



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

Spur Early CV Tech Deployment



Wirelessly Connected Vehicles



Mobile Devices



Infrastructure

Measure Deployment Benefits



Safety



Mobility



Environment

Resolve Deployment Issues



Technical



Institutional



Financial

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)

| Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 | Jul 2018 |
|----------|------------------------|----------|----------|----------|-----------------------|----------|
| ● | ◆ | ◆ | ● | ◆ | ◆ | ◆ |
| TRB | Application Deployment | SXSW | | | Operational Readiness | |

◆ Public Webinars ● Conference Presentations

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





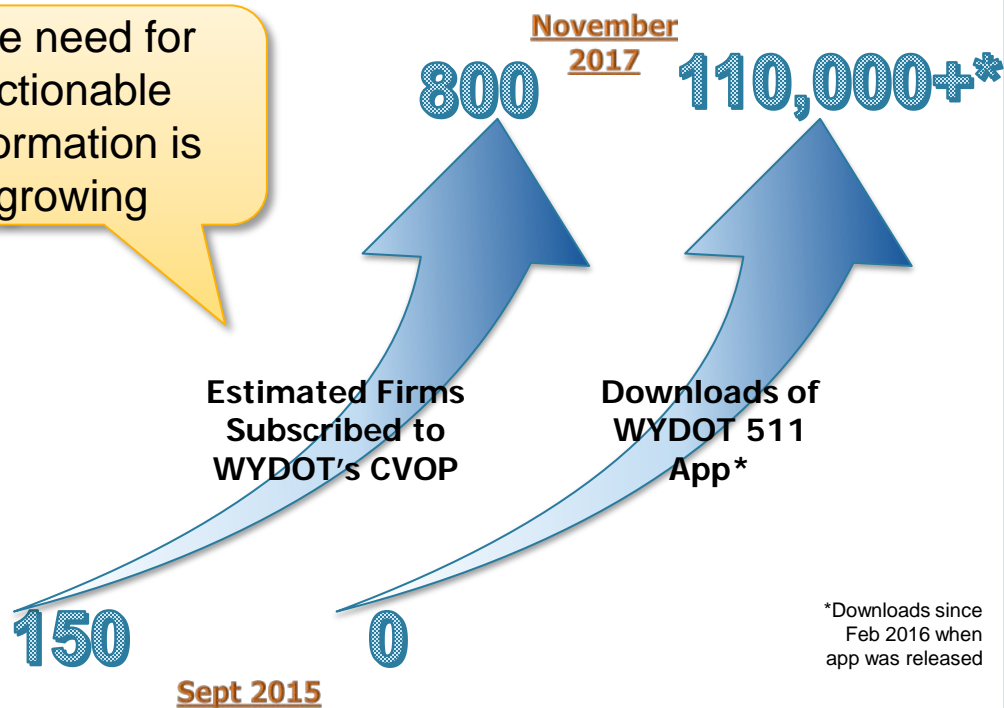
Wyoming DOT CV Pilot Deployment Overview

