SOLUTION
BRIEF

ni.com

ADAS and Autonomous Vehicle Test

Explore NI's Solutions

As advanced driver assistance systems (ADAS) and autonomous vehicles (AVs) introduce new technology into vehicles, they need adaptable, futureproof test systems. NI offers a single, software-connected platform approach to automotive test that can natively integrate all the I/O types you need to test today's and tomorrow's ADAS and AV technology.

MARSHA CHANG
PRINCIPAL MARKETING MANAGER, AUTOMOTIVE, NI

ADAS Record and Replay

You can record field data from advanced driver assistant systems (ADAS) sensors and play it back in the lab to simulate driving and increase test repeatability and test coverage. Real, recorded data is better for test because 3D-rendered scenes can be misinterpreted by algorithms designed for the real world.

A Solution that Evolves with You

01

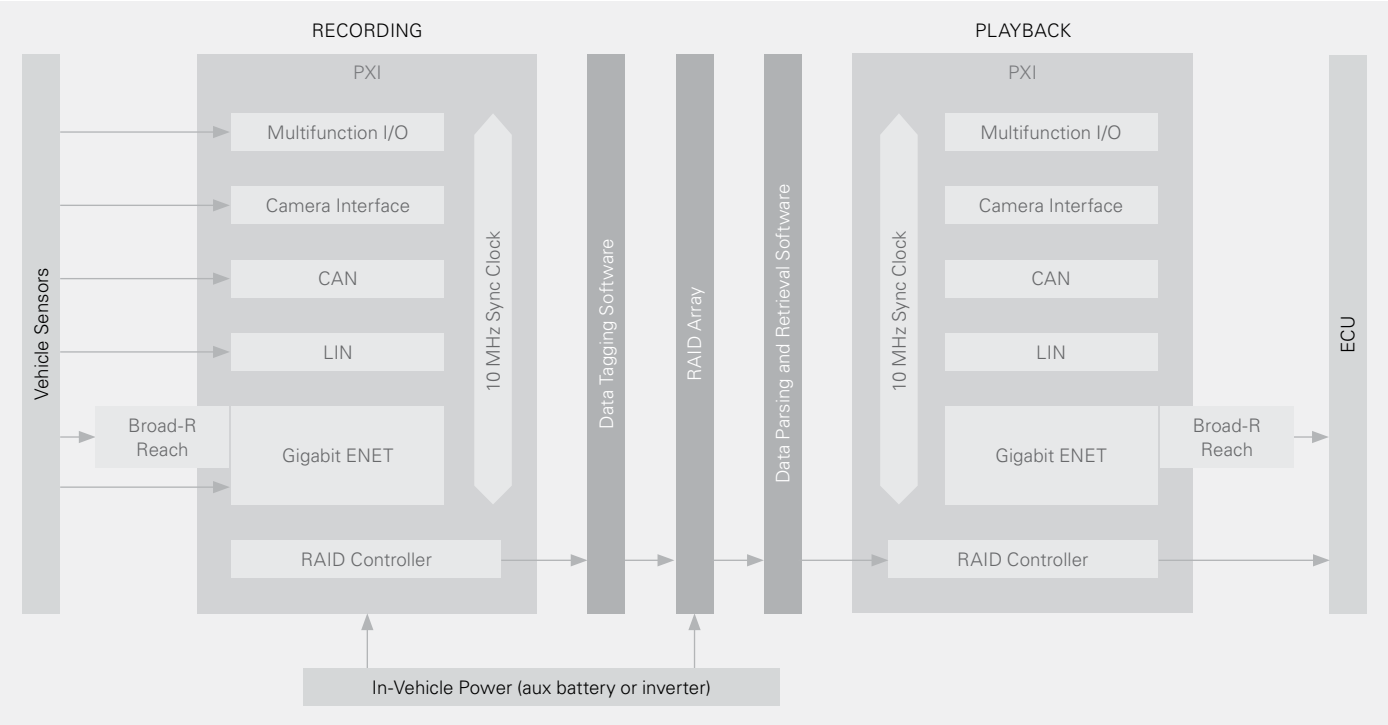
Synchronize interfaces to the microsecond for automotive networks, various camera interfaces, radar, and general-purpose I/O.

02

Stream terabytes of data at up to 6 GB/s with NI or third-party RAID storage options that easily interface with a PXI system.

03

Easily tag and manage your data files and quickly parse them for playback with the Data Management Software Suite.



> We typically deploy a PXI chassis in a vehicle and interface it to live camera, ultrasonic, vehicle bus, and environmental sensor data from typical driving situations. We use this live data to train and validate our computer vision deep learning algorithms at the bench later.

