

# X-ES

Fast, Flexible, and Customer-Focused Embedded Solutions

## ADP Highlights

- Risk Reduction
- Suite of System Components
- System Integration
- Conversion to Deployed Solutions



Figure 1: Avionics Development Platform (ADP)

## ADP - Avionics Development Platform

To significantly reduce schedule risk, X-ES offers the industry's first Avionics Development Platform (ADP) based on 3U VPX technology. Avionics system design is typically serialized and incurs long lead times for custom backplanes, cabling, and I/O breakout. Until the majority of system components are completed, it is difficult to make substantial progress in software development, system integration, and testing. The ADP enables software development and the deployed system hardware development to be performed in parallel.

## OpenVPX Based Development Platform

The ADP system solution utilizes the X-ES XPand1200 OpenVPX development platform (Figure 1), which supports conduction-cooled 3U VPX modules. The heat from the conduction-cooled modules in the XPand1200 is conducted to sidewall heat exchangers, where it is dissipated to the ambient environment by forced-air cooling.

Because the XPand1200 is an OpenVPX development platform with an OpenVPX backplane, compatible COTS payload, switch, power, and storage modules, and Rear Transition Modules (RTMs) can be integrated.

## Rapid Prototyping, Rapid Deployment

The Avionics Development Platform offers a means to get hardware and software into the hands of software and system developers early, and also making the transition to a deployable solution a low risk effort.

Please contact your X-ES sales representative today to start selecting your ideal ADP solution.

## Risk Reduction

Central to schedule risk reduction is the degree to which a development platform can emulate the target avionics system that will be deployed. Based on a COTS OpenVPX platform, the ADP comes as close as possible to the deployed solution.

### COTS Backplane, Chassis, and RTMs

The ADP incorporates COTS chassis, backplane, and RTMs. The ADP supports standard COTS air-cooled 3U VPX RTMs for all X-ES and 3rd party ruggedized 3U VPX payload modules, circumventing the need to develop custom backplanes to break out specific module I/O. The RTMs provide the same I/O interfaces that will pass through the MIL-DTL-38999 connectors in the deployed system. Leveraging a COTS backplane, chassis, and RTMs in the development platform:

- Enables early software development
- Enables testing of the deployed system hardware to be done in parallel with software development
- Maintains maximum compatibility between the development platform and the deployed system



Figure 2: XPedite7470

### Payload Modules

Historically, system integrators have used air-cooled modules for development and conduction-cooled modules in their deployed system. This forces much of the design to be serialized. This can also lead to problems because of variations between air-cooled and conduction-cooled versions of a module.

With the ADP, the payload modules are typically the same conduction-cooled modules that will be going into the deployed system which reduces integration and compatibility issues that arise from switching from air-cooled to conduction-cooled modules. This high level of reuse:

- Increases overall test exposure of the deployed modules
- Final system's Test Readiness Level (TRL) is increased
- Schedule risk is reduced

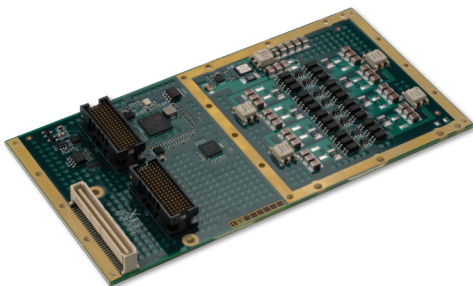


Figure 3: XPort9100

### Software

Software is arguably the most important aspect of the system and often the hardest to develop and keep on schedule. Because the ADP is functionally equivalent to the deployed system, with the same payload modules used in both, the operating system software as well as the application software developed on the ADP will run without modification on the deployed system.

## Ruggedized System Components

X-ES offers a suite of design elements, including ruggedized and COTS components, which allow the ADP system to be customized to meet your requirements.

### Conduction-Cooled Single Board Computers (SBCs)

- XPedite7170: Intel Core 2 Duo at up to 1.8 GHz
- XPedite7470: Intel Core i7 at up to 2.0 GHz (Figure 2)
- XPedite5170: Freescale MPC8640D at up to 1.25 GHz
- XPedite5370: Freescale MPC85722E at up to 1.5 GHz
- XPedite5470: Freescale P4080 at up to 1.5 GHz
- XPedite5570: Freescale P2020 at up to 1.2 GHz

These SBCs can host either an XMC or PMC. The hosted mezzanine can be utilized for additional processing capability, storage, or I/O.

### Conduction-Cooled Avionics Control

The ADP can have an avionics control module (XPort9100 - XMC. Figure 3) integrated to provide eight channels of +28V General Purpose I/O (GPIO).

