

Car Manufacturer Speeds Ahead with Automotive Ethernet Compliance Solution

Organization

- Top global car manufacturer

Challenges

- Accelerate the design cycle to under 18 months
- Receiver (Rx) compliance test to validate automotive Ethernet switch unit application
- Meet compliance test specifications for 100Base-T1

Solutions

- Keysight E6962A Automotive Ethernet Rx Compliance solution

Results

- Achieved 100% test coverage for physical layer Rx test, meeting IEEE 802.3bw-2015 standards
- Reduced initial test development time by two weeks

A fast, reliable, and lightweight physical network is essential for data-heavy applications in advanced driver-assistance systems (ADAS) and vehicle-to-everything (V2X) capabilities. A top global car manufacturer needed to find ways to innovate its designs while reducing cost and weight. It selected the well-established Automotive Ethernet standard to achieve its goals, and turned to Keysight for test and measurement solutions to meet its design goals.

This car manufacturer is racing to bring the super-connected car to the broader medium-priced market. It envisions its new model equipped with artificial intelligence and state-of-the-art over-the-air (OTA) connectivity.

These applications range from automatically turning on smooth jazz for the ride home to warming the oven for dinner while concurrently downloading the latest firmware upgrades.

The car maker's design team developed a 100BASE-T1 Ethernet platform for its new vehicle. It needed a faster platform to process the massive amounts of data from both infotainment and ADAS features. The platform also had to ensure seamless connectivity between the legacy controller area network (CAN) bus, the local interconnect network (LIN) devices, and the new Ethernet platform.

The Challenges

Unlike the slower speed backplanes of CAN and LIN platforms, 100BASE-T1 automotive Ethernet requires rigorous compliance testing. This leaves no room for error, as any data packet received in error or delay could mean the difference between stopping at a traffic light or running a red light into oncoming traffic.

The car maker wanted to ensure 100% conformance to the IEEE 802.3bw-2015 standards for the 100BASE-T1 automotive Ethernet. Specifically, the car maker's safety team wanted to validate the receiver (Rx) performance of a critical ethernet switch unit.

They faced two significant challenges:

1. The chipset vendor did not provide the bit error rate test (BERT) of their devices under test — this is a requirement of the IEEE standard.
2. An immediate automotive Ethernet Rx BERT solution was not available.

The car maker had initially considered developing their BERT. They soon realized the process was very tedious and would delay their test development schedule by weeks. Aside from trying to understand the standards specifications correctly, they had to configure and run the required tests from the beginning. There was also the challenge of analyzing and measuring the results obtained from their device under test (DUT), and a manual comparison against the published specifications.

The car maker decided to turn to their existing test and measurement vendors for a solution.

The Solution

After competitive evaluations, the car maker chose Keysight's E6962A Automotive Ethernet Rx Compliance solution, part of the Keysight suite of automotive Ethernet compliance solutions.



Figure 1. Keysight E6962A Automotive Ethernet Rx Compliance solution

The Keysight solution included the following:

- M9010A PXIe chassis
- M9037A PXIe embedded controller
- M3303A PXIe arbitrary waveform generator (AWG) and digitizer
- E6962 automotive Ethernet Rx compliance test software

At a click of a button — test patterns were generated and transmitted to the DUT, and the automotive Ethernet Rx solution then received and automatically analyzed the test patterns to return the BERT pass or fail results.

The Results

Keysight’s solution enabled the car maker to ensure performance and compliance while keeping the project on schedule.

- Physical layer electrical receiver compliance tests per BroadR-Reach V3.2 at 100%
- True BERT according to UNH-IOL PMA test suite test 96.2.1

The car manufacturer’s safety team trimmed two weeks off their initial test development schedule with the E6962A software, which intuitively and quickly walked them through the test set-up and results.

Going Forward

The car maker is exploring the possibility of upgrading its automotive Ethernet test capabilities for Layers 1 through 7 (see Figure 2) to remain in the forefront of superconnected car innovations.

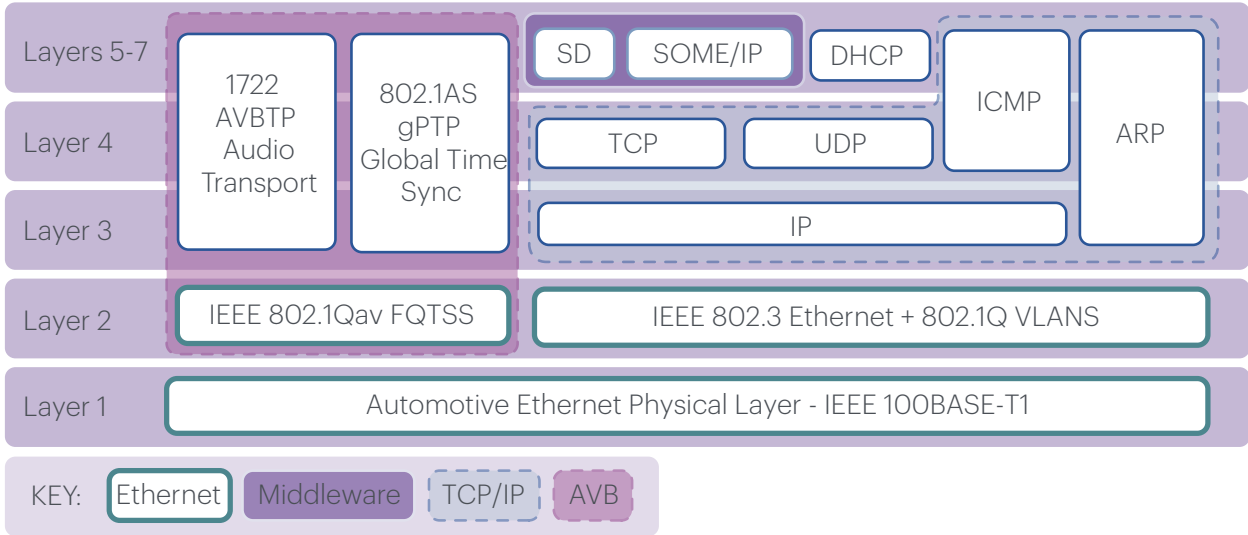


Figure 2. Thorough testing is necessary to ensure security and interoperability among the numerous electronic control units in an automotive Ethernet enabled in-vehicle network.

Related Information

- [Product Fact Sheet: Infiniium S-Series Oscilloscopes](#)
- [Data Sheet: Infiniium S-Series High-Definition Oscilloscopes](#)
- [Data Sheet: N6467B BroadR-Reach Automotive Ethernet Electrical Compliance Application](#)
- [Data Sheet: N8847A BroadR-Reach Triggering and Decode](#)
- [Data Sheet: E6960A 1000BASE-T1 Tx Automotive Ethernet Compliance Application](#)
- [White Paper: Why Autonomous Driving Systems Will Require Automotive Ethernet](#)
- [Case Study: Putting the Future in Motion with Automotive Ethernet](#)

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