



PCI Express Technology: Comprehensive Guide to Generations 1.x, 2.x and 3.0

By *Mike Jackson, Ravi Budruk*

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PCI Express 3.0 is the latest generation of the popular peripheral interface found in virtually every PC, server, and industrial computer. Its high bandwidth, low latency, and cost-to-performance ratio make it a natural choice for many peripheral devices today. Each new generation of PCI Express adds more features, capabilities and bandwidth, which maintains its popularity as a device interconnect.

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Essential topics covered include:

- PCI Express Origins
- Configuration Space and Access Methods
- Enumeration Process
- Packet Types and Fields
- Transaction Ordering
- Traffic Classes, Virtual Channels and Arbitration (QoS)
- Flow Control
- ACK/NAK Protocol
- Logical PHY (8b/10b, 128b/130b, Scrambling)
- Electrical PHY
- Link Training and Initialization
- Interrupt Delivery (Legacy, MSI, MSI-X)
- Error Detection and Reporting

Power Management (for both software and hardware)
2.0 and 2.1 Features (such as 5.0GT/s, TLP Hints, and Multi-Casting)
3.0 Features (such as 8.0GT/s, and a new encoding scheme)
Considerations for High Speed Signaling (such as Equalization)

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Donald Lewis:

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