
AWS
re:Invent
NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

CAMBRIDGE MOBILE TELEMATICS

STP207

Using privacy-first data processing to make drivers smarter

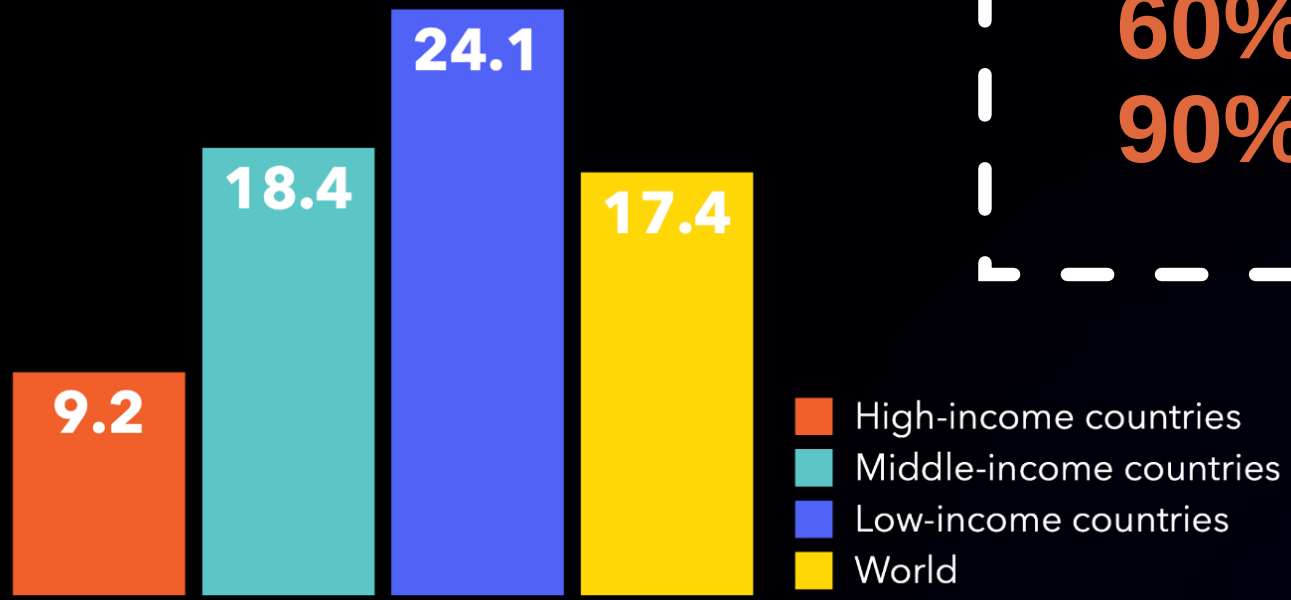
Hari Balakrishnan
Founder & CTO
Cambridge Mobile Telematics

aws

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50 MILLION
Road injuries per year

1.35 MILLION
Road traffic deaths per year



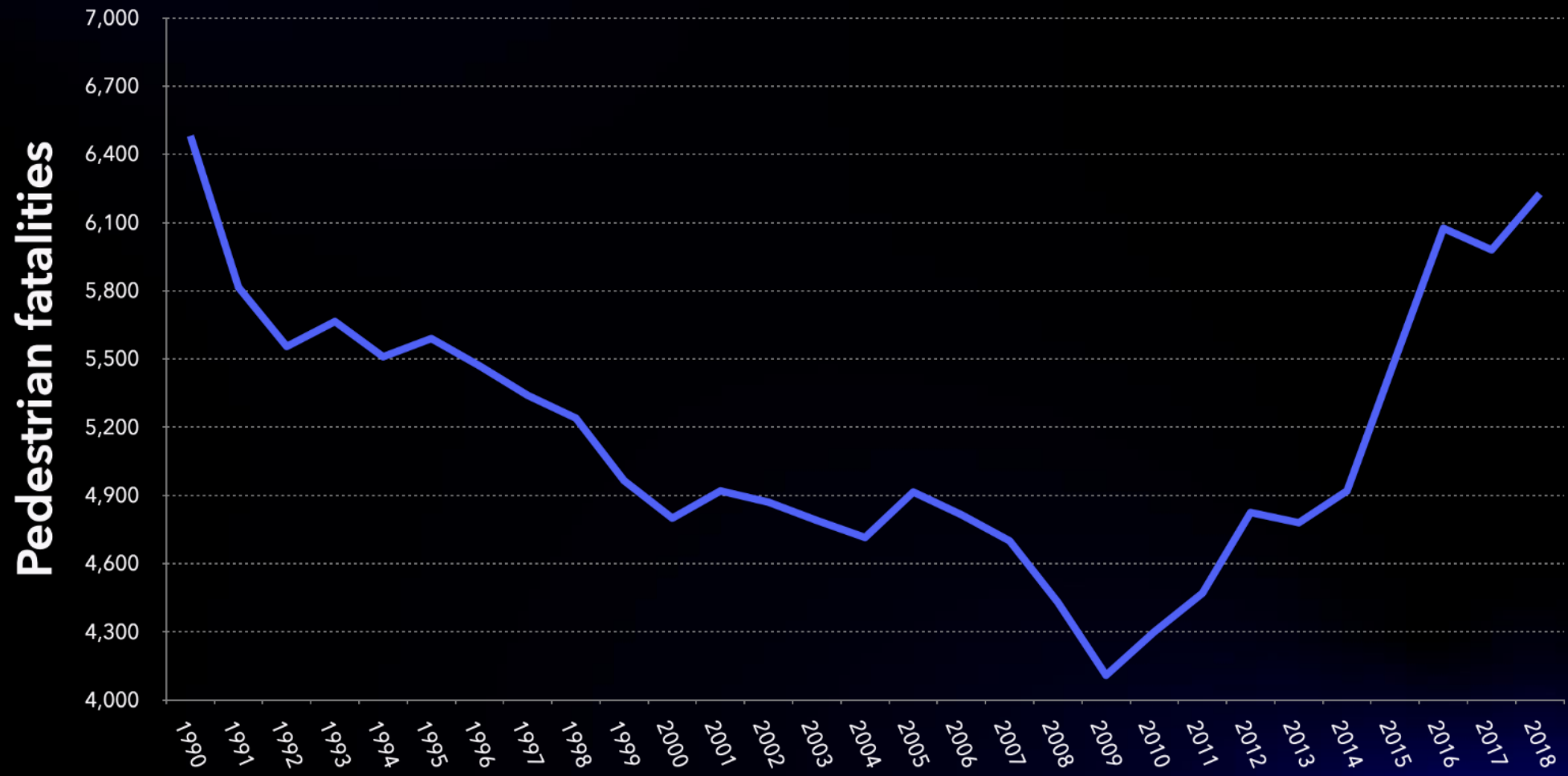
A GLOBAL PROBLEM

$1.8 trillion in losses
From all crashes globally, 2015-2030

Low-and Middle-Income Countries
60% of vehicles
90% of crash deaths

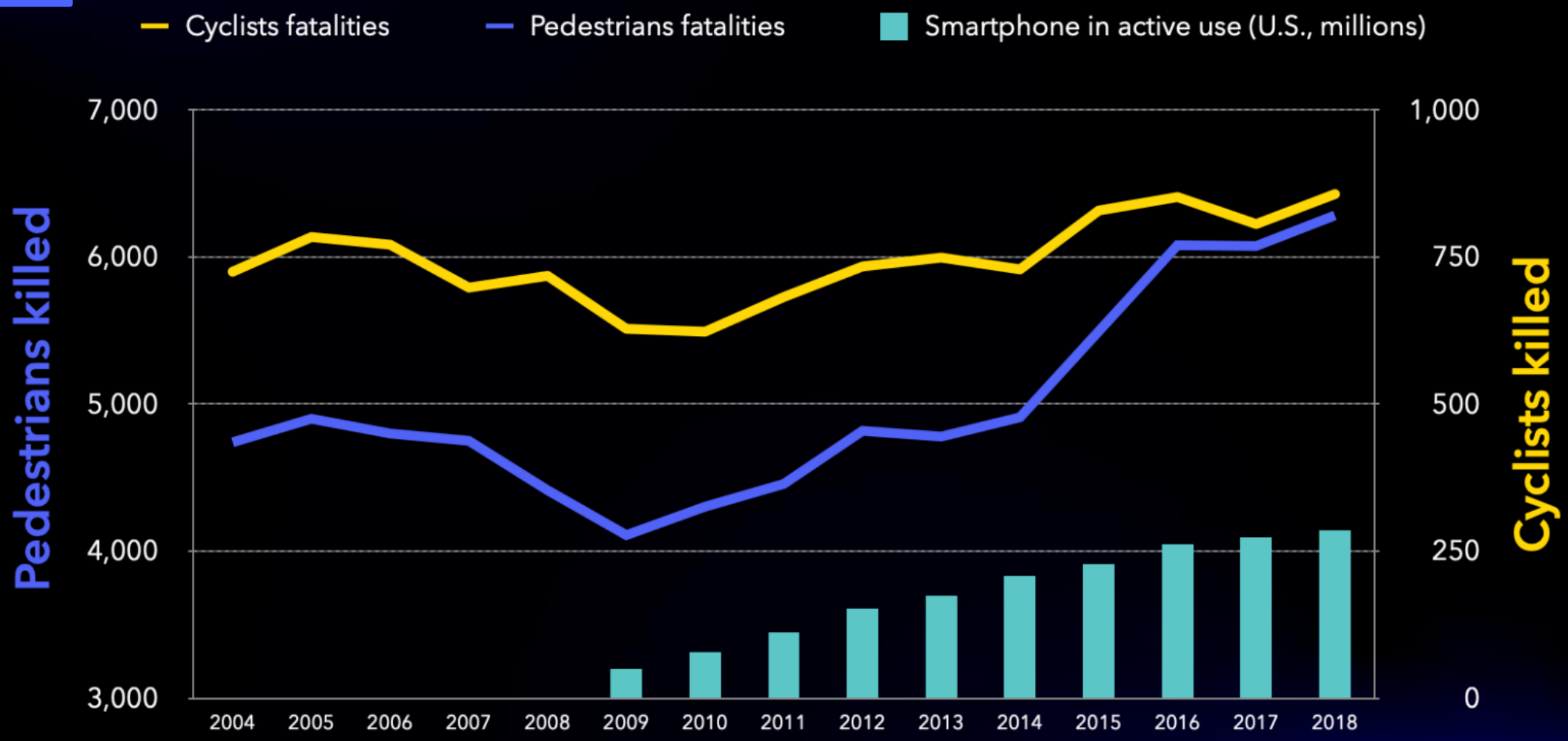
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Pedestrian Fatalities in the US, 1990-2018



