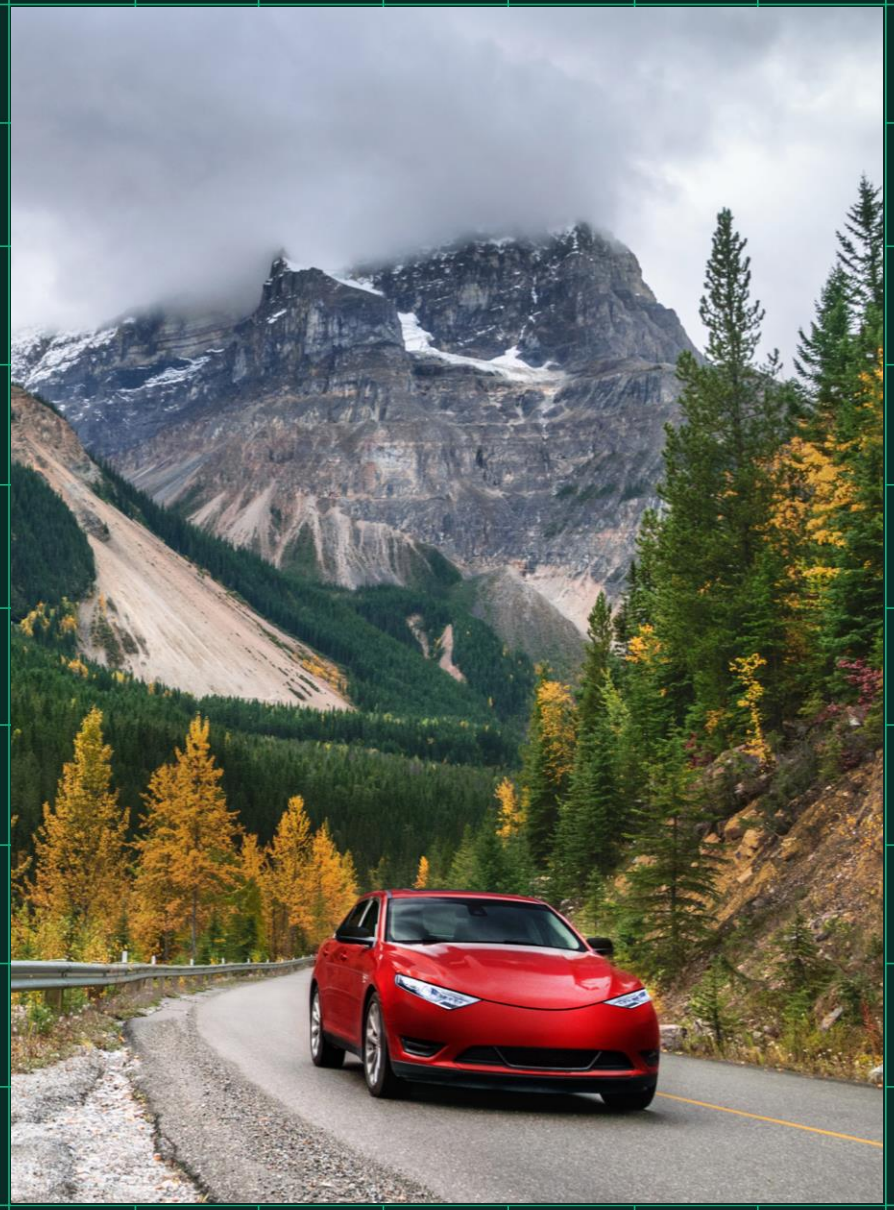
WELCOME TO AUSTIN

n'CONNECT

Mastering Data Record for ADAS and AD Together



Mastering Data Record for ADAS and AD Together

Daniel Riedelbauch,

Principal Solutions Marketing Manager,
ADAS & AD Validation, NI

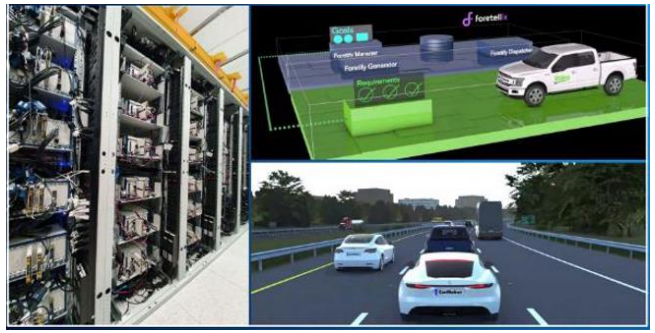
NI's Capabilities for ADAS / AD Test

A cohesive toolchain that combines the best-in-class components needed to test ADAS/AD software.
Modular and can be changed out to match a customers existing tools/workflows

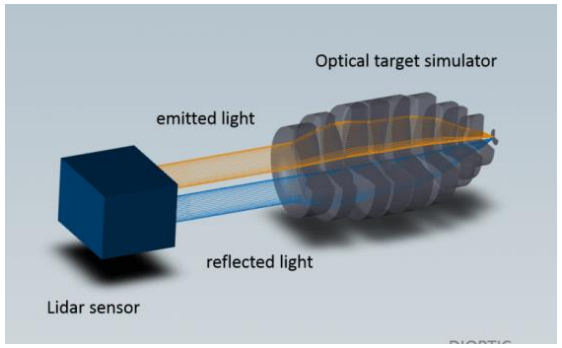
Software V&V

Sensor Logging → Simulation → Replay and Hardware in the Loop

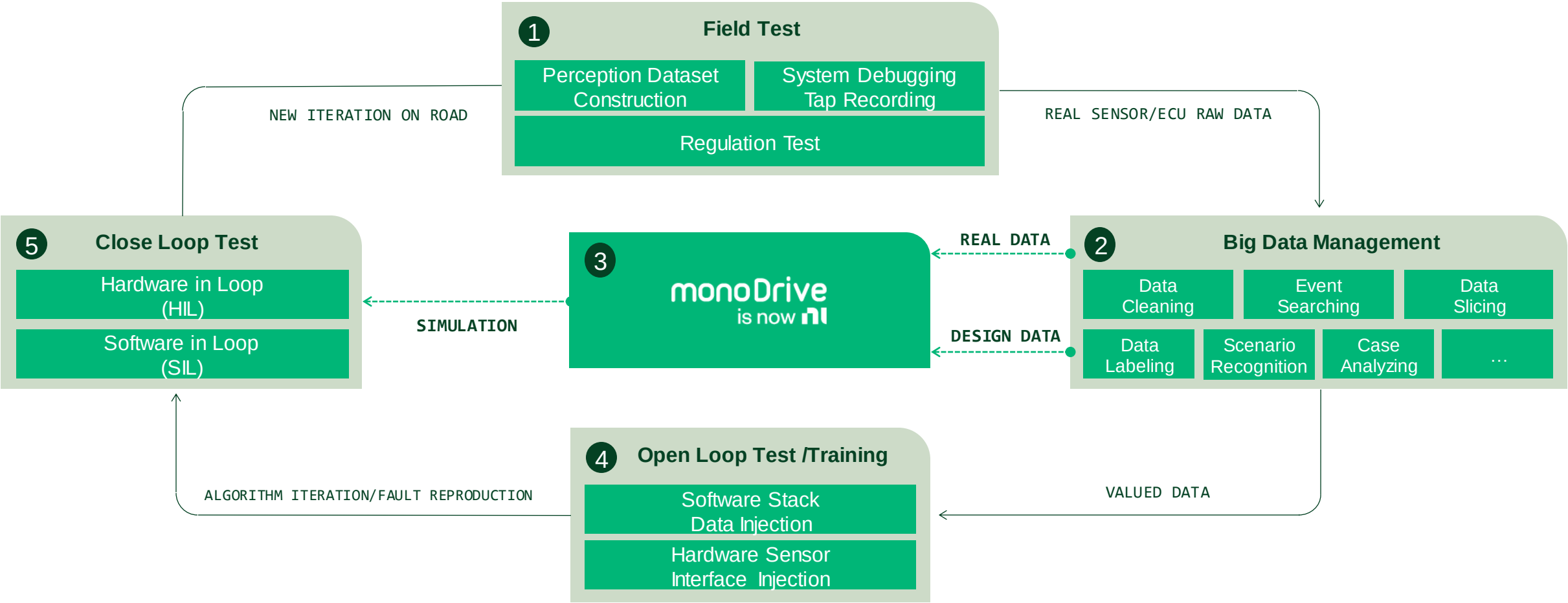
SEAGATE | monoDrive is now NI | monoDrive is now NI



Sensor Test



How to Leverage the Value of Data in the Whole Development Process



Diego Carvalho,

Expert and Software Tool
Lead Engineer, Valeo

VALEO Tool Chain

Diego CARVALHO

May 2022

SMART TECHNOLOGY FOR SMARTER MOBILITY

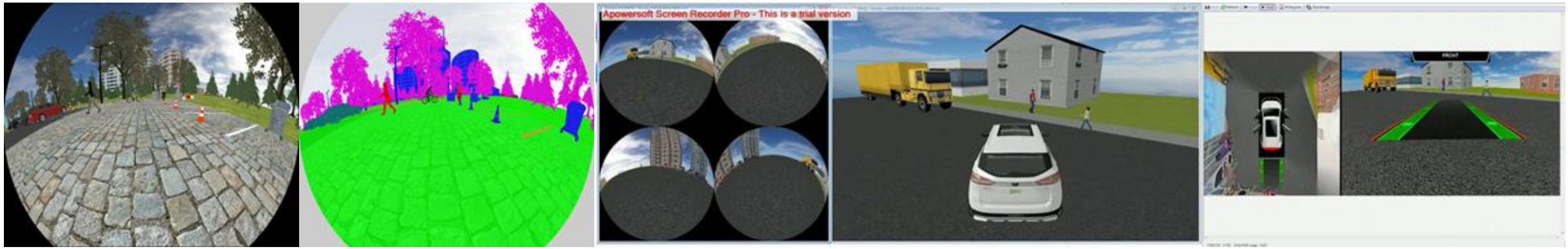
01
SW Platform

SOFTWARE PLATFORM

- Internally owned software and firmware
- Modular and Scalable Plugin Framework
  - 80+ plugins
- Common environment used for:
  - In-Vehicle Recording, HIL, industrial

