

# Guest Editorial

## Offices in the sky – A real-world PC/104 aerospace application



By Anne-Marie Charest

*Today, top corporate executives are placing greater demands on corporate aircraft manufacturers for the availability of high-performance Internet and network connectivity while in flight. Executives are often pressed for time and must maintain their workload during trips while providing responsiveness to their management teams. With the help of Condor Engineering, a leading manufacturer of avionics data bus interface solutions, PENTAR Avionics has developed an airborne network server that allows business passengers to access e-mail/Internet or corporate networks. Users now can stay connected while in flight, increasing their productivity by maximizing use of travel time.*

*Aircraft pilots and navigational personnel can also use PENTAR's solution to access multimedia and moving map capabilities for positioning and mapping trip progress from the aircraft's flight management system or navigational system. In addition, flight personnel can contact ground personnel for special requirements that need to be met upon landing such as handicap assistance, supply orders, or flight information.*

### Development of the aerospace server

Utilizing COTS Condor Engineering PC/104 interface products, PENTAR was able to quickly develop a small, rugged avionics quality cabin file server, the JetLAN XP. The PC/104 format was ideal for PENTAR's modular design approach. It allowed them to maximize the use of commercial off-the-shelf technology while offering packaging options that met the rigorous demands of in-flight applications. In designing this product, Condor Engineering's PC/104 solution provided PENTAR with high performance ARINC 429 multi-channel functionality in a rugged form factor with the programming support necessary to implement their airborne map application. Condor's product also facilitated simplified access to ARINC data, providing aircraft position information that was used as input to the moving map display.

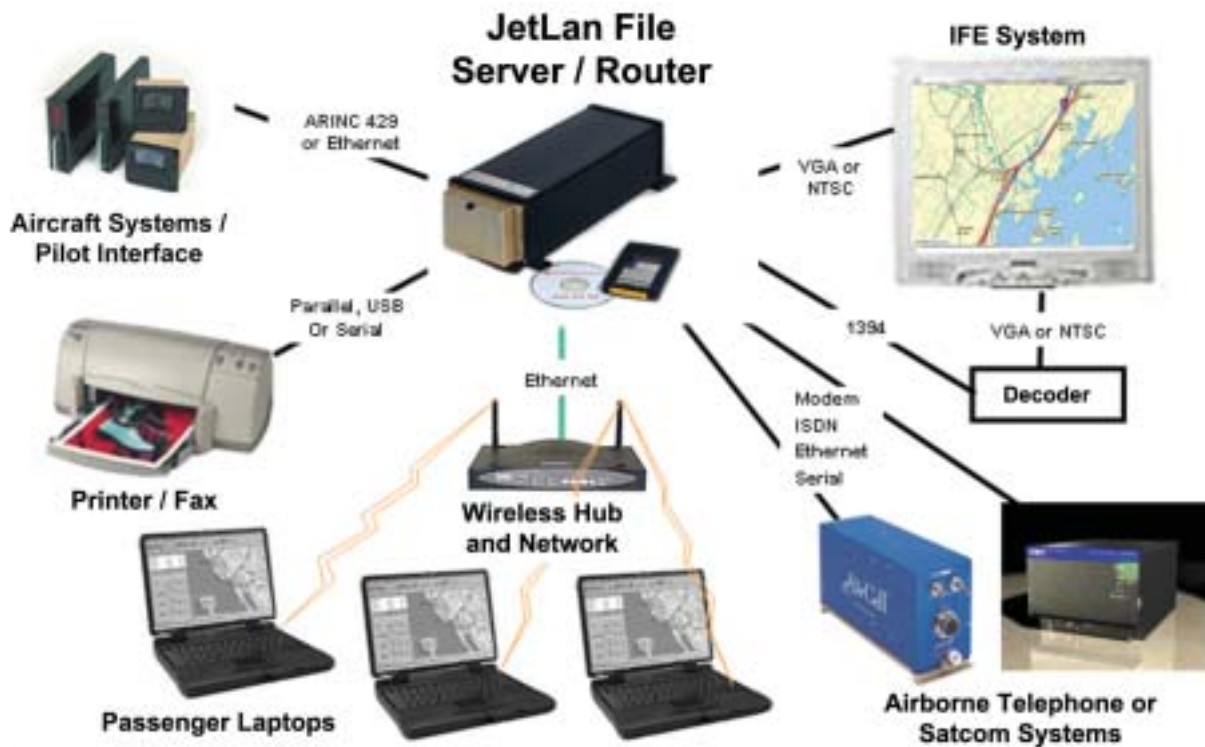


The JetLAN XP is unique in that it is smaller and lighter than comparable airborne servers. The modular design of the motherboard and two PC/104 card stacks allows for easy expansion, reconfiguration, and upgrades of hardware, thereby allowing a customized server to be assembled with any available interface card that meets PC/104 specifications. In addition, the JetLAN XP offers a dual-hard-drive bay that supports two 30-Gbyte removable hard drives rather than one fixed, non-removable drive. PC card (PCMCIA) slots support either one Type III or two Type II cards. Designed to mount just about anywhere in the aircraft and not only in an electrical equipment bay, the JetLAN XP has its own built-in cooling fans and battery backup. Therefore, it does not need to rely on aircraft-forced air-cooling or an external battery backup.

