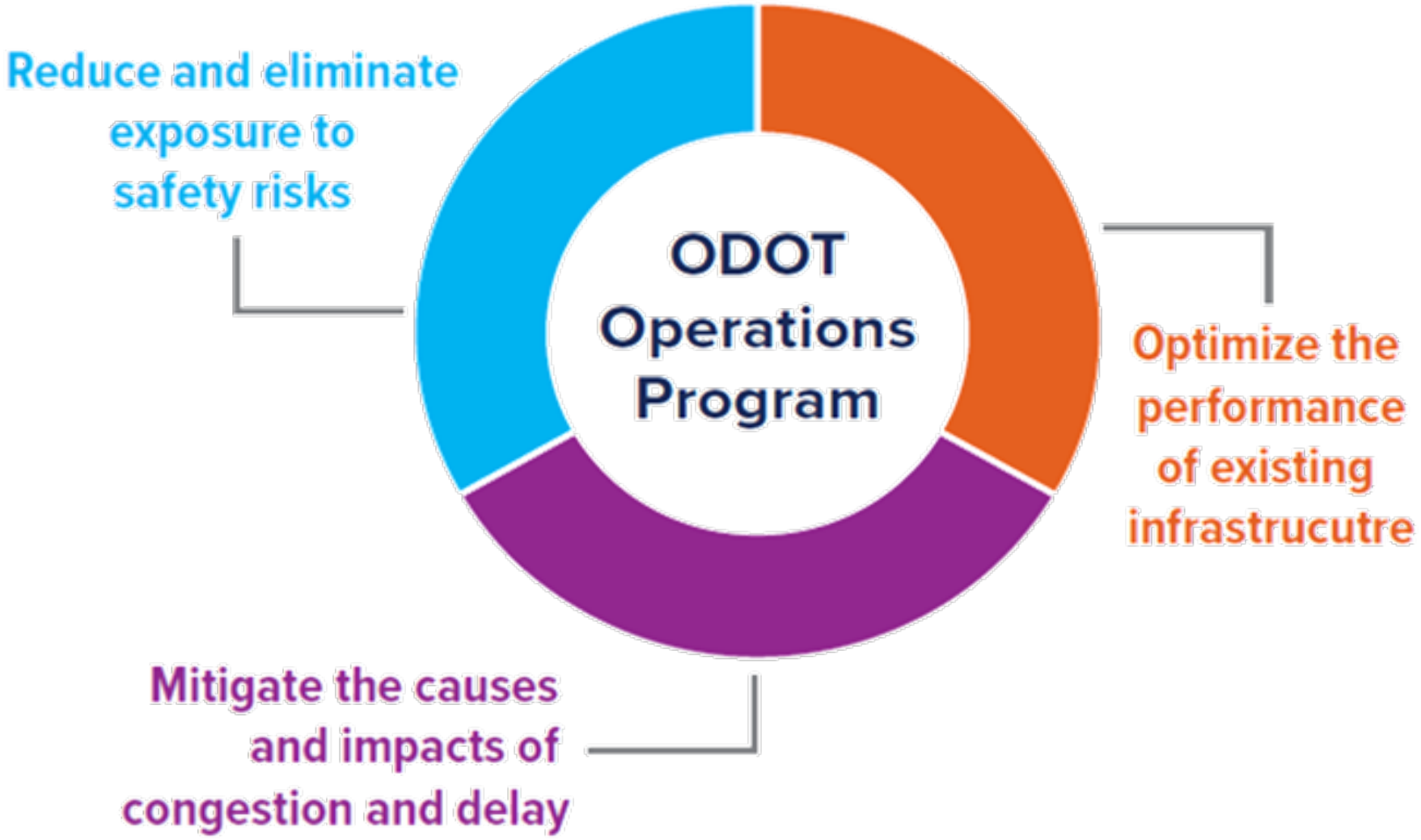
Oregon DOT ITS & CV APPLICATIONS

Galen McGill, PE

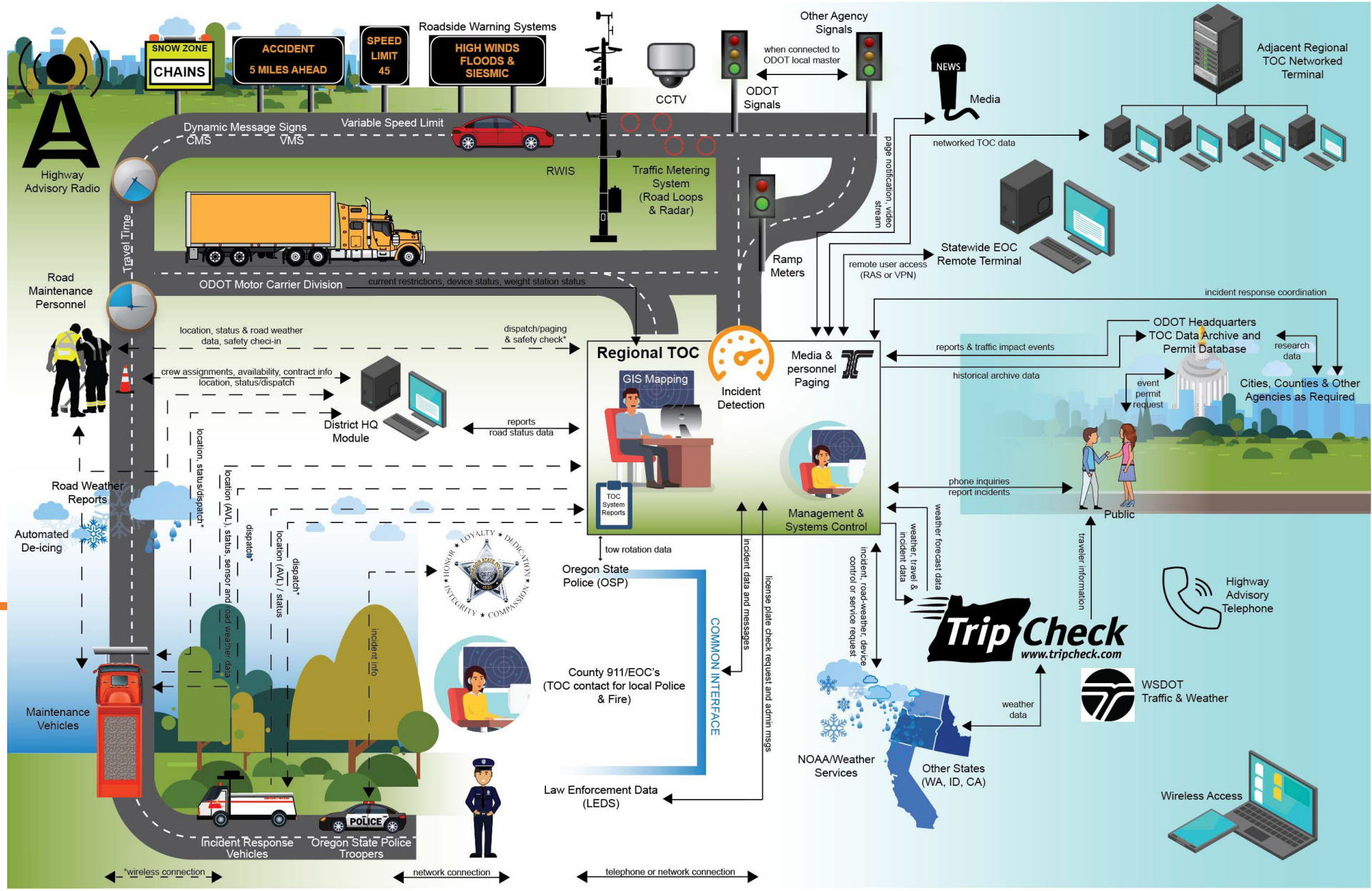
State Maintenance & Operations Engineer

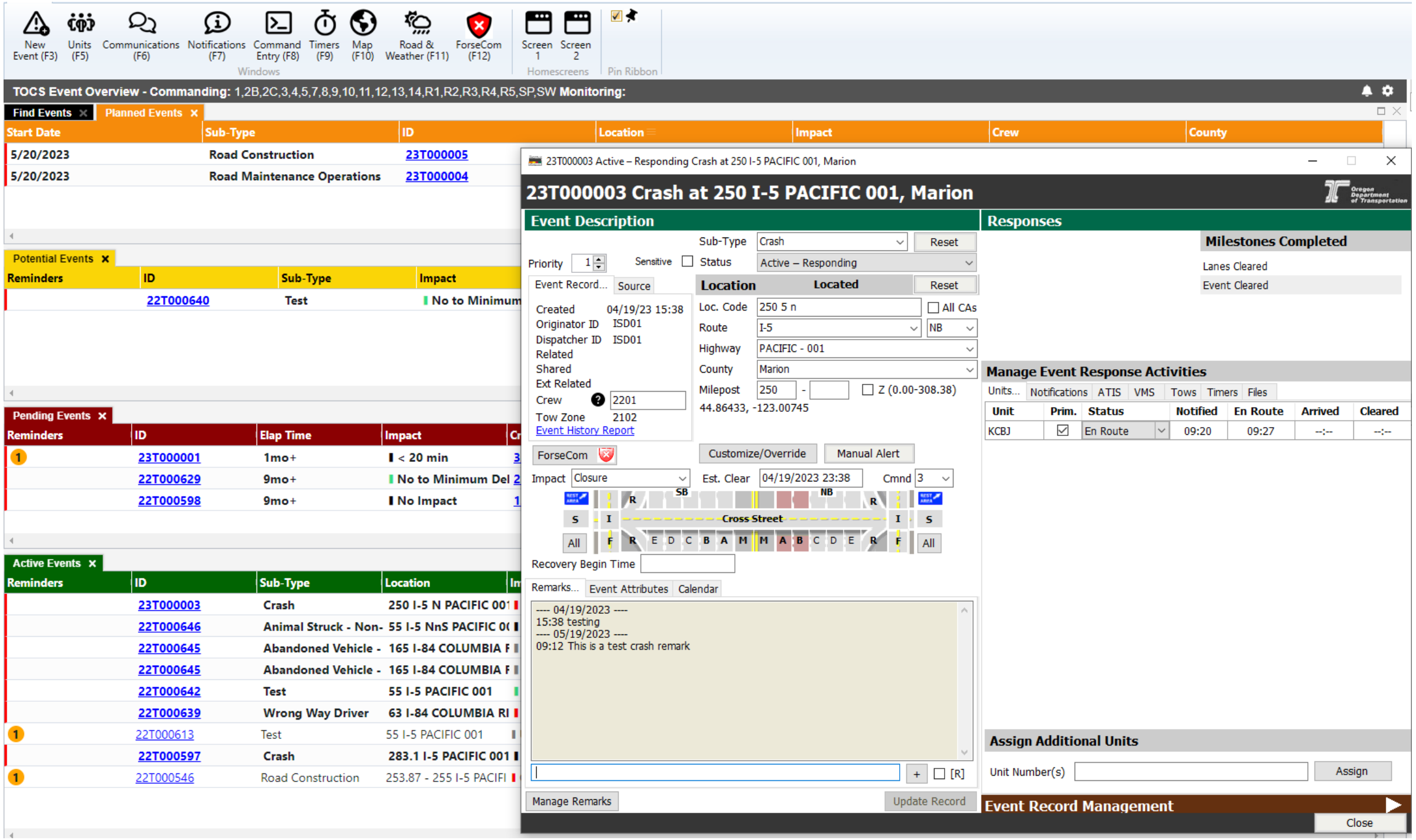
Oregon Department of Transportation



ODOT’s Operations Program Goals

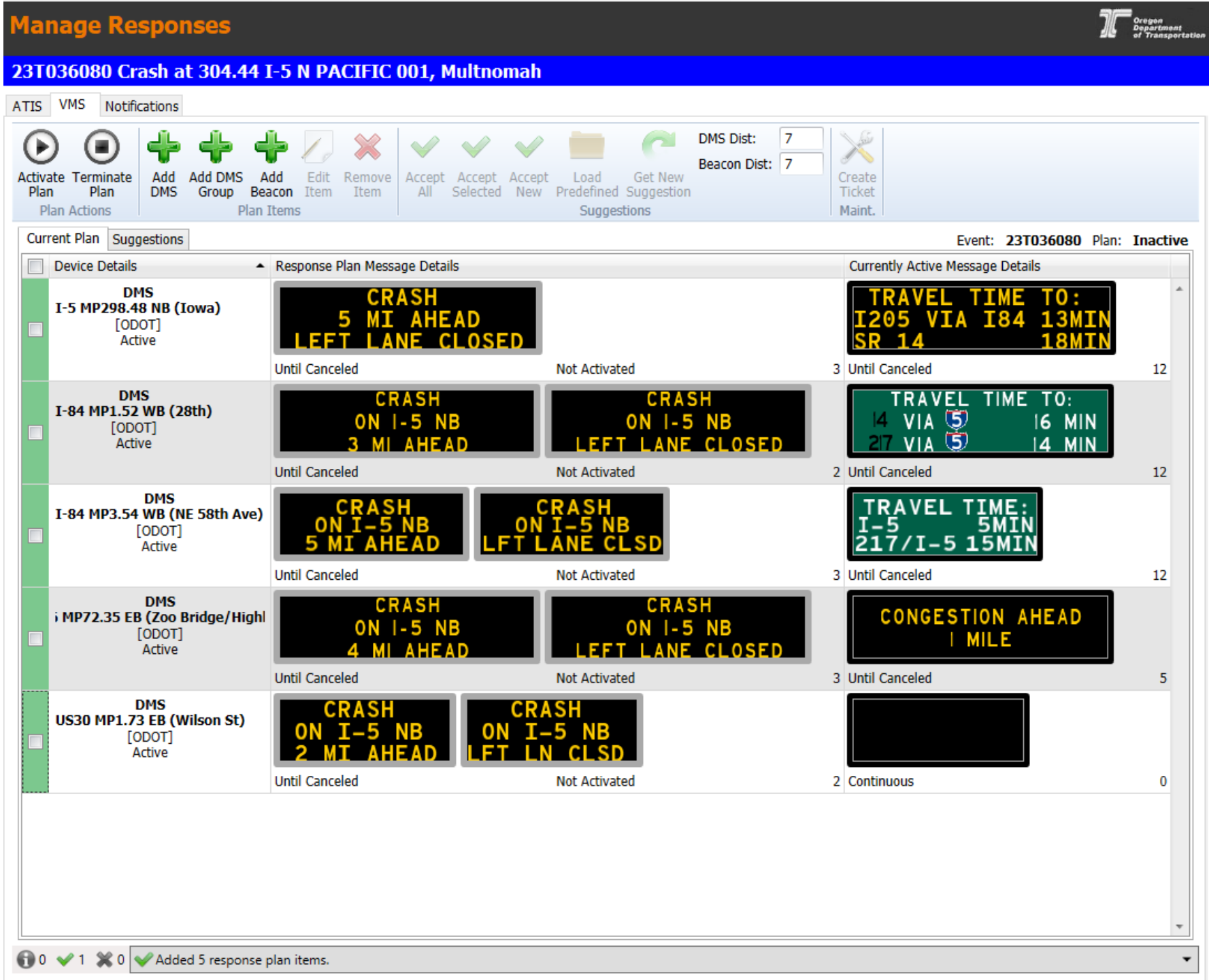
TOC ConOps


SNOW ZONE
CHAINS
ACCIDENT
5 MILES AHEAD
SPEED LIMIT 45
Roadside Warning Systems
HIGH WINDS FLOODS & SIESMIC
Other Agency Signals
when connected to ODOT local master
CCTV
ODOT Signals
NEWS
Media
Adjacent Regional TOC Networked Terminal
networked TOC data
Dynamic Message Signs
CMS
VMS
Variable Speed Limit
Highway Advisory Radio
RWIS
Traffic Metering System (Road Loops & Radar)
page notification, video stream
Travel Time
Ramp Meters
remote user access (RAS or VPN)
Statewide EOC Remote Terminal
Road Maintenance Personnel
ODOT Motor Carrier Division
current restrictions, device status, weight station status
incident response coordination
location, status & road weather data, safety checi-in
dispatch/paging & safety check*
Regional TOC
GIS Mapping
Incident Detection
Media & personnel Paging
reports & traffic impact events
ODOT Headquarters TOC Data Archive and Permit Database
research data
historical archive data
event permit request
Cities, Counties & Other Agencies as Required
crew assignments, availability, contract info
location, status/dispatch
District HQ Module
reports
road status data
location, status/dispatch*
Road Weather Reports
Automated De-icing
location (AVL), status, sensor and road weather data
dispatch*
location (AVL) / status
dispatch*
TOC System Reports
Management & Systems Control
phone inquiries
report incidents
Public
tow rotation data
Oregon State Police (OSP)
incident data and messages
license plate check request and admin msgs
incident, road-weather, device control or service request
weather, travel & incident data
weather forecast data
traveler information
Highway Advisory Telephone
TripCheck
www.tripcheck.com
COMMON INTERFACE
County 911/EOC's
(TOC contact for local Police & Fire)
incident info
Maintenance Vehicles
weather data
WSDOT Traffic & Weather
NOAA/Weather Services
Other States (WA, ID, CA)
Law Enforcement Data (LEDS)
Incident Response Vehicles
Oregon State Police Troopers
POLICE
Wireless Access
*wireless connection
network connection
telephone or network connection


New Event (F3)
Units (F5)
Communications (F6)
Notifications (F7)
Command Entry (F8)
Timers (F9)
Map (F10)
Road & Weather (F11)
ForseCom (F12)
Windows
Screen 1
Screen 2
Homescreens
Pin Ribbon
TOCS Event Overview - Commanding: 1,2B,2C,3,4,5,7,8,9,10,11,12,13,14,R1,R2,R3,R4,R5,SP,SW Monitoring:
Find Events
Planned Events
Start Date
Sub-Type
ID
Location
Impact
Crew
County
5/20/2023
Road Construction
23T000005
5/20/2023
Road Maintenance Operations
23T000004
Potential Events
Reminders
ID
Sub-Type
Impact
22T000640
Test
No to Minimum
Pending Events
Reminders
ID
Elap Time
Impact
1
23T000001
1mo+
< 20 min
22T000629
9mo+
No to Minimum Del
22T000598
9mo+
No Impact
Active Events
Reminders
ID
Sub-Type
Location
23T000003
Crash
250 I-5 N PACIFIC 001
22T000646
Animal Struck - Non-
55 I-5 NnS PACIFIC 0(
22T000645
Abandoned Vehicle -
165 I-84 COLUMBIA F
22T000645
Abandoned Vehicle -
165 I-84 COLUMBIA F
22T000642
Test
55 I-5 PACIFIC 001
22T000639
Wrong Way Driver
63 I-84 COLUMBIA RI
1
22T000613
Test
55 I-5 PACIFIC 001
22T000597
Crash
283.1 I-5 PACIFIC 001
1
22T000546
Road Construction
253.87 - 255 I-5 PACIFI
23T000003 Active – Responding Crash at 250 I-5 PACIFIC 001, Marion
23T000003 Crash at 250 I-5 PACIFIC 001, Marion
Oregon Department of Transportation
Event Description
Sub-Type
Crash
Reset
Priority
1
Sensitive
Status
Active – Responding
Event Record...
Source
Location
Located
Reset
Created
04/19/23 15:38
Originator ID
ISD01
Dispatcher ID
ISD01
Related
Shared
Ext Related
Crew
2201
Tow Zone
2102
Event History Report
Loc. Code
250 5 n
All CAs
Route
I-5
NB
Highway
PACIFIC - 001
County
Marion
Milepost
250
Z (0.00-308.38)
44.86433, -123.00745
ForseCom
Customize/Override
Manual Alert
Impact
Closure
Est. Clear
04/19/2023 23:38
Cmnd
3
SB
NB
Cross Street
All
Recovery Begin Time
Remarks...
Event Attributes
Calendar
---- 04/19/2023 ----
15:38 testing