Derek O'Dea
Measurement Equipment and Tools Development Manager, Valeo

CUSTOMER NEEDS

- Synchronize data within <1 s for both recording and playback to properly simulate driving.
- Interface with many different I/O types including camera, radar, and vehicle networks.
- Record and play back all raw data in real time at roughly 15 GB/s in the most complex ADAS.

KEY SPECIFICATIONS	
Maximum Data Rate	6 GB/s
Storage Capacity	>96 TB
Synchronization	<1 µs
Camera Interfaces	MIPI CSI-2, FPD-Link, GMSL, HDMI
Vehicle Bus Support	CAN FD, LIN, FlexRay, automotive Ethernet
Radar Support	Through vehicle bus
Lidar Support	Through vehicle bus
Ultrasonics	Through vehicle bus

The NI Advantage

01

Reduce implementation time, capital costs, and sparing costs by using the same hardware platform for data recording and playback.

02

Future-proof your system against changing requirements with the modular, software-defined PXI platform.

03

Don't worry about missing data. The performance of PXI ensures you can stream all of it with hardware.

Radar Sensor Production Test

As radar volumes continue to aggressively grow, the need to test as quickly and efficiently as possible while maintaining high-quality standards is paramount. Additionally, test systems should be built to adjust for future requirements like higher bandwidth sensors or different antenna designs.

A Solution that Evolves with You

01

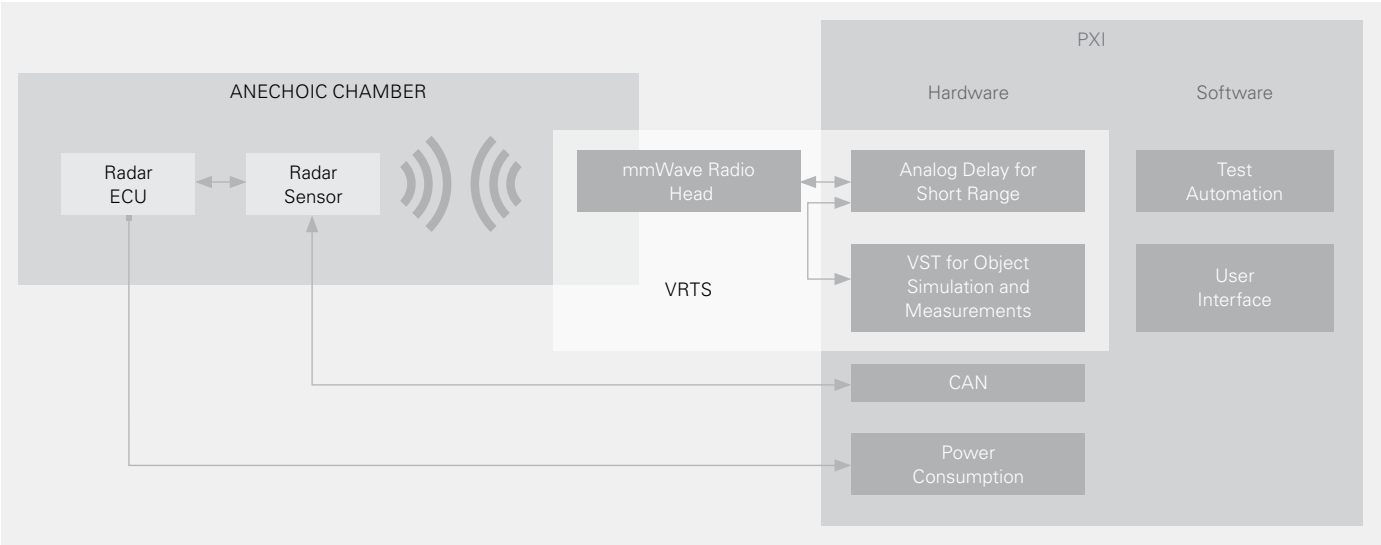
The Vehicle Radar Test System (VRTS) can perform best-in-class radar obstacle simulation and parametric measurements in parallel to reduce test time with a single instrument. It's also built as a modular solution to help upgrade your platform investment for future radar bandwidths.

02

TestStand test sequencing software makes test development easy and offers true parallel test capabilities. Use it to develop, execute, and deploy test system software. Also extend the functionality of your system by developing test sequences that integrate code modules written in any programming language.

03

VRTS integration partners design complete radar test solutions. They have experience integrating NI RF test systems into production environments including anechoic chambers, mechatronics systems, actuation systems, and software.



