CONNECTED VEHICLE PILOT
Deployment Program

Wyoming Pilot Update at the Application Design Stage

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Vince Garcia, Tony English, Shane Zumpf

ITS Joint Program Office

TODAY'S AGENDA

- Purpose of this Webinar
  - Share experiences of designing CV applications
  - Talk about how these applications are being designed/developed
  - Identify technical and other barriers and how they are being overcome
  - Discuss how these apps will eventually be tested and their performance measured

- Webinar Content
  - Connected Vehicle Pilot Deployment Program Overview
  - Wyoming DOT CV Application Design Experiences
  - Stakeholder Q&A

- Webinar Protocol
  - Please mute your phone during the entire webinar
  - You are welcome to ask questions via chatbox at the Q&A Section
  - The webinar recording and the presentation material will be posted on the CV Pilots website

CONNECTED VEHICLE PILOT DEPLOYMENT PROGRAM

PROGRAM GOALS

PILOT SITES

WYDOT

NYCDOT

Tampa (THEA)

STAY CONNECTED

- Participate in **Design/Build/Test Phase** Webinars/Conference Presentations from the three Pilot Sites (see website for exact dates and times)

- Visit Program Website for Updates: http://www.its.dot.gov/pilots
- Contact: Kate Hartman, Program Manager, Kate.Hartman@dot.gov

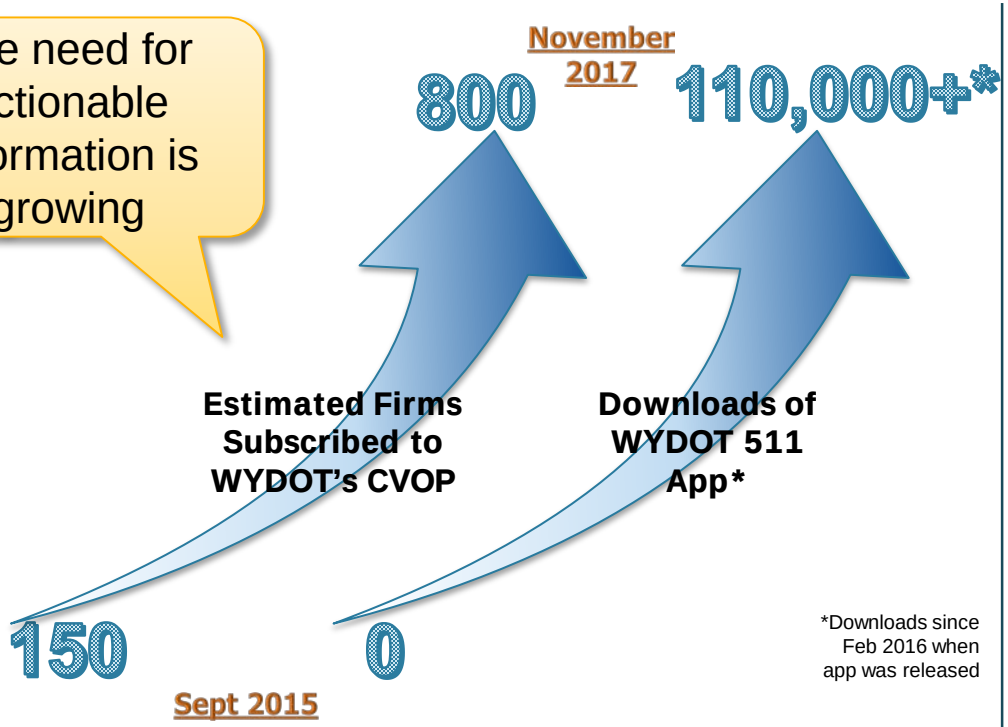
U.S. Department of Transportation

Wyoming DOT CV Pilot Deployment Overview

Vince Garcia

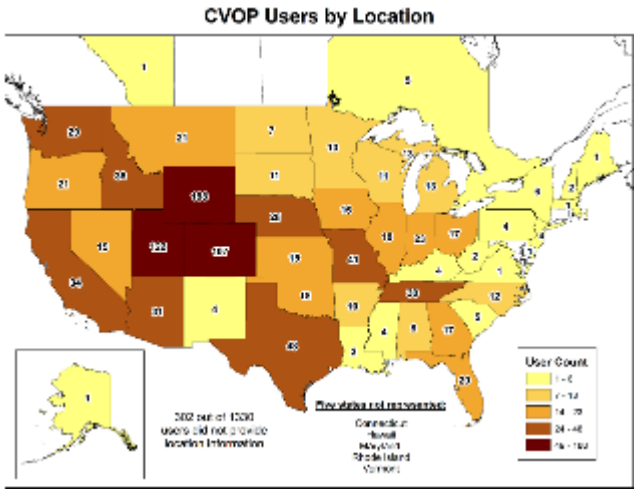
I-80 Users Need Actionable Road Weather Information

The need for actionable information is growing



*Downloads since Feb 2016 when app was released

WYDOT's Commercial Vehicle Operator Portal (CVOP)



Pilot Objectives

Road Weather Condition Input

1. Improve road weather condition reports received into the TMC

TMC Information Dissemination

1. Improve ability of the TMC to generate wide area alerts and advisories
2. Efficiently manage closures, restrictions and speed limits
3. Effectively disseminate and receive messages from TMC to en-route vehicles
4. Improve information to commercial vehicle fleet managers

Vehicle/Roadside Alerts & Advisories

1. Effectively transmit and receive V2V messages to reduce incidents and their severity
2. Enhance emergency notifications of a crash

Outcomes

1. Improve speed adherence and reduce speed variation
2. Reduce vehicle crashes

Pilot Elements

CV Environment

75 Roadside Units on I-80

400 Vehicles with DSRC Connectivity

V2V Applications

Forward Collision Warning

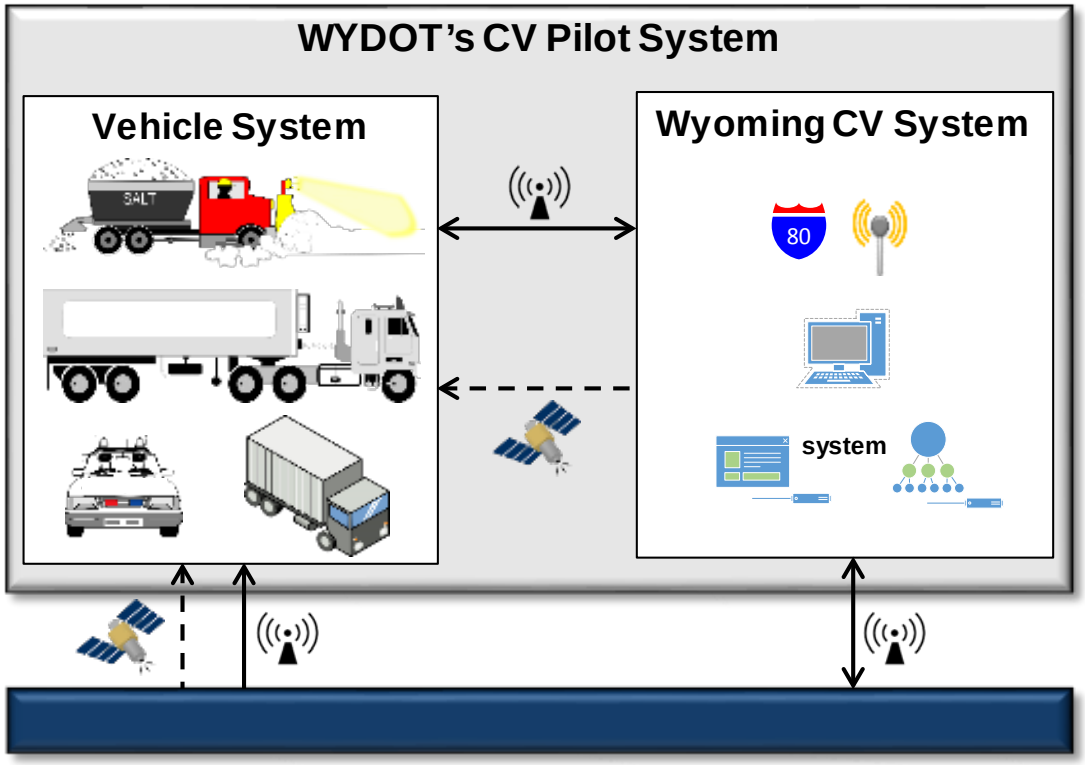
Distress Notification

V2I Applications

Situational Awareness

Spot Weather

Work Zone Warning



Wyoming DOT CV Applications and Design Experiences

Tony English

WYDOT Application Design Update

Topics for discussion

- Which CV applications are being used with the WYDOT CVP
- How these applications are being designed/developed
- Technical and other barriers we have found and how they are being overcome
- How these apps will eventually be tested and their performance measured

CV Applications

On-Board Applications

- Applications available to equipped vehicles

TMC Operations Applications

- Support for WYDOT Traveler Information and Traffic Management

Vehicle System

All vehicles that are part of the vehicle system will have:

