AFDX for Airplanes

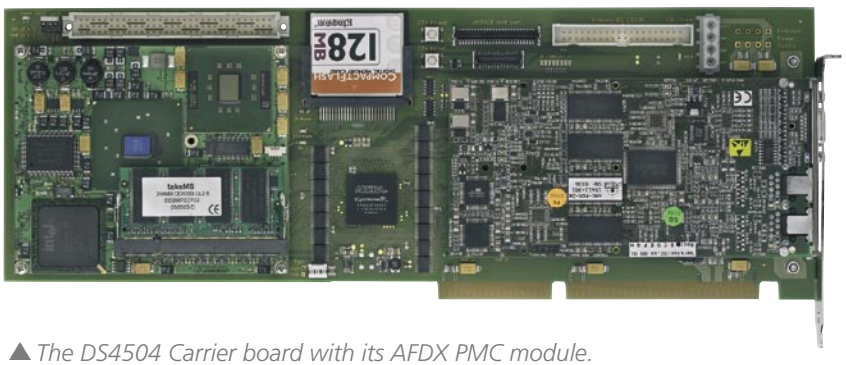
- **AFDX interface for rapid control prototyping and hardware-in-the-loop simulation**
- **In addition to ARINC429 and MIL-STD-1553 support**
- **Customer-specific solutions on request**

For the avionic and aerospace industry, dSPACE now offers the AFDX (Avionics Full Duplex Switched Ethernet) Solution Interface to connect a modular dSPACE system to an AFDX network. After ARINC429 and MIL-STD-1553, AFDX is the third avionic network protocol supported by dSPACE. It is based on the DS4504 board with an ETX (Embedded Technology eXtended) module working like an embedded PC.

The new AFDX Solution increases dSPACE's product range for the avionic and aerospace industry, adding support for another major avionic network protocol. For example, AFDX is used as a main data bus on the Airbus A380 and upcoming airplanes. The AFDX Solution can be used for rapid control prototyping (RCP) and hardware-in-the-loop (HIL) simulation, two procedures that are increasingly being used for developing and testing airplanes.

Based on DS4504 Board

The dSPACE AFDX Solution is based on the DS4504 board, which acts as a carrier for an ETX (an embedded PC) and a PCI Mezzanine Card (PMC). In principle the ETX works as an intelligent communication processor between a modular dSPACE system and the PMC module, which provides the AFDX interface, for example. Data exchange between the ETX and the dSPACE processor board runs via the PHS++ (peripheral high speed) bus and a 2-MByte dual-port memory (DPMEM), while the Peripheral Component Interconnect (PCI) bus handles data exchange between ETX and PMC. A Compact Flash (CF) card contains the QNX run-time operating system and the ETX application, for example, for AFDX.



▲ *The DS4504 Carrier board with its AFDX PMC module.*

The solution concept consists of:

- Processor board (DS1005 PPC Board or DS1006 Processor Board, or a multiprocessor system) for the real-time application
- DS4504 with ETX module (containing a mobile Pentium IV processor with 1.1 GHz), the PMC board, and a CF card

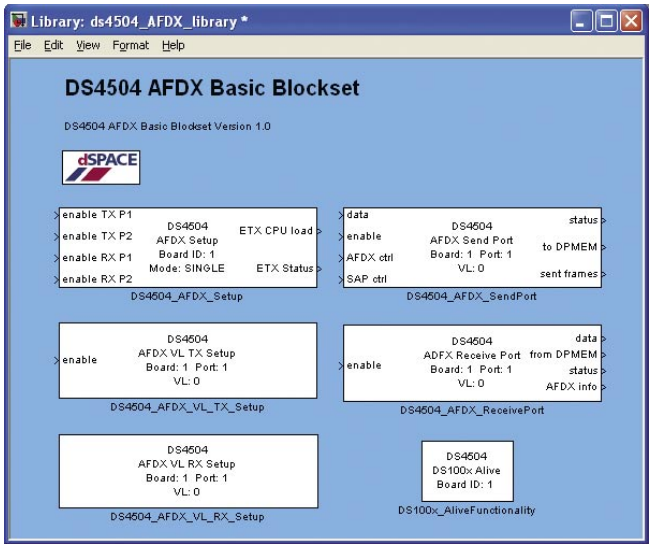
Various dSPACE I/O boards, providing A/D, D/A, ARINC429 or CAN interfaces, can be added to the modular system.

▲ *The PMC Module AMC-FDX-2 for connection to the ADFX network.*

dSPACE AFDX Solution

AFDX is the main avionics databus network onboard the A380 and is based on commercial 10/100-Mbit, full duplex switched Ethernet. It uses a special protocol providing deterministic timing and redundancy management which ensures secure and reliable communication of critical and noncritical data. AFDX communication protocols were derived from commercial databus standards (IEEE802.3 Ethernet MAC addressing, Internet Protocol IP, User Datagram UDP) to achieve the deterministic behavior required for avionics applications. The dSPACE AFDX Solution, playing the role of an AFDX end system, enables you to interface your AFDX network directly to

the real-time application running on the dSPACE processor board. The connection to AFDX uses an AIM PMC module and the corresponding QNX driver. AIM is a manufacturer of avionic test and simulation products.



