# YEA Engineering Introduction Slides





### Main Industries





### **Our Expertise**

- Systems Engineering
- Software Development
- Electronics Design and Development
- Mechanical Engineering
- Firmware Engineering
- Manufacturing





### **Available Machines**





# **Automotive Solution Offerings**

yeae.am

#### **ADAS-HIL System**

"What's remarkable about our collaboration with YEA and NI is the short time to market we achieved, such that other Russian companies are looking into also including HIL testing in their processes."



#### Challenge

#### Solution

Establish a first-oF-its kind advanced driver-assistance systems (ADAS) test laboratory to test ADAS ECUs, radars, cameras, and ADAS features both separately and together using hardware-in-the-loop (HIL) test methodologies and enable autonomous vehicle testing from lab to road in Russia.

stance Connect N Partner YEA Engineering's expertise with NIs CUs, radam, toolchain to design, build, and deploy Russia's first ADAS closed-loop HIL system that allows the Central Scientifio ogles and Research Automotive and Automotive Engines Institute (NAMI) and its surplices and ciscrement to take that ADAS

(NAMI) and its suppliers and outcomers to test their ADAS features in a controlled lab environment, minimizing the time and resources they spend on real-world drive tests.

#### Building an ADAS Test Lab with an HIL Solution

Established IXO years ago, NAMI is the leading automotive RAD center in Russia. Its services have expanded from design and test of electronic and mechanical components to the development of software and full vehicles. One recent example of NAMI's automotive development capability is AURUS, a new fleet of fuzzy vehicles originally created for the government that will eventually become available to the public.

As we've learned from the experience of all global automakers, designing and manufacturing a vehicle require many engineering resources and much expertise. From electronic design to secaratio creation for testing, algorithms in simulation, the process of bringing ADAS functions to market is complex and demanding. This type of expertise is not always available in-house, which makes collaborations orbital to the success of such projects. Starting in 2014, NMI began exploring integraphing ADAS and automorous which functions in ALIPLS, and so fir the institute has successfully developed safety functions like adaptive rules control (ACC) and autonomous emergency braking (AEB), NAM is now working toward the next set of autonomous functions, which involves connecting with the right partners to deliver on all ADAS safety expectations.

In 2020, NAMI collaborated with YEA Engineering, an NI Partner, to create Russia's first. ADAS closed-loop HIL system for testing:

- NAMI's ADAS ECUs with an HIL approach
- Automotive radar with active object simulation
- Camera functionality with optical projection
- · ADAS sensor fusion

Additionally, the system installed at NAM is scalable to add an automotive lidar environment simulation system and a GLONASS/GPS signal simulator, making it ideal to serve current needs and prepare NAMI for future autonomy test requirements.

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For NAMI, the reduction in the time to market was remarkable because it involved the whole process from the creation, programming, and validation of NAMI's ADAS EOU to the development of a test plan that covered standard and comer scenarios not possible to create with nead testing. This increased NAMI's confidence in the reliability of the ADAS features in AUFUS.

YEA Engineering's ADAS Closed-Loop HL Test System combines NIs commercial offthe-shelf components with the flexibility to customize the solution to NAMIs needs so the institute can test autonomous vehicles from lab to road in the future.

In addition to automotive development, NAMI performs automotive industry activities including standardization and certification, the operation of the Centre for Automotive Vehicle Testing and Reinsmert, and the fostaring of automotive development by cooperating closely with all main Russian OEMs and Tier 1 suppliers. For those activities, having the right connections between industry players, technology, expertise, and research is increasingly important; and can mean the difference between meeting time-to-market goals and becoming a leader or trailing behind in the industry.