Vince Garcia

I-80 Users Need Actionable Road Weather Information

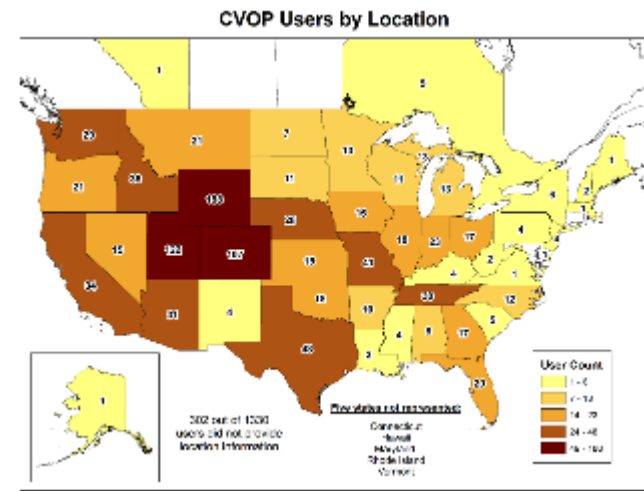


The need for actionable information is growing



*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



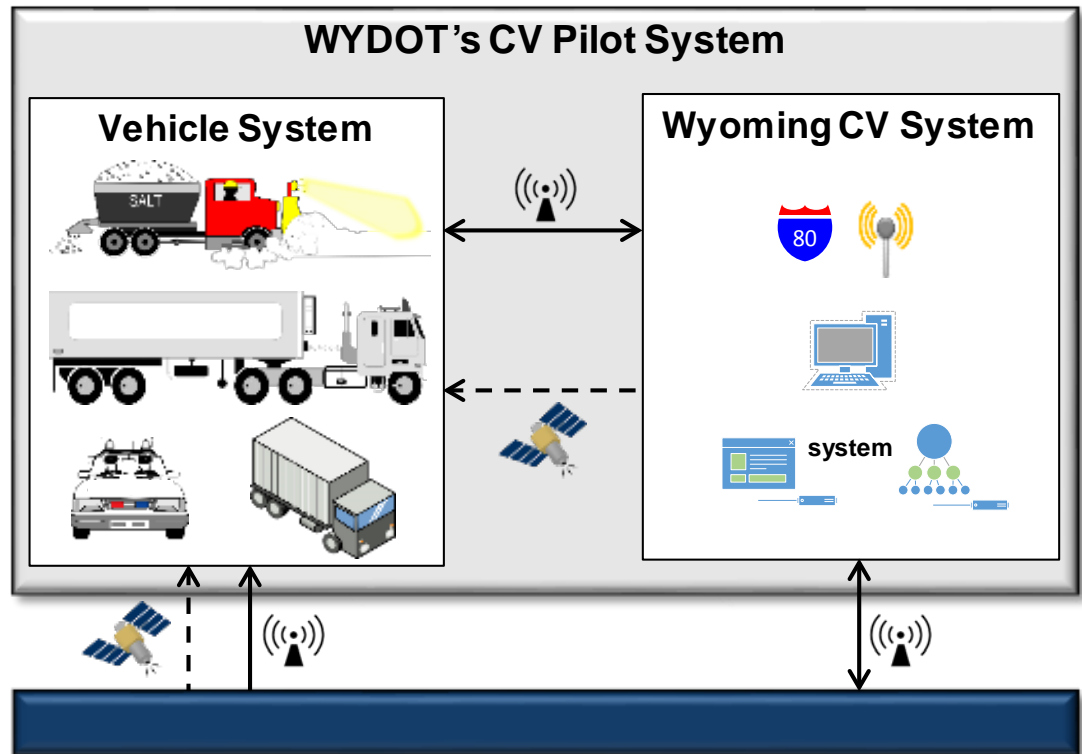
V2V Applications

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

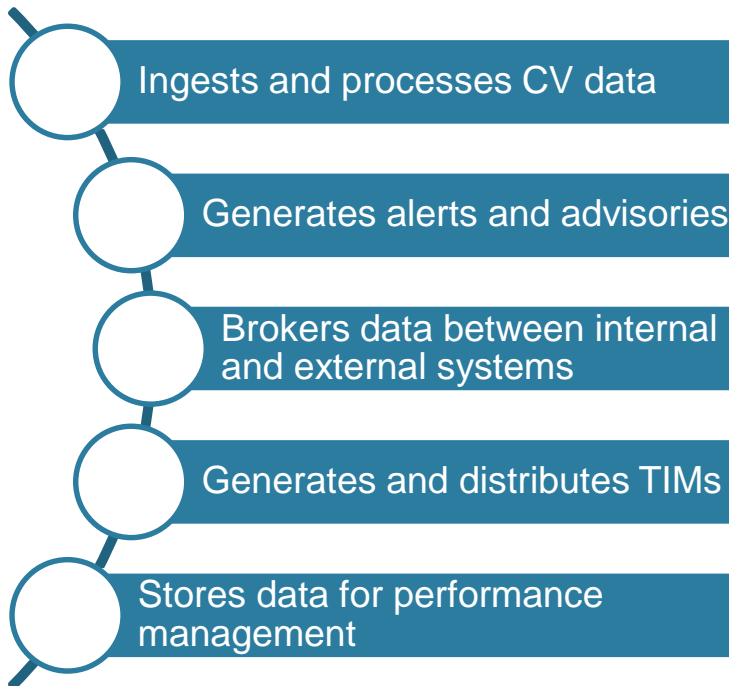
1. WYDOT Fleets
2. Integrated Trucks
3. Retrofit Vehicles
4. Highway Patrol

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

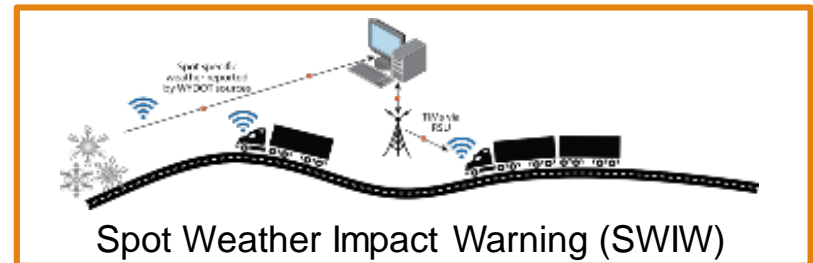
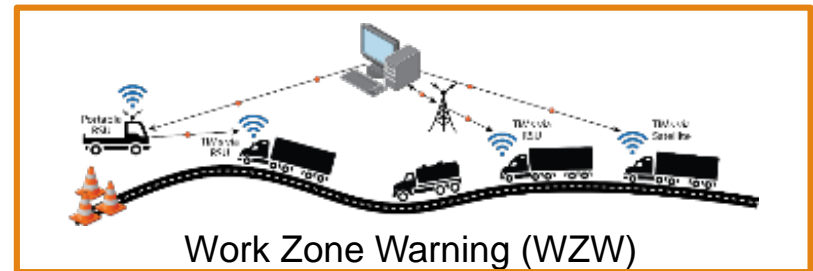
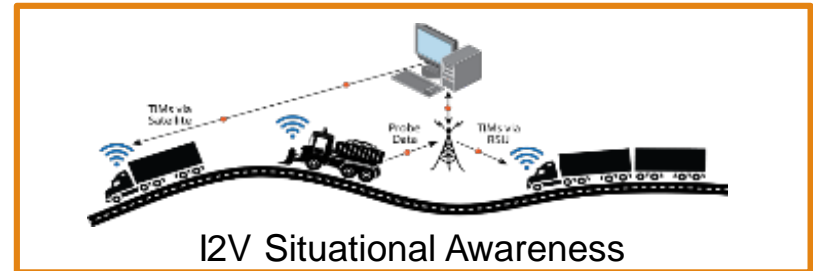
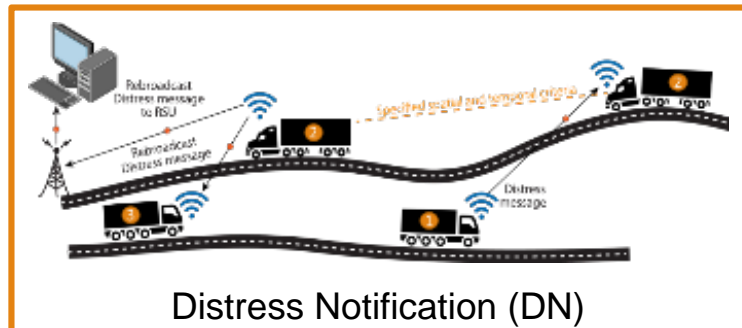
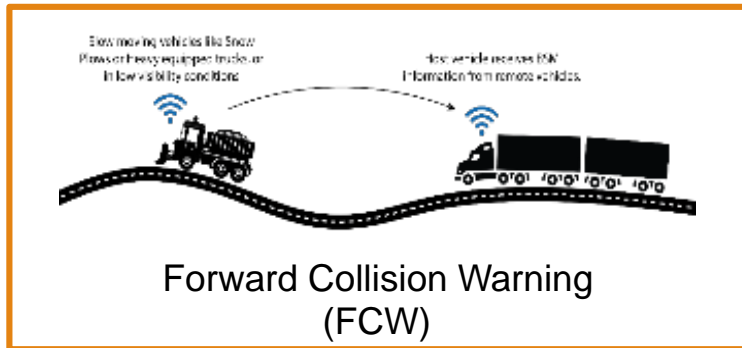
- US DOT Interfaces (e.g. SCMS)
- WYDOT Interfaces (e.g. ATMS and ATIS Systems at the TMC)
- Weather

