

Accelerating Business Growth with Industry-Standard, On-Premises IaaS

BMW's OpenStack* implementation shows that on-premises, industry-standard infrastructure as a service (IaaS) helps grow the business innovation and enhance operational efficiency through agility and automation.

The characteristics of OpenStack* mean that BMW can count on the support of the industry to continually improve the OpenStack ecosystem.

Executive Summary

To remain competitive, BMW Group needs to rapidly grow their revenue through enriched customer engagement. Innovative in-car apps and other cloud-native applications that enhance the customer experience can happen only in a nimble IT environment that supports Agile development and self-service provisioning.

In late 2014, BMW Group augmented their proprietary private cloud with an open software-defined infrastructure (SDI) based on OpenStack* and industry-standard Intel® hardware. The OpenStack implementation, which took only six months to bring to production, improved efficiency, agility, and platform availability. Compared to the proprietary cloud, SDI is far more agile and better positions BMW to accelerate business growth through innovation.

BMW cites the following benefits of the OpenStack environment:

- A well-known and well-accepted control API
- An ever-expanding supporting technology ecosystem
- Continual enhancement of OpenStack modules
- The ability of OpenStack components to be managed by a large number of automation and orchestration systems

The characteristics of OpenStack mean that BMW can count on the support of the industry to continually improve the OpenStack ecosystem so that BMW can focus its resources on application development.

The agility of an on-premises IaaS platform with SDI supports many use cases and has convinced many BMW internal customers that the private cloud is preferable to developing services off-premises. So far, more than 50 BMW application developers, testers, and other departments have taken advantage of SDI at BMW.

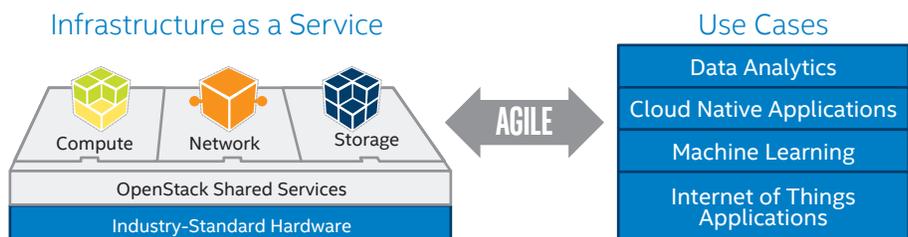


Figure 1. A software-defined infrastructure based on OpenStack* and Intel® architecture provides an agile and highly available infrastructure as a service that supports a wide variety of use cases.

Business Challenge

Business growth demands innovation, and innovation demands agility. BMW Group accelerates revenue growth through advanced technology, which includes developing cloud-native applications that enhance the customer experience both in and out of the car. However, BMW found its existing private cloud, based on proprietary infrastructure, inadequate to the task for the following reasons:

- Proprietary APIs slowed interface development to a crawl, and creating standards within the underlying framework was difficult.
- Applications did not always work as planned, depending on the operating environment.
- Internal maintenance consumed significant amounts of time, money, and personnel.

Andreas Pöschl, a senior solutions architect for BMW, said that these drawbacks severely limited BMW's business agility—developers could not develop applications fast enough, and IT could not get resources to developers quickly enough. To increase business velocity, BMW decided to implement software-defined infrastructure (SDI) that could support agile, on-premises IaaS.

Solution

BMW's SDI-based approach to cloud computing is based on OpenStack* and industry-standard Intel® architecture (Figure 2). According to Pöschl, SDI directly alleviates the barriers to business growth posed by the proprietary private cloud.

- OpenStack's APIs are supported by a large and growing technology ecosystem, which frees developers from having to create their own interfaces for each application.
- Those same APIs are standard across operating environments, contributing to application stability and reliability.
- OpenStack's pure IaaS solution simplifies managing and maintaining infrastructure resources and is compatible with a large number of automation and orchestration systems—thereby reducing maintenance effort and costs.

BMW Group has found that OpenStack's self-service IaaS delivery speeds cloud-native application development by avoiding infrastructure limits and manual intervention. The highly modular environment helps ensure a usable base of underlying infrastructure that is constantly being enhanced as new technologies emerge.