---- 05/19/2023 ----
09:12 This is a test crash remark
[R]
Manage Remarks
Update Record
Responses
Milestones Completed
Lanes Cleared
Event Cleared
Manage Event Response Activities
Units...
Notifications
ATIS
VMS
Tows
Timers
Files
Unit
Prim.
Status
Notified
En Route
Arrived
Cleared
KCBJ
En Route
09:20
09:27
--:--
--:--
Assign Additional Units
Unit Number(s)
Assign
Event Record Management
Close

RPS

- Selects Signs
- Builds messages based on incident attributes
- Operator activated



Law Enforcement Integration

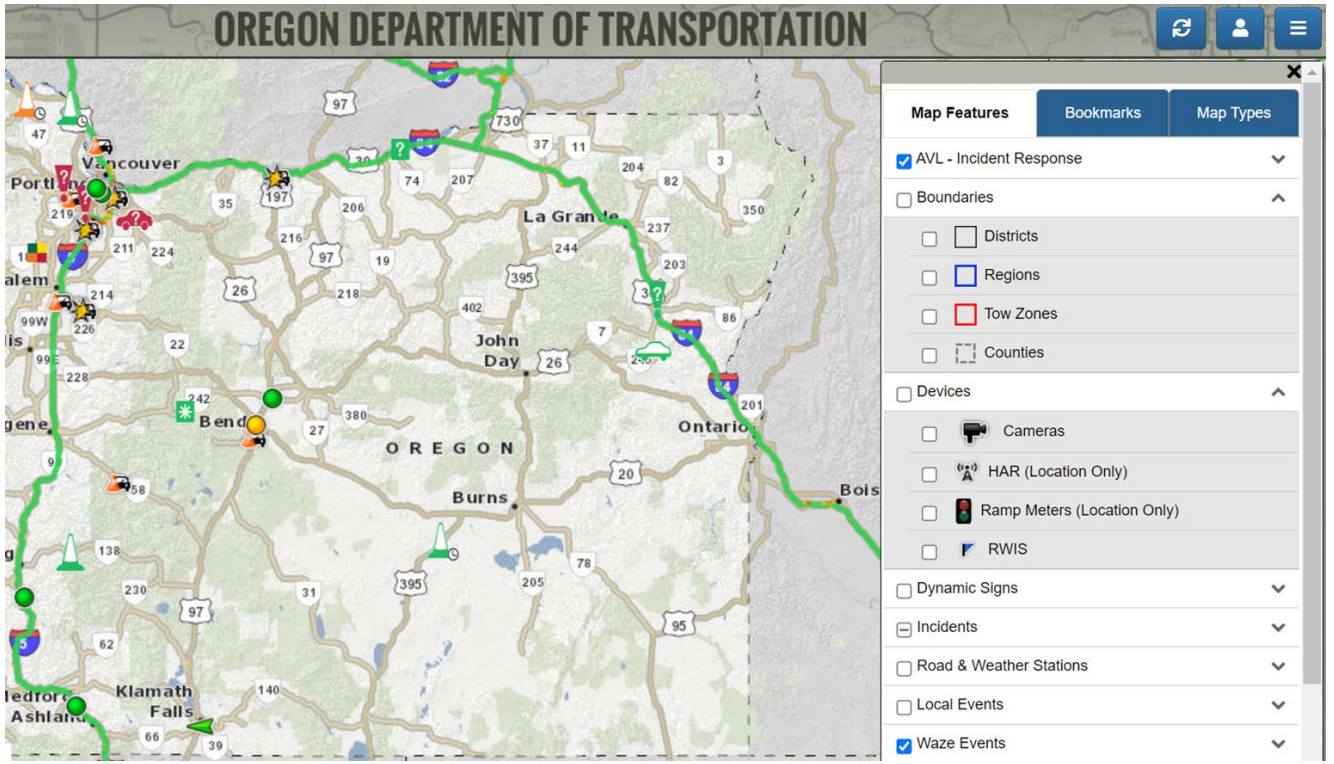
OIS Five Partnering Agencies

External Agency	Distinct Events
Deschutes County 911	3948
Frontier 911	1774
Hood River County 911	616
Oregon State Police	61466
Wasco County 911	71
Total	**64376**

INVIEW

Using INVIEW, you can:

- Search, update, create and view highway traffic events
- Search for crew and shift information
- Search for unit/crew member information
- Access the Crew Logger Tool
- Viewing INVIEW Map Includes Events and Conditions Throughout the State



Major Incident Report

- Gather/store additional details for fatal/serious injury incidents
- Weather conditions, infrastructure condition.
- Photos/videos
- Stored with dispatch record

Oregon Department of Transportation

Major Incident Report

Report Status:	Published	**Completed On Behalf Of:**	Atkinson, Brent
Last Updated On:	10/15/2019 2:52:49 PM	**Author:**	Atkinson, Brent

Section 1: Location

Highway Name	Highway Number	Route Number
WILLAMINA-SALEM	030	OR-22

Mile Post	District	County
5.0000	3	Polk

Section 2: Incident Details

Date Of Incident	Event ID	Time Of Day	Posted Speed
10-14-2019	19T002690	09:36:38	55

Hazmat?	If Yes, Hazmat Material	CAO?	Fatality?	Injury?
No		No	Yes	Yes

Section 3: Conditions

Temperature	Grade	Roadside Vegetation	
52	Horizontal curve	Moderate Vegetation	

Weather	Visibility	Road/Pavement	Other
Overcast	Unlimited, Daylight	Dry	

Section 4: Files

File Name: 20160313_205825 (2).jpg

Notes:

File Name: 126_closure_pic_b.jpg

Notes:

Home
Map
Event Search
Add New Event
Repairs
Resource Search
Add Resource
Road & Weather
Update R&W Report
Snow Zones
Crew Logger
Secure Reports
General Reports
Tools

Subscription # 1 for Galen McGill

Rules | Districts/Crews | Mile Points | Devices | Days and Times | Summary

Notify me about the following rules:

Filter:

- Amber or Missing Person Alert
- AOC Activation
- Applications
- Applications - Emergencies
- Automated Chain (Cond. A) Activation/Deactivation
- Automated Congestion Cleared
- Automated Congestion Detected
- Automated Congestion Persists
- Automated Flood Warning
- Automated Freezing Fog Condition Alert
- Automated Ice Warning
- Automated Overlength Vehicle
- Automated RWIS Fog Warning
- Automated RWIS Freezing Precipitation
- Automated RWIS Ice Warning
- Automated RWIS Station Communications
- Automated Variable Speed All

Add

Remove

Assigned

- Closure - I-5
- Closure - I-84
- Closure - US20
- Closure - US26
- Closure - US97
- Earthquake
- Fatal Crash
- Tsunami

ctrl + click to select multiple subscription rules

View Rules Description

Next Step

Exit Without Saving | Save & Continue | Save & Exit

INVIEW

- Home
- Map
- Event Search
- Add New Event
- Repairs
- Resource Search
- Add Resource
- Road & Weather
- Update R&W Report
- Snow Zones
- Crew Logger
- Secure Reports
- General Reports
- Tools

Subscription # 1 for Galen McGill

Rules | Districts/Crews | Mile Points | Devices | Days and Times | Summary

Notify me for the following districts/crews:

- (•) Receive ALL notifications
- ( ) Receive notifications for specific districts and/or crews

Previous Step

Next Step

Home
Map
Event Search
Add New Event
Repairs
Resource Search
Add Resource
Road & Weather
Update R&W Report
Snow Zones
Crew Logger
Secure Reports
General Reports

Subscription # 1 for Galen McGill

Rules | Districts/Crews | Mile Points | Devices | Days and Times | Summary

Notify me during these days/times:

- ○ Receive these notifications 24/7
- ◉ Receive these notifications during the following days and times

Add a new schedule

Start - select a day - ▾ ☐ All Day Add
End - select a day - ▾ Clear

Schedules for this notification

No Schedules are defined for this subscription.

