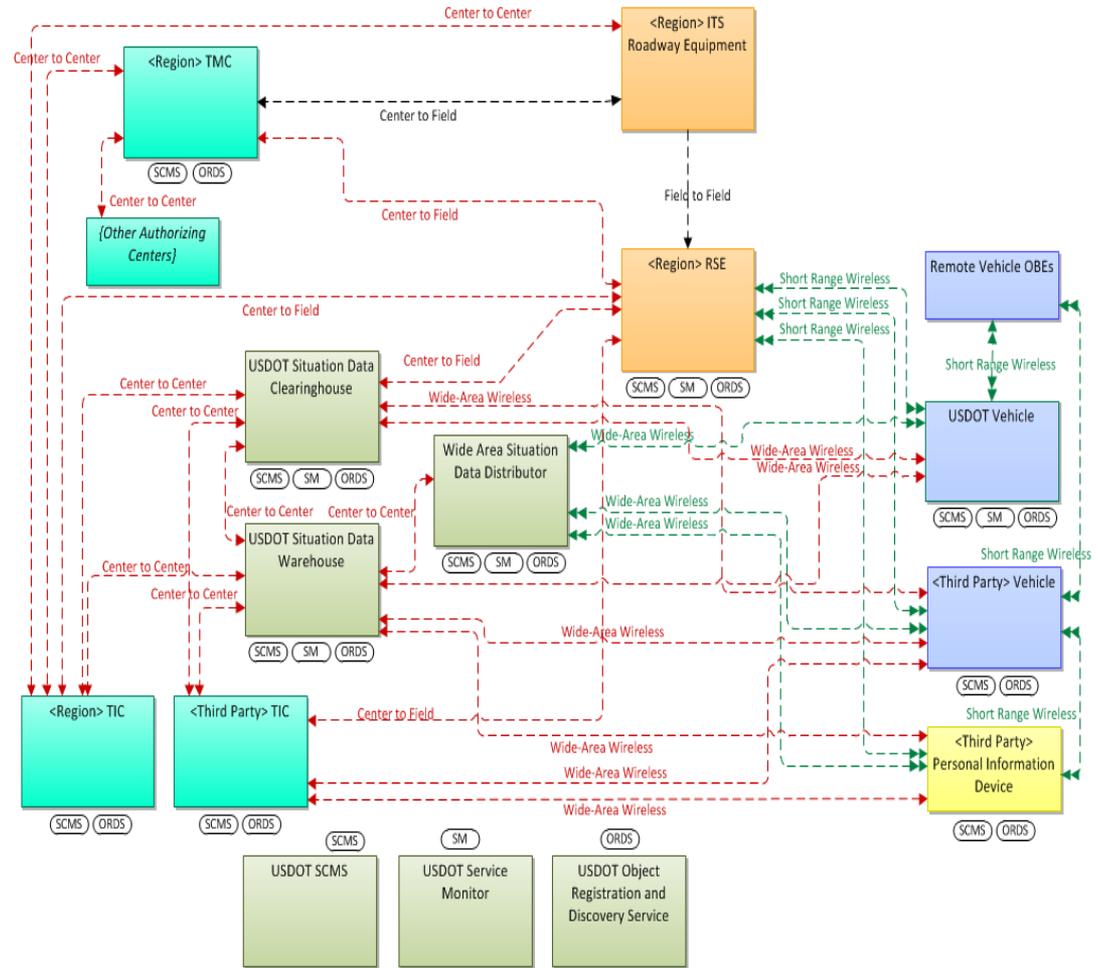
- ***Advancing Automation***

- shapes the ITS Program around research, development, and adoption of automation related technologies as they emerge.



Connected Vehicle Vision

- Complete System
- Comprehensive Communication Security
 - Common Cryptographic processes
- Data Flow and Evolution
 - Data from all, to all
 - Private data

