



# VxWorks 7 and Workbench Essentials

## COURSE DESCRIPTION

The VxWorks® 7 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 7 and later
- Wind River Workbench 4
- Earlier product releases (topics may vary)

## COURSE FORMAT

- This four-day expert-led course consists of lectures and lab sessions.
- Attendees use VxWorks 7 and Wind River Workbench 4 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 4 and VxWorks 7 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 7 and Workbench Essentials</b>
Duration:	Four days
Format:	Instructor-led lectures and hands-on lab sessions; instructor-led Live Remote delivery available
Content:	<b>Day 1:</b> Getting Started; VxWorks Targets and Connections; Managing Projects in Wind River Workbench; VxWorks Kernel Shell <b>Day 2:</b> Debugging in Wind River Workbench; Real-Time Multitasking; VxWorks Events <b>Day 3:</b> Semaphores; Inter-task Communication; Real-Time Processes (RTPs); VxWorks Memory <b>Day 4:</b> Exceptions, Interrupts, and Timers; Error Detection and Reporting; System Viewer; Analysis Tools

## 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

- VxWorks 7 Board Support Package and Device Driver
- VxWorks 6.x to 7 Migration
- Multi-core Technologies and Designing for Concurrency

## SYLLABUS

### Day 1

#### GETTING STARTED WITH VXWORKS 7

- Product overview
- Workbench 4 features
- VxWorks 7 features

#### VXWORKS TARGETS AND CONNECTIONS

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

#### MANAGING PROJECTS IN WIND RIVER WORKBENCH

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

#### VXWORKS KERNEL SHELL

- Introduction to 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 kernel shell**

### Day 2

#### DEBUGGING IN WIND RIVER WORKBENCH

- Debugger overview
- Setting breakpoints
- Downloading code
- Saving debug sessions
- Attaching to running tasks
- **LAB: Debugging with Workbench**

#### 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 tasks**

#### VXWORKS EVENTS

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

### Day 3

#### SEMAPHORES

- Overview of semaphore types
- Synchronization issues
- Binary and counting semaphores
- VxWorks events and semaphores
- Mutual exclusion issues
- Mutex semaphores
- Deletion and inversion safe mutex semaphores
- Other preemption locks for tasks and ISRs
- **LAB: Using 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: Communicating between VxWorks tasks**

## REAL-TIME PROCESSES

- Overview of the RTP models
- Use of MMU
- Memory allocation and tasks
- VxWorks component support for RTPs
- RTP execution and termination
- Debugging RTPs
- Shared library usage
- Shared data usage
- Public and private objects
- Design considerations
- **LAB: Working with real-time processes**

## VXWORKS MEMORY

- Introduction
- Physical memory layout
- Virtual memory layout
- Heap memory allocation
- Virtual memory allocation
- Examining memory
- **LAB: Managing VxWorks memory**

## 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: Using VxWorks exceptions, interrupts, and timers**

## ERROR DETECTION AND REPORTING

- Error reporting features
- Error reporting capabilities
- Error reporting framework
- Persistent memory manager
- Configuring ED&R in the kernel
- Legacy BSP support
- Error records and log
- Extending ED&R recording
- **LAB: Using VxWorks error detection and reporting**

## SYSTEM VIEWER

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

## ANALYSIS TOOLS

- Overview
- CPU profiler
- Memory analyzer
- System browser
- **LAB: Using VxWorks analysis tools**

## OPTIONAL MODULES (AVAILABLE FOR TAILORED COURSES)

- 64-bit VxWorks
- VxWorks dprintf
- VxWorks message channels
- VxWorks TIPC basics
- VxWorks kprintf
- Workbench source analysis

## 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/).

### Wind River World Headquarters

500 Wind River Way  
Alameda, CA 94501  
USA  
Toll-free: 800-545-9463  
Tel.: 510-748-4100  
Fax: 510-749-2454

[training@windriver.com](mailto:training@windriver.com)

### Wind River EMEA

Steinheilstrasse 10  
85737 Ismaning  
Germany  
Tel.: +49 89 962 445 0  
Fax: +49 89 962 445 999

[emea-training@windriver.com](mailto:emea-training@windriver.com)

