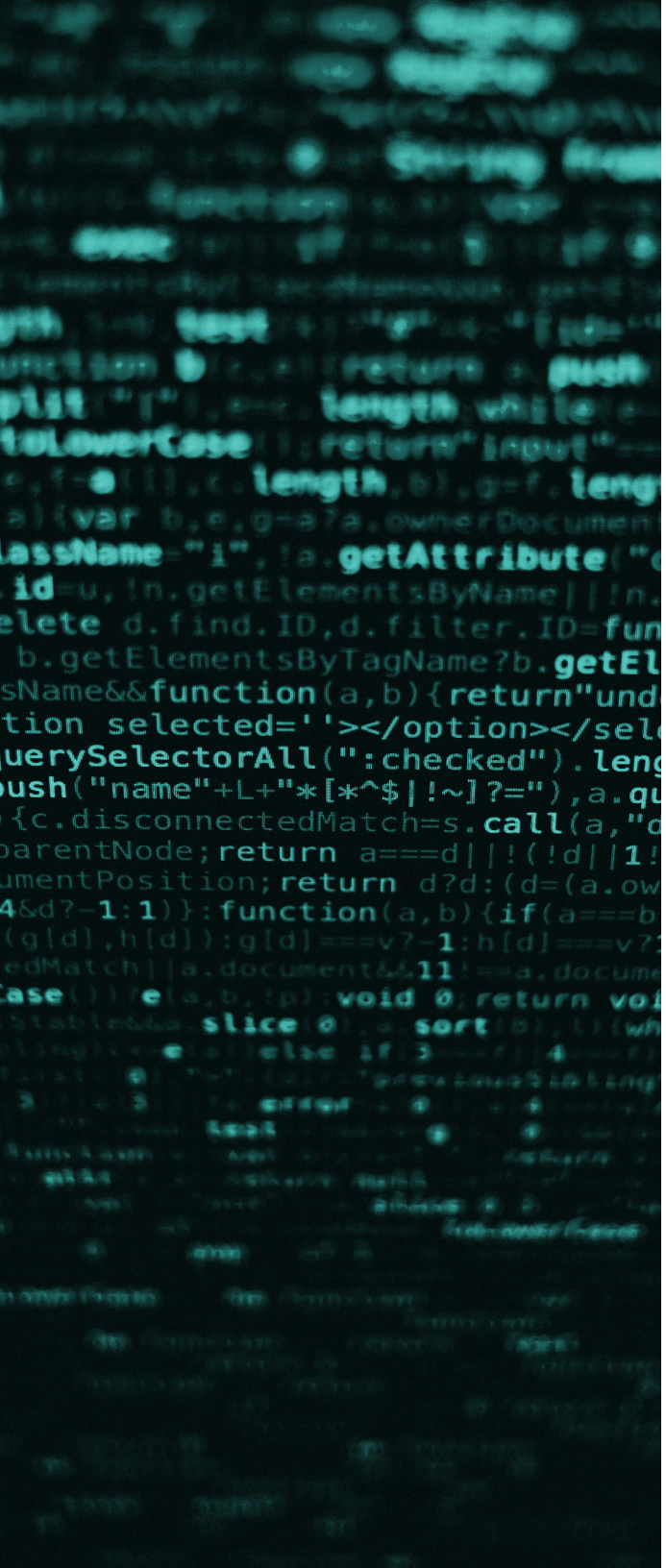
Driving Success with Platform Engineering for Mission-Critical Industries

Best Practices from Wind River and Capgemini

WNDRVR + Capgemini



The Platform Engineering Imperative

Software development is becoming increasingly complex, especially in safety-critical and mission-critical systems within industries such as aerospace, defense, telecommunications, industrial automation, automotive, robotics, and drones. Software is now central to innovation, driving new features and capabilities.

With the pace of innovation accelerating, developers have shifted away from the traditional waterfall model (requirements, code, testing, validation, certification, and deployment) and toward a more agile approach. They use cloud-native technologies that support modular code through virtualization or containerization, in addition to over-the-air (OTA) deployments to update code quickly.

Platform engineering addresses the need for speed, consistency, and quality. The software development platforms created through platform engineering ensure consistent and robust pipelines, enabling faster time-to-market. This approach empowers developers to focus on value-added services, innovate rapidly, improve developer productivity, and achieve their business goals.

Contents

What Is Platform Engineering?

Platform engineering is the practice of providing a streamlined, self-service experience for developers, reducing the friction and cognitive load of complex infrastructure and tooling. By abstracting the complexities of the process, platform engineering enables developers to concentrate on delivering value-added features and innovation.