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Cyclist and Pedestrian Road Fatalities in the US



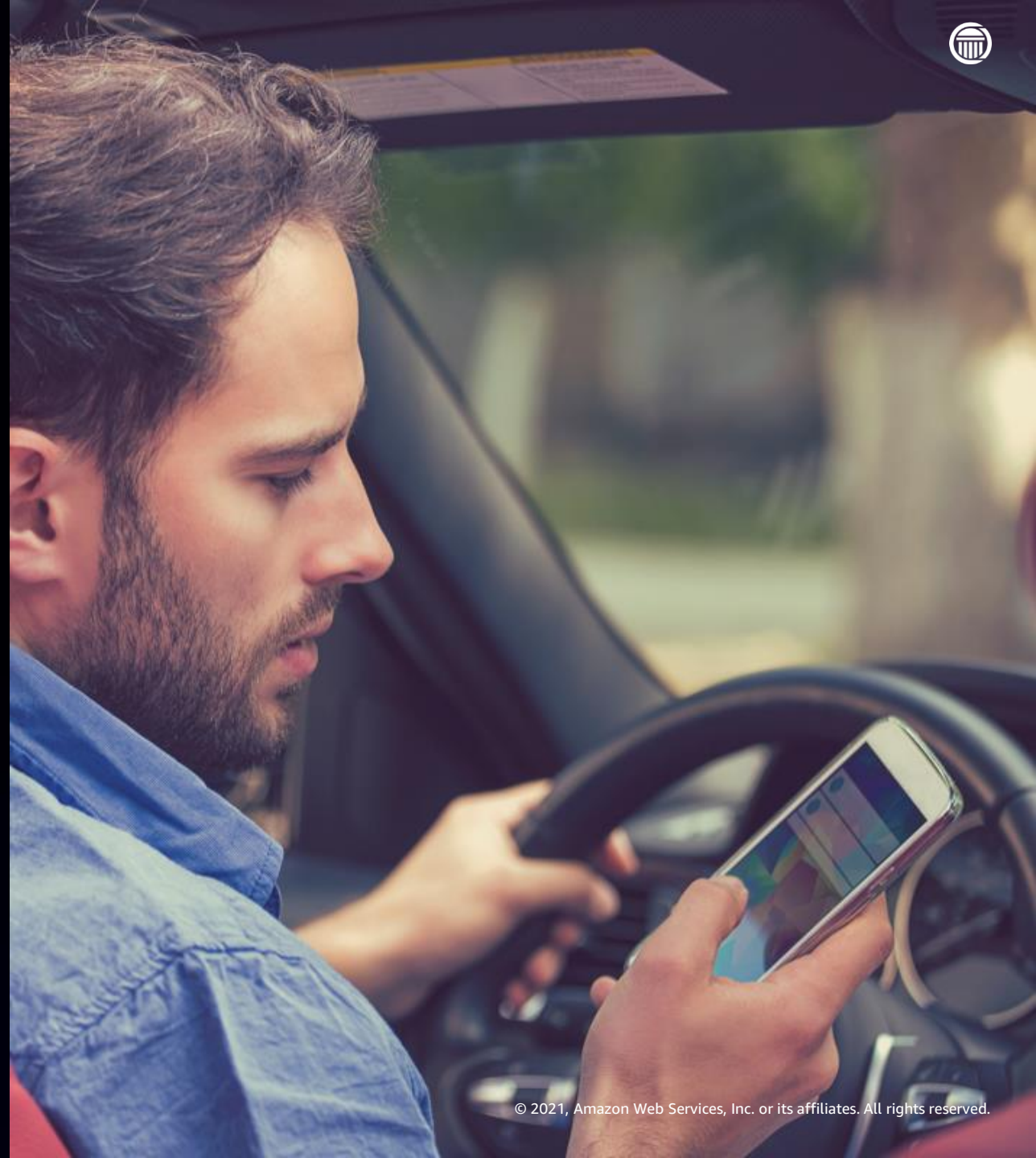
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Weapons of Mass Distraction

37% of trips
involve phone distraction

36% of all distractions
occur at a high driving speed
of **over 50 mph (80 kmph)**

Source: CMT driving data, 2019



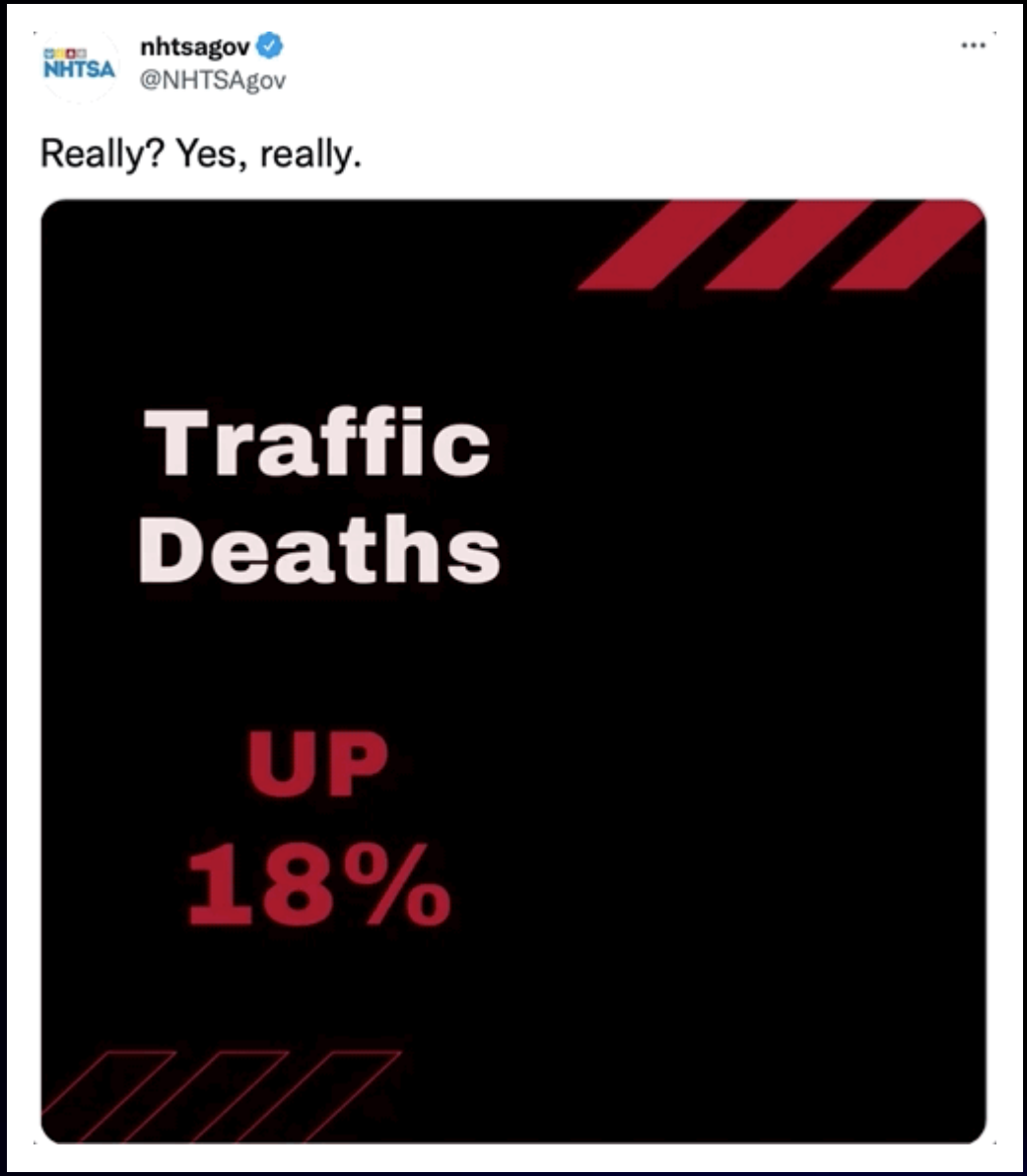
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Traffic Fatalities Up 18% in 2021

