Industry Use Cases of Azure Kubernetes Service

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What is Kubernetes?

Modern applications are increasingly built using containers, which are microservices packaged with their dependencies and configurations. Kubernetes (pronounced "koo-ber-net-ees") is open-source software for deploying and managing those containers at scale — and it is also the Greek word for helmsmen of a ship or pilot. Build, deliver and scale containerised apps faster with Kubernetes, sometimes referred to as "k8 s" or "k-eights.

What is Azure?

Across industries, companies are investing in hybrid and multicloud technologies to ensure they have the flexibility to innovate anywhere and meet evolving business needs. Customers tell us a key challenge with hybrid and multicloud adoption is managing and securing their IT environments while building and running cloud-native applications. To enable the flexibility and agility customers are seeking to innovate

anywhere while providing governance and security, we created [Azure Arc](#) — a set of technologies that extends Azure management and services to any infrastructure. Today, we are announcing new Azure Arc innovation that unlocks more scenarios.
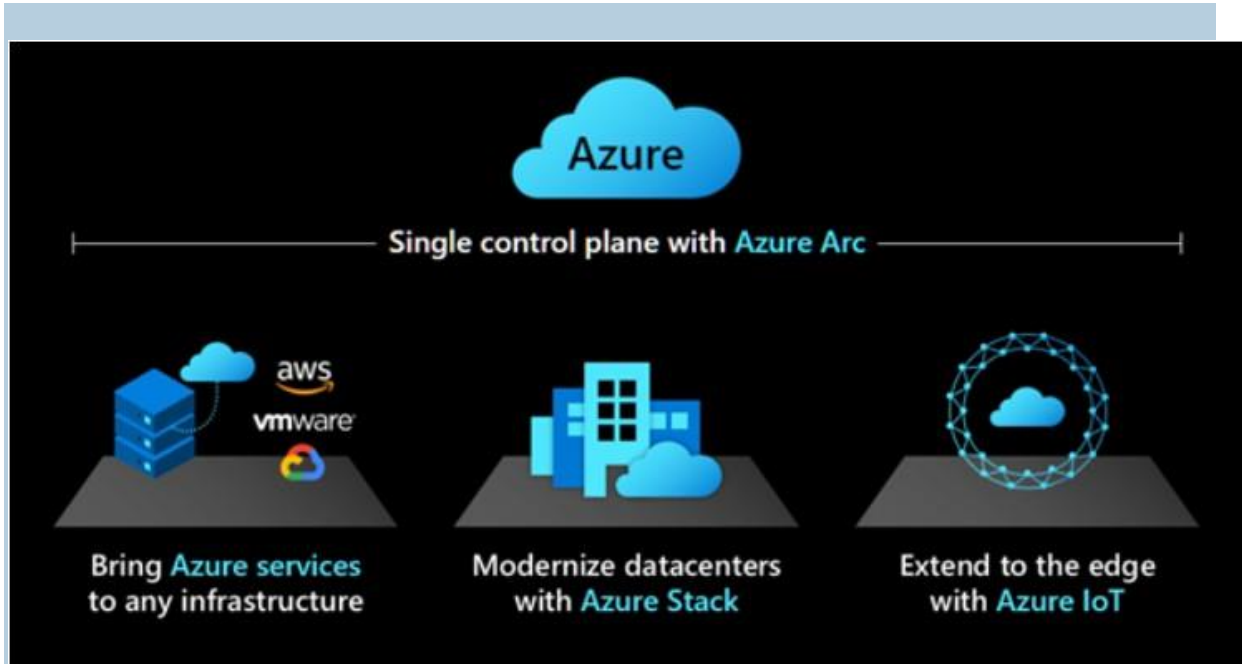
How Industry Uses Azure Kubernetes Services: 5 Companies Use Cases

Use any Kubernetes conformant with CNCF

We are committed to providing customers with choices and supporting their existing Kubernetes investments. Azure Arc is built to work with any cloud native computing foundation (CNCF) conformant Kubernetes distribution. To give customers more confidence, we've collaborated with popular Kubernetes distributions including VMware Tanzu and Nutanix Karbon, which join Red Hat OpenShift, Canonical's Charmed Kubernetes, and Rancher Kubernetes Engine (RKE) to test and validate their implementations with Azure Arc. We look forward to validating more partners in the future.