#### Company: FSUE «NAMI» MOSCOW

Industry: AUTOMOTIVE, RESEARCH

Application Area: ADAS VALIDATION

Authors: NIKOLAY MEZENTSEV, HEAD OF DEPARTMENT, INTELLIGENT VEHICLES, NAMI

VIGEN HOVHANNISYAN, BUSINESS DEVELOPMENT MANAGER YEA ENGINEERING

#### NI PRODUCTS USED:

Automotive Communications

NI Vehiole Radar Test System

NIRF Instrumentation

YEA ENGINEERING

AUTOMOTIVE SOLUTIONS

#### ADAS-HIL Platform





#### **ADAS-HIL System**

ADAS Closed-Loop HIL System allows Automotive OEM companies and their suppliers to test their ADAS Systems in a controlled in-lab environment, thus minimizing the time and resources spent on real-world drive tests.

ADAS-HIL Platform consists of the following components

- Hardware-in-the-loop system for ADAS ECUs
- Automotive RADAR Target Simulation System
- Camera Optical Projection System
- Automotive LiDAR Environment Simulation System (optional)
- GLONASS/GPS Signal Simulator (optional)





### Hardware-in-the-Loop for Sensor Fusion ECU

Parameter	Value
Connection to ECU	CAN (500 kbps to 1 Mbps) (optionally: Automotive Ethernet, FlexRay, LIN)
Number of Channels	2 (scalable to 28)
Prebuilt Scenarios for ADAS	ACC, AEB, LDW/LKA, SAS (Support for EuroNCAP scenarios)
Signals Exported to ECU	Simulated RADAR Signals Simulated Camera Signals (Videostream) ESP Module Signals EMS Signals ABS Signals Steering Wheel Unit Signals Transmission Control Module Signals Powertrain Control Module Signals Devertrain Control Module Signals Simulated LiDAR and RADAR Signals Camera Video Stream
Signals Imported from ECU	Acceleration/Deceleration (m/s^2) Steering Wheel Angle (degrees) ADAS Instrument Cluster Warnings Fixed Obstacle Distance (for ACC and AEB)





#### Automotive Camera Test System





### Automotive RADAR Target Simulator

System that allows to test Automotive RADARs starting from the 1<sup>st</sup> prototype to the production units.

Parameter	Value
Number of Targets	4 targets (2 Angles of Arrival)
Minimum Simulated Range	3.3m (6m in current setup)
Maximum Simulated Range	>300m
Range Resolution	5cm to 12cm
Minimum Simulated Velocity	0 km/h
Maximum Simulated Velocity	±500 km/h
Velocity Resolution	0.1 km/h
RCS	50 dB of range
RCS Resolution	1 dB
Frequency	User Configurable: 75-82 GHz Up to 4GHz bandwidth





### ECU Test System

The ECU Test System (ECUTS) is a functional tester for end-of-line (EOL) test of automotive ECUs built on NI's adaptive, open technology. Our systems R&D engineers have integrated the following core components into this system.

- Core Rack: Safety, Display, Power
- Instrumentation
- Custom Cabling

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- Mass Interconnect
- Loads and High-Power Switching
- Low-Power Switching

Standardizing on this tester can reduce capital and operational expenses through efficiency driven by asset and architecture reuse, streamlined global supply, and service programs. The ECUTS also reduces test time and floor space through parallel test powered by a best-in-class test executive and a portfolio of high quality I/O.



## ECU Test System

Faster Development Higher, standardized starting point



Up to 12 Highly I/O dense DUTs in parallel



Same design to scale from low to high pin count



#### ECU End-of-Line Test Systems based on NI ECUTS









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#### Automotive RADAR End-of-Line Test System

#### Features:

Obstacle Simulation (Range, Velocity, RCS, Angle)
Scenario Simulation (BSD, RTCA, AEBS, etc.)
Parametric Measurements (EIRP, OBW, Radiation Pattern)
Antenna Calibration

#### Specifications:

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Range Simulation: 3.5m – 300m
Velocity Simulation: 0 km/h – ±500 km/h
RCS Simulation: 50 dB dynamic range
Azimuth Angle Simulation: ±65 deg.
Elevation Angle Simulation: ±20 deg.



# Thank you !