20,160 U.S. Traffic Fatalities

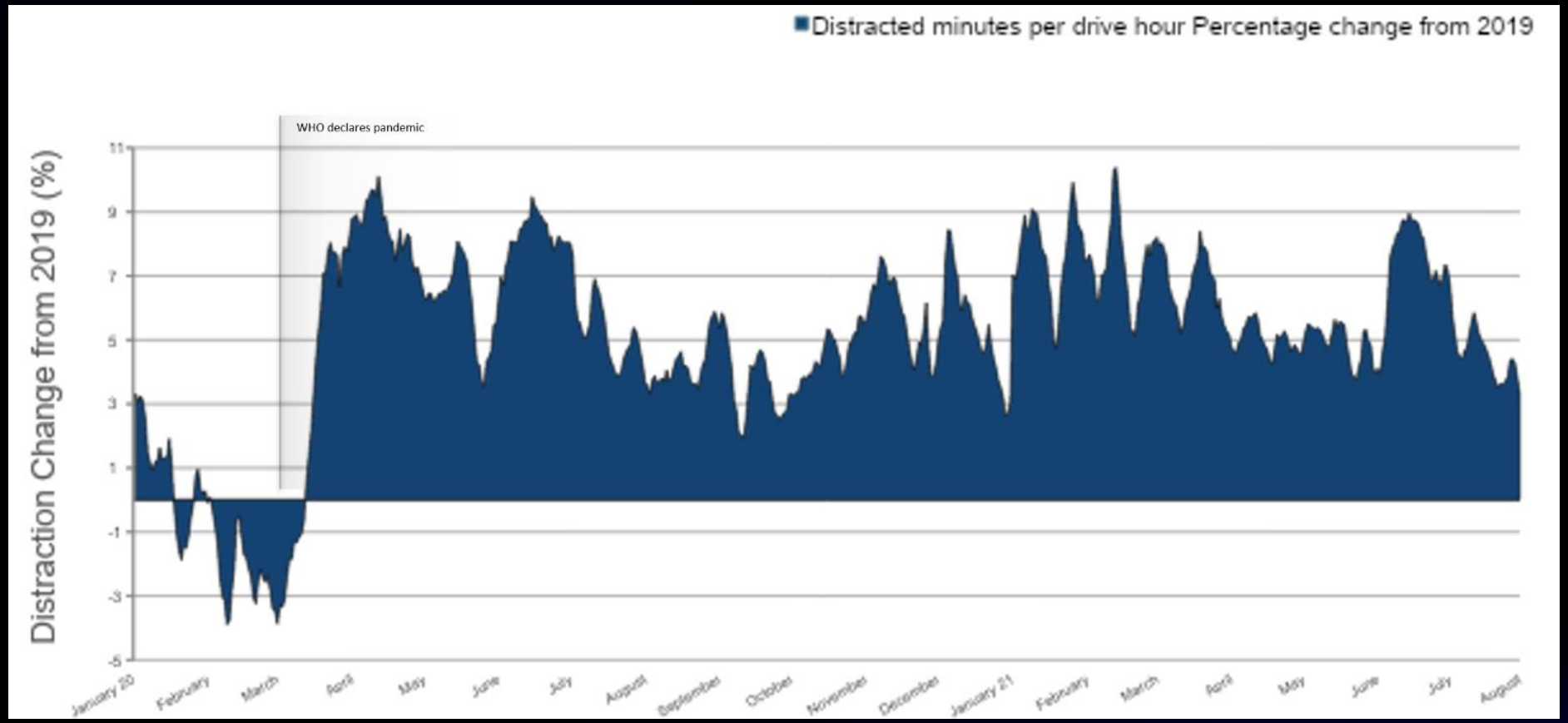
January – June 2021

Largest 6-Month Increase Ever Recorded



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COVID-19 Era: Phone Distraction Has Risen



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Our Mission

To make the world’s roads & drivers safer



Artificial Intelligence

Behavioral Science

Mobile Sensing

Internet of Things (IoT)

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CMT

The trusted global leader in mobile telematics

80	20	7M	400	21M
programs	countries	drivers	employees	IoT Tag devices shipped



Auto insurance



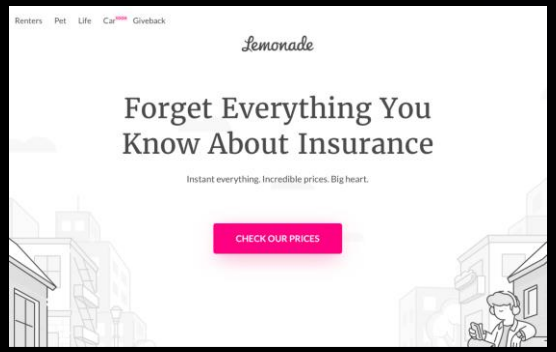
Automakers



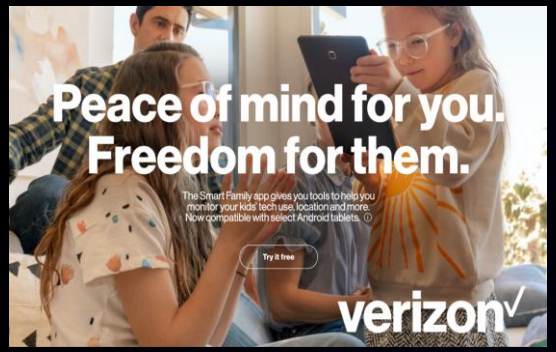
Mobility



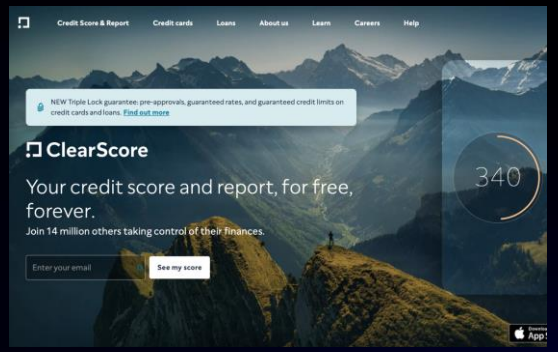
Auto retail



Insurtech



Wireless carriers



Finance



Security

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Our Platform & Products

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Telematics Mobility Ecosystem



USERS



- Business Users
- End Users

MOBILITY PARTNERS



- Personal Insurance
- Commercial Insurance
- Automakers
- Rideshare
- Personal Safety
- Fleets
- Rental

TELEMATICS SOLUTIONS



- Usage-Based Insurance
- Behavior-Based Insurance
- Family Safety
- Fleet Safety
- Behavioral Change
- Crash Concierge
- FNOL
- Claims

CMT PLATFORM & PRODUCTS



- CMT's DriveWell Platform & Products ▶▶

VEHICLES & DRIVERS



- Cars & Trucks
- Fleet Trucks
- Motorcycles
- ADAS
- Autonomous Vehicles

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CMT's DriveWell Platform & Products Power Telematics Solutions

TELEMATICS SOLUTIONS



- Usage-Based Insurance
- Behavior-Based Insurance
- Family Safety
- Fleet Safety
- Behavioral Change
- Crash Concierge
- FNOL
- Claims

CMT PLATFORM & PRODUCTS



CMT Products ▶▶

DriveWell Platform

Data Pipeline

- Trip Data Processing
- Sensor Stream
- Video Stream

Data Sources



DriveWell Mobile SDK
Phone, BLE Tag, wearables



CMT Standalone Devices
LTE Tag, DriveScape Video



Third-Party Devices
Connected cars, OBD-II

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CMT's DriveWell Platform & Products Power Telematics Solutions

TELEMATICS SOLUTIONS

- Usage-Based Insurance
- Behavior-Based Insurance
- Family Safety
- Fleet Safety
- Behavioral Change
- Crash Concierge
- FNOL
- Claims

CMT PLATFORM & PRODUCTS

CMT Products

Interfaces

Data Flows
APIs, reports, cloud storage

Workflows
apps, portal, UMP

Products
Insights

Risk Studio
risk factors, scores, context

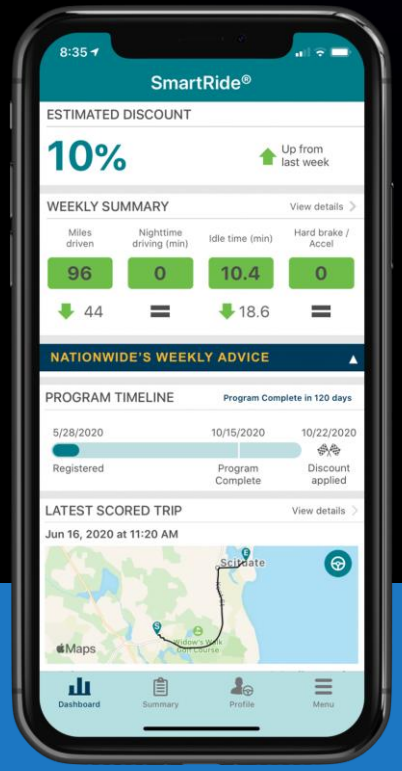
Behavior Studio
feedback, incentives, messaging

Claims Studio
crash detection, reconstruction, fraud

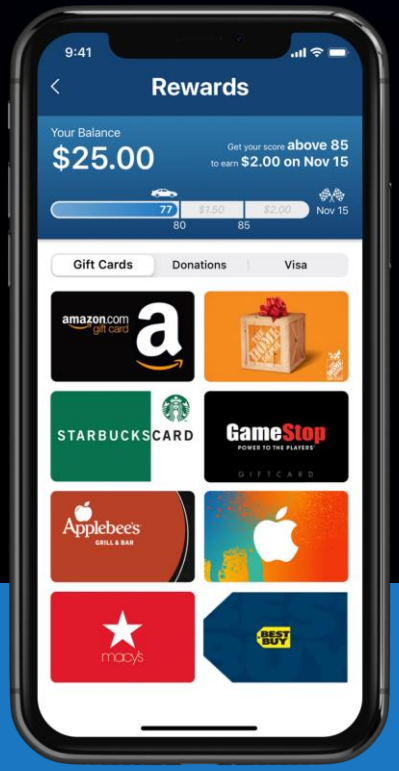
DriveWell Platform

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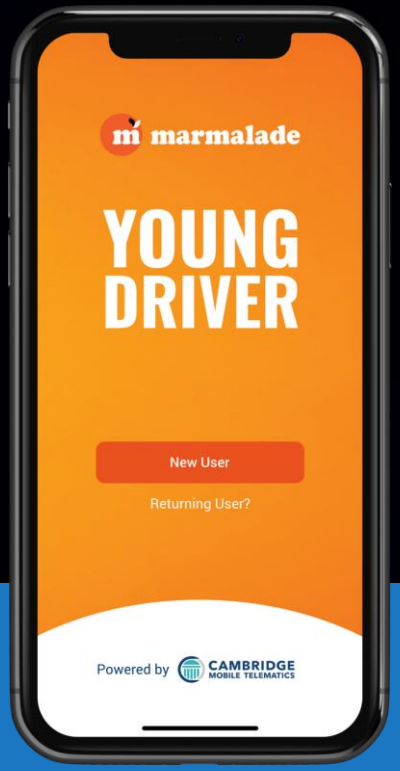
CMT powers many different types of programs to help assess risk and improve driving behavior



