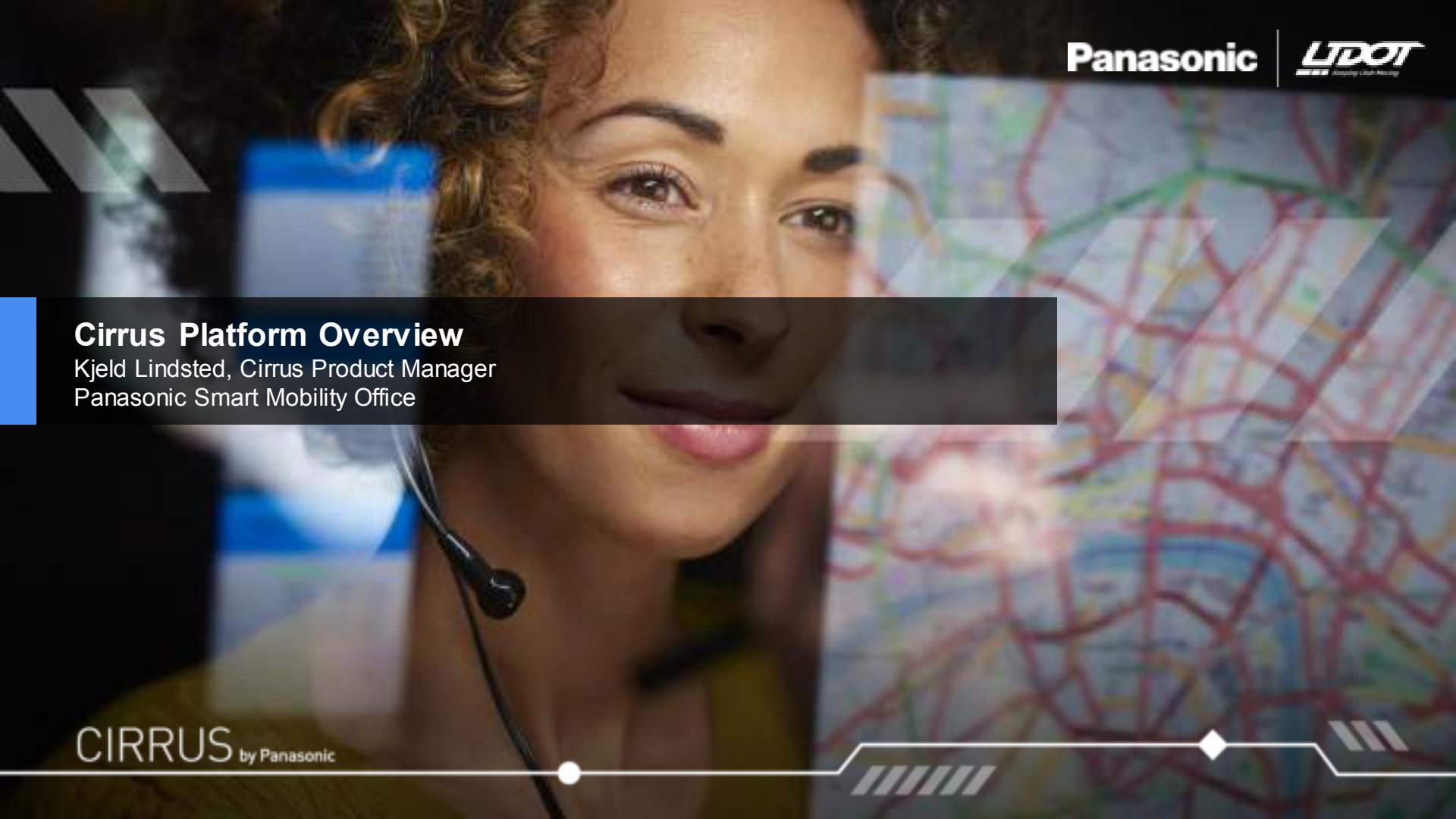
Webinar #2:

