Wind River Education Services enables clients to unleash the power of Wind River tools by creating developers skilled in our technology. We provide the knowledge you need to meet your commitments and exceed your company's expectations. With Wind River Education Services, you will develop, run, and manage your application software faster, better, at lower cost, and more reliably.

Course Description
The VxWorks 6.x Symmetric Multiprocessing course presents several methodologies to optimize application performance by using parallel design techniques. Issues in migrating applications to parallel design are detailed. Specifics of creating and migrating to Wind River's VxWorks SMP applications are also addressed.

After taking this workshop, students will have the knowledge and skills to do the following:
- Understand multicore processor architecture
- Distinguish between multicore and multiprocess environments
- Use debug tools to analyze concurrency
- Understand VxWorks SMP system configuration
- Analyze code changes for migration to VxWorks SMP
- Implement parallel algorithms using VxWorks API
- Perform run-time analysis using the system API

Products Supported
Wind River VxWorks 6.7

Who Should Attend
- Application engineers
- System integrators and architects

Prerequisite Skills
- C programming
- Functional knowledge of UNIX
- Basic VxWorks API knowledge
- Real-time programming basics

Prerequisite Courses
- Multicore Technologies and Designing for Concurrency
- VxWorks 6.x and Workbench Fundamentals

Course Format
- Our two-day instructor-led courses consist of lectures and lab sessions.
- Students gain hands-on experience and receive personal guidance from expert Wind River instructors.
- Students examine details of the Wind River Workbench environment, focusing on the most commonly used areas.
- Specific questions are addressed.
- Lab sessions allow hands-on application of course concepts.

Global Reach of Wind River Education Services
- 4,000 students per year
- 400 classes delivered per year
- 36 instructors worldwide
- Access to 200 subject-matter experts
- 24 training centers worldwide
- 20+ years of device software experience

Private Courses
Private courses are conducted at your location and include the use of a preconfigured laboratory environment that may consist of a remote connection to a lab server through your browser or equipment that we bring to your facility. Private courses can be tailored to your specific needs by adding or removing topics from one or multiple courses. Visit education.windriver.com for registration and public course schedule information.
Rapid Integration and Mentoring Bundles

To complement training, Wind River Education Services offers Rapid Integration and Mentoring (RIM) bundles to help accelerate tools and technology integration in your custom environment. While the goal of training is to increase the skill set of a few engineers on your team, RIM bundles ensure successful adoption, customization, and integration into your existing environment of people, systems, and processes.

This is an onsite engagement where a subject-matter expert from Wind River analyzes your environment and helps formulate process adoption plans such as tools integration, technology deployment, and development workflow, taking into consideration best practices, trade-offs, and future maintenance costs. This consultant provides customization and mentoring and guidance to your entire team, as applied to your projects and development process. A wide variety of RIM bundles is available for all Wind River technologies to ensure maximum return on your investment.

Skills and Topics

- Understand Multicore Processor Architecture
  - Multicore vs. Multiprocessing
  - Other Multicore Configurations
  - SMP vs. AMP
  - SMP Basic Concepts
  - SMP Performance
- Perform Code Analysis
  - Parallel Design and Implementation
- Use Debug Tools to Analyze Concurrency
  - Multicontext Debugging
  - Live Lock Debugging
- Understanding VxWorks SMP System Configuration
- Analyzing Code Changes for Migration
  - Deprecated APIs
  - New SMP APIs
- Implementing Parallel Algorithms Using VxWorks API
  - Use of Spinlocks, Semaphores, and Interrupts
  - POSIX and VxWorks Comparisons
- Run-Time Analysis of System API
  - Performance Profiler
  - System Viewer
- SMP System Requirements
  - VxBus

VxWorks SMP Architecture

- SMP Architecture Overview
- Cache and Cache Coherence
- The Sequential Memory Model
- Mutual Exclusion
- Spinlocks and Deadlocks
- Memory Barrier
- Development Challenges

VxWorks SMP Configuration

- VxWorks SMP Configuration Overview
- Software and Hardware Requirements
- BSP
- VxWorks SMP Configuration Lab

Day 2

VxWorks SMP Programming

- Spinlocks
- Read and Write Semaphores
- CPU Affinity
- Interrupt CPU Affinity
- Atomic Memory Operations
- Memory Barriers
- CPU Information and Management
- UP Incompatibilities
- Data Synchronization Lab
- Implicit Synchronization Lab

Debugging and Analysis Tools

- Multicore Debugging Overview
- Breakpoints
- Multiple Context Debugging
- On-Chip Debugging Tools
- Run-Time Analysis Tools
- VxWorks Simulator (VxSim)
- WDB and Kernel Shell Debugging
- SMP Debugger Lab

Introduction to Software Parallelism

- SMP Limits
- Parallel Software Design
- Threading
- Implementing a Parallel Programming Model
- Examples

SMP Uniprocessor to SMP Migration

- Migration Guideline
- Three-Step Migration Plan
- SMP Optimization
- Pthreads
- SMP Performance Measurement

Syllabus

Day 1

Introduction to SMP

- Introduction to Multicore and Multiprocessing History
- Introduction to SMP Overview
- Other Multicore Configurations
- Terminology and Abbreviations