- Ability to share information via DSRC with connected devices (vehicles and RSUs)
- Ability to broadcast Basic Safety Message
- Ability to receive Traveler Information Messages (TIM)
- Human-Machine Interface (HMI) to communicate alerts and advisories to driver

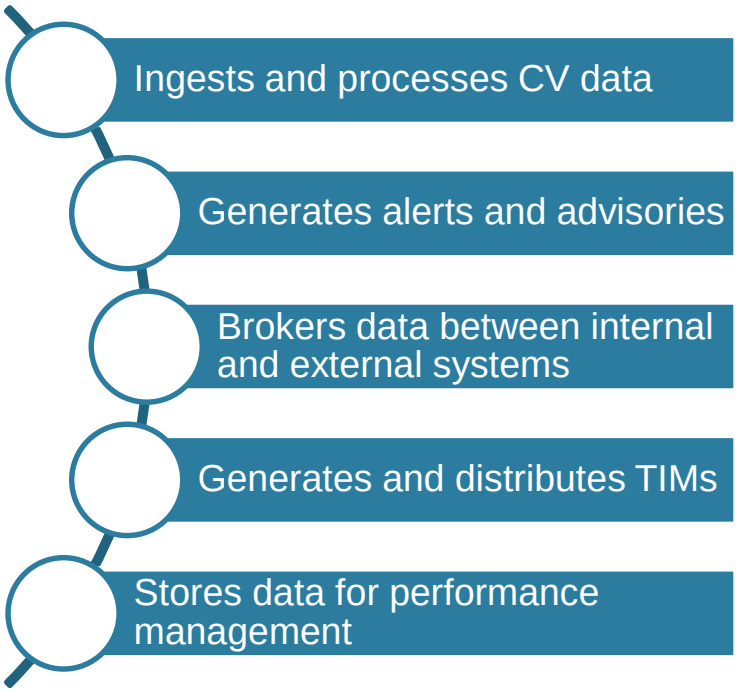
Vehicle Sub-Systems

1. WYDOT Fleets
2. Integrated Trucks
3. Retrofit Vehicles
4. Highway Patrol

On-board Vehicle Technologies

- OBU with DSRC and Satellite Receiver
- Human Machine Interface
- CAN Bus Integration (selected vehicles)
- Environmental Sensors (selected vehicles)

System Overview



Wyoming CV Pilot System

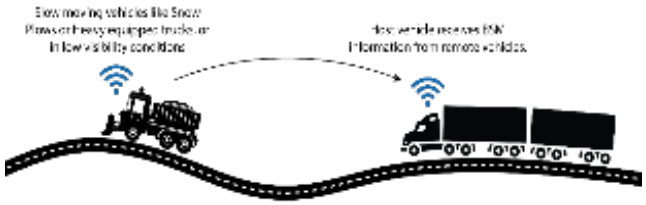
External Interfaces

- US DOT Interfaces (e.g. SCMS)
- WYDOT Interfaces (e.g. ATMS and ATIS Systems at the TMC)
- Weather

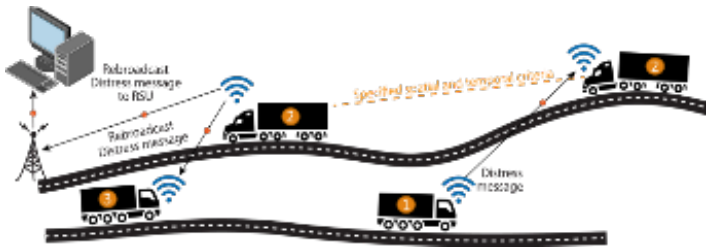
CV Subsystems

- Roadside Units
- Operational Data Environment
- Pikalert® System
- WYDOT Data Broker
- WYDOT Data Warehouse

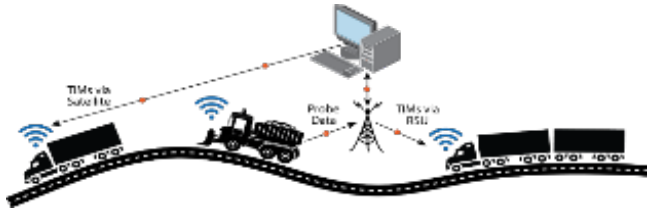
Onboard Applications



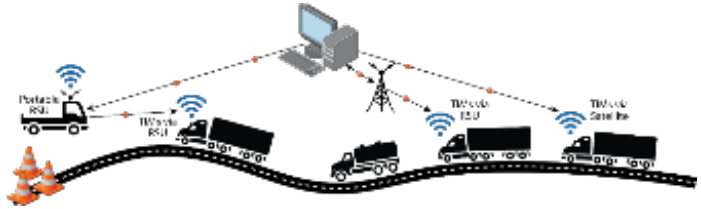
Forward Collision Warning (FCW)



Distress Notification (DN)



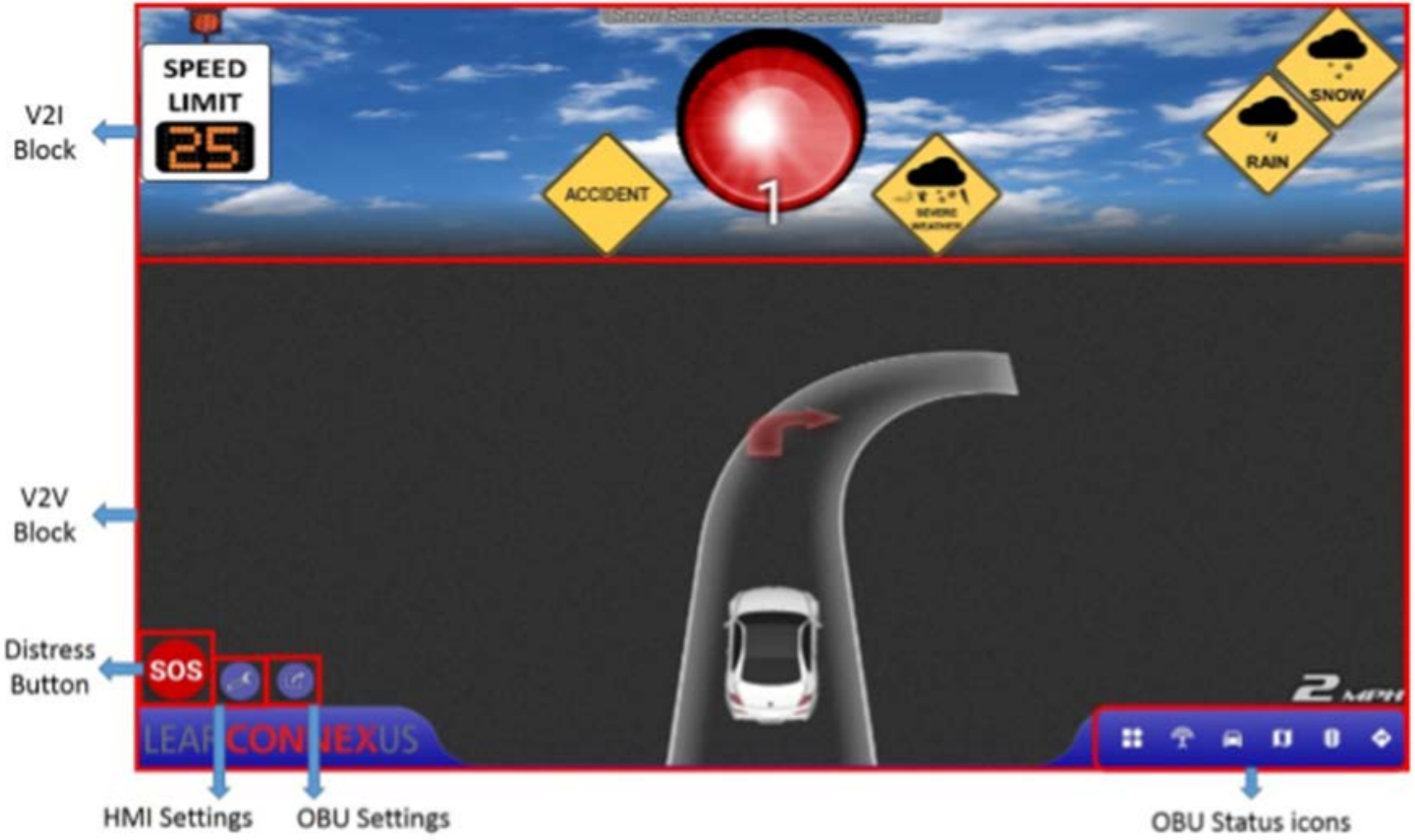
I2V Situational Awareness



Work Zone Warning (WZW)

Spot Weather Impact Warning (SWIW)

CV Applications



Design of CV Apps

Worked with two vendors in the development of applications

- Selected of applications based on User Needs assessment

Testing has been on-going, but quite time consuming

- Iterative process done in Agile framework

Barriers

- Rollout of IPv6, CV technology is evolving, security

Performance Measures (Vehicle only, will cover TMC later)