VPI

SIMULATION HIL SOFTWARE



SOFTWARE PLATFORM

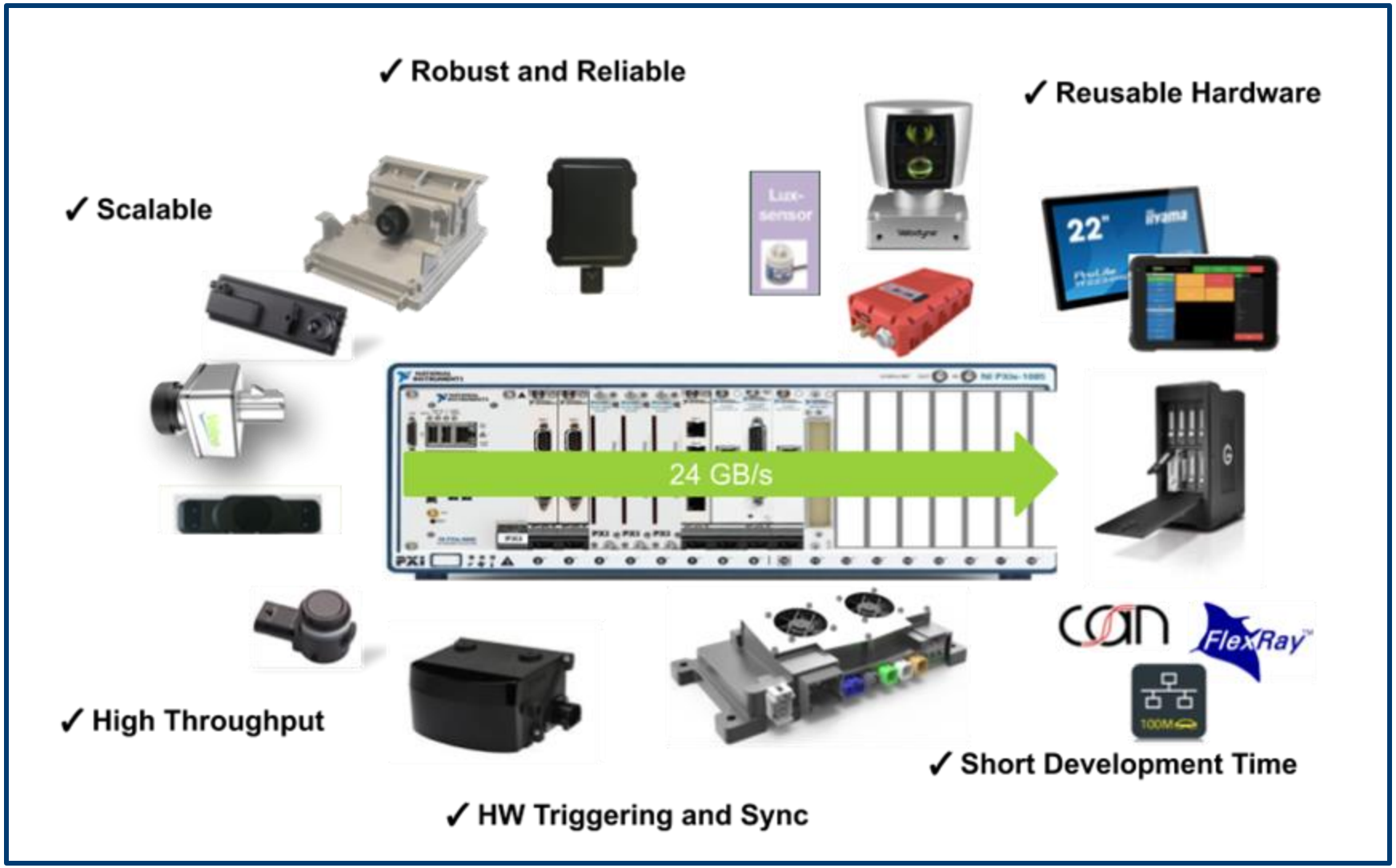
- High level of expertise;

- Certified as a LabVIEW center of excellence

LabVIEW™
Center of Excellence

02
HW Platform

HARDWARE PLATFORM



HARDWARE PLATFORM

- 7 FlexRIO custom camera adapter modules developed
- 20+ different camera variants
- FPD-LINK
- GMSL

03
Valeo & NI

VALEO & NI

- Multilayer Partnership

- Mutual R&D Collaboration
- CAB sessions / Valeo Requirements
- Earlier Access Program

PXIe-1486

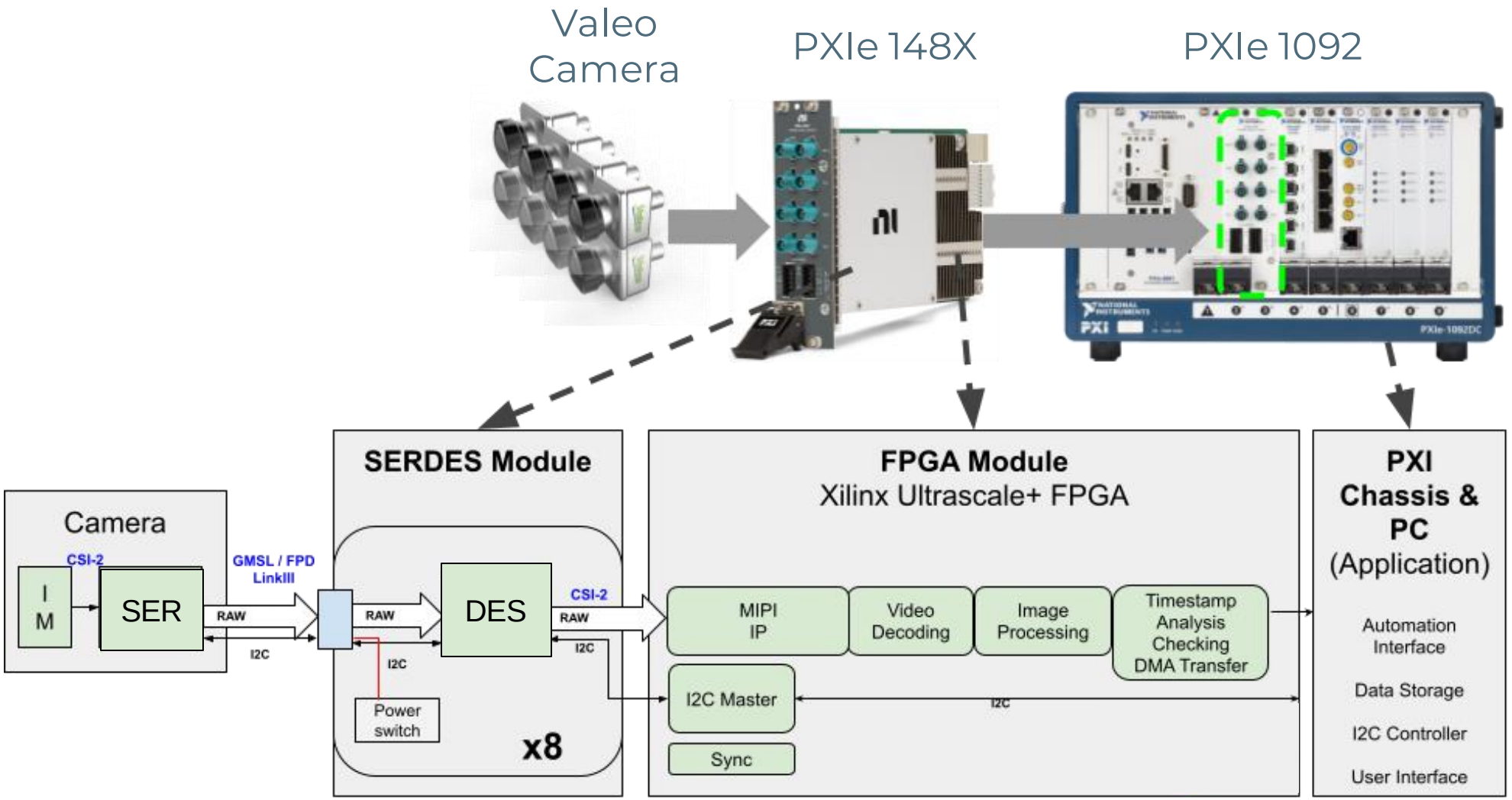
TI - FPD-LINK

PXIe-1487

GMSL 1/2

04
Use Cases

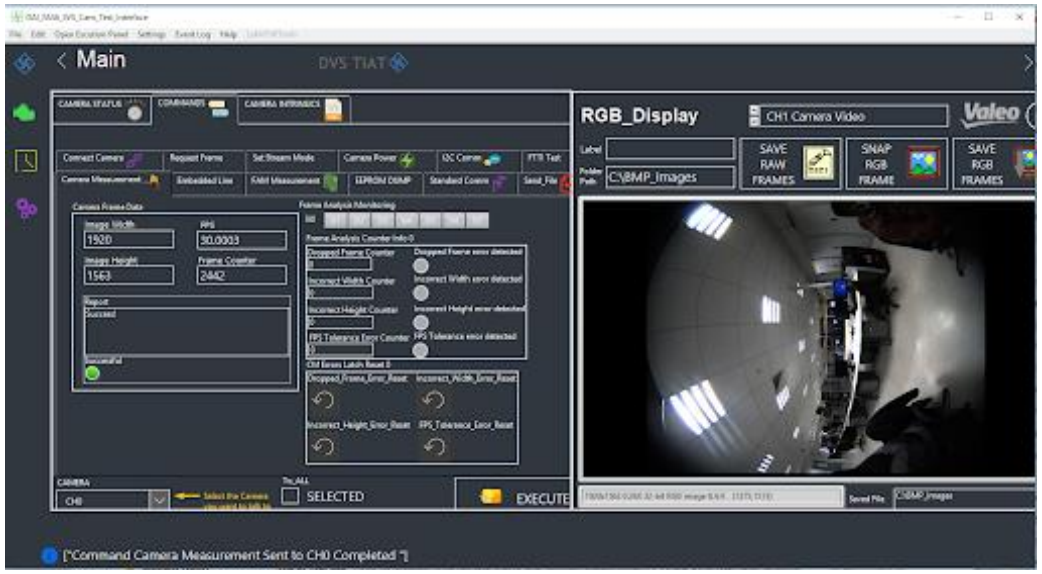
CAMERA TEST INTERFACE

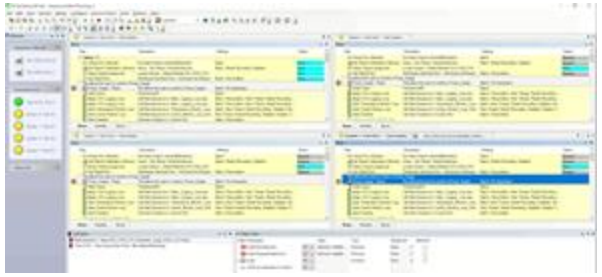


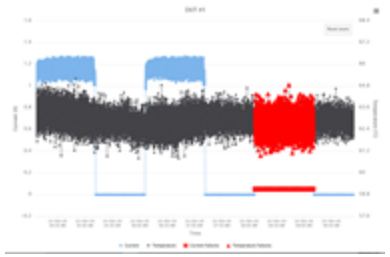
CAMERA TEST INTERFACE

- Camera bringup, DV / PV, hardware test, EMC test, IQ testing, lens alignment (production), EOL testing (production).
- Up to 8 cameras in parallel (use case of up to 24 cameras in DV/PV)
- Frame analysis (pixel level & MIPI protocol level)
- Full backchannel access for link monitoring
- Controllable externally via TestSTAND, TCP/IP and VI-server