Previous Step

Next Step

ATM & Road Weather Applications

ODOT RWIS Count by Area

184 RWIS Total

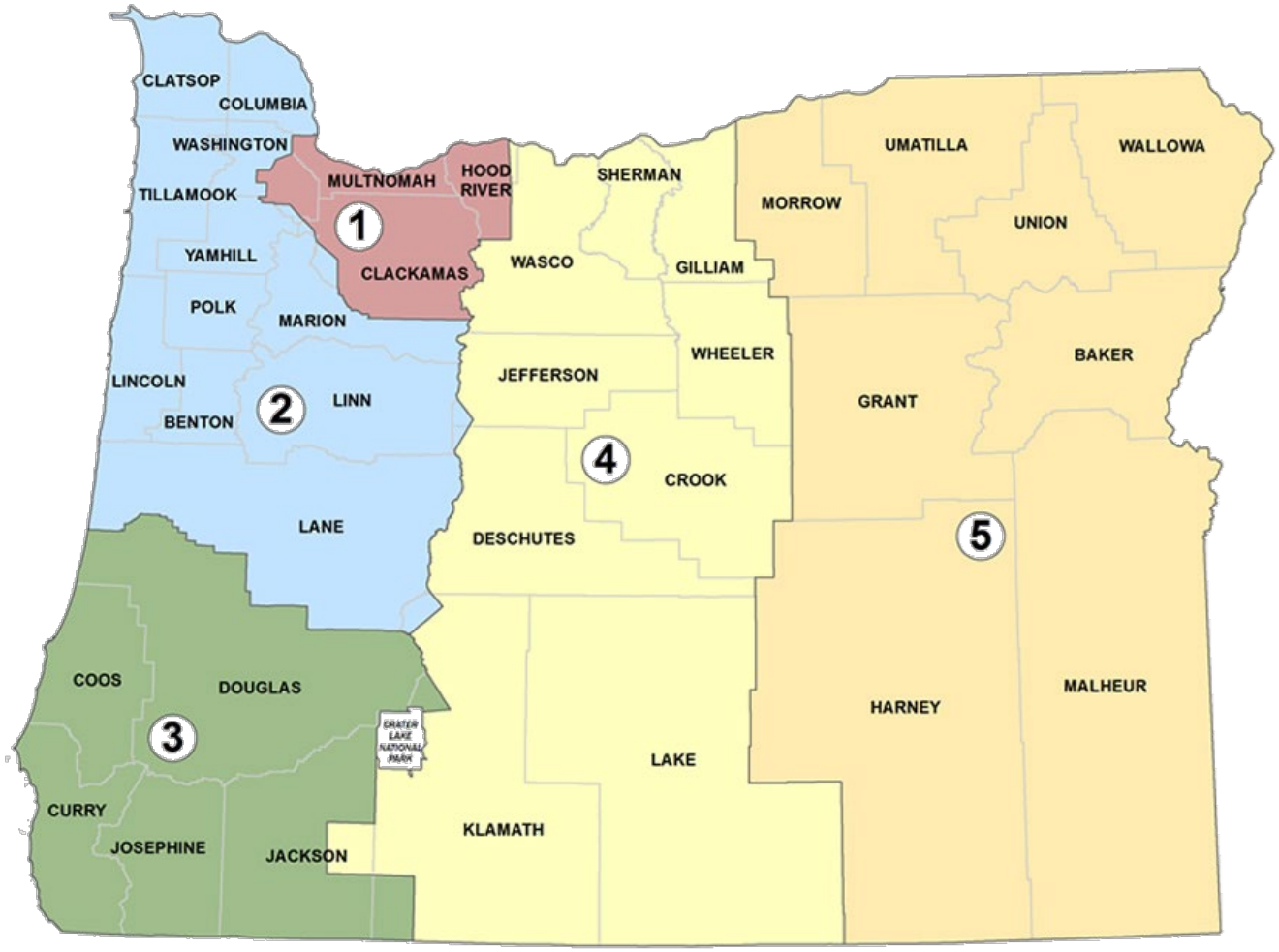
Region 1: **33**

Region 2: **40**

Region 3: **29**

Region 4: **45**

Region 5: **37**



Rural Weather Warning Systems

Weather Response Curve Warning

The signs are weather responsive displaying icy or wet conditions

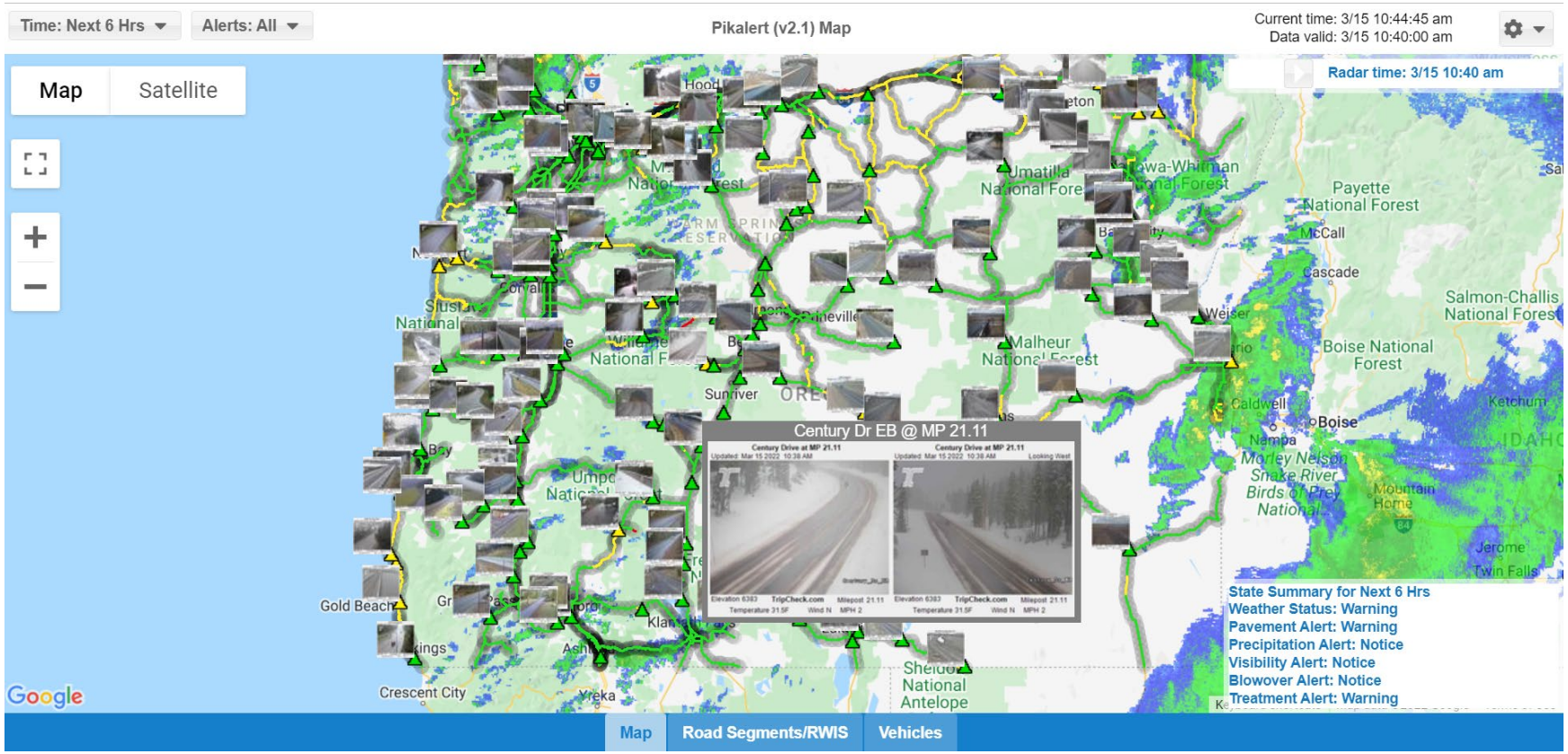
Signs are activated via grip factor, surface temperature, and surface condition data

PikAlert

Provides weather forecasts up to 72 hours out by specific roadway segment.

Includes a Maintenance Decision Support System (MDSS) which suggests treatment types, timing, rates, and locations.

Current RWIS observations are available on Pikalert.

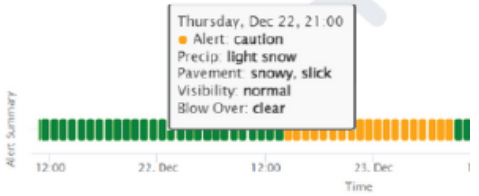


PikAlert

PIKALERT FEATURES

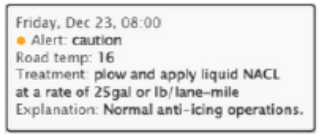
ALERT SUMMARY

A quick temporal view of where activity is expected.



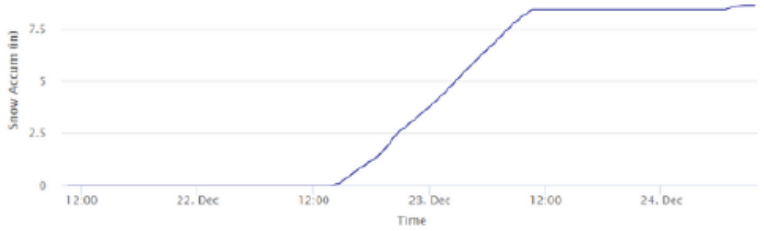
RECOMMENDED TREATMENTS

Detailed treatment recommendations at the time they should be applied.



SNOW ACCUMULATION

A graph showing expectation of snow accumulation over time.



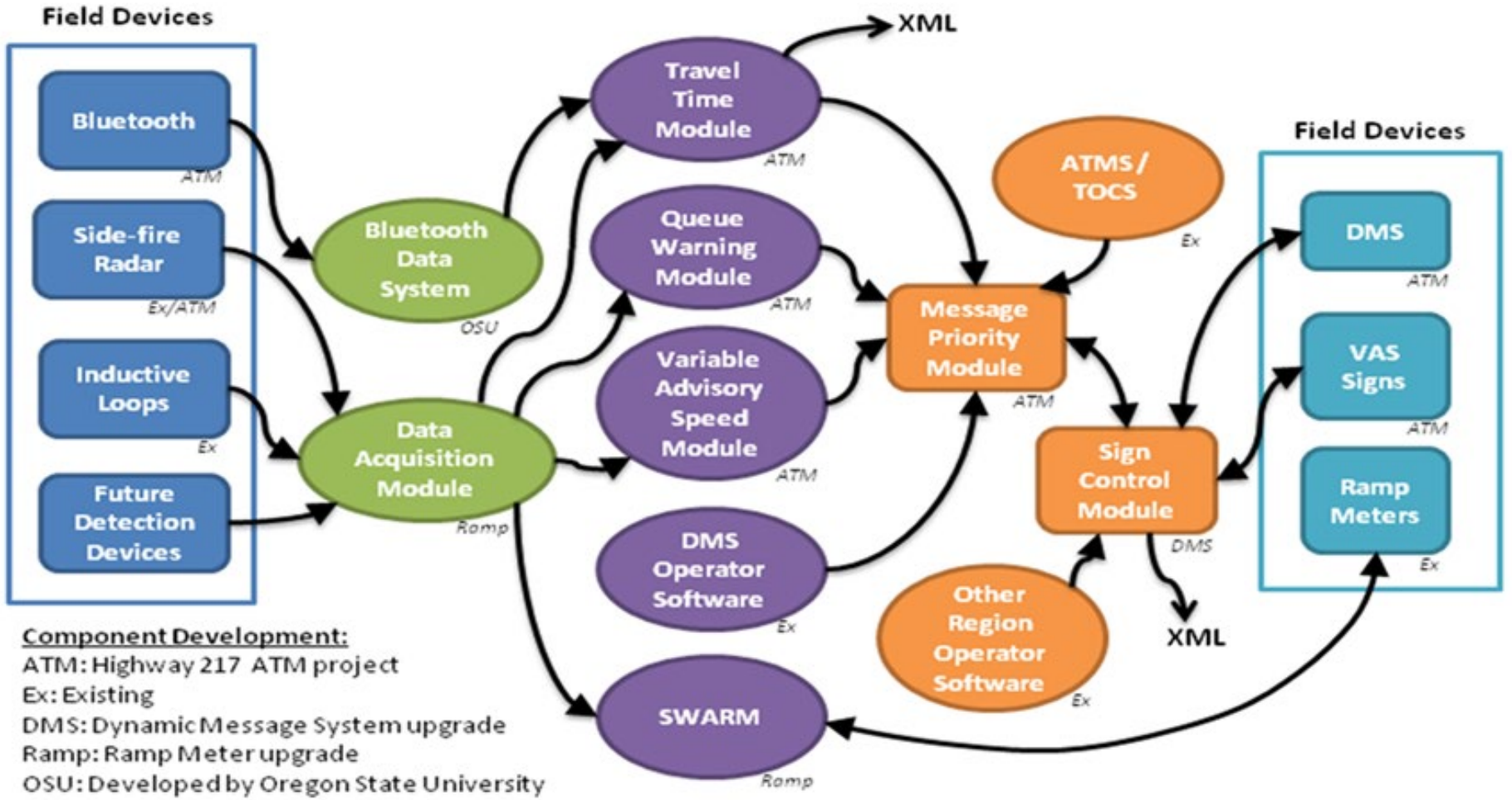
SNOW RATE

A graph showing inches of snow per hour over time.