- Logging of BSM (during events, 30 second, privacy)
- Logging of TIM (creation, reception, alert)
- Logging of DB (creation, alert)
- Application, Security, HMI, and Environmental Logging

Wyoming DOT TMC Applications Supporting CVs

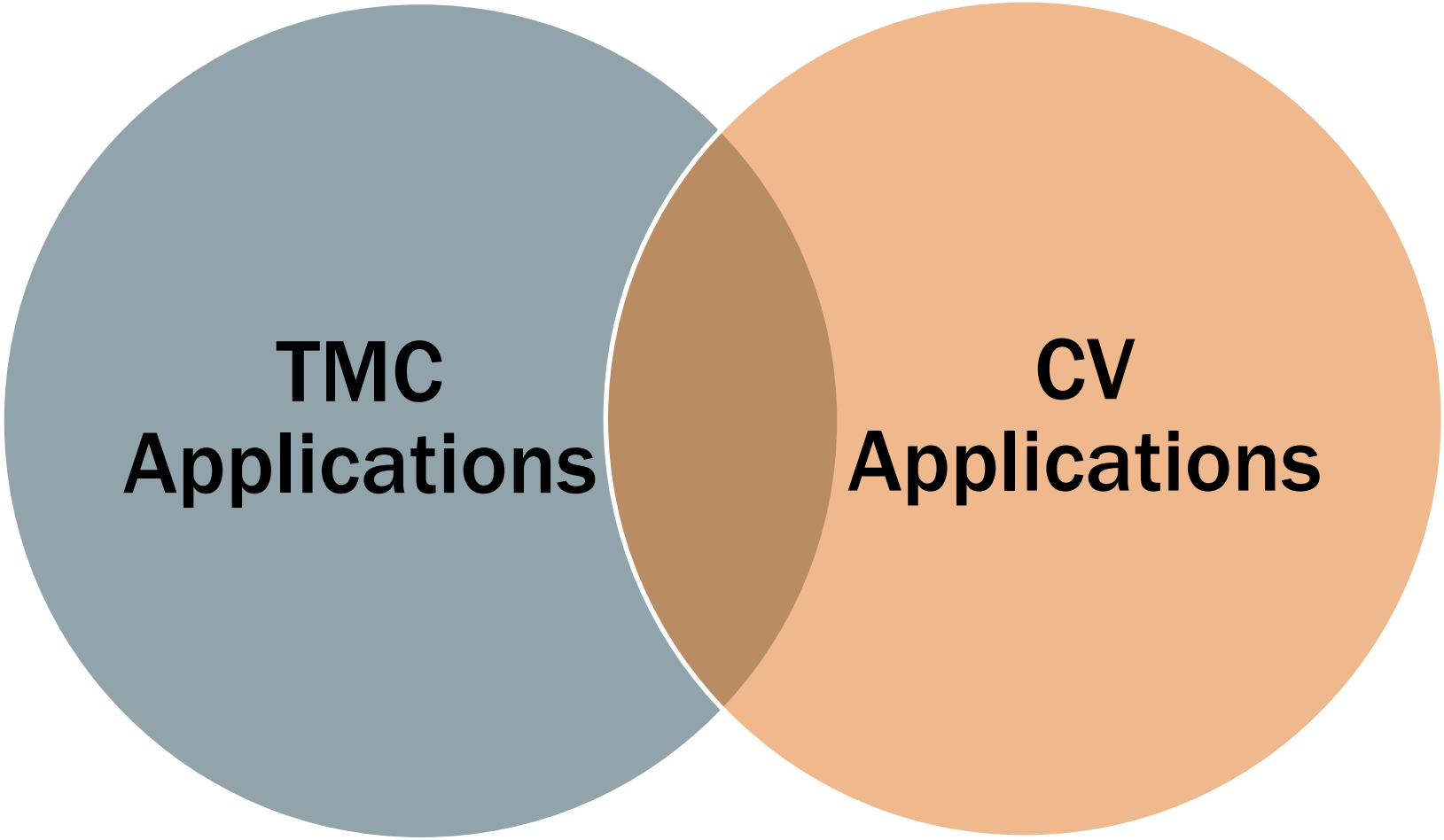
Shane Zumpf

TMC Operations Applications

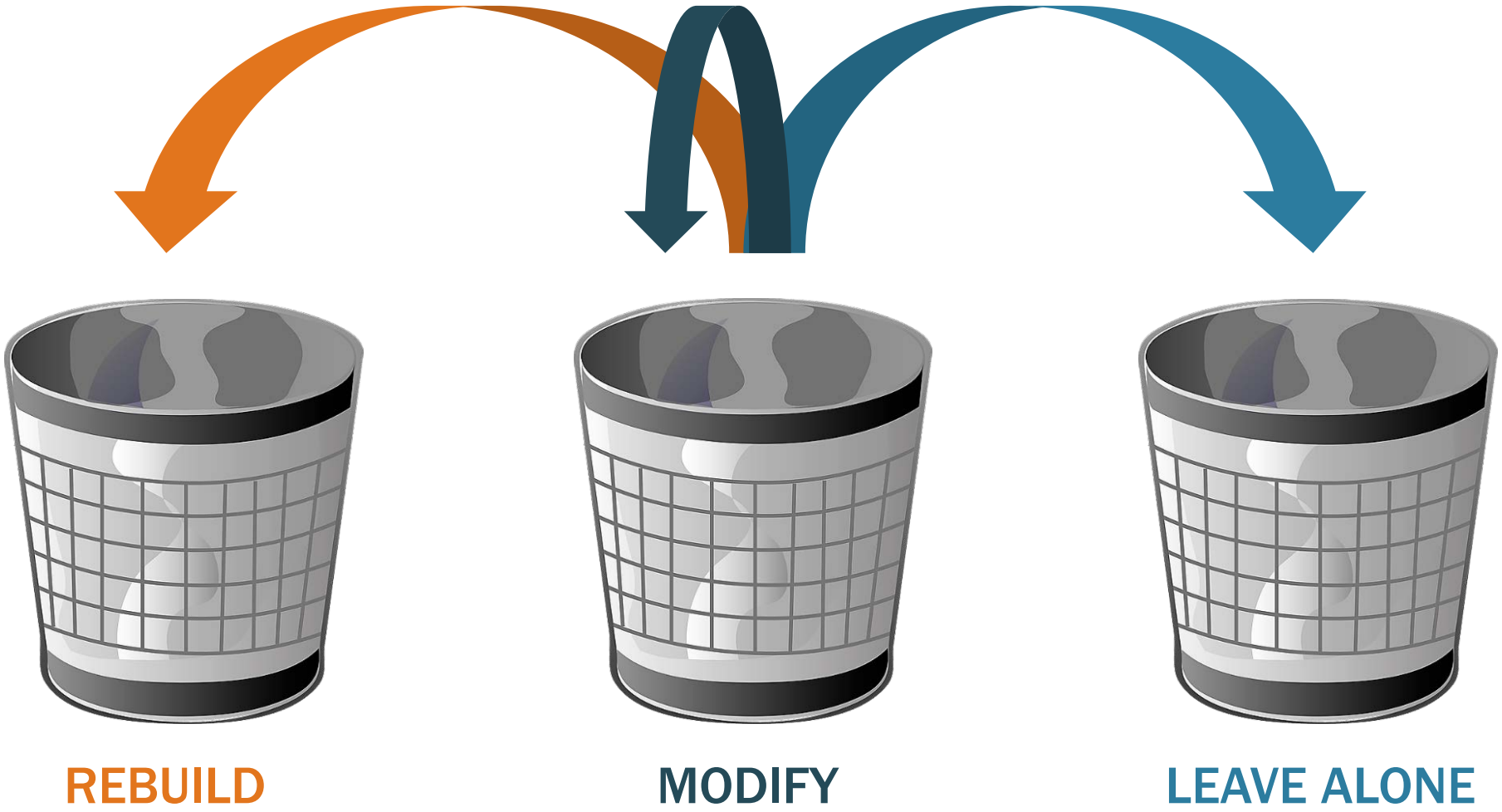
CV Data will support several TMC functions for traffic management and traveler information on I-80. All these applications will be enabled by external interfaces to the existing TMC Systems from the Wyoming CV System

- ***Support Variable Speed Limit, Closures, Restriction Management***
- ***Support Wyoming Traveler Information (WTI) Updates***
- ***Support Commercial Vehicle Operators Portal Updates***
- ***Support Third-Party Interface***