Connected Vehicle Data Ecosystem & Applications

Wednesday, August 2, 2023 | Kjeld Lindsted & Lauren Cordova

Panasonic Smart Mobility Office

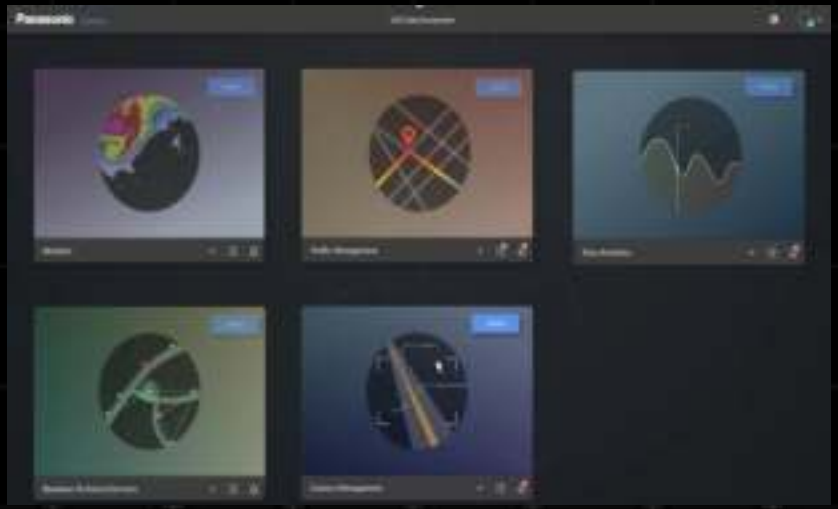
CIRRUS by Panasonic


Panasonic
UDOT
Cirrus Platform Overview
Kjeld Lindsted, Cirrus Product Manager
Panasonic Smart Mobility Office
CIRRUS by Panasonic

Cirrus by Panasonic

Deployment Solutions

Cloud Platform



Cloud Platform Approach

+ Critical pipelines & infrastructure

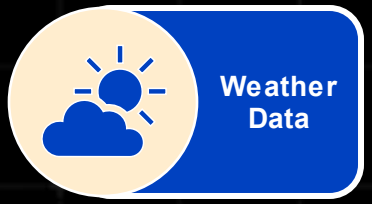
+ Highly decoupled, asynchronous architecture

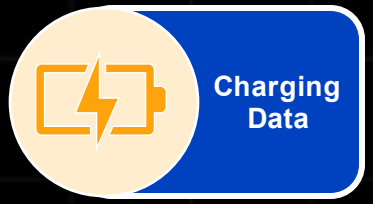
+ Serverless, event-driven design

+ Internet scale

+ Strong security-first approach, regardless of data type

Connected Vehicle Ecosystem Approach





V2X: A Common Mobility "Language"

Work Zone Warning
Curve Speed Warning
Spot Weather Impact Warning
Crash Detection

Transit Signal Priority
Emergency Vehicle Preemption
Freight Signal Priority
Snowplow Preemption

Vulnerable Road User Alert
Red Light Violation Warning
Green Wave & Speed Advisory
Collision Avoidance

V2X

Security through Standardization

Message Authenticity

Allow messages only from trustworthy sources

Message Authorization

Allow messages to only do authorized things

Message Integrity

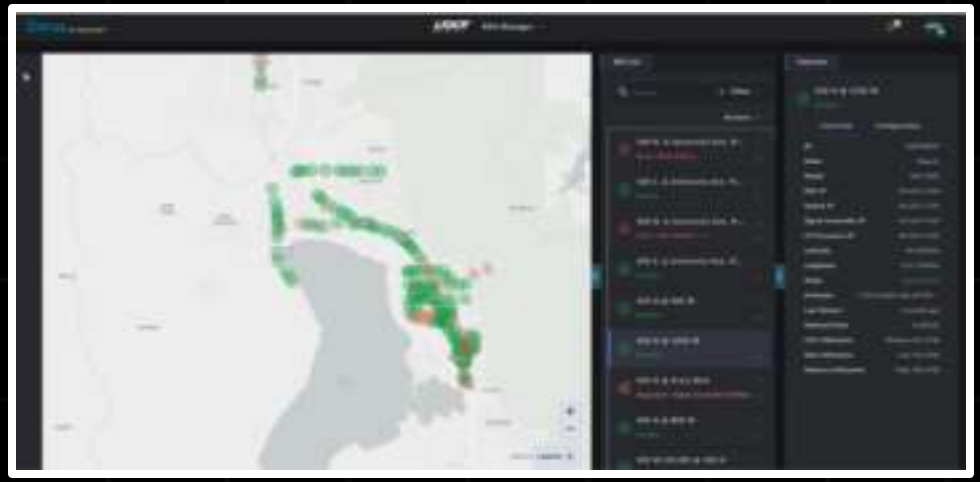
Allow messages only if not modified en route