How Industry Uses Azure Kubernetes Services: 5 Companies Use Cases

How DevOps industry uses kubernetes? I have collected and summarized promising cases which are available here as well in greater detail.

Companies Who Uses Azure k8's Services

1. ***[Hafslund nett](#)***

2. ***[Maersk](#)***

3. ***[Siemens Healtineers](#)***

4. ***[Finestra](#)***

5. ***[Bosch](#)***

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1. Hafslund nett

Power grid operator uses containerized software to promote smart utility initiatives, improve customer service

Hafslund Nett (Hafslund) — the power grid operator that serves 1.5 million Norwegians — determined that legacy systems for reading meter data needed higher capacity and that externally developed software was difficult to manage. To address the issue, Hafslund chose to develop its own meter-system software, using Microsoft Azure as its cloud platform, Azure Kubernetes Service (AKS) to manage software containers, and Azure Monitor for containers to optimize container performance. Hafslund IT staff will soon save time managing their improved systems, and customers will benefit from higher reliability.

"We wanted a platform to speed development and testing but do it safely, without losing control over security and performance. That's why Azure and AKS are the perfect fit for us."

— Ståle Heitmann: Chief Technology Officer

Apply containerization and Azure Kubernetes Service

Based on experience with large-scale projects in other corporate divisions, Hafslund recognized the value of containerized applications and the efficiencies of scale that they offer. Working with Microsoft Partner Network members Aurum and Computas, Hafslund turned to [Microsoft Azure](#) and [Azure Kubernetes Service (AKS)](#) to create its own smart-meter software powered by efficient, industry-recognized tools.

Hafslund had used Azure on previous projects, so Heitmann knew the platform offers high performance and reliability. For example, he says, "We established highly secure networking between on-premises IT resources and Azure, which was a prerequisite for workloads we want to run with Kubernetes." Additionally, he notes that [Azure Active Directory](#) readily supports role-based access control on Kubernetes clusters, which is a security measure that aligns with the company's critical best practices.

Regarding AKS, Hafslund is planning for projects in the future that will benefit from containerization. The company is building a platform that uses AKS to support not only meter-reading but also most internally developed software covering three broad areas:

- Data integration — that is, microservices to implement representational state transfer (REST) interfaces used by an internal central data integration tool

- APIs that expose data both internally and externally

- Complex systems consisting of several interoperating services that interact directly with users

Emphasizing the point about the company's use of AKS, Heitmann says, "We are building *our own* new applications using microservices, and AKS is our choice for orchestrating their workloads."

Measure and monitor containers, manage builds and releases

Hafslund uses Azure Application Insights to gather application performance metrics and Azure Monitor for containers to monitor the performance of container workloads that are deployed to managed AKS-hosted clusters. "We found it easy to get Azure Monitor for containers up and running," says Heitmann. "The metrics and charts right out of the Monitor box are perfect to help us quickly tune our clusters and services and resolve technical issues."

For containerized software development, the company uses Azure DevOps (formerly Visual Studio Team Services) for all tasks related to software builds and releases. Specifically:

- Reusable libraries are built and released as NuGet packages.

- Docker images are built and published to [Azure Container Registry](#) for all microservices.

- Kubernetes YAML files are maintained in source code. (YAML is a structured data format.)

- Releases are automatically triggered when artifacts are published.

By using these Azure DevOps capabilities, Hafslund promotes efficient continuous integration/continuous deployment (CI/CD) practices that reduce development time, effort, and management.

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2. Maersk

Maersk uses cloud to spur development of containerized solutions built on Kubernetes

As part of its digital transformation efforts, shipping giant A.P. Moller — Maersk needed to streamline IT operations and optimize the value of its IT resources. Maersk adopted Microsoft Azure, migrated key workloads to the cloud, and modernized its open-source software, which included the adoption of Kubernetes on Azure. Maersk software engineers now spend less time on container software management and more time on innovation and value-added projects. The resulting business value is savings on resource costs, faster solution delivery time, and the ability to attract expert IT talent.

"Using Kubernetes on Azure satisfies our objectives for efficient software development. It aligns well with our digital plans and our choice of open-source solutions."