Application Areas

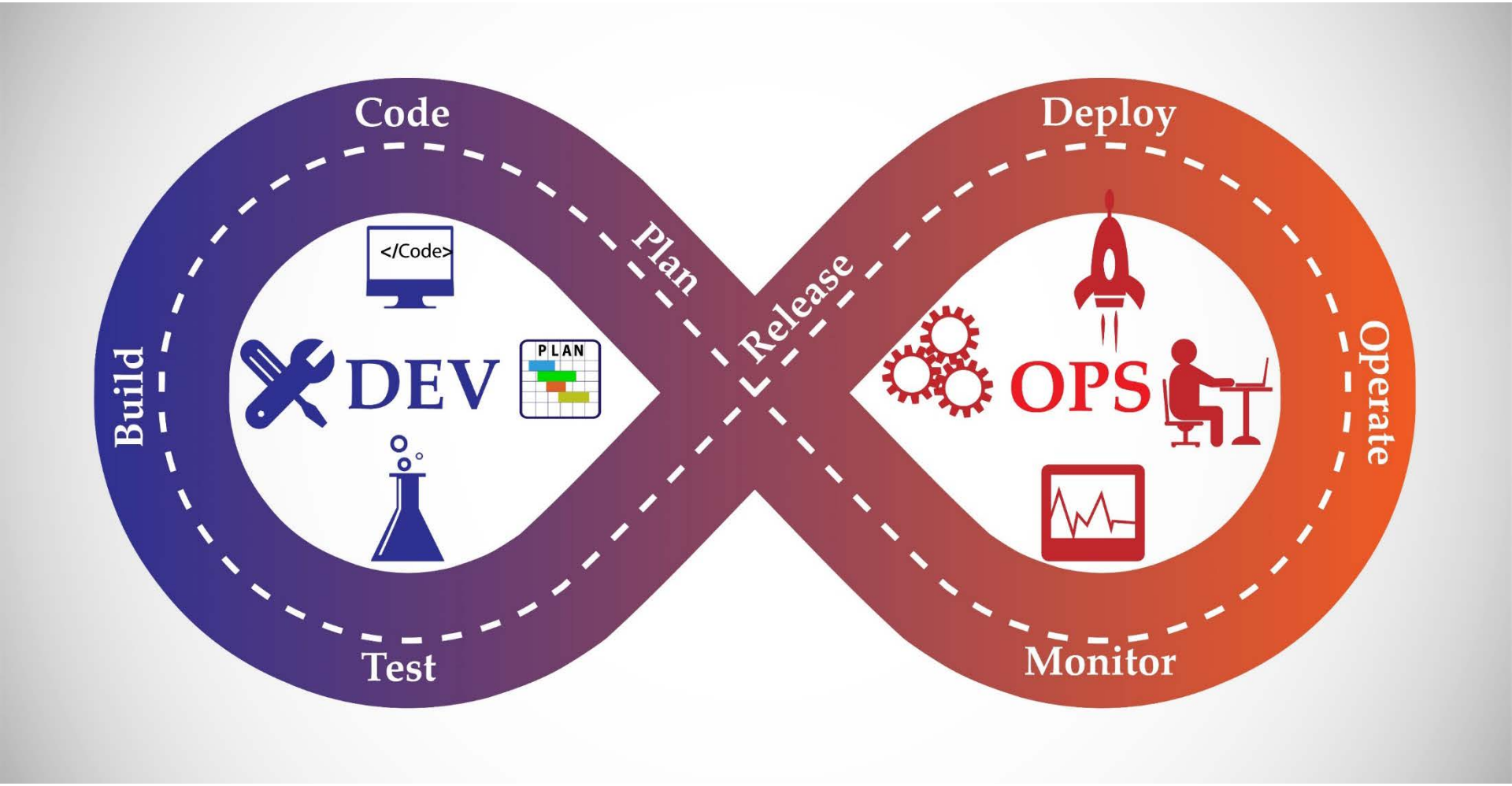


Determine Level of Effort

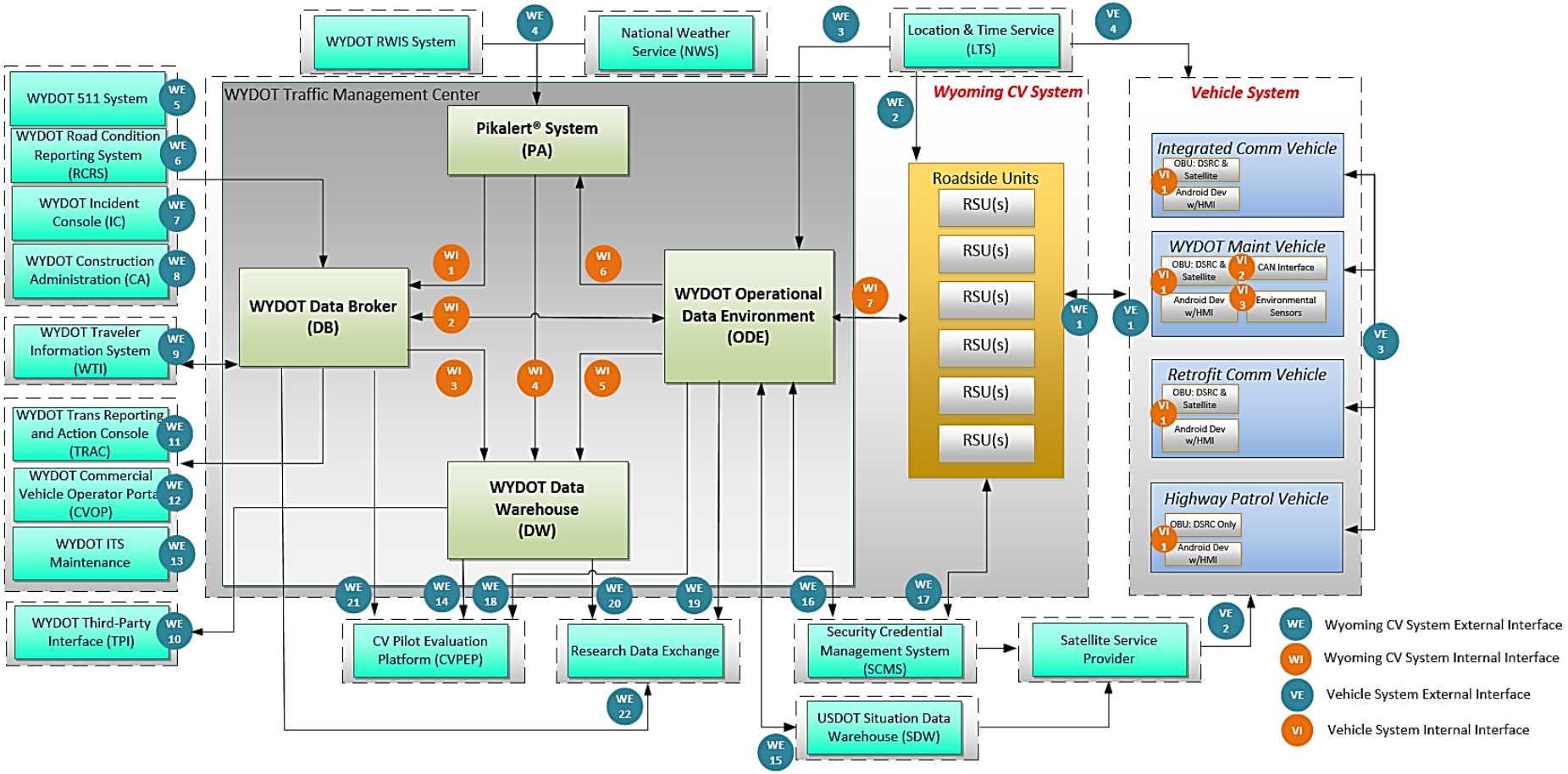


Agile

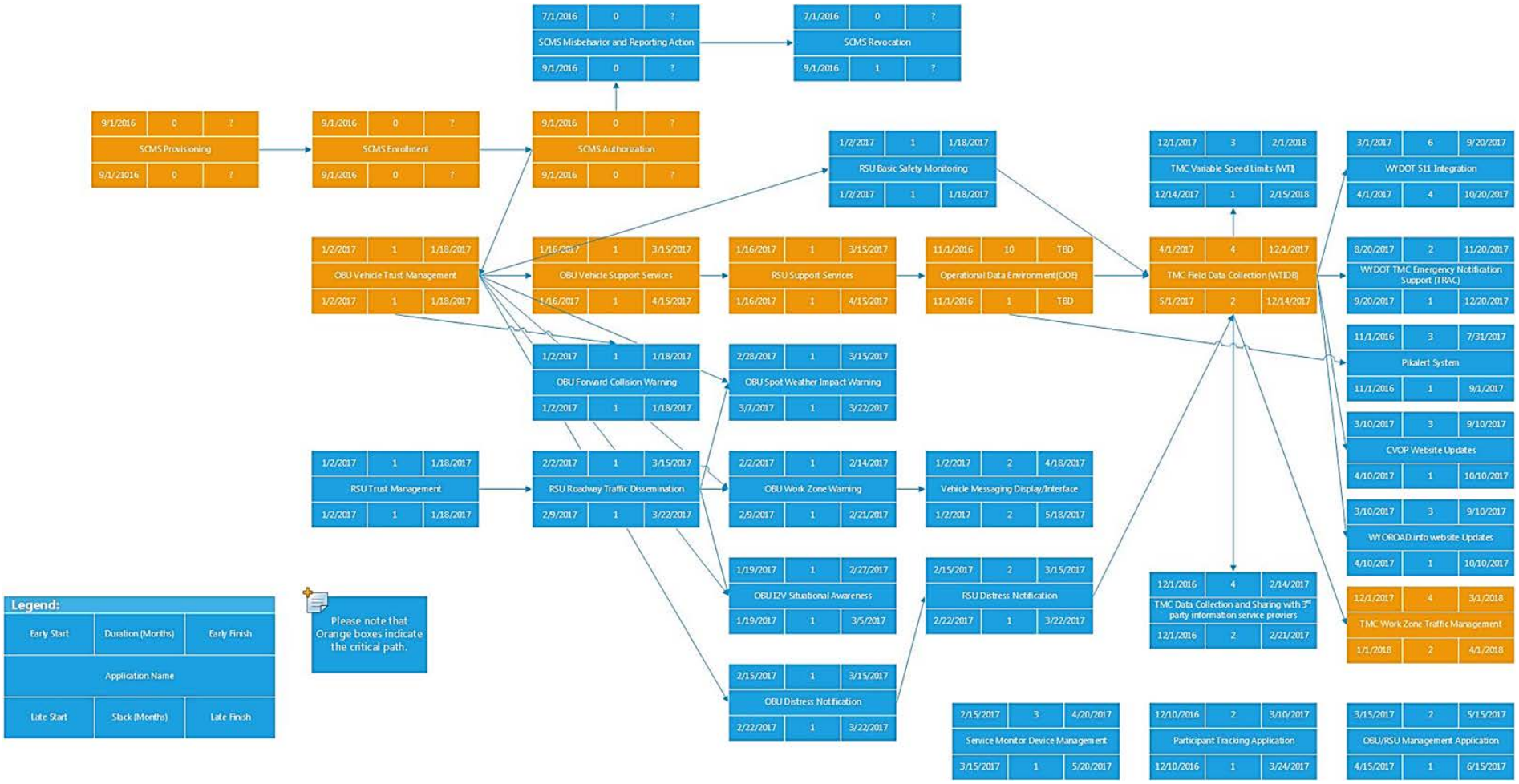
Agile/Testing



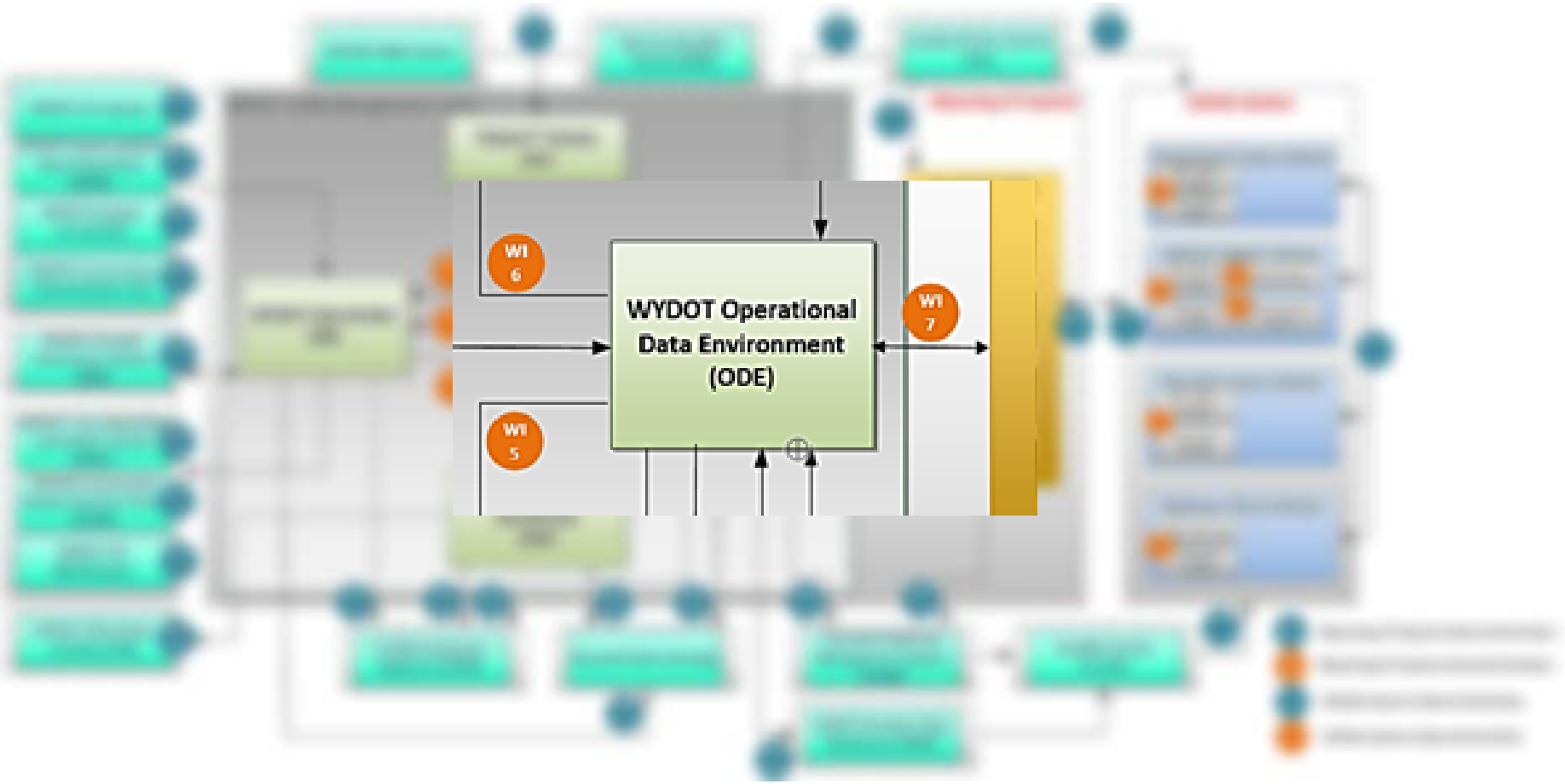
System Architecture



