WIND

DIGITAL TRANSFORMATION OF REFINERY OPERATIONS WITH 5G WIRELESS

Adding Intelligence Throughout Refinery Operations Powers Agility and Dependability, Reducing Costs and Boosting Revenue Streams

REFINERY OPERATIONS CHALLENGES

- Optimize the advantages of data transmission and collection offered by new 5G networking technologies
- Significantly reduce the cost and complexity of control automation systems, refinery system management, maintenance, safety, and security at the facility edge
- Reduce CAPEX as well as OPEX, and protect the value of critical refinery equipment

WIND RIVER SOLUTIONS

- VxWorks: The world's leading RTOS, enabling deterministic applications scaling from very small compute packages
- Wind River Linux: Industry-leading open source operating system for connecting, securing, and running IIoT systems, networks, and devices
- Wind River Helix Virtualization Platform: A real-time, embedded, Type 1 hypervisor that can manage unmodified guest operating systems running in virtual machines, consolidating workloads for facility control automation
- Wind River Cloud Platform: A productiongrade Kubernetes solution that makes 5G possible by solving the operational problem of deploying and managing distributed edge networks at scale

THE CHALLENGE

In the drive to lower refinery CAPEX and OPEX, the petroleum industry is poised to open up the digital-transformation value of wireless machine-to-machine communication using 5G networking, with its faster transmission speeds, lower latency, greater bandwidth, and enhanced security. The industry aims to drive refinery efficiencies and lower costs; access to more data, including actionable data, can produce the desired results. In the vast and complex system of systems that surround an oil refinery, every element—from a core IT component to an individual valve in a pipeline Christmas tree, far out of human view—is a potential producer and consumer of information. 5G networking, as an important element of digital transformation, is arising as the connectivity of choice for this new conception, bringing in data from the refinery's intelligent edge and putting that data wherever it is needed, in real time.

Much of the value 5G can bring will be realized through private networks that replace existing technologies and offer higher performance and security and standardization. However, in the capital-intensive oil and gas vertical, operational efficiencies are critical—and, equally important, risks to revenue streams cannot be tolerated. How can this data-driven segment make the transition successfully while reducing CAPEX and OPEX and protecting the value of critical capital equipment?

THE APPROACH

Building on proven foundations that have powered refineries and other safety-critical industrial facilities for decades, Wind River[®] solutions are enabling the digital transformation of the 5G refinery, paving the way for adoption that is as agile, efficient, and cost-effective as possible.



Figure 1. Sample value-added applications of 5G in refineries

5G Wireless Networking Reduces Refinery CAPEX and OPEX

Eliminating physical cabling from newly built refinery facilities (and from those being modernized) is a key enabler for digital transformation, providing dramatically improved connectivity and access to data. In addition to saving potentially hundreds of thousands of dollars by eliminating the cabling itself, supporting private 5G networking within a refinery complex increases flexibility and acts as a force for technology standardization, while delivering more intelligent data via faster data transmission and wider bandwidth.

Benefits of 5G networking in refineries include:

- Improved data-driven operations: By improving access to intelligent edge data from every part of the refinery, real-time insights based on data analytics and artificial intelligence systems within cloud platforms can drive decisions over all facets of operations.
- Standardized edge-to-cloud connectivity: As the single form of wireless connectivity for all refinery equipment, 5G simplifies the edge-to-cloud environment and enhances efficiency.
- Enriched operating data: Detecting real-time anomalies enables intelligent automation control systems at the refinery edge to respond rapidly and effectively to exceptions, preventing costly outages.

Predictive Maintenance Optimizes Value and Lifespan of Capital Equipment

Maximizing the value of capital equipment in a refinery is critical to operational efficiency and return on investment. With digitalization, optimizing maintenance intervals using insights based on analytics driven by sensor data avoids failures that lead to unscheduled outages, as well as wasteful, unnecessary service. Digitalization enabled by intelligent sensors at crucial refinery systems can provide real-time data via 5G feeds to a cloud platform to enhance predictive algorithms with continually refreshed, rich process and operational data, enabling:

- Protected return on capital investments: Optimizing maintenance based on the best information available helps protect revenue generation over the lifespan of equipment.
- Transition from reactive to proactive maintenance: Relative to following static schedules or responding to unanticipated failures, predictive maintenance drives productivity and efficiency.