CV Subsystems

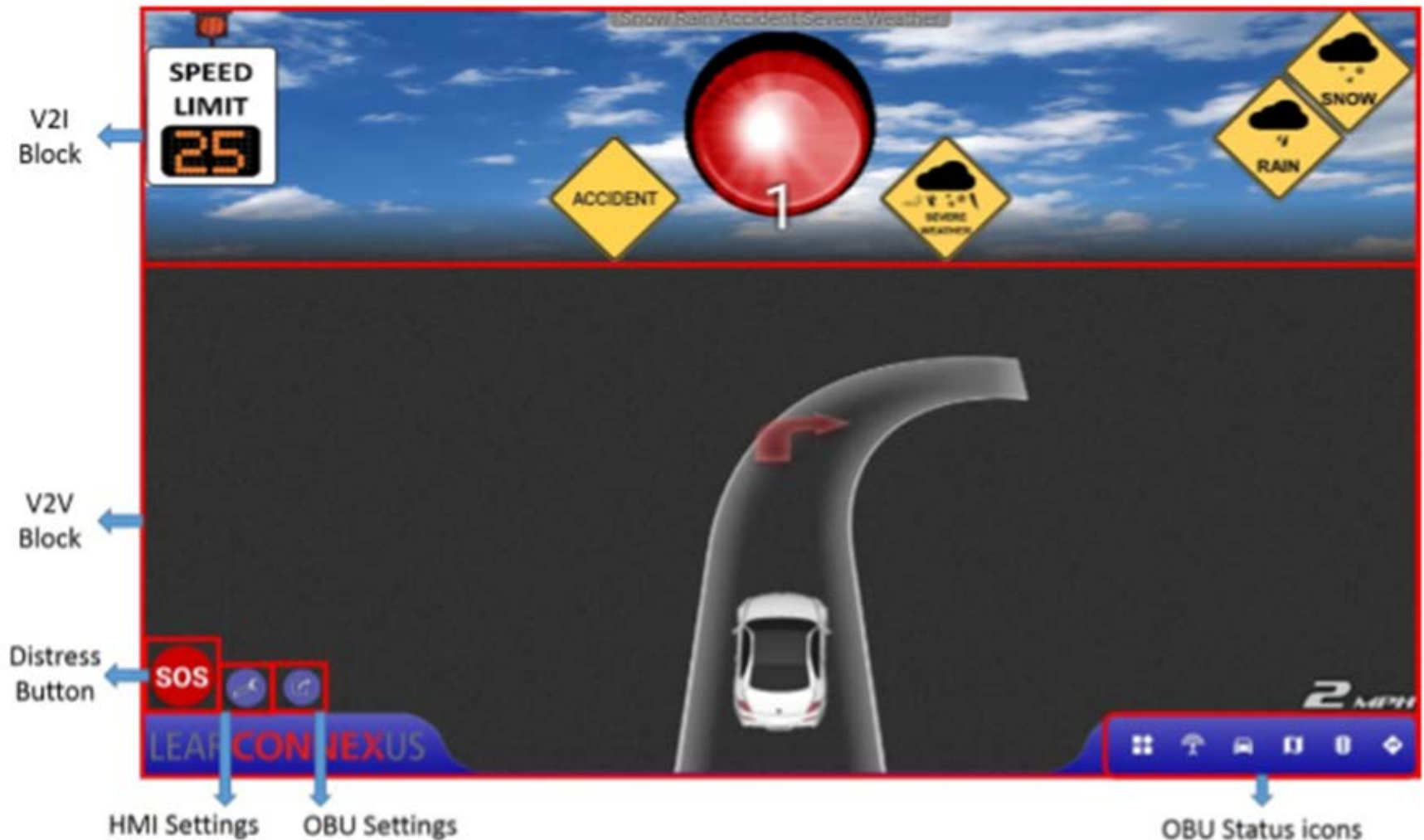
- Roadside Units
- Operational Data Environment
- Pikalert® System
- WYDOT Data Broker
- WYDOT Data Warehouse