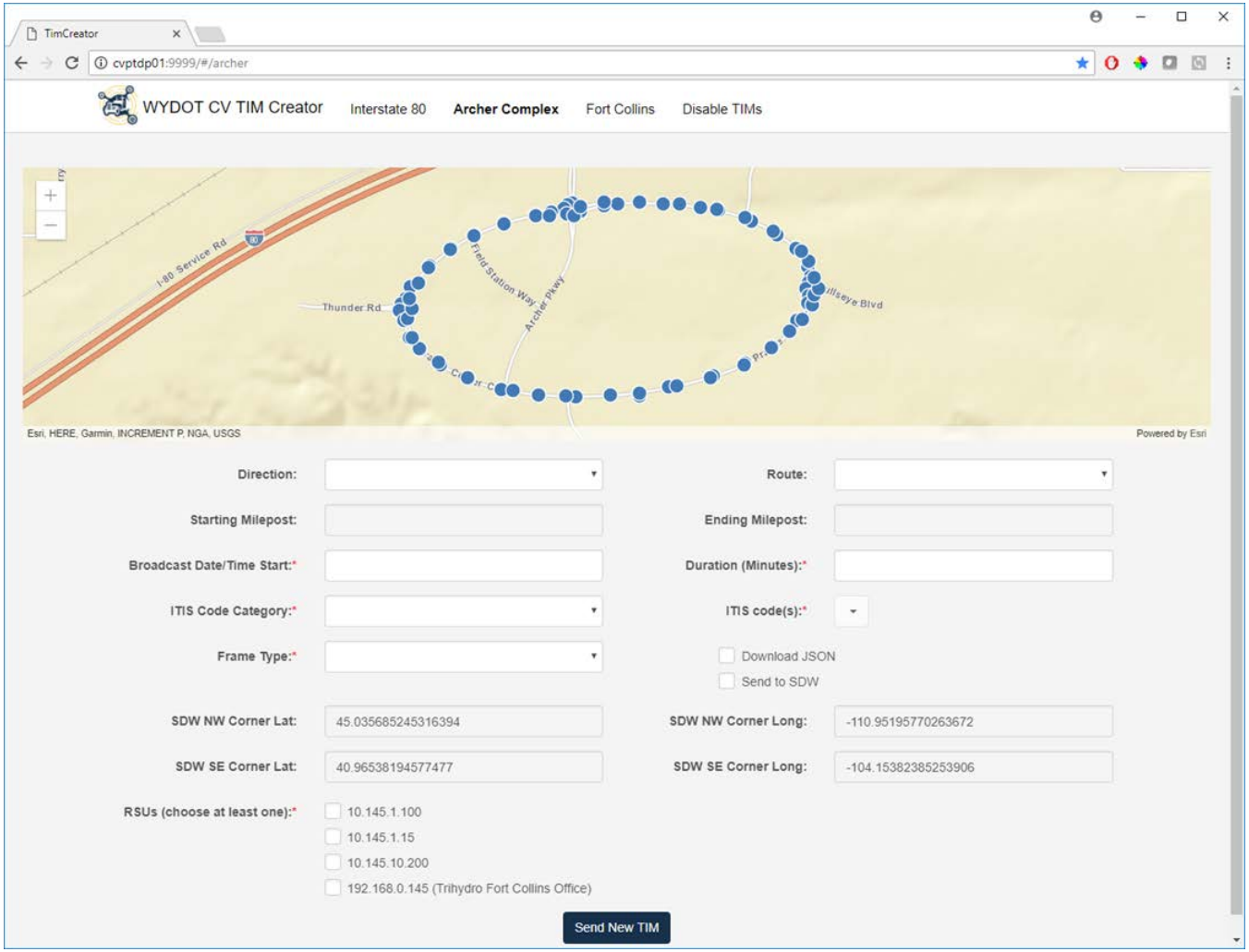
Critical Path Analysis



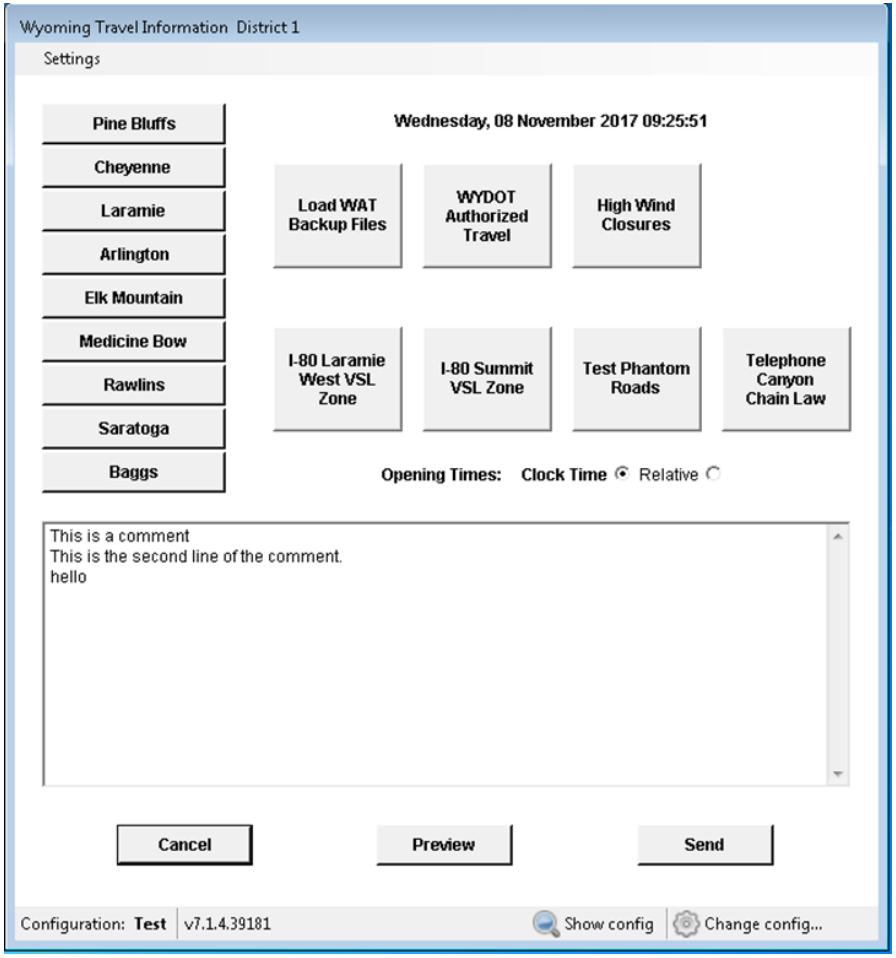
Operational Data Environment (ODE)



Proof of Concept Tools



Wyoming Traveler Information (WTI)



Wyoming Traveler Information

WTI Application

- TMC Operator Updates VSL