> NI's mmWave radar technology provides the industry's widest bandwidth and low-latency software, which helps us develop automotive radar technology research in great depth. Through NI's flexible platform-based approach, we could finish both radar performance test and radar simulation, helping us accelerate the process of autonomous driving.
>
> **Geely Automotive**

CUSTOMER NEEDS

- Take parametric measurements and simulate radar obstacles for 77 GHz and 79 GHz radar bands.
- Achieve fast test time and fast test development and deployment to meet production targets.
- Integrate handling, actuation, and an anechoic chamber with the measurement instrumentation.

KEY SPECIFICATIONS	
Frequency Range	76 GHz to 81 GHz with 4 GHz instantaneous bandwidth
Simulated Distance (not including setup distance)	2.5 m to >300 m with 5 cm resolution
Simulated Velocity	0 km/hr to +/-500 km/hr with 0.1 km/hr resolution
Radar Cross Section	50 dB minimum with 0.25 dB resolution
Out-of-the-Box Measurements	Equivalent isotropically radiated power (EIRP), phase noise, occupied bandwidth, radiation pattern, beam width, chirp analysis

The NI Advantage

01

Reduce test time, capital expenses, and footprint by performing parametric and simulation test in parallel with a single system and generating multiple targets at once.

02

Future-proof your investment with a modular solution that you can upgrade for technology like 79 GHz and different polarities.

03

Leverage work across design, validation, and production to speed implementation by using a single platform that can work across all three.

Sensor Fusion HIL with Scene Generation

Integrate scene generation tools with hardware I/O to play back simulated scenarios for validating the sensor fusion and decision-making algorithms on ADAS controllers. Scene generation increases test coverage because you can create scenarios that meet specific test requirements rather than relying on road tests or previously recorded data.

A Solution that Evolves with You

01

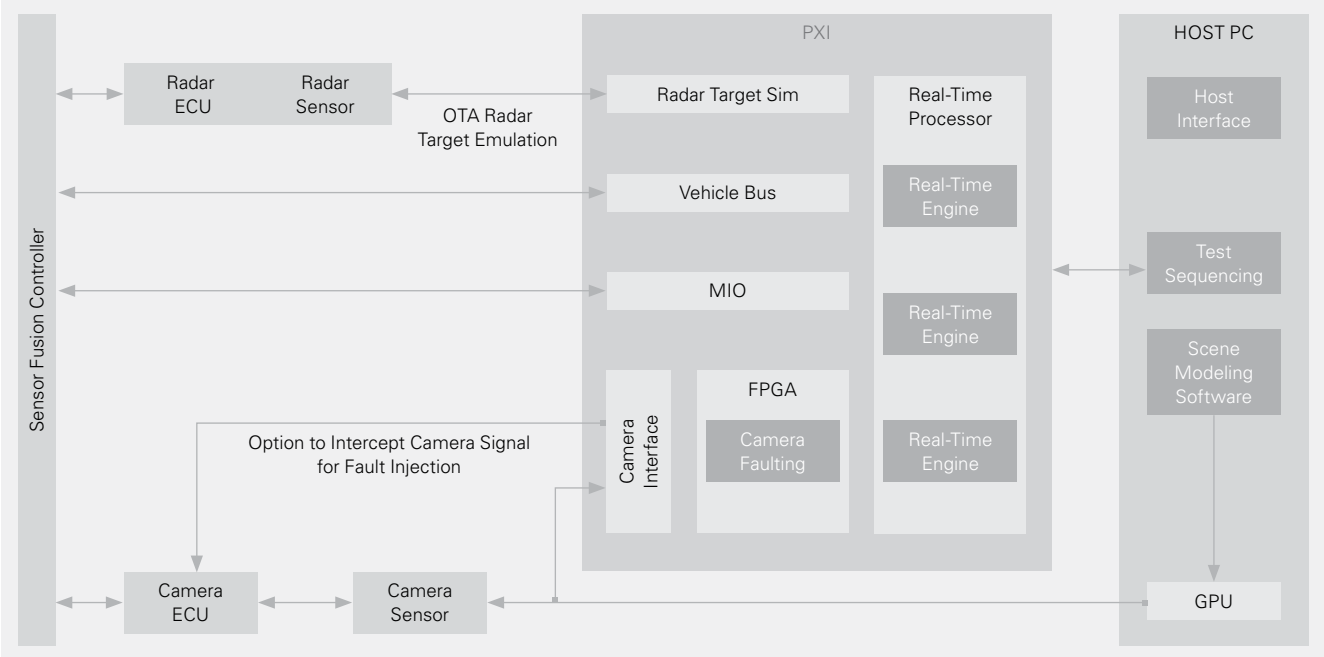
VeriStand real-time test software integrates with a wide variety of third-party scene generation tools, so you can choose the tool that works best for you.