Onboard Applications



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



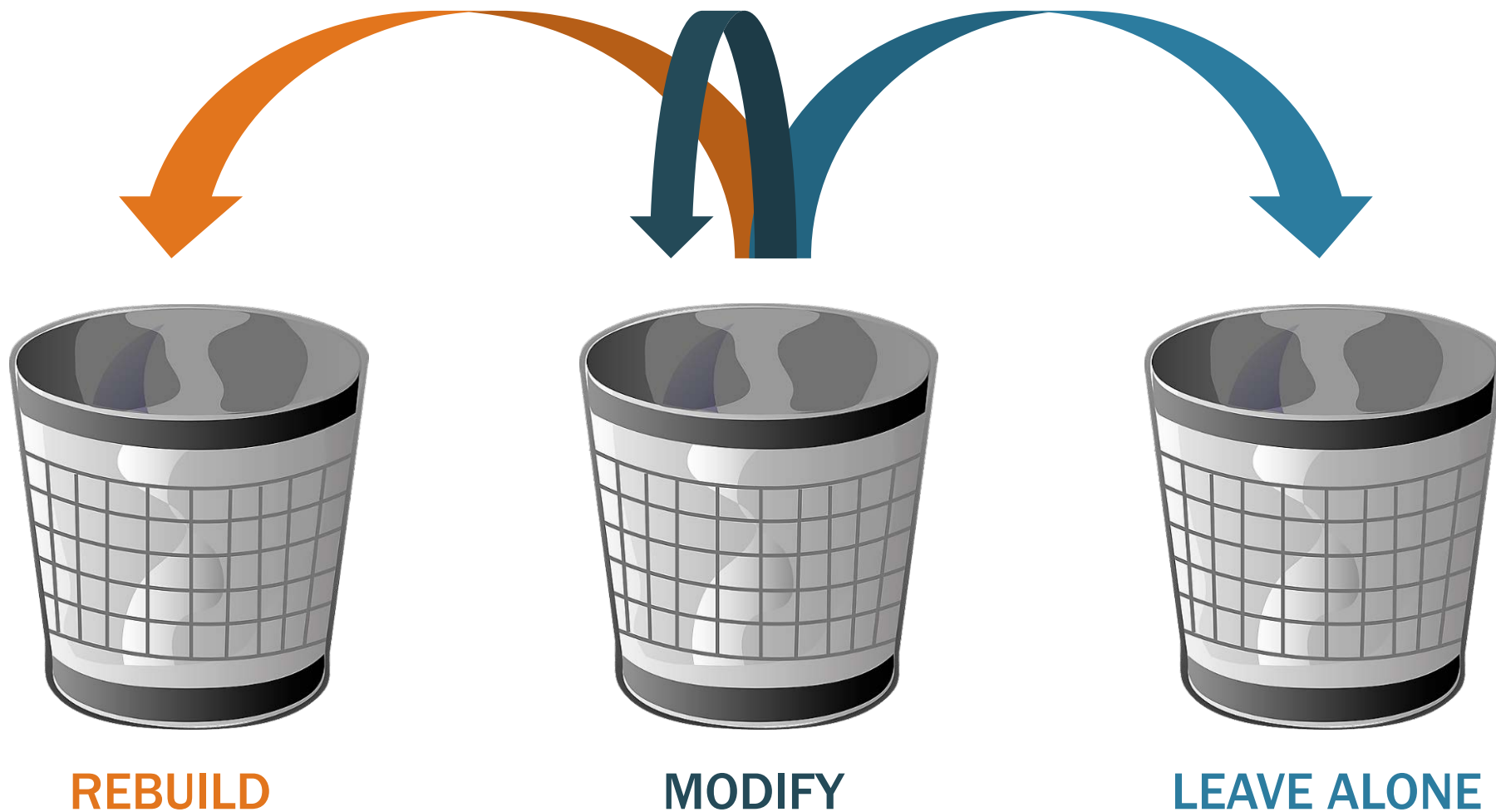
Application Areas



**TMC
Applications**

**CV
Applications**

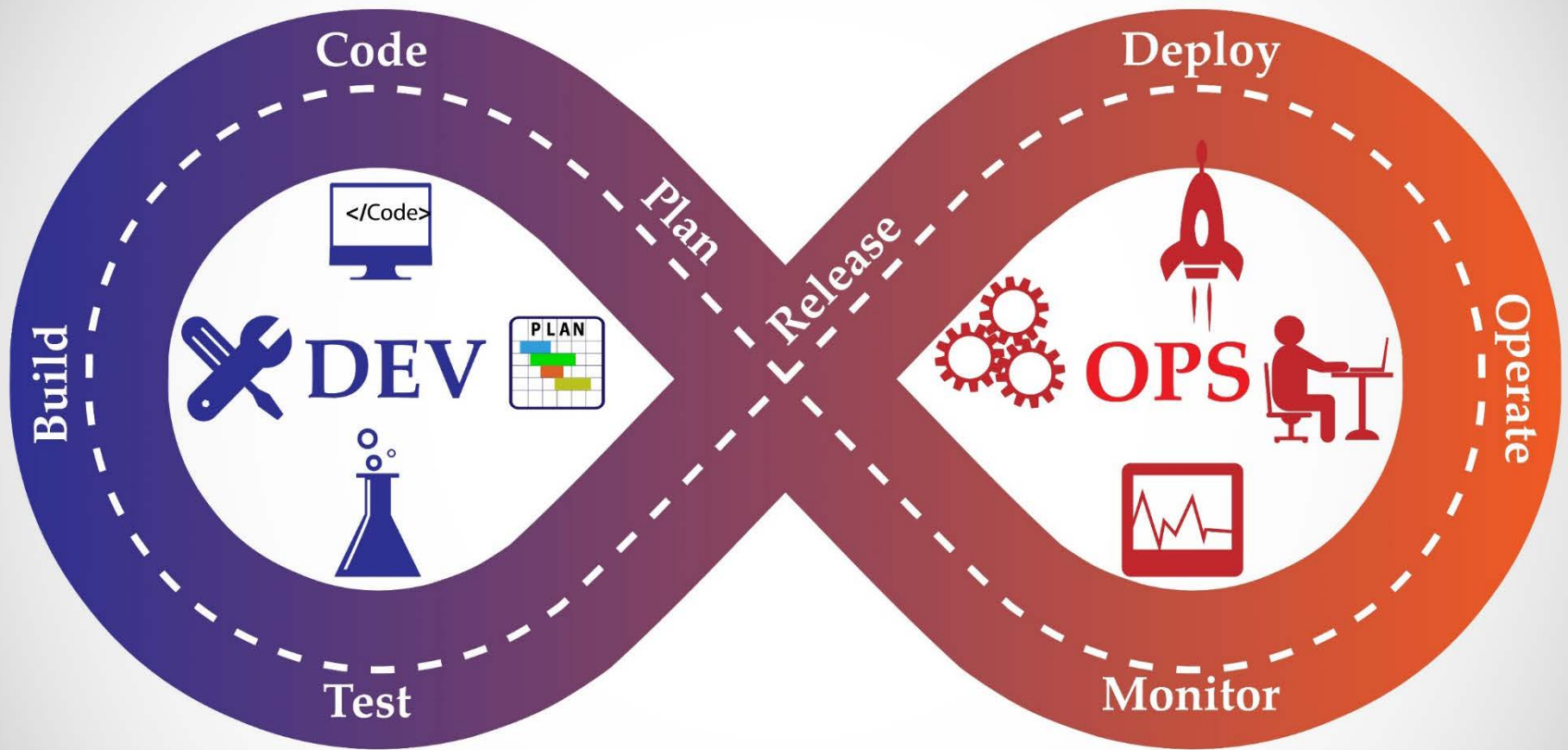
Determine Level of Effort



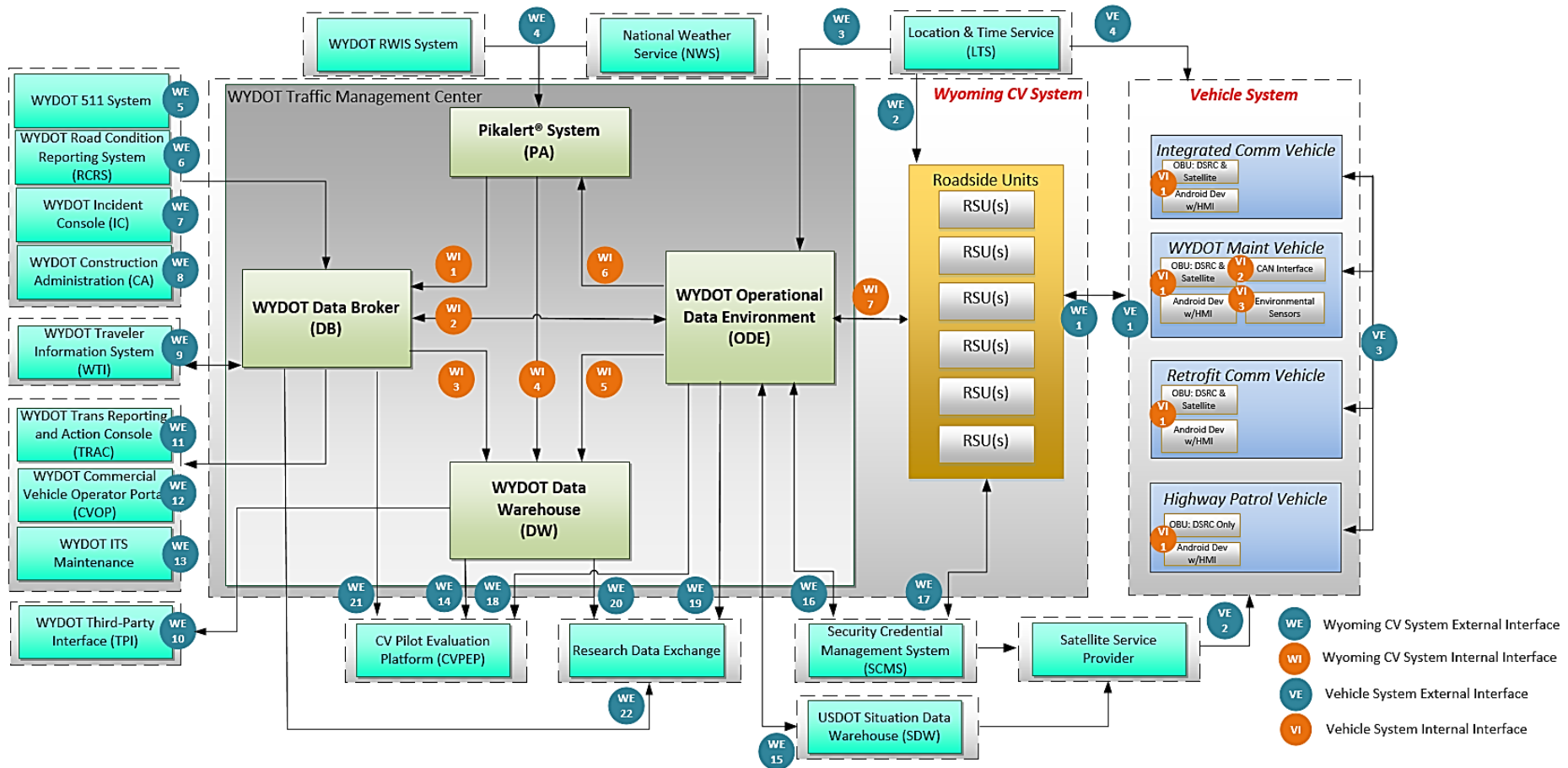
Agile



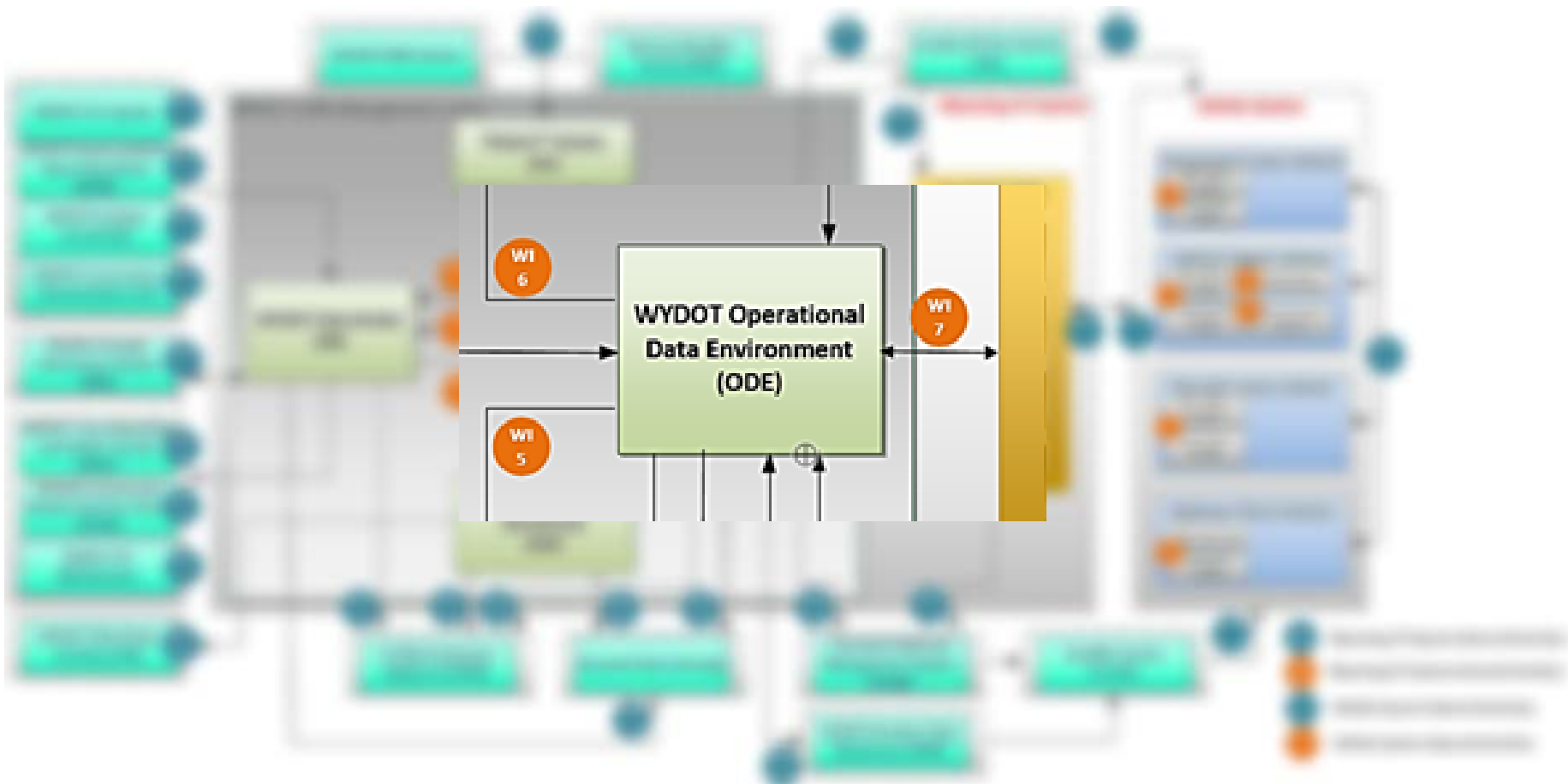
Agile/Testing



System Architecture



Operational Data Environment (ODE)



Proof of Concept Tools



TimCreator x

cvptdp01:9999/#/archer

WYDOT CV TIM Creator Interstate 80 Archer Complex Fort Collins Disable TIMs

Esri, HERE, Garmin, INCREMENT P, NGA, USGS Powered by Esri

Direction:

Route:

Starting Milepost:

Ending Milepost:

Broadcast Date/Time Start:

Duration (Minutes):

ITIS Code Category:

ITIS code(s):

Frame Type:

Download JSON

Send to SDW

SDW NW Corner Lat:

SDW NW Corner Long:

SDW SE Corner Lat:

SDW SE Corner Long:

RSUs (choose at least one):

- 10.145.1.100
- 10.145.1.15
- 10.145.10.200
- 192.168.0.145 (Trihydro Fort Collins Office)

Wyoming Traveler Information (WTI)



Wyoming Travel Information District 1

Settings

Pine Bluffs

Cheyenne

Laramie

Arlington

Elk Mountain

Medicine Bow

Rawlins

Saratoga

Baggs

Wednesday, 08 November 2017 09:25:51

Load WAT Backup Files

WYDOT Authorized Travel

High Wind Closures

I-80 Laramie West VSL Zone

I-80 Summit VSL Zone

Test Phantom Roads

Telephone Canyon Chain Law

Opening Times: Clock Time Relative

This is a comment
This is the second line of the comment.
hello

Cancel Preview Send

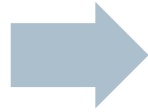
Configuration: Test v7.1.4.39181 [Show config](#) [Change config...](#)

Wyoming Traveler Information



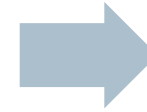
WTI Application

- 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

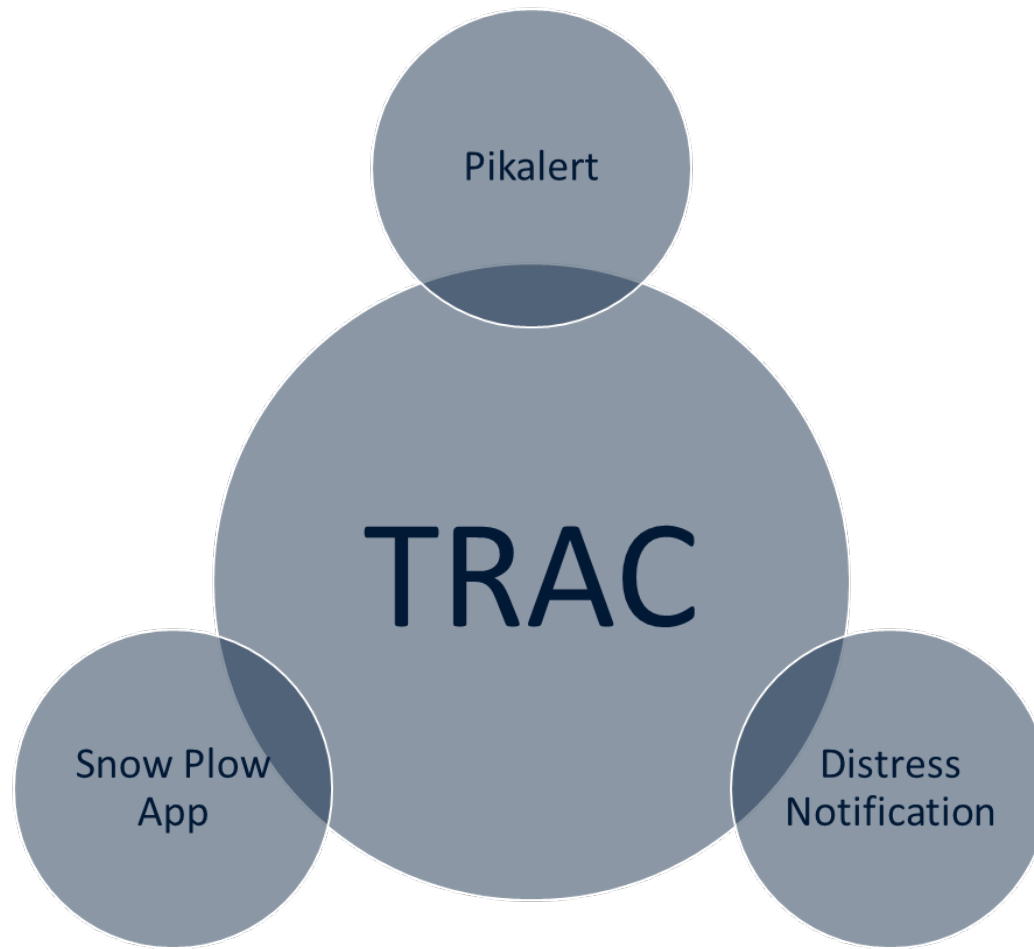


ODE

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



Transportation Reports and Action Console (TRAC)