Platform engineering has been key to the success of companies such as Google, Meta, and Amazon, allowing rapid scaling and frequent deployments. These companies' ability to iterate quickly and deliver innovative products is largely due to their solid platform engineering foundation.

Core Principles

Platform engineering relies on a consistent and robust pipeline, enabling teams to deliver code with high quality and reliability. It includes:

- **Automation**: Automating repetitive tasks to improve efficiency
- **Self-service**: Providing developers with self-service access to resources and tools
- **Standardization**: Establishing consistent standards across the software development lifecycle
- **Developer experience**: Focusing on creating a positive and productive experience for developers

Platform engineering is becoming increasingly challenging as architectures, software, and electronics grow in sophistication. Skill shortages and market pressures further compound these challenges.

Why Platform Engineering Matters for Embedded Systems

Software development for embedded systems presents unique hurdles, including:

- **Variants**: Having numerous variants leads to more codebases and increased verification needs.
- **Mission-critical requirements**: Critical systems demand high levels of reliability, safety, and security.
- **Legacy systems**: Legacy architectures and codebases can make modernization and integration challenging.

In mission-critical applications, reliability and security are paramount. Platform engineering promotes consistency, reducing errors and vulnerabilities. A well-defined platform supports better security and vulnerability management. And the platform helps manage diverse codebases and streamline verification.

Forging a Path Forward on Platform Engineering

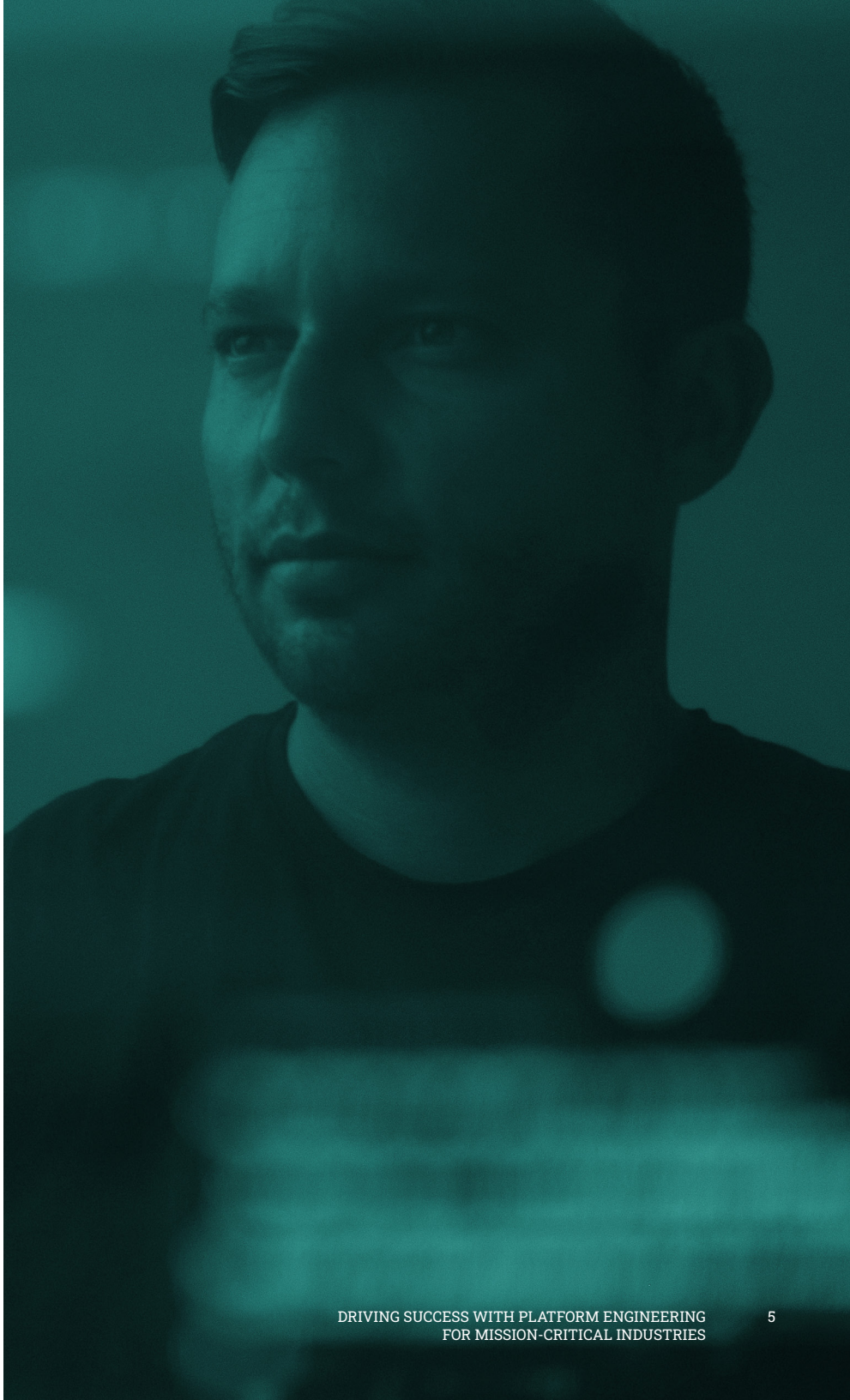
Capgemini sees clients across diverse industries embracing platform engineering, including those in safety-critical sectors such as aerospace, defense, industrial, and automotive, where there is high value in consistency and speed. The goal is to balance centralizing practices and accounting for legacy systems, sharing knowledge, building consistency, and increasing cost efficiency.