02

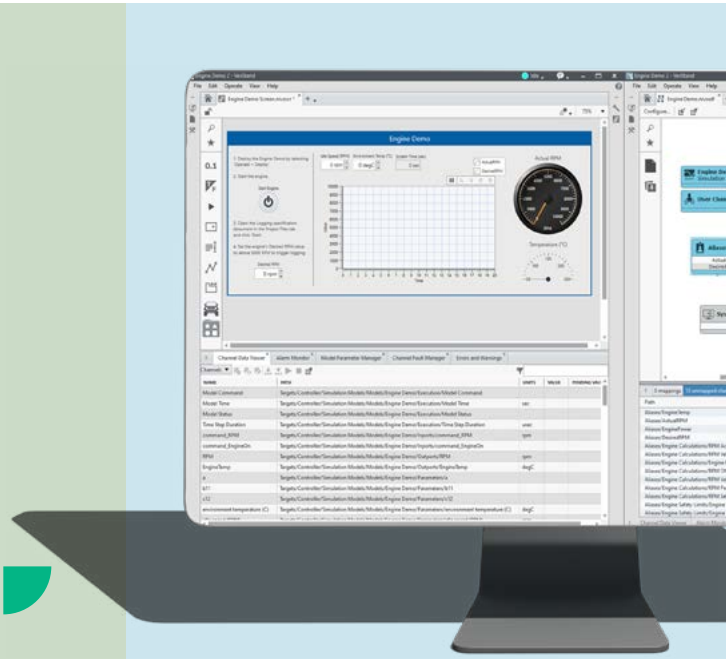
PXI modular hardware generates OTA radar signals, camera signals, vehicle bus traffic, and general-purpose I/O. It also features hardware and software faulting capabilities and nanosecond synchronization and timing control.

03

TestStand automated test software or Python scripting helps you implement test sequencing to automate test vectors and increase test coverage in shortened test schedules.



> The flexibility, modularity, and scalability of the NI system enable users to easily integrate it with other I/O as part of a comprehensive HIL tester for radar design and test applications—and to use the same system for both target emulation and radar device measurements, lowering the cost of device and system test.
>
> **Giuseppe Doronzo**
> Advanced Architect, Altran Italia



CUSTOMER NEEDS

- Integrate hardware I/O with scene generation tools like IPG CarMaker, Ansys VRXPERIENCE, Vires VTD, TASS PreScan or monoDrive.
- Synchronously generate I/O signals to interface with the ADAS controller. With tight control over timing, you can test faults like frame delays or phase coherency.
- Maintain flexibility for future I/O requirements as systems continue to add more cameras, radar, and I/O types like lidar.

KEY SPECIFICATIONS	
Synchronization	<1 µs
Scene Generation Support	Anything with an API (IPG, TASS, VIRES, Unity)
Camera Interfaces	MIPI CSI-2, FPD-Link, GMSL, HDMI
Radar Sensor Support	77 GHz, 79 GHz
Minimum Emulated Radar Distance	2.5 m
V2X Emulation Protocols	DSRC, 4G C-V2X
Location Emulation Protocols	GNSS, GPS, GLONASS
Other I/O	General-purpose I/O, CAN, LIN, FlexRay, automotive Ethernet

The NI Advantage

01

Achieve the greatest control over your test system and maximize your test coverage using the openness of the NI toolchain.

02

Change camera interfaces, inject bitstream faults, and test radar sensors with real over-the-air (OTA) reflections, or add new sensor types without significant costs or hardware changes.

03

Future-proof your system with a modular, software-defined platform like PXI combined with VeriStand. You can simply add an I/O module to the system as your requirements change.

AV Compute Platform Tester

Autonomous vehicles (AVs) are among the most complex systems being tested today. At the heart of the AV is a powerful compute platform that analyzes the environment around the vehicle and determines the appropriate action to help ensure the safety of the car and its surroundings. The compute platform must be able to take in synchronized data from multiple sensors; detect objects, their distances, lanes, and the environment; and plan the route and trajectory of the vehicle. As companies design and build their own AV supercomputers that combine automotive-specific networks and sensors with consumer electronic components, a critical balance must be struck between high-computing power and adequate efficiency. Testing this balance is crucial to building safe and reliable AVs.

