WNDRVR

VXWORKS 7 POWERPC CERT EDITION ESSENTIALS

COURSE DESCRIPTION

The Wind River® VxWorks® 7 PowerPC Cert Edition Essentials course provides engineers with a fast, cost-effective way to acquire the skills necessary to develop safety-critical applications. The course covers VxWorks 7 PowerPC Cert Edition, as well as the Wind River Workbench 4 development suite. Typical use cases in application development and debugging are explored and a deployment workflow for a certification objective is indicated.

After this course, participants will be able to perform the following:

- Understand VxWorks 7 PowerPC Cert Edition features and the DO-178C certification standard challenges
- Accelerate the development and configuration of DO-178Ccompliant safety-critical systems using Workbench 4
- Develop, debug, build, and test safety-critical applications with the VxWorks 7 Cert Edition real-time operating system (RTOS)

PRODUCTS SUPPORTED

- Wind River® VxWorks 7 PowerPC Cert Edition
- Wind River® Workbench 4
- Wind River® Simics 6 (as simulated targets for labs)

COURSE FORMAT

- This four-day expert-led course consists of lectures and lab sessions.
- Attendees use Wind River VxWorks 7 PowerPC Cert Edition, Wind River Workbench 4, and Wind River Simics 6 to gain experience with the topics presented.
- Participants examine and exercise simulated target systems in hands-on labs.
- Participants receive individual guidance from an expert engineer who has extensive experience with Wind River technologies.

AUDIENCE

- Application developers creating DO-178C standard-based safetycritical applications
- Engineers who need to develop applications using the features of the VxWorks 7 PowerPC Cert Edition RTOS

PREREQUISITE SKILLS

Course title:	VxWorks 7 PowerPC Cert Edition Essentials
Duration:	Four days
Format:	Instructor-led lectures and hands-on lab sessions; instructor-led Live Remote delivery available
Content:	Day 1: Getting Started with VxWorks 7 PowerPC Cert Edition; VxWorks Cert Targets and Connections; Managing VxWorks Cert Projects in Workbench; VxWorks Cert Kernel Shell
	Day 2: Debugging VxWorks Cert in Workbench; VxWorks Cert Real-Time Multitasking; VxWorks Cert Events; VxWorks Cert Semaphores
	Day 3: VxWorks Cert Inter-task Communication; VxWorks Cert Real- Time Processes; Introduction to VxWorks Symmetric Multiprocessing; VxWorks Cert RTP Access Control; VxWorks Cert Memory
	Day 4: VxWorks Cert Exceptions, Interrupts, and Timers; VxWorks Cert Error Detection and Reporting; System Viewer in VxWorks Cert; Analysis Tools in VxWorks Cert; VxWorks 7 Certification
One year of C programming Design understanding of an article system.	

- Basic understanding of operating systems and debugging techniques
- User-level familiarity with the host operating system on which VxWorks 7 PowerPC Cert Edition will be installed
- Basic understanding of DO-178B/C concepts

PREREQUISITE COURSES

· Real-Time Programming for Embedded Systems

RELATED COURSES

- · VxWorks 7 Board Support Packages and Device Drivers
- · VxWorks 653 3.x Multi-core Edition Essentials
- Wind River Helix Virtualization Platform Essentials for Aerospace and Defense

SYLLABUS

Day 1

GETTING STARTED WITH VXWORKS 7 POWERPC CERT EDITION

- Product overview
- Workbench 4 features
- VxWorks 7 features
- VxWorks 7 PowerPC Cert Edition considerations

VXWORKS CERT TARGETS AND CONNECTIONS

- Hardware target configuration
- Booting the hardware target
- · Workbench tools architecture
- Configuring and connecting the TCF server
- VxWorks Simulator—a high-level simulator
- Simics—a true hardware simulation
- LAB: Getting Started with VxWorks 7 PowerPC Cert Edition

MANAGING VXWORKS CERT PROJECTS IN WORK-BENCH

- Introduction to projects and workspaces
- VxWorks 7 installation directory structure
- · VxWorks 7 layers and package management
- · The wrtool utility
- · VxWorks source build projects
- · VxWorks image projects
- · Configuring the kernel
- ROMFS
- · Configuring application projects
- Importing and exporting
- · Building projects
- LAB: Managing VxWorks Cert Projects

