Transforming Mobility for the 21st Century
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ITS AMERICA

From Years to Seconds: Making Real-Time Data the New Default

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SESSION AGENDA

Purpose:

- To share how the Wyoming Connected Vehicle Pilot is making their data available in real-time throughout their project via innovate practices
- To tee up discussion of how this model can be extended across the ITS ecosystem

Agenda:

- Background: The ITS JPO Data Program and the Wyoming CV Pilot
- The Traditional Approach: Data shared years after it is generated
- The Wyoming Approach: Data available within seconds of generation
- How We Went from Years to Seconds: Key innovations in the Wyoming CV Pilot
- What's Next: Scaling and institutionalizing these practices
- Discussion

Background: The ITS JPO Data Program and the Wyoming CV Pilot

PROGRAM STRATEGY
ABOUT THE ITS JPO DATA PROGRAM

The ITS JPO Data Program is a multimodal effort to enhance how data is managed and used throughout the transportation ecosystem to support the next generation of ITS technologies.

We aim to establish a foundation for agility, data sharing, and privacy protection in the future transportation system – including connected and automated vehicles and smart communities – to maximize the societal benefits of these technologies.

https://www.its.dot.gov/factsheets/pdf/FactSheet_EnterpriseData.pdf

PROGRAM STRATEGY
PROBLEM SOLVING APPROACH – LEARN BY DOING

- Bring a system-wide/multimodal perspective to data availability and use
- Default to agile and open (data, code, docs) and other digital best practices[1]
- Pilot new approaches with the coalition of the willing to solve real problems
- Where successful, **add new tools to our collective toolbox**

[1]USDS playbook available at: https://playbook.cio.gov/

Example of project developed in the open: https://github.com/usdot-jpo-ode/

PROGRAM STRATEGY
FOCUS ON NATIONAL PRIORITIES

The **Wyoming Connected Vehicle Pilot** aims to reduce the number and severity of adverse weather-related incidents in the I-80 Corridor in order to improve safety and reduce incident-related delays.

WYDOT | CONNECTED VEHICLE PILOT

For more information, visit: https://www.its.dot.gov/pilots

The Traditional Approach: Data shared years after it is generated

SAFETY PILOT MODEL DEPLOYMENT (SPMD)

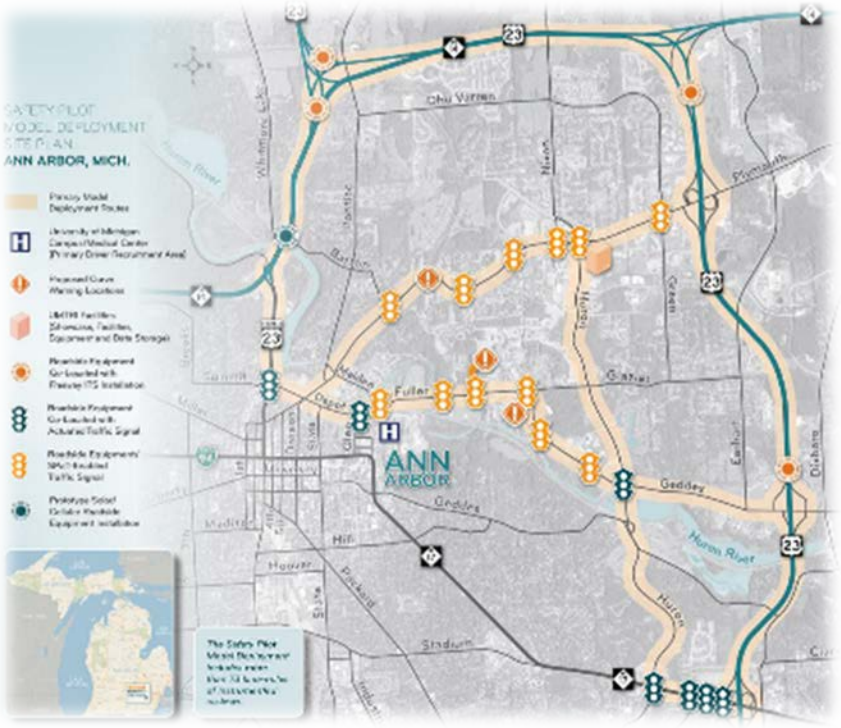
FRAGMENTED DATA DELIVERED AT THE END OF THE PROJECT

Observations:

- Data was collected for specific purposes by different organizations, with no overarching data management plan
- Data access and retention policies were unclear
- Institutional Review Board (IRB) terms of data use were defined narrowly

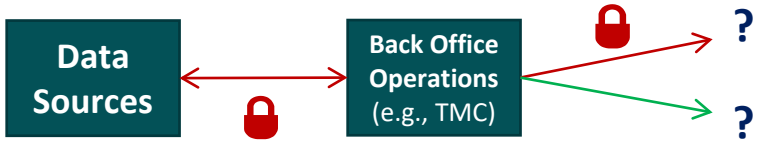
As a Result:

- Years later, no one group (including USDOT) has access to the full archive of data generated
- This limits return on investment, and slows down pace of research