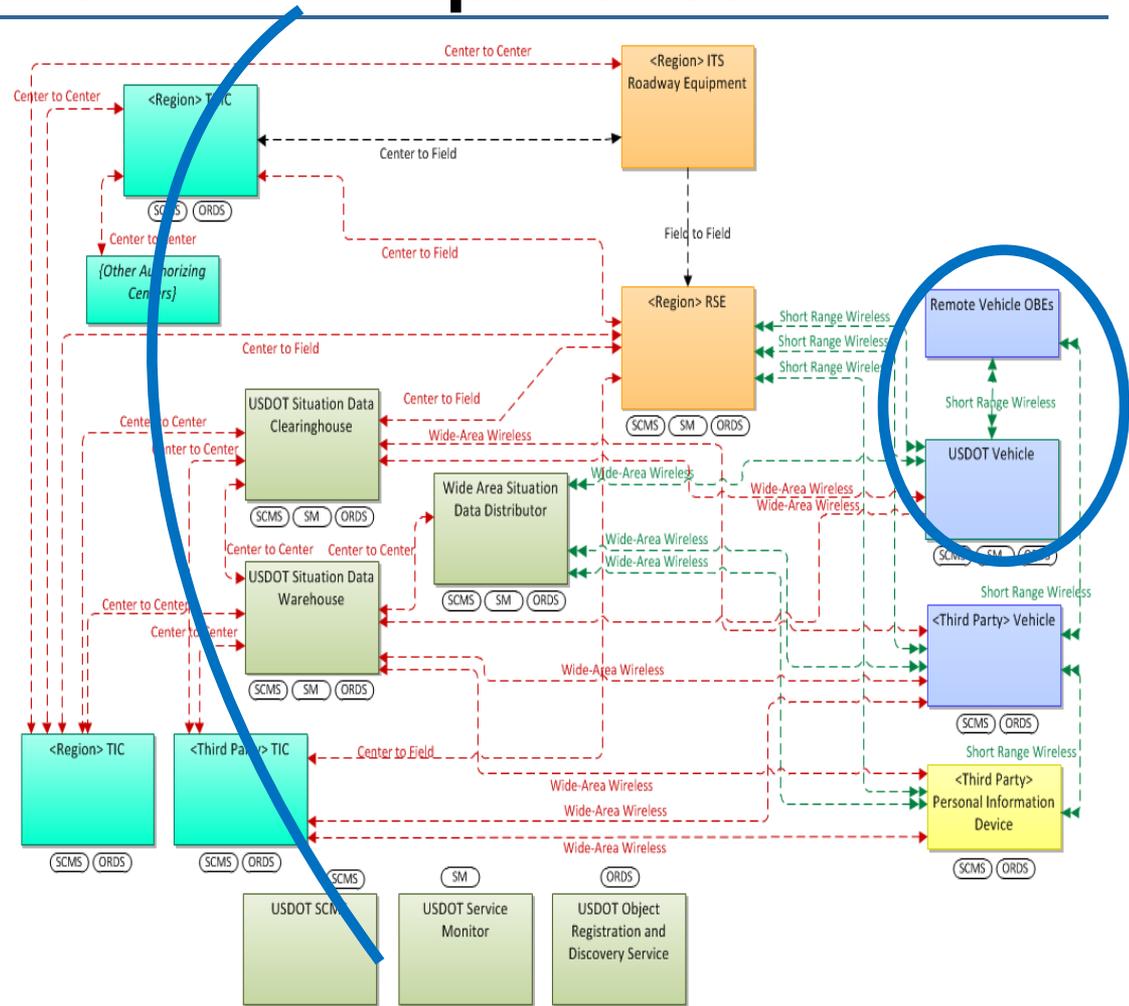


G: Integrated v1			
4	Physical View	Oct 14 2014	WLF



Opportunity for a Common Experience

- Started with crash avoidance
- Extending to interaction with field devices and data to/from back offices