VXWORKS CERT KERNEL SHELL

· Introduction to the kernel shell

- Kernel shell configuration
- · Kernel shell commands and help
- · Kernel shell usage
- Command-line history and editing
- · Object module loader
- LAB: Using the VxWorks Cert Kernel Shell with a Non-Cert Configuration

Day 2

DEBUGGING VXWORKS CERT IN WORKBENCH

- · Debugger overview
- · Application mode and stop mode debugger
- Setting breakpoints
- Downloading code
- · Attaching to running tasks
- Attaching to a system
- LAB: Debugging VxWorks 7 Cert with Workbench and a Non-Cert Configuration
- LAB: Debugging VxWorks 7 Cert in Stop Mode with a Non-Cert Configuration

VXWORKS CERT REAL-TIME MULTITASKING

- · Introduction to real-time requirements
- Task states in VxWorks
- Context switching
- · Spawning new tasks
- Task control routines
- Task information
- · Alternative POSIX support
- System tasks
- LAB: Working with VxWorks Cert Tasks

VXWORKS CERT EVENTS

- · VxWorks Cert events overview
- Task event register
- Event handling in VxWorks
- · Receiving events
- Sending events
- · Other eventLib routines
- Usage caveats
- · LAB: Working with VxWorks Cert Events

VXWORKS CERT SEMAPHORES

- · Overview of semaphore types
- Synchronization issues

- Mutex semaphores
- · Deletion and inversion safe mutex semaphores
- · Other preemption locks for tasks and ISRs
- LAB: Using VxWorks Cert Semaphores

Day 3

VXWORKS CERT INTER-TASK COMMUNICATION

- · Overview of communication methods
- · Shared memory and data structures
- Message queues
- · Creating, sending, and receiving messages
- Message queue events
- Pipes in non-Cert VxWorks
- LAB: Communicating between VxWorks Cert Tasks

VXWORKS CERT REAL-TIME PROCESSES

- · Overview of the RTP model
- Use of MMU
- Memory allocation and tasks
- VxWorks component support for RTPs
- RTP execution and termination
- Debugging RTPs in a non-Cert configuration
- Public and private objects
- · Design considerations

INTRODUCTION TO VXWORKS CERT SYMMETRIC MULTIPROCESSING

- VxWorks Cert SMP configuration
- VxWorks Cert SMP programming
- VxWorks Cert SMP scheduler

VXWORKS CERT RTP ACCESS CONTROL

- Overview
- RTP time partition scheduling
- · Access control for public objects, directories, and files
- · Access control for memory resources
- · Access control for system calls
- LAB: Building an RTP Access Control System

VXWORKS CERT MEMORY

- Introduction
- Physical memory layout
- · Virtual memory layout
- Heap memory allocation
- · Virtual memory allocation

- Examining memory with a non-Cert kernel shell
- LAB: Managing VxWorks Cert Memory

Day 4

VXWORKS CERT EXCEPTIONS, INTERRUPTS, AND TIMERS

- Exception handling overview
- · Interrupt service routine basics
- · Interrupt handling example
- ISR guidelines
- · Timing and the system clock
- Watchdog timers
- LAB: Using VxWorks Cert Watchdog Timers

VXWORKS CERT ERROR DETECTION AND REPORT-ING

- ED&R overview
- · Error reporting capabilities in non-Cert VxWorks
- · Error reporting framework in non-Cert VxWorks
- · Handling fatal errors
- · Persistent memory manager in non-Cert VxWorks
- Configuring ED&R in the non-Cert kernel
- Error records and logs in non-Cert VxWorks
- LAB: Using VxWorks Cert Error Detection and Reporting

SYSTEM VIEWER IN VXWORKS CERT

- System Viewer overview
- · Configuring System Viewer with a non-Cert VxWorks
- · Collecting and displaying event data
- User-defined events
- Additional analysis views
- LAB: Using System Viewer with a Non-Cert Configuration

ANALYSIS TOOLS IN VXWORKS CERT

- Overview
- System Browser in a non-Cert VxWorks
- CPU Profiler in a non-Cert VxWorks
- LAB: Using VxWorks Analysis Tools with a Non-Cert Configuration

VXWORKS 7 CERTIFICATION

- Introduction to DO-178
- · Background and definitions
- · DO-178 and software safety

- · Binary and counting semaphores
- · VxWorks Cert events and semaphores
- Mutual exclusion issues
- · Software verification
- VxWorks 7 PowerPC Cert Edition considerations
- LAB: Deploying a VxWorks Cert System

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