



EDUCATION SERVICES

# VXWORKS 6.9 AND WORKBENCH ESSENTIALS

## COURSE DESCRIPTION

The VxWorks® 6.9 and Workbench Essentials training course provides engineers with a fast, cost-effective way to acquire the skills necessary to develop real-time applications with VxWorks and Wind River® Workbench.

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

- Design and develop real-time applications in kernel and user modes
- Debug, build, and test real-time applications in a target host development environment with Workbench and VxWorks

## PRODUCTS SUPPORTED

- VxWorks 6.9 and later
- Wind River Workbench 3.3
- Earlier product releases (topics may vary)

## COURSE FORMAT

- This four-day expert-led course consists of lectures and lab sessions.
- Attendees use VxWorks 6.9 and Wind River Workbench 3.3 to gain experience with the topics presented.
- Participants examine and exercise simulated network topologies in hands-on labs.
- Participants receive individual guidance from an expert engineer who has extensive experience with Wind River technologies.

## AUDIENCE

- Anyone who will receive Workbench and VxWorks 6.9 within 60 days
- Developers who work with Workbench and VxWorks
- New project members on teams already using Wind River products
- Senior engineers who want to evaluate VxWorks technology

Course title:	<b>VxWorks 6.9 and Workbench Essentials</b>
Duration:	Four days
Format:	Instructor-led lectures and hands-on lab sessions; instructor-led Live Remote delivery available
Content:	<p><b>Day 1:</b> Getting Started; VxWorks Targets and Connections; Managing Projects in Wind River Workbench; VxWorks Shells</p> <p><b>Day 2:</b> Debugging in Wind River Workbench; Real-Time Multitasking; VxWorks Events</p> <p><b>Day 3:</b> Semaphores; Inter-task Communication; Memory; Real-Time Processes (RTPs)</p> <p><b>Day 4:</b> Exceptions, Interrupts, and Timers; Error Detection and Reporting; System Viewer</p>

## PREREQUISITE SKILLS

- One year of C programming
- Basic understanding of operating systems and debugging techniques

## PREREQUISITE COURSES

- Real-Time Programming for Embedded Systems

## RELATED COURSES

- Workbench On-Chip Debugging for VxWorks and Linux
- VxWorks 6.x Board Support Package
- VxWorks 6.x Device Drivers
- Multi-core Technologies and Designing for Concurrency
- VxWorks Build and Configuration Use Cases
- VxWorks Intermediate Application Development Use Cases
- VxWorks Application Debugging Use Cases
- Qt Graphic Solutions for VxWorks

## SYLLABUS

### Day 1

#### GETTING STARTED

- Product overview
- Workbench 3.x features
- VxWorks 6.x features

#### VXWORKS TARGETS AND CONNECTIONS

- Hardware target configuration
- Booting the hardware target
- Workbench tools architecture
- Configuring and connecting the target server
- Wind River VxWorks Simulator – a high-level simulator
- Wind River Simics – a true hardware simulation
- **LAB: Getting started (hardware, Simics, or VxWorks Simulator target)**

#### MANAGING PROJECTS IN WIND RIVER WORKBENCH

- Introduction to projects and workspaces
- VxWorks image projects
- Kernel configuration
- ROMFS
- Configuring application projects
- Import and export
- Building projects
- **LAB: Project management**

#### VXWORKS SHELLS

- Introduction to VxWorks shells
- Host shell commands and help
- Host shell usage
- Command-line history and editing
- Host shell configuration
- Shell interpreters
- Spawning VxWorks tasks and I/O
- Kernel shell comparison
- **LAB: Host shell**

### Day 2

#### DEBUGGING IN WIND RIVER WORKBENCH

- Debugger overview
- Setting breakpoints

- Task mode vs. system mode debugging
- Downloading code
- Saving debug sessions
- Attaching to running tasks
- **LAB: Debugger**

#### REAL-TIME MULTITASKING

- Introduction to real-time requirements
- Task states in VxWorks
- Context switching
- Spawning new tasks
- Task control routines
- Alternative POSIX support
- System tasks
- **LAB: Multitasking**

#### VXWORKS EVENTS

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

### Day 3

#### SEMAPHORES

- Overview of semaphore types
- Synchronization issues
- Binary and counting semaphores
- Events and semaphores
- Mutual exclusion issues
- Mutex semaphores
- Deletion and inversion safe mutex semaphores
- Other preemption locks for tasks and ISRs
- **LAB: Semaphores**

#### INTER-TASK COMMUNICATION

- Overview of communication methods
- Shared memory and data structures
- Message queues
- Creating, sending, and receiving messages

- Message queue events
- Pipes in VxWorks
- **LAB: Inter-task communication**

## MEMORY

- Memory maps with and without processes
- Memory pools – kernel heap and WDB
- Memory allocation
- Additional memory management routines
- Partition manager
- **LAB: Memory**

## REAL-TIME PROCESSES (RTPs)

- Overview of the RTP model
- Use of MMU
- Memory allocation and tasks
- RTP terminology
- VxWorks component support for RTPs
- RTP execution and life cycle
- Debugging RTPs
- Shared library usage
- Public and private objects
- Design considerations
- **LAB: Real-time processes**

## Day 4

## EXCEPTIONS, INTERRUPTS, AND TIMERS

- Exception handling and signals
- Installing signals to handle exceptions
- Interrupt service routine basics
- Interrupt handling example
- ISR guidelines
- Timing and the system clock
- Watchdog timers
- Polling
- The auxiliary clock
- **LAB: Exceptions, interrupts, and timers**

## ERROR DETECTION AND REPORTING

- Error reporting features
- Error reporting framework

- Handling fatal errors
- Configuring ED&R
- Persistent memory manager
- BSP support
- Kernel configuration
- Error records
- **LAB: Error detection and reporting**

## SYSTEM VIEWER

- System Viewer architecture overview
- Configuring System Viewer
- VxWorks component support
- Logging level selection
- Upload options
- Buffer management
- Searching for events in the log
- Triggering interface
- User-defined events
- Additional analysis views
- **LAB: System Viewer**

## OPTIONAL MODULES (AVAILABLE FOR TAILORED COURSES)

- VxWorks source builds
- VxWorks dprintf
- VxWorks overlapped memory
- VxWorks message channels
- 64-bit VxWorks
- VxWorks TIPC basics
- VxWorks kprintf
- VxWorks core dumps
- Run-time analysis tools
- Workbench source analysis
- VxWorks 5.x to 6.x migration

## GLOBAL REACH OF WIND RIVER EDUCATION SERVICES

With more than 30 years of device software experience, Wind River provides education services in every region of the world. Our private classes can be tailored to your needs by adding or removing topics from multiple courses. If you have more specific project challenges, Wind River Mentoring provides coaching by experienced engineers to help you integrate Wind River



solutions into your environment. And when you're too busy to attend a whole class, our On-Demand Learning options provide around-the-clock access to advanced and specialized topics. All of our education services are led by expert engineers who are closely connected to the Wind River technical community for access to specific expertise.

## CONTACT US

For more information about Wind River Education Services, visit [www.windriver.com/education/](http://www.windriver.com/education/).

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