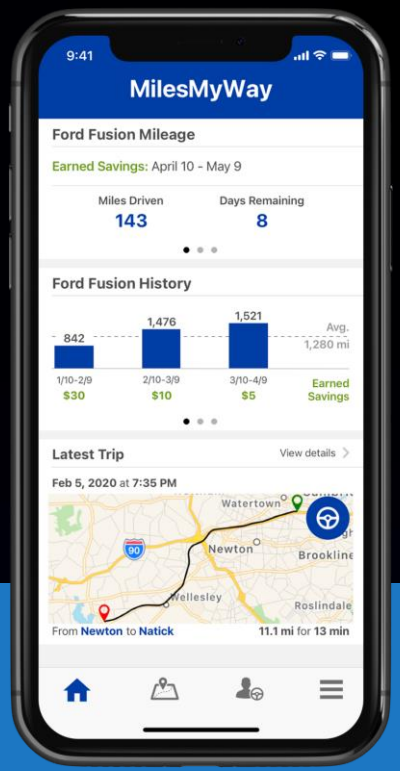
Discounts



Rewards



Young Drivers



Low Mileage



Family Safety



Try Before You Buy

aws

Mobile Telematics Makes **Roads Safer**



39%
Distracted Driving



30%
Speeding



50%
Hard Braking

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Measuring Driving Behavior

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Score Driving by Computing Risk Factors

Causative



Phone Motion



Screen Interaction

Controllable



Hard Braking



Harsh Acceleration

Differentiated



Speeding



Road Type



Cornering



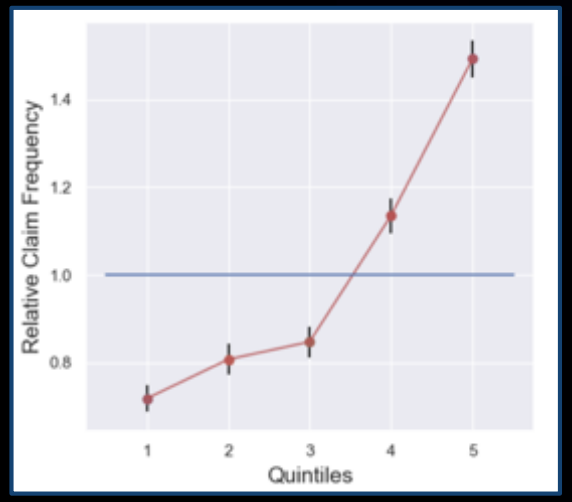
Telematics Collisions

Risk factors based on millions of trips and many billions of miles

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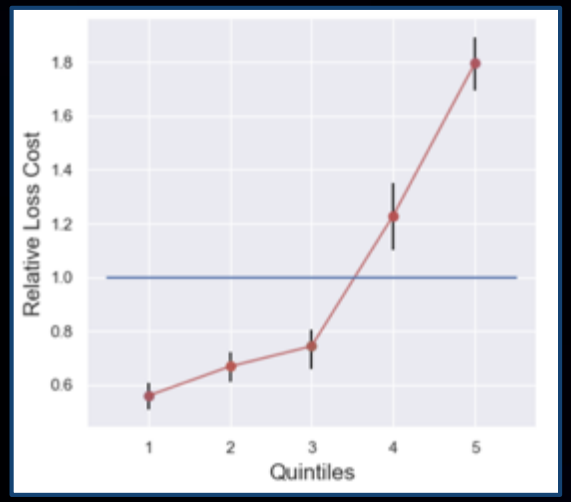
Validating Risk Factors and Scores Using Crash and Insurance Claims Data

Frequency of Loss



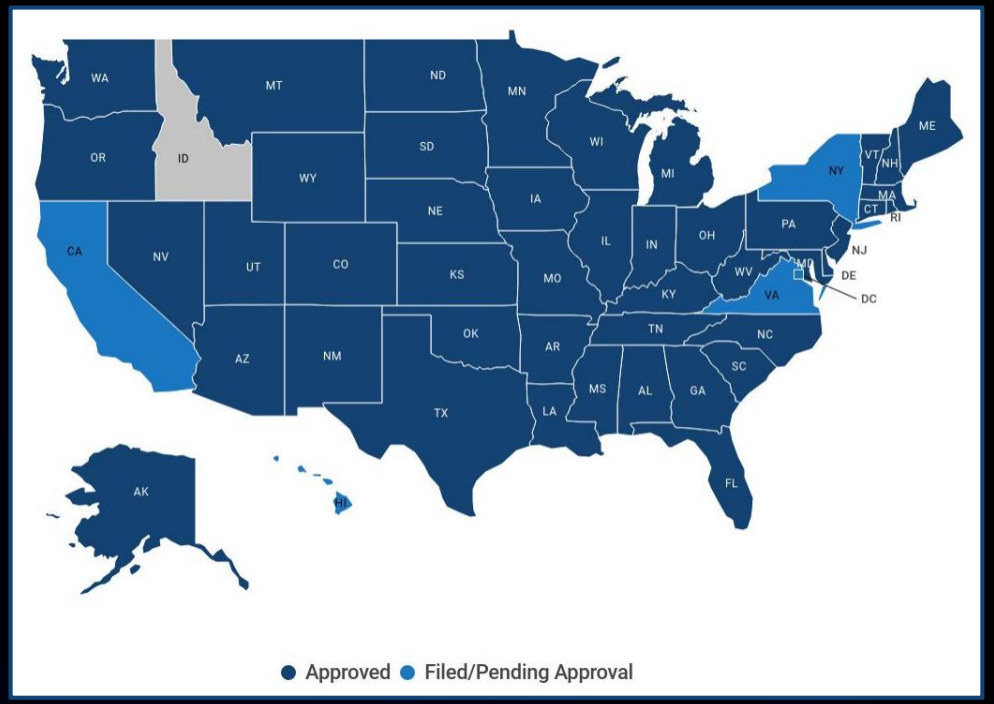
Mean Lift: 2.08
[1.97-2.2 Quartile Range]

Loss Cost Validation



Mean Lift: 3.22
[2.88-3.59 Quartile Range]

Lift Charts Show Predictivity Between a Score or Risk Factor and Likelihood of Incident



Approved score validated by 48 U.S. state departments of insurance (and counting)!

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Telematics is Rooted in Sensor Data

Historically, needed expensive hardware

We pioneered using smartphones and invented a new IoT device (the Tag)

Measure both vehicle dynamics and driver behavior



Accelerometer
Identifies phone position with axis-based motion sensing.

Gyroscope
Works with accelerometer to determine position of phone.

Magnetometer
Measures magnetic fields.

GPS
Identifies phone location with multiple satellites.

Barometer
Measures air pressure.

Proximity sensor
Determines the proximity of the phone to nearby objects.

Ambient Light
Measures the amount of light near the phone.

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DriveWell Tag

- Combine Tag and phone data
- Record only in tagged vehicle
- Record events with no phone
- Vehicle mileage & speed estimates
- Simple Bluetooth onboarding
- “Peel and stick” installation; no wires



Sleek 2” x 2” design

Bluetooth Wireless

4+ Years Battery Life

Over-the-Air Upgrades

Unique Security Key

ConnectedPLUS:

Multiple data sources, one driver profile

From Vehicle	Risky maneuvers ADAS functions and more
From Phone/IoT	Hard braking Speeding Phone motion Screen interaction
From 3rd Party	Weather Road conditions



DriveScape

Computer Vision AI + Dual-Facing Dashcam



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Algorithms Convert Raw Data into Insights



Vehicle dynamics



Map-matching

Automatic recording



Distraction



Transport mode & driver/ passenger

Low battery drain



Mileage & speed



Real-time crash detection

Sensor data → Trip details

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Crash assistance

We detect crashes and get you help fast

aws

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Automated Crash Detection using Signal Processing and Machine Learning

- Rapid deceleration
- Cabin pressure spike
- Pulled over
- Heavy traffic



- Walked around
- Used phone
- Accident-prone location
- Overcast

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Automated Crash Descriptions using AI

Crash Storyline

Crash Storyline ID: **973404** Trip ID: **2012601643**

Driver ID: Customer Vehicle ID:

Tag ID: **0c:c8:44** Crash Time: **Oct. 19, 2021, 1:49:42 PM (UTC+02:00)**

Crash Location: **Budapest, Istenhegyi út, 1125 Hungary**

Claims STUDIO



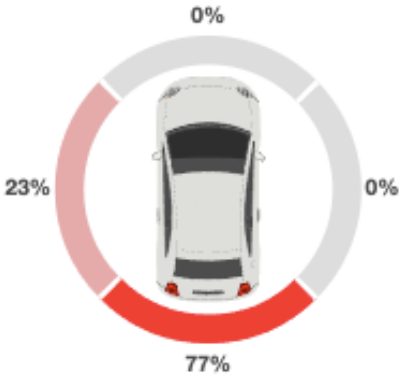
Crash Description

The driver was traveling Southwest along Istenhegyi út at 13 mph at 13:49:40 on 2021/10/19. At 13:49:41 a collision occurred on the rear side of the vehicle while the vehicle was traveling at 11 mph. The collision event ended at 13:49:43 when the vehicle reached a speed of 7 mph. The driver continued driving after the crash event toward their destination.