• Optimized potential from the Internet of Things: Vast networks of sensors and other end points require dramatic improvements over existing limited connectivity, such as 4G or satellite.

Autonomous Inspections Enhance Visibility and Control for Pipelines and Facilities

Computer-vision cameras and other sensors, including those on artificial intelligence–enabled autonomous air, land, and sea vehicles, can monitor and inspect vast networks of pipelines, pumping stations, and other infrastructure, even in harsh, remote conditions. With the use of a public or private 5G network, the high throughput and low latency of 5G networks—plus their power efficiency, reliability, and security—make them ideally suited to more sophisticated data gathering than was previously possible.

- Enhanced inspection mechanisms: 5G provides greater support for advanced capabilities such as streaming video, computer vision, machine learning, and artificial intelligence.
- Data-driven real-time control: Information from massive, real-time data flows can feed intelligent real-time control automation that optimizes efficiency at the refinery edge.
- Better adherence to safety standards: More sophisticated insights into the state of physical infrastructure help avoid costly service interruptions and spills.

VxWorks

The <u>VxWorks</u>[®] real-time operating system (RTOS) is an outstanding platform for the deployment of deterministic applications with high-speed, low-latency 5G networks. Refineries use VxWorks to power next-generation capabilities in areas such as control automation, process control, predictive maintenance, and robotics. With deterministic operation, low latency, and minimal jitter, VxWorks is ideal for hard real-time applications. It provides safety and security based on advanced security features and certification to safety standards. And it is developercentric, offering broad support for modern development languages, frameworks, and infrastructures.

Wind River Linux

Wind River Linux is an open source embedded Linux that is hardened, optimized, and supported by Wind River. On a subscription basis, customers can rely on best-in-class support from Wind River experts to reduce operational and technology risk, helping protect stability, security, and profitability. Wind River Linux is also container ready, driving improved application flexibility and readiness for Docker or Kubernetes to enable applications for refinery systems. It provides reduced production and maintenance expense for lower total cost of ownership, as well as production-ready maintenance and support, drawing on personalized, ongoing Wind River expertise. And in an era of increased threat of cyberattack, it offers enhanced security for connected systems, including continuous threat monitoring and security updates.

Wind River Helix Virtualization Platform

Built on top of VxWorks, <u>Wind River Helix™ Virtualization Plat</u>form is built for real-time operating environments, with support for any combination of virtual machines (VMs) and containers. Applications in refineries can run directly in VMs or in containers within those VMs, and safety-critical applications can run in isolation alongside standard applications. The environment enhances agility through compatibility with Docker, Kubernetes, and other container-management platforms. With a goal of being simple, secure, and future proof, Helix Platform consolidates mixed-OS and mixed-criticality workloads. It is a proven, trusted environment, streamlining adoption of new software practices. And with options for highly dynamic or regulated applications, it provides a flexible infrastructure for development.

Wind River Cloud Platform

<u>Wind River Cloud Platform</u> is an open source, production-grade distributed Kubernetes solution that makes 5G possible by solving the operational problem of deploying and managing distributed edge networks at scale. Based on the OpenStack StarlingX project, Cloud Platform represents a compilation of best-in-class open source technology that delivers the features needed to effectively deploy and manage distributed networks. Cloud Platform has performance optimized per use case, making it an ideal solution for the energy sector. It offers high availability with zero downtime for applications. By design, this platform has fully integrated security.

THE RESULT

Early digital transformation benefits from 5G will accrue to refinery operators who implement private 5G networking to drive dramatically greater throughput, lower latency, and enhanced security. The Wind River software portfolio is fully optimized to streamline 5G adoption, reducing risk and augmenting success and profitability with real-time OS, next-generation security, enhanced virtualization based on both VMs and containers, and open source cloud platform capabilities. As they make their refinery infrastructures more capable and efficient, oil companies stand to save on both CAPEX and OPEX while enhancing revenue-generating activities.

To learn more about VxWorks, Wind River Linux, Helix Platform, or Cloud Platform, visit windriver.com or contact salesinquiry@windriver.com.



Wind River is a global leader in delivering software for the intelligent edge. Its comprehensive portfolio is supported by world-class professional services and support and a broad partner ecosystem. Wind River is accelerating digital transformation of critical infrastructure systems that demand the highest levels of safety, security, and reliability.

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