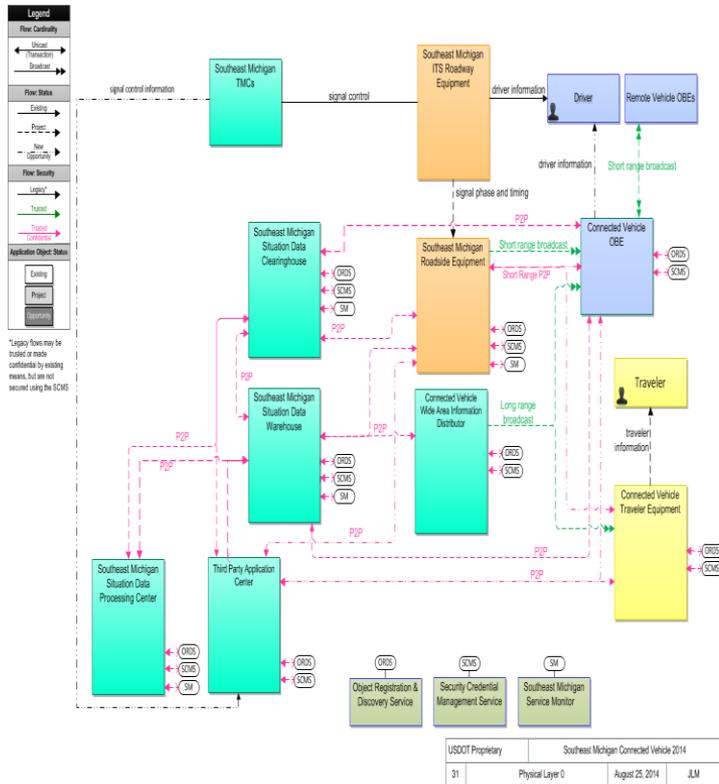


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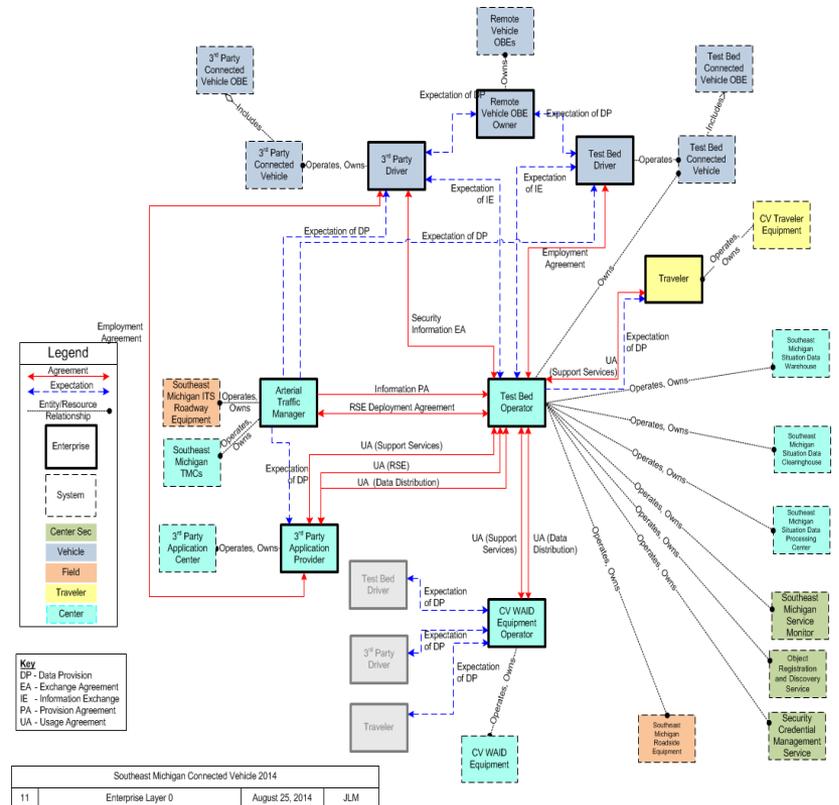