Secure Driver/ Owner Identity

Secure Make/ Model/Year/VIN

Anonymize Origin/ Destination

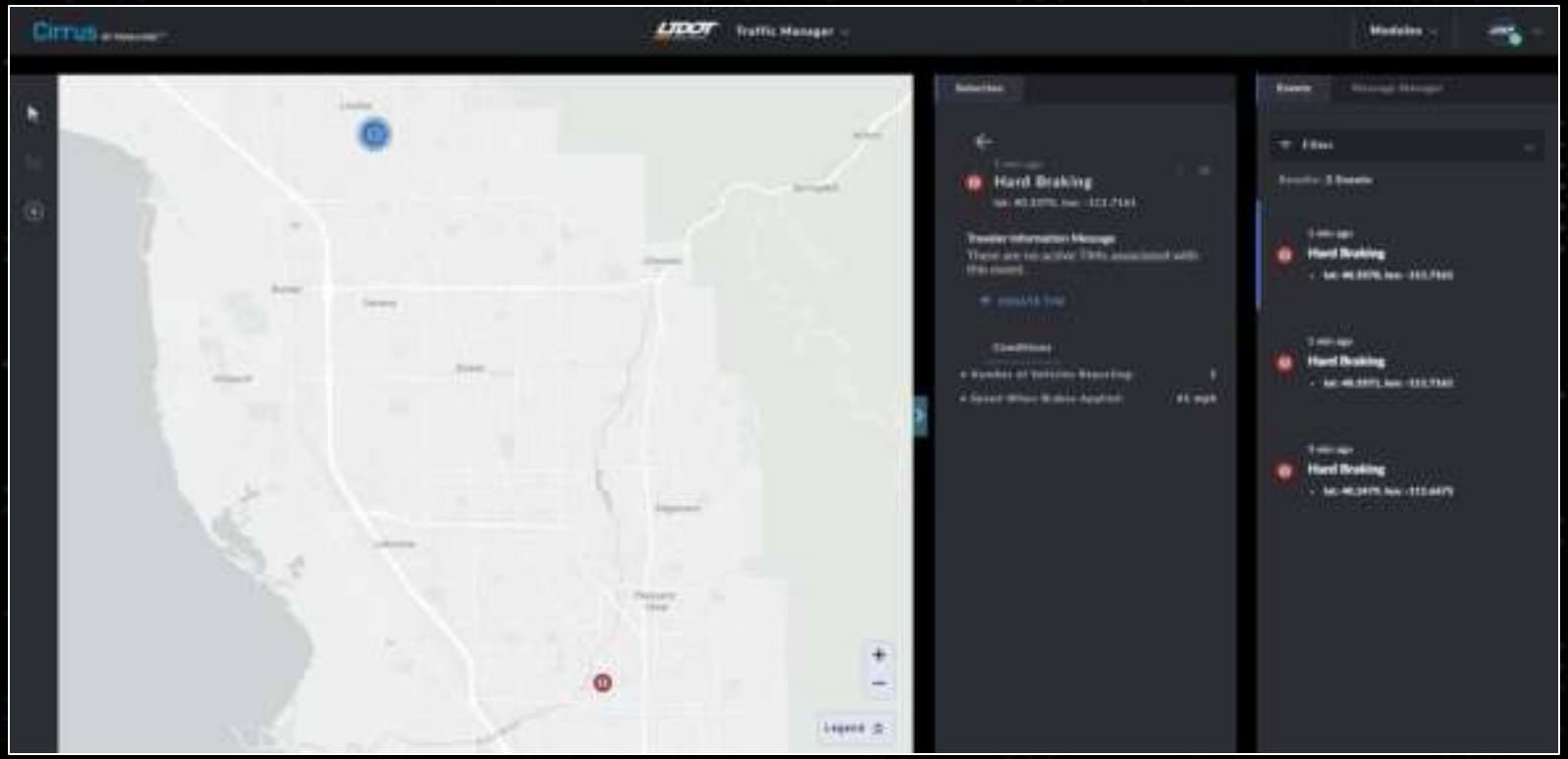
Cirrus V2X Applications



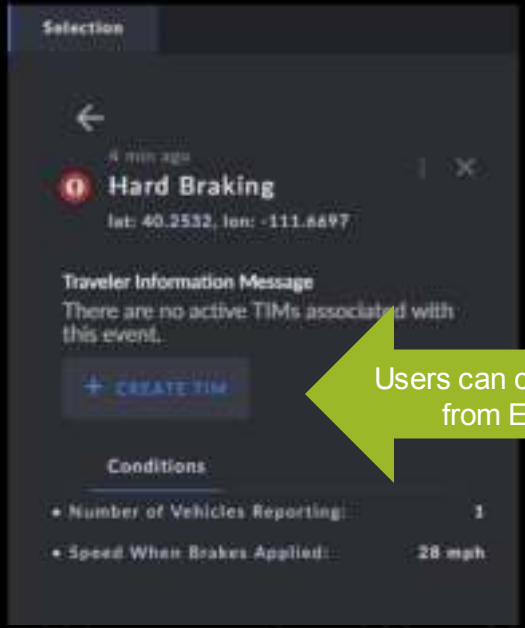
Sample Road Events Detected from BSMs

- **Hard Brake** (from vehicle acceleration/deceleration data)
- **Hazard Lights** (from vehicle light status data)
- **Rain** (from vehicle wiper and temperature sensor data)
- **Snow** (from vehicle wiper, temperature sensor, and traction control data)