Camera Test



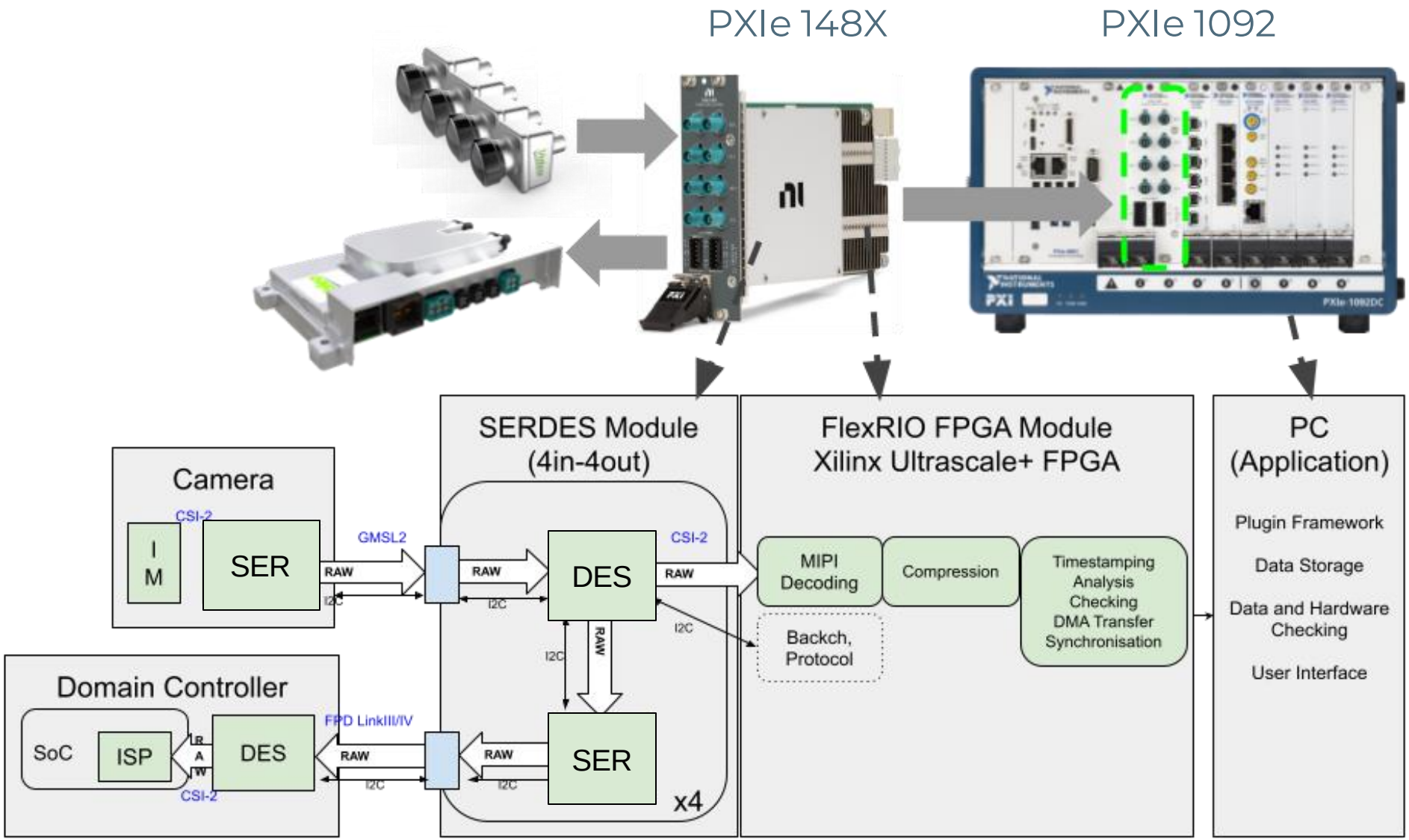




LabVIEW

NI TestStand

IN-VEHICLE RECORDING

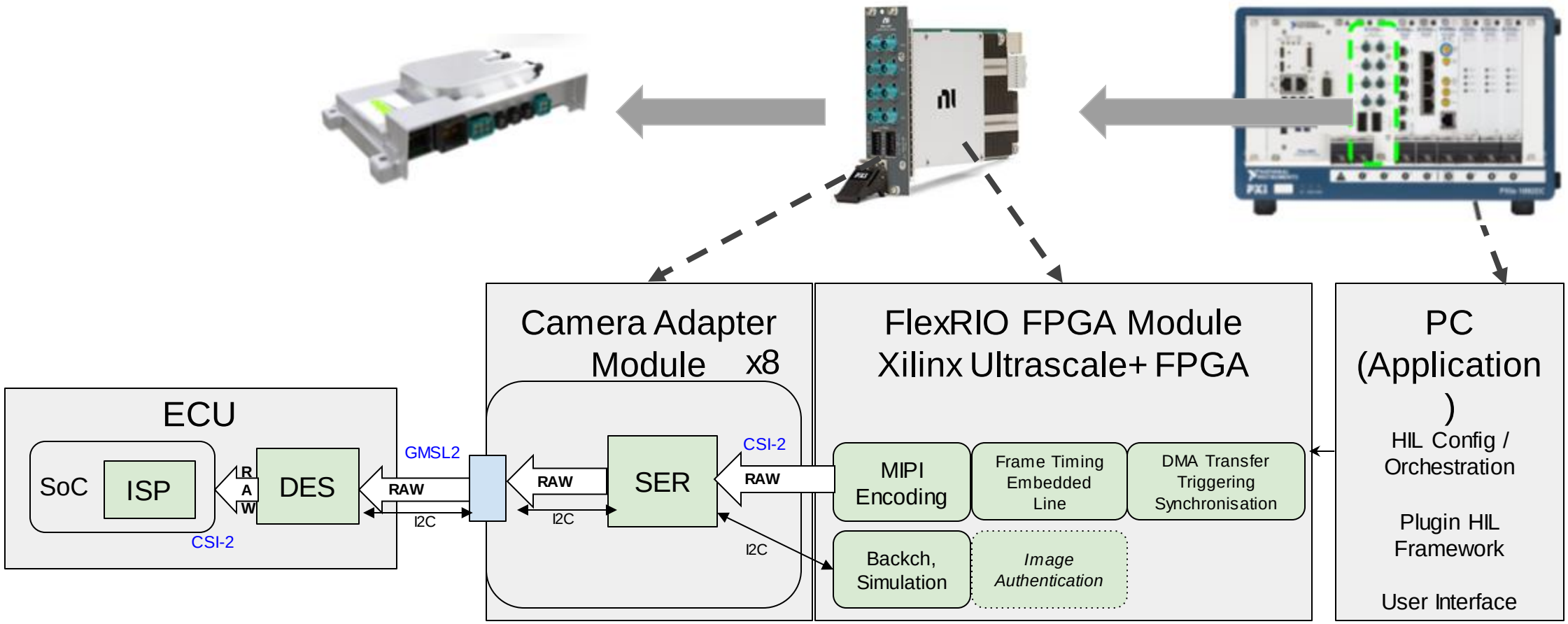


RECORDING SOFTWARE

- Image Control from ECU
- No interference with ECU comms and camera data
- On the fly check for Camera Sync and Frame drop
- Live error reporting
- GPU accelerated debayering and display

RECORDING SOFTWARE

HIL



Backchannel Auth.

HIL

- Synchronisation with ECU Sync Mechanism
- Simulated I2C Slaves (Camera EEPROM)
- Embedded Line Emulation
- Precise camera frame timing
- RAW / YUV Rendering

HIL SOFTWARE

05

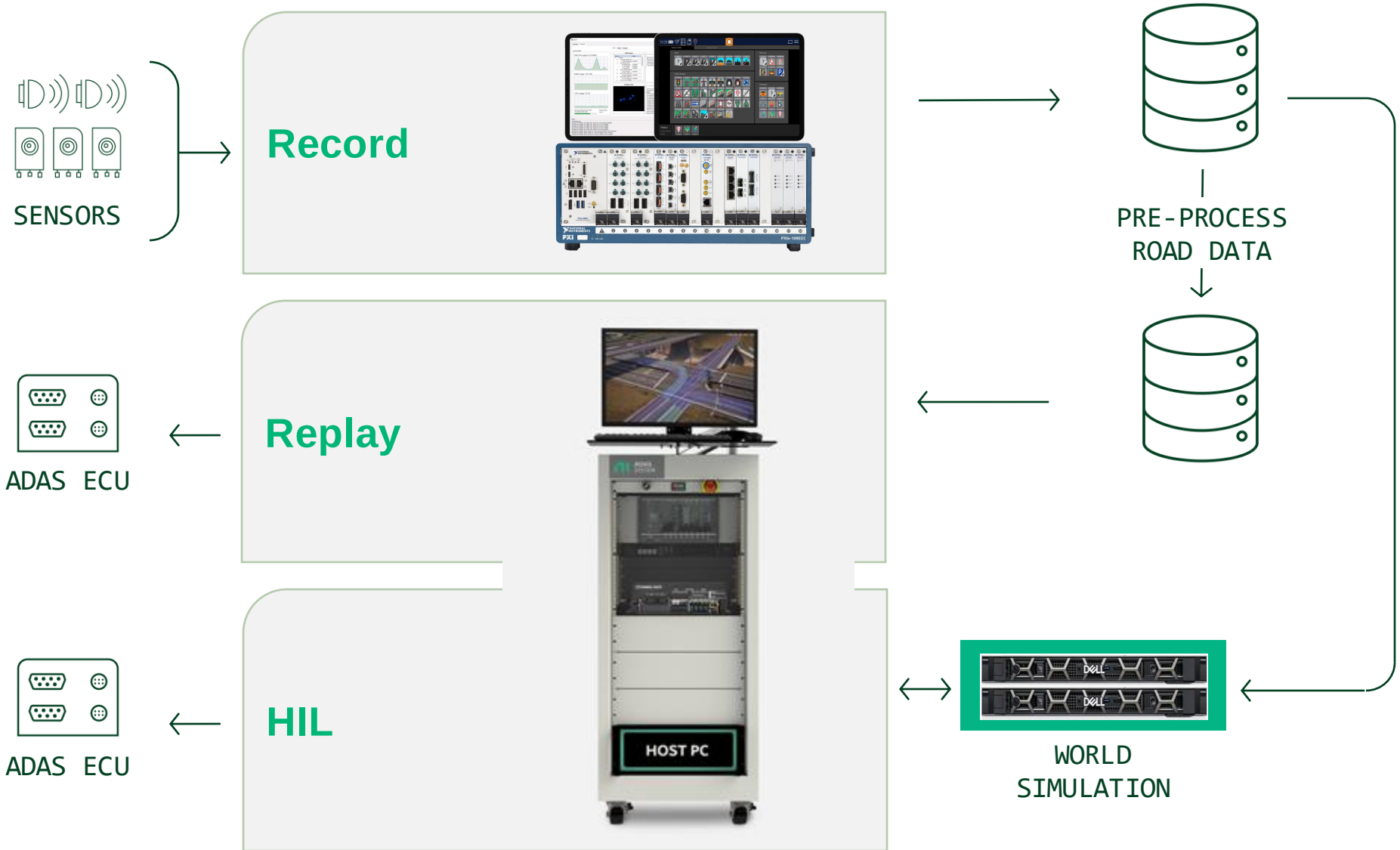
Benefits & Improvements

Benefits & Improvements with PXIe-1486 and 1487

- Industrial Grade HW available off the Shelf from NI
- Common solution for all cameras
- DV Setup increased from 4 cameras up to 24 cameras
- Global support

