

Easier Data Bus Interfacing... Now Coming to a LAN Near You.

Next-generation data bus interface products eliminate traditional interface cards and controller software. Allow multiple users to control and monitor bus data from any computer, with any application...over a standard Ethernet LAN.

Accessing avionics data buses with traditional interface cards has always come with more than its fair share of inconvenience. Hunting for the right card and driver...Paying dearly for proprietary hardware and software... Struggling to adapt the controller program to your application... Access for only one application per card... Cramping host computer (and user) alongside equipment under test, due to cable length restrictions... Fear of losing your investment when it comes time to upgrade your host computer or operating system...

But interfacing data buses is now much easier – and cheaper – thanks to an innovative solution from MBS Electronic Systems in Starnberg, Germany.

Æasy as Connecting an Æthernet Cable

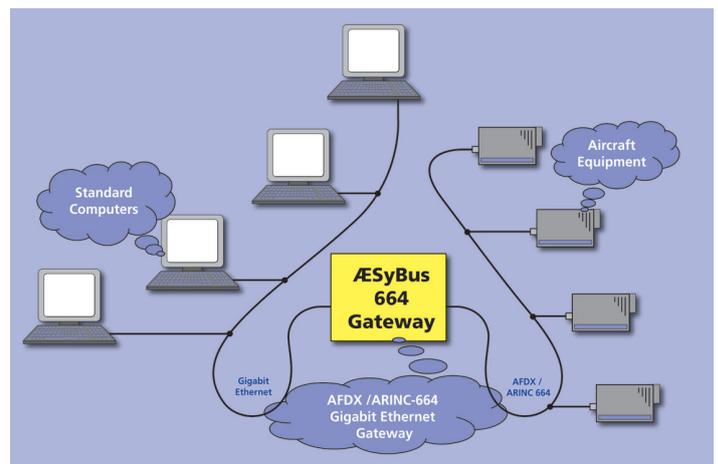
MBS founder Charles Nicholls has applied the concept of “Industrial Ethernet” to data bus interfaces. And in doing so, he has swept away most of the difficulties associated with traditional interfacing solutions.

Nicholls calls his invention ÆSyBus (“easy bus”) for Ethernet System Bus. The Æ symbol recalls the old English spelling of Æther, the imaginary medium through which electromagnetic waves propagate. But you can also think of Æ as representing a seamless Avionics/Ethernet interface, because that’s just what this new line of products gives you.

The ÆSyBus system doesn’t rely on pc-cards, processors or software to capture and control bus data. Nor does it rely on a proprietary software program that makes that data available to only one user. Instead, ÆSyBus interface modules are small, independent units that don’t require a host computer. They capture and process real-time bus data in hardware, and make it available to multiple users over a standard Gigabit Ethernet LAN, using standard Internet protocol.

The ÆSyBus Concept:

Provide a high performance interface between avionics and practically any computer, OS and application, using a standard Gigabit Ethernet LAN.



A True Open-Source Solution to the Data Bus Interfacing Problem

In many ways, ÆSyBus is similar to other “industrial Ethernet” concepts, such as EtherCAT, ProfiNET, LXI... even AFDX (ARINC 664). But unlike most of these systems, ÆSyBus does not create new protocols or infrastructure. Instead, like LXI, ÆSyBus makes use of what’s already available, either at low cost – due to the massive production scale of Ethernet hardware – or free of charge, as almost all operating systems and development applications now come with built-in Ethernet and IP support. Why not use LXI? Speed. LXI was designed as an instrumentation bus. It uses TCP/IP protocol to assure reliable communication over extended networks where message collisions can occur. But the overhead necessary to make TCP reliable also makes its response times too slow for real-time system control, testing and simulation.

So instead of TCP/IP, ÆSyBus modules use UDP/IP protocol.

Making UDP/IP Reliable Enough for Real-Time

The ÆSyBus system takes advantage of recent advances in Ethernet switch technology that make UDP/IP communication reliable enough for real-time, deterministic applications. This might come as a surprise to some. UDP is a connectionless protocol typically used for applications like streaming media, VoIP and online gaming. It is generally considered unreliable, however, for applications that require high data integrity. And that’s true when UDP is used on the Internet, or on a network using hubs, gateways and Ethernet’s traditional

CSMA/CD protocol in half-duplex mode.

