



WIND RIVER LINUX USER SPACE PROGRAMMING

COURSE DESCRIPTION

The Wind River® Linux User Space Programming course gives engineers the skills they need to develop complex applications for Linux-based devices, with an emphasis on the Wind River Linux and Wind River Workbench products.

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

- Write applications that take advantage of advanced Linux features
- Design, develop, build, and run applications in a target-host development environment
- Effectively debug multi-threaded and multi-process applications
- Configure, build, and manage Wind River Linux application projects
- Prepare applications for integration with Wind River Linux-based devices

PRODUCTS SUPPORTED

- Wind River Linux 8
- Wind River Workbench 4
- The following target is available:
 - QEMU simulated target (Intel® x86-64)

COURSE FORMAT

- This four-day, expert-led course consists of lectures and lab sessions.
- Attendees use Wind River Linux 8 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

- Developers who want to learn more about writing applications targeting Linux-based devices
- Customers who have recently purchased or are considering purchasing Wind River Linux

Course title:	Wind River Linux User Space Programming
Duration:	Four days
Format:	Instructor-led lectures and hands-on lab sessions; instructor-led Live Remote delivery available
Content:	Day 1: Introduction to Embedded Linux; Introduction to Wind River Linux; Wind River Workbench Day 2: Target Management; Application Development; Linux Processes and Threads Day 3: Memory Management; File Input/Output Day 4: Inter-process Communication; Synchronization; Libraries

PREREQUISITE SKILLS

- Basic understanding of embedded operating systems and debugging techniques
- Functional knowledge of a Linux command-line environment
- Basic understanding of makefiles and software build tools
- One year of C or C++ programming experience on Linux/UNIX

PREREQUISITE COURSES

- None

RELATED COURSES

- Wind River Linux and Workbench Essentials
- Linux Device Drivers

SYLLABUS

Day 1

INTRODUCTION TO EMBEDDED LINUX

- Overview of Linux
- Linux boot process
- Linux user space
- Cross development
- Open source software licenses

INTRODUCTION TO WIND RIVER LINUX

- Overview of Wind River Linux
- The Yocto Project
- Wind River Linux platform
- Software development models
- **LAB: Getting Started with the Wind River Linux Lab Environment**

WIND RIVER WORKBENCH

- Overview of Wind River Workbench
- Projects and resources
- Workspace
- Perspectives
- Working with projects
- Source control management
- **LAB: Getting Started with Workbench**
- **LAB: Working with Managed Build Projects**
- **LAB: Working with Makefile Projects**

Day 2

TARGET MANAGEMENT

- Hardware targets
- Cross development workflow
- Deploying to hardware targets
- Simulating a target with QEMU
- **LAB: Managing Simulated Targets in Workbench**
- **LAB: Managing Simulated Targets from the Command Line**

APPLICATION DEVELOPMENT

- Application development workflow
- Migrating applications in a build environment
- Application debugging
- **LAB: Building Applications from the Command Line**

- **LAB: Building Applications in Workbench**
- **LAB: Debugging Applications in Workbench**
- **LAB: Debugging a Program Crash in Workbench**
- **LAB: Using the Memory Analyzer**
- **LAB: Using the CPU Profiler**

LINUX PROCESSES AND THREADS

- Processes
- Process lifecycle
- Threads
- Thread lifecycle
- Scheduling
- **LAB: Multitasking in a Linux Application**
- **LAB: Managing a Scheduler**

Day 3

MEMORY MANAGEMENT

- How memory is managed
- Allocating and releasing memory
- Mapping anonymous memory
- Manipulating memory
- Common memory problems
- **LAB: Allocating Memory**
- **LAB: Sharing Memory**
- **LAB: Tuning and Debugging Memory Allocation**

FILE INPUT/OUTPUT

- Overview of files in Linux
- Basic I/O
- Buffered I/O
- Memory-mapped I/O
- Exchanging binary data
- **LAB: Reading and Writing Data**
- **LAB: Implementing Advanced File I/O**
- **LAB: Working with Directories**

Day 4

INTER-PROCESS COMMUNICATION

- Overview
- Files
- Pipes and FIFOs
- Message queues

- Shared memory
- Sockets
- Signals
- Other IPC methods
- **LAB: Communicating with Pipes**
- **LAB: Communicating with FIFOs**
- **LAB: Communicating with Message Queues**

SYNCHRONIZATION

- Overview of concurrency
- File locks
- Semaphores
- Mutexes
- Futex
- Condition variables
- Deadlock
- **LAB: Synchronizing Threads**

LIBRARIES

- Overview of libraries
- Static libraries
- Shared libraries
- Dynamically loaded libraries
- Common libraries
- Library tools
- **LAB: Creating Libraries**
- **LAB: Working with Dynamically Loaded Libraries**

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.

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

Wind River EMEA

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

emea-training@windriver.com