ATM System Concepts

Goals

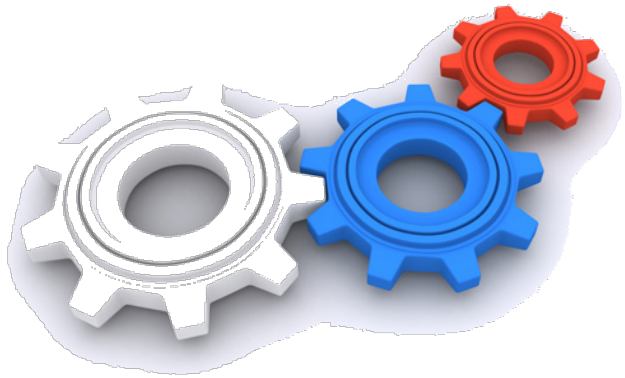
System Overview



DMS Message Priorities

MQM Priority	Operational Messages	NTCIP Priority
1	Drawbridge Ops, Road Closures and Emergencies	225
2	Incidents with High Impact (greater than 2h)	200
3	Incidents with Medium Impact (20min - 2h)	180
4	Incidents with Low Impact (less than 20min)	170
5	Adverse Weather or Environmental Conditions	150
6	Incidents with No To Minimum Imapct (Informational, Unconfirmed)	125
7	Construction or Maintenance	100
8	Amber Alert	75
9	Special Events	50
10	Travel Time	25
11	Special Public Safety Messages	10
12	Information Directed at Individual Vehicles	5
13	Public Service Announcement	2
14	Test Messages	1

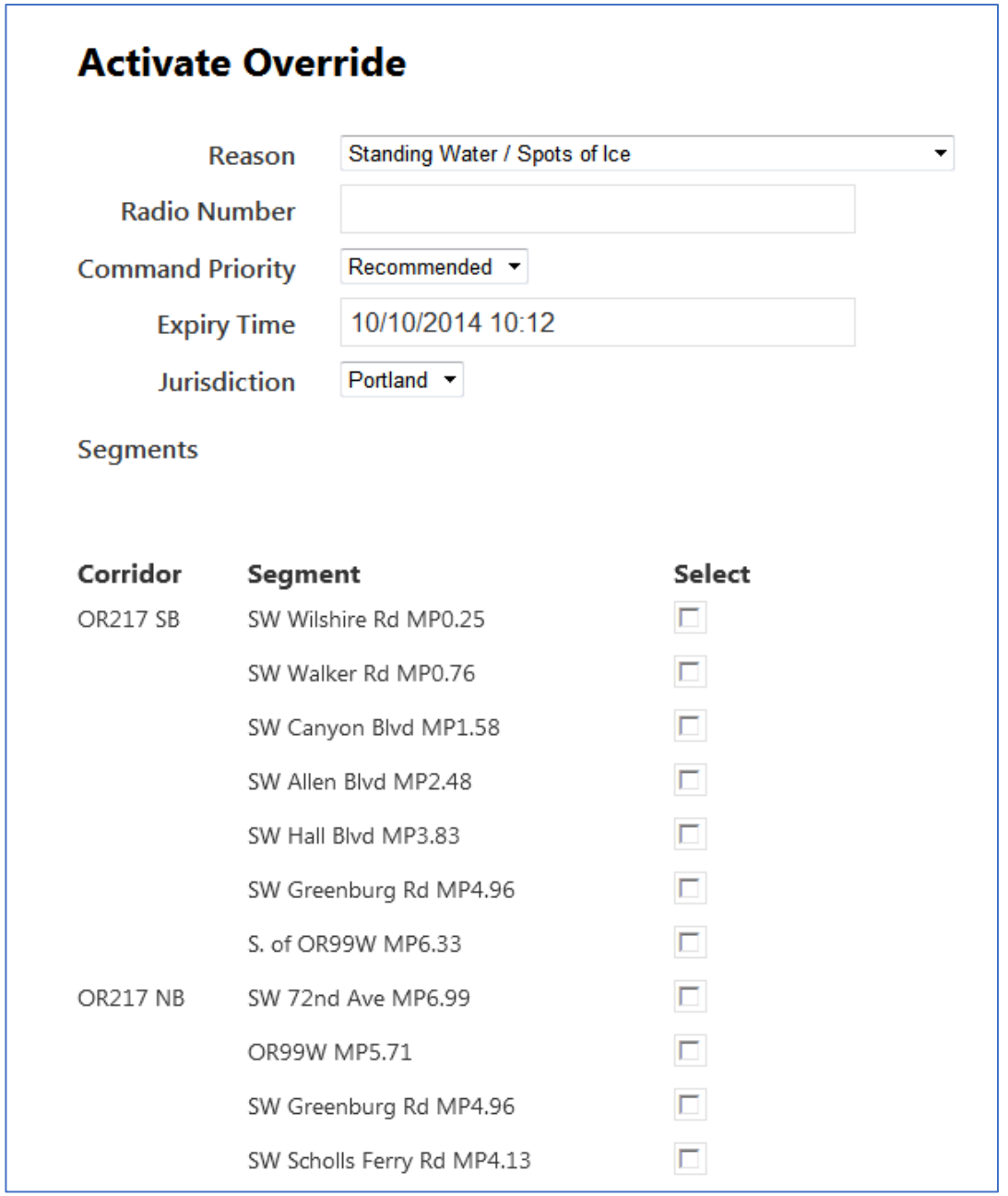
Process Priority



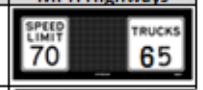
1. ATM – Queue Warning
2. ATM – Weather Warning
3. Multnomah Falls Parking
4. Response Plan System – Chain/Traction Tire restriction
5. Response Plan System – Incident message
6. Travel Time

Variable Speed Manual Override

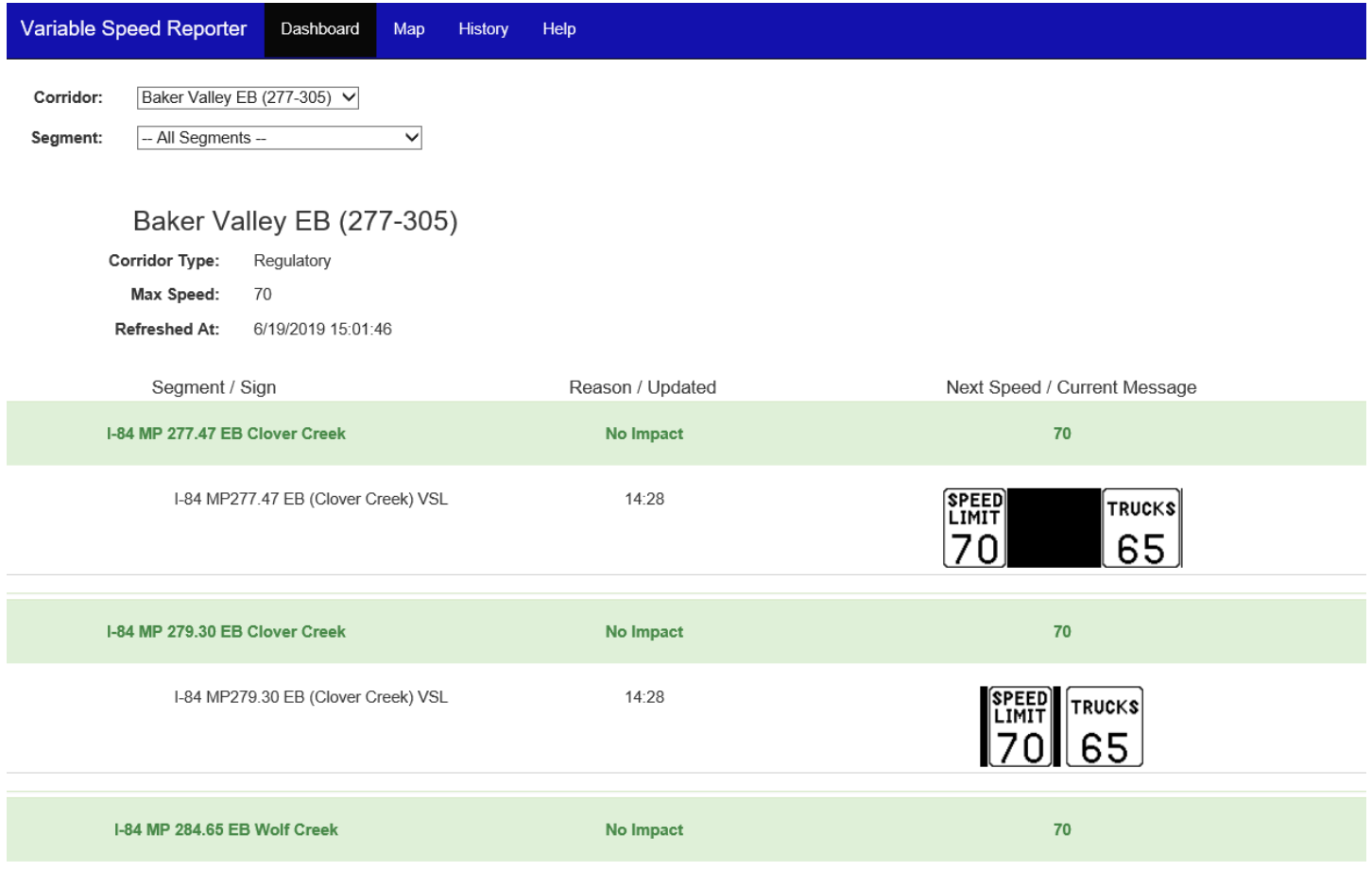
Reason for Override	Speed	Duration (Default)
(70 MPH) Black Ice / Packed Snow	45	30 min
(70 MPH) Black Ice / Packed Snow - Escalated	30	30 min
(70 MPH) Condition B / B1 - Chain Requirement in Effect	45	30 min
(70 MPH) Condition C - Chain Requirement in Effect	35	30 min
(70 MPH) High Winds	55	30 min
(70 MPH) Ice / Packed Snow - Plus Low Visibility	30	30 min
(70 MPH) Standing Water / Spots of Ice	55	30 min
(70 MPH) Visibility Less Than 500 Feet	55	30 min
Black Ice / Packed Snow	Posted Speed - 20	30 min
Black Ice / Packed Snow - Escalated	Minimum Slow Speed	30 min
Condition B / B1 - Chain Requirement in Effect	45	30 min
Condition C - Chain Requirement in Effect	35	30 min
High Winds	Posted Speed – 10	30 min
Ice / Packed Snow - Plus Low Visibility	Minimum Slow Speed	30 min
Standing Water / Spots of Ice	Posted Speed - 10	30 min
Visibility Less Than 500 Feet	Posted Speed - 10	30 min
System Failure - Faulty Data	Posted Speed (Max)	48 hours



ATM Condition Table for Speed Reduction

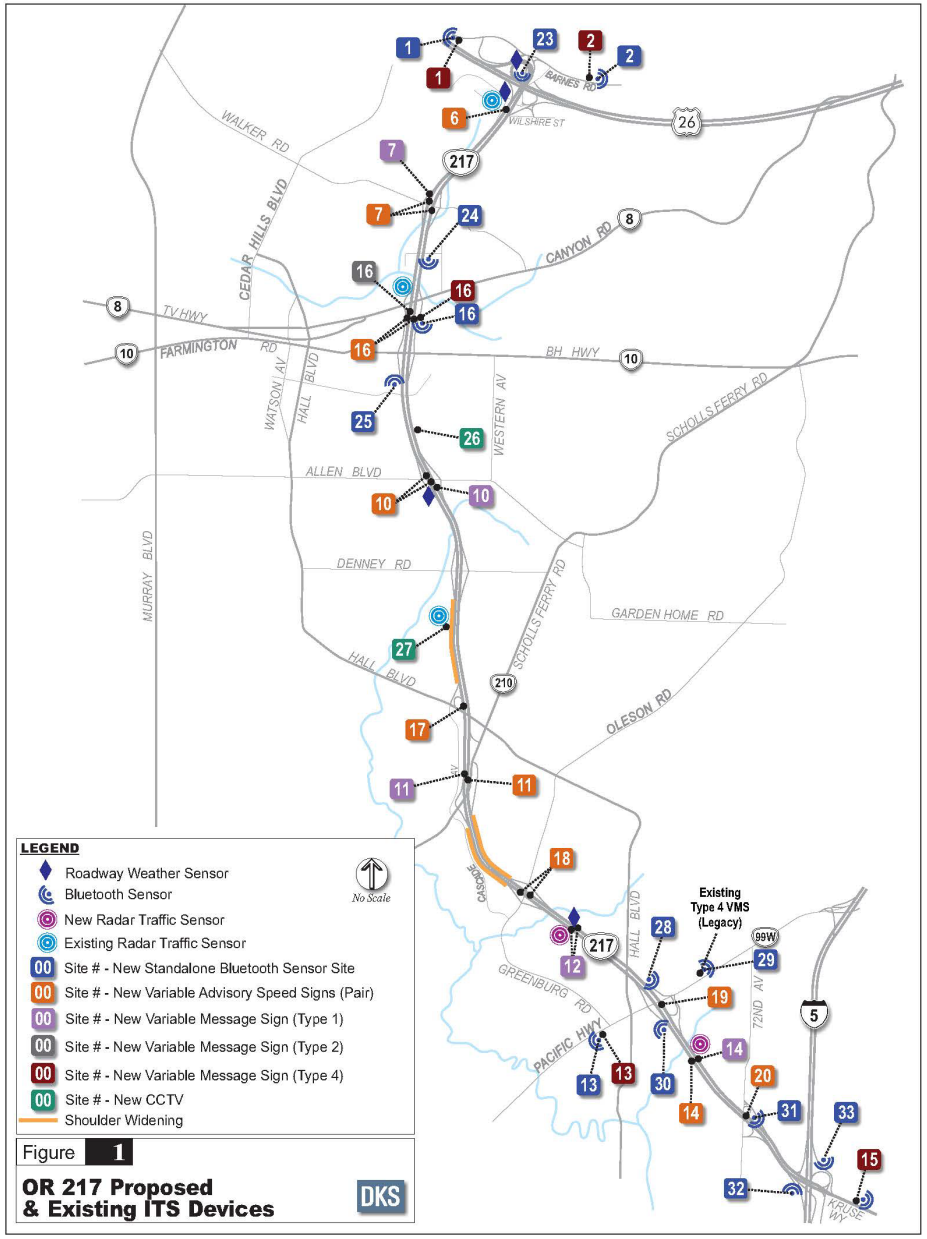
Condition Code	Surface Condition Classification	Grip Factor	Visibility	Air Temperature	Condition Speed for 65 MPH Max Speed Limit Highways	Condition Speed for 70 MPH Max Speed Limit Highways	Weather Message	Actual Sign Message for 70 MPH Highways
1	Moist, Wet	Greater Than Threshold	Greater Than Threshold	Greater Than Threshold	Maximum Speed	70 MPH 65 MPH for Trucks	None	
2	Moist, Wet	Greater Than Threshold	Greater Than Threshold	Less Than Threshold	Maximum Speed	70 MPH 65 MPH for Trucks	None	
3	Moist, Wet	Greater Than Threshold	Less Than Threshold	Greater Than Threshold	Maximum Speed - 10 MPH	55 MPH	Low Visibility	
4	Moist, Wet	Greater Than Threshold	Less Than Threshold	Less Than Threshold	Maximum Speed - 10 MPH	55 MPH	Low Visibility	
5	Moist, Wet	Less Than Threshold	Greater Than Threshold	Greater Than Threshold	Maximum Speed - 20 MPH	45 MPH	Slippery When Wet Sign	
6	Moist, Wet	Less Than Threshold	Greater Than Threshold	Less Than Threshold	Maximum Speed - 20 MPH	45 MPH	Slippery When Wet Sign	
7	Moist, Wet	Less Than Threshold	Less Than Threshold	Greater Than Threshold	Minimum Speed (30 MPH)	30 MPH	Slippery When Wet Sign	
8	Moist, Wet	Less Than Threshold	Less Than Threshold	Less Than Threshold	Minimum Speed (30 MPH)	30 MPH	Slippery When Wet Sign	
9	Frosty, Snowy, Icy, or Slushy	Greater Than Threshold	Greater Than Threshold	Greater Than Threshold	Maximum Speed	70 MPH 65 MPH for Trucks	None	
10	Frosty, Snowy, Icy, or Slushy	Greater Than Threshold	Greater Than Threshold	Less Than Threshold	Maximum Speed	70 MPH 65 MPH for Trucks	None	
11	Frosty, Snowy, Icy, or Slushy	Greater Than Threshold	Less Than Threshold	Greater Than Threshold	Maximum Speed - 10 MPH	55 MPH	Low Visibility	
12	Frosty, Snowy, Icy, or Slushy	Greater Than Threshold	Less Than Threshold	Less Than Threshold	Maximum Speed - 10 MPH	55 MPH	Low Visibility	