Severity



Hit Location



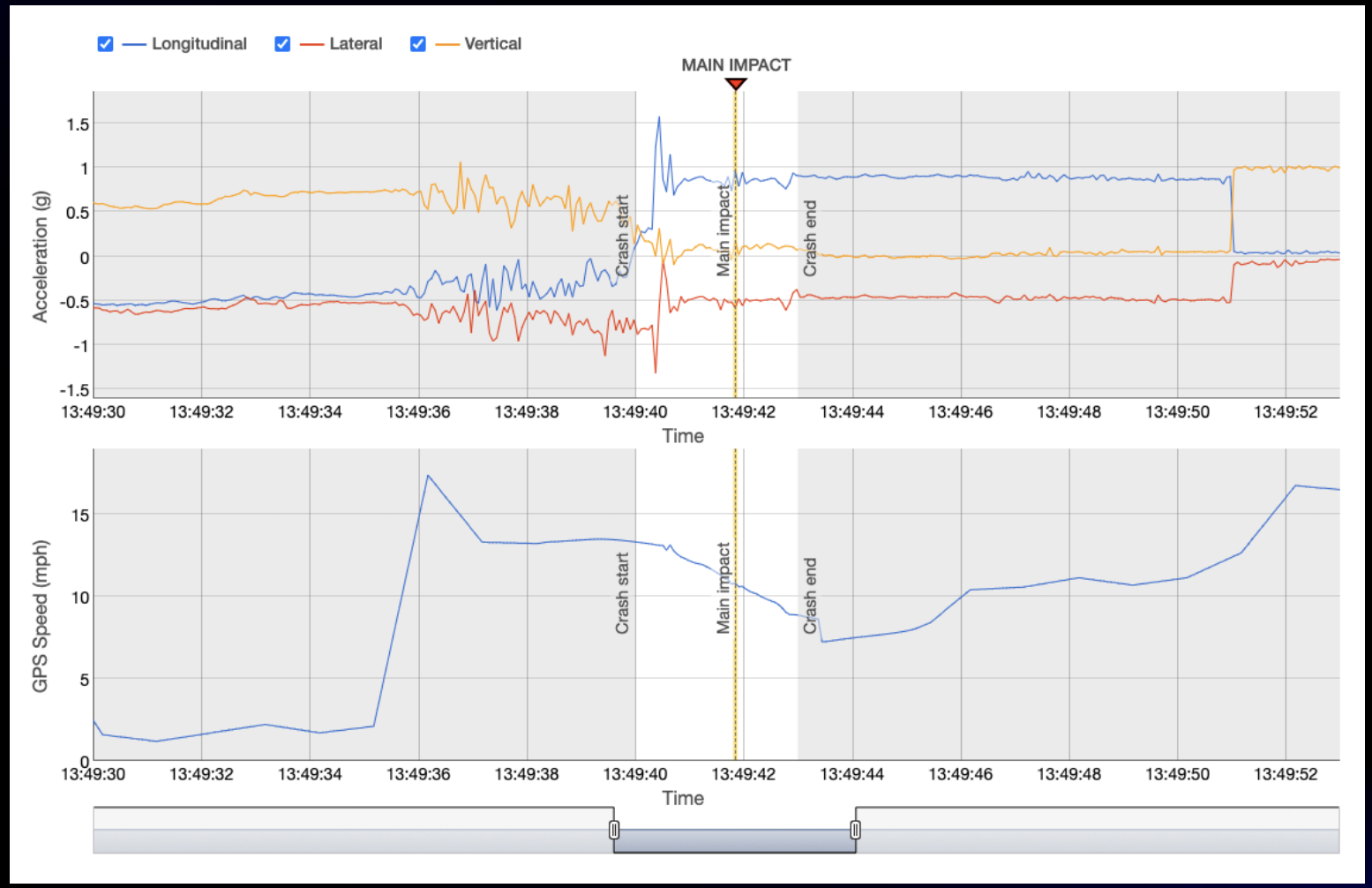
Weather Data

Observed: 2:03 PM
Precipitation: None
Wind: 8 mph S
Wind Gust: 13 mph
Visibility: 10 mi
Daytime: Yes
Sun Facing Driver: No

58 °F
Sunny

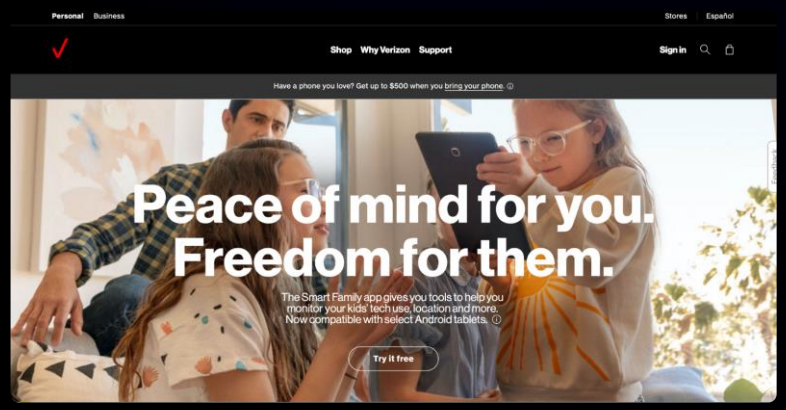
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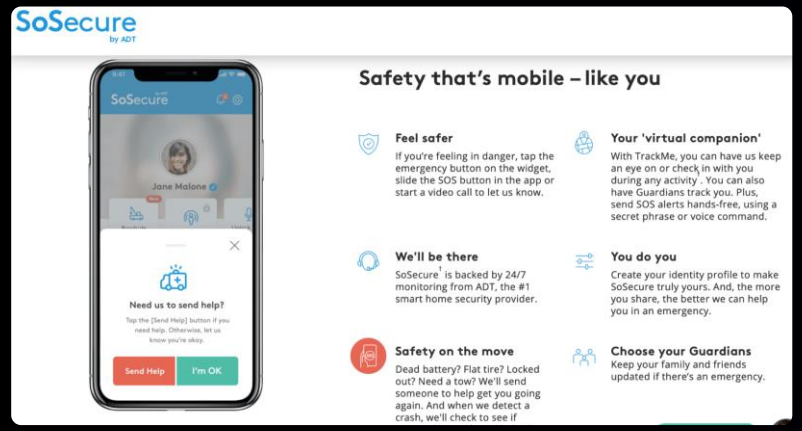
...Based on sensor data



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CrashAssist is Going Mainstream





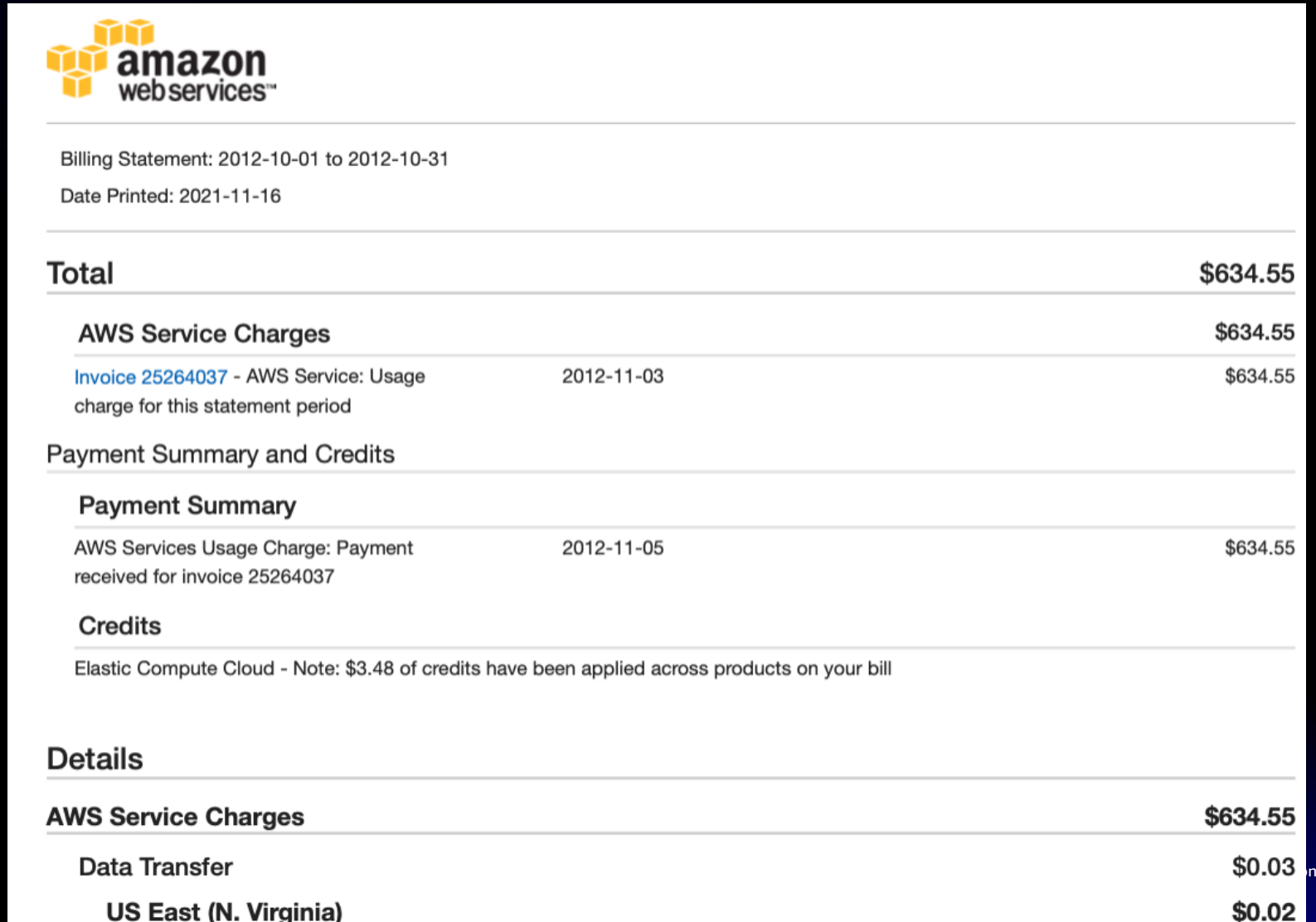


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Processing & Data Infrastructure