2014 → 2022

ADAS AD Solutions



Data Record System AD

NI's solution for ADAS and AD data logging

FUTURE PROOF SYSTEMS
Customization & Flexibility

REDUCE TOTAL COST OF DATA
Edge Computing

SYSTEM INTEGRATION & EVOLUTION
Certified Partner – Konrad Technologies

MORE THAN JUST A LOGGER
Single Unified Toolchain

INCREASE DATA QUALITY
I/O, Throughput, Timing & Sync

MINIMIZE SYSTEM COMPLEXITY
Get close to One Single System

Becky Linton,

Senior Systems Engineer, Engineering Team Lead, Konrad Technologies

Plug-Ins for Data Record AD

IO Plugins

Input/Source	Output/Sink	Processor
Audio Recording	AudioLogger (WAV)	System Timing Orchestrator
Camera Capture Simulated	IMAQ Decimate and SystemLink Publish	RAM Rolling Buffer
GigE Vision Acquisition	In Vehicle Networks Raw TDMS	RAID Rolling Buffer
In Vehicle Networks Raw Streaming	MDF4 File Logger	
PXI-6683H GPS Data / Lock	TDMS File Logger	
PXIe-148x Ser Des Acquisition	ADTF File Logger	
Periodic UDP Input	gRPC Publisher	
System Health		

FPGA Automotive Camera Modules

Utilizing FPGA-based Compression IP

6 Total Hardware Variants – 3 each for GMSL2 and FPD-Link III

8 outputs – HIL, Lab-Based Replay, ECU Test

8 inputs – In-Vehicle Data Logging, Camera Test

4 inputs and 4 outputs – In-Vehicle Data Logging

User Programmable FPGA enables inline compression

Lossless compression that provides ~50% (typ.) reduction in file sizes

Low CPU overhead and no external compute nodes for data reduction

Compression on the module or on a separate FPGA using peer-to-peer communication

Parameter	Typical	Minimum	Maximum
Compression ratio (*) (depending on input data)	0,52	1,08	0,125
Compression speed	>600 Full HD (1920x1080) images per second per core (12-bit Bayer RGGCy CSI-2 packed images)		
Memory Consumption	1.5MB resident		
CPU Consumption	1.8 GB/s per core (or 0.56 Cores per GB/s) if incoming data is 16bpp @ 200MHz: 0.25 Cores		

MAXIMIZE QUALITY OF DATA

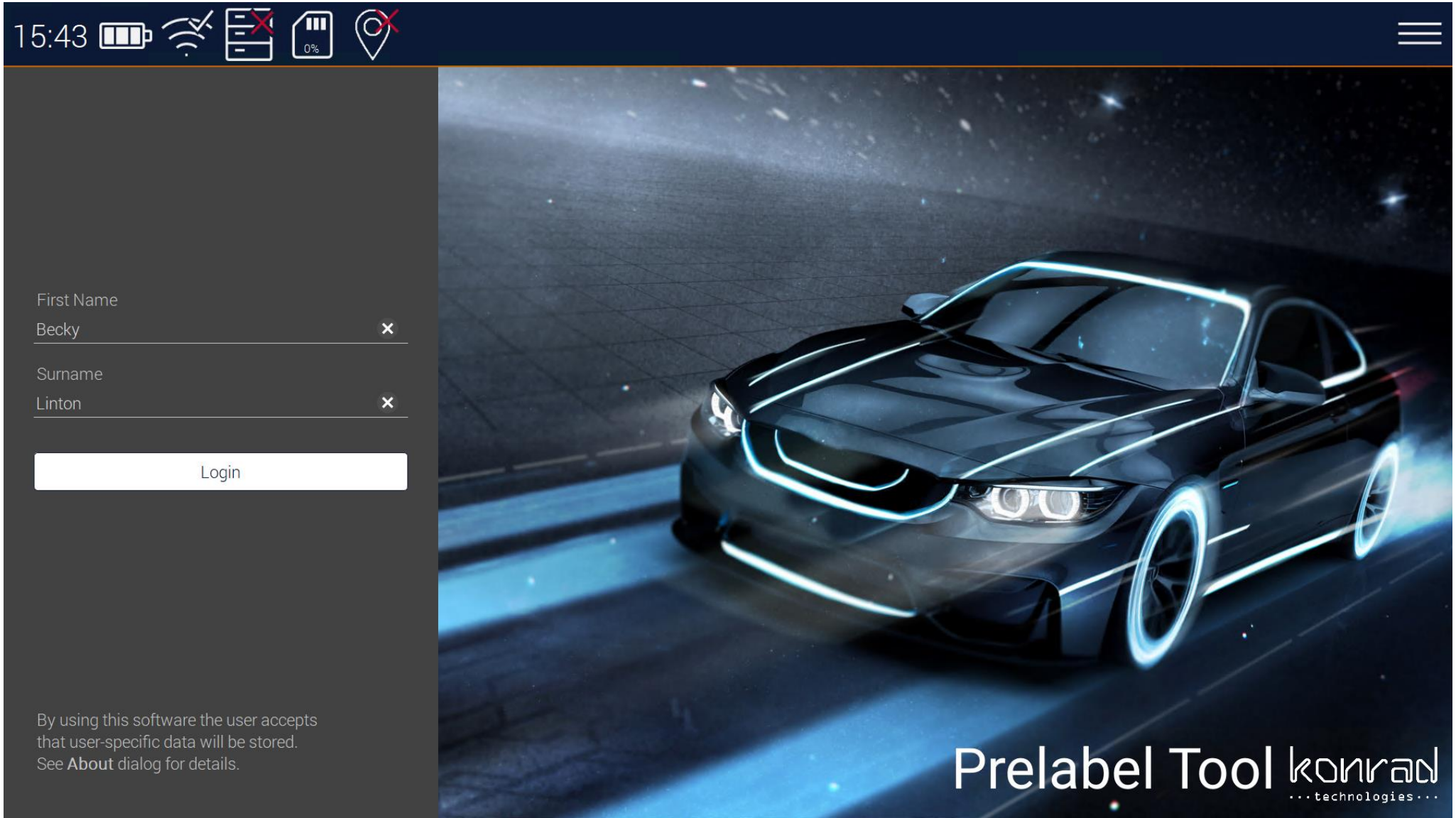
MINIMIZE COST OF DATA THROUGH SMART DATA REDUCTION