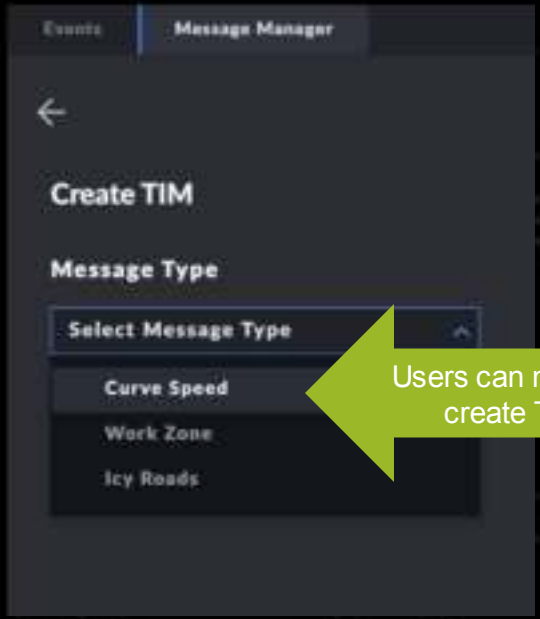
Road Events are Detected from BSMs



Cirrus Warns Drivers About Events



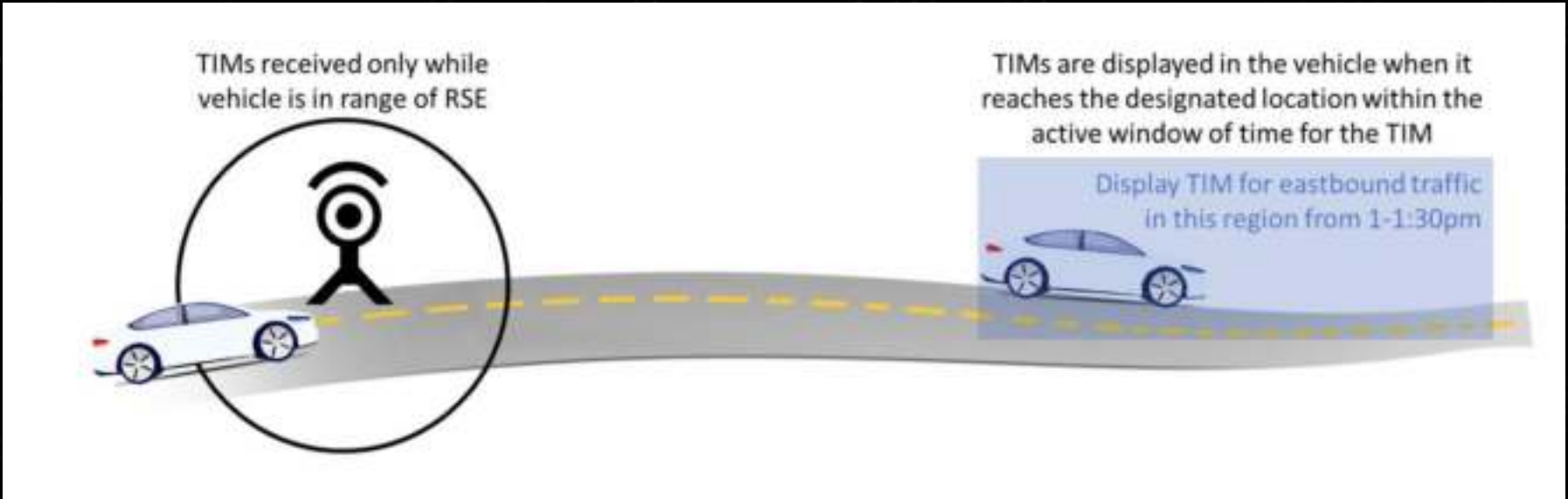
Users can create TIMs from Events

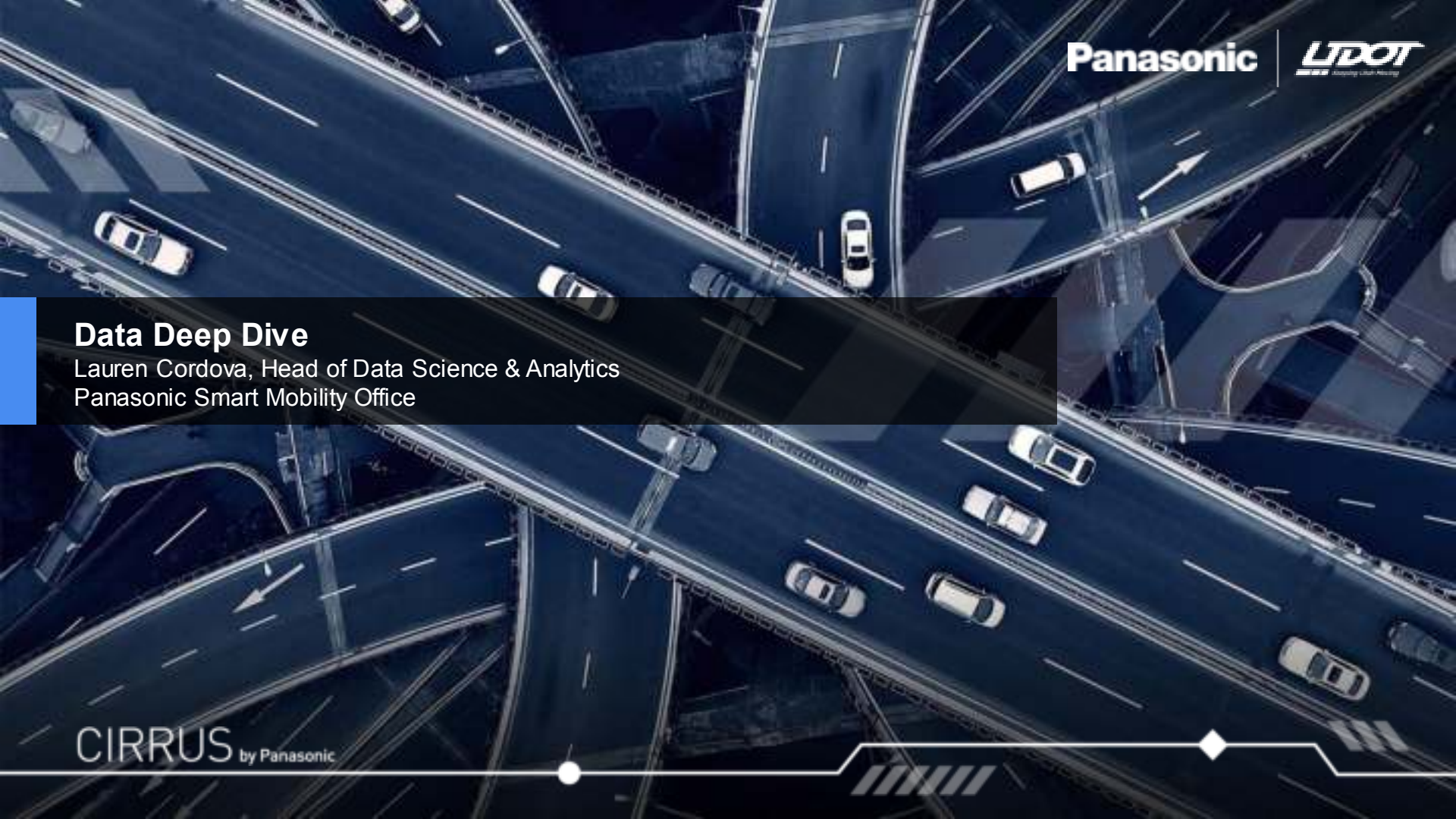


Users can manually create TIMs

Example TIMs

