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Embracing the shift to software-defined vehicles: Q&A with Red Hat

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Q&A with Red Hat

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The software-defined vehicle (SDV) is a new buzz phrase in the car industry. It refers to vehicles that can enhance their capabilities through software updates, eliminating the need for physical part replacements. SDVs use software to govern operations, incorporate new features, and facilitate the integration of novel functionalities. This concept marks an advancement in the automotive industry, laying the foundation for autonomous driving and vehicle connectivity technologies.

To learn more, we spoke to Francis Chow, vice president and general manager, In-Vehicle Operating System and Edge, Red Hat Inc. Established in 1993, Red Hat develops open-source software solutions for businesses. It operates as a subsidiary of IBM and maintains its main office in Raleigh, NC, US along with several other global locations.

Key takeaways:

- The shift to SDVs brings challenges in managing software complexity, integrating multiple sources, and continuously adding new features. Security and compliance are top priorities to protect privacy and ensure road safety. Transformations in personnel, processes, and organization are needed for success.
- Open source principles are essential for the automotive industry to meet consumer expectations and accelerate development. Collaboration and the use of Linux as a foundation for SDVs can reduce costs and speed up the delivery of innovative applications. Automakers must evaluate the value of proprietary in-house software during this transformation.
- OEMs [original equipment manufacturers] can embrace software in the development process by adopting modern, open, and cloud-native technologies, collaborating with suppliers, and working with software system integration teams.
- Prototyping and validating AI object detection models in the cloud environment improves the safety and efficiency of SDVs by enabling quick development and testing. Cloud-based testing reduces real-world risks, ensures higher quality models, and allows for rapid iterations and continuous improvements.

The following is an edited transcript of the conversation.

S&P Global Mobility: How does the growing interest in SDVs impact the automotive industry?

Red Hat: The arrival of SDVs in the automotive industry is happening both very slowly and all at once. It feels like everyone (including Red Hat) is talking about them, but getting to the point of realization takes time. Vehicles are complex to build, and safety is critical. But there's no turning off the faucet. SDVs enable feature updates and upgrades through the life cycle of vehicles and are absolutely going to be part of most of our daily lives sooner rather than later. But this means the automotive industry has to meet the moment by embracing a collaborative model to accelerate innovation, where we believe open source will be a significant enabler of it. With each passing year, consumers learn more and more about the possibilities of SDVs and will expect to see these features in their next vehicle purchase.

What are the major challenges faced by automotive OEMs in developing SDVs?

The sheer volume, and complexity of software that is required to meet the consumer demand for convenience features, slick human-machine interfaces, driver assistance and more, is a major challenge itself, especially the integration of software that may come from multiple internal and external sources. OEMs also were accustomed to one large software release at the start of production, and subsequent freezing of software except for critical fixes. Now the expectation is to continue to add innovation, new features and services well into the post production life cycle, and this requires an entirely new software factory operation center for deploying on-demand software updates to potentially millions of customer vehicles wherever they are. This requires transformations in personnel, processes, and organizationally at an enormous scale.

In addition, navigating security and compliance is a big priority. SDVs are interconnected and depend on complex software, which means you have to pay extra attention to guarding against cybersecurity threats. Additionally, regulatory bodies and industry standards demand compliance to protect user privacy, data integrity and general road safety. Setting up strong security measures and following regulations are crucial for SDVs to reach their full potential and gain trust from consumers and stakeholders.

What specific features and capabilities of SDVs are driving the interest in them?

There are a lot of features and capabilities that SDVs will bring to consumers, but right now, we're seeing a lot of interest in the following: AI detection models in the car (including GenAI for scenarios evaluation), advanced infotainment systems with better connectivity, over-the-air updates that provide automakers with the ability to better prototype software fixes, new feature deployment from cloud-to-car without needing to visit the dealership, chatbots, local mapping, predictive maintenance and advanced driver assistance systems [ADAS] applications. The possibilities are endless.

What specific advancements has Red Hat made in open source for the automotive industry, particularly in relation to safety-critical systems in SDVs?

Red Hat is working to meet these rigorous functional safety requirements for our continuously updated Linux operating system for automotive. We recently announced the Linux math library (libm.so glibc), a fundamental component of the Red Hat In-Vehicle Operating System, has achieved ISO 26262 ASIL-B functional safety certification from Exida, a global leader in functional safety and cybersecurity certification. Our work continues to employ innovative usage of container technology

to deliver freedom from interference requirements, as well as to comply with emerging cybersecurity regulations for automotive applications.

Why is embracing an open-source philosophy important for the development of SDVs?