Source: Safety Pilot Model Deployment Lessons Learned and Recommendations for Future Connected Vehicle Activities; September 2015 [Pg. 1] (FHWA-JPO-16-363). https://rosap.ntl.bts.gov/view/dot/4361

Most Transportation Deployments
NOT ARCHITECTED FOR DATA FLUIDITY



Limited data fluidity and flexibility limit the art of the possible

The Wyoming Approach: Data available within seconds of generation

WYDOT CONNECTED VEHICLE PILOT DATA AVAILABLE

- Basic Safety Messages
- Traveler Information Messages

View and download data streams from early deployers:

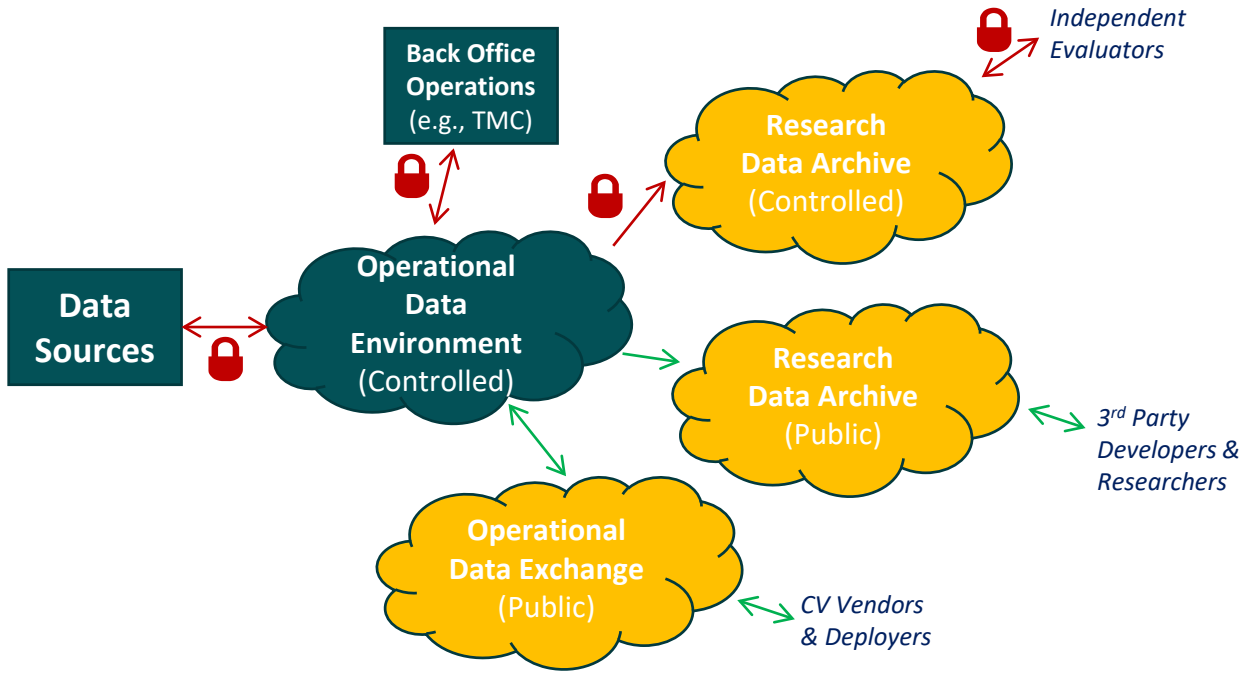
- FULL DATA SET: https://github.com/usdot-its-jpo-data-portal/sandbox
- SAMPLE: https://data.transportation.gov/Automobiles/Wyoming-CV-Pilot-Basic-Safety-Message-One-Day-Samp/9k4m-a3jc

Wyoming data is now streaming and available to the public.

