WIND™

5G BRINGS NEW OPPORTUNITIES TO OPERATORS

Leverage Embedded Experience from Wind River to Connect with New 5G Markets

5G INDUSTRY CHALLENGES

- Manage complex, distributed networks with large numbers of base stations
- Deliver high levels of performance: latency, capacity, and determinism
- Transition from 4G to 5G
- Maintain security throughout the lifecycle
- Minimize operational cost and total cost of ownership (TCO)

WIND RIVER SOLUTIONS

- **Wind River Cloud Platform:** Open source, production-grade distributed Kubernetes that simplifies the deployment and management of edge networks requiring ultra-low latency

- **Wind River Linux:** Industry-leading, open source operating system for connecting, securing, and running network infrastructure: systems, networks, and devices

EMERGING 5G OPPORTUNITIES

5G technology, bringing improved latency, capacity, and speed, is expected to enable new business models and use cases in a wide range of market segments. Clearly the most impacted market is telecom, which will be required to deploy large amounts of networking infrastructure, such as virtual radio access networks (vRAN) to support the new spectrum and resulting use cases.

It's expected that the automotive industry will become the largest market opportunity for 5G Internet of Things (IoT) solutions, representing 53% of the overall 5G IoT endpoint opportunity in 2023,[1] according to Gartner. The company also forecasts strong demand for 5G-enabled outdoor cameras used by city and building operators to enhance physical security.

Other 5G-relevant market segments are factory automation and logistics, in which robots perform manufacturing tasks and carry materials around warehouses. In medical, ultra-low latency 5G networks will support remote, collaborative surgery with doctors and patients in different geographic locations. Agricultural use cases include automated tractors and drones helping to plant and harvest crops. And these are just a handful of the emerging opportunities.

CULTIVATING NEW 5G MARKETS

Network operators will invest up to $1 trillion in 5G networks between 2018 and 2025,[2] and, of course, they are looking for ways to maximize the return on this enormous expenditure. This effort includes offering new revenue-generating services in emerging 5G markets such as the aforementioned. With nearly 40 years of embedded experience, Wind River® provides the

cross-industry expertise and worldwide presence to help operators gain a strong foothold in new market segments. Companies around the world, such as Ericsson, Nokia, Boeing, GE, and Ford Motor Company, trust Wind River as the foundation for their innovation in the telecom, aerospace and defense, industrial, medical, and automotive industries.
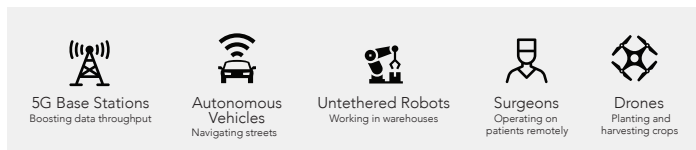

| 5G Base Stations | Autonomous Vehicles | Untethered Robots | Surgeons | Drones |
| Boosting data throughput | Navigating streets | Working in warehouses | Operating on patients remotely | Planting and harvesting crops |

Figure 1. Examples of emerging services at the edge of the 5G network

ADDRESSING 5G INDUSTRY CHALLENGES

Before network operators can pursue new markets with 5G, they need to deploy equipment at the network edge that allows them to overcome some key challenges, such as:

Managing complex, distributed networks

Since 5G uses a smaller wavelength than 4G, it will be necessary to deploy many more base stations than with 4G, making network management more complex. Adding to the complexity is the need to dynamically scale services as needed. Helping to simplify network management, Wind River Cloud Platform provides live scalability (from one to many nodes and from edge to core) and a single pane of glass interface that can be used to manage thousands of remote systems. The platform is highly reliable and telecom grade, supporting 99.9999% (six nines) guaranteed uptime.

Delivering high levels of performance and extremely low latency

5G standards and technologies enable performance that is several orders of magnitude greater than 4G, presuming 5G network infrastructure is adequately designed for the task. Engineered to satisfy stringent 5G performance demands, Cloud Platform ensures ultra-low latency in

virtual radio access networks (vRAN), which is critical for supporting real-time applications such as voice over LTE (VoLTE) and enabling future 5G services. Wind River Linux, based on a Yocto Project implementation, is carefully tuned to deliver deterministic, low-latency performance, matched to the use case in a small code footprint, enabling it to be deployed in both small (i.e., single device) and very large network infrastructures.

Transitioning from 4G to 5G

Network operators are looking for network solutions that deliver carrier grade performance, massive scalability, and rapid service instantiation for 4G networks while laying the foundation for 5G networks in the future. Already successfully deployed in existing 4G networks and the majority of early 5G rollouts, Wind River Linux helps ensure a smooth and cost-effective transition for telecommunications equipment manufacturers (TEMs) and network operators.

Maintaining security throughout lifecycle

Operators need to ensure that their network remains secure over the entire lifecycle. Helping to continuously safeguard deployed network systems, Wind River provides ongoing threat mitigation against common vulnerabilities and exposures (CVEs). The Wind River security team is constantly monitoring security vulnerabilities, including specific security notifications from U.S. government agencies and organizations such as the National Institute of Standards and Technology and the United States Computer Emergency Readiness Team, as well as public and private security mailing lists and the CVE database.

Minimizing cost

The operating cost to support and maintain a roll-your-own or commercially available operating system can be significant. Lowering the TCO for building, deploying, and maintaining network infrastructure, Wind River open source products such as Cloud Platform and Wind River Linux provide a fully supported solution, including:

- Commercial hardening and packaging, including a full set of user documentation, installation, and configuration
- Long-term support for the lifecycle of an operator's network infrastructure
- Continuous monitoring and fixes for security vulnerabilities
- An extended list of Linux board support packages (BSPs) across a variety of architectures
- IP compliance with reporting and OpenChain Conformance
- Customer-specific capabilities and alignment with upstream services

Notes

1. Gartner, "Gartner Predicts Outdoor Surveillance Cameras Will Be Largest Market for 5G Internet of Things Solutions Over Next Three Years," October 17, 2019, https://www.gartner.com/en/newsroom/press-releases/2019-10-17-gartner-predicts-outdoor-surveillance-cameras-will-be.
2. GSMA Intelligence, "Investing in 5G," June 25, 2019, https://www.gsmaintelligence.com/research/2019/06/investing-in-5g-the-scale-promise-and-challenges-of-tomorrows-networks/777.

NEW 5G SERVICES AT THE EDGE OF THE NETWORK

Delivering low latency and high speeds at the network edge, wireless 5G networks are a promising alternative to wired networks, particularly for mobile use cases found in manufacturing, transportation, healthcare, energy, and agriculture. As a trusted supplier in these market segments, Wind River can help network operators efficiently develop and deploy new revenue-generating services.

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