



WORKLOAD CONSOLIDATION IN THE FACTORY FOR INDUSTRIAL CONTROL

Adding Control Management Capabilities, Data Analytics, Safety, and Security with Industry 4.0

INDUSTRIAL CHALLENGES

- Significantly reduce the cost and complexity of system management, maintenance, safety, and security at the factory edge
- Monitor and measure processes for immediate actions

WIND RIVER SOLUTIONS

- **VxWorks:** The world's leading RTOS with virtualization provided by a real-time, Type 1 hypervisor to enable workload consolidation
- **Wind River Linux:** Industry-leading open source operating system for connecting, securing, and running IIoT systems, networks, and devices
- **Wind River development tools:** Powerful tools to save developers time and increase quality for embedded systems

THE CHALLENGE

As global manufacturers face increasing competition, the need to optimize the efficiency, productivity, and quality levels within their discreet manufacturing facilities is becoming a matter of business survival. Existing factory infrastructure is aged and inefficient, often using multiple separate systems based on software platforms as old as the buildings they operate in.

How can a manufacturing company significantly reduce the cost and complexity of system management, maintenance, safety, and security? Additionally, how can factory personnel monitor and measure processes as they occur and take action immediately when intervention is required?

THE SOLUTION

The weight of these challenges is driving industrial companies to bring greater intelligence to the factory floor and field locations in order to gain a competitive advantage. With recent Industry 4.0 software innovations, industries are able to bring more edge-based industrial control solutions to the manufacturers of the world.

VxWorks® with virtualization technology can take multiple separate systems and enable a workload consolidation solution operating on a single compute platform to increase control management capabilities; to conduct data analytics for timely actions, including predictive maintenance; to run both safety-critical applications and non-safety applications; and to increase security functions that safeguard the system.

VxWorks

VxWorks is a real-time operating system used in more than 2 billion devices in industrial, medical, transportation, and defense solutions. It provides a small footprint and enables deterministic applications scaling from very small compute packages to complex manufacturing systems and avionics systems. It works on the major processor architectures ARM®, x86, and PowerPC. Using VxWorks hypervisor virtualization technology, it enables virtual machines (VMs) to run independent security, control, and other applications in independent operating system environments.

The VxWorks hypervisor is a real-time, embedded, Type 1 hypervisor. It can manage unmodified guest operating systems running in VMs in devices targeting a broad range of market segments, including medical, industrial, transportation, and defense. The VxWorks hypervisor can manage independent VMs running VxWorks, Wind River Linux, and other unmodified guest operating systems such as Windows and Android. With these capabilities, system developers can consolidate and reliably run multiple applications—such as control management, data analytics, safety-critical and non-safety-critical applications, and legacy applications—all on a single system. Additionally, the hypervisor can securely partition a VM running a safety-critical application to ensure that there is no interference or conflict from any other VM. This virtualization platform can be the foundation for a workload consolidation industrial solution at the edge.

Wind River Linux

Wind River Linux is the embedded operating system of choice for IIoT software developers who want a combination of open source flexibility, commercial grade reliability, and support to help minimize the total cost of ownership. Wind River Linux delivers vital components for the productization and commercialization of any IoT device. Within a VxWorks workload consolidation solution, a Wind River Linux VM can be established to run Linux applications, such as communications.

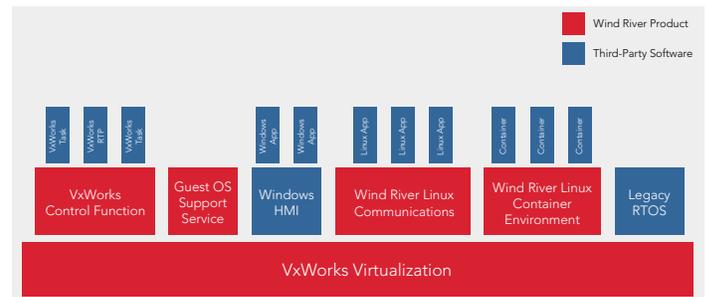
Wind River Development Tools

To create a workload consolidation solution for your specific manufacturing components and needs, Wind River provides powerful and time-saving development tools. Wind River Simics® is a simulation platform that can simulate any compute mode,

chip to system. It provides access, automation, and collaboration tools required for agile development practices. The Wind River Workbench suite of development tools allows the developer to configure the operating system, analyze and tune the software, and debug an entire system. Wind River Diab Compiler helps boost application performance; reduce memory footprint; and produce high-quality, standards-compliant object code for embedded systems.

WORKLOAD CONSOLIDATION WITH VXWORKS

Using VxWorks and its hypervisor together with Wind River Linux and Wind River development tools, a workload consolidation solution can be developed for a wide variety of industrial manufacturing operations. A typical configuration is shown below:



Components of the solution in Figure 1 are:

- Multi-core system (x86, PowerPC, ARM)
- VxWorks hypervisor
- VxWorks real-time operating system
- VMs running VxWorks and guest OSes
 - Machine 1: Isolated/partitioned VxWorks OS control management application
 - Machine 2: Guest OS support services
 - Machine 3: Guest Windows OS running human-machine interface (HMI)
 - Machine 4: Wind River Linux OS running communications
 - Machine 5: Wind River Linux OS running container environment
 - Machine 6: Legacy RTOS running applications

To learn more about VxWorks, virtualization, or Wind River Linux, visit www.windriver.com, or contact salesinquiry@windriver.com.

