COMPLIANCE TESTING TOOLS

A systems approach to the compliance testing of ARINC664 end systems and switches that is based on the very latest off-the-shelf technology offers a fully traceable solution

The use of ethernet-based ARINC664 technology for communication between avionics computers and systems, introduced by Airbus first on the A380 program, known as AFDX (avionics full duplex switched Ethernet), is increasingly being used on many other aircraft. It has led to further developments and implementations of End Systems (E/S) and switches in the industry that have to be compatible to the ARINC664 specification, or its variants as used by Boeing on the 787 program or another AFDX derivative called MicroAFDX

Since no standardized public test plans were released, the responsibility of test plans for the above-mentioned devices has been placed on the designers and manufactures of these components which normally leads to proprietary test system implementations.

The first stage for creating such a system solution is the identification of the functional requirements and the specification of the related test requirements for End Systems and Switches derived from the ARINC664 specification. Since the ARINC664 specification does not fully define all of the functional requirements in detail, the E/S and/or Switch supplier has to "fill in the gaps" with proprietary device specific definitions.

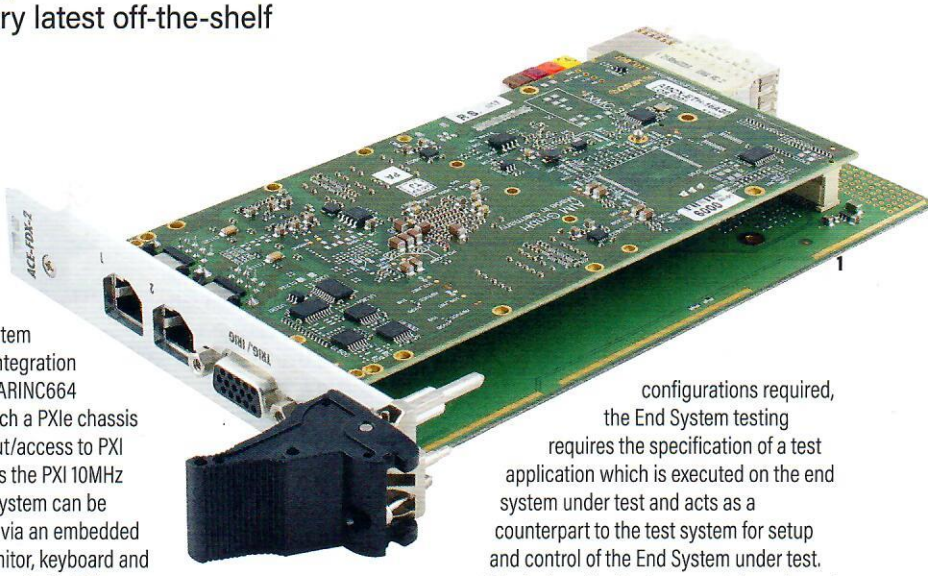
It has proved to be the case that dedicated ARINC664 COTS test equipment, specifically interface boards with IRIG-B synchronization, time stamping, error detection/injection capabilities for received/transmitted frames, and hardware trigger input/output support, ease such a test system's implementation and reduce risk with basically zero development effort on hardware side.

Today PXIe, as the latest hardware platform, offers a powerful and modular solution for many different kinds of test systems and therefore qualifies as a good candidate for hosting the ARINC664 test and simulation interfaces. Such a test system solution is suitable for both ARINC664 Switch and End System testing. The hardware engineering tasks for such a test system can be reduced to the integration of corresponding COTS ARINC664 interface boards into such a PXIe chassis which supports breakout/access to PXI trigger signals as well as the PXI 10MHz system clock. The test system can be operated either directly via an embedded PXIe controller with monitor, keyboard and mouse connected or via suitable PXIe extender unit to a suitable control host PC.

From the software side, the specified test requirements justifies the use of a Commercial Off-The-Shelf (COTS) software solution as a baseline that offers customization, automation (scripting), report/logging generation and data loading capabilities. The software engineering tasks are then related to the specification, implementation and test of the related testing scripts, which are organized and executed via the COTS software's own scripting capability.

One of the most important benefits of building the test system with mostly COTS hardware and software components is that it gives rise to the possibility of quickly setting up an intermediate test system for manual/interactive and pre-testing prior to the final formal test, because it represents, without any customization thus far, a fully functional multi-channel ARINC664 network analyzer.

Compared to the switch testing, where taking the UUT as a black box with different configurations required, the End System testing requires the specification of a test application which is executed on the end system under test and acts as a counterpart to the test system for setup and control of the End System under test. This test application is a mandatory element since the test focus is basically on ARINC664 interoperability and not on a particular operational functionality.



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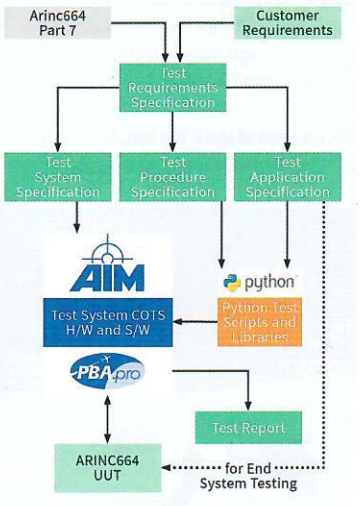
1 // PXIe offers a modular system for test systems

2 // The approach to end systems and switches uses COTS hardware and software is low risk



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In summary, the described approach offers a fully traceable method of testing ARINC664 compliance from the ARINC specification level with its functional requirements down to the implemented test scripts in the test system for ARINC664 compatible switches and End Systems. This is based on customization of COTS tools as well as on Windows software and the PXIe hardware platform. Adaptations of the current solution to more customer-specific requirements are possible. These can be undertaken by the customer and are of low risk due to the modular approach of the test system hardware and software.

As a supplier of COTS hardware and software products for ARINC664 test and simulation, AIM has already implemented and delivered several ARINC664 test systems and developed the corresponding test plans for compliance testing, available as optional Script Packages for the COTS databus test and analysis software, PBA.pro. \\