Explore the data at ITS Public Data Hub

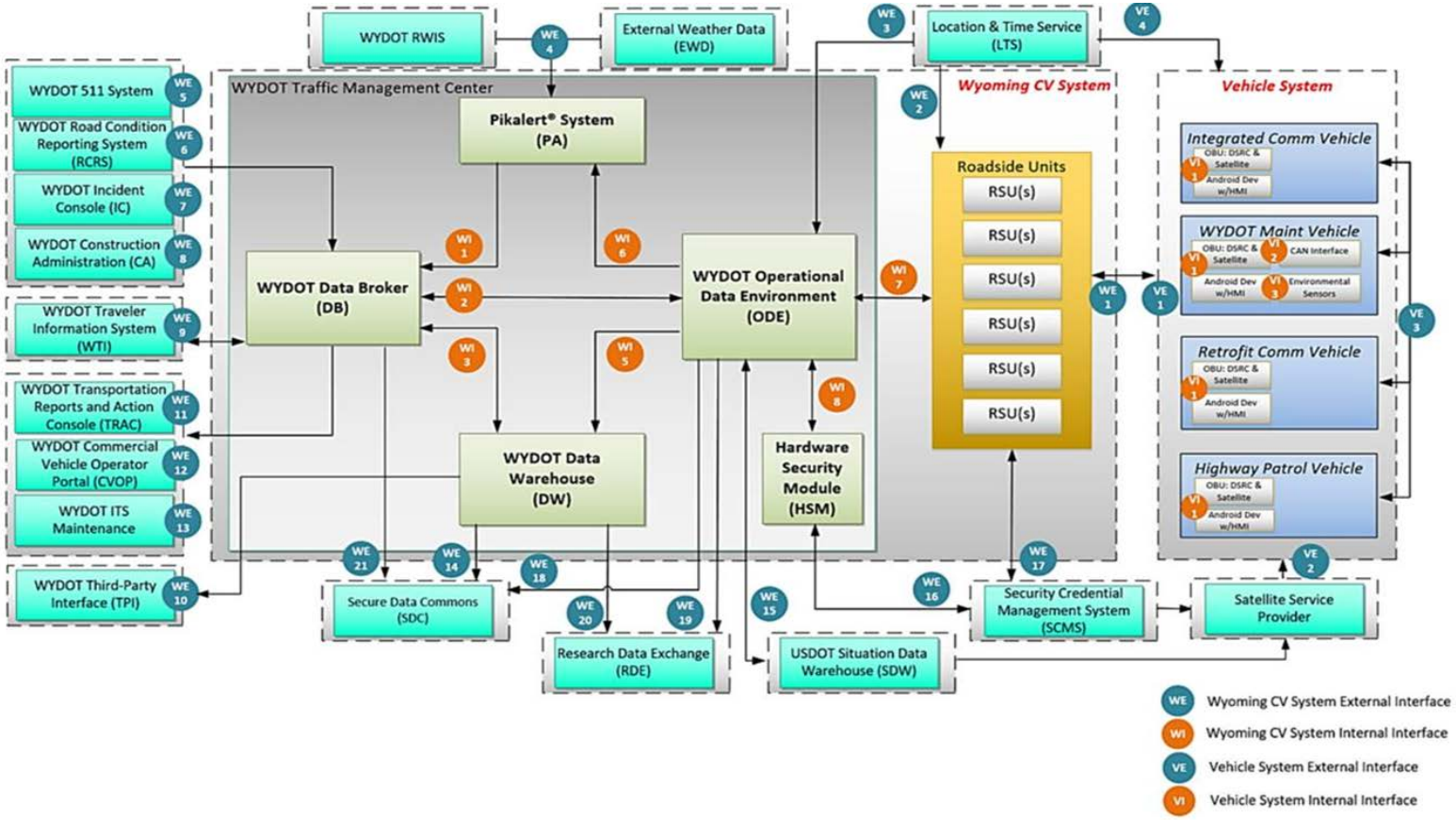
www.its.dot.gov/data

Wyoming Deployment
Architected for the Future



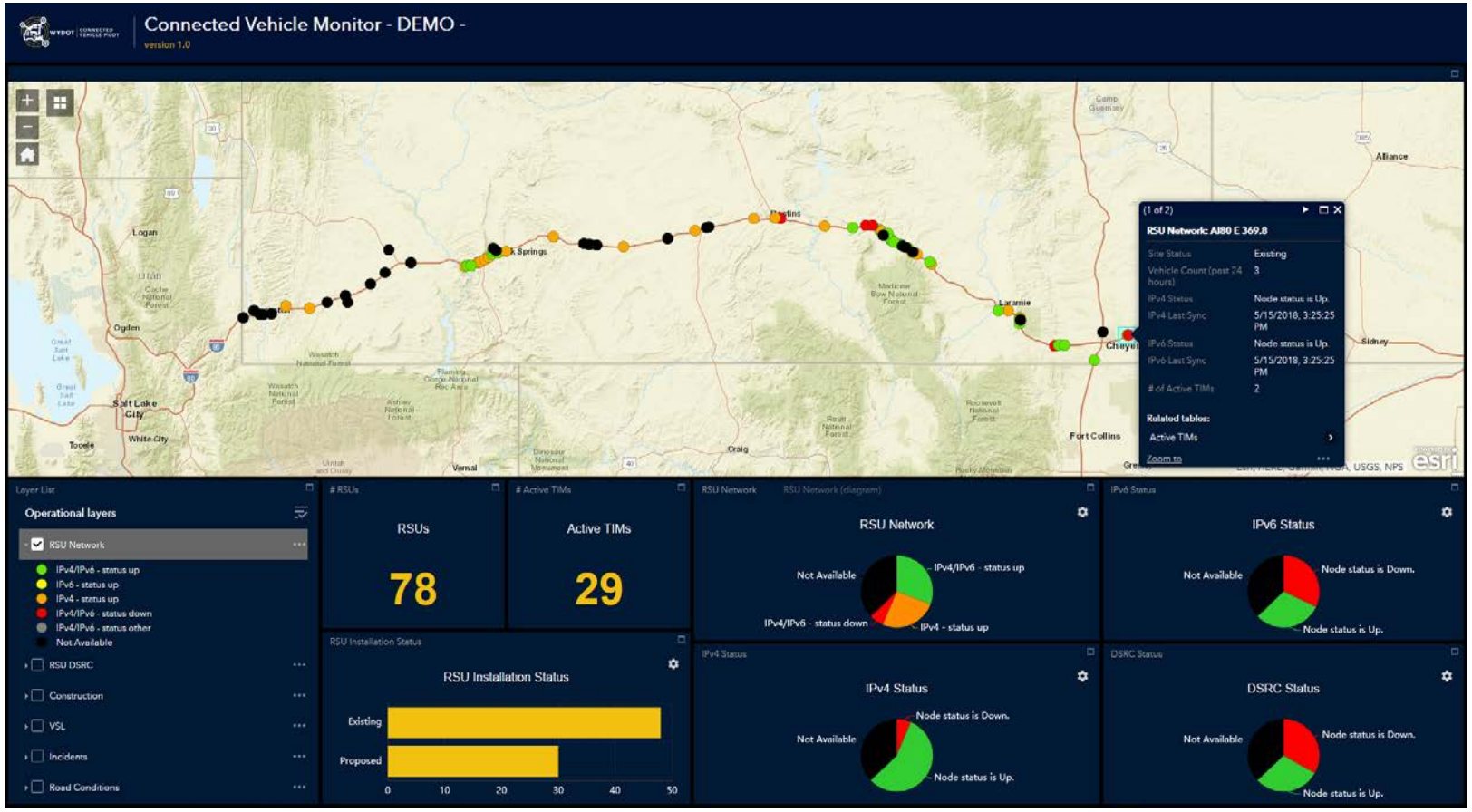
Programmatic privacy protection and data fluidity enable rapid innovation, now and in the future