— Rasmus Hald: Head of Cloud Architecture

Maersk moves things — a lot of things to a lot of places. It's the biggest container-shipping company in the world. Shipping is a physical activity, but the company decided to make its operations increasingly digital. As Rasmus Hald, Head of Cloud Architecture at A.P. Moller — Maersk, puts it, "The Maersk strategy is to overlay physical container-shipping with digital services that strengthen customer engagement." He notes that achieving this level of transformation requires thorough analysis of huge amounts of data from cargo ships, ports, and the company's everyday activities worldwide.

Implementing a container strategy

As part of its overall cloud migration strategy, Maersk chose [Azure Kubernetes Service (AKS)](#) to handle the automation and management of its containerized applications. (A containerized application is portable runtime software that is packaged with the dependencies and configuration files it needs in order to run, all in one place.) AKS fully supports the dynamic application environment in Maersk without requiring orchestration expertise.

The company uses AKS to help set up, upgrade, and scale resources as needed, without taking its critical applications offline. "We want to focus on using containers as a way to package and run our code in the cloud, not focus on the software required to construct and run the containers," Hald says. "Using

Kubernetes on Azure satisfies our objectives for efficient software development. It aligns well with our digital plans and our choice of open-source solutions for specific programming languages."

Additionally, Maersk chose Azure over other cloud platforms because Azure offers a wider variety of available services and global scalability that supports the number and type of tasks the company wants to undertake. "The key question we ask is, 'Where does the cloud stop and where does our work begin?' For the Connected Vessel program, Azure made the most business sense, and it promotes agility," says Hald. "Just the fact that we're asking questions like this illustrates our paradigm shift to support digital transformation."

Freeing talent to create

These examples illustrate how important it is to Maersk to deploy IT engineers more effectively. "We want engineers to be an active part of our new way of working, which means spending their time and effort where it makes the most business impact," Hald says. "When topped with open source, Azure gives engineers freedom. Software developers have had enough of servers. They want to create. And we want them to." Combining advanced technology with this mindset also helps Maersk better attract talented engineers who value innovation and the opportunity to positively affect the business.

For example, with increased time and talent, Maersk engineers were able to address customer requests by adding additional shipment monitoring capabilities to the company's portfolio of solutions. Namely, they are in the process of building an Internet of Things (IoT) solution that will use AKS along with [Azure IoT Hub](#) to more closely monitor shipments and physical shipping containers (not to be confused with software containers governed by AKS), including conditions within the containers. "Running an IoT hub may not differentiate Maersk in the market but having a connected vessel — with a growing multitude of our services to support it — soon will," says Hald.

This project demonstrates the company's new agility, such as greatly reducing the time and bureaucracy required to get IT resources in place to start it. "Without Azure, it could be six months before we had the first server ready for developers on our Connected Vessel program," says Hald. "With it, we completed concepting, development, testing, and deployment in six months."

Hald summarizes the progress Maersk has made, saying, "Imagine solutions that harvest data that has never been available before — data that informs customers and ships' crews about the condition of their cargo. Imagine data that powers a model that *calculates* IoT locations even when physical devices can't be tracked. That's the world we'll soon live in, and Maersk will help make it possible."

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3. Siemens Healtineers

Siemens Healthineers moves more computing to the cloud to support value-based care development

Helping millions of patients benefit from better care? All in a day's work for worldwide healthcare technology company Siemens Healthineers. Siemens Healthineers is leading the digitalization of healthcare with its Digital Ecosystem, which helps health providers and solution developers bring more value to the delivery of care, ultimately improving the quality of insights derived from healthcare data. Siemens Healthineers uses Microsoft Azure to make solutions more accessible, and it uses Azure Kubernetes Service (AKS) and other tools for a fast, efficient, and competitive development pipeline.

"Using Azure Kubernetes Service puts us into a position to not only deploy our business logic in Docker containers, including

the orchestration, but also ... to easily manage the exposure and control and meter the access.”

— Thomas Gossler: Lead Architect, Digital Ecosystem Platform

Any time you interact with technology in a healthcare setting, there's a good chance you will encounter a solution from Siemens Healthineers. The Erlangen, Germany–based company provides a broad portfolio of leading-edge, high-quality medical technology that touches the lives of approximately five million patients every day. Siemens Healthineers uses the data gathered from its 600,000 systems running worldwide to generate insights that help healthcare providers realize new opportunities to increase value and improve clinical, operational, and financial outcomes.