TRAC(d) - TRAC Task List x

gisd01:8070/trac/

Not in Production Wyoming State Government: Citizen Business Government Visitor

Main Menu, Not logged in

Transportation Reports and Action Console (development)

TRAC Task List

This unsecure page may soon be removed. Please [log in to the secure page](#).

Update Now Uncheck a district to hide tasks for that district. Last updated 2017-11-14 15:50:57

D1 D2 D3 D4 D5 Other

| 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)



WYDOT Commercial Veh... x

https://gisd01.gisits.local:8060/cvop-main/

WYDOT Commercial Vehicle Operator Portal

Forecast Summary | Road Forecasts - Text | Road Forecasts - Map | Current Conditions - Text | Current Conditions - Map | Email/Text Subscriptions | Account & Password Management

CVOP Forecast Load Layers

Time frame: FRI PM - 10/06 (0 - 12 Hours)

Forecast type: All

Legend

Forecast Types

- Visibility
- Wind
- Road Surface

Forecast Impacts

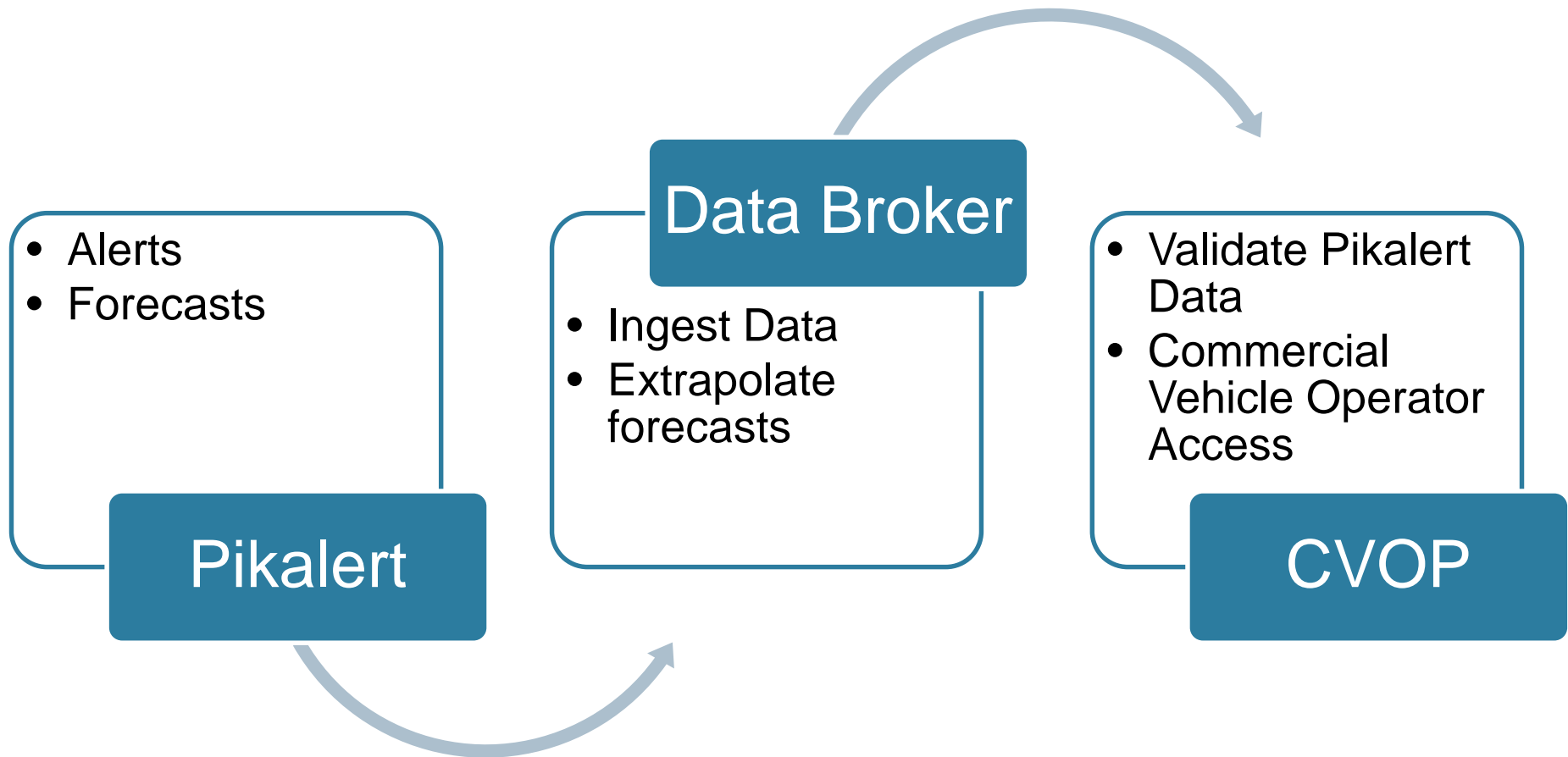
- Low
- Medium
- High

Esri, USGS | Parks Canada, Esri, HERE, Garmin, FAO, NOAA, USGS, Bureau of Land ...