TIMs can be deployed from any RSU





Data Deep Dive

Lauren Cordova, Head of Data Science & Analytics
Panasonic Smart Mobility Office

Utah BSM Data and Event Volumes in July 2023

Raw Data

322 Million Basic Safety Messages (BSMs)

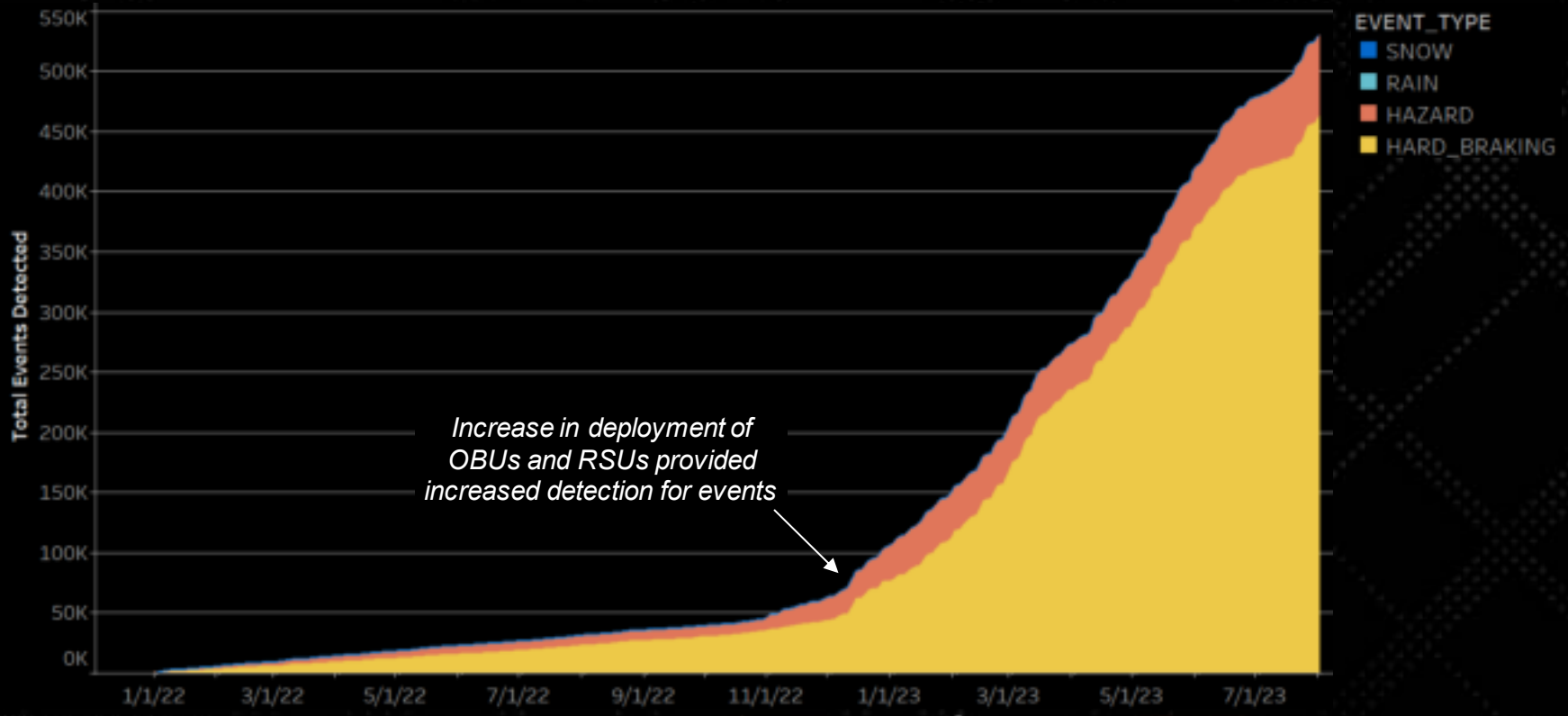
39 GB of Basic Safety Messages (BSMs)