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AWS: CMT's Infrastructure Provider since 2012



amazon web services™

Billing Statement: 2012-10-01 to 2012-10-31

Date Printed: 2021-11-16

Total $634.55

AWS Service Charges $634.55

Invoice 25264037 - AWS Service: Usage charge for this statement period	2012-11-03	$634.55

Payment Summary and Credits

Payment Summary

AWS Services Usage Charge: Payment received for invoice 25264037	2012-11-05	$634.55

Credits

Elastic Compute Cloud - Note: $3.48 of credits have been applied across products on your bill

Details

AWS Service Charges $634.55

Data Transfer $0.03

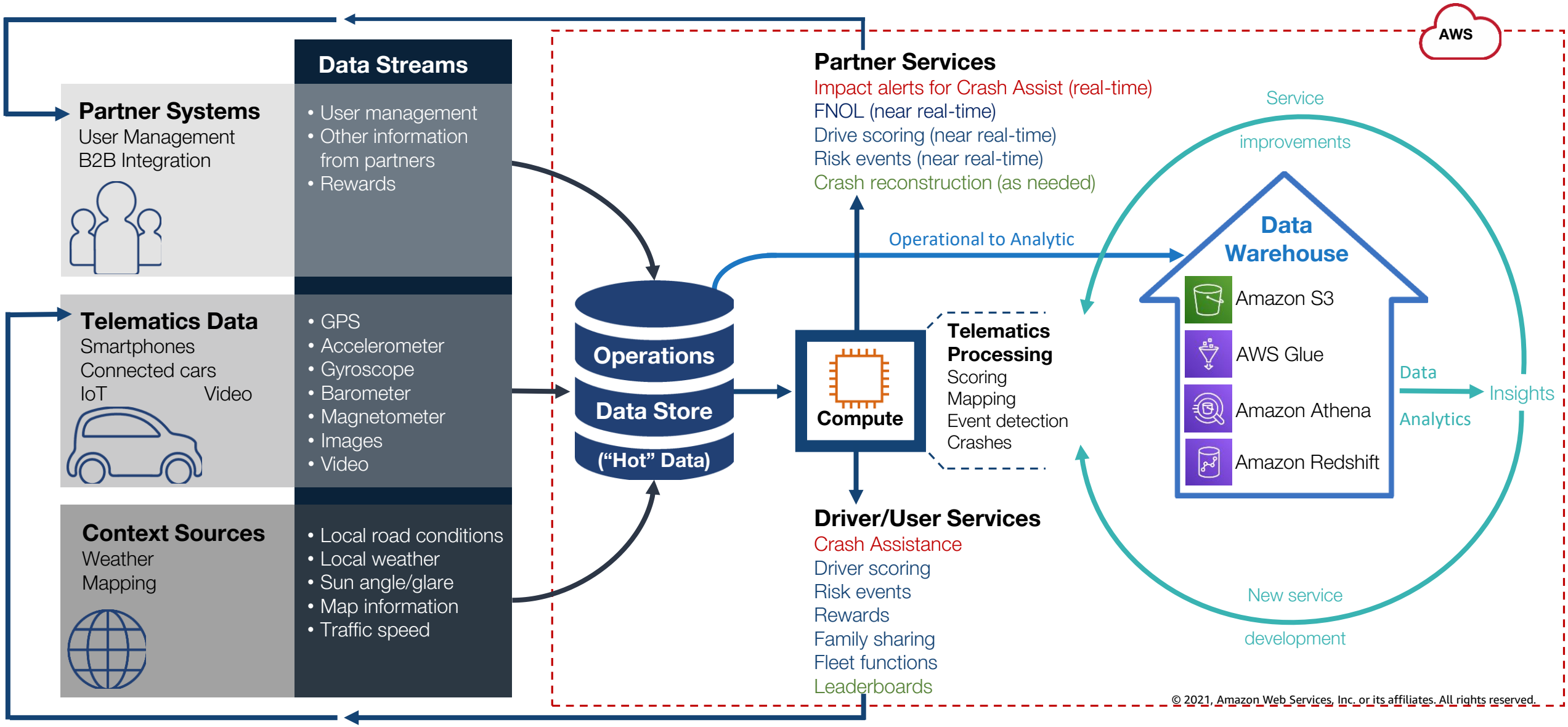
US East (N. Virginia) $0.02

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CMT's Operational AWS Footprint (2021)