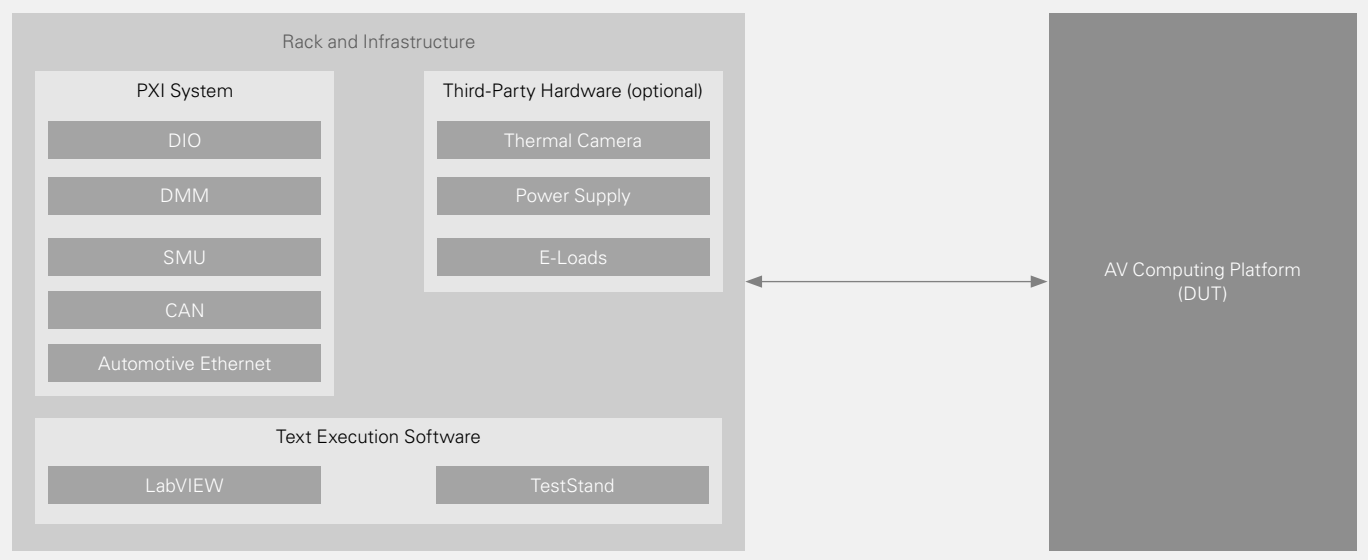
A Solution that Evolves with You

01

Modular hardware for CAN, automotive Ethernet, current and voltage measurement, current and voltage generation, and more to customize a system that fits your exact I/O needs.

02

Flexible and interoperable with third-party hardware to complete the system with your existing hardware and/or with hardware that meets your requirements. Stream terabytes of data at up to 15 GB/s with NI or third-party RAID storage options that easily interface with a PXI system.



CUSTOMER NEEDS

- Validate features of the AV computing platform, such as:
  - Thermal performance
  - Power consumption
  - Automotive networks functionality
  - AV sensor interface functionality
  - PCB electrical measurements
  - GNSS functionality
- Quickly adapt the system following design changes of the computing platform
- Meet the time-to-market deadline for building AVs

The NI Advantage

01

NI provides a flexible software-defined platform with modular hardware and a configurable set of I/O.

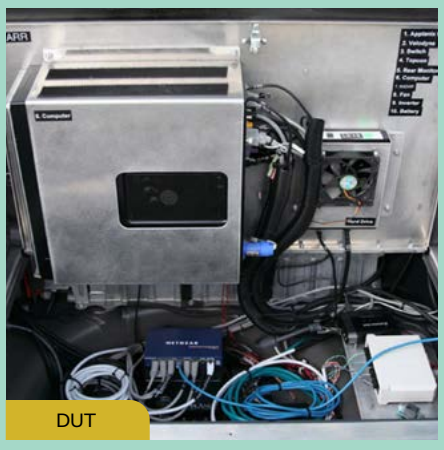
02

NI's solution is equipped to test multiple functionalities of the computing platform with one system, including the automotive network, network interfaces, thermal performance, power measurements, electrical measurements, and more.

03

NI's modular and software-defined system can adapt quickly to new requirements or design changes.

AV COMPUTING PLATFORM TESTER



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> With over 40 years working with teams automating V&V test systems, NI is a trusted advisor for helping test engineering groups maximize test effectiveness, enabling them to release quality products efficiently and confidently.

Chad Chesney
General Manager and Vice President, Transportation, NI

System Integration on Your Terms

NI offers a variety of solution integration options customized to your application-specific requirements. You can use your own internal integration teams for full system control, or leverage the expertise of our worldwide network of Alliance Partners to obtain a turnkey system.

Contact your account manager or call or email us to learn more about how NI can help you increase product quality and accelerate test timelines at (888) 280-7645 or **info@ni.com**.

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