Having significant legacy systems and complexity can make it challenging to shift from project-based approaches, and companies often struggle with reuse and consistency.

Gradual steps make the transition manageable, and expert solutions can help resolve complexity.

Platform engineering builds an infrastructure and a common baseline for a wide variety of developers and teams. In organizations with many developers, a dedicated team maintains this common infrastructure, with customization through add-ons, plugins, and blueprints, ensuring security and vulnerability management.

WNDRVR + Capgemini



Overcoming the Heterogeneity Challenge

The edge computing landscape is remarkably diverse, unlike desktop, mobile, or cloud environments. With various architectures, semiconductor vendors, and operating systems, complexity is immense.

Development teams often find themselves bogged down as they face multiple customers, industries, endpoints, silicon architectures, and software development kits. The conventional solution of simply adding more people becomes unsustainable.

The viable solution involves abstracting commonalities across the system. Wind River® integrates best practices and tools into a common set of pipelines, enabling customers to start with a common baseline and gradually customize. Companies can leverage Wind River's product to establish a common infrastructure team, supporting the developer community and ensuring security and vulnerability management.

Building a Mature Platform

Building a mature platform starts with a dedicated team responsible for maintaining a common infrastructure that serves a wide variety of developers and teams.

Customization is key. By offering add-ons, plug-ins, blueprints, and solution integration models, the platform allows developers to bring in custom tools and integrate different testing and validation routines while still leveraging the common baseline.

A well-maintained platform matures into a standardized environment, allowing more robust security and vulnerability management.

Wind River helps organizations by integrating best practices and tools used by developers across tool chains and industries into a common set of pipelines. Customers can start with a common baseline and gradually customize, structuring a common infrastructure team to support the developer community.

The Future of Platform Engineering

Platform engineering represents a fundamental shift in how software is developed — particularly for mission-critical and embedded systems — embracing consistency, quality, and speed. By building internal platforms and streamlining development processes, organizations can empower their developers to focus on innovation, drive efficiency, and achieve their business goals. Companies across industries are adopting platform engineering to manage variants, ensure reliability, and accelerate time-to-market.

Wind River and Capgemini are committed to supporting you on this journey. We can help overcome the heterogeneity challenge, build mature platforms, and unlock the full potential of platform engineering for your business.

Contact Wind River today to learn how our solutions and expertise can help you accelerate innovation, improve developer productivity, and achieve your business goals.

Get Started Today

WNDRVR + Capgemini

About the Authors

Sandeep Modhvadia,
Chief Product Officer, Wind River

As Wind River Chief Product Officer, Sandeep Modhvadia is responsible for driving product strategy and product management, playing a critical role in Wind River's leadership advancing the software-defined future of mission-critical systems. He has more than two decades of technology and product management experience with Acuity Inc, Google, and Microsoft.

Jiani Zhang, Chief Software Officer, Capgemini Engineering

Jiani Zhang is the chief software officer of Capgemini Engineering, where she oversees the software engineering aspects of building software for products. She specializes in software transformation, helping clients adopt platform engineering practices for speed and consistency.

About

Wind River

Wind River is a global leader in delivering software for mission-critical intelligent systems. Founded in 1981, it specializes in embedded systems and cloud software, including real-time operating systems and simulation technology. The company is known for powering billions of devices across industries including automotive, aerospace, defense, and telecommunications while emphasizing security, safety, and reliability. Wind River is a subsidiary of Aptiv PLC and is headquartered in Alameda, California.

Capgemini

Capgemini is a multinational IT services and consulting company headquartered in Paris, France. Founded in 1967 by Serge Kampf, it provides a wide range of services including consulting, technology, and outsourcing solutions. Capgemini helps organizations transform their businesses through technology, leveraging strengths in AI, cloud, and data. With more than 341,000 employees worldwide, the company is a leading global provider of digital transformation solutions.