

# AN UPSURGE IN AUTOMOTIVE DIGITAL SERVICES

SOLUTION BRIEF



Intel sees market opportunities in vehicle automation—an economic wave that could realize USD 1.3 trillion in savings for the U.S. economy, USD 507 billion gained in productivity, USD 488 billion in accident cost reductions, and USD 138 billion in productivity savings from reduced congestion.<sup>1</sup>

## THE CONNECTED CAR SPURS NEW DIGITAL SERVICES

The promise of connected cars has sparked the imaginations of many leading automobile manufacturers, and, in response, a supporting ecosystem is growing around this vision with technologies from Intel and Red Hat enabling many of the capabilities. As cars are transformed into mobile communication centers—rather than simply being a mode of transportation—software services that inform, guide, and entertain drivers and passengers are being designed and deployed. As this trend accelerates, the industry is witnessing a surge of innovative services centered around driver convenience, safety, and instant availability of relevant information.

The boom in automotive digital services is not without challenges. Massive volumes of driving and vehicle data need to be collected, aggregated, and analyzed. Autonomous driving requires the coordination of input from multiple sensors and sources, requiring a strong, supporting Internet of Things (IoT) infrastructure. The integrity of digital services depends on delivering applications securely to vehicles and protecting against intrusions or compromised code. Intel and Red Hat are involved in all these areas, providing technologies and solutions to address the challenges.

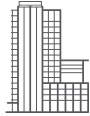
## THE PROMISE OF THE CONNECTED CAR

Automobile manufacturers—including Porsche, Tesla, and others—are moving beyond basic infotainment in vehicles to an entirely new realm, giving customers the option to download apps that enable new services. Expect to see real-time vehicle troubleshooting and fixes through personalized services such as software downloads; machine-to-machine communication for accident avoidance and safer vehicle operation; intelligent guides to advise drivers of requested services, routes, parking availability, and medical facilities; and safe driver coaching based on telematics data.

Intel and Red Hat have collaboratively developed hardware and software solutions and reference architectures in support of these kinds of initiatives. Intel is deeply involved in IoT initiatives and offers IoT gateways to capture, filter, and relay data from sensors and devices, as well as integrated 5G solutions. Red Hat® Virtualization tools can utilize compute resources more effectively and dynamically reconfigure storage and compute components to adjust to varying demands.

## A PLATFORM FOR SECURE, STABLE DEPLOYMENT

The avalanche of apps and services being developed for connected cars requires an application development and deployment platform to meet the growing demand. One such platform, built using a Red Hat Enterprise Linux® foundation and Red Hat OpenShift Container Platform, combines industry-leading container technologies—including Kubernetes, Project Atomic, OpenShift Origin, and Linux Containers—with advanced application delivery and container management capabilities. The platform architecture supports access to traditional applications running in parallel with microservices. This framework lets automakers take advantage of existing IT investments while gaining a streamlined method for rapidly designing, developing, and deploying new apps and services to customers and subscribers.



## ABOUT RED HAT

Red Hat is the world's leading provider of open source software solutions, using a community-powered approach to provide reliable and high-performing cloud, Linux, middleware, storage, and virtualization technologies. Red Hat also offers award-winning support, training, and consulting services. As a connective hub in a global network of enterprises, partners, and open source communities, Red Hat helps create relevant, innovative technologies that liberate resources for growth and prepare customers for the future of IT.

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## BEST PRACTICES FOR CONTAINER TECHNOLOGY

Several proven Red Hat components are combined in this platform to ensure interoperability, agility, and security. The Platform-as-a-Service framework provided by Red Hat OpenShift lets developers quickly build, launch, and host innovative applications in the public cloud, with automated provisioning and management. To mitigate security risks, workloads are isolated and protected against root execution. Red Hat OpenShift provides exceptional cluster management for containers and can work across mixed infrastructures that include local servers, public clouds, and multiple geos.

## OPEN CONTAINER INITIATIVE PROMOTES INTEROPERABILITY

Container images and runtimes—based on the respective Open Container Initiative (OCI) specifications (de facto industry standards)—promote interoperability and make it easier to consume other prepackaged components that simplify integration and enhance capabilities.

*“A business’s ability to streamline the application development process, from creation to deployment, is key to enterprise-level digital transformation and a trend that we hope to see more and more, especially as other organizations follow the example of trailblazers like the BMW group.”<sup>2</sup>*

- ASHESH BADANI, VICE PRESIDENT AND GENERAL MANAGER, OPENSIFT, RED HAT

## AUTONOMOUS VEHICLES: THE ULTIMATE CONNECTED CARS

The ultimate manifestation of the connected car is a vehicle that navigates roadways autonomously, relying on a host of technologies to ensure safe and reliable vehicle operation. Along these lines, Intel has advanced automated driving powered by Mobileye technology, launching test programs and refining the usability for real-world applications.<sup>3</sup> Camera and sensor data captured during vehicle operation constitutes about 4 terabytes of information every 90 minutes, which must be filtered, normalized, routed, and aggregated, all areas in which Red Hat enterprise solutions and storage assets can be engaged.

Intel occupies a unique niche for enabling autonomous driving, with compute resources that supply the intelligence behind IoT sensors and devices, network solutions that link the “things,” and cloud infrastructure hardware built with Intel® architecture. Red Hat provides essential middleware components, software-definable storage to accommodate massive data volumes, and automation solutions that can connect the diverse IoT components with analytics engines and derive intelligence from raw data.

## FUTURE ENDEAVORS

As connected car technology advances, Red Hat and Intel are at the forefront of this sector, with research and projects closely aligned with the requirements of automobile manufacturing industry and the ecosystem that surrounds it. This collaborative work focuses on making driving safer, enhancing the driving experience, and improving manufacturing processes and vehicle quality.

<sup>2</sup> “Red Hat OpenShift Container Platform Takes Digital Innovation into the Fast Lane with Major European Automaker.” Business Wire. 2017. <http://www.businesswire.com/news/home/20170503005730/en/Red-Hat-OpenShift-Container-Platform-Takes-Digital>

<sup>3</sup> Baldwin, Roberto. “Intel and BMW’s highly-automated cars hit the road.” Engadget. 2017. <https://www.engadget.com/2017/05/03/intel-and-bmw-s-autonomous-cars-hit-the-road/>