Common Architecture, Graphical Language

Things



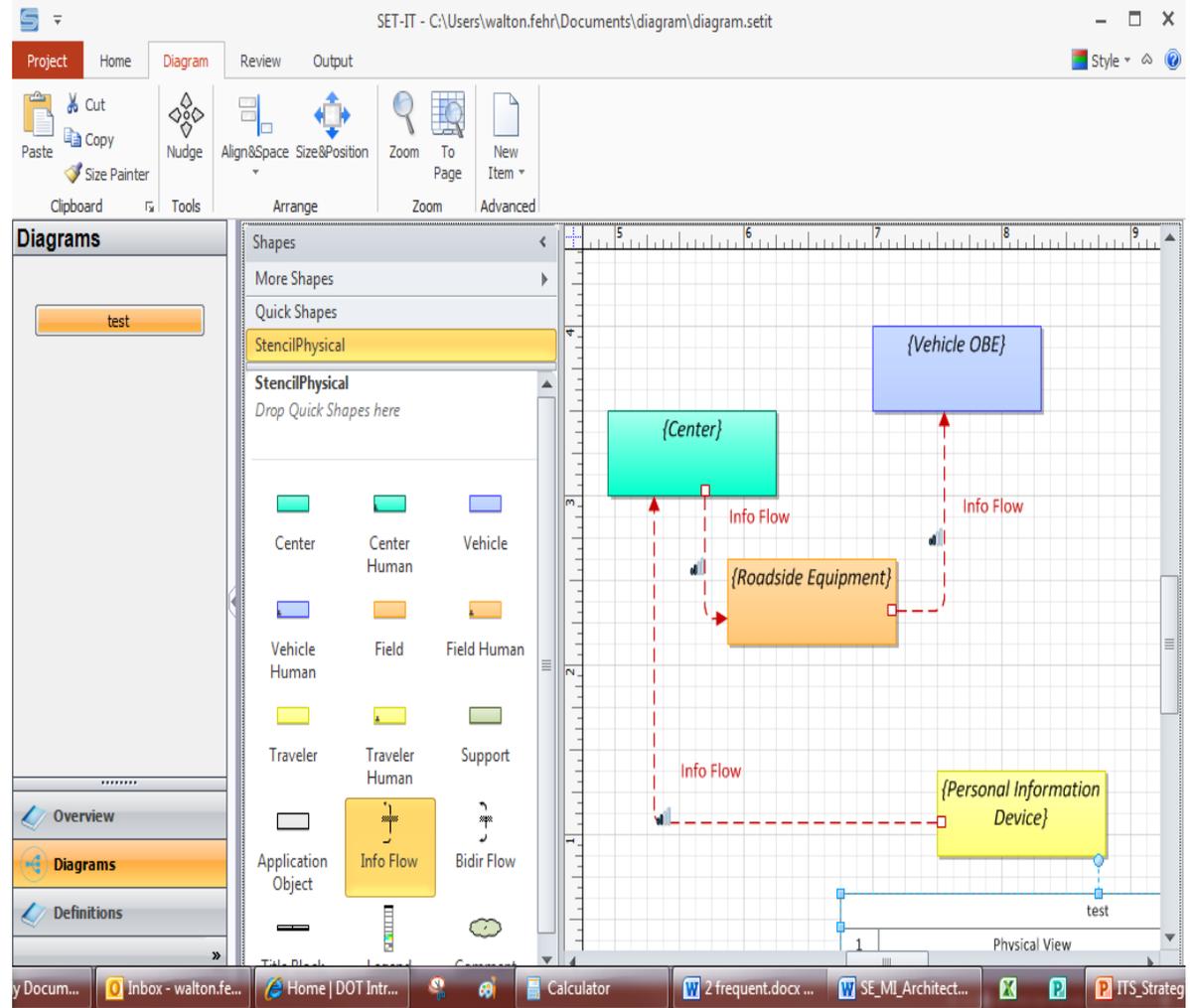
People



The Stop Sign metaphor

Common Parts, Common Tools

- Architecture
- Concept of Operation
- Design Elements
 - Objects
 - Information Flows



Unified Implementation of CVRIA - Regional

- **Architecture**

- Based on Southeast Michigan 2014 Project Architecture which built upon the Connected Vehicle Reference Implementation Architecture, Safety Pilot Model Deployment and Proof-of-Concept experiences.

- **Concept of Operation** – *Preserving privacy by design*

- **Design Elements** – Agreement on standards usage, common communication security practice

- **Vehicle Situation Data, Field Situation Data**

- Broadcast and bundle-based
- Intersections and other roadside infrastructure installations