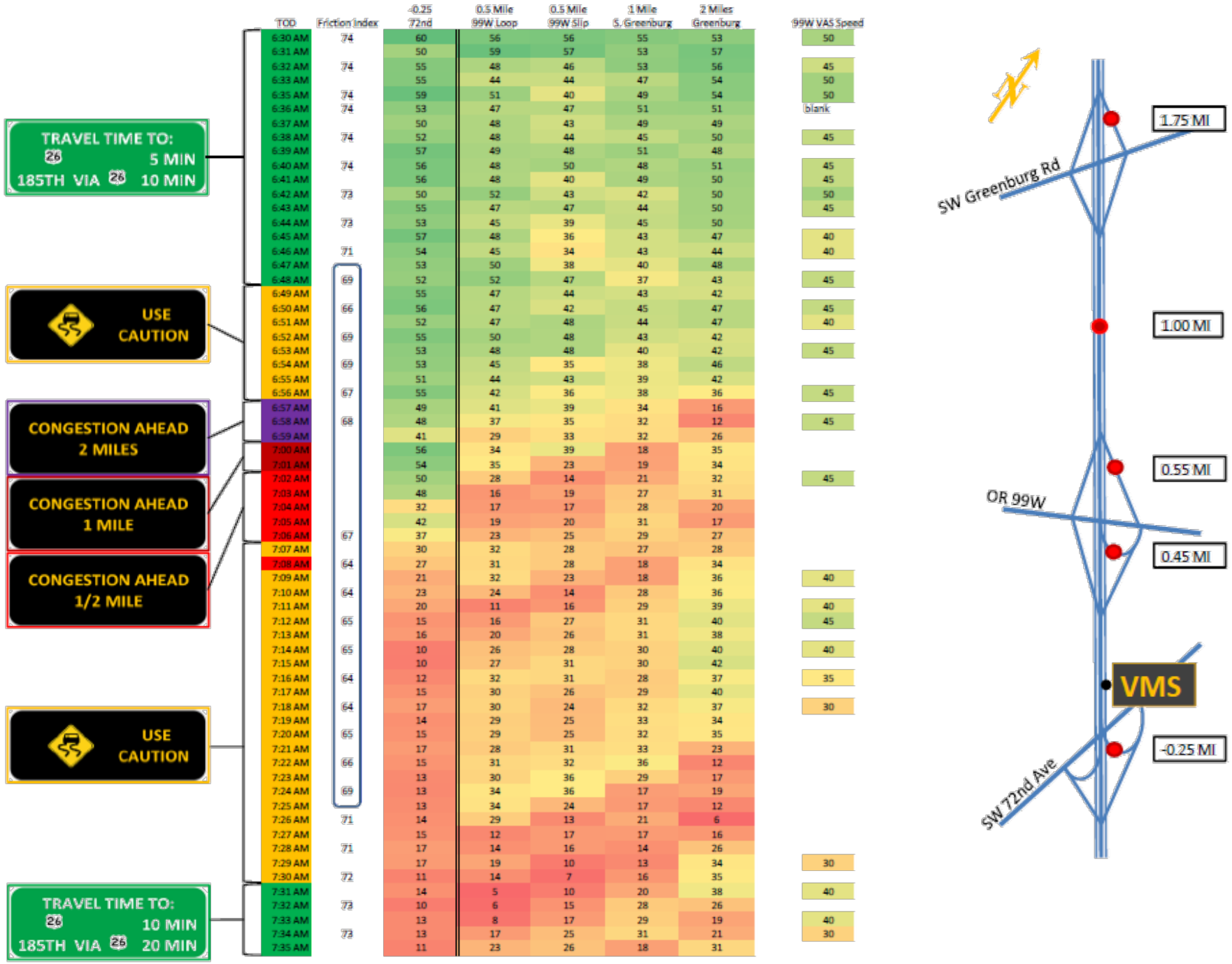
Law Enforcement Data Portal



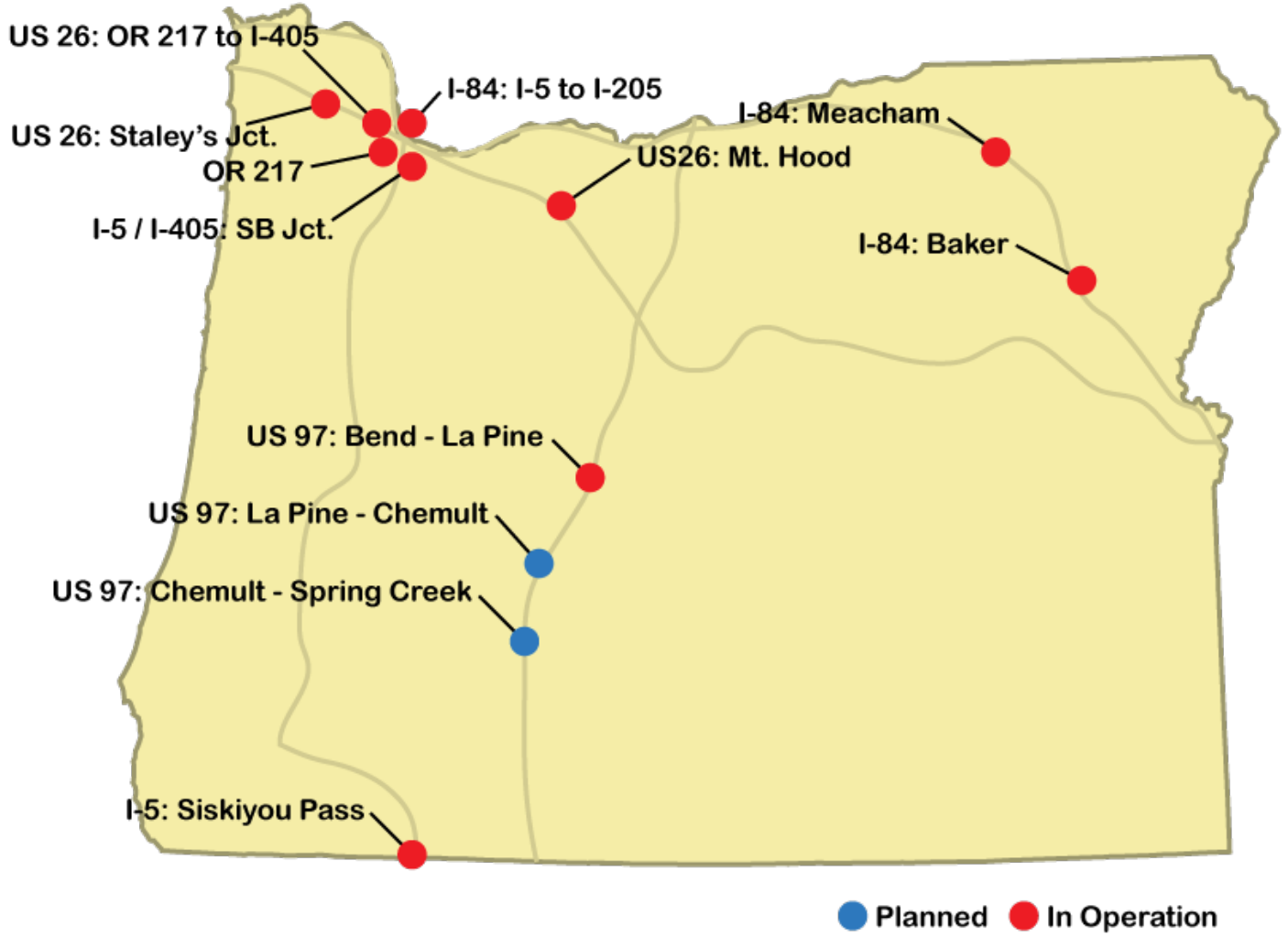
OR-217 Variable Advisor Speeds - Overview

- 7.5 Mile Highway Connecting I-5 And US-26
- 2-3 Lane Freeway With 122,000 ADT
- Signs Provide Travel Time, Weather Warning, And Advisory Speed Limits
- Congestion And Weather Response




TRAVEL TIME TO:
26 5 MIN
185TH VIA 26 10 MIN
USE CAUTION
CONGESTION AHEAD 2 MILES
CONGESTION AHEAD 1 MILE
CONGESTION AHEAD 1/2 MILE
USE CAUTION
TRAVEL TIME TO:
26 10 MIN
185TH VIA 26 20 MIN
TOD
Friction Index
-0.25 72nd
0.5 Mile 99W Loop
0.5 Mile 99W Slip
1 Mile S. Greenburg
2 Miles Greenburg
99W VAS Speed
1.75 MI
SW Greenburg Rd
1.00 MI
0.55 MI
OR 99W
0.45 MI
VMS
-0.25 MI
SW 72nd Ave

Oregon ATM Systems



ODOTs AVL/Telematics program.

Interstate 84 pileup in eastern Oregon

Images from the Oregon Department of Transportation show a massive pileup that closed Interstate 84 in eastern Oregon on Monday, Feb. 21, 2022. The crash occurred near Deadman Pass, east of Pendleton.

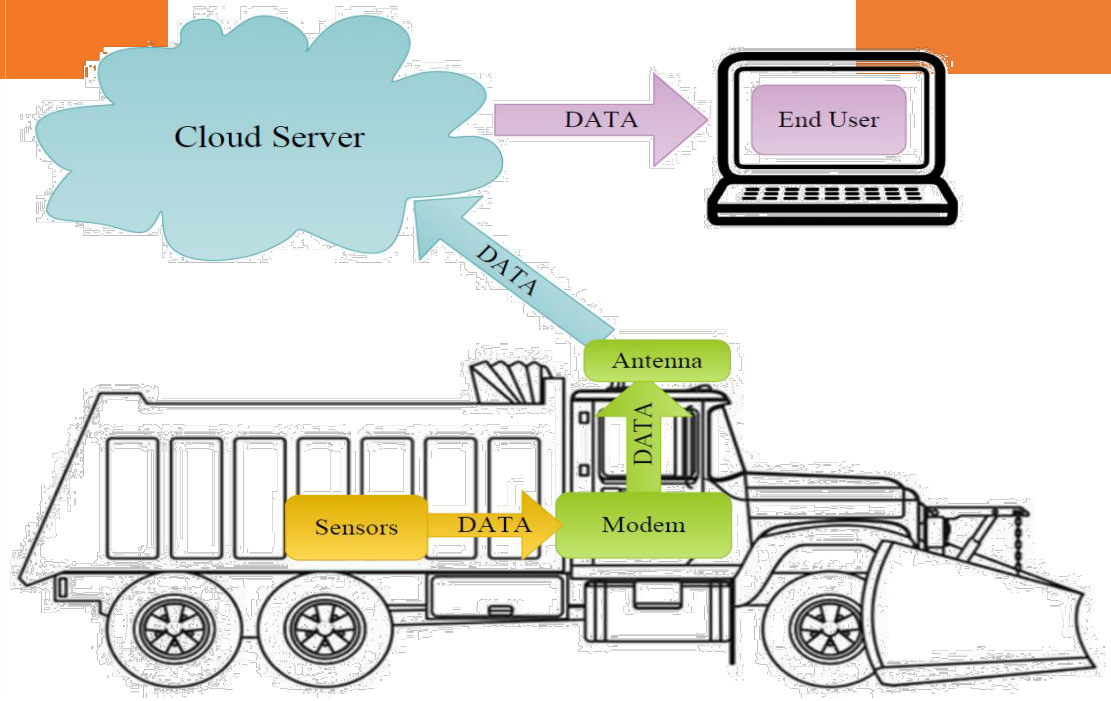
Crashes involving nearly 100 vehicles closes Interstate 84 on Feb. 21, 2022