Insights

38,000 Hard Braking Events

9,000 Hazard Light Events

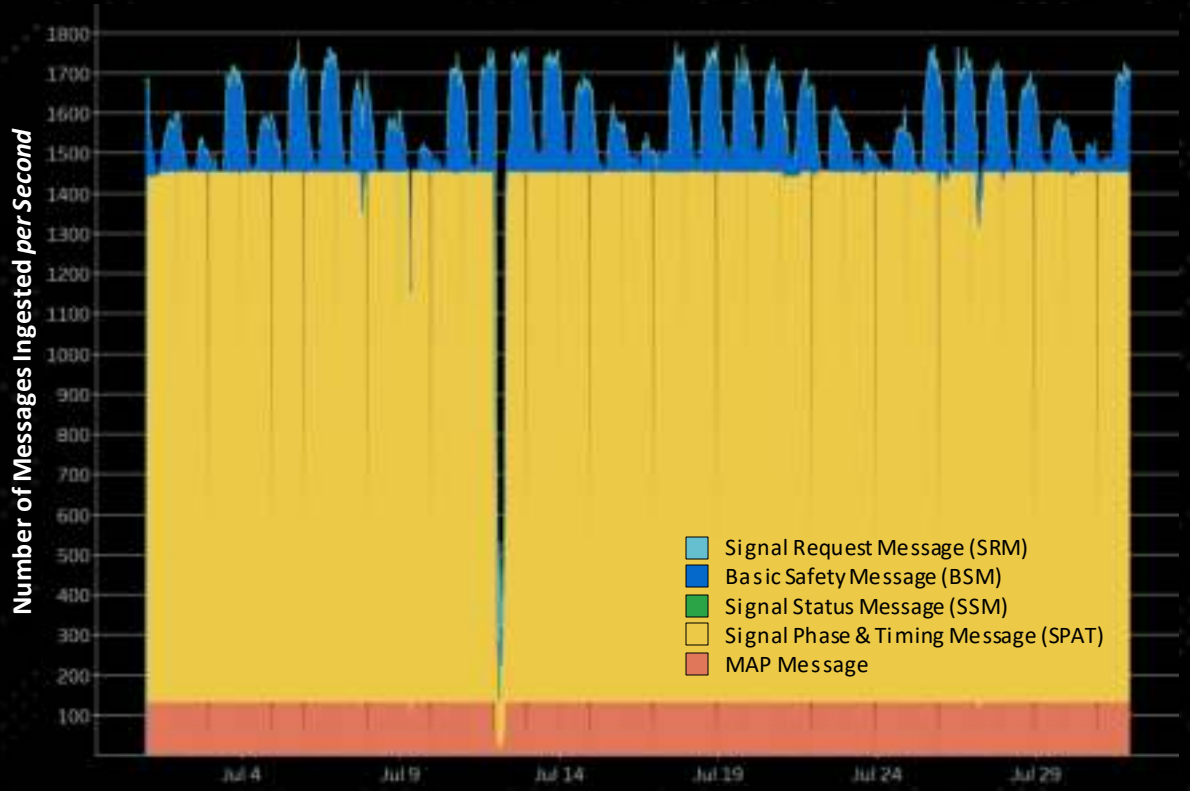
Utah Roadway Events Detected



Hard Braking Example

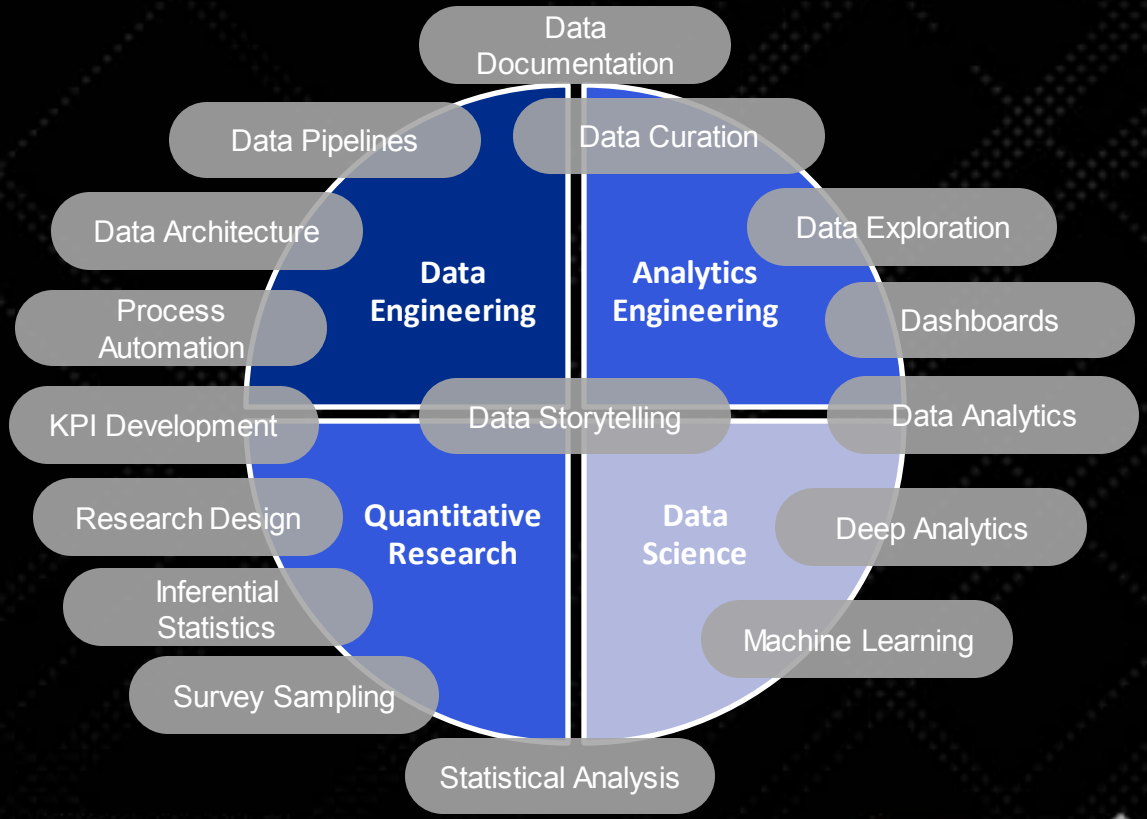
- The map to the left plays hard brake events in the UDOT V2X enclave by week in 2023
- Darker, larger circles represent locations with the most hard braking events detected

Continuous Data Processing



- Connected Intersection messages sent continuously
  - SPAT at 10Hz
  - MAP at 1Hz
- Vehicle based messages sent when vehicles are present
  - BSMs at 10Hz
  - SRMs at 10Hz
  - SSMs at 10Hz
- Cirrus requirements for low latency ingestion and detection

Data Science & Analytics Team & Methodology



Data Ingestion

- Automated
- Scalable
- Monitored
- ELT

Data Review

- Latency
- Richness
- Quantity
- Accuracy

Data Insights

- Dashboards
- KPIs
- Predictions

Data Science & Analytics Team & Methodology

Data Ingestion

- Automated
- Scalable
- Monitored
- ELT

Data Review

- Latency
- Richness
- Quantity
- Accuracy

Data Insights

- Dashboards
- KPIs
- Predictions

Overview of UDOT/Panasonic Data Community

Mission Statement

To advance innovation and collaboration with a diverse community of transportation experts through a curated data ecosystem.

Benefits

- Cloud Data Warehouse
- Curated & Documented Datasets
- Easy Accessibility
    - Web Based Query IDE
    - BI Tools (Tableau, Power BI, Looker, Spotfire etc.)
    - Microsoft Office Tools (Excel, Access)