- TMC Operator Updates Road Conditions

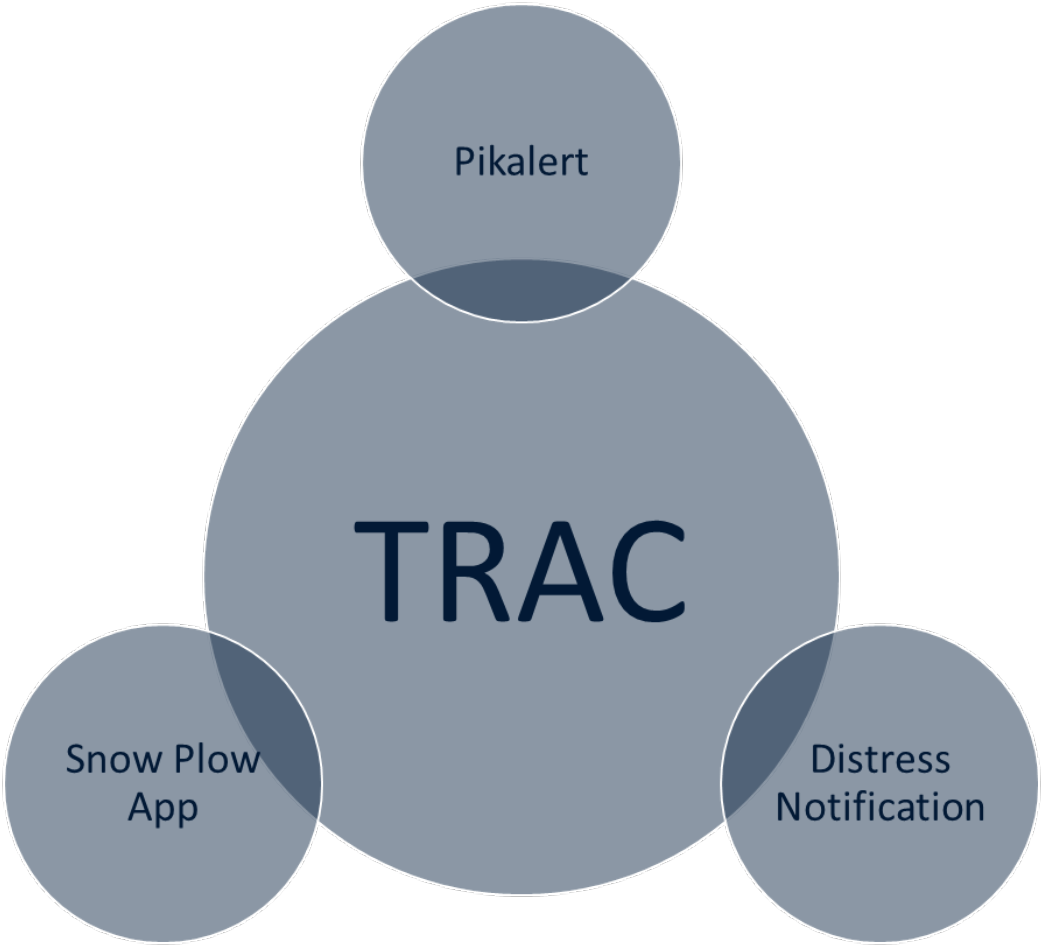
ODE Wrapper

- Formats input to valid TIM
- Calls ODE to generate TIM
- Determines area and RSUs

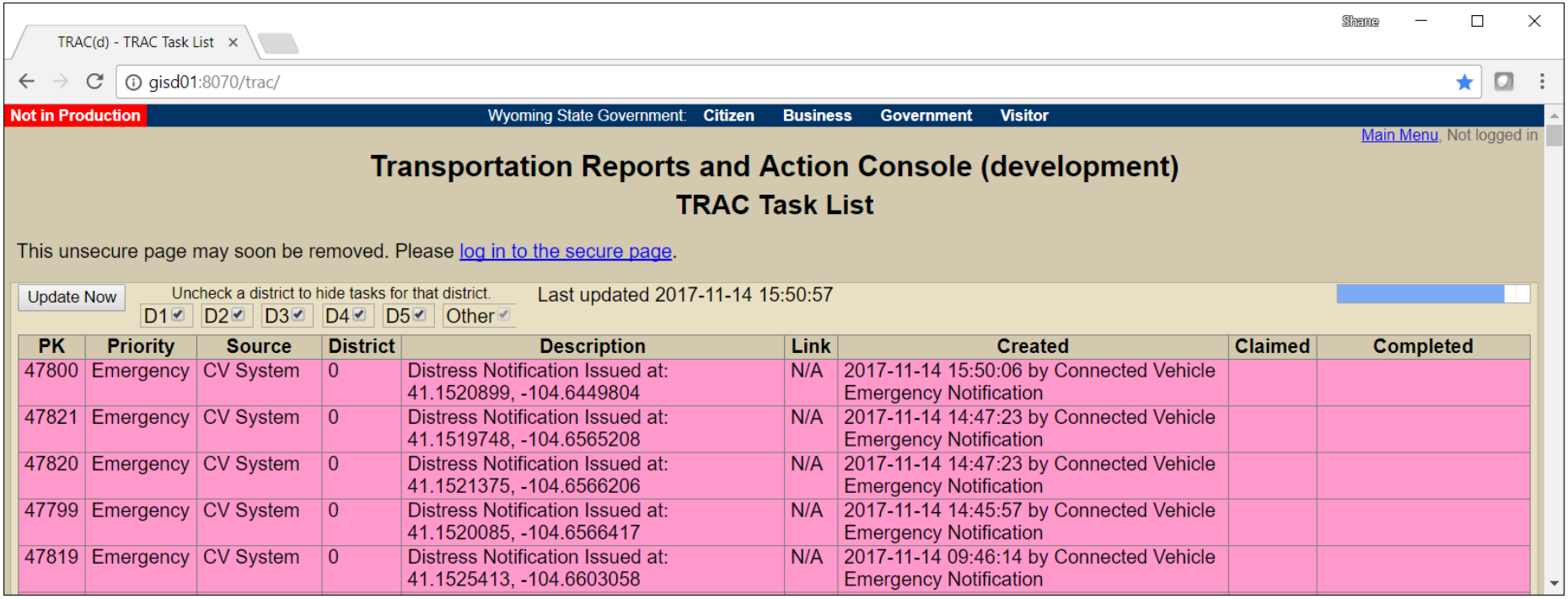
ODE

- Generates TIMs
- Pushes to RSU(s)
- Pushes to SDW (satellite)

