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EADS Uses Saber for the Validation of New FlexRay Networking Applications

The stringent quality and safety requirements for aerospace systems demand the use of State-of-the-Art engineering methods and tools. Saber is our preferred solution for the development and validation of new airplane network implementations like FlexRay."

Dr. Ing. Christoph Heller
Research Engineer, EADS Innovation Works

EADS

FlexRay in Aerospace Applications

The time-triggered protocol standard, FlexRay (www.flexray.com), was designed for use in automotive applications, but the aerospace industry has begun to investigate potential applications for aircraft design. The FlexRay standard is still somewhat immature. While introduced some years ago, only a few automobiles have gone to production with the standard. The first commercial automotive application of FlexRay happened in 2007 when BMW released the X5. As a result, there are few automotive FlexRay experts, and even fewer aerospace FlexRay experts.

Challenge: Meeting Aerospace Reliability & Safety Requirements

The aerospace industry has one of the most stringent sets of requirements for reliability and safety of any industry. As an example, manufacturers must ensure that the avionics system will function properly under all conditions. The engineering effort required to validate the reliability of an aircraft electrical system represents one of the greatest verification challenges of all. Physical prototypes are typically not available until late in the design cycle, which makes it even more difficult to validate system robustness and to uncover implementation problems that were created during the specification phase. An additional challenge is to test the aircraft systems across a wide range of varying conditions such as outside air temperature. Reproducing test results under precise condition values for consecutive test runs is difficult.

Solving the Challenge with Saber

To accelerate the aircraft development cycle, engineers from EADS have chosen to use a simulation-based methodology with the Saber® simulation products from Synopsys®. The benefit of using Saber is that test results about the robustness of the electrical network implementation for the aircraft are obtained long before a physical prototype is built. This allows for the validation of concepts very early in the development cycle, which enables early discovery of potential problems and the simulation of alternative solutions. In addition to accelerating the development process, cost savings and increased robustness of the electrical system are two other major reasons for adopting a simulation-based methodology. New communication networking

"A simulation-based test methodology using Saber enables EADS to begin testing aircraft network implementations within 2-3 weeks. Classic testing methods typically do not allow us to start testing before 2-3 months."

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topologies and technologies, like FlexRay, are just one of several aircraft electrical applications that EADS is analyzing with the Saber simulator.

The primary criteria resulting in EADS' decision to choose Saber as the preferred simulation platform are:

- Saber's industry-leading simulation performance for electrical systems
- Saber's simulation model fidelity for FlexRay transceivers and transmission lines
- Synopsys' technical project support enabling quick ramp-up of the FlexRay network simulation project
- Saber's high adoption in aerospace supply chains due to proven robustness and model exchange
- Saber is built on industry standard modeling languages

Modeling the Virtual Iron Bird in Saber

EADS engineers created simulation models of the aircraft network to be implemented based on the design specification and measured component parameter values. System simulation runs were made to analyze signal integrity and the impact of built-in protection methods (e.g. against lightning strikes). This analysis is important for the network simulation because the required TVS diodes or varistors used to protect the system have parasitic capacitances in the range of several hundred pF. This range has the potential to significantly disrupt the quality of the transmitted signals on the FlexRay bus. Another important aspect is the validation of the cabling for the electrical implementation of the network. Aircraft networks can have total cable lengths of up to 100m, which presents a significant challenge for the engineers to ensure that accurate communication is taking place. The increase in aircraft electrical loads (e.g. galley equipment, infotainment and avionics) creates additional challenges for network topology validation. To solve this challenge, Saber models of these loads were included as network nodes and simulated by EADS to determine their effects on system behavior.

Result: Project Success

Among the top measures of success for the simulation-based method using Saber was the significant time savings. Testing was begun within 2-3 weeks compared with a 2-3 month waiting period with previous prototyping methods. EADS engineers now use this time savings to further optimize the aircraft network topology. The combination of an optimized design, with fewer resources and improved time-to-market makes Saber a technical and business winner for EADS.

About EADS Innovation Works

EADS is a leading global aerospace and defense company with headquarters in Europe (www.eads.com). EADS Innovation Works is the EADS internal network comprising technical capability centers around the world.

"Saber is an instrumental tool that enables EADS to validate new concepts for aerospace networks and supports our Simulation-based methodology to address the high safety and reliability requirements associated with our products."

Dr. Ing. Christoph Heller
Research Engineer, EADS Innovation Works

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