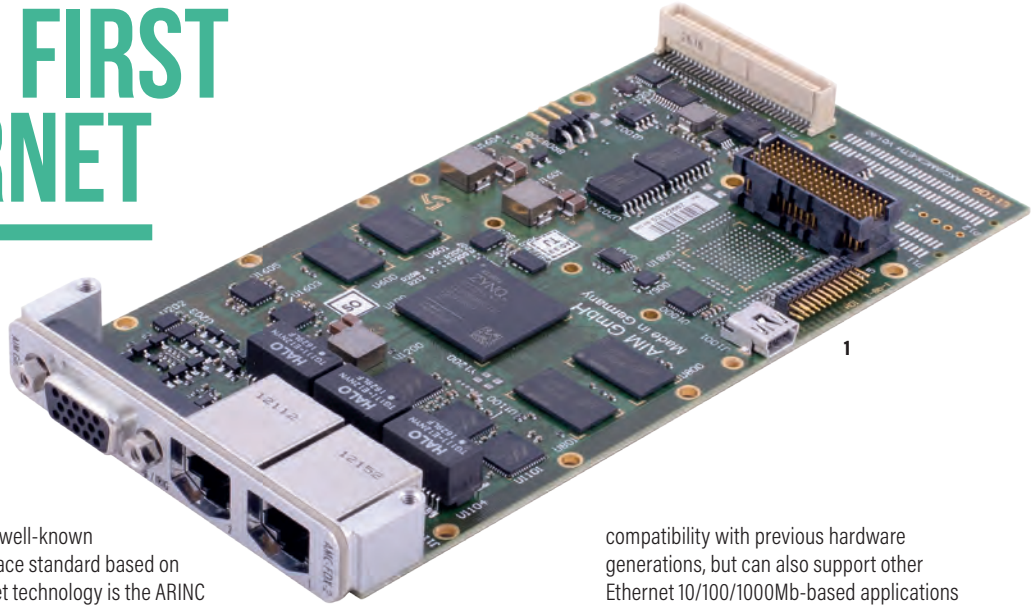
FLEXIBILITY FIRST WITH ETHERNET

Testing solutions using Ethernet-based data communications are simple in concept, but variations in upper layers add complications, and enabling special features requires flexibility



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There are several well-established dedicated communication standards in the aerospace and defense market, but Ethernet is the most prevalent communications method in avionics architectures. Despite dating back to the 1970s, Ethernet technology remains in demand. There are several reasons for the popularity of its new programs.

First, it offers high data rates of 10/100/1000Mb based on proven implementations and COTS components. Second, the development of higher data rates up to 10Gb is already implemented, offering transparency for upper layer standard protocols and enabling the efficient migration of existing Ethernet-based applications to the latest technology.

Statements like 'using Ethernet' do not really make the situation clear, since they can refer simply to the lower layers of the ISO/OSI model, specifically the physical layer. An important step when envisioning the use of Ethernet for an operational data communication system is to look at the application or system requirements, since dedicated data communication standards such as MIL-STD-1553 offer redundancy and a robust, deterministic behavior that is missing in the standard Ethernet world.

Today, there are many extensions of standard Ethernet, derived from applications tailored for industrial automation, automotive, railway, aerospace and defense. These derivatives have their own specialities with respect to addressing specific application needs. Potential users, such as system designers, adopters of Ethernet technology and test equipment suppliers, need to understand that talking about 'using Ethernet' is not enough to identify the best testing protocol solution.

One well-known aerospace standard based on Ethernet technology is the ARINC 664P7 standard, or the Avionics Full-Duplex Switched Ethernet. First adopted more than 15 years ago, it uses reduced IP and UDP upper layer protocols over 10/100Mb, but with extensions on the MAC Layer (ISO/OSI Layer 2) for deterministic behavior and redundancy support.

The nature of these extensions means that, although standard Ethernet equipment may be fit for some testing purposes, dedicated test equipment is needed.

More complex testing scenarios, such as interface/device verification or the simulation of multiple devices of an aircraft system, demand powerful hardware and software testing products to support the corresponding testing solutions.

AIM has more than 16 years' experience with Ethernet-based systems. As a test equipment supplier for avionics databuses and networks, AIM has addressed almost all aspects of AFDX/ARINC664P7 testing.

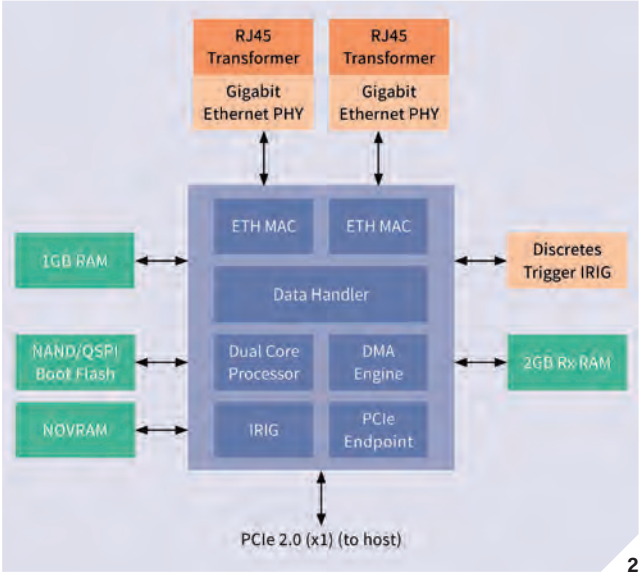
The products and systems from the company range, from protocol analyzers, interface modules for system integration benches, and switch and end systems compliance testing solutions, to Boeing ARINC664P7 variants, ARINC 615A data loading and dedicated technical seminars.

AIM has now developed a family of modules which not only handle all of the AFDX/ARINC 664P7 features, but can also be easily adapted to other types of applications and Ethernet variants. The hardware platforms for testing the Ethernet-based AFDX/ARINC 664P7 have been updated with the new APE-FDX-2 PCI Express board design, utilizing the latest SoC (system on chip) technology (Figure 2). This offers compatibility with previous hardware generations, but can also support other Ethernet 10/100/1000Mb-based applications due to a flexible hardware and software design with a customized FPGA MAC (media access controller), external time sync and hardware trigger I/O capability, and an embedded LINUX-based onboard dual core CPU.

A major goal for this new interface – also available as XMC and PMC (Figure 1) – was 'flexibility first'; in addition to AFDX/ARINC 664P7, it handles other Ethernet-based data communication standards up to 1Gb. \\

1 // AXC-FDX-2: XMC-based ARINC664P7/ Ethernet module

2 // Block diagram for PCIe-based ARINC664P7/ Ethernet module



2