WYOMING DEPLOYMENT
ARCHITECTED FOR THE FUTURE



NOTE: The Wyoming CV System Interface WI4 (PA→DW) was not implemented in the final system design.

Wyoming Deployment
Live and interactive public and private data view



How We Went from Years to Seconds: Key innovations in the Wyoming CV Pilot

ARCHITECTED FOR THE FUTURE

The **ITS Operational Data Environment** is a real-time virtual data router that ingests and processes operational data from various connected devices – including vehicles, infrastructure, and traffic management centers – and distributes it to other devices and subscribing transportation applications.

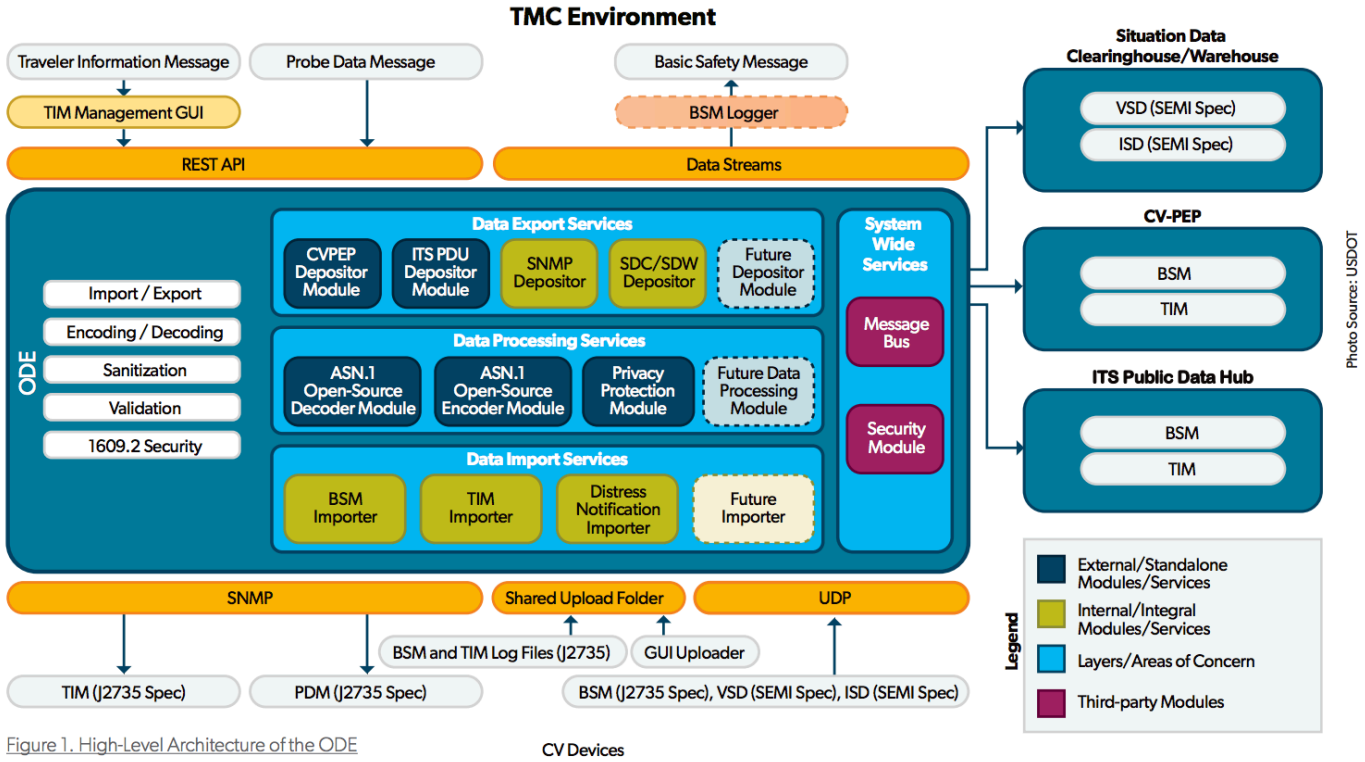


Figure 1. High-Level Architecture of the ODE

Photo Source: USDOT

All code and documentation is open source: https://github.com/usdot-jpo-ode/

PROGRAMMATIC PRIVACY PROTECTION

The **Privacy Protection Module** is:

A **standalone capability** that integrates with the ODE to handle multiple J2735 message types

An **application-specific** privacy protection tool to address
streaming data

Geofencing filter: identify and isolate
a known, irregular area

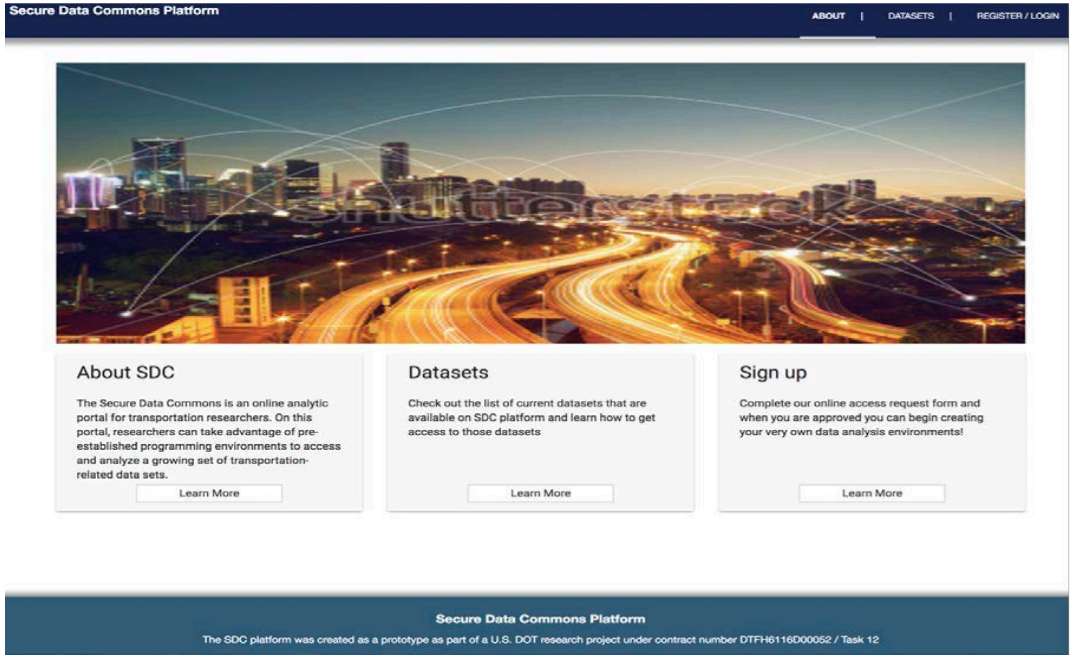
Locations are classified as outside or inside the fence in real time

All code and documentation is open source: https://github.com/usdot-its-jpo-data-portal/privacy-protection-application