### Conduction-Cooled Avionics-Specific Communications

The ADP includes 3rd party options for MIL-STD-1553, ARINC 429, and MIL-STD-188-203-1A (ATDS) interfaces:

- DDC AceXtreme™ MIL-STD-1553 PMC Card BU-67X10F/M
- DDC AceXtreme™ MIL-STD-1553 & ARINC 429 PMC Card BU-67107F/M
- GET Engineering MIL-STD-188-203-1A (ATDS) PMC

### Conduction-Cooled Communications

- XPort1003: RS-232/RS-422/RS-433/RS-485
- XChange3012: 3U VPX Ethernet Switch with two 10/100/1000BASE-T ports and six 1000-BASE-BX ports.
- XPort3300: 10GbE (10GBASE-T) and SFP+ XMC (Figure 4)

### Conduction-Cooled Video / Audio

- XPort4101: Component/composite video input, DVI/VGA video output XMC
- XPedite7470: Intel Core i7 3U VPX SBC with DVI video, audio line-out

### Conduction-Cooled Storage

- XPort6172: 512 GB 3U VPX SSD
- XPort6103: 512 GB SSD XMC
- XPort6170 & XPort6192: 256 GB Removable SSD module (Figure 5)

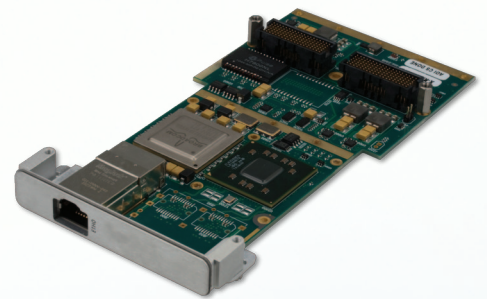


Figure 4: XPort3300

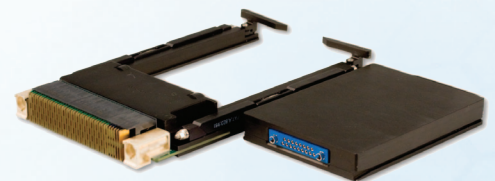


Figure 5: XPort6170 & XPort6192

# COTS Development System Components

The chassis, backplane, power supply, and RTMs of the ADP are designed for use in the lab along with the ruggedized components while the custom chassis, backplane, and power supply are being developed for the deployed system.

## COTS Development Chassis

The ADP is based on a COTS development chassis with a 3U VPX backplane, 10 slots for conduction-cooled modules on a 1" pitch, and an RTM bay for air-cooled 3U VPX RTMs. The chassis conducts heat from the conduction-cooled modules to side wall heat exchangers. The heat is removed from the side wall heat exchangers by forced-air cooling.

- XPand1200 3U OpenVPX development platform

## COTS Development Backplanes

The ADP includes an OpenVPX backplane with six 1" pitch payload slots, two switch slots, and two power slots.

- XTend4130: 6-payload slots with single/dual star topology
- XTend4131: 6-payload slots with leaf node support (Figure 6)

## COTS Development Power Supplies

The ADP includes an integrated AC input to 28 V DC power supply in combination with a 3U VPX 28V DC input to ±12V, 5V, and 3.3V output development power module.

A conduction-cooled 3U VPX 28V input power module with 110 ms of hold-up time and integrated MIL-STD-461E filtering can be integrated into the ADP in place of the development power module, if it meets the needs of the deployed system.

- XPm2000 3U VPX Power Module

## COTS Rear Transition Modules

X-ES offers a full line of air-cooled Rear Transition Modules (RTMs), PMC I/O Modules (PIMs), and XMC I/O Modules (XIMs) to bring the I/O of the X-ES and 3rd party product payload modules to the rear of the ADP for easy access.

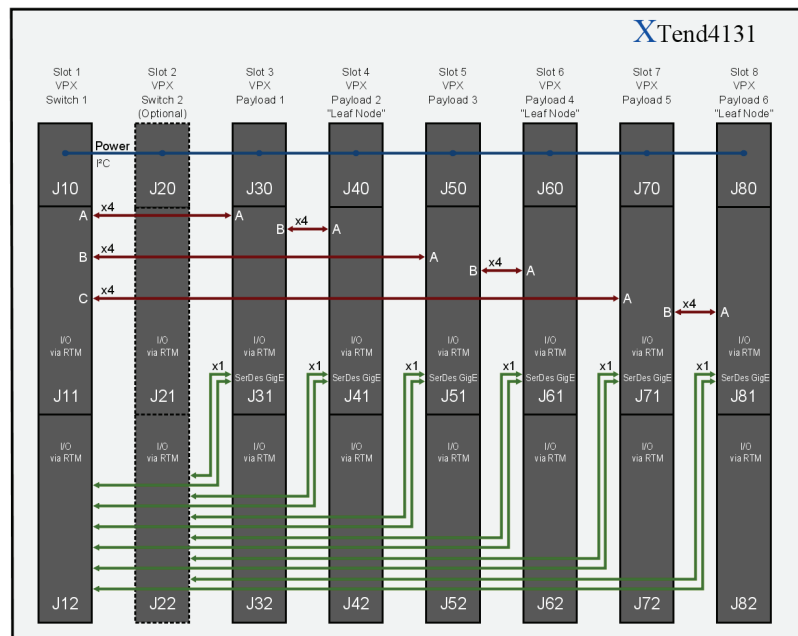


Figure 6: XTend4131 Block Diagram

# Development System Integration

After the core system components have been selected, the ADP system is assembled and tested.

