

The Volkswagen Group builds virtual, automated test environment with Red Hat

VOLKSWAGEN GROUP

Software

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The Volkswagen (VW) Group, a leader in the global automotive market, works to create innovative solutions for electric vehicles, digital mobility services, and autonomous driving. Its electric research and development (R&D) department tests and enhances the software and physical components that support intelligent, connected vehicles. To improve testing speed, scalability, and consistency across internal teams and external partners, the VW Group created a virtual testing environment with Red Hat OpenShift and other Red Hat technology. With this new environment and an architecture created with guidance from Red Hat Open Innovation Labs, the VW R&D department has improved component integration and streamlined provisioning with self-service capabilities.



Automotive

671,205 employees

Benefits

- Reduced system test bench costs by 50% with standardized virtual infrastructure
- Improved internal and third-party collaboration with remote test bench access
- Improve test bench setup time from days to hours

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Marcus Greul

Program Manager, Integration Platform,
Passenger Cars R&D, The VW Group



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Michael Denecke
Head of Test Technology, The VW Group

Simplifying and automating component testing for electric vehicles

The Volkswagen (VW) Group is the largest carmaker in Europe, with a 29% share of the global automotive market. It operates production plants in 31 countries and sells vehicles in 153 countries. In 2019, the VW Group delivered 10.97 million vehicles to customers. The group’s mission is to make sustainable mobility solutions for current and future generations with a focus on electric vehicles, digital mobility services, and autonomous driving.

The Electric Development department, part of the VW Group’s Passenger Cars Research and Development (R&D) department, tests and enhances the technologies that support intelligent, connected vehicles. The department uses test benches, environments used to verify designs or models, to test and adjust electronic control units (ECUs), the embedded systems that control a vehicle’s electrical systems or subsystems.

“To ensure all of the electronic components and driver assistance systems in a car, such as mirror adjustment controls, work properly and safely together, we have to test them repeatedly and in high-stress situations,” said Michael Denecke, Head of Test Technology, The VW Group. “There can be more than 60 ECUs in a single vehicle. In addition, we use simulations and models of car systems and road conditions to integrate with real ECUs for our test scenarios.”

However, several factors made it challenging for the VW Group’s teams to complete this work with traditional methods and technology. Each time an ECU is updated or added, all related tests must be repeated and integration becomes more complex. Additionally, a lack of on-demand provisioning for integration test environments created delays.

“We want to completely standardize and automate the release cycle of software components into our vehicles—including development, testing, and deployment—by creating a shared environment for using both virtual and physical components,” said Marcus Greul, Program Manager, Integration Platform, Passenger Cars R&D, The VW Group.

Adopting a virtual environment supported by agile and DevOps approaches with expert, hands-on guidance

After defining a long-term project vision, gathering base requirements, and investigating different technical approaches, the group turned to Red Hat, a trusted vendor, for a solution. “We looked at other Kubernetes container solutions, but those discussions all ended with hesitancy and the need to do more research into our situation,” said Greul. “Red Hat was willing to just get started, to experiment with new ideas in the right spirit and with the optimism we needed. And we knew, with their subscription model, that we’d have the best support for our unique demands.”

The group engaged [Red Hat Open Innovation Labs](#) through a 12-week hands-on residency where Red Hat consultants and VW employees developed and tested the core of VW’s future software integration platform. This platform supports early integration testing of software functions at scale using Red Hat OpenShift, an enterprise Kubernetes container platform. The new architecture also includes several other Red Hat technologies. Red Hat Quay enhances OpenShift with a private container registry that stores, builds, and deploys container images. Red Hat Runtimes provides comprehensive products, tools, and components to effectively develop and maintain cloud-native applications. Messaging is managed by Red Hat AMQ, a lightweight platform for real-time integration. The group uses Red Hat Virtualization, a software-defined platform, to virtualize workloads running in Red Hat Enterprise Linux, a consistent operating system foundation for hybrid cloud and traditional infrastructure.

To help the VW Group's teams learn more about these new technologies and related concepts, Open Innovation Labs includes Red Hat Learning Subscription, an all-access pass to Red Hat Training.