But Ethernet can now be used in *full-duplex mode* with switches instead of hubs. In full-duplex, separate send and receive channels eliminate any possibility of bus collisions. And the switches forward only well-formed packets, ensuring data integrity. These switches also implement flow control and buffer data under heavy bus traffic conditions. Since the data buffers are very large, applications can collect data as their processing cycles allow, without missing messages.

Charles Nicholls designed ÆSyBus modules to work on just such a network... the same way AFDX is used on aircraft. And like AFDX, ÆSyBus employs a feature that controls the rate and size of messages transmitted, preventing bus congestion.

No Bottlenecks – Time-Critical Tasks Performed in Hardware

This is all possible because ÆSyBus modules do not employ embedded processors.

Embedded processors perform operations serially. Even high-speed RISC processors create a bottleneck in a system that must transfer huge amounts of data between networks.

Instead, Nicholls opted for a design that performs all time-critical tasks in hardware. FPGA's in each ÆSyBus module execute many operations in parallel. They process the entire UDP/IP protocol stack at line speed, even at the Gigabit data rate. That's 1000 times faster than MIL-STD-1553, and 10,000 times faster than ARINC 429. In other words, ÆSyBus modules easily handle everything the bus can throw at them... while using only a tiny fraction of the available user bandwidth.

ÆSyBus Modules for MIL-STD-1553 (shown), ARINC 429 and RS485 are available in stand-alone and 3U Eurocard (VME) formats. The stand-alone modules come in external-power, Power-over-Ethernet, and battery-powered versions.



Traditional Interfacing Problems Eliminated

ÆSyBus eliminates a host of problems associated with data bus interface cards.

No more hunting for drivers. ÆSyBus modules are independent units. You don't install them on host computers, so you don't need drivers. And since every serious operating system and development environment provides support for Ethernet and IP protocol, you can connect to ÆSyBus modules with almost any application – from practically any computer.

In addition, ÆSyBus interface modules come with example software and support classes written in Visual C#, along with source code. So you're sure to find whatever help you need to connect your favorite tool set.

You're no longer restricted by a single, proprietary program controlling the interface. Users can log on as many as 10 applications simultaneously, from the same or multiple computers,

using the 10 UDP user ports each module provides.

Charles Nicholls believes users should be free from the handcuffs of proprietary controller applications. And the expense of buying them. *"Many of our competitors are providing software solutions with a basic test / analyser system or an API... provided as an additional product. We believe that a customer's test requirements cannot always be fully satisfied with a general-purpose test and simulation package. We have found that many of our customers need the flexibility of systems like LabVIEW to quickly construct test systems tailored to their particular requirement."*

Finally, unlike ever-changing PC and OS technology, Ethernet is an enduring standard. Through 30 years of performance improvements, the frame formats (and hence the higher layer interfaces) have remained the same. All generations of Ethernet readily interconnect and will likely do so for years to come. So ÆSyBus users never have to worry about loss of investment due to technology obsolescence.

More products are being developed, not only to widen the range of interface products, but also to improve the infrastructure and so provide new solutions, opportunities and capabilities for exploitation by expedient engineers.

Greater Flexibility through LAN and WLAN Networking

Users gain other important benefits, simply because ÆSyBus modules are addressed remotely. Stub length restrictions of buses like MIL-STD-1553, for example, affect only the module. Users can work from their own desks. They don't need to be anywhere near the equipment under test.

Engine testing and many on-aircraft ground trials require long cable runs from equipment to application host. In these cases, ÆSyBus modules provide an easy way to access the equipment without degrading signal integrity. You also reduce cost, using fewer and less expensive (Ethernet) cables.

And in situations where you can't use fixed cables, or where space and weight constraints apply (hardware-in-the-loop, motion simulators, etc.), ÆSyBus modules let you eliminate cables... by using a Wireless LAN.

Coming Soon:

ÆSyBus Interface Modules for ARINC 664 (AFDX) – including an airworthy version for connecting with an onboard LAN.



About the Author

John Cole is an avionics systems engineer with 20 years experience developing systems for military aircraft, including the F-16 and Eurofighter Typhoon. He lives in Turin, Italy, where he now works as a freelance copywriter and marketing consultant dedicated to the aerospace industry. The name of his company is Aerospace Marketing Ink., and he can be reached at (+39) 011 569 4951, or by email at aerospace.copywriter@gmail.com.