- **Traveler Situation Data**

- Multiple delivery media

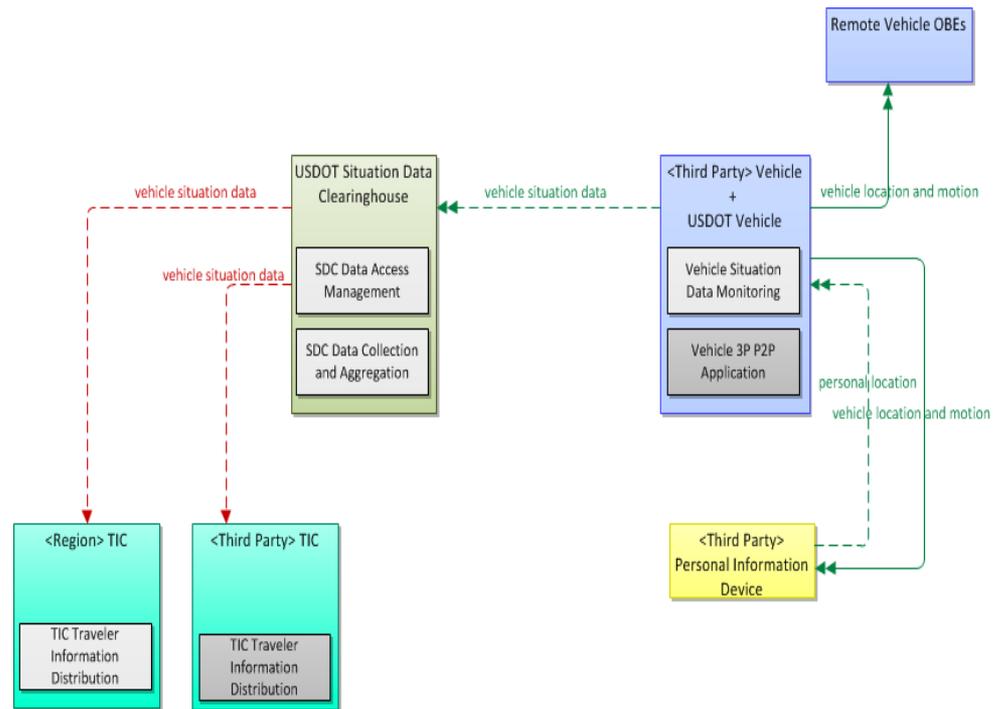
- **Peer-to-Peer Data Exchanges**

- Maintenance, Management, Enforcement, Commercial



Vehicle Situation Data

- All mobile devices will have a location service that meets J2945.1 performance requirements
- Pooled signing certificates will be available
- USDOT will provide the clearinghouse
- As many vehicles as possible will transmit BSM's
- As many vehicles as possible will make Vehicle Situation Data deposits
- USDOT vehicles will provide weather and electric vehicle data items

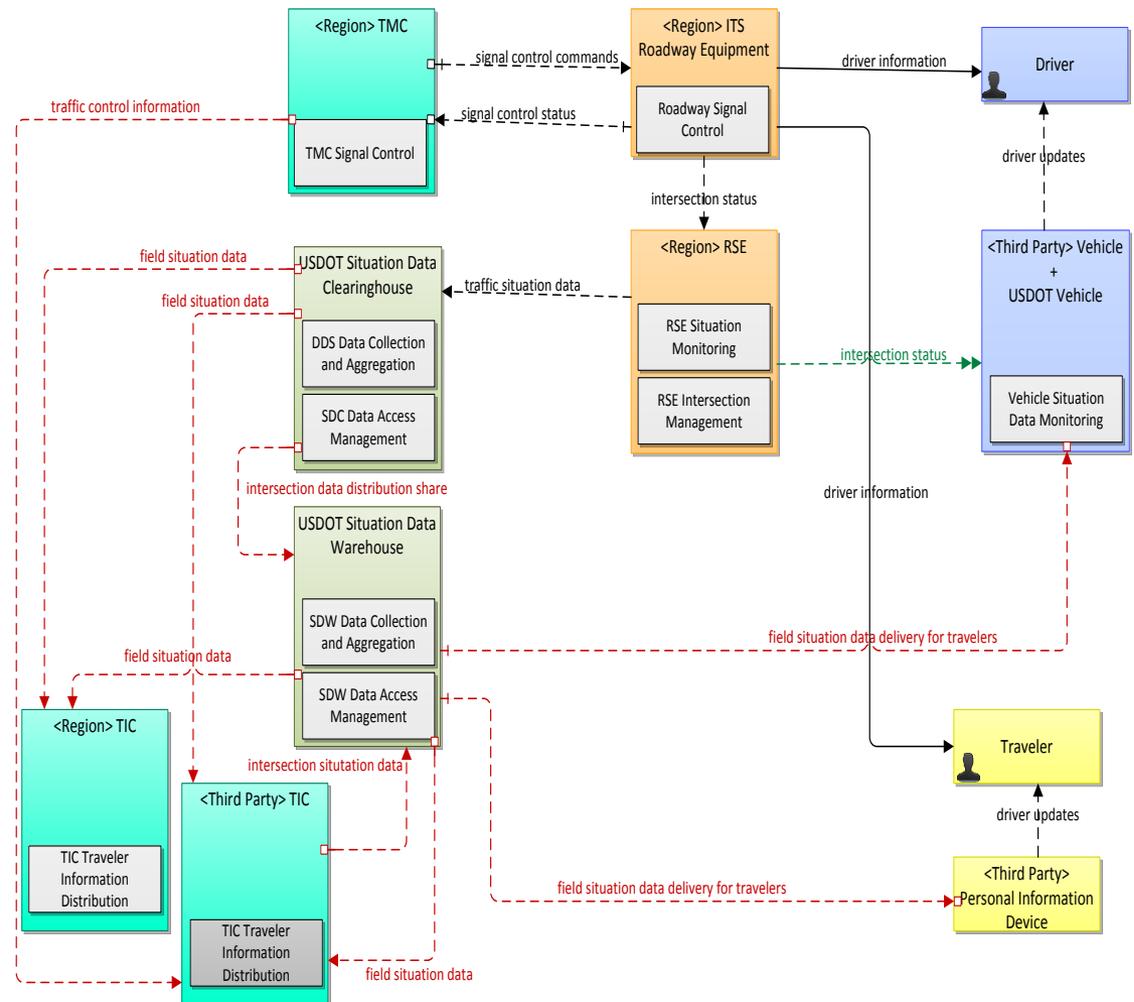


2: Dist-VSD			
3	Physical View	Oct 14 2014	WLF



Field Situation Data

- Common style for creating and grouping MAP and SPaT data elements
- USDOT will provide the clearing house and warehouse
- USDOT will provide a tool for creating MAP and SPaT groupings