## Software

All operating systems supported by a configured ADP's selected SBC are available. The operating system selected may be restricted by the driver support available for third-party I/O boards. X-ES integrates the hardware and software components of each specific ADP configuration and tests the ADP interfaces using the X-ES and third-party board device drivers (note, X-ES will test third-party I/O board interoperability to the extent provided by third-party vendor's drivers and utilities). Each ADP is delivered with a CD containing the operating system BSP, drivers, and utilities for all included boards. X-ES support is available before purchase and after delivery to discuss operating system compatibility issues. X-ES can perform software integration for additional third-party VPX and mezzanine modules. A full suite of BIT software is offered for X-ES's COTS products. BIT system level integration can be provided to further improve system coverage.

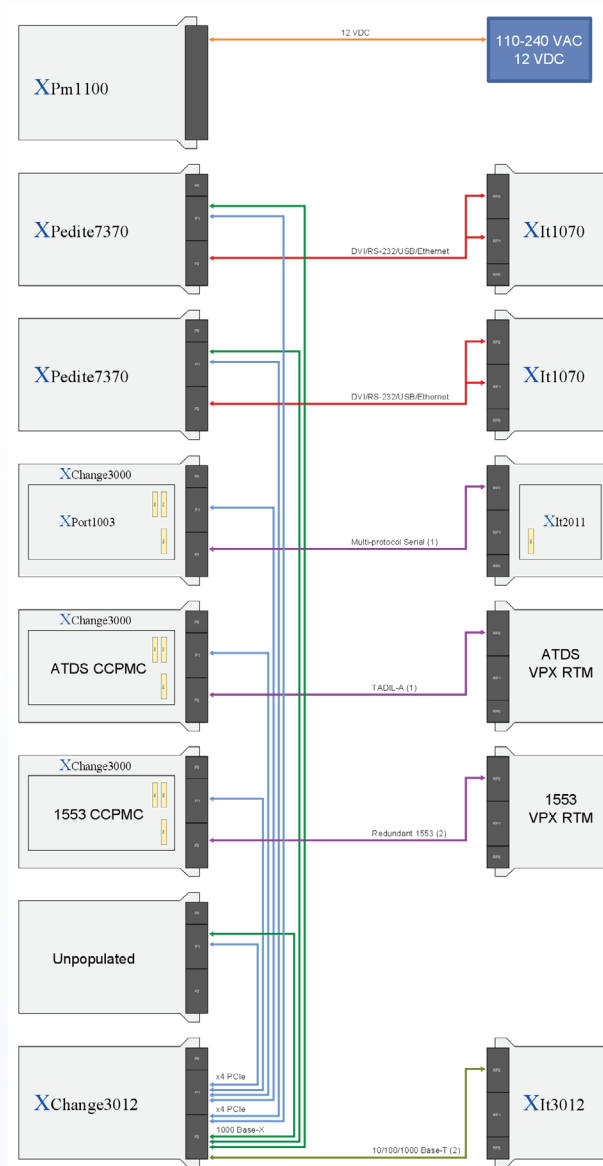


Figure 7: ADP Block Diagram

## Conversion to Deployed Solutions

When developing with the ADP, retargeting an integrated avionics development platform to the deployable configuration is a low risk exercise. The core system components undergo testing throughout the software development process on the ADP. In parallel with software development on the ADP, a deployable chassis, backplane, and power module can be developed. When the custom hardware development is completed, the deployed system integration and testing can begin.

### Deployable Chassis

X-ES offers deployable ½ ATR chassis solutions for all types of environments. These designs can be modified to meet specific application requirements.

- XPand3200: Cold plate conduction-cooled chassis
- XPand4200: Rugged forced-air and cold plate conduction-cooled chassis for conduction-cooled modules (Figure 8)
- XPand5200: Natural convection cooling chassis

X-ES supports the military industry standard D38999 circular connectors for I/O breakout.

### Deployable Backplane

Since every backplane design in a deployed system needs to meet specific I/O and interconnectivity requirements, X-ES will design a custom backplane to meet your requirements. X-ES is very experienced with the design of high performance backplanes and high-speed serial fabrics.

### Deployable Power Supply

X-ES offers robust avionics power supplies. The XPm2000 takes in a MIL-STD-704 28V-DC input voltage and provides up to 200 W on 3.3V, 5V, and ±12V at up to 90% efficiency. The XPm2000 also provides on card MIL-STD-461E EMI filtering. If the XPm2000 meets the application needs, it can be used as is. Otherwise, a derivative or a full custom power supply design can be developed by X-ES.



Figure 8: XPand4200

### Corporate Overview

Extreme Engineering Solutions, Inc. (X-ES) designs and builds chassis, single-board computers, I/O, power, backplane, and system-level products within the embedded computer industry. X-ES offers cutting-edge performance and flexibility in design plus an unparalleled level of customer support and service. For further information on X-ES products or services, please visit our website: [www.xes-inc.com](http://www.xes-inc.com) or call (608) 833-1155.