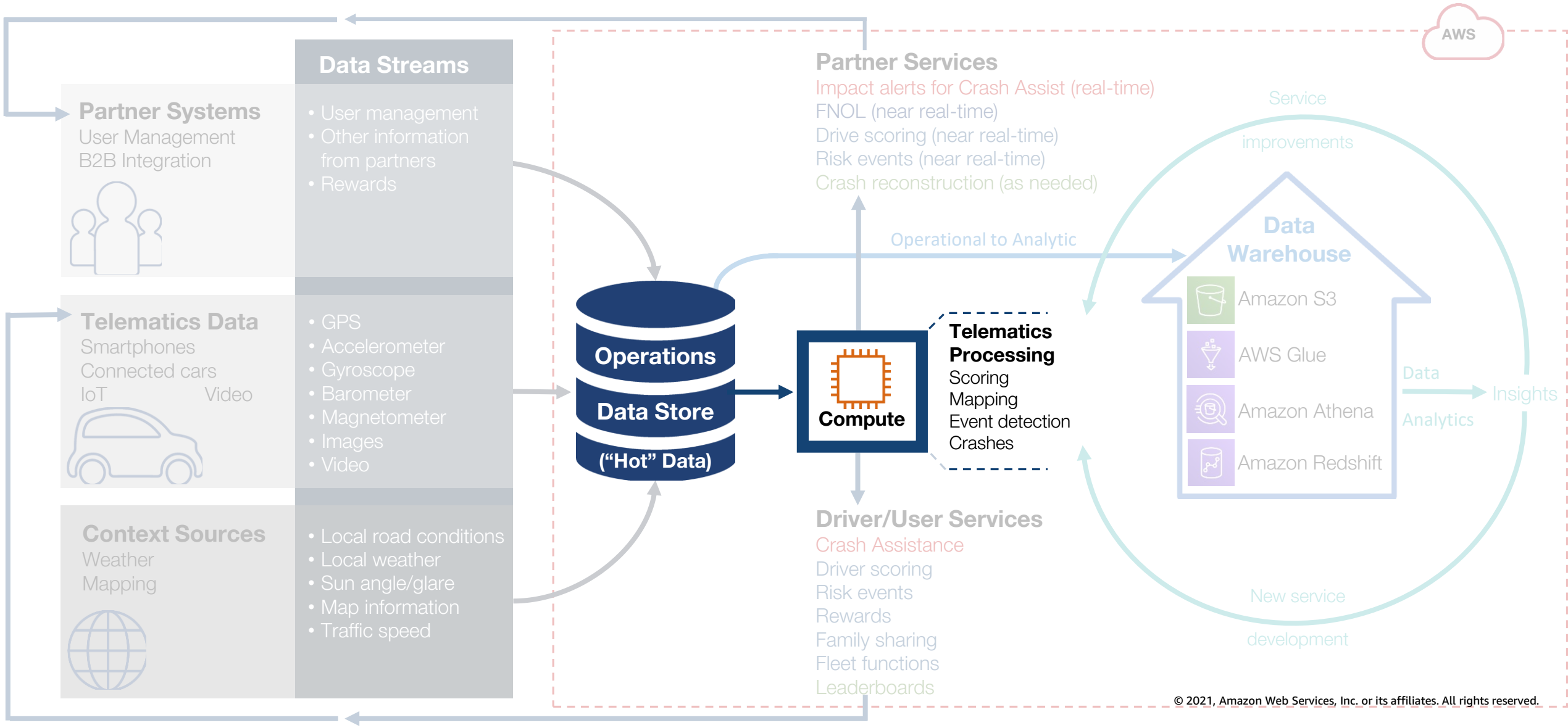


Telematics Processing Architecture



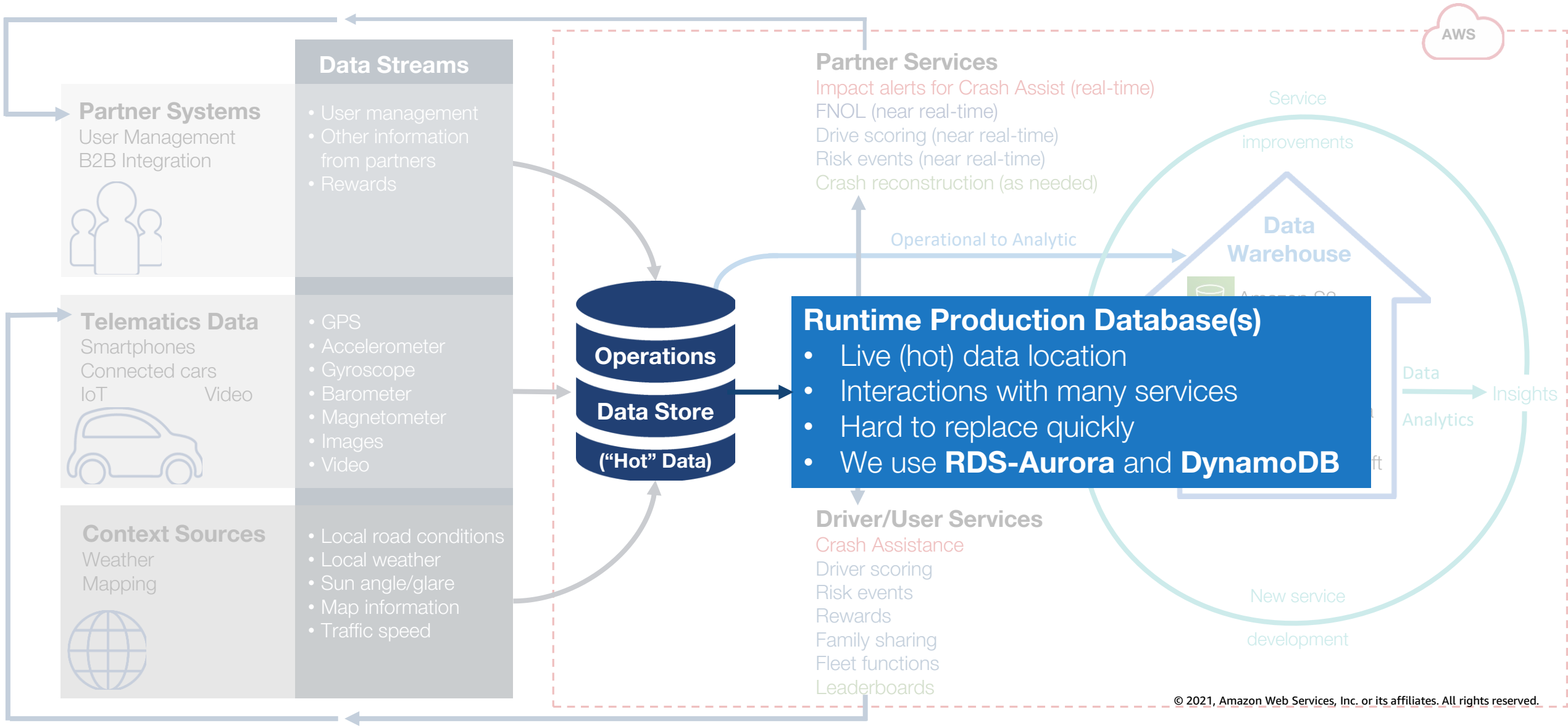
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Operations Core Mission



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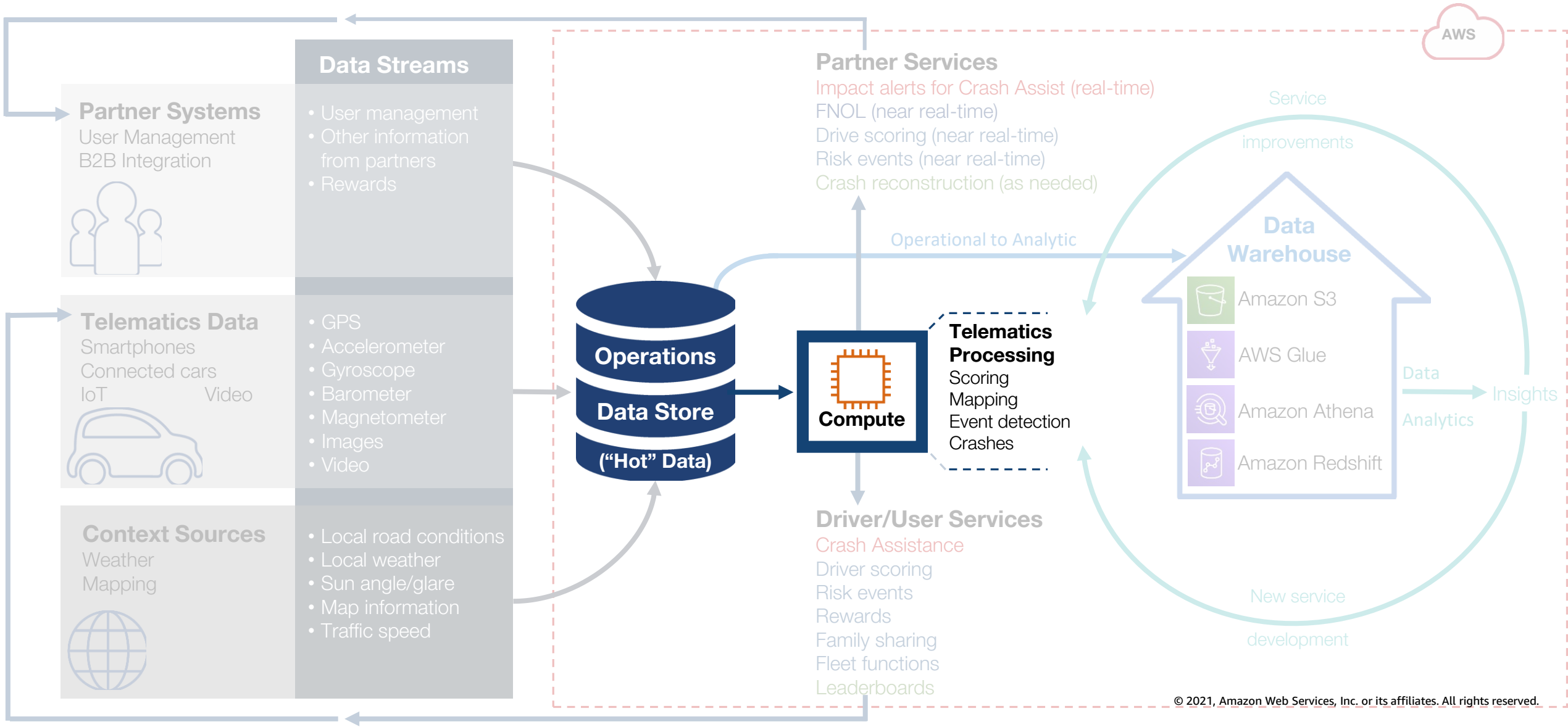
Hot Data