ODOT AVL/Telematics

Initial Focus – **Safety, Stewardship & Tort Claims**

Is the Industry Standard

10 Year Contract With Gofleet / Geotab



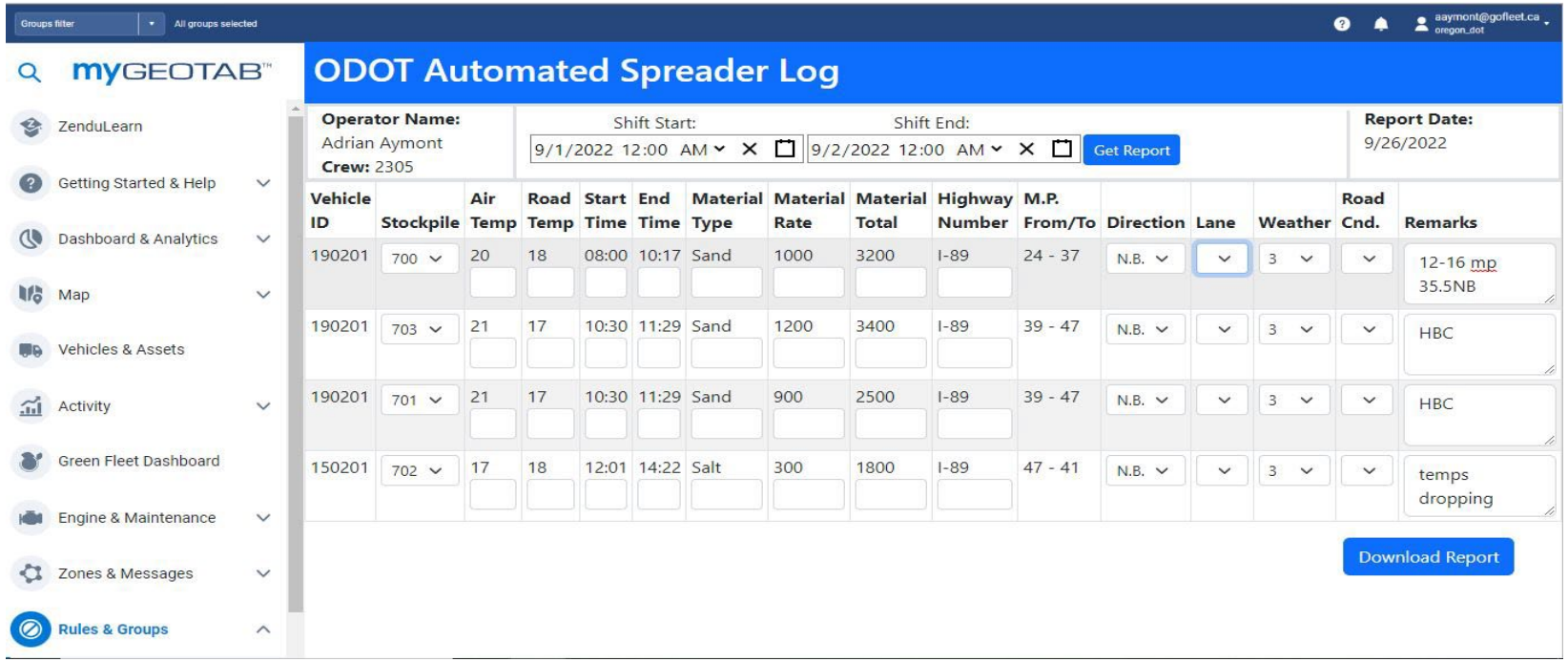
Progress summary

AVL in 970 vehicles across ODOT

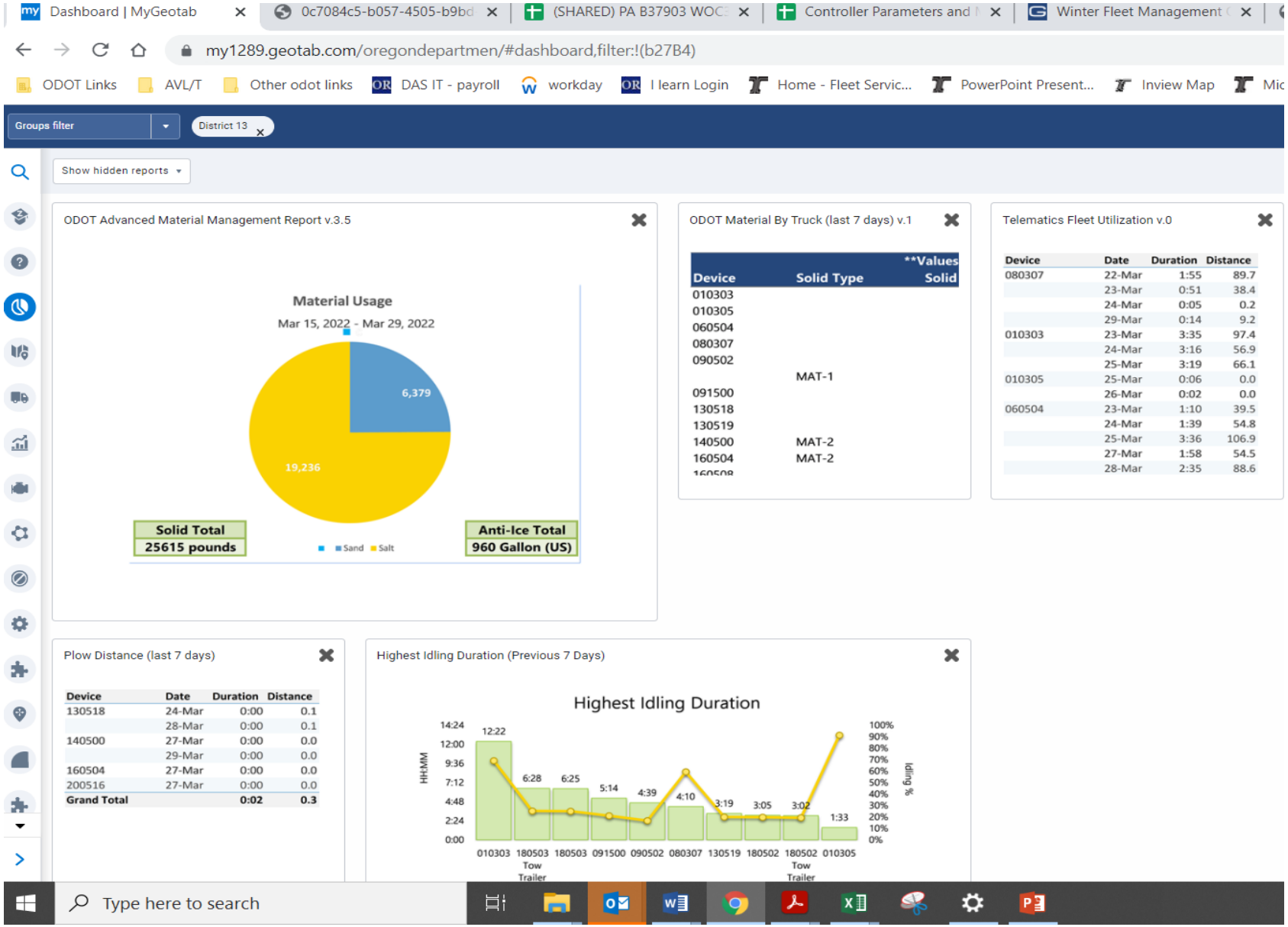
~120 w/ Full Telematics

All ODOT Heavy Fleet equipped by July 2025

Integration presents ongoing priority and responsibility

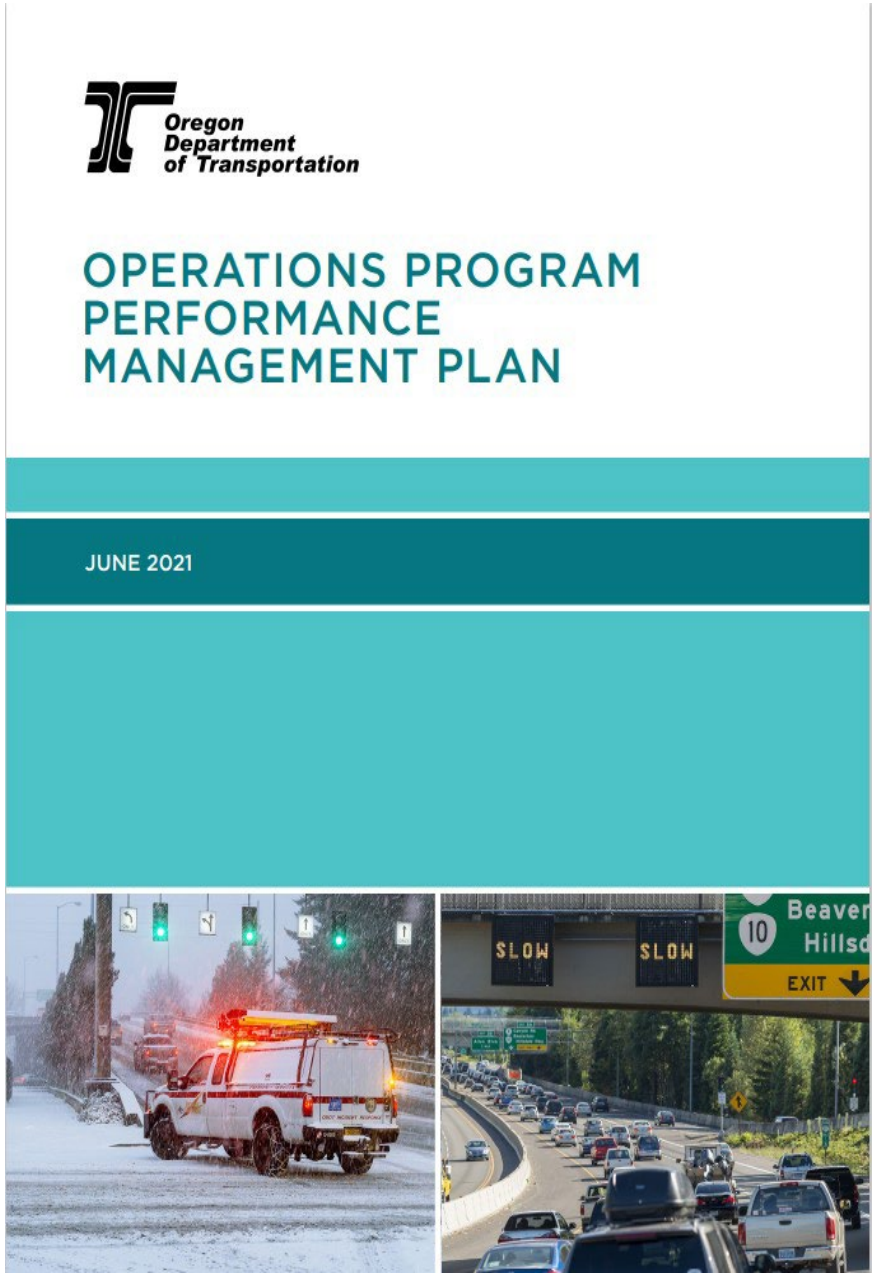


Data has become increasingly important



Data and Digital Infrastructure

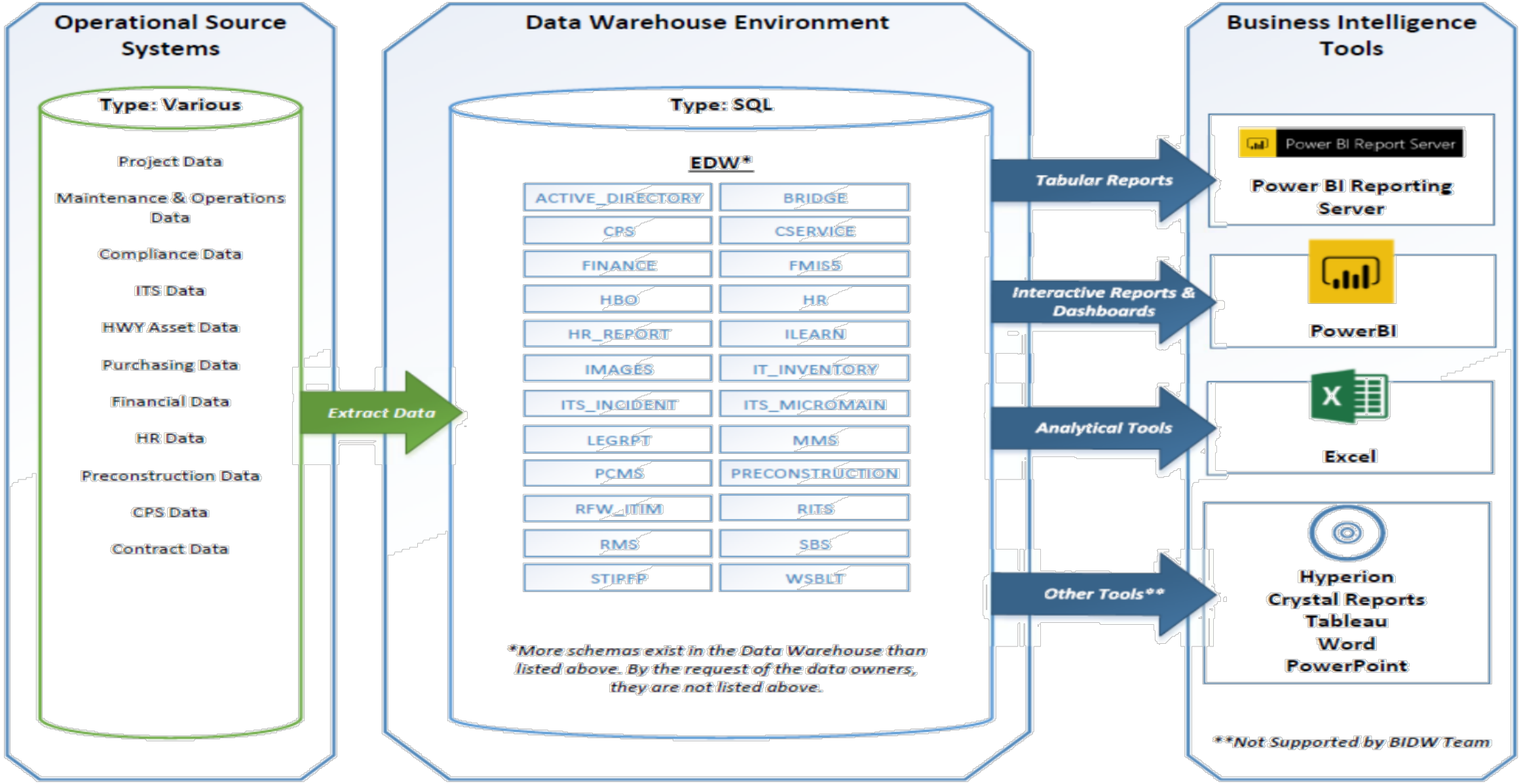
Performance Management



- Mobility
- Asset Management
- Work Management
- Traffic Incident Management
- Transportation Operations Centers
- Traveler Information
- Traffic Signals

ODOT BIDW Program Enterprise Technical Architecture

1/24/2020



INVIEW Reports

Core Performance Measures

- TOC Workload (TOC Actions)
- Major Incidents without Traveler Info. (ATIS)
- Events without Sent Notifications

Incident Lookup

- Current Incidents
- Event Summary - Long

Process Support Reports

- Response Plan System (VMS) Report
- Micromain Tickets Created in TOCS
- Blocking Crashes Over 90 Minutes Without Assigned Cause
- Annual Event Actions by Dispatcher and TOC
- Dispatcher Monthly Event Count
- Events per Dispatcher and Avg. Actions
- Command Use

TripCheck API v1.3

Search operations

Group by tag

TripCheck API v1.3

API definition Changelog

TripCheck API is designed to provide developers with access to the data available on ODOT's traveler information website, including incidents, cameras, message signs, weath
more information, go to https://www.tripcheck.com/.

CCTV Inventory

The CCTV Inventory datafeed provides an inventory of all available cameras currently displayed on TripCheck, along with an Internet URL that can be used to access the speci
Cameras may be ODOT owned and maintained or owned and maintained by a partner agency.