Users

75+

Companies

16

Public Agencies

10

Universities

5

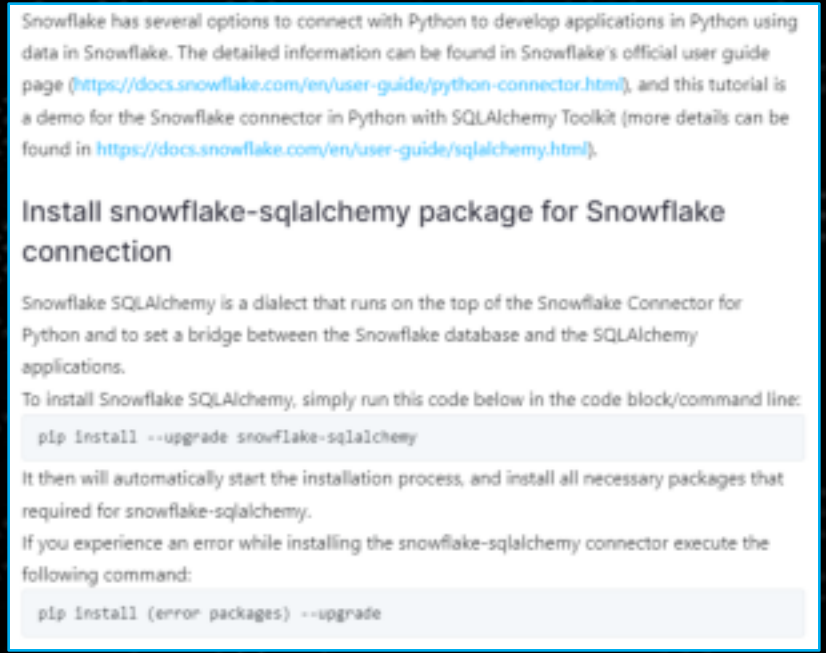
Data Community Instructions

Web Based Documentation Platform

Instructions are provided to connect to the available datasets via several common tools. However, there are numerous other software platforms capable of connecting with the same database server information. Data community members can reach out us if assistance is needed connecting with a different set of tools.

Instruction Guides

- Connect to Snowflake (Web)
- Connect to Tableau
- Connect to DBeaver
- Connect to Excel
- Connect to Access
- Connect to Python



Snowflake has several options to connect with Python to develop applications in Python using data in Snowflake. The detailed information can be found in Snowflake's official user guide page (https://docs.snowflake.com/en/user-guide/python-connector.html), and this tutorial is a demo for the Snowflake connector in Python with SQLAlchemy Toolkit (more details can be found in https://docs.snowflake.com/en/user-guide/sqlalchemy.html).

Install snowflake-sqlalchemy package for Snowflake connection

Snowflake SQLAlchemy is a dialect that runs on the top of the Snowflake Connector for Python and to set a bridge between the Snowflake database and the SQLAlchemy applications.

To install Snowflake SQLAlchemy, simply run this code below in the code block/command line:

```
pip install --upgrade snowflake-sqlalchemy
```

It then will automatically start the installation process, and install all necessary packages that required for snowflake-sqlalchemy.

If you experience an error while installing the snowflake-sqlalchemy connector execute the following command:

```
pip install (error packages) --upgrade
```

Data Dictionary

Web Based Documentation Platform

- Data Dictionary
- Universal Search Feature

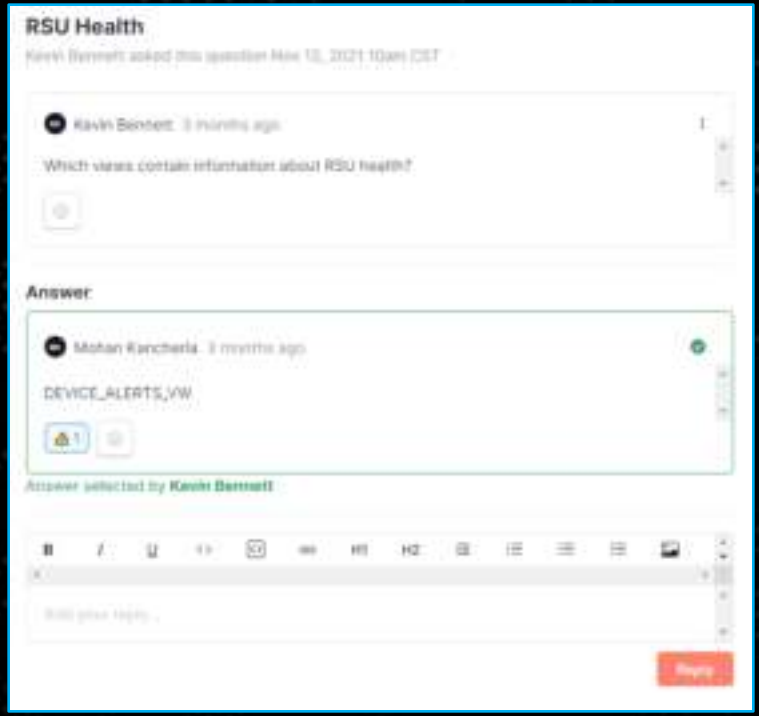
Data Community Support

If data community members experience any errors or need additional help connecting or understanding the data, there are two primary ways contact us for support:

- Dedicated support email: V2XSupport@us.panasonic.com
- Online Question Forum

Data Access Interest Form:

https://app.smartsheet.com/b/form/edfec6388a7046fdb1263d59acd2fa2b




Panasonic
LIDOT
Thank You!