MAXIM INTEGRATED GMSL2

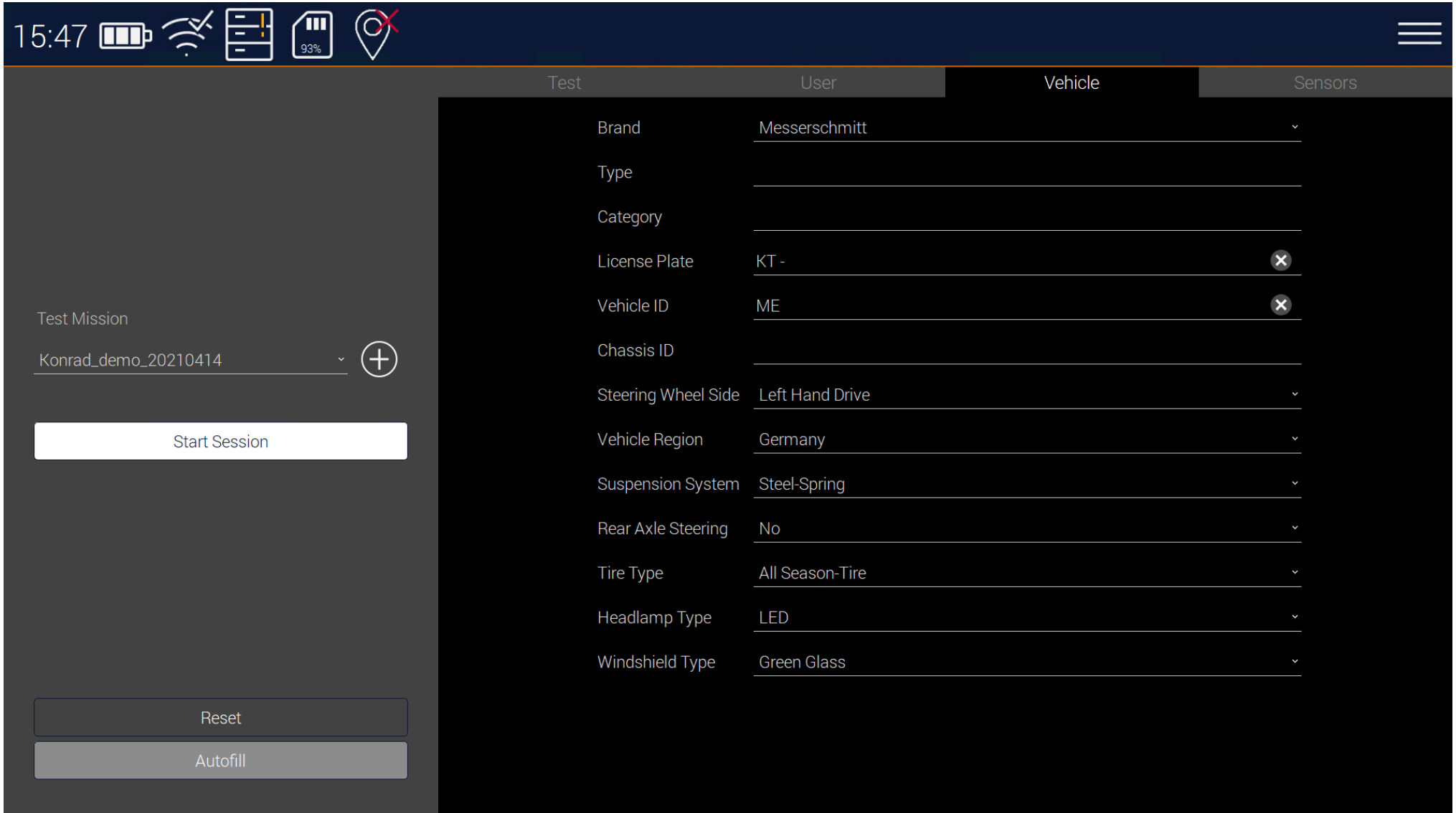
TEXAS INSTRUMENTS FPD-LINK III

POWERED BY FPGA-BASED (DE-) COMPRESSION IP

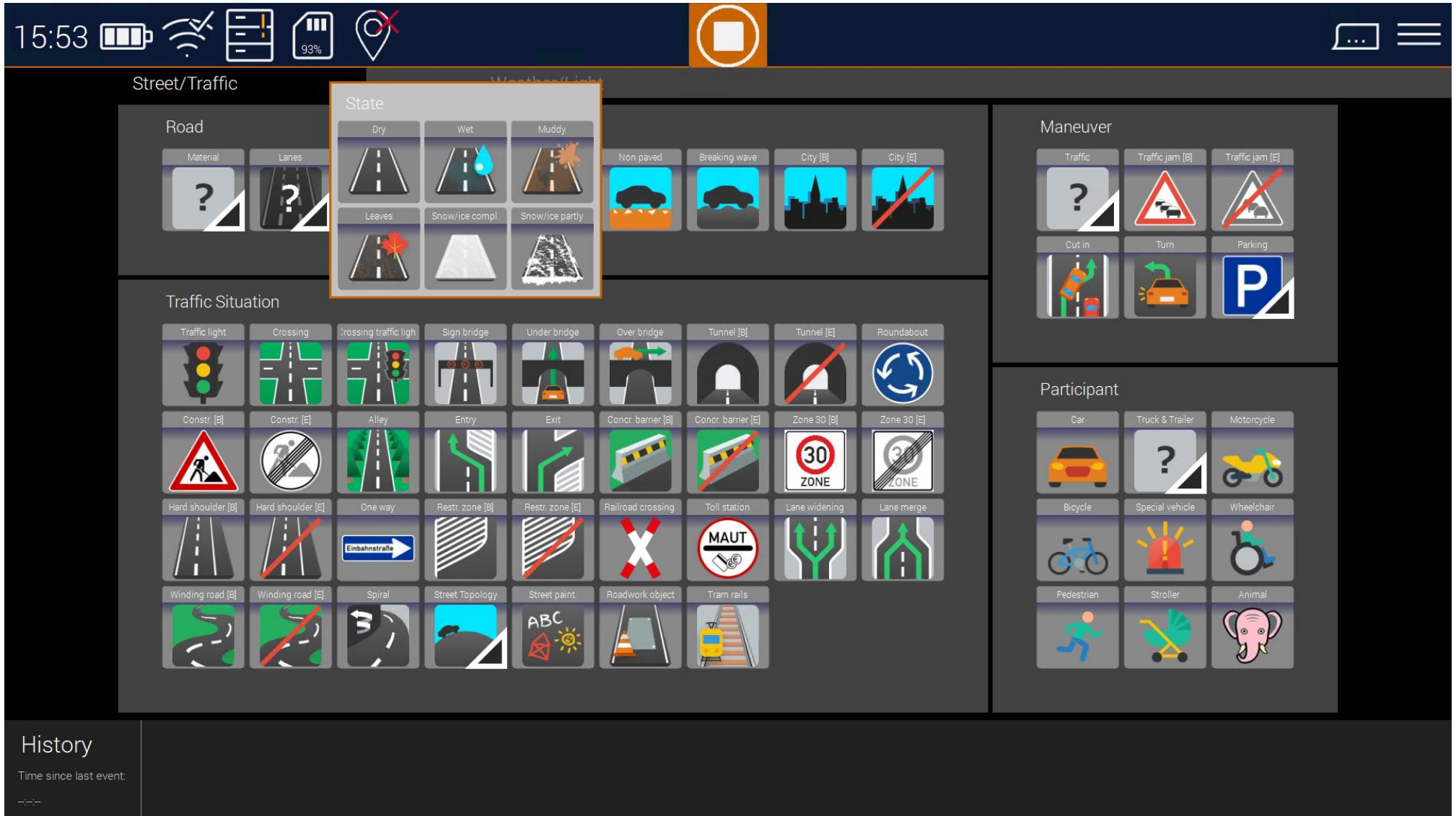
Graphical User Interface Developments



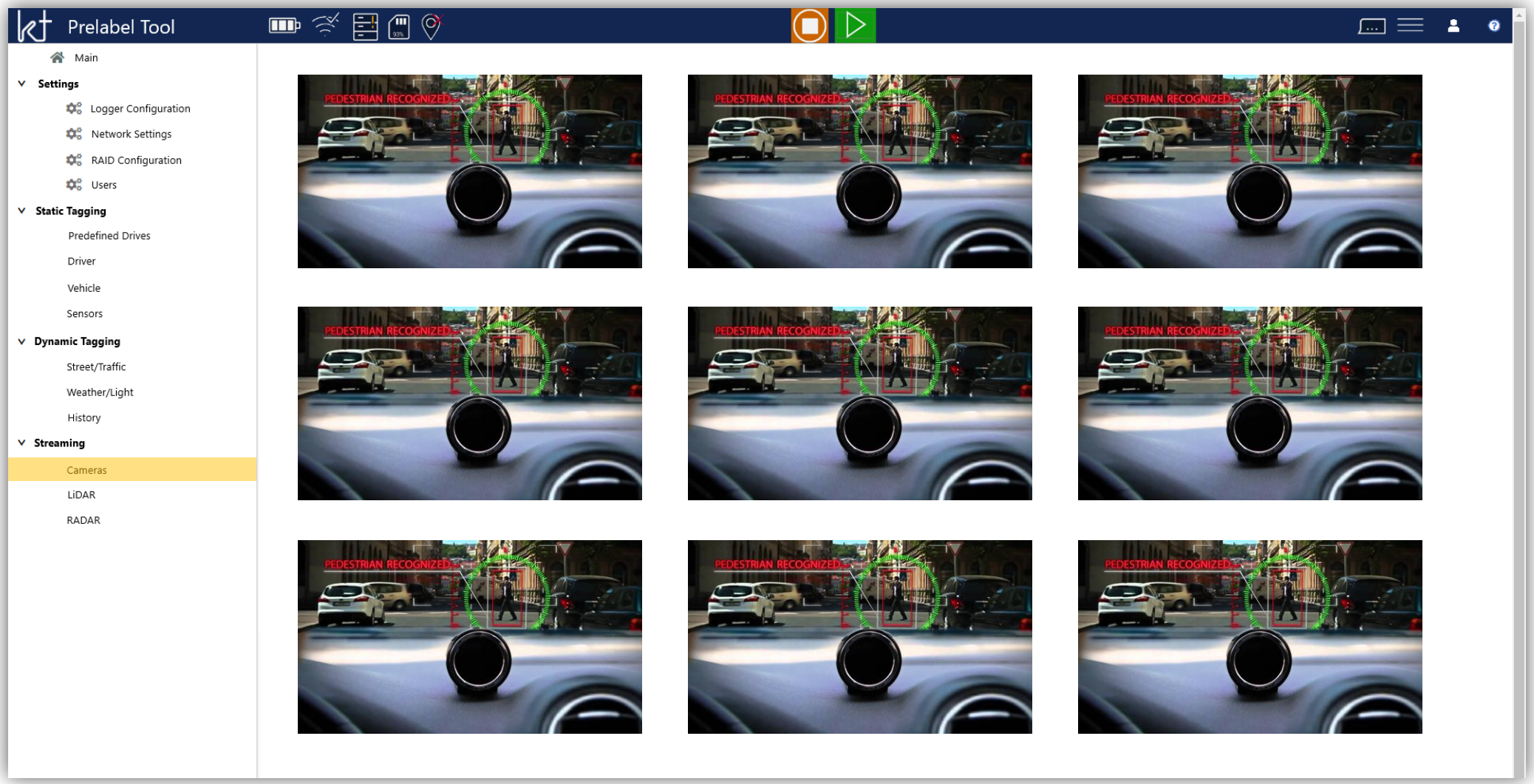
Graphical User Interface Developments



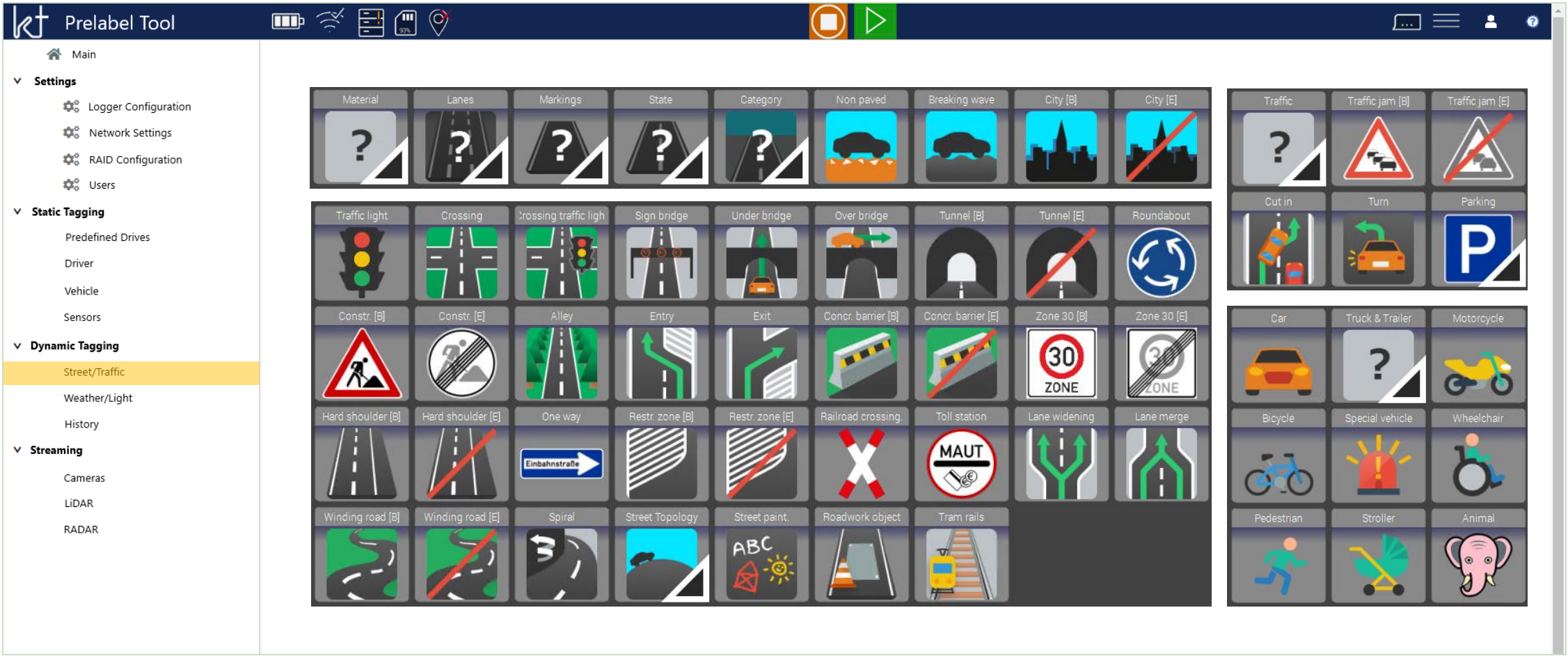
Graphical User Interface Developments



Graphical User Interface Developments



Graphical User Interface Developments



Nicholas Keel,

Chief Offering Manger,
ADAS & AD Validation, NI

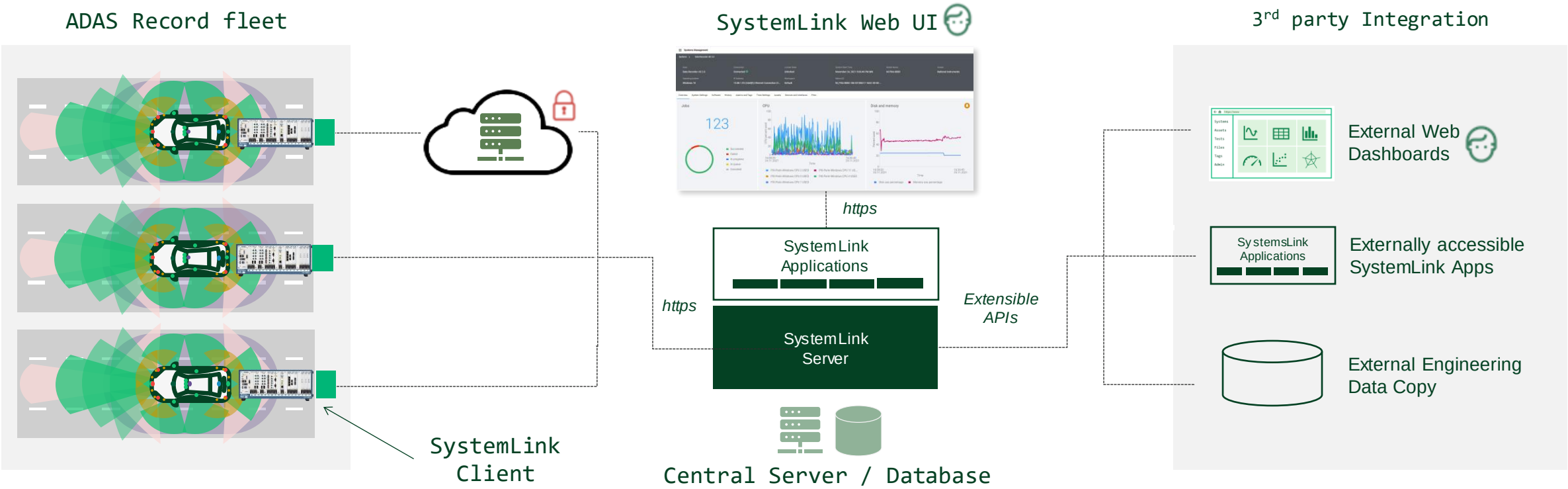
NI SystemLink for Fleet Management Architecture

Standards-Based
Developed with industry-leading open-source technologies

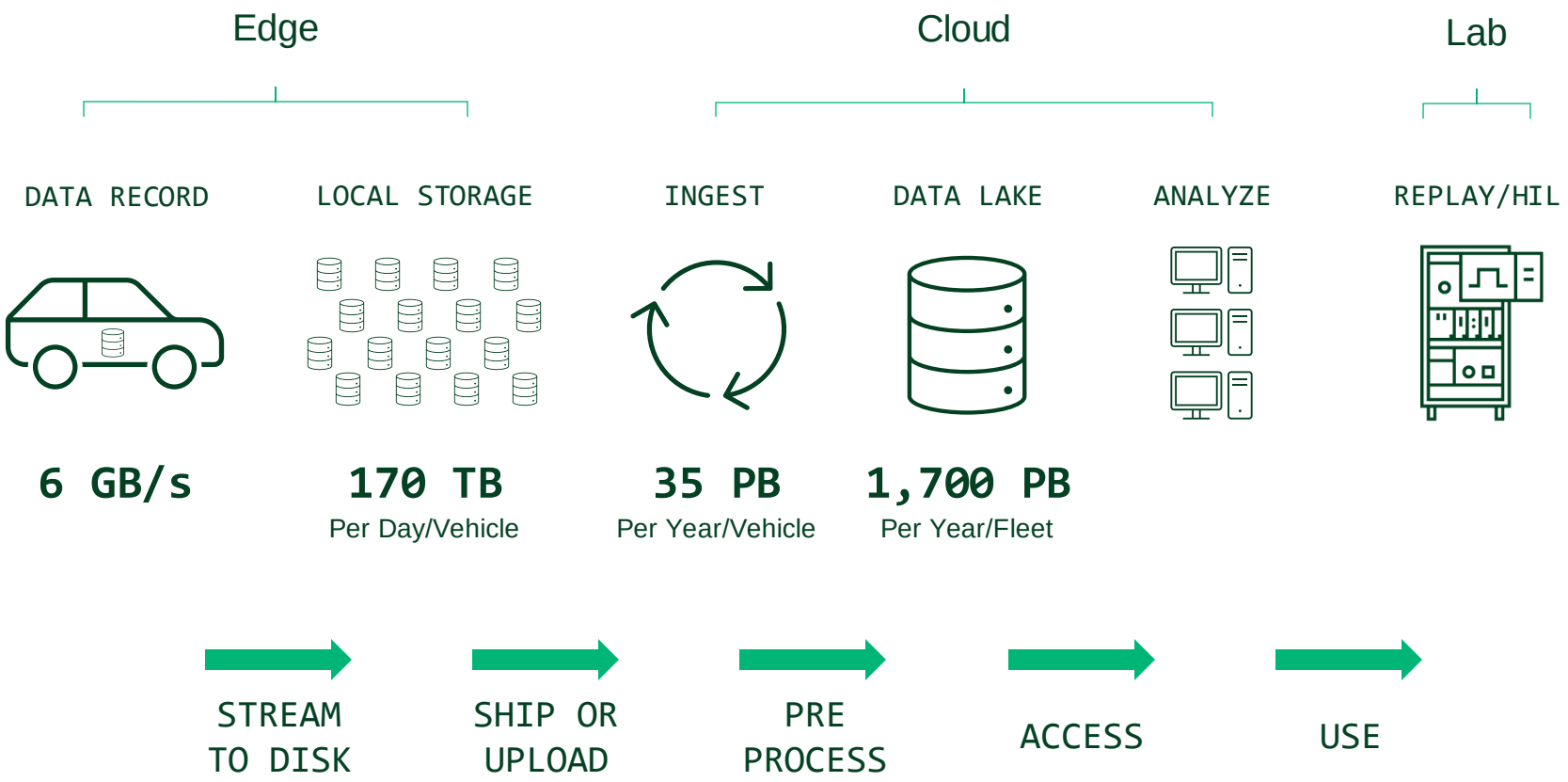