The challenges that come with a small server size design like the JetLAN XP include weight limitations, heat dissipation, damping, thermal protection, and communication requirements with other sub-systems. The server size and weight had to be minimized for installation into extremely limited spaces, as is often the case on business aircraft. Since the server

design accommodates containment in such a compact enclosure, it had to be capable of dissipating heat efficiently. Thermal protection circuits were designed to turn fans on and off as needed based on the ambient temperature in the server. Communication requirements needed to support other avionics equipment include ARINC 429, RS-232, RS-422, RS-485, modem, USB, Parallel Port, and aircraft discretes.

The JetLAN XP server is different from regular land servers. Its design allows use of aircraft supplied power and resists power fluctuations or interruptions. These circuits include battery hold-up, safe shutdown when aircraft power is interrupted or removed, and automatic restart when aircraft power is reapplied. Certification of the JetLAN XP conforms to the environmental requirements of the Radio Technical Commission for Aeronautics (RTCA) DO-160D specifications. The JetLAN XP interfaces to aircraft systems that use military circular connectors rather than ARINC standard connectors (i.e., ARINC 404 or 600). The ruggedized design of the product also includes the ability to withstand vibration and thermal stress such as extreme cold and heat.



**Figure 1. Network configuration**

The JetLAN XP is the center of an airborne network based on 10/100Base-T Ethernet and uses the standard TCP/IP communication protocol. The resulting LAN is the same as you find in an office environment, so any laptop computer with a standard network interface can plug into the network and gain connectivity. The server will assign the laptop computer with an IP address through its Dynamic Host Configuration Protocol (DHCP) service. The user can then log into the server and access the provided applications or can communicate to the ground through one of the onboard communication systems that is interfaced with the server (i.e., Satcom, Airborne Telephone, HF, RF, VHF, etc.). This feature provides Internet access, e-mail capabilities, and other online connectivity services. The server uses the Internet-connection sharing function to allow a laptop user to demand dial to any phone number for data communication. See Figure 1 for a depiction of the network.

**Connection features**

Internet connection speed can vary depending on the types of devices with which the server interfaces. For example, it will run at 2.4 -Kbits/sec over a Satcom dial-up link, 9.6 Kbits/sec over an airborne telephone link, and 64-128 Kbits/sec over ISDN high-speed data communication satellite link. The server is designed to communicate to the ground at faster speeds as new and faster communications systems are developed.

The key benefit of using JetLAN XP over other airborne network solutions is that the

JetLAN XP delivers affordable Internet access and network connectivity in real time. Many carriers today only provide static Internet content. JetLAN offers a greater compatibility with user laptop systems running on Windows 98, Windows 2000, Windows NT 4.0, Windows 2000 advanced server, and Linux 6.0. This means the user does not require third-party or proprietary software installations to utilize its in-flight network server. In addition, users are able to use their existing Exchange, Outlook, or Lotus Notes application net access with a ground server. With PENTAR's unique PC-based system, a user's e-mail is not stored or routed to an intermediate server, which increases the security of their e-mail content. In essence, this solution is a complete *Office in the Sky*.

The JetLAN XP provides server functionality to cabin-based LANs allowing the passengers to access e-mail/Internet with the same PC platform that can provide aircraft position overlaid on a topographical map. JetLAN products are currently flying or being installed on a variety of executive aircraft including Boeing Business Jet, GulfstreamV, Bombardier Global Express, and Dassault Falcon 900 EX. PC/104 has proven itself to be a viable platform for this avionics application, as users today surf the Internet, send and receive e-mail, access corporate ground-based data files, share files with other passengers, utilize cabin printers, and store critical files.

Condor recognizes the importance of PC/104 to the aerospace industry and will

continue to provide rugged, cost effective, powerful, and easy-to-use avionics products that will allow customers such as PENTAR to successfully develop and implement their applications.

*Condor Engineering is a leader in the design, manufacture, and support of high-quality, cost effective, data communications solutions for avionics. Products from Condor include test, simulation, and production interfaces for Commercial (ARINC, CSDB) and Military (MIL-STD-1553/1773) avionics data buses.*

*Founded in 1989, Condor boasts a proud history of developing quality-engineered products that meet the rigorous requirements of the commercial and military avionic sectors.*

*For further information, visit the Condor Engineering Web site at [www.condoreng.com](http://www.condoreng.com).*

*PENTAR Avionics has more than 12 years experience in providing the avionics industry with a wide variety of products and services for test simulation and development applications. From the extensive line of interface card products, integrated test systems, and airborne solutions, PENTAR has the products, technology, skills, and experience to meet the needs of the avionics industry.*

*For further information about PENTAR, visit the Web site at [www.PENTAR.com](http://www.PENTAR.com).*