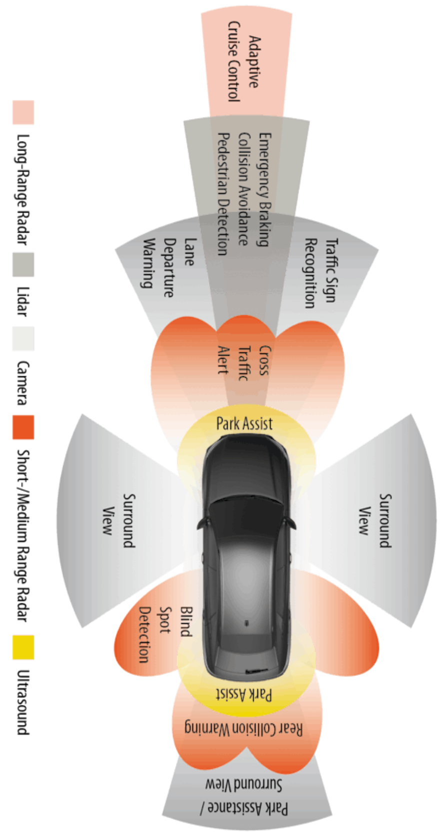
ADAS HIL System

ADAS (Advanced Driver Assistance Systems) are passive and active safety systems designed to remove the human error component when operating vehicles of many types. ADAS uses a combination of sensor technologies to perceive the world around the vehicle, and then either provide information to the driver or take action when necessary.



Types of ADAS sensors

To jump straight to the point here is the list of main types of ADAS sensors in use today:

- **Video cameras**
  → Cameras are used for
    - traffic sign recognition,
    - reading lines and other markings on the road,
    - detecting pedestrians, obstructions, and much more.

  → They can also be used for security purposes, rain detection, and other convenience features as well.

- **SONAR (aka Ultrasound)**
  → SONAR (Sound Navigation and Ranging), aka "ultrasound" sensors generate high-frequency audio on the order of 48 kHz.
    - backup detection and self-parking sensors in cars, trucks, and buses.
- **RADAR**
  → RADAR (Radio Detection and Ranging) sensors are used in ADAS-equipped vehicles for detecting large objects in front of the vehicle. They often use a 76.5 GHz RADAR frequency, but other frequencies from 24 GHz to 79 GHz are also used.

  → RADAR is especially good at detecting metal objects, like cars, trucks, and buses. They are essential for collision warning and mitigation, blind-spot detection, lane change assistance, parking assistance, adaptive cruise control (ACC), and more.
- **LiDAR**
  → LiDAR (Light Detection and Ranging) systems are used to detect objects and map their distances in real-time.

  → They are increasingly used in conjunction with cameras because LiDAR cannot detect colors (such as the ones on traffic lights, red brake lights, and road signs), nor can they read the text as well as cameras. Cameras can do both of those things, but they require more processing power behind them to perform these tasks

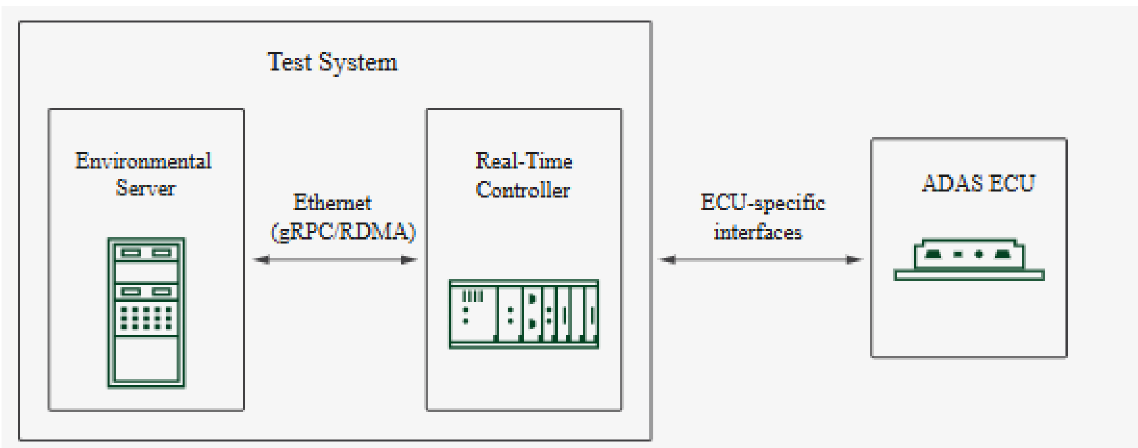
- **GPS/GNSS sensors (satellite interface)**
    - → In order to make self-driving vehicles a reality, we require a high-precision navigation system. Vehicles today are using the Global Navigation Satellite System (GNSS).

As vehicles move toward autonomous capability, there is a rising need for hardware-in-the loop (HIL) testing to validate and verify the functionality of advanced driver assistance systems (ADAS.

The ADAS HIL setup includes industry standards like PXI, providing compact, modular, and flexible instrumentation-grade I/O and nanosecond-level timing and synchronization for cutting-edge measurement quality and performance. With software centric approach, it enables interfaces and connectivity to third-party simulation tool providers, IT infrastructure, and cloud services, giving you the freedom to choose from the best to reach your solution faster.

Validating perception algorithms on ADAS ECUs is key to ensuring the safety and reliability of ADAS and AD functions in the vehicle. HIL test allows to simulate the infinite number of edge scenarios and test the complex algorithms to ensure the safe operation of ADAS and AD functions.

HIL Advantage:



- Maximize test coverage by running more test cases and scenarios in lab and simulation to decide which tests must be performed on the road.
- Future-proof your system with H/W & S/W customization, flexibility and 3rd party openness. Develop faster by leveraging work across design and validation through BlauPlug toolchain to perform reliable test at each stage.
- Keep requirements from outgrowing test capability with BlauPlug range of I/O for cameras, radar, V2X, lidar and GNSS sensors.
- Move back and forth between data replay and HIL test through a unified test system architecture within the same system and a single platform for data record.
- One or more environmental servers are the primary source for the sensor data that represents the environment around the vehicle.
- This data can be dynamically generated in response to ECU interactions (through HIL).
- The ADAS ECU(s) that the controller communicates with are the DUT(s) of the system.
- The environmental server communicates with the system controller using an RDMA Ethernet connection for high bandwidth sensor data and standard networking for other communication.

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