Moving to the cloud for better applications while protecting patient health data

Providing solutions to a worldwide customer base can be complicated and of less value in regard to data-aggregation and analytics capabilities if systems need to be installed on-premises, so Siemens Healthineers relies on the cloud. “As a software development company, we see great value in cloud technology. With it, we can develop products for our customers that are accessible from anywhere, update products at any time in a seamless way for users, and provide a consistent user experience over a broad range of services,” says Spies.

But when it comes to healthcare information, deploying software in the cloud can be a tricky business because of specific security obligations. So, Siemens Healthineers thoroughly researched the options to ensure that its customers would be comfortable with its cloud platform. Ultimately, Siemens Healthineers selected [Microsoft Azure](). "Countries around the world consider patient health data sensitive personal information," explains Thomas Gossler, Lead Architect, Digital Ecosystem Platform, at Siemens Healthineers. "There are differences in legislation and regulations, but everyone agrees that the data needs to be handled with care and a high level of technical security and privacy assurances. Microsoft has earned a large number of certifications for certain Azure regions, and this helps reassure our customers that a public cloud environment can be as secure as any other on-premises datacenter."
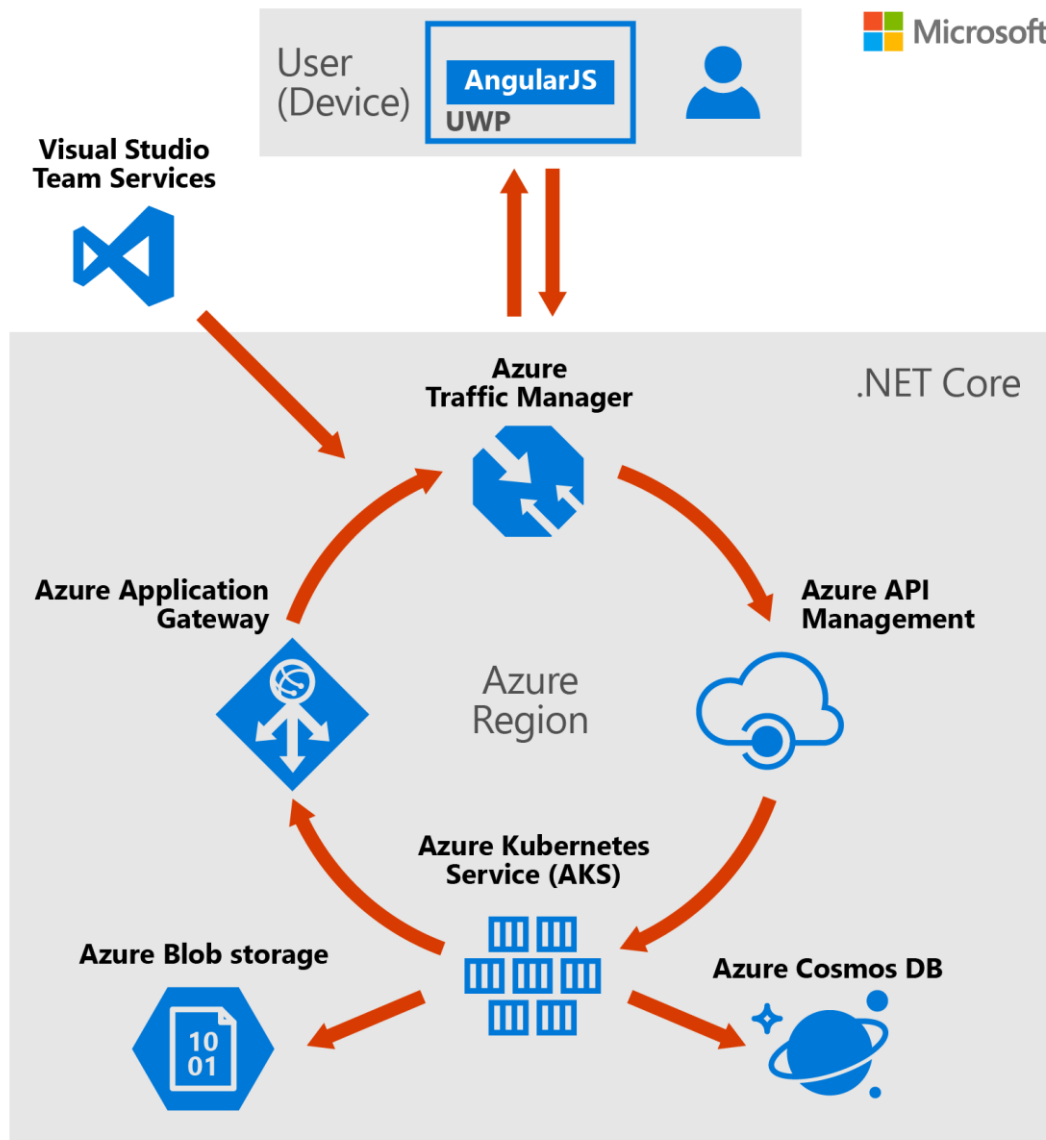
Using Azure services to streamline development processes