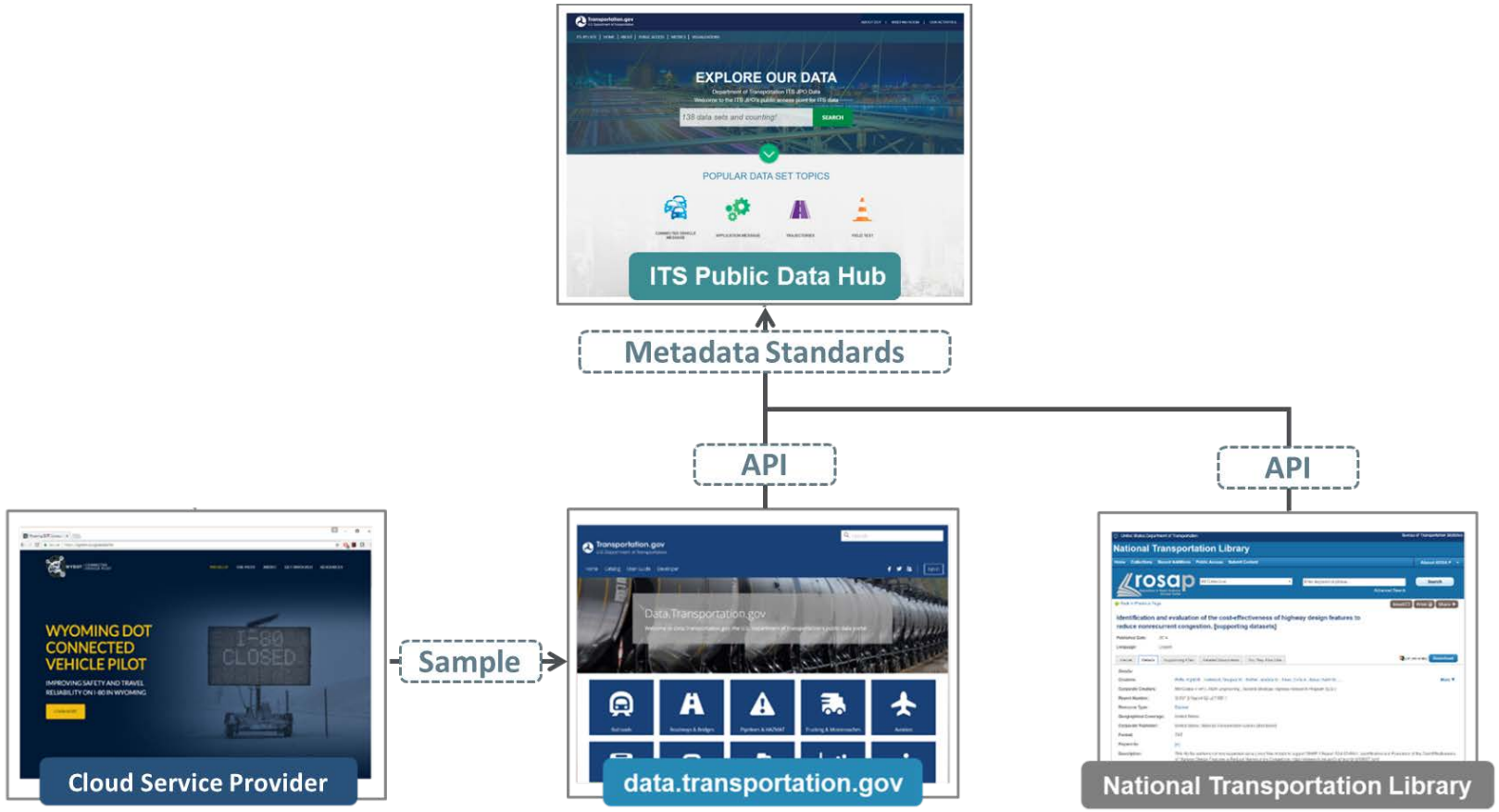
SECURE DATA ACCESS

Controlled access to streaming WYDOT data through the USDOT Secure Data Commons (SDC) Portal, a cloud-based analytic sandbox

- Immediate, secure access for independent evaluators to use WYDOT data as it is generated
- Ability to conduct analysis within the sandbox through a cloud-based workstation
- Evaluators can share code, results with others within and outside the system