Open source provides a means to an end for the automotive industry. They're looking to make their vehicles intuitive and interactive, but to keep the pace of these rising expectations they have to speed up development and continuously serve drivers with new features while remaining profitable. What does this mean? Cars will be increasingly software-defined, but old ways of working can place too many dependencies that lock automakers into traditional platforms and slow down innovation. Embracing open source principles helps bolster industry-wide collaboration and fosters a culture of transparency and accessibility, a necessity for driving future advancements in automotive technology.

By utilizing Linux, for example, carmakers are presented with a robust and scalable foundation with a stronger software platform for their SDVs. Furthermore, the economics of open source and open collaboration make fundamental business sense. Automakers are beginning to understand that a significant portion of the software stack is not differentiating. So much time and precious engineering resources are wasted re-inventing non-differentiating software that could be more efficiently realized and maintained through open collaboration with other stakeholders, slowing the delivery of truly differentiating applications and time to revenue. Every proprietary in-house software element carries a cost of ownership. So, which in-house software is truly worth the impact on schedule and the bottom line? This is the question automakers need to ask themselves in this transformation.

How are you addressing the challenges of managing multi-vendor software ecosystems in the context of SDVs?

Red Hat is embracing a standard open source Linux-based in-vehicle operating system addressing multiple automotive use cases. Open source Linux represents the best foundation for multi-vendor collaboration addressing the requirements to realize the vision of SDV, given that Linux is the most widely supported software platform across most industries. Plus, the extensive Red Hat partner ecosystem includes the industry's leading global systems integrators (GSIs), OEMs and tier-1 suppliers, many of which have extensive experience and expertise in modern software development, validation and delivery best practices. Multi-vendor software integration is what these stakeholders deliver for clients every day, and so they play a crucial role in streamlining not only the DevOps and cloud-to-car processes and procedures but also the collaborative integration of all of the building blocks from multiple vendors and multiple communities that make up automakers growing software stacks today and into the future.

How can OEMs embrace software in the development process and understand the impact of software on the production schedule?

We believe a combination of factors can help here, especially embracing modern, open and cloud-native technologies; increasing collaboration with suppliers to share the burden of building and maintaining common, open building blocks as mentioned above regarding multi-vendor ecosystems; and, working with software system integration teams who have deep experience and expertise in modern software tools, architectures, DevOps and operational aspects required to develop an efficient software factory. These teams are available from Red Hat, our parent company, IBM, and the many automotive partners we have in our partner ecosystem, many of which already have established engagements with OEMs.

How does the ability to prototype and validate AI object detection models in the cloud environment contribute to improving the safety and efficiency of SDVs, and what role does Red Hat's platform play in facilitating this development?

Expanding testing of automotive features in general to include testing in cloud environments augmenting on device testing is critical to meet time to market requirements by increasing overall development productivity. AI object detection modeling is a good example of this, where complete reliance on vehicle-based testing is not sufficient. Red Hat's development environment is cloud-native by default, and in-vehicle workloads like object detection are excellent candidates for cloud-based prototyping and testing.

Prototyping and validating AI object detection models in the cloud enhances the safety and efficiency of SDVs by enabling quick development and testing. Cloud environments allow for safe virtual testing, which reduces real-world risks and ensures higher quality models. The scalability of the cloud means many tests can be run simultaneously, speeding up the validation process. Additionally, using virtual environments is cost-effective, as it reduces the need for expensive physical tests. This flexibility allows for rapid iterations and continuous improvements to detection models.

For example, our platform Red Hat OpenShift AI simplifies the development and deployment of AI applications by reducing the time and effort spent on managing AI infrastructure. It provides reliable, tested AI/ML tools and supports the entire AI life cycle, from data preparation to model deployment and monitoring. The platform ensures consistency across different environments, whether on-premises or in the cloud, and enhances support for advanced AI models, including those used in edge deployments. OpenShift AI delivers a flexible and scalable solution that accelerates the creation and deployment of AI-enabled applications.

Could you share any insights or lessons learned from collaborations with industry partners like Deloitte, ETAS, and General Motors that have influenced the approach taken in the collaboration with Qualcomm Technologies?

Generally speaking, each of our partners brings unique strengths in technologies and/or expertise across multiple areas of increasingly complex tasks to realize the full potential of the SDV vision.

We increasingly see value in working with multiple partners on pre-integrated, reference software stacks, combined with software development, validation, operational, and other expert services to help OEMs get to market faster and maintain more efficient post-production operations in the new SDV working model. This is part of the collaboration with Qualcomm Technologies.

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