Siemens Healthineers has taken a containerized approach to application development, which means it uses virtualization at the application operating system level as opposed to launching virtual machines. The company deploys its distributed applications in Docker containers, orchestrates those containers using Kubernetes, and monitors and manages the environment

with [Azure Kubernetes Service (AKS)](#). Siemens Healthineers chose AKS because developers can quickly and easily work with their applications with minimal operations and maintenance overhead — provisioning, upgrading, and scaling resources without taking applications offline. With AKS, Siemens Healthineers can comfortably scale out its Kubernetes environment and scale back again if it doesn't need the compute power, creating very high-density deployments on a microservices level.

"Using Azure Kubernetes Service puts us into a position to not only deploy our business logic in Docker containers, including the orchestration," says Gossler, "but also, through application gateway and API management, to easily manage the exposure and control and meter the access continuously."

Managing a stable runtime environment with AKS helps Siemens Healthineers realize shorter release cycles and achieve its desired continuous delivery approach. Highly regulated environments like healthcare typically require many steps to go from development to public release, but implementing a continuous delivery pipeline has simplified the process and helped Siemens Healthineers achieve the speed it wants. And when rolling out new software, the company appreciates that it doesn't have to worry about breaking its production environment, due to AKS upgrade and failure domains — new releases get deployed smoothly to customers with zero downtime. "With numerous competitors, big and small, entering the healthcare market, we need to accelerate delivery of

improved functionality and new features to our customers to stay ahead of the competition," says Gossler.

Delivering applications that optimize the business

The company's use of Azure services has a direct impact on the development life cycle, but those improvements benefit the business side as well. Siemens Healthineers is reducing the total cost of ownership of its production workloads, creating more flexibility in the business models and pricing structure it can offer its customers.

"This is about economies of scale," explains Gossler. "By operating the infrastructure at low cost and high availability, which we're able to do with Azure, our customers benefit directly. And by incorporating technologies like Kubernetes, a well-known open-source environment, we are enabling partners to bring their own applications and software into our system so that together we can offer more and better solutions to our customers worldwide. We've been working with Azure for three-and-a-half years, and I'm reassured time and time again that Microsoft is able to provide us with the technology we need to keep moving forward. I'm looking forward to continuing this relationship."

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4. Finastra

Finastra pioneers next-generation fintech ecosystem, powered by Microsoft Azure

With offices in over 60 countries, 10,000 staff and revenue exceeding $2 billion, Finastra is a significant Fintech force. Already an established leader in financial software and cloud solutions, its first platform offering, FusionFabric.cloud, launched to public cloud in June 2018.

"Our platform intersects a great deal of data and technology, yet our complete integration with Azure streamlines our infrastructure, simplifies our processes and makes our lives infinitely easier."

— Félix Grévy: Global Head of Product Management

FusionFabric.cloud is Finastra's ground-breaking Platform as a Service (PaaS) development ecosystem that is revolutionizing the future of banking. Banks, financial technology (fintech) providers, independent developers and Universities are leveraging its collaborative, open source environment to author innovative new applications for retail and corporate banking, payment processing, lending, treasury and capital markets. The result is banks and financial services institutions can quickly implement new product innovations on top of existing systems, in a secure environment, at significantly reduced operating costs.

