

ARM Virtualization

Training

Let MindShare Bring “ARM Virtualization” to Life for You

Virtualization support implemented in hardware (at the processor and at the SoC level) is a relatively new feature for the ARM architecture. The first complete processor virtualization implementation was introduced with the Cortex-A15.

This course explains what virtualization is, and how it is implemented in an ARM platform such as a Micro-server or mobile architecture.

You Will Learn:

- What virtualization is, and the use cases in the ARM environment.
- The theory of virtualization dating back to the IBM mainframes of the 1960s and 1970s, and how that mainframe technology is relevant to the phone, tablet, and micro-server today.
- The ARM processor, memory and interrupt controller enhancements to support virtualization.
- ARM platform enhancements to support virtualization of I/O devices that are passed through to the guest, including PCIe devices.
- The major sources of overhead added to the system with virtualization, and some ways in which they may be alleviated.
- Other potential uses for this virtualization hardware.

Course Length: 3 Days

Course Outline:

- Introduction to virtualization technology.
 - Brief overview of the ARM processor and platform architecture.
 - What is virtualization?
 - The usage scenarios for virtualization.
 - Virtualization theory – classical virtualization – trap and emulate.
 - Paravirtualization techniques.
- Virtualization implemented totally in software.
 - Interrupt controller support added to support software virtualization.
- ARM processor virtualization support.
 - Processor mode (Hyp) mode added in 32-bit ARM to implement hardware virtualization of the processor core.
 - The intersection of virtualization support and security support (TrustZone).
 - ARM 64-bit processor virtualization implementation – Exception Levels 2 and 3.
- Interrupts and Virtualization.
 - Interrupt delivery, and the role of the hypervisor.
 - vIRQ and vFIQ support in the interrupt controller.
- Memory management.
 - Paravirtualization techniques.
 - Brief introduction to paging.
 - Hardware support for paging guest operating systems.
 - Significance of guest physical (intermediate physical address space), especially with regard to I/O.
 - TLB management and TLB features to support virtualization.
- IO Virtualization.
 - Paravirtualization techniques, and the benefits of paravirtualization.
 - Trap and emulate.
 - Virtualization of the network, as an example of I/O.
 - Hardware support for device pass-thru to guests.



1-800-633-1440

www.mindshare.com

training@mindshare.com

Recommended Prerequisites:

A background in ARM architecture will assist the students in understanding the material. We can not understand how to virtualize a particular function unless we first understand that function! Each section will include a brief review of the appropriate ARM architecture to help fill in any holes in the students' knowledge, but this class is not intended to be a complete ARM architecture class.

Course Materials:

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



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