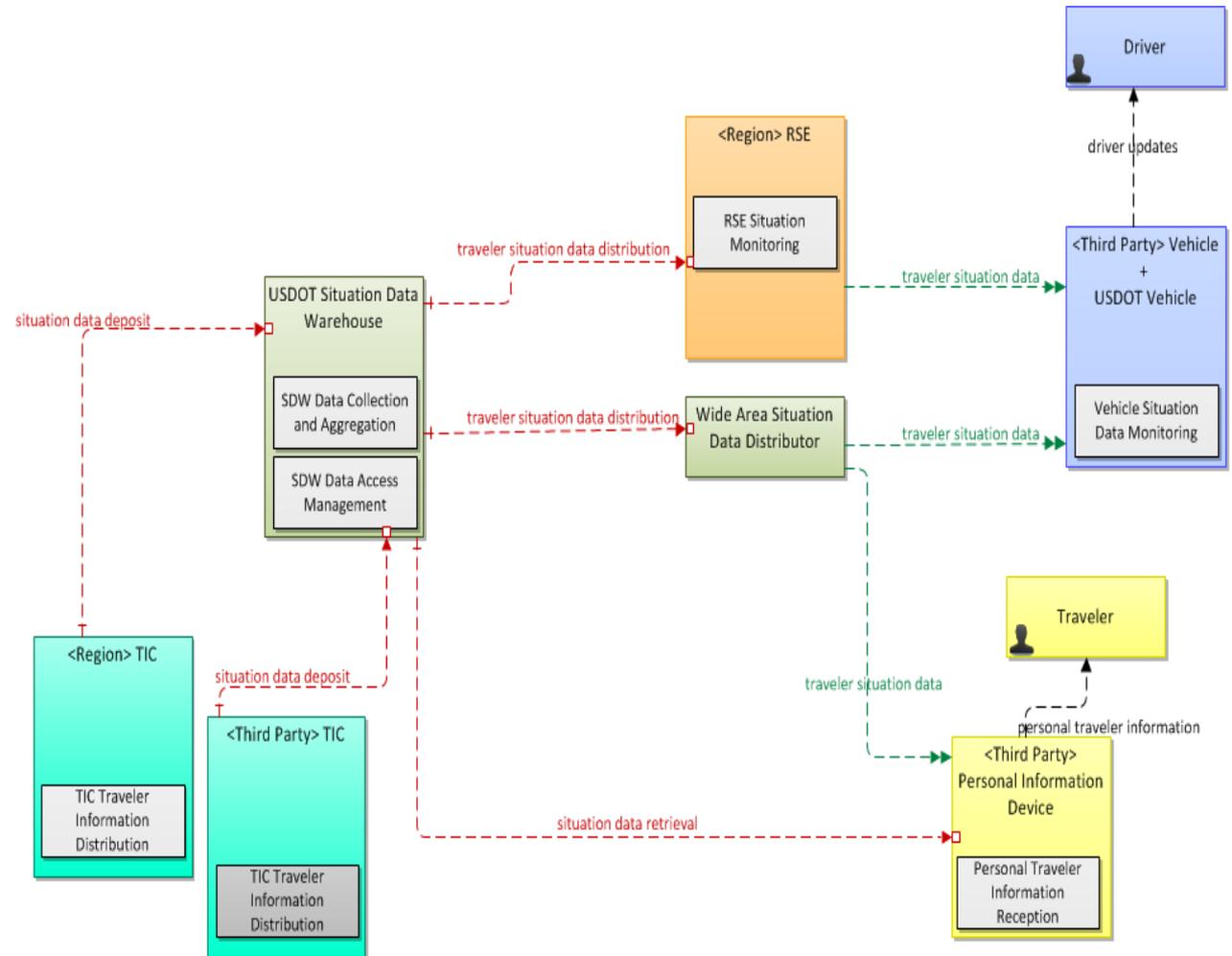


2: Dist-FSD			
4	Physical View	Oct 16 2014	WLF



Traveler Situation Data

- Everyone will use the warehouse for data delivery
- USDOT will provide a tool for creating Traveler Situation Data deposits