Cctv

Request

GET `https://api.odot.state.or.us/tripcheck/Cctv/Inventory[?DeviceId][&DeviceName][&RouteId][&Bounds]`

Request parameters

Name	In	Required	Type	Description
`DeviceId`	query	false	`string`	Accepts single device-id, or multiple comma delimited de "157-160,281"
`DeviceName`	query	false	`string`	Accepts single device-name, or multiple comma delimite contains search. Ex. "I-5 at Siskiyou Summit, Tollgate, I-84

Audi Person Signal Assistant

PRESS RELEASE

Traffic Technology Services, Inc. Establishes Oregon DOT as First Statewide Vehicle-to-Infrastructure Service, Escalates Virginia DOT to Largest

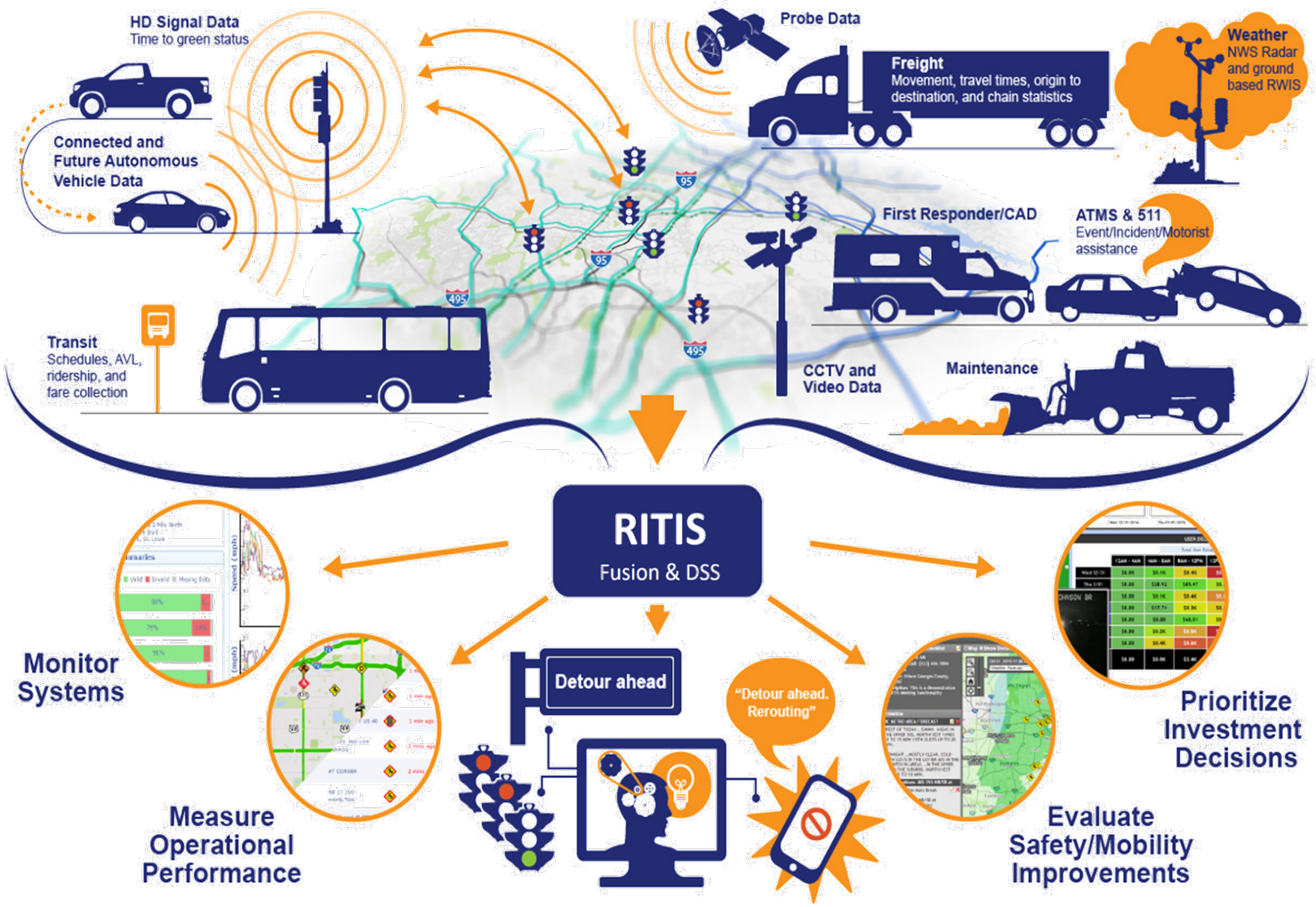
- Six state and District of Columbia Departments of Transportation (DOTs) providing data for TTS V2I system
- Audi expands Traffic Light Information feature based on TTS service

February 20, 2019

From Data Provider to Consumer

Challenges

RITIS is for Planning, Operations & Research



Probe Data Use

Preparing for the Future of Transportation Data

Strategic Action Plan Outcome: Implement Transformative Technology

By the end of 2023, ODOT will make advancements in projects that bring transformative technology to Oregon's Transportation System.

1. Connected Vehicle Ecosystem Project
2. Over-dimension Permit System Replacement
3. ODOT Broadband Strategy
4. Advanced Transportation Controller Upgrades

Oregon DOT 5.9GHz V2I Pilot

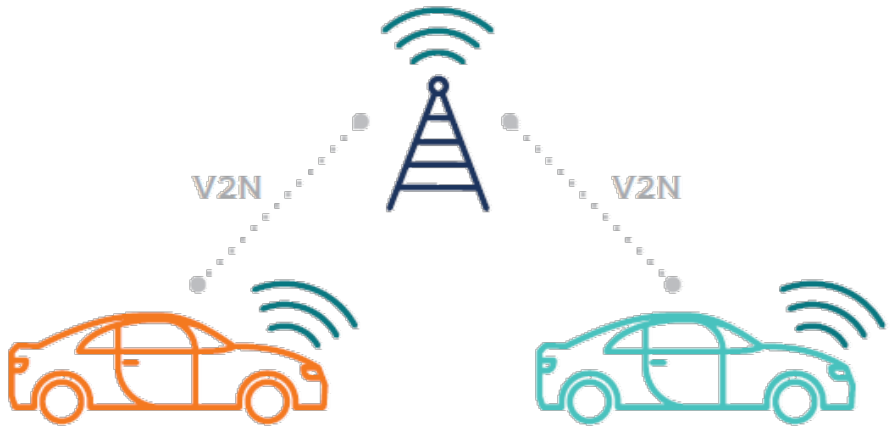
Connected Vehicle Ecosystem: Enabling V2I, I2V, V2V, and V2X

V2X VEHICLE-TO-EVERYTHING

DIRECT COMMUNICATIONS

- USES DSRC/C-V2X
- OPERATES IN THE ITS BAND (5.9 GHz)

