

## PCI Express 3.x and 4.0 Update

### Training

#### Let MindShare Bring PCI Express To Life For You

The PCI Express (PCIe) architecture is a high-performance I/O bus used to interconnect peripheral devices in computing and communication platforms. PCI Express has been designed into consumer and high-end PCs, embedded computing, and communication markets and has established itself as the bus of choice for on-board I/O connections. This architecture is governed and defined by the PCISIG (Peripheral Component Interconnect Special Interest Group).

This MindShare course assumes knowledge of PCIe up to 2.1. This course goes over the higher speeds (8.0GT/s and 16.0GT/s) offered at Gen3 and Gen4 along with a short overview of the additional features / capabilities introduced in the 3.x and 4.0 specs.

**Course Length:** 1 day

#### Course Outline:

- Overview of PCIe Generations
- Physical Layer Logic (8.0GT/s and 16.0GT/s)
  - 128b/130b Encoding/Decoding
  - Ordered-Set Blocks and Data Blocks
  - Data Streams and Packet Framing
- Physical Layer Electrical (all speeds)
  - Differences Between Speeds
  - 8.0GT/s and 16.0GT/s Equalization
  - 16.0GT/s Lane Margining
- Link Initialization and Training (LTSSM)
  - Short overview of Detect, Polling, Configuration, L0 States
  - Recovery (Retraining) State
    - Link Speed Change
    - 8.0GT/s Equalization Training
    - 16.0GT/s Equalization Training
- Overview of Features Introduced with PCIe 3.x:
  - L1 Sub-States (L1.0, L1.1 and L1.2)
  - Separate Refclk Independent SSC (SRIS)
  - Downstream Port Containment (DPC) and Enhanced DPC (eDPC)
  - Lightweight Notification (can be used for lightweight cache coherency)
  - Process Address Space ID (PASID)
  - Precision Time Measurement (PTM)
  - Device Readiness Status (DRS) and Function Readiness Status (FRS)
- Overview of Features Introduced with PCIe 4.0
  - Support for Retimers
  - Flattening Portal Bridge (FPB)
  - Enhanced Allocation
  - Hierarchy ID Reporting
  - Designated Vendor-Specific Extended Capability (DVSEC)

#### Required Prerequisites:

Deep understanding of PCIe 1.x and 2.x.

#### Course Material:

- 1) Downloadable PDF version of the presentation slides
- 2) Optional: [Comprehensive PCI Express 3.1 eLearning course](#)