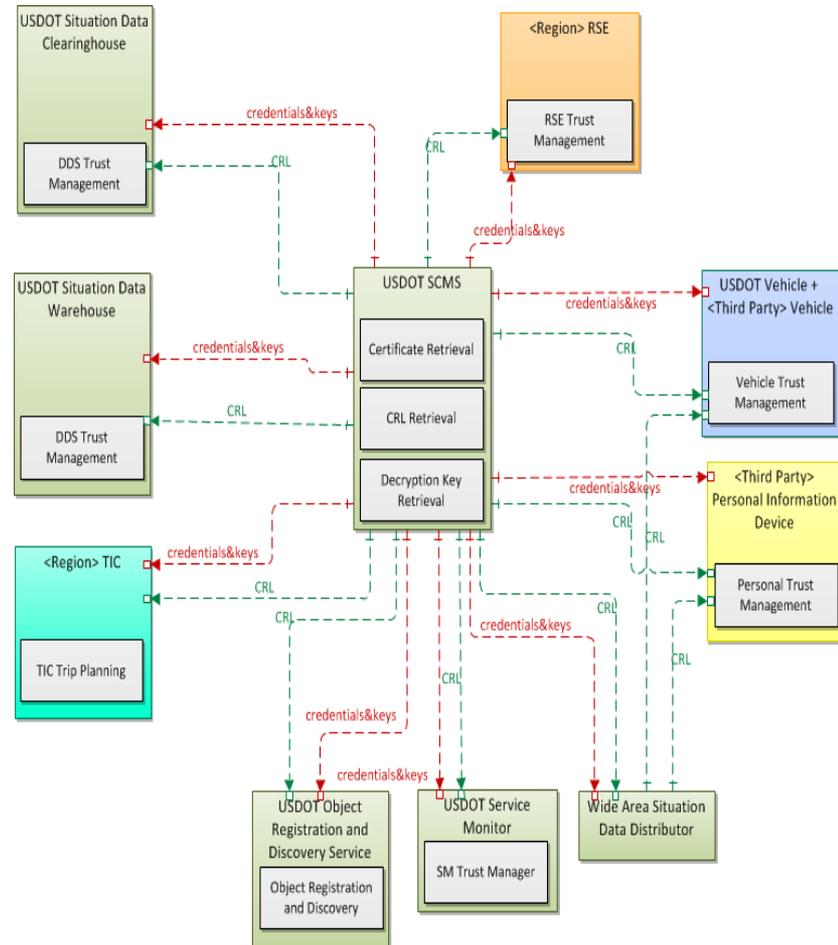


2: Dist-TSD			
3	Physical View	Oct 14 2014	WLF



Communication Security

- Common communication security approach
- 1609.2 will be used between mobile objects and field and center objects
- USDOT will provide the Security Credential Management System