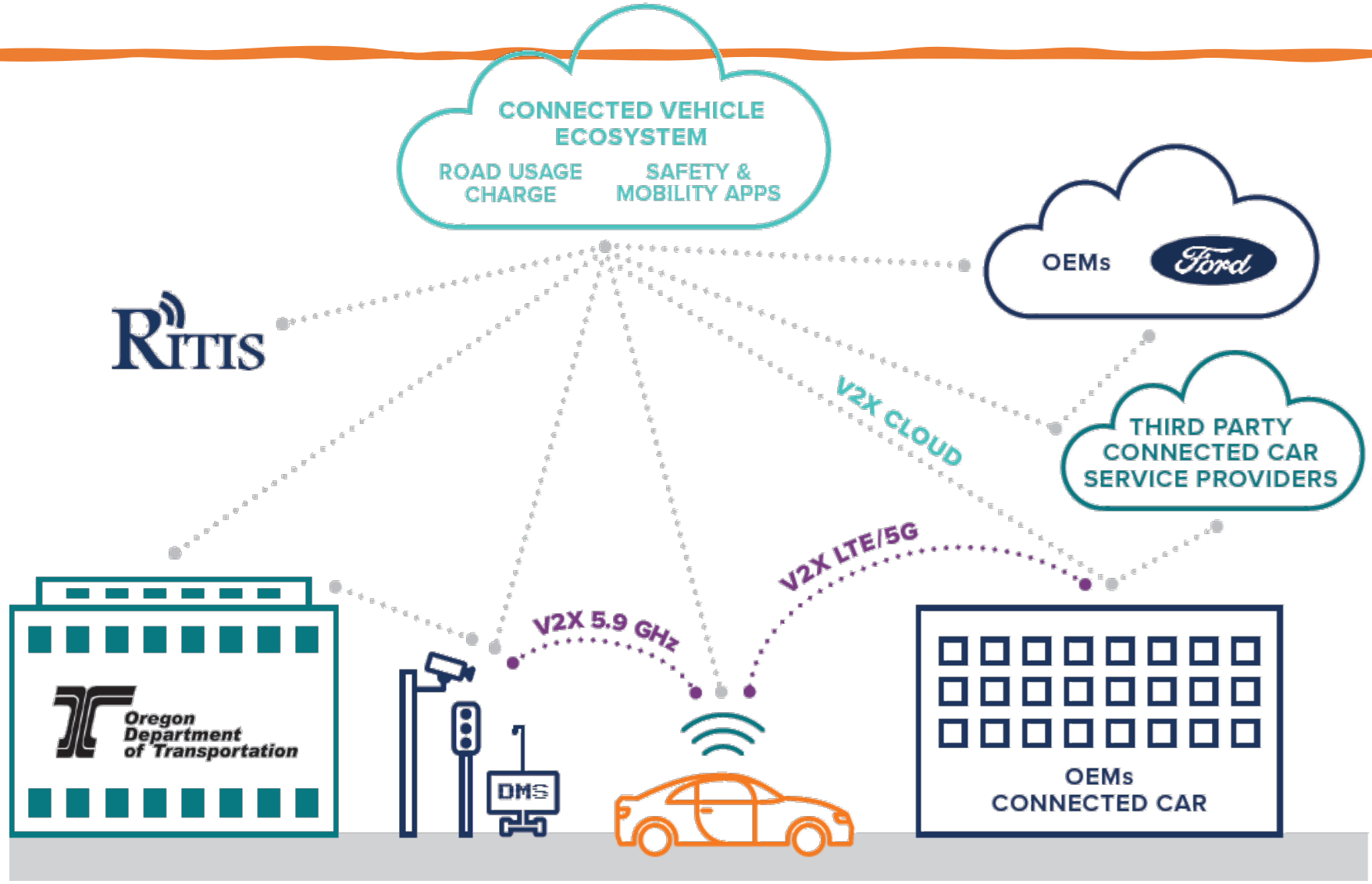
V2N VEHICLE-TO-NETWORK

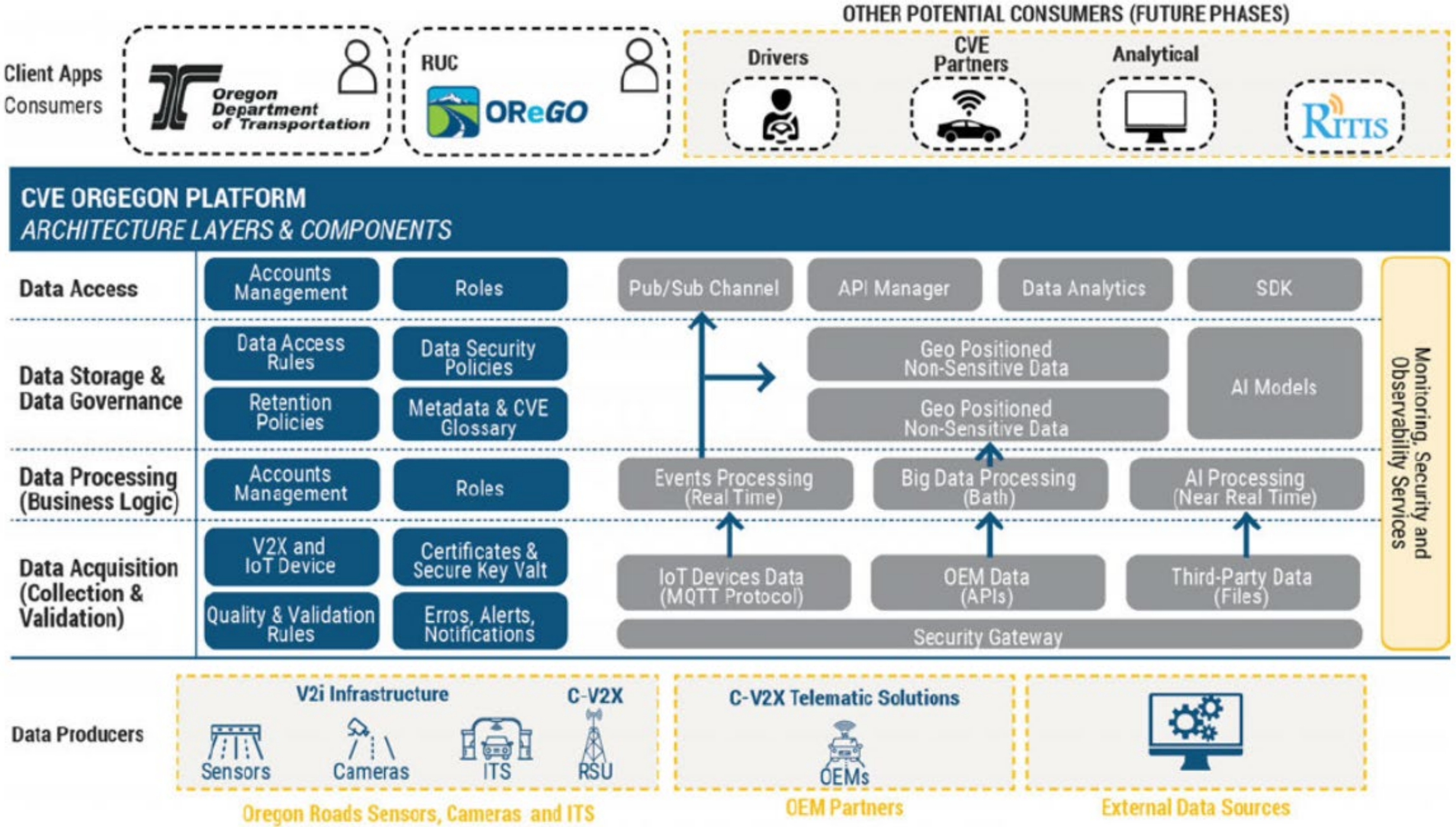


NETWORK COMMUNICATIONS

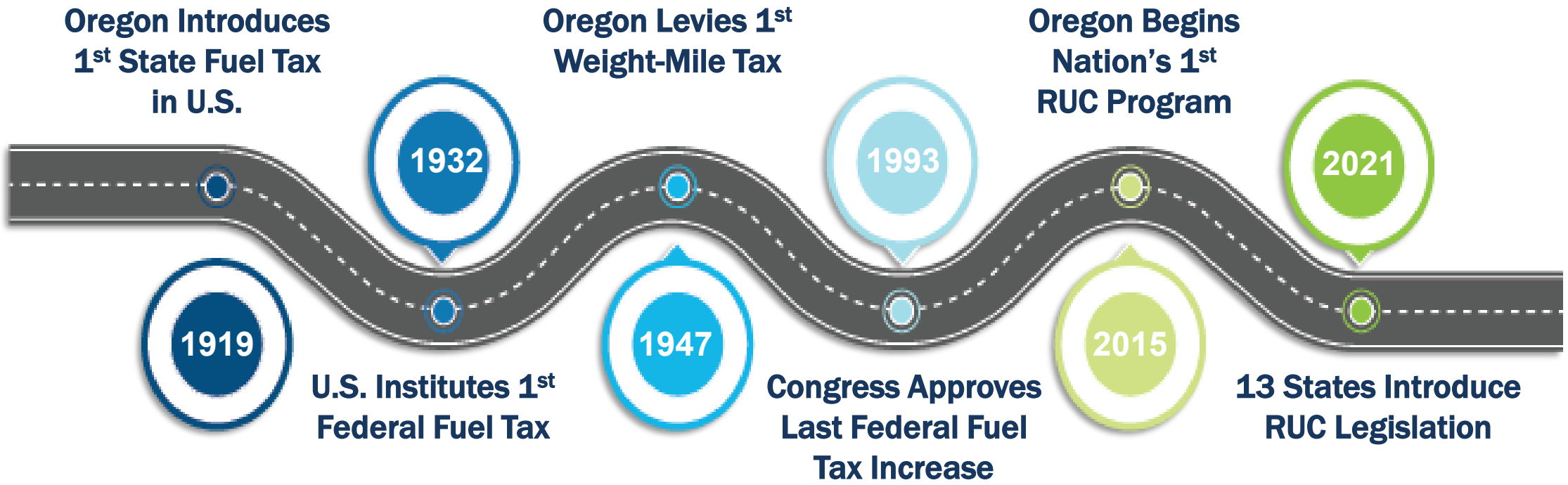
- LTE/5G FOR V2N
- OPERATES IN LICENSED CELLULAR SPECTRUM AND OVER THE INTERNET

Connected Vehicle Ecosystem



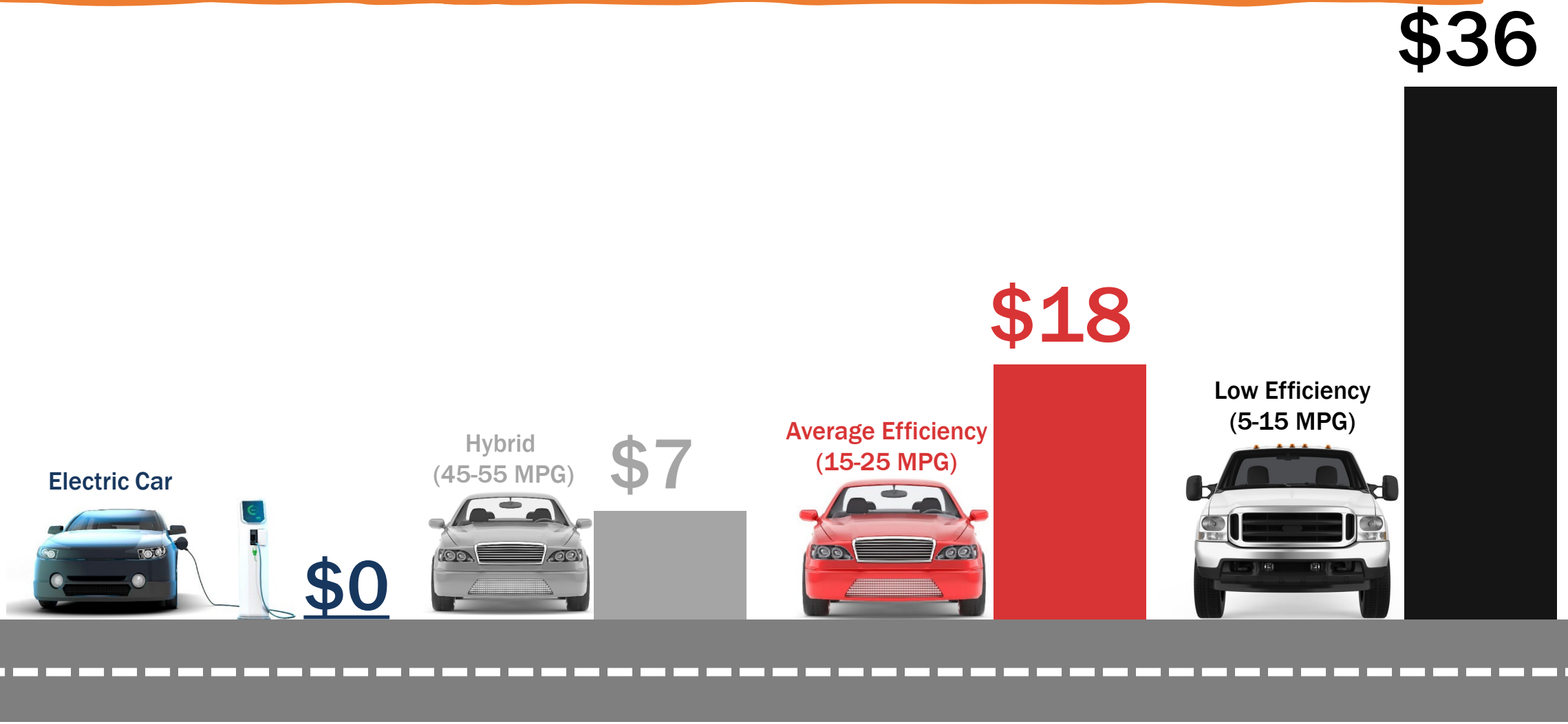

OTHER POTENTIAL CONSUMERS (FUTURE PHASES)
Client Apps
Consumers
Oregon Department of Transportation
RUC
OReGO
Drivers
CVE Partners
Analytical
RITIS
CVE ORGEGON PLATFORM
ARCHITECTURE LAYERS & COMPONENTS
Data Access
Data Storage & Data Governance
Data Processing (Business Logic)
Data Acquisition (Collection & Validation)
Accounts Management
Roles
Data Access Rules
Data Security Policies
Retention Policies
Metadata & CVE Glossary
Accounts Management
Roles
V2X and IoT Device
Certificates & Secure Key Valt
Quality & Validation Rules
Erros, Alerts, Notifications
Pub/Sub Channel
API Manager
Data Analytics
SDK
Geo Positioned Non-Sensitive Data
Geo Positioned Non-Sensitive Data
AI Models
Events Processing (Real Time)
Big Data Processing (Bath)
AI Processing (Near Real Time)
IoT Devices Data (MQTT Protocol)
OEM Data (APIs)
Third-Party Data (Files)
Security Gateway
Monitoring, Security and Observability Services
Data Producers
V2i Infrastructure
C-V2X
Sensors
Cameras
ITS
RSU
C-V2X Telematic Solutions
OEMs
Oregon Roads Sensors, Cameras and ITS
OEM Partners
External Data Sources

Our transportation funding system is old. But it has changed in response to technology changes.

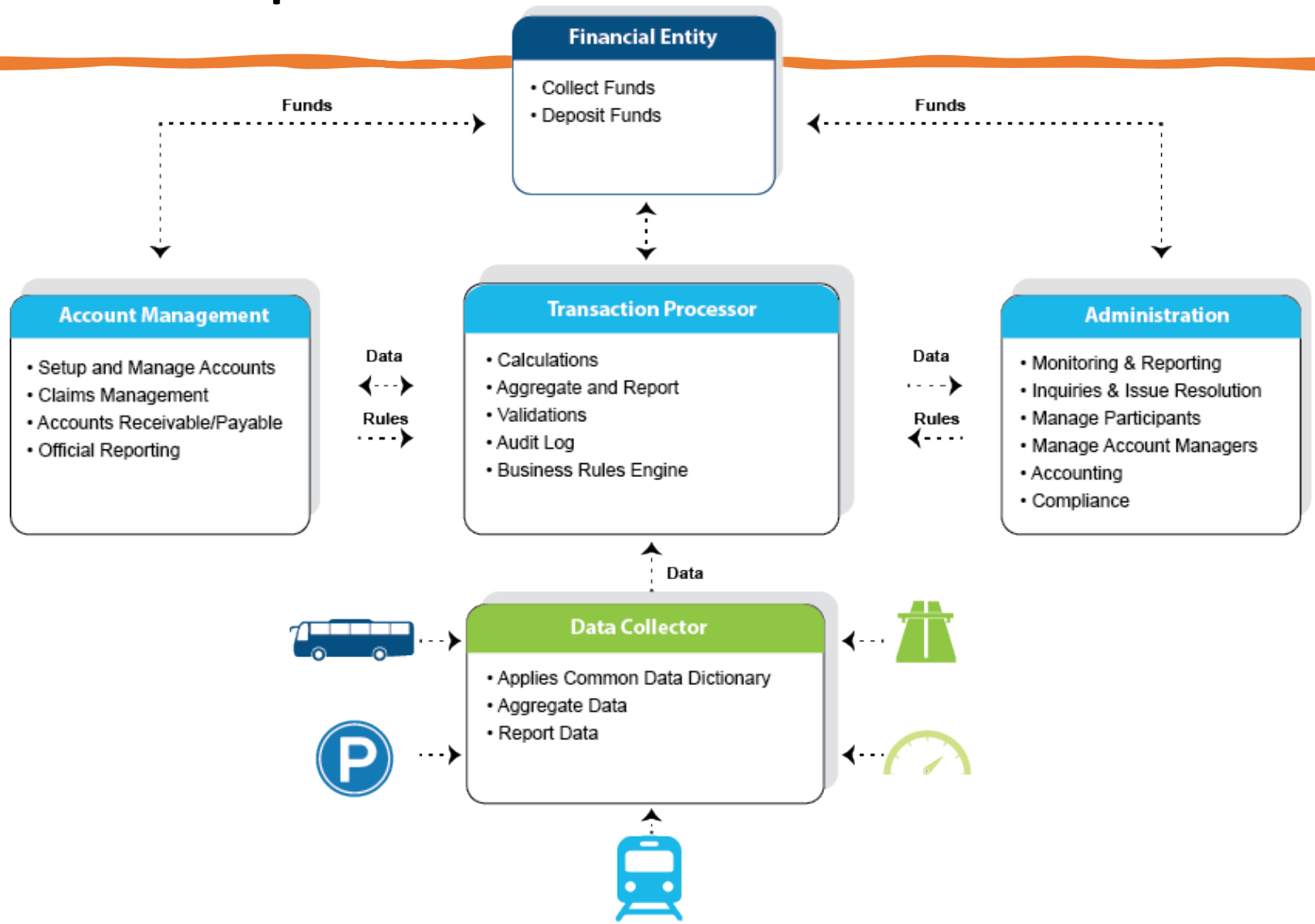


Impact of Increased Fuel Efficiency

Ex: Monthly fuel-tax paid for 1,000 Miles Driven



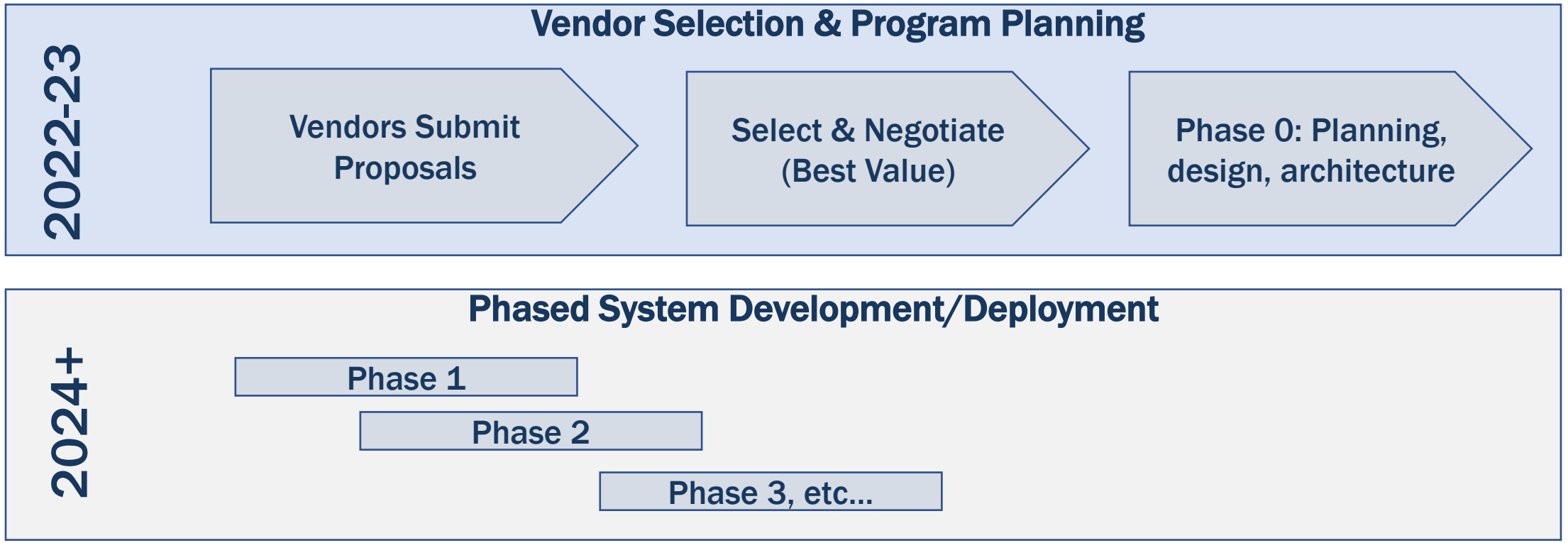
CVE and Open Architecture Enables RUC



CVE Project Objectives

- **Partnership with Industry on CV Applications**
  - **C-V2X and Cellular**
  - **Safety/Mobility and Road Usage Charging**
- **Develop cloud based production platform**
  - **Initial Planning/Design phase**
  - **Multi-year, Multi-phase Implementation**
  - **Demonstrate and Implement applications**
- **Establish long term business model**
- **OEM applications vs after market device**

Next Steps


2022-23
Vendor Selection & Program Planning
Vendors Submit Proposals
Select & Negotiate (Best Value)
Phase 0: Planning, design, architecture
2024+
Phased System Development/Deployment
Phase 1
Phase 2
Phase 3, etc...