PROFESSIONAL SERVICES
MULTI-CORE PLATFORM SOLUTION ASSESSMENT

As a pioneer in the development of real-time operating systems, platforms, and tools for multi-core and embedded virtualized systems, Wind River® has helped many customers analyze the potential benefits of multi-core and virtualization, plan the migration of architectures to enable new product roadmaps and business models, and implement new solutions. This experience and expertise is the foundation of the Wind River Multi-core Services Practice. In addition to Multi-core Platform Architecture Studies, the practice also provides Multi-core Platform Implementation Services and Multi-core Platform Support and Maintenance Services.

The objective of a Multi-core Platform Architecture Study is to provide a technical plan for achieving system requirements while minimizing program risks as engineering teams migrate from single processor and single core systems to multi-core, multi-OS, multiprocessor, and embedded virtualized architectures.

PROMISE OF MULTI-CORE ARCHITECTURES
To address the market demands of increased functionality, smaller packaging, higher reliability, and lower operating costs, semiconductor providers have introduced many new multi-core processors and supporting chipsets. At the same time, real-time operating system (RTOS) providers have introduced embedded virtualization that provides developers with the tools and intellectual property needed to configure the new multi-core hardware.

Embedded virtualization and multi-core together enable the simultaneous running of multiple embedded operating systems on a single piece of hardware (single core or multi-core) and are having a profound effect on how engineers build the embedded devices of the future and the corresponding business models around them. The companies that leverage these new technologies most effectively are able to more competitively differentiate their products and services, manage costs, and compete.

BENEFITS OF MULTI-CORE ARCHITECTURES
- Consolidate multiprocessor systems into a single processor board.
- Maximize performance and resource utilization.
- Add new functionality to existing systems.
- Achieve new levels of safety and security.
MULTI-CORE DESIGN CONSIDERATIONS

Making the right choice when architecting multi-core and embedded virtualized architectures has become a critical business decision for many companies due to the overwhelming business benefits that may be realized, as well as the potential program risks. Successful initiatives start with careful consideration and evaluation of both processor and embedded virtualization technologies. Challenges related to development infrastructure and program management issues need to be addressed as well.

Technical Challenges

Primary technical architecture selections need to be made as early as possible in the development lifecycle to establish expectations for system performance, platform extensibility, legacy software reuse, bill-of-materials costs, safety, security, regulatory compliance, and many other critical requirements. Technical architecture selection decisions can also have a profound impact on development schedules and costs.

Many different configurations are possible on today’s hardware. The following are some of the most basic architectural questions that design teams need to consider when assessing architecture trade-offs:

- Is the system under development best developed on a single operating system, or should there be multiple operating system instances, either of the same type or different types (real-time and general purpose combined)?
- Which architecture is best for short-term and long-term needs? Single core (traditional or virtualized) or multi-core (SMP, unsupervised AMP, supervised AMP, virtualized, etc.)?
- Is there legacy code, systems, or third-party software that needs to be integrated?
- How will the hardware change over the next few years or product release cycles, and how will the software be isolated from this change or adapt?
• Which performance requirements can be traded for cost, safety, real-time determinism, resource isolation, power consumption, and security, and which cannot?
• Is scalability important? If so, what is the best approach?
• How do you balance separation, partitioning, reboot, safety, and security requirements?
• Are devices shared, virtualized, emulated, or directly assignable?
• How will the system interact with other entities?
• What is the appropriate virtualization technology based on the requirements? An embedded hypervisor, an open-source-based virtualization solution, a commercial solution?
• Will the solution be deployed in a cloud environment requiring features such as software defined networking (SDN), OpenStack, live migration, high availability, etc.? How will it be managed?

Each architecture choice carries with it additional interdependencies such as resource and memory usage, processor availability, hardware acceleration methods, operating system and executive support, middleware availability, stack completeness, acceleration engine effectiveness, legacy reuse options, IP lifecycle, and many others. It takes experience to understand the intricacies of the various configurations.

**Development Infrastructure Challenges**

New and advanced multi-core hardware and software architectures sometimes present new development infrastructure challenges as well as opportunities. New methods for system design, simulation, test, and debug are becoming available and may require investment in design infrastructure as well as engineer retraining. Tools and methods of the past may or may not be capable of handling the design, simulation, development, test, and validation needs of multi-core, multiprocessor, multi-OS, and virtualized systems. Assessment should be made to determine whether extension or modification efforts are required.

