

Defusing the time bomb

WHEN AIRCRAFT OUTLIVE THEIR TEST EQUIPMENT, NEXT-GENERATION INTERFACE SOLUTIONS FROM MBS WILL MAKE UPGRADING EASIER

BY JOHN COLE

Computer-hosted testing solutions often hold a hidden cost for aerospace testing and maintenance organizations. Although their aircraft often remain in service for 30 years or more, the computer databases used in their test systems typically become obsolete within 10 years. Consequently, maintaining an operational test system when computers or databases fail can require the expense of replacing interface cards, developing new software, and re-qualifying the test system.

Fortunately, a new class of avionics bus testing solutions is emerging that offers longer life spans for test equipment. Employing standard Ethernet and IP protocol, they show promise for ending this vicious cycle.

For almost 30 years, test-system manufacturers have consistently made use of the latest PC consumer interface technologies. From PC-XT in the early 1980s, to PC-AT, to PCI and PCI-X – each new generation has brought greater performance and ease of use at low cost.

“There’s a problem, however,” says Charles Nicholls, technical director of MBS Electronic Systems. “These buses are lasting no longer than 10 years before being phased out – but the pieces of aircraft equipment they test have lifetimes of two to three times longer. As test systems get old, it becomes more and more difficult to replace parts when failures occur. This is creating serious problems.”

MBS encounters this regularly. In a recent telephone conversation, a maintenance manager complained he could not find a new interface card that would work with his test system. He was still using PC-AT computers because all his test software had been written for that standard. And now he was afraid if it broke down, he would be unable to maintain and test his products.

The PCI time bomb

This cycle is getting ready to repeat itself for a new generation of testers.

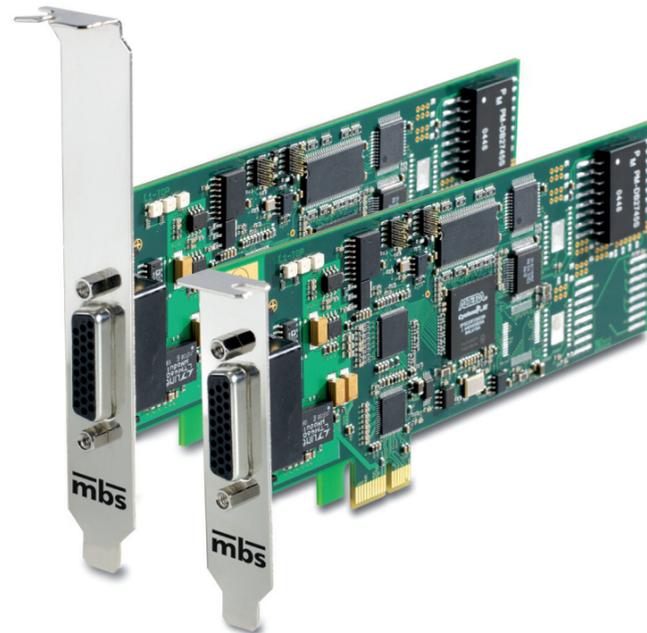
The world is moving away from PCI and even PCI-X and rapidly toward high-speed serial buses such as PCI Express (PCIe). Already, we find fewer and fewer PCI slots in our PCs.

This trend is not confined to the PC world. Similar things are happening in industrial computing. VITA is also moving to high-speed serial buses. In particular, with VITA 42, we see the rise of XMC with PCIe, RapidIO, and HyperTransport.

What happens when PCI hits the dust? Is the testing world responding to these changes? Or is it burying its head in the sand and hoping that computers with the old, parallel PCI buses will live forever? Test equipment designers should take this rapid obsolescence of computer buses into account and adopt solutions with a predictably long lifespan. They need to ‘think outside the box’ – in this case, outside the PC.

