Case Study

Building a Secure and Compliant Software Framework at CARIAD with Docker

CARIAD
A VOLKSWAGEN GROUP COMPANY

Industry: Software Development
Company size: 6,000+ developers, engineers, and business team members
Location: Germany, United States, Estonia, China, and India

Highlights

Standardized environments: CARIAD's development setups with Docker, cutting down compatibility issues and fragmentation.

Boosted efficiency: Docker Desktop with WSL2 improved security and streamlined operations, reducing maintenance time.

Knowledge sharing: CARIAD's whitepaper provides in-depth guidance for Enterprise usage with Docker.

"Docker isn't just about streamlining our builds; it's about enriching our entire development ecosystem. From generating the initial code skeletons to providing containerized environments for testing, Docker enables us to enhance our productivity and ensures consistency across all stages of development."

Julius Pravtchev
Senior DevOps, CARIAD

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Introduction

Leading innovation in automotive software

CARIAD is the automotive software company of the Volkswagen Group, bundling the Group's tech and software competencies. The company transforms automotive mobility by developing the leading tech stack to make the automotive experience safer, more sustainable, and more comfortable. The brands benefiting from CARIAD's software solutions are all Volkswagen Group brands.

CARIAD's software platform provides constant and efficient updates, cutting-edge vehicle functions like driver assistance systems, an innovative infotainment platform, and other software functions, creating a vast digital ecosystem within and around the VW Group vehicles. The digital platforms suit any car model, from entry-level to top-end. Applications are customized to the emerging needs of the brand, the model, and in the end, the end-user's individual mobility behavior.

Due to the various complex development tasks, CARIAD chose to partner with Docker to create a safe and compliant containerized development environment ensuring compatibility across diverse hardware platforms. By adopting advanced technological solutions, CARIAD addresses the dynamic challenges of automotive software development to streamline development processes and boost development efficiency and innovation.

Challenges

Steering through fragmentation and technical debt

CARIAD's history is one of unparalleled growth. Developers from different automotive and tech companies were engaged in one software powerhouse to develop Volkswagen's leading tech stack. Accumulating operational fragmentation, the software specialist faced growing complexity as it integrated disparate systems, each with its own technological stacks and development methodologies.

The unique aspect of CARIAD's use case lies in its deployment of Unix-based software within its vehicles, utilizing Linux devices or embedded Linux distributions. However, its development process necessitates the use of Windows technology, driven by contractual obligations, compliance mandates, and technical constraints, particularly for testing purposes where software is exclusive to Windows. This requirement is not unique to CARIAD and is a common scenario faced by developer teams across various industries operating within intricate corporate environments.

Additionally, with around 6,000 developers, engineers, and business team members working in software competence centers across Germany, the United States, Estonia, China, and India, CARIAD has a strong need of knowledge transfer. Some developers need to familiarize themselves with containers and learn about this technology.

A team of cloud-native savvy developers who act as internal evangelists for Docker and containers are keen to address this. They work with various teams, demonstrating container technologies and how their development tools can be smartly containerized. This approach ultimately saves time by eliminating the need for developers to use separate devices, allowing them to work in diverse developer environments directly on their machines.

> "Our engagement with Docker Inc.'s leadership, particularly their CEO, Scott Johnston, was profoundly impactful. His deep technical insights and hands-on knowledge of Docker impressed us and affirmed the robust support and innovative spirit driving Docker forward."
>
> **Valentin Pravtchev**
> Senior DevOps, CARIAD

The initial situation CARIAD faced:

Standardization and integration

CARIAD's diverse systems, each designed for specific legacy operations, provided a rich variety of technologies. Emphasizing standardization and compatibility helped facilitate the seamless integration of new software solutions across the extensive portfolio.

Development environments

With developers working in varied setups, CARIAD identified an opportunity to enhance the development process. Streamlining these environments aimed to reduce risks and ensure smooth transitions from development to production.

Operational efficiency

The initial integration of systems revealed opportunities to enhance operational workflows. By aiming for a cohesive structure, CARIAD focused on minimizing redundant efforts and improving responsiveness to market and regulatory demands, ensuring that operations were both efficient and agile.

Scalability

CARIAD's extensive portfolio demonstrated the company's robust capabilities. Addressing the unique requirements of each new integration or system upgrade enabled the company to explore opportunities for leveraging economies of scale and achieving efficient solution scaling.

CARIAD's decision to adopt Docker and containerization technology aimed to create a standardized, scalable, efficient development and operational framework while enhancing overall productivity and innovation.

"Docker helps us streamline our development process. It gives us a consistent environment across all stages of development, which is a significant time saver for us."

Julius Pravtchev
Senior DevOps, CARIAD

"One of the most significant advantages of Docker is its portability. It allows us to move applications between different environments quickly and easily."

Julius Pravtchev
Senior DevOps, CARIAD

"Thanks to Docker, our new developers can get up and running on projects much faster than before, accelerating our onboarding process."