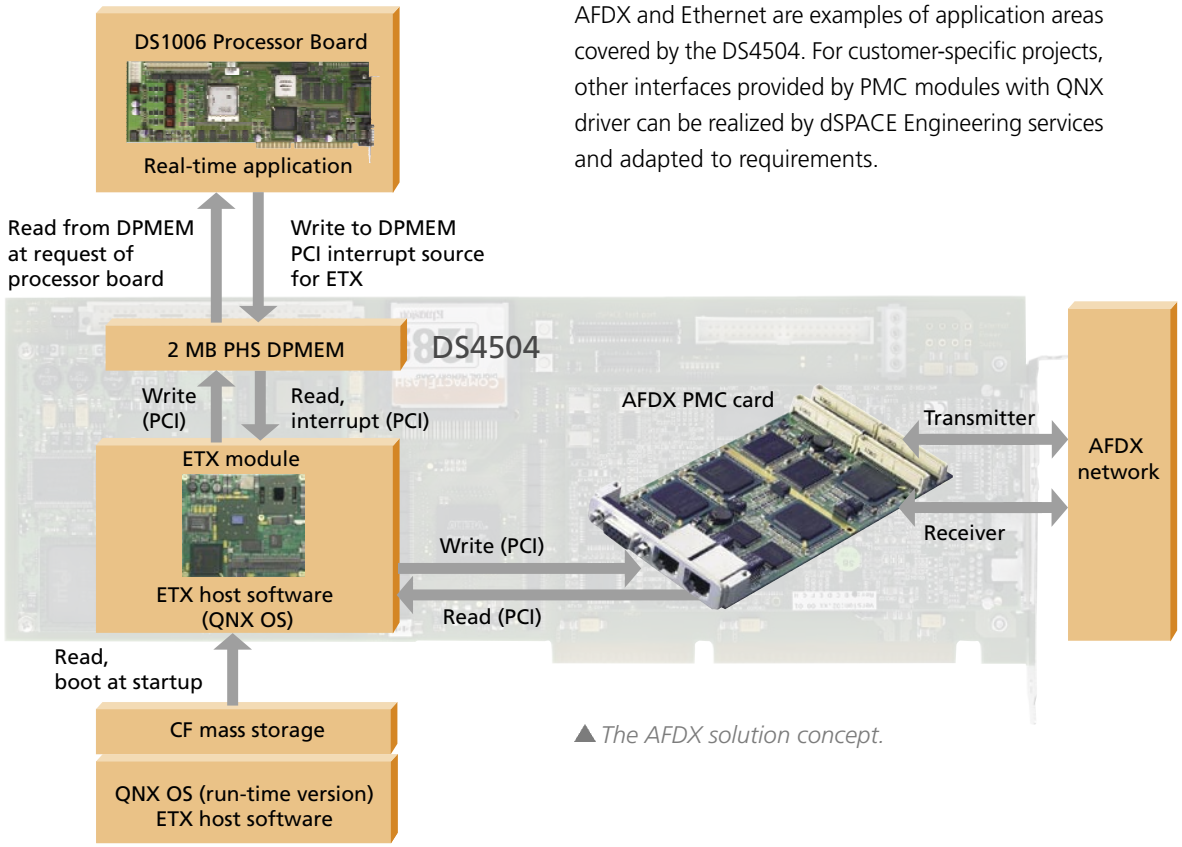
▲ *The AFDX Basic Blockset gives complete graphical support for configuring the AFDX board.*

The solution and the connection to the Simulink® model are configured graphically by means of the DS4504 AFDX Basic Blockset, based on S-functions. This Real-Time Interface (RTI) software helps you to configure general AFDX and board settings, and detailed virtual link and port settings.

Ethernet Solution

Also based on the DS4504 is dSPACE's 100-Mbit/s Ethernet Solution. The new 100-Mbit/s Ethernet Solution enables you to transmit data between dSPACE processor boards (DS1005, DS1006, or multiprocessor system) and a remote computer system. The UDP/IP and TCP/IP protocols are supported. Data transmission between the processor board and a customer-specific bus system can also be implemented by using an appropriate gateway computer connected to the Ethernet network. For example, in one specific customer project, an interface to a MOST (Maynard Operation Sequence Technique) network was implemented with the 100-Mbit Ethernet Solution using a special gateway.

AFDX and Ethernet are examples of application areas covered by the DS4504. For customer-specific projects, other interfaces provided by PMC modules with QNX driver can be realized by dSPACE Engineering services and adapted to requirements.



▲ *The AFDX solution concept.*