

# Infotainment HIL Simulator at Audi

- // **Testing infotainment networks for Audi's A4/A5 series**
- // **dSPACE Simulator is core of HIL test system**
- // **MOST® bus connection via OptoLyzer**

Car buyers nowadays can expect to find an optimum onboard functionality mix of information, entertainment, and communication, collectively known as infotainment. To test the fault diagnostics capability of networked infotainment components in its A4/A5 series, Audi uses a dSPACE Simulator combined with a MOST® interface (based on SMSC OptoLyzer) and 152 original infotainment components. Using the dSPACE Simulator, Audi can switch back and forth between all the different component configurations, simulate faults, and simulate LIN/CAN ECUs in restbus simulation – with a minimum of configuration work and the highest possible testing speed.

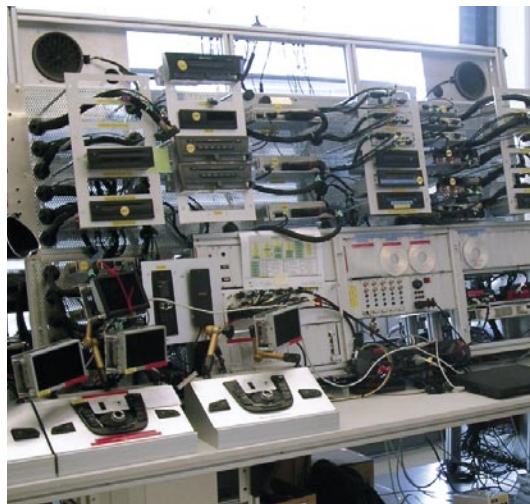
## The Infotainment Superbrain

From pure “onboard entertainment” to a major human-machine interface – that’s how the evolution of in-vehicle infotainment systems could be described. For driver and passengers to use the radio, CD, TV, telephone, navigation system and various vehicle settings in the Audi A4/A5, the vehicle has a Multi Media Interface (MMI). This is a central system with an eye-level display and a terminal within easy reach. The infotainment components communicate with one another via the optical MOST bus (Most = Media Oriented Systems Transport). Vehicle data from the CAN bus such as battery status and speed are provided to the gateway ECU via restbus

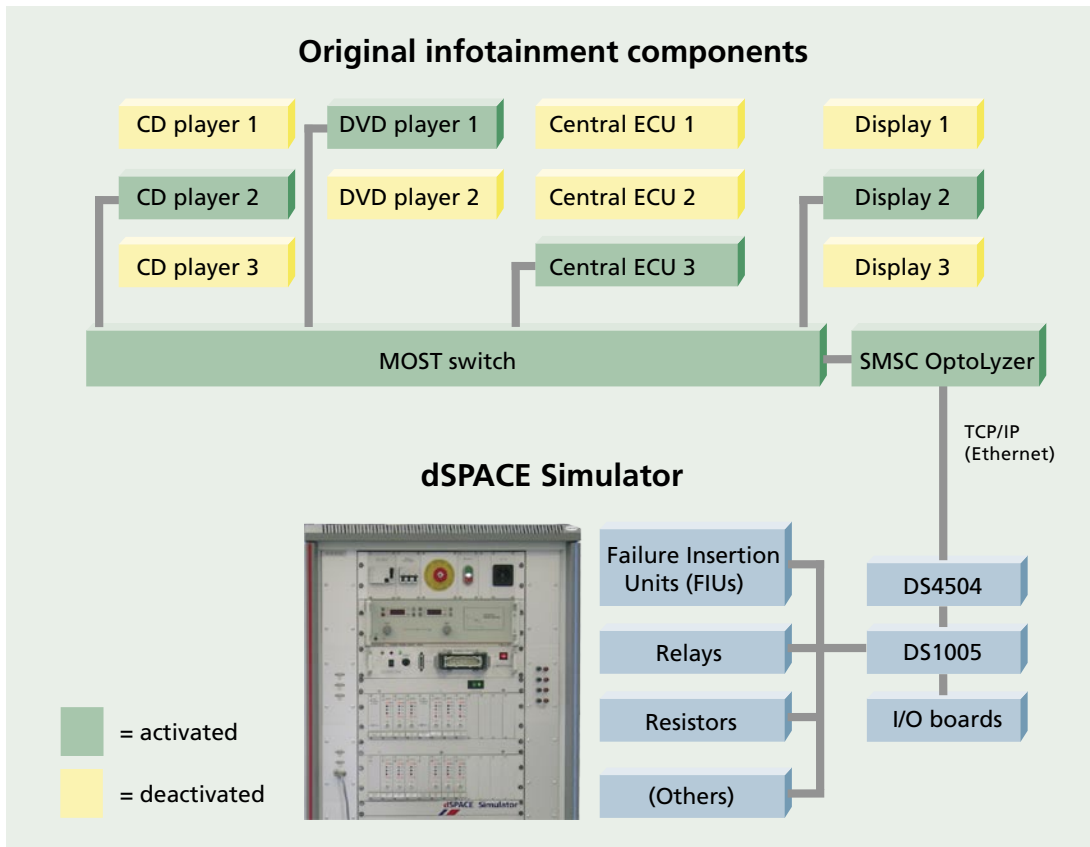
simulation. Because customers can request different configurations of infotainment components in the same vehicle model, Audi has to test all possible configurations via hardware-in-the-loop (HIL) tests and simulate possible faults. Audi uses a dSPACE Simulator for this, with 152 original infotainment components and a MOST interface implemented by dSPACE (based on SMSC OptoLyzer).