Julius Pravtchev
Senior DevOps, CARIAD

Solution

Shifting gears, CARIAD's drive to accelerate software delivery

CARIAD embraced a strategic initiative to streamline its development and operational frameworks. The company chose Docker containerization for its robust capability to encapsulate software in a fully portable and consistent environment, ensuring that applications perform uniformly across diverse computing landscapes. By adopting Docker CARIAD unified its development environments, facilitating a smoother integration of acquired technologies and significantly reducing the prevalence of compatibility issues.

This move not only promised to enhance operational efficiency but also positioned CARIAD to leverage continuous integration and deployment in a scalable manner.

Embracing container technologies

The best way to streamline development environments was to expand the use of containerization technology. This strategic move leveraged containerization's prowess in encapsulating and managing software code, ensuring consistent execution across diverse computing environments. By embracing containers, CARIAD aimed to eradicate the prevalent "it works on my machine" predicament, enhancing deployment reliability and consistency.

Integration of Docker Desktop's system architecture

Docker Desktop was implemented into CARIAD's workflow, incorporating a hybrid system architecture that significantly enhances the security and efficiency of their containerization environment. The system utilizes the local and Windows Subsystem for Linux (WSL2) components, allowing CARIAD to seamlessly manage a diverse development stack across Windows and Linux platforms.

Docker Desktop's architecture integrates these components effectively. It deploys a Linux container engine within a highly optimized WSL2 virtual machine while maintaining local processes that manage Windows containers directly on the host.

This setup ensures that Docker-managed containers can operate efficiently and securely, aligning with CARIAD's compliance requirements and reducing the overhead of managing multiple development environments.

For a detailed account of the methodologies and technologies employed, CARIAD's white paper, using Docker Desktop in large-scale Enterprises, offers an in-depth look at their containerization strategy and the benefits realized.

> "I appreciate our cooperation between the CARIAD and Docker teams. It has not just improved our technical capabilities but also encouraged a more collaborative and innovative culture within our teams."
>
> **Valentin Pravtchev**
> Senior DevOps, CARIAD

Key Benefits

Enhanced developer efficiency

Containers allow developers to execute consistent testing and deployment procedures, significantly reducing discrepancies across different stages of development.

Streamlined operations

The adoption of an automation pipeline facilitated by containers minimized the need for manual setups and maintenance, freeing up developer time for more critical tasks.

Reduced time for maintenance

By transitioning to containerized environments, CARIAD could maintain different product lines more efficiently, easing the burden of managing dependencies and updates.

Enhanced security and compliance

CARIAD uses Docker Business features like SSO, Registry Access Management, and Image Access Management to ensure continuous compliance with IT security and IP protection.

Outcomes

Speeding towards the future, revving up results through software integration

The strategic implementation of Docker at CARIAD transformed the company's software delivery and operational processes. Docker technology not only streamlined the development lifecycle but supported the acceleration of innovation at CARIAD.

Much information or expertise is needed to get Docker and WSL2 up and running. Different domains of technical knowledge are required to work with these specialized containers. The development team needs to know about networking issues and kernel commands from Linux and Windows. A single person cannot do it; a team of experts is needed to address the broad technical landscape around these solutions.

Not only is CARAID helping its automotive customers, but it is also helping others in the Docker community and enterprise customers across industries. After becoming experts in Docker and WSL2, CARIAD published a whitepaper to share the knowledge they had acquired and make it available to other developers and companies facing the same challenges. This whitepaper details how the developer workstation is configured, the developers' permissions on these workstations, and the company's distinct characteristics.

The partnership of Docker and CARIAD improved deployment speed, product quality, and overall market responsiveness by fostering a more cohesive and efficient developer environment.

Transforming software delivery

The shift to containerization technology marked a pivotal transformation in CARIAD's operational framework. It allowed for a more integrated approach to software development and management, aligning with their strategic goals of innovation and efficiency. The technical team at CARIAD noted significant improvements in development speed and efficiency.

The change in development process contributes to CARIAD's mission to create leading digital technology within the Volkswagen Group, influencing broader adoption across the organization. Their success story with container technology has set a benchmark within the Volkswagen Group, promoting a culture of technological innovation.

> "Docker improves our deployment processes, ensuring consistency and efficiency from development to deployment. It's been a tipping point in approaching software delivery, aligning closely with our security and reliability needs."
>
> **Julius Pravtchev**
> Senior DevOps, CARIAD

Conclusion

CARIAD's journey with containerization technology addressed the immediate challenges of system fragmentation and established a scalable and efficient framework for future software development. This case study exemplifies how embracing innovative technologies can significantly enhance productivity and operational efficiency, setting a new standard in the automotive industry. As CARIAD continues to explore and integrate new technological advancements, its innovative approach paves the way to make software a competitive advantage for the Volkswagen Group.

> "Initially, our use of Docker was constrained to virtual environments due to policy restrictions on our workstations. The introduction of Docker Desktop and WSL2 enabled access to container technologies on our physical workstations at scale."
>
> **Julius Pravtchev**
> Senior DevOps, CARIAD