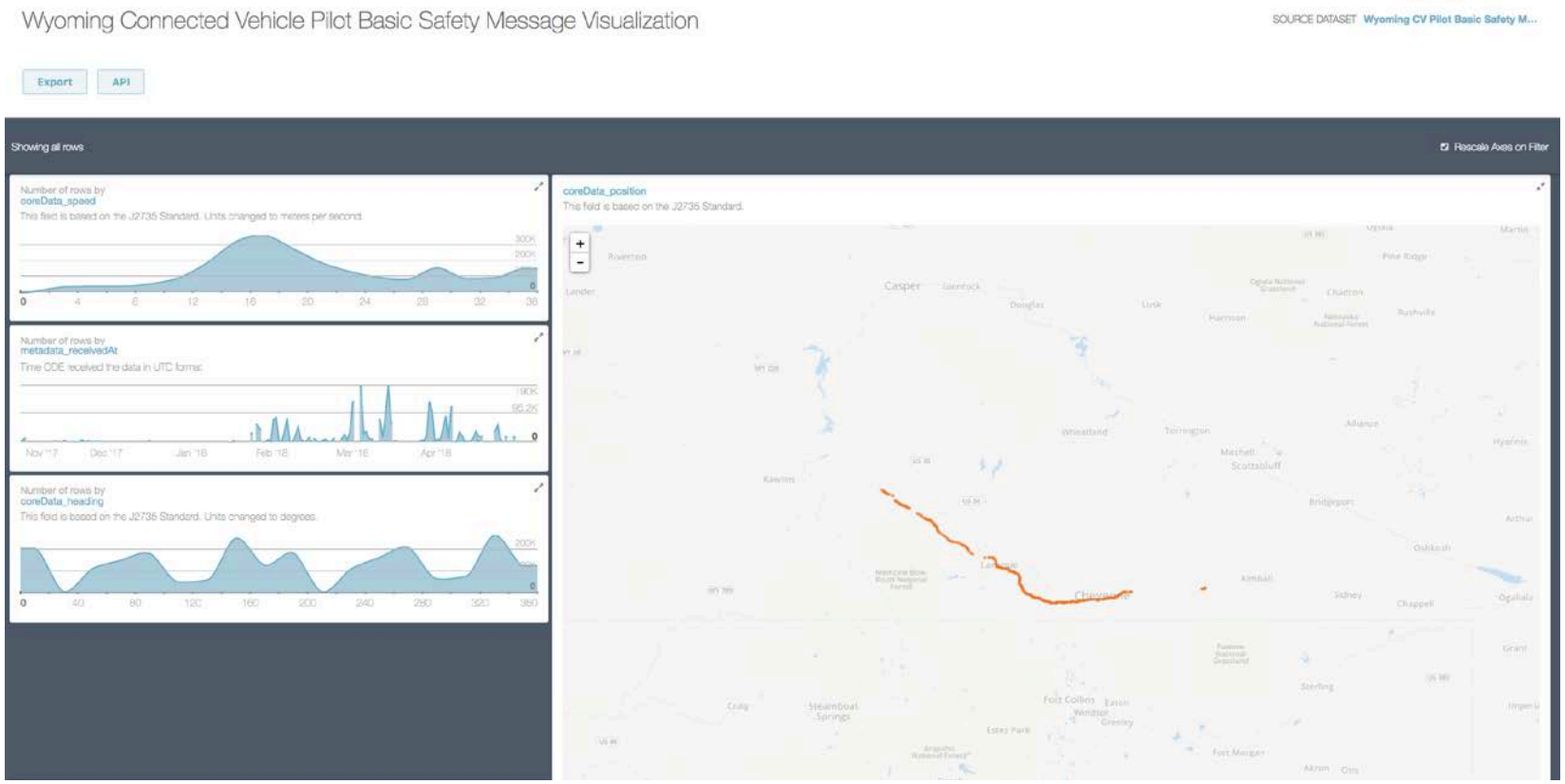


PUBLIC DATA ACCESS



ITS Pubic Data Hub code and documentation is open source: https://github.com/usdot-its-jpo-data-portal/microsite

PUBLIC DATA ACCESS

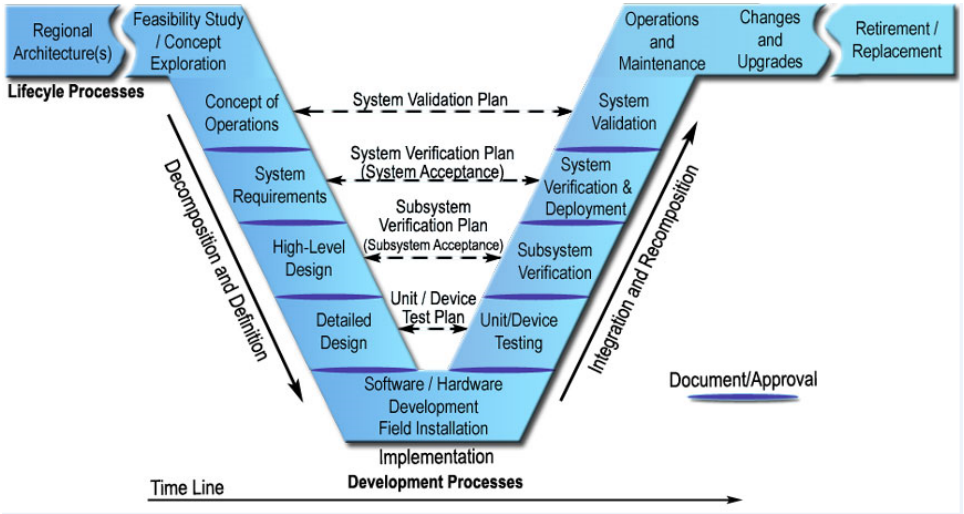


https://data.transportation.gov/Automobiles/Wyoming-Connected-Vehicle-Pilot-Basic-Safety-Messa/hchs-a7s6

DEVELOPED VIA AGILE METHODOLOGIES

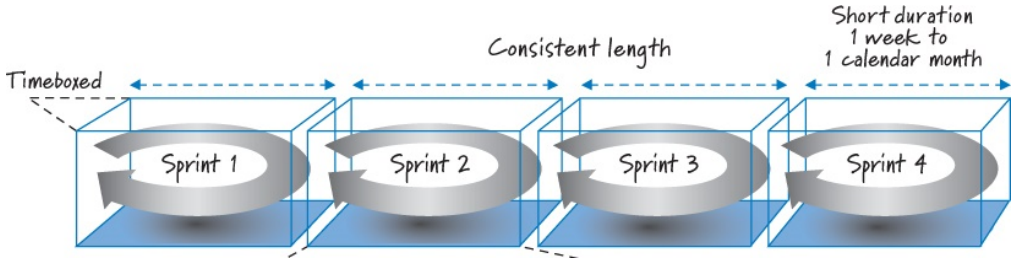
Waterfall (e.g., Vee):

- **Code produced**: After all planning is done.
- **Documentation and testing**: Largely after coding is done.
- **Value delivered**: At end of project.



Agile (e.g., Scrum):

- **Code produced**: Iteratively as enough planning is done.
- **Documentation and testing**: As code is developed.
- **Value delivered**: Incrementally at end of each sprint (1 wk. to 1 mo.)