## Flexibility with dSPACE Simulator

34 possible MOST nodes are integrated into the dSPACE Simulator-based test environment (central ECU, amplifiers, radios, telephones, navigation systems, CD drives/jukeboxes and vehicle gateway), together



▲ Audi makes quick work of combining and recombining 152 infotainment components to test fault diagnostics. The developers switch component configurations on the dSPACE Simulator in next to no time, simulate fault cases, and perform restbus simulation of LIN/CAN ECUs.



▲ Because it saved so much time, the infotainment HIL system used for the Audi A4/A5 series, based on dSPACE Simulator, will soon be used for other model series as well.

with 82 aerials (such as radio, TV, GSM and GPS) and 36 different types of loudspeakers, and they can all be switched in and out as required. In addition, there are several different terminal/display combinations for the Multi Media Interface. The dSPACE Simulator is based on DS1005 PPC Boards with ControlDesk as the experiment software and uses approx. 600 relays, more than 200 digital outputs, 300 failure insertion

was to give the dSPACE Simulator a MOST interface. dSPACE very quickly created a custom MOST interface for Audi, based on SMSC OptoLyzer (MOST analysis and development platform from SMSC), a dSPACE Ethernet interface board, special Simulink® S-functions, and the DS1005 PPC Boards.

**The Future with dSPACE Simulator**

It took only 4 months from start of project to get Audi’s infotainment simulator into productive operation, including the test phase and despite the MOST interface having to be implemented from scratch. Formerly, Audi had to perform installation work to change infotainment components. Now the developers can switch between configurations flexibly, so the dSPACE Simulator is in nonstop active use. In the future, the infotainment simulator from dSPACE will be used for other model series in addition to the A4/A5 series.

*“Our dSPACE Simulator for testing infotainment networks fulfills our requirements outstandingly: We achieve considerable time savings in both configuring and testing compared with previous processes.”*

**Markus Ritzer, Audi AG**

channels and 32 resistance channels. It enables Audi to perform failure simulation rapidly for all configurations and on almost all pins. Examples of faults are a break in the MOST ring caused by the failure of a MOST node (every node can receive and send) and a weak battery. Audi can simulate LIN/CAN ECUs on the dSPACE Simulator as the restbus. An initial challenge

*Markus Ritzer  
 Audi AG  
 Ingolstadt, Germany*