Transportation Reports and Action Console (TRAC)

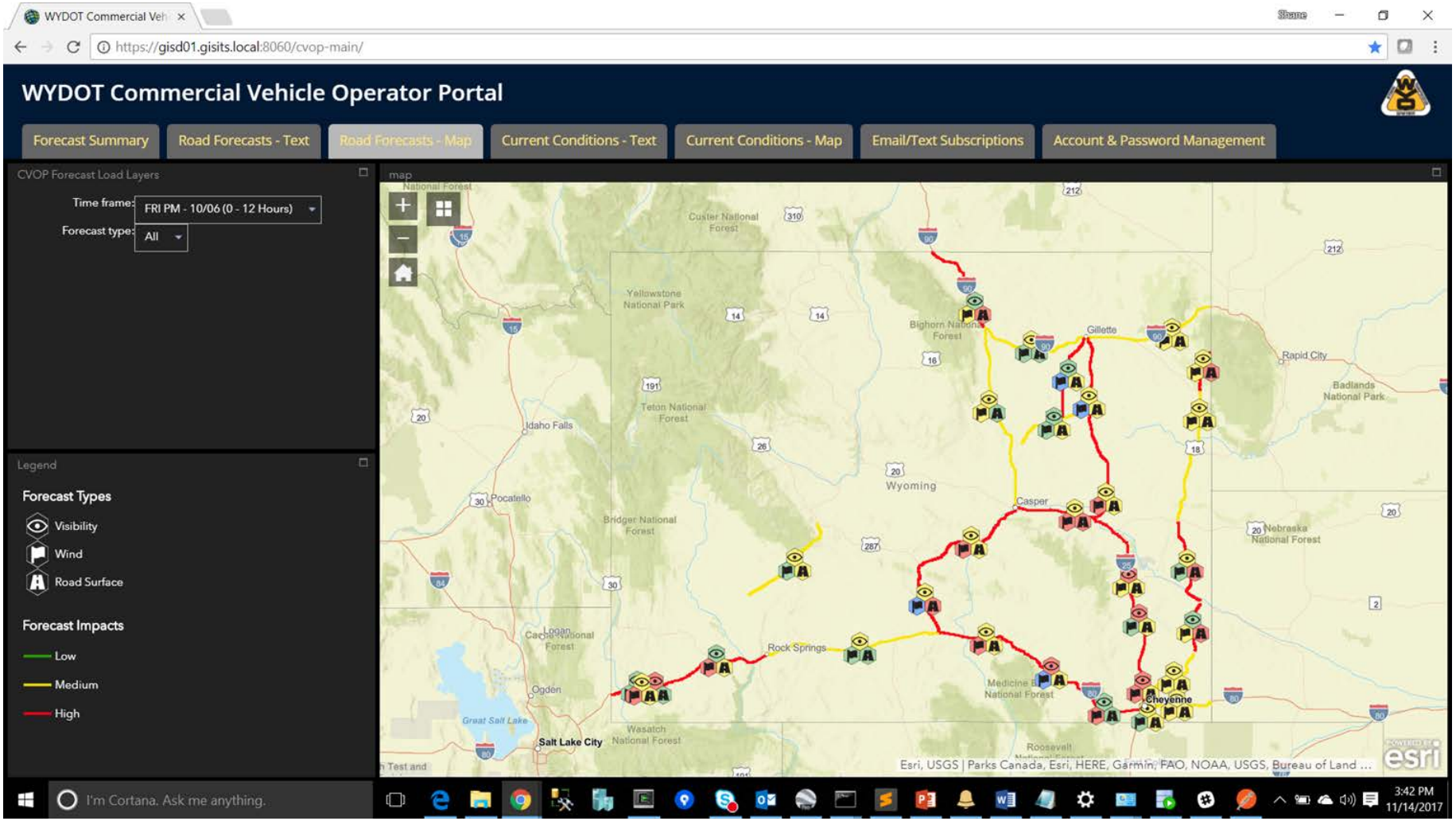


TRAC

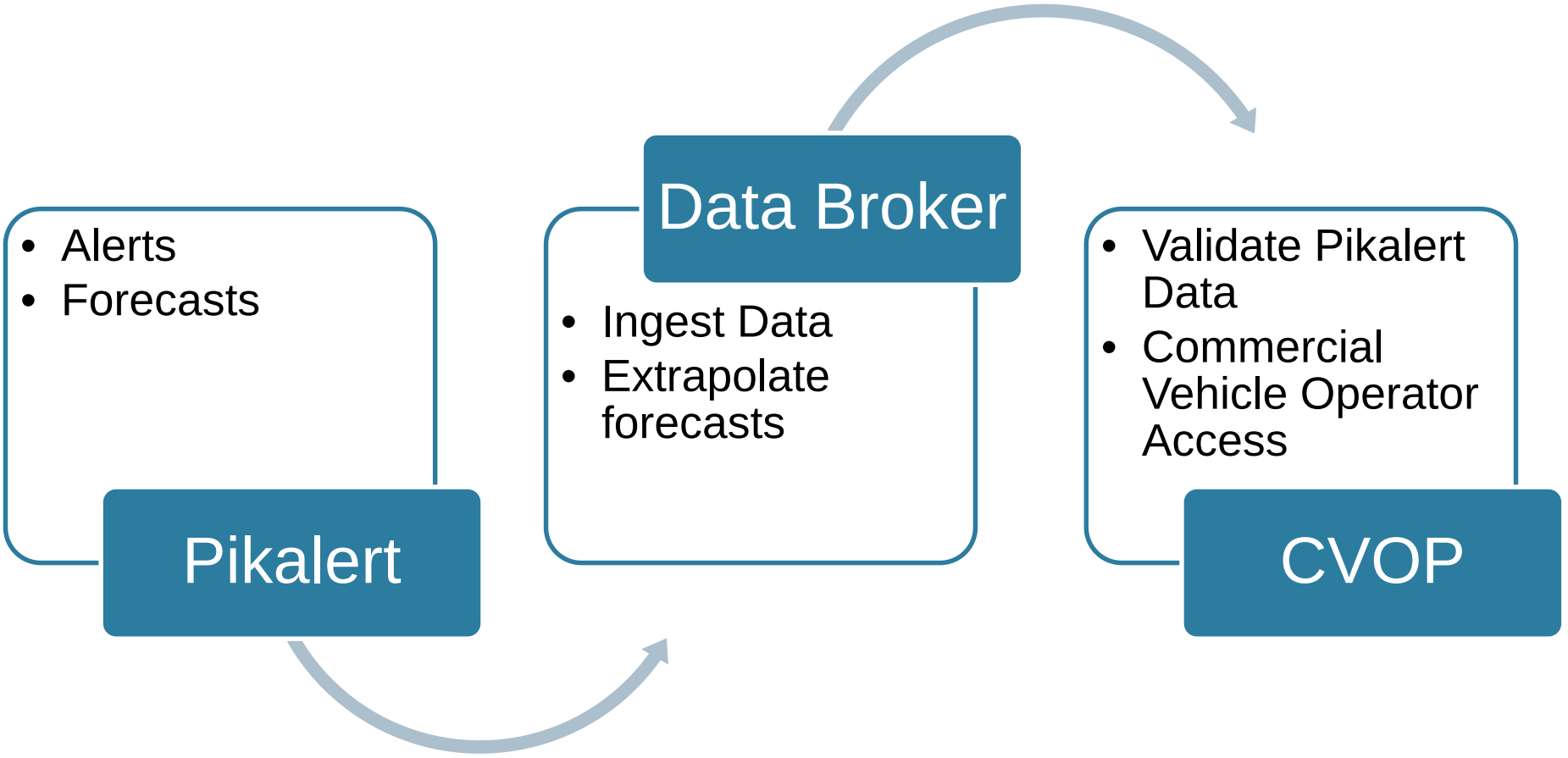


PK	Priority	Source	District	Description	Link	Created	Claimed	Completed
47800	Emergency	CV System	0	Distress Notification Issued at: 41.1520899, -104.6449804	N/A	2017-11-14 15:50:06 by Connected Vehicle Emergency Notification		
47821	Emergency	CV System	0	Distress Notification Issued at: 41.1519748, -104.6565208	N/A	2017-11-14 14:47:23 by Connected Vehicle Emergency Notification		
47820	Emergency	CV System	0	Distress Notification Issued at: 41.1521375, -104.6566206	N/A	2017-11-14 14:47:23 by Connected Vehicle Emergency Notification		
47799	Emergency	CV System	0	Distress Notification Issued at: 41.1520085, -104.6566417	N/A	2017-11-14 14:45:57 by Connected Vehicle Emergency Notification		
47819	Emergency	CV System	0	Distress Notification Issued at: 41.1525413, -104.6603058	N/A	2017-11-14 09:46:14 by Connected Vehicle Emergency Notification		

