



## PCI Express® Architecture Frequently Asked Questions PCI-SIG®

### **Q: What is the PCI Express® (PCIe®) architecture?**

A: PCI Express architecture is an industry standard high-performance, general-purpose serial I/O interconnect designed for use in enterprise, desktop, mobile, communications and embedded platforms. It has many state-of-the-art attributes, including:

- PCI™ compatibility using the established PCI software programming models, thus facilitating a smooth transition to new hardware while allowing software to evolve to take advantage of PCI Express features
- A cost-effective, low-pin count interface offering maximum bandwidth per pin, reducing cost and design complexity and enabling smaller form factors
- Scalable bandwidth of 16 Gigabytes per second at its initial signaling rate of 2.5GHz with much higher transfer rates in the future using higher frequency signaling technologies
- Support for multiple interconnect widths via 1, 2, 4, 8, 12, 16 and 32 lane configurations aggregated to match application bandwidth needs
- Support for new and innovative, hot-plug/hot-swap add-in card and module devices
- Unique, advanced features such as Power Management, Quality of Service and other native functions not available in other I/O architectures

### **Q: What prompted the creation of PCI Express architecture?**

A: The interconnect demands of emerging computing and communications platforms exceed the capabilities of traditional parallel buses such as PCI. Innovations such as 10GHz and higher CPU speeds, faster memories, high-end graphics, gigabit networking and storage interfaces, and high-performance consumer devices have driven the need for a system interconnect with much greater bandwidth scalability and lower cost of implementation. PCI Express architecture uniquely meets these varying market segment requirements.

### **Q: How does PCI-SIG® ensure product interoperability?**

A: PCI-SIG® holds regular Compliance Workshops in various locations around the world to satisfy the needs of its members. These workshops are intended for members to demonstrate their product's interoperability with those of other PCI-SIG members. Member products that successfully demonstrate interoperability at a workshop are listed on the PCI-SIG Integrators List. Member products that conform to the PCI Express architecture may use the PCI Express logo (registered trademark of PCI-SIG) subject to the PCI-SIG Trademark and Logo Usage Guidelines.

### **Q: What and how many PCI Express architecture specifications are there?**

A: The PCI Express architecture suite of specifications can be described as follows:

1. PCI Express Base Specification: the core specification for the multi-layered PCI Express architecture
2. PCI Express Card Electromechanical Specification: the ATX-based form factors
3. PCI Express Mini Card Electromechanical Specification: the BTO/CTO mobile platform form factor

4. PCI Express to PCI/PCI-X™ Bridge Specification: the bridging architecture to enable PCI Express components to function with legacy PCI devices
5. PCI Express x16 Graphics 150W-ATX: the considerations for power and thermal issues in the next generation of platforms with leading-edge graphics and multimedia applications to deliver higher performance capabilities
6. PCI Express ExpressModule™: a hot-pluggable modular form factor defined for servers and workstations

**Q: What is the PCI Express x16 Graphics 150W-ATX 1.0 Specification?**

A: PCI Express x16 Graphics 150W-ATX 1.0 is a supplementary specification to the PCI Express architecture specification specifically for delivery for higher performance capabilities for the next generation of platforms with leading-edge graphics and multimedia applications. The specification considers power and thermal issues in these platforms and provides a solution space for designers of these systems.

**Q: What is the PCI Express ExpressModule?**

A: The ExpressModule Specification is a PCI Express modular form factor defined for Servers & Workstations. Its ease-of-use packaging and integrated features provide benefits to many customers and system integrators (OEM, IHV, VAR and End-users). The ExpressModule enables and promotes fundamental improvements in the way Servers & Workstations are built and serviced.

**Q: How does ExpressModule improve the way Servers and Workstations are built and serviced?**

A: The ExpressModule form factor provides Servers and Workstations with a modular I/O adapter that is closed chassis hot-pluggable. The design of ExpressModule frees the I/O adapter from direct connection to the system board, thus allowing greater flexibility in system design. Server I/O Modules can be placed in the front or back of the system, vertical or horizontal, or above system I/O board. The Server I/O Modules flow-through cooling model increases system venting while providing adapter developers an airflow scheme, thus improving reliability for both adapters and systems. The standard management features promote remote service while the modular enclosure enables customer service and upgrades.

**Q: What is the PCI Express Wireless Form Factor (WFF)?**

A: WFF is a form factor being developed within PCI-SIG by member companies focused on the unique requirements associated with integrating existing and new wireless technology into a wide range of usage models, e.g. portable notebook computers.

**Q: What is the PCI Express External Cable specification?**

A: The PCI Express External Cabling specification was developed to address multiple market segment cable requirements to extend PCI Express protocol and functionality across arbitrary distances and packaging that cannot be met using existing backplane trace connectivity.

**Q: What is ExpressCard technology?**

A: ExpressCard technology is the name of a standard introduced by PCMCIA in Spring 2003. The ExpressCard standard promises to deliver thinner, faster and lighter modular expansion to desktop and notebook computer users. Consumers will be able to add hardware capabilities such as memory, wired and wireless communications and security features by simply inserting a module into their systems. All ExpressCard slots will accommodate modules designed to use either Universal Serial Bus (USB) 2.0, or the emerging PCI Express

standards. Over time ExpressCard technology is expected to become the preferred solution for hot-pluggable internal I/O expansion for desktop and mobile computers.

**Q: Who developed the ExpressCard standard?**

A: The ExpressCard standard was created by a broad coalition of PCMCIA member companies, including Dell, Hewlett Packard, IBM, Intel, Lexar Media, Microsoft, SCM Microsystems and Texas Instruments. PCMCIA developed the new standard with assistance from the USB Implementers Forum (USB-IF) and PCI-SIG. PCMCIA was a non-profit trade association founded in 1989 to establish technical standards for PC Card technology and to promote interchangeability among computer systems. In 2010, PCMCIA transferred its technology assets to the USB-IF and dissolved as an organization.

**Q: How can PCI Express developers build components that can be integrated into ExpressCard products?**

A: First, developers must use silicon that has passed the PCI-SIG compliance program. PCI Express components that successfully pass the PCI-SIG compliance tests may be useable in an ExpressCard module if they allow for a module design which meets the additional requirements (e.g., power management, power and thermal) detailed in the ExpressCard standard.

**Q: What is the compliance program for ExpressCard products?**

A: The ExpressCard compliance program is now being run by the USB-IF. For full details, visit [http://www.usb.org/developers/expresscard/expresscard\\_compliance/](http://www.usb.org/developers/expresscard/expresscard_compliance/).