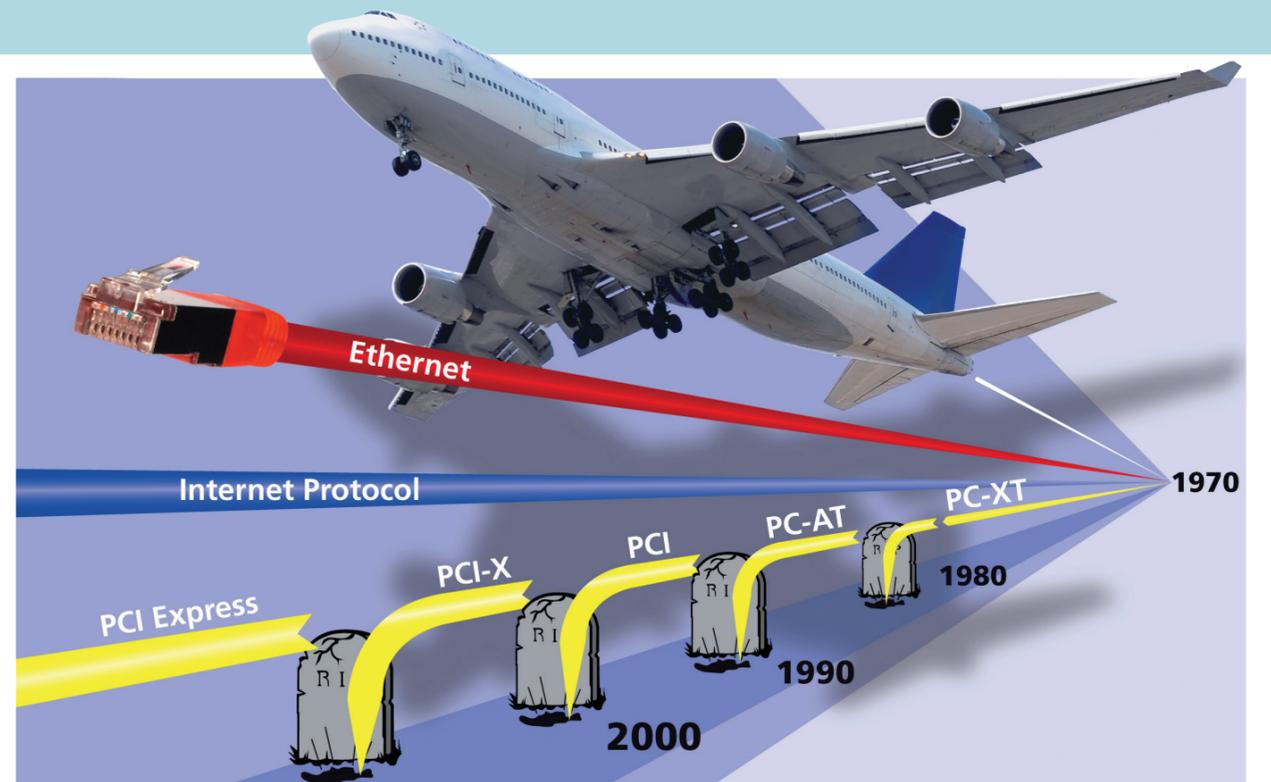


Avionics-to-Ethernet interface solutions – like this MIL-STD-1553/Gigabit Ethernet interface module offers a standalone interface solution that doesn't become obsolete



One solution to this dilemma has already emerged: avionics-bus-to-Ethernet interface modules. Ideally, these are standalone units, independent of any host computer. They employ a standard Ethernet interface in full duplex mode, and communicate using standard UDP/IP protocol.

A major benefit of this solution is its promise of longevity. Ethernet began 30 years ago and all evidence seems to indicate that it will be around for another 30 years. Indeed, the standard has been upgraded several times, constantly increasing its speed while remaining backward-compatible. These modules offer other benefits as well. As they aren't installed in computers, no device drivers are required. And as every operating system supports Ethernet and IP protocol, any computer can access them. Users can upgrade computers, software, and other parts of their test system without replacing or even disturbing the avionics interface.



Unlike many interconnect options, cable length is not an issue with Ethernet, which is very useful for potentially hazardous situations such as engine testing.

And Ethernet and IP are very well supported. Low-cost infrastructure is readily available, making it inexpensive to set up a LAN and replace components. Wireless networking is an option for some applications where cables would interfere.

There seems to be no real alternative to Ethernet for a computer-independent interface solution. The so-called ‘Industrial Ethernet’ standards EtherCAT and ProfiNET employ new protocols that are not standard to operating systems. In fact, the only open standard interface that would meet this criterion seems to be USB 3.0.

Why not use USB? USB also goes some way in this direction, and the criticism that it is too slow is gradually being overcome as USB 3.0 finds its way onto the market. But USB 3.0 also has its limitations. Computers and operating systems do not yet support it to the same extent the Ethernet-UDP/IP pair enjoys. What’s more, it lacks many of the features that

Computer buses come and go while Ethernet and internet protocol lives on

make the Ethernet-UDP/IP combination so attractive. It cannot be simultaneously accessed by multiple applications, and it has problems relating to cable length – possibly no longer than 3m for USB 3.0.

Next-generation interfaces

MBS Electronic Systems was the first to come to market with an avionics-to-Ethernet solution when it introduced its ÆSyBus line three years ago. Other suppliers are now following suit. It has taken some time to get the word around, but now others are coming out with their own Ethernet interface products.

MBS currently offers ÆSyBus data-bus-to-Gigabit-Ethernet interface modules for MIL-STD-1553, ARINC 429, ARINC-717, AFDX, RS-485, and CANbus. And it continues to expand the range.

In addition to the benefits listed above, ÆSyBus offers a number of other advantages over conventional interface cards. ÆSyBus modules provide multi-user access for up to 10 applications simultaneously. And there are no processing bottlenecks, because there are no processors or

controller software to slow things down. All functions are performed in hardware, and the Gigabit Ethernet transfers data 1,000 times faster than MIL-STD-1553 and 10,000 times faster than ARINC 429.

What about engineers who just need a short-term solution? There will always be those who need a system in a box. Their system doesn't need the benefits of networking and they don't want an interface ‘on a string’. They want their interface in a slot. These engineers need to be considered.

For those engineers, MBS recommends interface cards built on PCI Express or XMC standards. If they opt for a PCI card, they should be aware that it may be a very temporary solution.

MBS has recently begun developing a new range of PCI Express cards. ARINC 429, MIL-STD-1553, and CANbus are already available. A similar range of XMC cards will soon follow these products. ■

John Cole is a freelance writer and avionics systems engineer with more than 20 years of aerospace industry experience. He is the founder of Aerospace Marketing Ink, headquartered in Turin, Italy