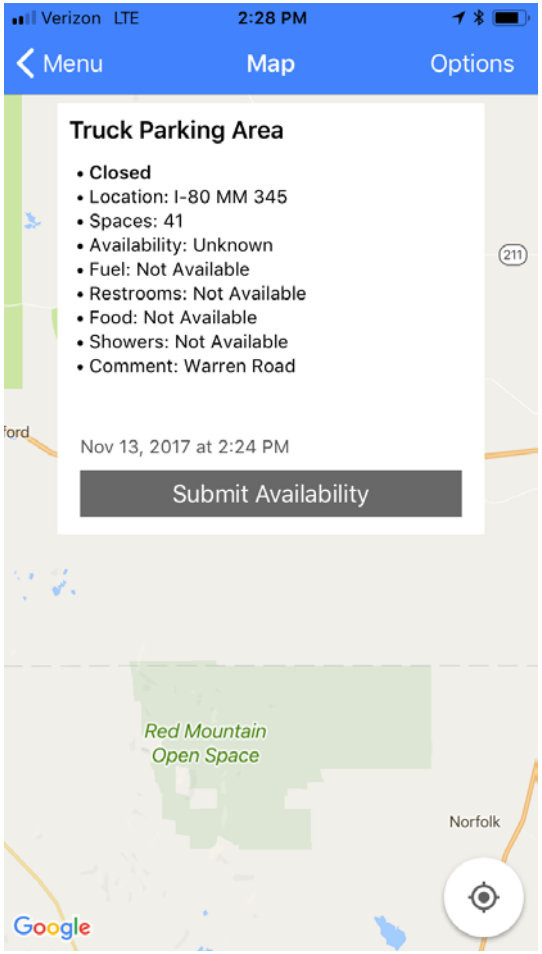
Commercial Vehicle Operator Portal (CVOP)

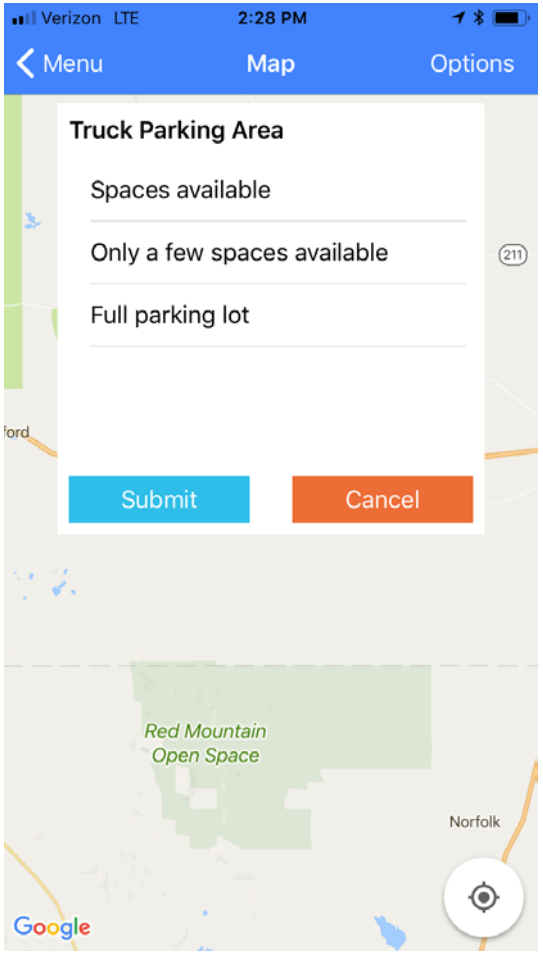


Pikalert to CVOP



Wyoming 511 App





Data Collection

System Data - Vehicle -

- Basic Safety Messages
  - Part 1 & 2
- Mobile Weather Observations
- Vehicle Interactions
  - V2V, V2I

System Data - CV System -

- Pikalert
  - Road conditions
  - Advisories, warnings
- Traveler information messages
- WYDOT TMC logs

Non-System Data

- Road weather reports
- Individual vehicle speeds
- Road Weather Information
- Variable speed limits
- Dynamic message signs
- Road closures
- Crashes

Survey and Interview Data

- Commercial Vehicle Operator
- Drivers
- WYDOT staff
- Other stakeholders

Modeling and Simulation Data

- Modifications to VISSIM Model Of I-80 Section

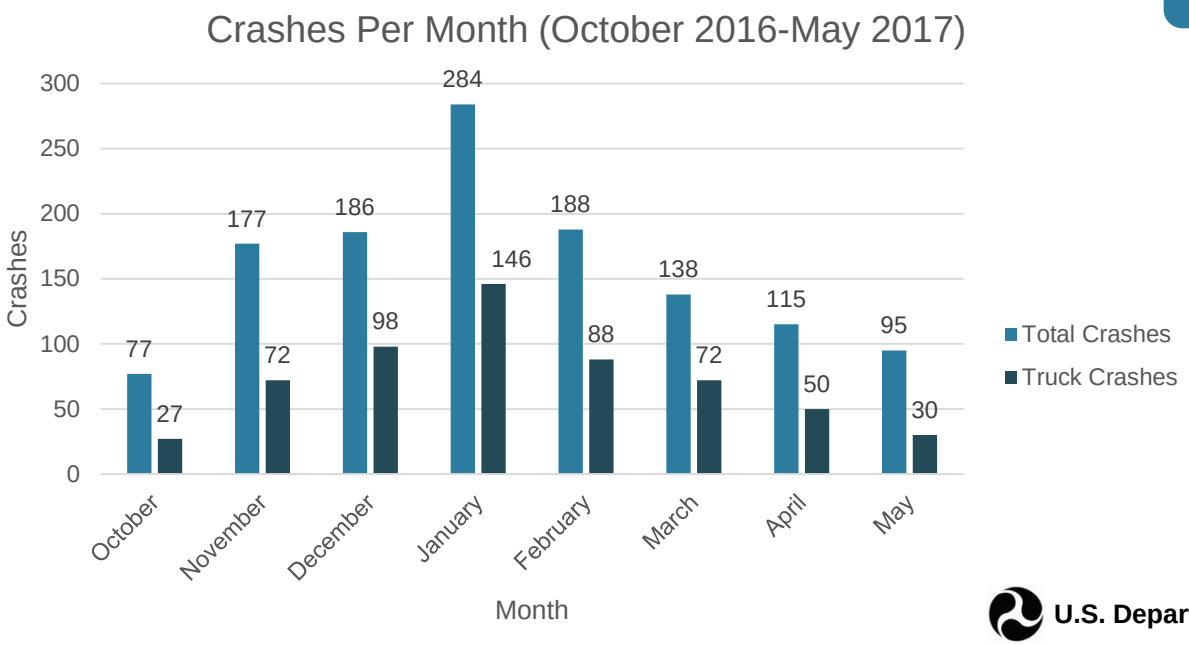
Pre-Deployment Data Collection and Analysis

- Collected Pre-Deployment data to establish baseline conditions
  - October 2016 through January 2018
- Phase 2 System Performance Report (Baseline)
  - Initial – 12/11/2017 (completed)
  - Final – 4/30/2018 (under development)

Non-System Data

Survey and Interview Data

Modeling and Simulation Data



Testing/Lessons Learned

- ✓ Ensure CV tech is fully integrated with TMC operations, yet loosely coupled
- ✓ Plan for CPU and Disk needs
- ✓ Have integration with IPv6 at TMC
- ✓ Be prepared for addition security considerations
- ✓ Build human readable dashboards for TMC that present CV data

STAKEHOLDER Q&A

- Please keep your phone muted
- Please use chatbox to ask questions
- Questions will be answered in the order in which they were received

STAY CONNECTED

Join us for the *Getting Ready for Deployment* Series

- Discover more about the CV Pilot Sites
- Learn the Essential Steps to CV Deployment
- Engage in Technical Discussion

Visit the Pilot Site Websites for more Information:

- NYCDOT Pilot: https://www.cvp.nyc/
- Tampa (THEA): https://www.tampacvpilot.com/
- Wyoming DOT: https://wydotcvp.wyoroad.info/

Contact for CV Pilots Program:

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Contact for Pilot Sites:

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- Govind Vadakpat, THEA Site AOR G.Vadakpat@dot.gov