

Comprehensive Embedded USB 2.0

Training

Let MindShare Bring “USB 2.0” to Life for You

The Universal Serial Bus (USB) provides for an easy connection of external peripheral devices to PCs. USB devices currently available include input devices (e.g., keyboards and mice), a wide variety of mass storage devices, and even video cameras. The original versions of USB (1.0 and 1.1) defined transmission rates of 1.5 Mb/s (Low Speed) and 12Mb/s (Full Speed). The latest version of the USB specification (version 2.0) provides major improvements in performance (60Mb/s transmission rates) as well as the ability to support more devices simultaneously. USB 2.0 also provides backward compatibility to 1.0 and 1.1 USB devices.

The host PC originates all communication with the peripheral devices on the USB bus and consequently USB does not support direct peer-to-peer transfers. A separate specification called USB On-the-Go was introduced to permit point-to-point communication between USB devices, thereby eliminating the need for a host system. For backward compatibility, On-the-Go devices can also operate normally in a host-based USB environment.

You Will Learn:

- How USB host software generates and schedules USB traffic
- How to verify proper USB packet protocol for all USB transfer types
- To recognize compliant HS signaling when viewing a scope capture
- Techniques for validating the USB protocols
- To evaluate and explain the activity captured by a protocol analyzer when a High-Speed device is hot plugged into both full-speed and high-speed ports
- The requirements for implementing an endpoint device
- How to implement HID and Mass Storage class devices
- The operation of both full-speed and high-speed USB hubs

Course Length: 3 or 4 days (depending on content)

Who Should Attend?

This in-depth course is designed with the hardware or software engineer in mind. The course contains practical examples of USB transactions and error conditions. It describes all the rules required for a host and device to be specification compliant.

Course Outline:

- History and Background
- The USB Hardware and Software Model
- USB Topology and Hardware Elements
- Transfers, Transactions & Scheduling
- Error Detection and Recovery
- USB Power Conservation
- HS Hub Operation & Split Transactions
- USB Configuration Overview
- Device Configuration
- Hub Configuration
- Standard Device Requests
- Hub Requests
- Overview of Device Classes
- Device Class Requests

Optional Topics:

- Universal Host Controller Interface (UHCI)
- Open Host Controller Interface (OHCI)
- Enhanced Host Controller Interface (EHCI)
- Device Class Implementations
- USB On-the-Go (OTG)
- Physical Layer Implementations (UTMI, UTMI+, ULPI)
- Details of High-Speed Hub Operation

Recommended Prerequisites:

A fundamental understanding of PC Architecture is recommended.

Course Material:

MindShare's *USB System Architecture* Textbook (2nd Edition)

Author: Don Anderson

Publisher: Addison Wesley

Available through the MindShare Store and major bookstore outlets.

Students will be provided with an electronic version of the slides used in class.





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- ☞ Serial Attached SCSI (SAS)
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- ☞ High-Speed Design
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Comprehensive eLearning Modules

eLearning Module Training

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- **Intro to Virtualization Technology**
- **Intro to IO Virtualization**
- **Intro to PCI Express 2.0 Updates**
- **PCI Express 2.0**
- **USB 2.0**
- **AMD Opteron Processor Architecture**
- **Virtualization Technology**
- **...and more**

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