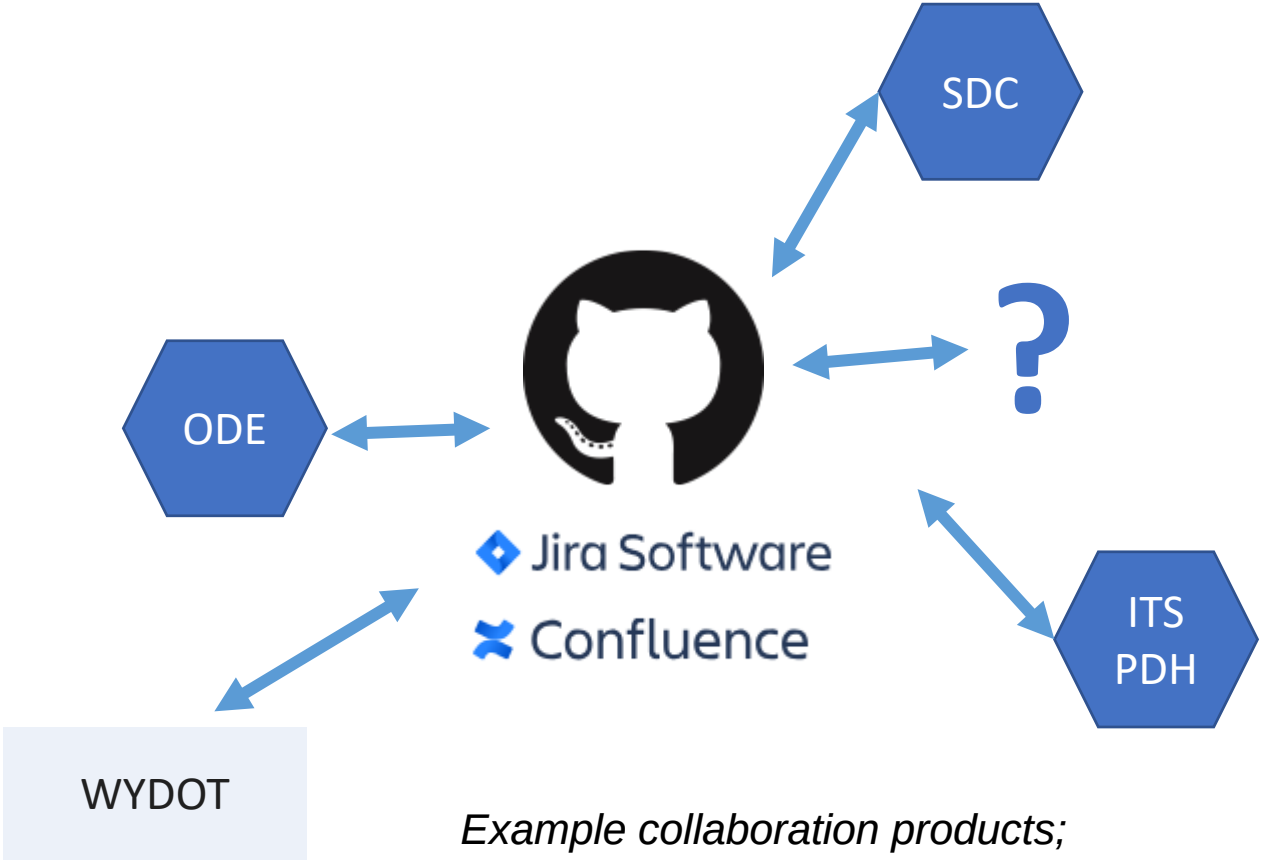
DEVELOPED COLLABORATIVELY AND IN THE OPEN

Benefits for agile projects:

- **Community**
- **Coordination**
- **Transparency**

Benefits for transportation projects:

- **Increase interoperability**
- **Enable re-use**
- **Accelerate deployment**



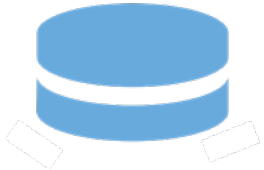
Example collaboration products; does not imply endorsement

What’s Next: Scaling and institutionalizing these practices

MORE DATA FROM WYOMING CV PILOT

Small Field Test
(~30,000 messages)

Nov 2017



6 Test Vehicles
(up to 3M messages)

Jan 2018

50 Test Vehicles
(up to 15M records a day)

Mid 2018

400 Production Vehicles
(up to 115M records a day)

Late 2018

MORE DATA FROM OTHER ITS PROJECTS

2017

WYOMING CV PILOT
Preliminary Test Data
(6 Vehicles)

Late 2017

2018

Early 2018

WYOMING CV PILOT
Test Data (50 Vehicles)

138 DATA SETS
BSMs, Incident Identification, Simulated Data Environments, Trajectory, Road Weather, Archived Real-time Location, and more

Currently Available

TAMPA CV PILOT
Field Test Data

NYC CV PILOT
Initial Test Data

Mid 2018

WYOMING CV PILOT
Operational Data
(400 Vehicles)

TAMPA CV PILOT
Operational Data

Late 2018

2019

Mid 2019

NYC CV PILOT
Operational Data

RE-USE AND EXPANSION IN OTHER DEPLOYMENTS

DENVER SMART CITY

https://www.denvergov.org/content/denvergov/en/denver-smart-city.html

RECAP: MAKING REAL-TIME DATA THE NEW DEFAULT

Recap

- Background: ITS JPO Data Program and the Wyoming CV Pilot?
- The Traditional Approach: Data shared years after it is generated
- The Wyoming Approach: Data available within seconds of generation
- How we went from years to seconds: Key innovations in the Wyoming CV pilot
- What's Next: Scaling and institutionalizing these practices

Key insights

- Develop collaboratively and in the open via Agile development methodologies
- Architected for the future with programmatic privacy protection
- Enable better evaluation and analysis and product development

Extend this to all ITS projects

- Holistic data access and evaluation program
- Holistic source code management and development program
- Incubate innovative practices and methodologies

Discussion

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