**Program Management Challenges**

New architectures, new tools and methods, new people skills, and so on. Sounds like a schedule and budget buster, doesn’t it? It doesn’t have to be. The best way to ensure program success is to have a sufficient plan from which to set proper expectations related to the realization of benefits, required investments, and risk mitigation options.

**ACTIVITIES AND DELIVERABLES**

With each engagement we tailor major activities and deliverables to fit your unique program needs. Whether it is a short workshop-style engagement or an in-depth study, Wind River Multi-core Platform Solution Assessment experts will collaboratively work with your design and program teams as needed to interpret system requirements, architect multi-core platform system options, and provide recommendations to meet business, technical, and program goals. The following are examples of typical major activities that can be included in a Multi-core Platform Architecture Study:
• Review of business and technical drivers, opportunities, and constraints
• Review of feasibility of architecture options to identify the most appropriate candidates (SMP, AMP, sAMP, multi-core, multiprocessor, multi-board, and virtualization options)
• Architectural trade-off analysis to determine a low-risk approach for a system solution that meets requirements
• Development of a prioritized roadmap that provides the following:
  – Recommendations on the most appropriate multi-core and virtualization techniques that address business and product needs
  – Migration strategy from existing architecture to a multi-core or virtualized architecture that achieves product roadmap goals while minimizing risks and costs
  – Scalability plans to define how the platform would scale up or scale across multiple product lines if needed
  – Recommendations on corresponding design department infrastructure needs, such as tools, processes, and training, to support advanced multi-core design, performance analysis, simulation, debug, and test activities
• Knowledge transfer and training

At the conclusion of the engagement, Wind River experts present the results of the study. They work through questions and clarifications as needed to transfer knowledge and help your team prepare for project execution.

Deliverables for a Solution Assessment are tailored to a customer’s needs and could include one or more documents with the following information:

• Consolidated high-level requirements
• Trade-off analysis matrix
• Preliminary architecture description and designs
• Recommendations with supporting documentation, rationale, and analysis
• Migration strategy
• Detailed design phase planning describing tasks, work breakdown structure, and a schedule
• Risk assessment identifying major risks and mitigation plans so that proactive activities can be undertaken to reduce program costs and schedule impact

OTHER MULTI-CORE SERVICES

Wind River also provides other multi-core-platform-related adoption services.

Multi-core Platform Implementation Services

Wind River extends the value of the Multi-core Platform Solution Assessment by offering implementation services to help our customers who may not have all of the skill or experience needed to accomplish their goals. Multi-core Platform Implementation Services include the following:

• Migration planning
• Proof of concept
• Simulation
• Detailed architecture design
• Custom platform development
• Hardware and third-party software integration
• Turnkey solutions
• Testing, debug, and optimization
• Qualification, validation, and certification
• Support services

Multi-core Platform Support and Maintenance Services
Wind River can provide support and maintenance of the customized multi-core platform. The Wind River certified customer support organization delivers ongoing support for projects from start to deployment, including maintenance and managing upgrades of various upstream sources. Long term support means Wind River is standing beside you throughout your entire obligation to your customers before and after start of production. The Wind River platform solutions model delivers consistent, worldwide customer support.

COMPLETE MULTI-CORE TRANSITION SOLUTION
• OS and executive run-times
• Industry and device-specific platforms
• Hypervisor and virtualization run-times
• Middleware
• Development and debug tools
• Simulation and test tools
• Architecture and planning services
• Implementation and optimization services
• Migration planning and execution
• IP management
• Education and training
• Support

WIND RIVER PROFESSIONAL SERVICES
Wind River Professional Services has a strong track record of guiding our customers through the complexities of embedded software design and implementation. Certified to CMMI Level 3 across all of our global development centers, our proven engagement methodology, timely delivery, and in-depth understanding of market and technology dynamics have made Professional Services a valuable implementation partner to our customers.

Professional Services welcomes the opportunity to discuss multi-core services to meet your specific needs. For further information, contact your local Wind River sales representative by visiting www.windriver.com/company/contact, calling 800-545-WIND (9463), or sending an email to inquiries@windriver.com.