To take advantage of SDI's overall scalability and flexibility without having to reengineer its entire data center, BMW created an OpenStack implementation as an adjunct to its existing traditional IT infrastructure. In this way, BMW can run traditional processes on traditional infrastructure and concentrate on using OpenStack for workloads that are suited for "cloud native development." These workloads are characterized by scalability, automated installation and configuration, and the ability to be redeployed as a core concept. They benefit from SDI's ability to provide APIs that manage the underlining infrastructure and SDI's flexibility for quickly changing requirements and rapid deployment.

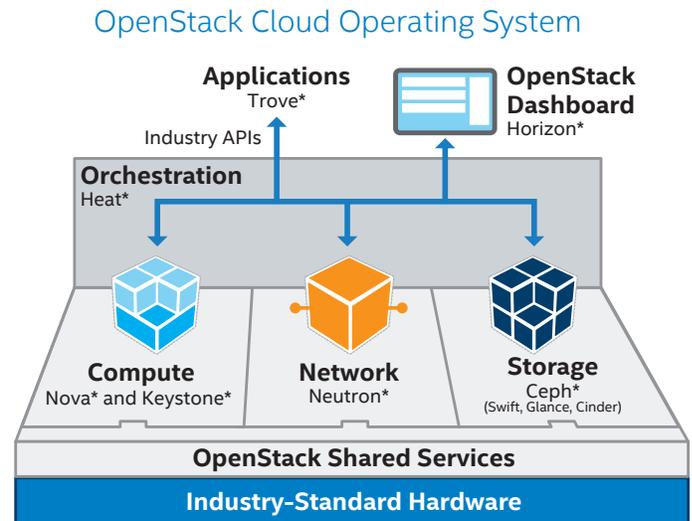


Figure 2. The software-defined infrastructure enabled by OpenStack* provides a scalable, reliable environment for a variety of use cases including application development, automated testing, and big data analytics. Compute, storage, and networking services are shared and optimized. Industry-standard hardware helps assure portability and keep costs under control.

Solution Architecture

An SDI based on OpenStack consists of compute, storage, and network components that together support a variety of use cases and can be quickly scaled—up or down—as necessary.

At BMW Group, its SDI is built on the following components:

- **Compute.** Intel® Xeon® processor-based servers, each with 40 physical cores and 450 GB of memory.
- **Storage.** Ceph* storage on Intel® Xeon® processor-based servers. Specifically, for each SAS server, BMW also uses two Intel® Solid State Drive Data Center Family for SATA. These solid-state drives are used for journaling, which accelerates writing to disk.
- **OpenStack distribution.** SUSE OpenStack Cloud* Internal customer demand at BMW for OpenStack instances is high—especially for continuous integration, server-side engines for dynamic in-car applications, and big data analytics.

Pöschl says BMW Group is currently expanding the current environment by ordering new hardware and preparing software.

Intel® Technology Helps Bring OpenStack Implementations to Life

Intel is committed to making open cloud computing a possibility for every enterprise (see the sidebar, "Intel Works to Accelerate Cloud Adoption"). To that end, Intel representatives work with companies such as BMW to help initiate OpenStack projects and share information.

Intel® technology also is a key component of every layer of an OpenStack SDI implementation, as shown in Figure 3.