Creating a development ecosystem

With fintech gaining momentum, Finastra seized the opportunity to champion collaboration and opened its core systems to third party development. Félix Grévy, Global Head of Product Management at FusionFabric.cloud explains, "Our goal was to create an ecosystem of development partners to deliver applications quickly and at low cost. At the same time, our customers would be able to leverage fintech innovation in our familiar and stable workflow environment."

Embracing Azure Kubernetes Service

Kubernetes is at the heart of the FusionFabric.cloud platform, allowing the orchestration of Docker containers. Fintech applications can run and scale with ease on Azure Kubernetes Service (AKS), the next-generation service that builds on the Azure Container Service Engine (ACS). Currently on an ACS-

engine, Finastra plans to migrate to AKS. AKS brings a fundamental benefit to the development team at Finastra, as Grévy explains, "AKS gives us a pure Kubernetes and Docker imaging environment that we don't have to manage ourselves. Our team has regained the resources to accelerate deployment and maximize our PaaS offering."

The team uses Azure Container Registry (ACR) to simplify container development, while geo-replication helps run disaster recovery procedures for different locations. The ACR can also audit whether data residency is running in the same jurisdiction as the banks. Inbuilt application auto scaling allows the team to manage cost burden and react quickly to meet spiked demands of partners and customers.

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5. Bosch

Bosch increases vehicle safety using map-matching algorithms and Azure Kubernetes Service

Bosch has partnered closely with the world's automakers for decades. The company continues to develop networked safety and assistance systems that support drivers today and pave the way for fully automated driving.

When the product team brainstormed the idea to solve the problem of wrong-way driving, they did not know whether it was technically possible. For such a service to work commercially, it had to locate vehicles in real time with pinpoint precision.

Smartphones or an onboard connectivity unit can anonymously record GPS coordinates and can send that location data to the

cloud if the device is in a hotspot area, but GPS satellites broadcast their signals in space with only limited accuracy. What is received depends on many factors, including satellite geometry, signal blockage, atmospheric conditions, and the design and quality of the receiver. For example, GPS-enabled smartphones are typically accurate within a 4.9-meter (16-foot) radius under open sky.

"Using AKS was a strategic decision. We looked for a managed orchestrator so we could offload the work of patching, upgrading, and production-level services. That's why we chose AKS — and it's a very open, flexible platform."

— Hai Dang Le: technical lead

The Bosch team had to solve two major issues: first, to get the last piece of information out of the noisy sensor data; and second, to develop a highly scalable and ultra-flexible service to process the data in near real time. The question was how to build a real-time data ingestion and processing pipeline capable of returning notifications to drivers within seconds. Bosch Technical Lead Hai Dang Le developed a proof of concept using only a small technology stack, adding, "We really went for it!"

The problem was speed. The team assumed that devices emitting location information, such as smartphone apps and automotive head units, could eventually send thousands of data points to the solution per second, from all over Europe and eventually other countries. Bosch needed lightning fast compute

capable of filtering events and pushing a notification back to an end device within 10 seconds — the time estimated to make the solution viable.

The team decided to offload the work of scaling and cluster maintenance to a managed service in a public cloud with a global reach. Thanks to the trusted partnership Bosch had with Microsoft, Azure Kubernetes Service was the obvious choice. A team of Microsoft cloud solution architects worked closely with Bosch engineers, who provided valuable feedback to Azure product teams. Microsoft continues to work with Bosch teams around the world. Working together, they devised a solution that produced the speed Bosch needed.

The key was orchestration. By orchestrating the deployment of containers using AKS, Bosch would get repeatable, manageable clusters of containers. Bosch already had a continuous integration (CI) and continuous deployment (CD) process to use in producing the container images and orchestration. The result: increased speed and reliability of deployments.