Scalable
From a single one to 100s of nodes and 1000s of data sources

Extensible
Config-based dashboards, plug-in applications, and open APIs

Secure
HTTPS / TLS data encryption; authentication & access control



The ADAS & AD Data Life Cycle Challenge



$6.4M

in cloud storage & access costs per vehicle per year

$318M

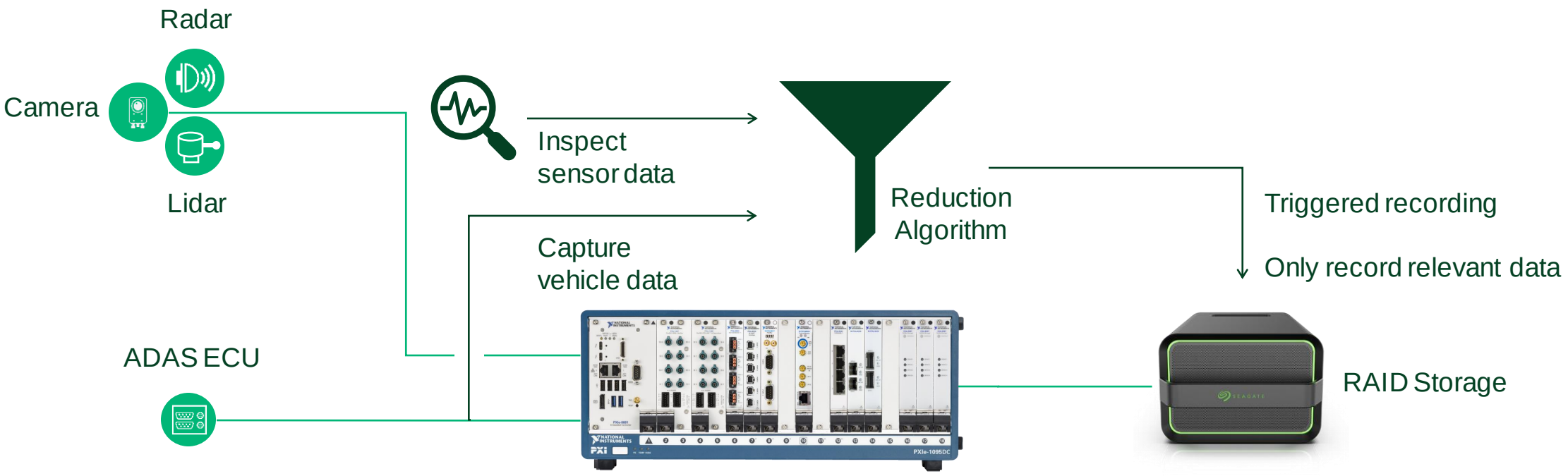
in cloud storage & access costs for a 50-vehicle fleet per year

Up to

1 Month

Edge Data Reduction – Intelligent Data Capture

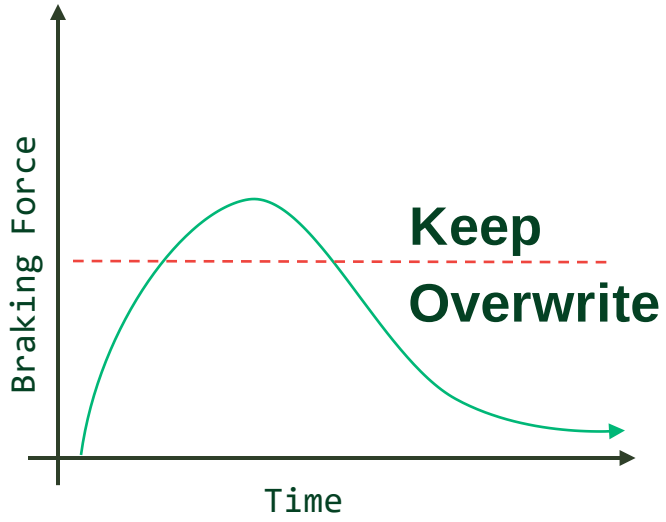
NI provides customers **data reduction** in-vehicle, enabling **orders of magnitude reduction** in data volume **without losing unique** or **interesting data**.