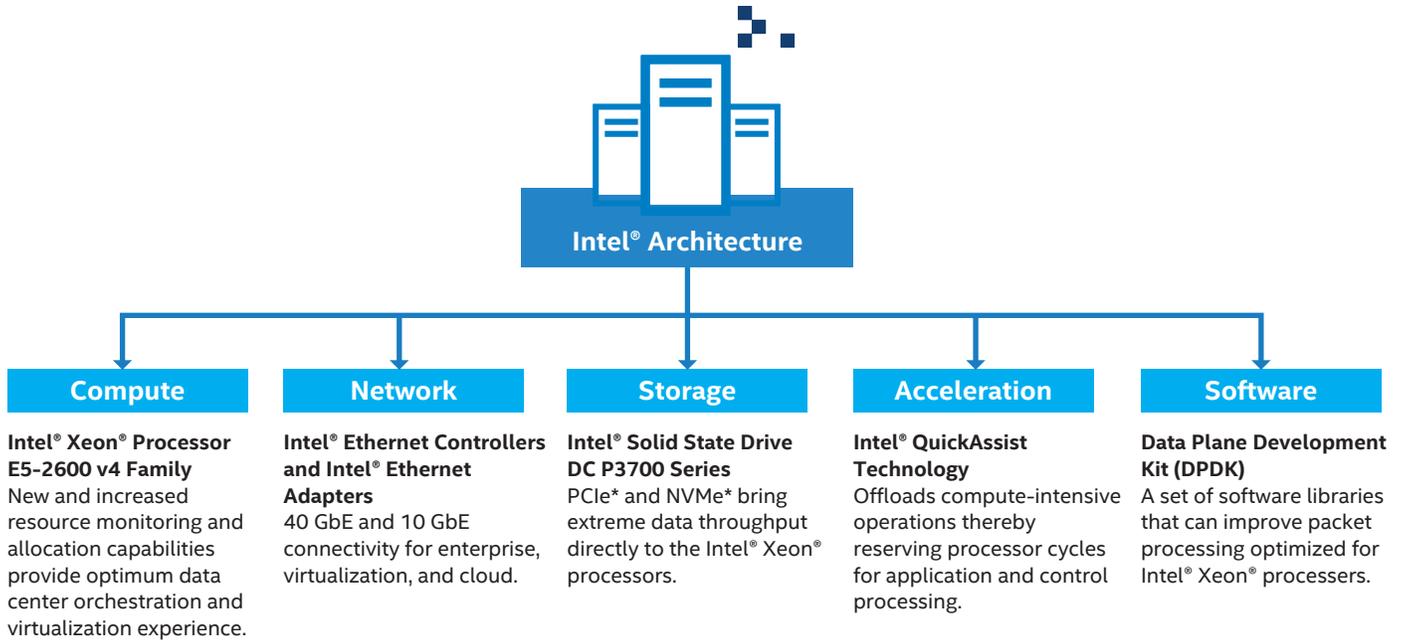


Figure 3. Several Intel® technologies empower OpenStack* implementations by supporting software-defined infrastructure and workload optimization.

OpenStack Results and Key Learnings from BMW Group

When BMW Group launched their OpenStack project in October 2014, the goal was to use SDI to accelerate cloud-native application development and drive new revenue streams. BMW’s developer community has responded enthusiastically to the scalability and flexibility of SDI. BMW will use lessons learned as it expands and extends its OpenStack implementation to further stimulate innovation and revenue growth.

Agile Environment Wins Internal Customers Back to Private Cloud

Since first going live, 50 new internal developers and other customers have launched projects on BMW’s OpenStack implementation—some customers have as many as 60 separate instances (see Figure 4). Prior to the launch of SDI at BMW, application developers tended to use off-premises public cloud solutions for cloud-native development—which in some cases can raise agility, security, and cost concerns. As the reputation of the OpenStack environment has spread, BMW’s IT department is seeing an increase in internal customers asking for OpenStack-based development environments.

BMW connected with internal users through internal communications and conducted marketing events to train users about the kinds of workloads best suited for the OpenStack environment. They also recently held their first internal cloud summit. By creating a highly communicative, collaborative community focusing on use cases and evangelizing new SDI capabilities, BMW has been able to identify and prioritize appropriate workloads for the cloud.

BMW Adoption of OpenStack Environment

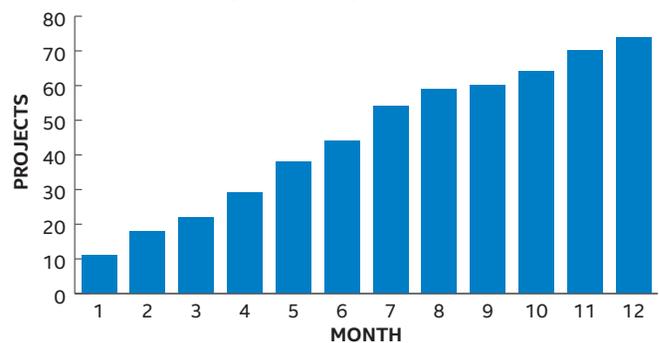


Figure 4. Interest in the OpenStack* environment at BMW has escalated quickly, as developers, testers, and other BMW project leaders realize how agile and scalable the new development environment is.