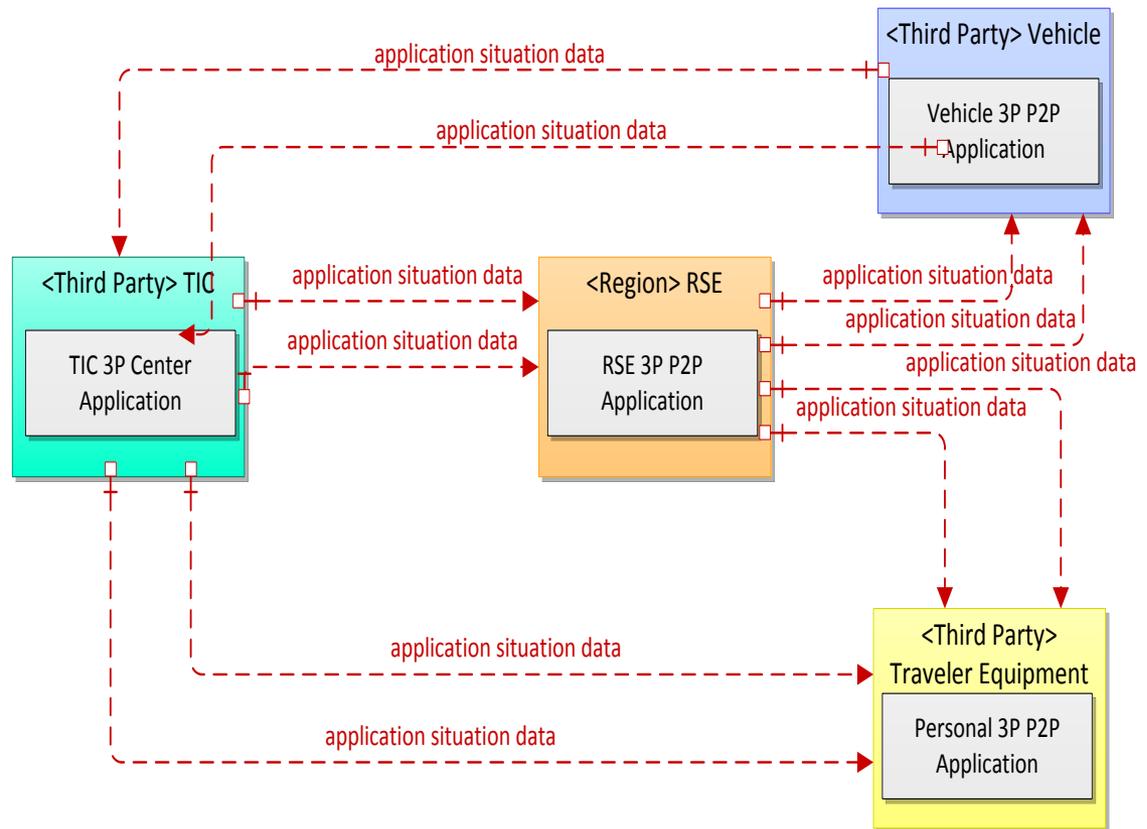


2: Security			
4	Physical View	Oct 14 2014	WLF



Peer-to-Peer Data Exchange Applications

- **Common message sequence**
- 5.9GHz DSRC roadside equipment needs to have adequate backhaul for Internet Protocol transport activities
- Used for maintenance, management, enforcement, commercial types purposes



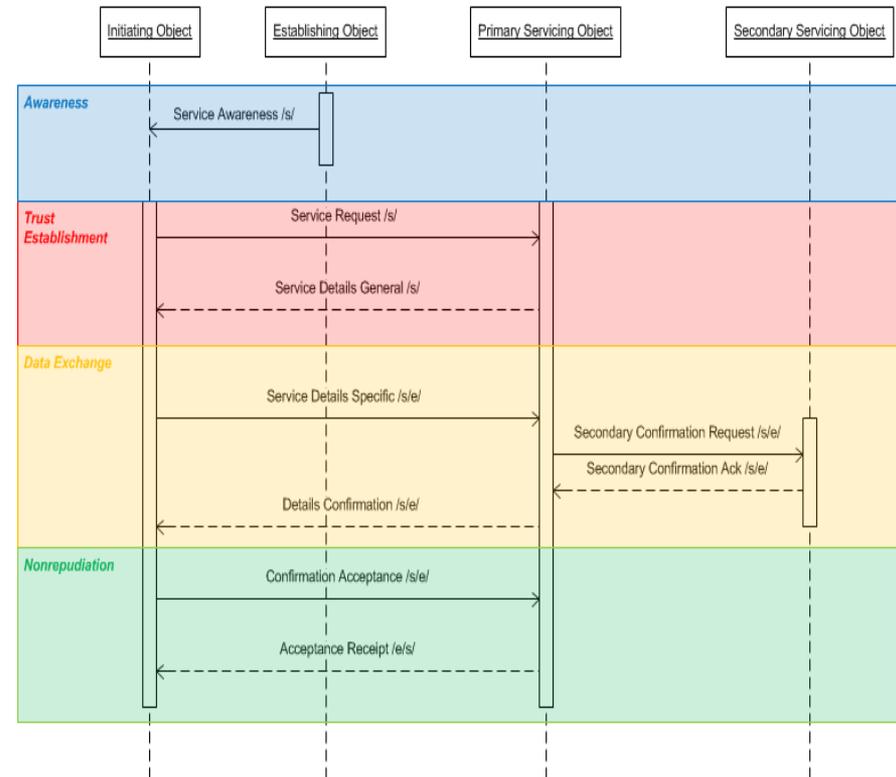
2: Third P2P			
3	Physical View	Oct 16 2014	WLF



Data Exchanges – *Preserving privacy by design*

- **Common Pattern** – based on the four phases of a peer-to-peer data exchange message sequence.
- **Common Communication Security** – build on crash avoidance experience.
- **Maintenance, Management, Enforcement, Commercial** – examples of all peer-to-peer data exchange activities.
- **Nonrepudiation** – accounting of contributions and uses.

Phases of a Peer-to-Peer Data Exchange Message Sequence

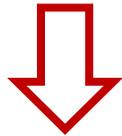


The credit card metaphor

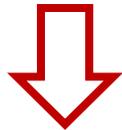


Proposed Progression for Interoperability

Graphical Language



*Designs and Tools,
Certification*



Training, Resources

Southeast Michigan 2014 Architecture



Unified CVRIA Architecture 2015 - Regional



Unified CVRIA Architecture 2016 - National



Unified CVRIA Architecture 2017 - Continental



Connected Vehicle Pilots



- Pilot deployments should **use USDOT-sponsored research**
- Well-defined, focused while part of the whole, with quantitative **performance measures**
- **Share data and lessons learned** while protecting privacy and intellectual property
- www.its.dot.gov/pilots



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