Data Reduction Dimensions

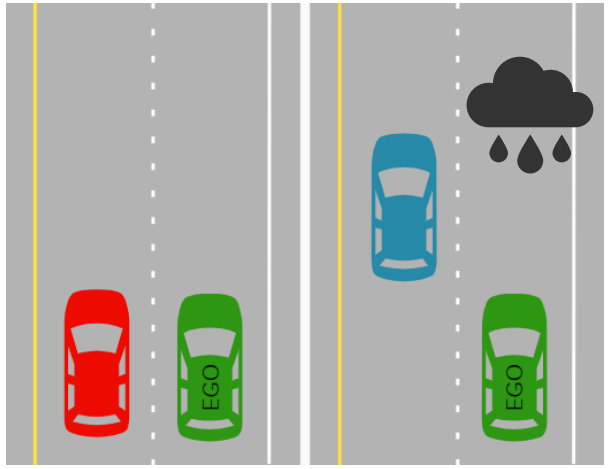
KPI Driven Reduction

"Keep data when a KPI crosses a threshold"



Attribute Driven Reduction

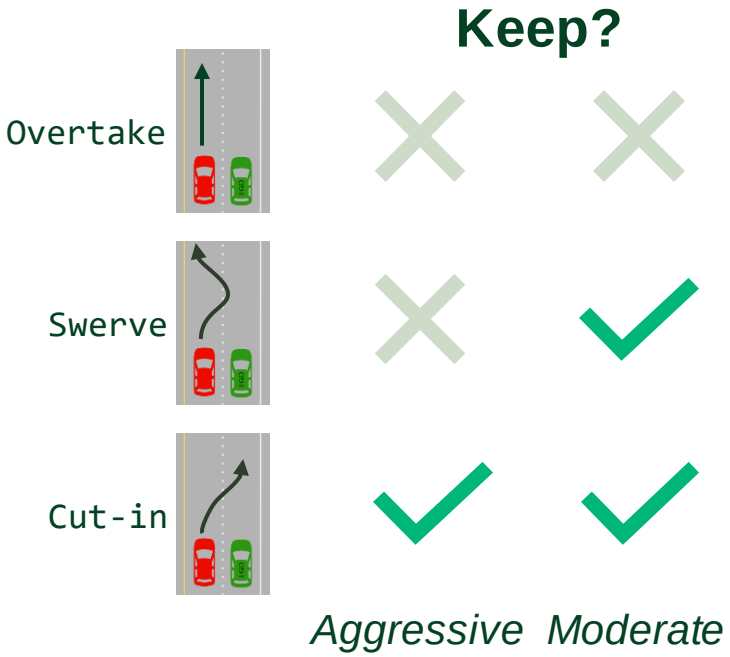
"Keep data only during rain on a two-lane road with a blue car"



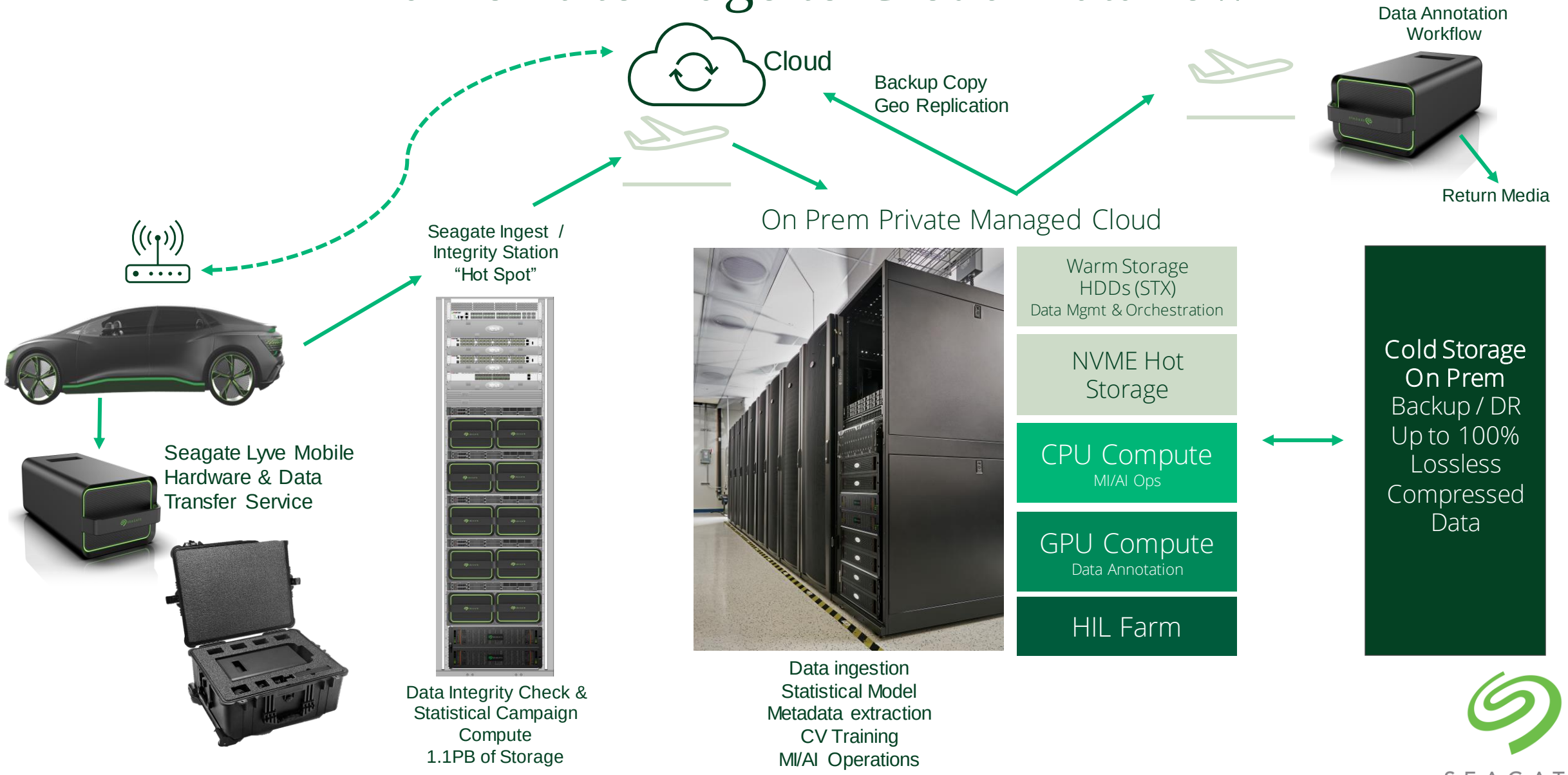
Overwrite **Keep**

Scenario Driven Reduction

"Keep data when a cut-in occurs"



End Point to Edge to Cloud Dataflow



SEAGATE

What is Driving Customers Towards the Service Model?

Fleet of 50 vehicles transferring up to 64TB of data from each car to the data center daily for 12 months

CAPEX (Competitive Product)		**OPEX**	
64TB Storage:	$50K per unit x 50	**92TB** Mobile Array:	$4K per unit / month
Copy Station:	$10K per unit x 50	Rackmount Receiver:	Included
Storage Warranty:	$5K per unit x 50	Car Mount:	Included
Copy Station Warranty:	$3K x 50	Updates:	Included
		Replacements:	Included
Total up front cost = + substantial operational cost + not including cost of uploading to cloud and data logistics	**$3.4M to 4M**	Total up front cost =	$0
		Total for 12 Months =	**$2,145,000- 2.4M**

1. Simplifies Device Management
2. Enables faster refresh of IT equipment/devices
3. Procurement efficiencies and reduced IT staff workload
4. A simple, predictable cost model

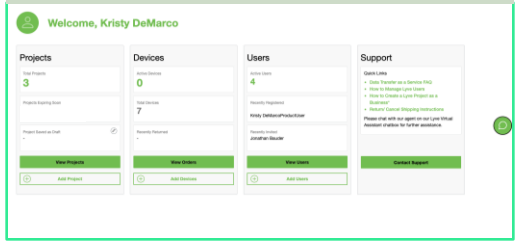
SEAGATE

Global Data Transfer and Data Logistics Services

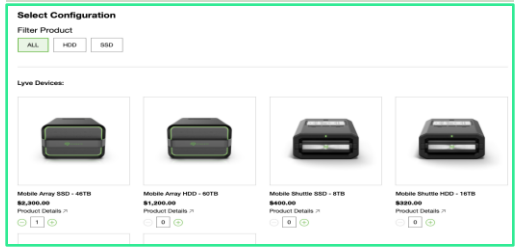
Full lifecycle management from product provisioning and fulfillment, in-subscription device and software upgrades, secure asset return and data erasure.