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Scaling Approach

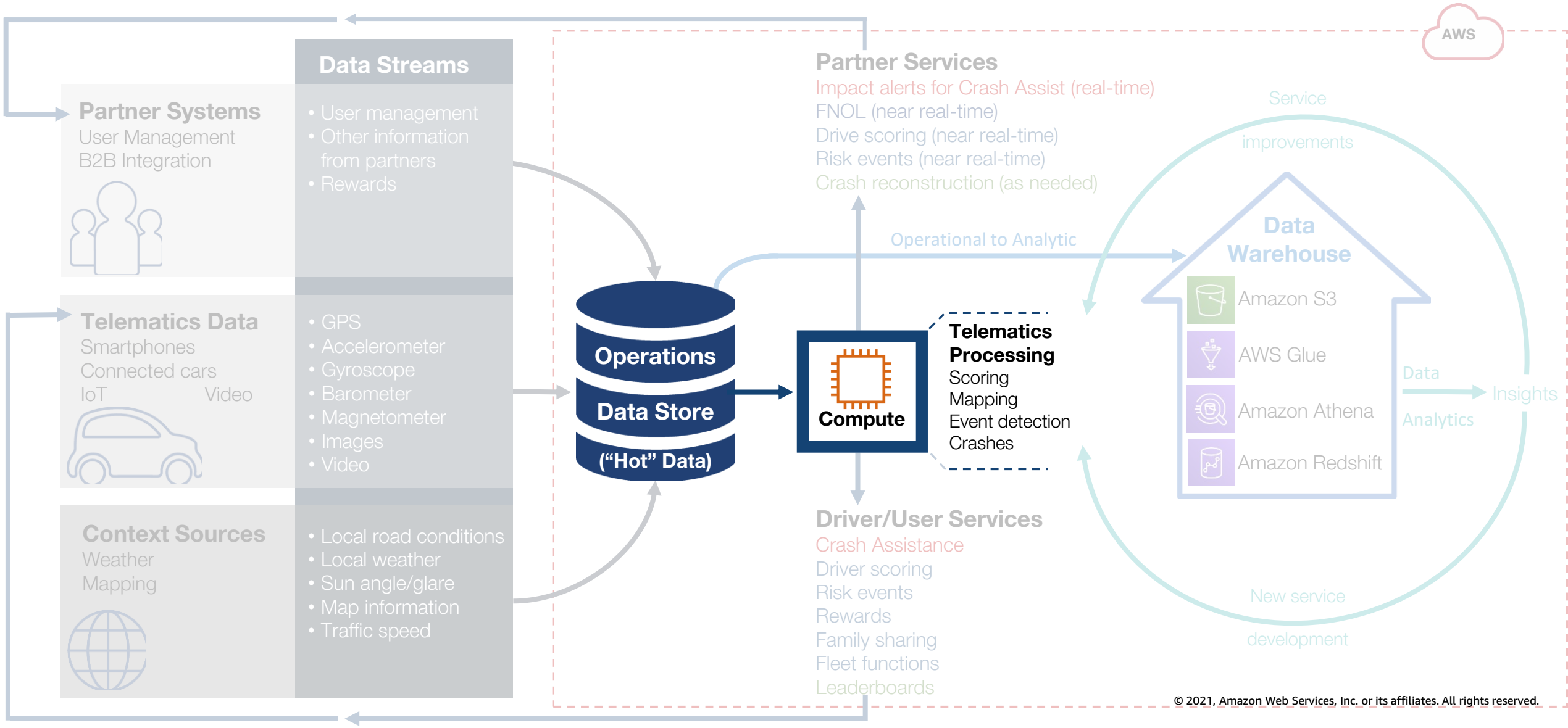
Goal: Efficient and Cost Effective



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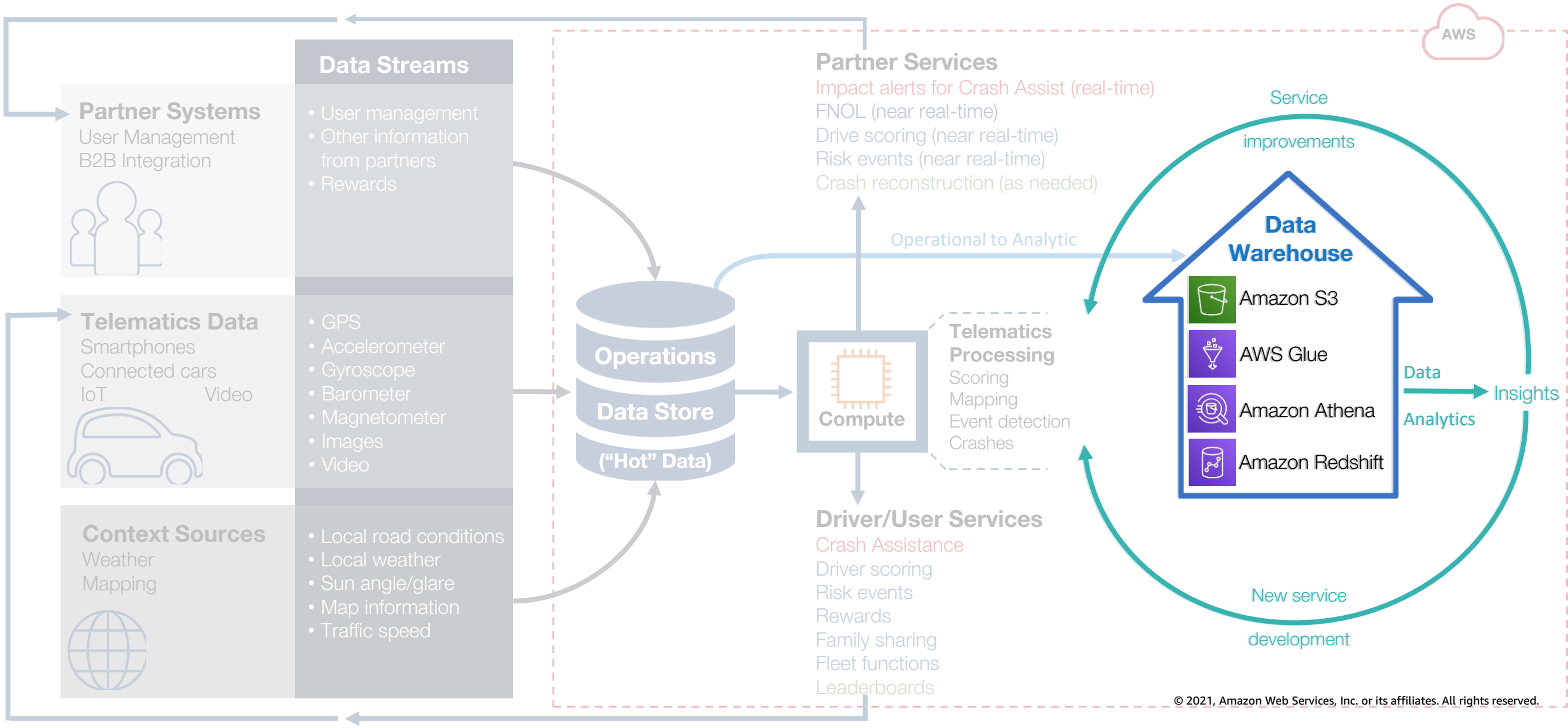
Processing Telematics Data

Goal: Efficient and Cost Effective



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Storage for Analytics & Machine Learning



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Data Privacy

Privacy by design

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CMT’s Privacy Compliances

CMT has a robust information security and privacy program that complies with:



General Data Protection Regulation (GDPR)



California Consumer Privacy Act (CCPA)



ISO 27001

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Data privacy and security by design



Continuity



Security



Privacy

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Best-In-Class Privacy Practices

No Data is Shared or Sold
Consumer data is not used for any other services besides those offered by CMT.

Minimum Amount of Data
CMT only collects the minimum personal information necessary to provide its services. In general, the only PII CMT collects is Unique Identifier, GPS coordinates, and IP address.

End-to-End Encryption
From collection to storage, data is encrypted at transfer and at rest,

Simple and Transparent EULA
CMT provides a clear explanation to its users of what data is collected and how it is used.

Retention
Data is only stored for as long as it’s necessary to provide CMT’s services.

Consent
Users can withdraw consent to CMT processing their data at any time.

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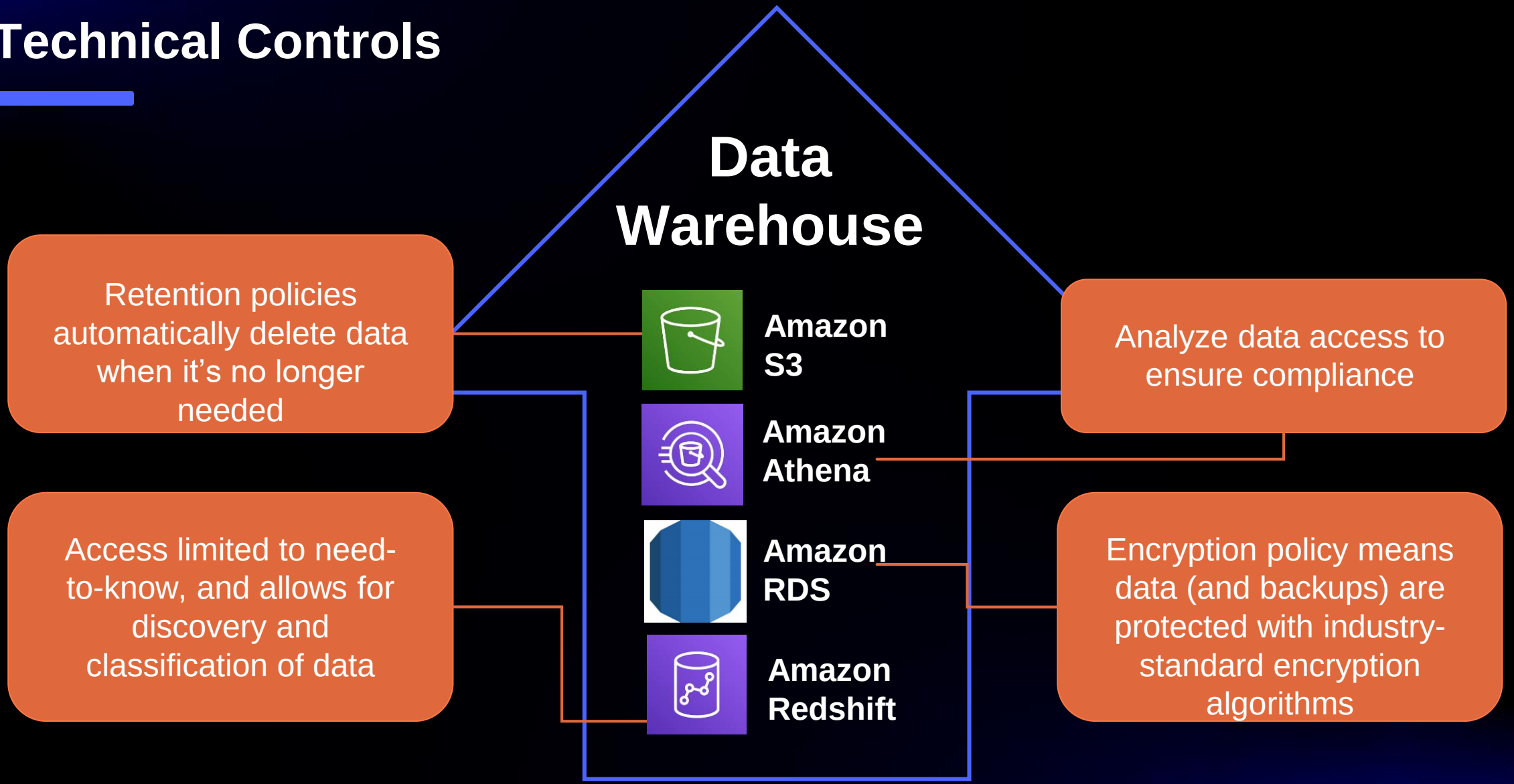
Data Residency

Data is stored and processed in the region in which it was collected (e.g. US data remains in the US, EU data remains in the EU, CA in CA, etc.)



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Technical Controls



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CMT’s Privacy Board



Daniel Weitzner
Board Chair

Head of MIT Internet Policy Research Initiative
Deputy CTO, Obama White House



Kathleen O’Toole

21CP Solutions



Orin Kerr

UC Berkeley Law Professor



Patrick Van Eecke

University of Antwerp
& Cooley LLP

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Thank you!

Hari Balakrishnan

Founder & CTO

hari@cmtelematics.com

CAMBRIDGE MOBILE TELEMATICS



39%

Distracted Driving



30%

Speeding



50%

Hard Braking

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