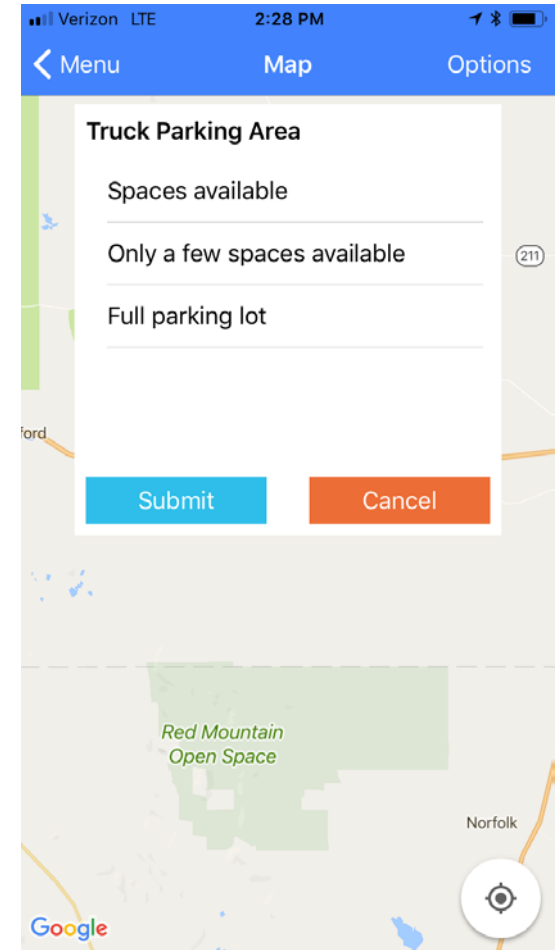
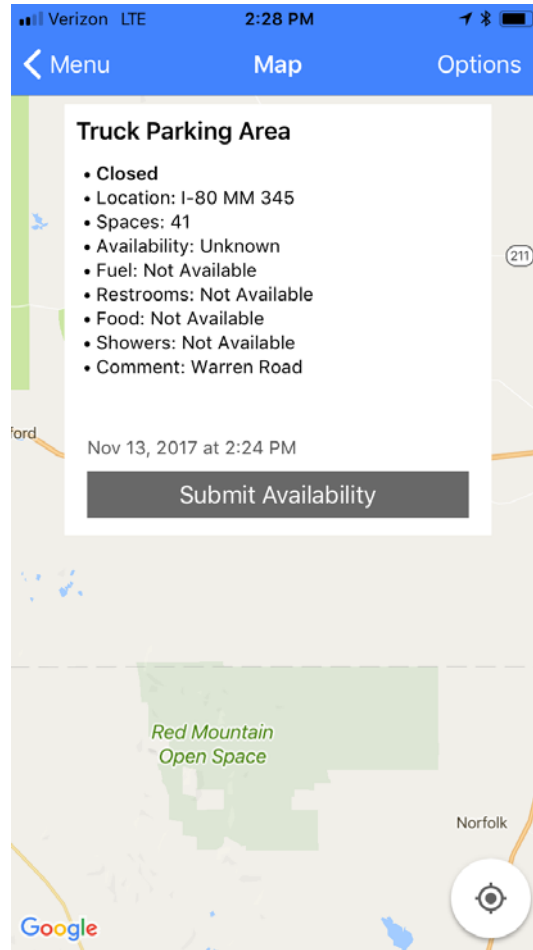
esri

3:42 PM 11/14/2017

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

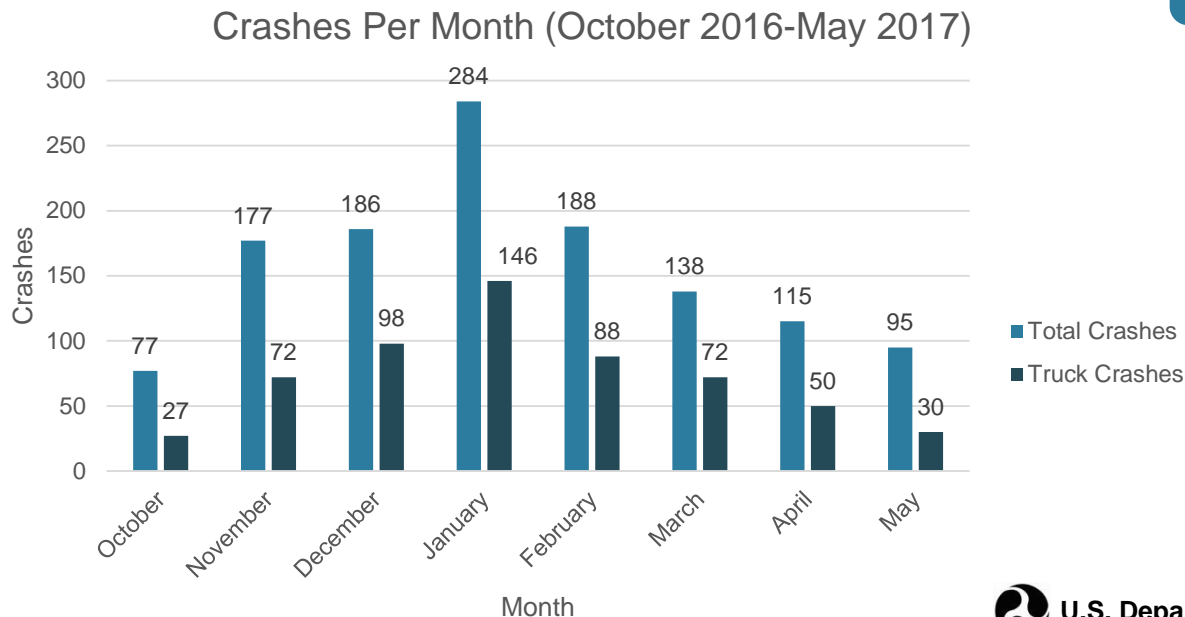


- Collected Pre-Deployment data to establish baseline conditions
 - October 2016 through January 2018
- Phase 2 System Performance Report (Baseline)
 - Initial – 12/11/2017 (completed)
 - Final – 4/30/2018 (under development)

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:

- Kate Hartman, WYDOT Site AOR
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- Jonathan Walker, NYCDOT Site AOR
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- Govind Vadakpat, THEA Site AOR
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