FULL ACCESS & CONTROL

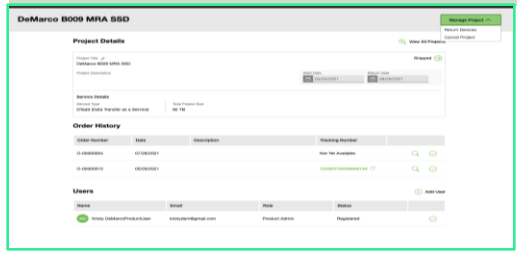
Centralized Dashboard



Project Ordering

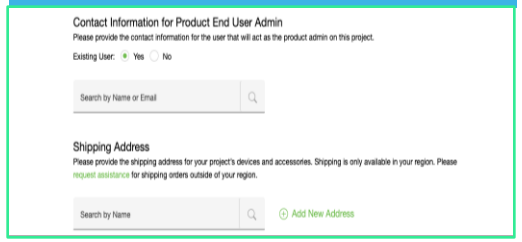


Subscription Management

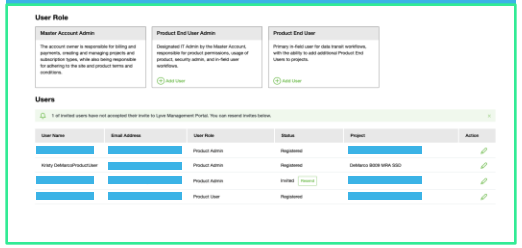


DEVICE & USER MANAGEMENT

Device Provisioning



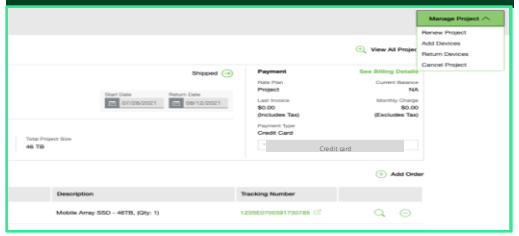
Multi-User Management



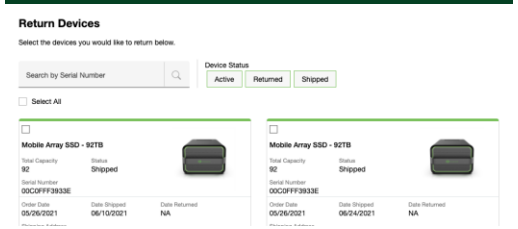
Virtual Assist

ASSET SCALABILITY & RETURN

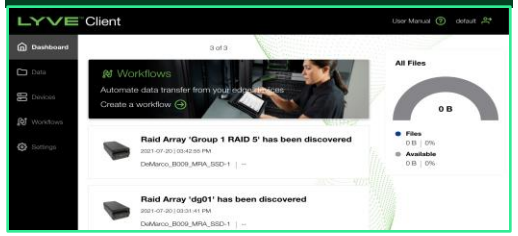
Power Up & Down



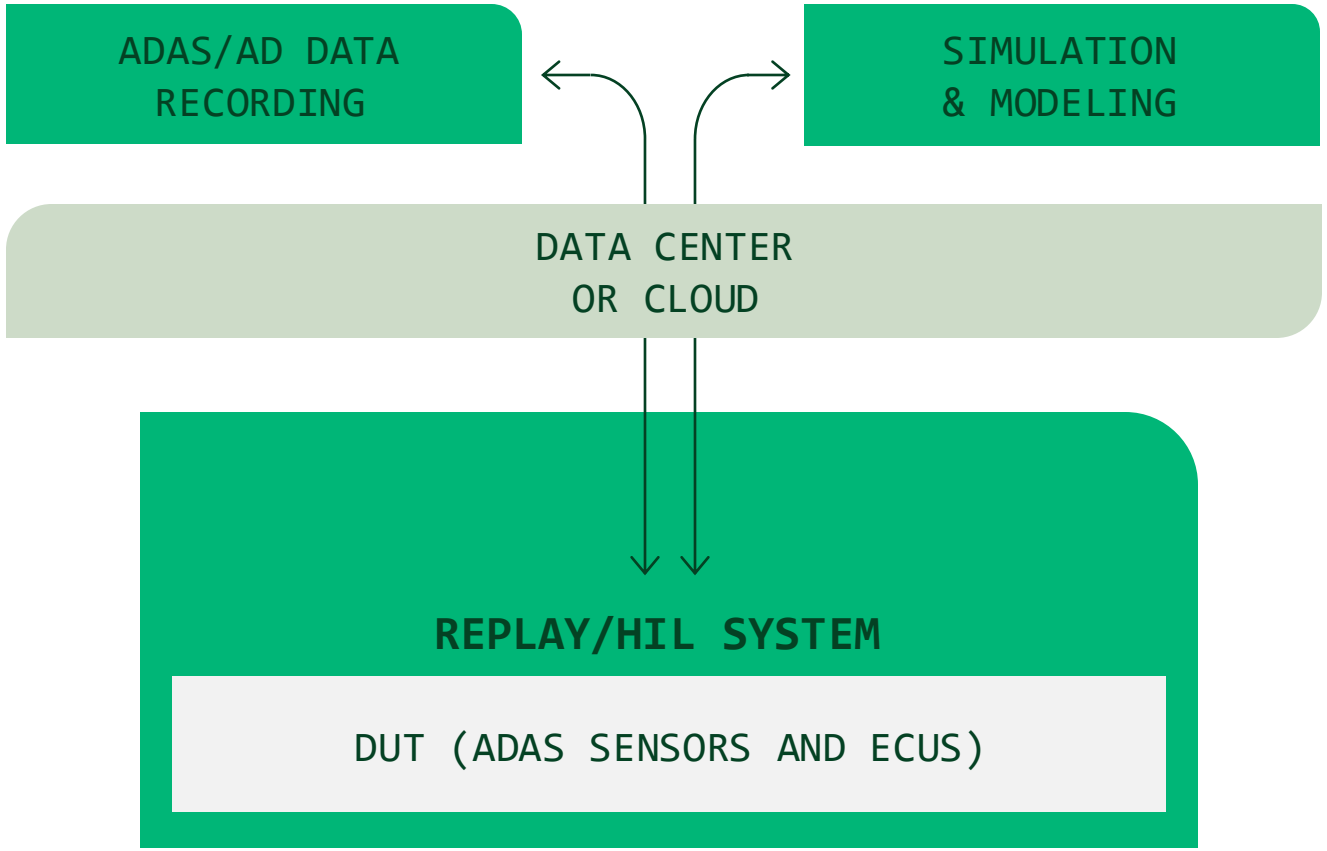
Return Management



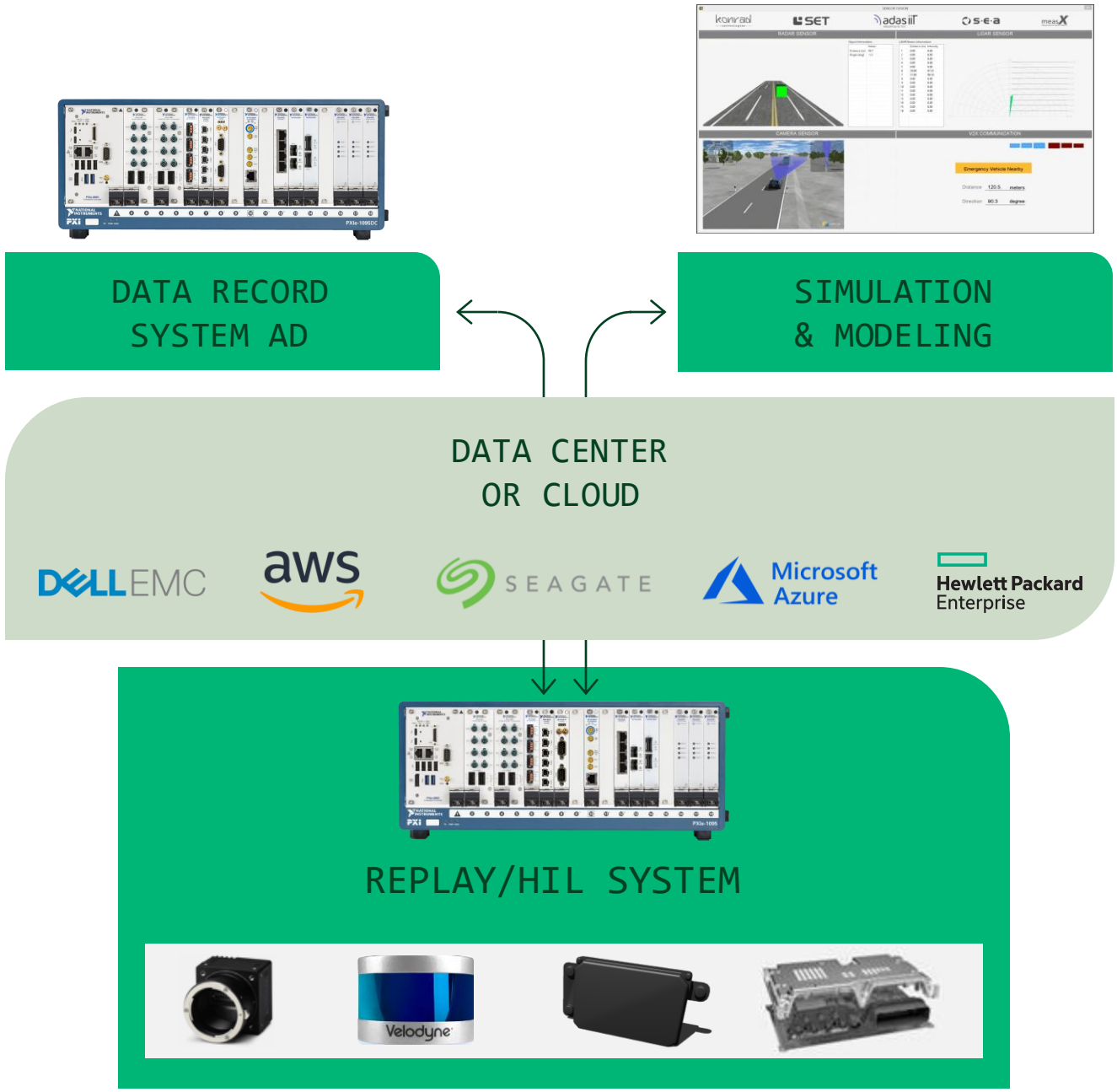
Data Erasure



SEAGATE



One Single Platform for Record, Replay & Closed-Loop HIL



One Single Platform for Record, Replay & Closed-Loop HIL

Data Record AD – Your Solution for ADAS and AD Record Applications

konrad technologies + ni + SEAGATE

BENEFITS

- Unified Toolchain
- Customization and Flexibility
- System Specifications
- Data Quality and Time to Data
- Data Processing and Reduction
- Vast ADAS and AD Ecosystem

RESOURCES

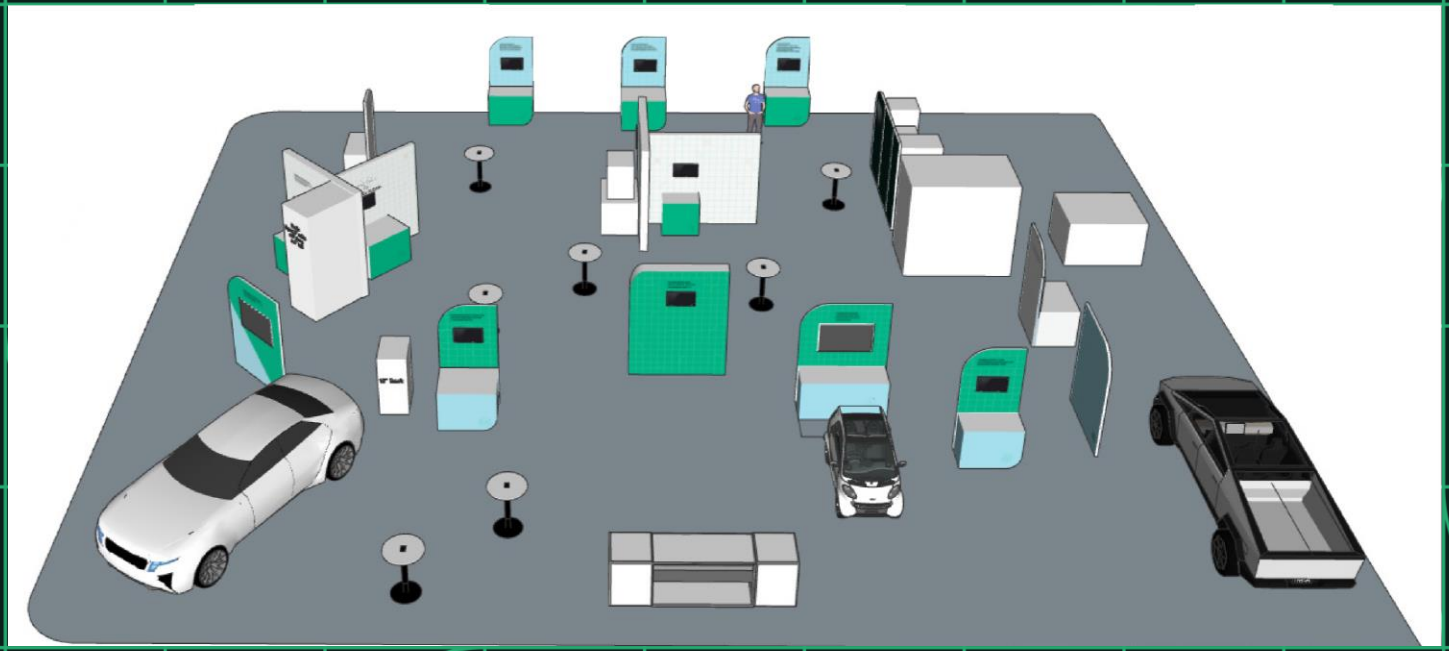
Jaguar Land Rover & NI
ADAS Data Logging

Seagate, IBM, NVIDIA & NI
Managing Mass Data for ADAS/AD

Seagate & NI
Solution Brief

Data Record System AD
ni.com

Contact Us



EXPERIENCE LOUNGE

ADAS REPLAY AND HIL DEMO

SCENARIO-BASED TEST DEMO

Questions

n'CONNECT