Key Learnings

BMW recognized several key learnings while implementing OpenStack:

- **Knowledge is everything.** Implementing certain aspects of the project requires internal knowledge and sufficient resources (examples include DNS integration and intellectual property management). Enterprises cannot rely only on external system integrators.
- **Maintain separation between traditional workloads and cloud workloads.** The cloud is not the solution for every workload. It is not sufficient simply to run projects on cloud infrastructure—it is also necessary to leverage that infrastructure effectively and efficiently.
- **Establish business value and business support at the outset.** Without a clear benefit and buy-in from upper management, the project will often flounder.

Intel Works to Accelerate Cloud Adoption

Intel believes software-defined infrastructure (SDI) can unlock business value and improve efficiency and reliability. The OpenStack* platform is the cornerstone of an open SDI.

In July 2015 Intel launched the **Intel® Cloud for All Initiative**. The goal is to make cloud technology available to everyone, and unleash tens of thousands of new clouds. To achieve this goal, Intel is making significant investments in developing cloud infrastructure solutions that are enterprise-ready and easy to deploy. These investments occur in three key areas: technology and initiatives, strategic partnerships, and standards development.

Intel is working with the industry to deliver a choice of customer-optimized cloud solutions and supports a rich ecosystem of partners providing cloud solutions across the industry. Intel's technology leadership is enabling performance, reliability, management, and security for next-generation cloud solutions.

Intel's strategy is to deliver leading silicon for a full range of workloads, make SDI efficient and easier to deploy, and work with the industry to break down barriers to broad adoption.

- **Focus on use cases, not technology.** OpenStack is the base framework to serve new concepts and use cases—it is not a drop-in replacement for traditional infrastructure and workloads. OpenStack technology discussions must align with discovery, analysis, prioritization, and practical implementation of workloads and processes.
- **Act like a startup—grow and evolve with customers.** Established project management approaches may not be appropriate or elastic enough for projects that are based on entirely new paradigms. In the early stages of BMW's OpenStack project, an agile feedback loop about features and functionalities helped move the project forward quickly.
- **Choose the right distribution and establish a strong relationship with the distributor.** To achieve stability and supportability, using a distribution can be better than independently assembling and integrating OpenStack components. Several OpenStack distributions are available that handle QA and integration and thereby limit the enterprise's exposure to OpenStack integration complexities—the enterprise can then concentrate on cloud implementation and business outcomes.



- **Find the right level of process integration.** Dynamic workloads can be impeded by traditional levels of process integration. OpenStack is designed to be the master orchestrator, more or less autonomously, and it is designed to optimize agility. Finding the right balance—both at the outset and as more workloads are added—between the short-term need for agility and the long-term need for process is critical to the project's success.
- **Never forget the “Why.”** Although OpenStack is beneficial for some use cases, traditional IT approaches might be more suitable for others. OpenStack usage is not an end in itself—it must always contribute to business success.
- **Seek close interaction with internal customers.** IaaS isn't meant to obscure or render unimportant the people behind the workloads. Especially in the cloud ramp-up phase, it's important to talk to potential internal customers about their use cases, requirements, and expectations. These conversations provide the ability to choose the right workloads and discover new use cases, keeping the business value of the OpenStack implementation high.

Conclusion

By improving agility, SDI built on OpenStack and industry-standard Intel architecture can help remove barriers to innovation and empower enterprises to pursue new revenue streams. Other benefits can include reduced operational costs, enhanced control of security and data, and better availability. In an enterprise such as BMW Group, where in-car applications are being developed almost daily and even a single minute of downtime can mean significant loss, the agility afforded by SDI and OpenStack has proven its worth.

Over the next few years, BMW intends to expand the number of use cases and workloads running in their SDI environment and to further implement SDI through client-based software-defined networking. In other words, BMW is “motoring ahead” with SDI based on OpenStack and industry-standard hardware.

To discover more about Intel and cloud computing, visit www.intel.com/Cloud.

Learn More

You may find these resources useful:

- OpenStack Software: openstack.org
- Software-Defined Infrastructure 101 Video: intel.com/content/www/us/en/data-center/software-defined-infrastructure-101-video.html
- Intel's SDI vision: intel.com/content/www/us/en/switch-silicon/software-defined-infrastructure-sdi-infographic.html

¹ Ceph* is an open source project that offers object, block, and file storage in a distributed cluster. It is designed to provide excellent performance, reliability, and scalability. Serial Attached SCSI (SAS) and Serial ATA (SATA) are two commonly used data transfer protocols.

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