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Universal Flash Storage (UFS) Architecture Training

Let MindShare bring "Universal Flash Storage (UFS) Architecture" to life for you

MindShare's UFS course starts with an overview to provide the big-picture context, and then drills down into the details of the layered architecture. UFS defines a storage interface optimized for the mobile environment that combines aggressive power management with high performance and finds application in mobile phones, tablets, and other applications that need mass storage. To facilitate migration and backward compatibility, the command set includes a simplified set of SCSI commands. This course provides a thorough understanding of the hardware and an overview of the software protocols.

You Will Learn:

- Design goals for the UFS interface
- Definition of terms
- How the Host-Controller model works
- Definition of registers
- Command set details
- An overview of the UniPro interface
- M-PHY details

Course Length: 3 days

Who Should Attend?

This course emphasizes hardware, but is suitable for both hardware and software engineers because the configuration registers used to control the hardware are covered in detail. The course is ideal for RTL, chip-, system- or system board-level design engineers who need a broad understanding of UFS. The course also contains practical examples of transactions on the interface and is suitable for chip-level and board-level validation engineers.

Course Outline:

UFS Device Interface

- Motivation, overview, comparison with eMMC
- Layered Architecture
    1. UFS Command Set layer (UCS) – protocol
        - Task Manager
        - Device Manager
    2. UFS Transport Protocol layer (UTP) – protocol translation
    3. UFS InterConnect layer (UIC) – UniPro and M-PHY
- Service Access Points (SAP) between layers
- Supported speeds, topology, devices
- Signaling: serial lanes, RefClk, Reset

UFS Host

- Host-Controller Interface (UFS-HCI) motivation and overview
- Command and response structure
- Register structure
- Data structures

Command Set

- Overview of SCSI Architecture Model (SAM-5) – client/server model
- Overview of the reduced set of SCSI commands used:
    - SCSI Primary Commands (SPC-4)
    - SCSI Block Commands (SBC-3)

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UniPro Interface

- Motivation and Overview
- Simplified UFS implementation
- Terminology
- Signaling interface from application to UniPro
- UniPro layered architecture and interactions between them
  - Transport
  - Network
  - Data Link
  - Phy Adapter
- Configuring
- Initialization

M-PHY 3.0 Logical and Electrical

- Module State Machines
- M-TX, M-RX Characteristics
- Link Initialization
- Dynamic Bandwidth changes: power management
- Electrical characteristics
- Differential signaling

Course Material:

Downloadable PDF of the presentation slides.

Recommended Prerequisites:

A basic understanding of serial bus architectures such as PCIe is highly recommended.