With guidance on the new technology, DevOps principles, and agile development approaches, the VW Group created an on-premise OpenShift infrastructure for data and integration workloads that is managed by the group's IT department. Red Hat Technical Account Management provides ongoing expert support and troubleshooting assistance.

"We didn't think we'd be able to get this much done so quickly, in just three months, but we saw for ourselves that Red Hat's approach with Open Innovation Labs really works," said Denecke.

The success of the project led to the VW Group's recognition with a 2021 [Red Hat Innovation Award](#).

Uniting testing and development for driver assistance innovation

Reduced system test bench costs by 50% with standardized, scalable infrastructure

The VW Group now has a standardized architecture and virtualized, automated environment for its test benches. This new approach includes a continuous integration and delivery (CI/CD) pipeline that improves efficiency and has helped the group reduce test bench costs by 50%.

"With well-defined and consistent application logic, container structure, and interfaces, we can now control and combine ECUs for very complex simulations and testing with these components and integrations," said Greul. "Developers and integration testers can spin up test environments to fit their needs. By using these environments for both manual and automated testing processes, we are creating what is essentially Testing as a Service."

As a result, the VW Group's R&D department can scale to run several scenarios or combinations in parallel with centralized data and artifacts—such as simulations, sensor data, and models—for integration testing.

Improved test bench setup time from days to hours

During setup of a test bench, ECUs must be integrated with model and simulation components. In addition to reducing related costs, the VW Group has simplified this complex processes to speed provisioning of complete testing environments from days to hours.

"By using [Open Container Initiative](#) models to follow best practices for container formats and runtimes, combined with the standardized infrastructure provided by Red Hat OpenShift, we can dynamically link these container models to our ECUs to speed test bench delivery, saving days of working time," said Greul.

Enhanced internal and third-party collaboration with remote test bench access

The VW Group needed to align work approaches and architectures across distributed internal teams and third-party partners—including subsidiary organizations—to build consistent, reusable components.

With its new integration platform based on Red Hat OpenShift and supported by [agile](#) and DevOps work approaches, anyone at the VW Group around the world can take advantage of the test benches hosted at the Wolfsburg testing center.

Additionally, the VW R&D department now has a security-focused, reliable foundation for virtual collaboration with third-party ECU original equipment manufacturers (OEMs) to test and troubleshoot new software and features—without requiring visits to physical test centers.

Exploring open source and building a community

Its success with virtual test benches using Red Hat's software has prompted the VW Group to explore open source further, including open sourcing its Functional Engineering Platform.

"We see open culture as potentially beneficial to some of the large projects we're working on," said Greul. "We're looking forward to building a cross-brand automotive community and adopting these modern, collaborative principles."

Volkswagen plans to continue enhancing its virtual testing environment to achieve even more efficiency and transparency. "The industry is facing massive change right now. Future cars will be CASE: connected, autonomous, shared, and electric, with technologies taking over more driving tasks," said Greul. "We've achieved our vision of faster testing to get improvements to our vehicles faster, but that's just the start of our vision."

About The Volkswagen Group

The Volkswagen Group, with headquarters in Wolfsburg, Germany, is one of the world's leading automobile manufacturers and the largest carmaker in Europe. The Group comprises twelve brands from seven European countries: Volkswagen Passenger Cars, Audi, SEAT, ŠKODA, Bentley, Bugatti, Lamborghini, Porsche, Ducati, Volkswagen Commercial Vehicles, Scania, and MAN. The passenger car portfolio ranges from small cars to luxury-class vehicles. Ducati offers motorcycles. In the light and heavy commercial vehicles sector, the products range from pick-up trucks to buses and heavy trucks. Every weekday, 671,205 employees around the globe produce on average 44,567 vehicles, are involved in vehicle-related services, or work in other areas of business. The Volkswagen Group sells its vehicles in 153 countries.



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About Red Hat



Red Hat is the world's leading provider of enterprise open source software solutions, using a community-powered approach to deliver reliable and high-performing Linux, hybrid cloud, container, and Kubernetes technologies. Red Hat helps customers integrate new and existing IT applications, develop cloud-native applications, standardize on our industry-leading operating system, and automate, secure, and manage complex environments. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500. As a strategic partner to cloud providers, system integrators, application vendors, customers, and open source communities, Red Hat can help organizations prepare for the digital future.



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