"We were looking for a cloud option where we could run our core business logic with zero changes on top of a new infrastructure," explains Le.
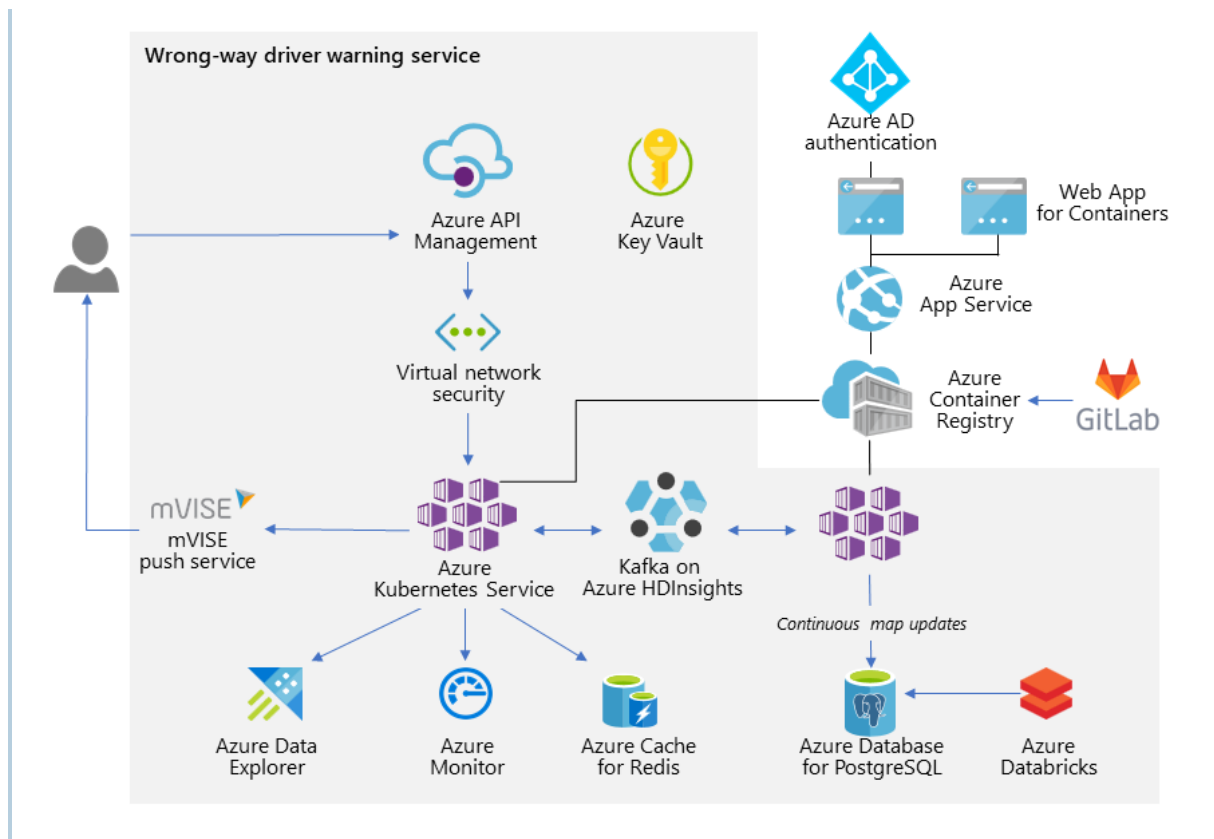
An architectural overview of the Bosch wrong-way warning driver service on Azure

AKS also offered the simplicity of a managed Kubernetes service in the cloud. It provided the elastic provisioning that Bosch wanted, without the need to manage its own infrastructure. In addition, the developers did not have to rethink all their design decisions. Instead, they could take the core business logic developed on-premises using the open-source tools they knew and run the solution virtually as is, within a faster infrastructure with a worldwide reach. The developers can deploy self-managed AKS clusters as needed, and they get the benefit of running their services within a secured network environment.

In addition, by running their solution on Azure and AKS, the average time to calculate whether a driver is going the wrong way could be improved to approximately *60 milliseconds.*

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That's all

- [Azure Kubernetes Service](#)

- [Industry Use Case](#)

- [Aks](#)

- [Azure Devops](#)

- [Azure Services](#)

[How To Increase Static Partition in Linux Without Disconnect](#)

Partition Storage Increase On The Fly With Data

Basically, there are two mainly memory management techniques : Contiguous and non-Contiguous. The major difference between Contiguous and Non-contiguous memory allocation is that the contiguous memory allocation assigns the consecutive blocks of memory to a process requesting for memory.

Static partition is part of the contiguous memory. This is little bit old method but still use it a lot. Let's start without wasting time.

First we'll take a hard disk and connect it with storage. As you can see, I have connected 1 GB of hard disk.