Building an agile and trusted SAP environment on Microsoft Azure

SAP is the backbone of our digital transformation. Like many enterprises, Microsoft uses SAP—the enterprise resource planning (ERP) software solution—to run the majority of our business operations. And we’re the only cloud provider that runs SAP on our own platform. At Microsoft, we’re running SAP on Azure—the preferred platform for SAP and the best platform for digital transformation. Azure is tested, proven technology that we trust for our mission-critical systems and by migrating SAP to Azure, we’ve gained business and operational benefits that make our SAP environment agile, efficient, and able to grow and change with our business. Specifically, we have:

- **Optimized our cost savings.** We’ve seen approximately a 15 percent cost savings when moving from our on-premises physical and virtual servers to Azure.
- **Increased agility and scalability, while maximizing system uptime.** In the cloud, we can allocate virtual machines, change virtual machine sizes, and initiate failover processes within minutes.
- **Learned more about how to efficiently run our processes and operations in Azure.** We migrated SAP to Azure to create a more efficient environment for SAP and improve our overall SAP operations metrics, and we were able to do so and ensure that our data was secure.

Microsoft now has an SAP instance of 100 percent in the cloud, and it’s more secure than ever. To learn more about our journey to Azure, visit [Hello Azure: Unpacking how Microsoft moved its SAP workload to the cloud](#). Running SAP on Azure also puts us in the position to leverage the breadth of Azure functionality and integrated SAP features as our business grows and changes. Azure makes SAP better.

**SAP at Microsoft**

SAP is how business gets done at Microsoft. Our SAP environment is critical to our business performance and is integrated into most of our business processes. SAP provides functionality for human resources, finance, supply chain management, commerce, and other enterprise services at Microsoft. We use a wide variety of SAP applications—including ERP/ECC, E-Recruiting, GRC, GST, CPM, SCM, OER, MDG, and SMG, among others.

**Figure 1. SAP use at Microsoft**

The infrastructure that powers SAP at Microsoft is immense. Our global use of SAP and the infrastructure necessary for that use generate some pretty significant numbers.
Our SAP environment includes around 600 servers, and for ERP/ECC, our largest SAP application, the numbers look like this:

- A 16 TB of compressed database (equivalent of 50 TB uncompressed)
- 110,000 internal users.
- 6,000 named user accounts.
- 300,000 monitored jobs per month.
- Up to 270 million transaction steps per month.
- Up to 10 million dialog steps per day.

The SAP and Microsoft partnership

We started our journey with SAP at Microsoft in 1993. Through the almost 25 years of working with SAP and growing our business partnership, we’ve come to depend on SAP for our most important business needs and have developed a two-way relationship with SAP that allows both companies to take advantage of each other’s technology. Our relationship with SAP consists of three important aspects:

- Go-to market provider. Microsoft is a member of the S/4HANA and SAP HANA extended alliance. Microsoft and SAP have worked together to jointly market interoperable technology solutions for years. 90 percent of Fortune 500 companies are running on Microsoft cloud technologies and 85 percent of Fortune 500 companies are running SAP.
- Technology partner. Microsoft and SAP have worked together for years. Together, we share the largest partner ecosystem in the world. Our development is co-located in both Walldorf, Germany and Redmond, Washington, USA. Microsoft has been a certified platform for SAP solutions since 1994.
- Customer. SAP has been a strong Microsoft customer for more than 20 years. In fact, they’re one of our top global customers. SAP’s 84,000-person workforce is powered by Microsoft technologies and their extensive internal use helps us build the best offerings for customers.

Running SAP

Historically, we’ve run SAP at Microsoft on infrastructure hosted in our datacenters on a combination of physical and virtual hardware. With around 600 servers in the environment, SAP infrastructure maintenance and governance has always been a big job for us. Maintaining a datacenter-based solution for SAP involved big infrastructure, in physical numbers and in raw computing power.

Drivers for change

Running SAP in the datacenter presented us with several day-to-day challenges that we faced:

- Infrastructure costs were high. As our need for SAP solutions has grown, so has the infrastructure that supports these solutions. Standard datacenter operations needs, such as power and climate control, contribute to our operational costs. The purchase and procurement of the hardware presented significant capital costs, and redundancy, backup and disaster recovery solutions added to that. Infrastructure maintenance, including hardware and software maintenance, backup procedures, and management tasks further added to operational costs.

- We had to build our system to support peak load. The pace of our business changes throughout the year, month, and even day. When demand required that our SAP infrastructure had a high capacity for computing throughput, whether storage input/output (I/O), raw CPU power, or transaction processing speed, the infrastructure had to have enough resources to meet the demand, so we built our systems with peak use in mind. However, peak use was often infrequent and much of our infrastructure ended up underutilized.

- Our on-premises infrastructure was hampering digital transformation. We’re actively engaged as a company in digital transformation—building and adopting agile and flexible technology solutions that grow with and enhance our business, rather than dictate it. In other areas of the company, a DevOps culture change effort was
leading to more agile development, providing ubiquitous, up-to-date business solutions, and supporting a modern workstyle where our employees could do their work where and when it suited them best. Our on-premises SAP solution simply did not allow us to do this.

Creating the best SAP environment with Azure

Azure is the preferred platform for SAP. As the top SAP certified cloud provider, Azure enables us to reliably run our mission critical SAP environment on a trusted cloud platform built for enterprises. Azure meets our scalability, flexibility, and compliance needs, and we can do more with SAP on Azure because of the expanded partnership between Microsoft and SAP. We can run the most complete set of SAP applications across dev-test and production scenarios in Azure—and be fully supported. Azure is certified for more SAP solutions than any other cloud provider, including solutions like SAP HANA and S/4 HANA, SAP Business Suite, SAP NetWeaver, and SAP Business One to name a few.

Azure also carries a large number of benefits when hosting the SAP platform, including:

- The strongest and most diverse portfolio of cloud services: software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS).
- Full support for a diverse set of on-premises to cloud migration strategies.
- World-wide region coverage with 54 Azure regions across the globe.
- Deep integration with Azure Active Directory and single-sign-on capabilities with SAP Cloud.

For more information, go to SAP on Azure at Azure.com.

Goals and drivers

We wanted Azure on SAP to be a complete platform solution with the aspiration of 100 percent of our SAP infrastructure running on Azure. At a high level, there were several goals we wanted to achieve for the SAP on Azure migration. These were platform goals that we wanted SAP on Azure to fulfill to better meet our business needs and fit into these important enterprise scenarios:

- **Operate the SAP ecosystem.** Deliver and scale SAP easily and efficiently while optimizing the landscape and improving service levels with Azure.
- **Grow the SAP ecosystem.** Introduce change on SAP systems with an approach that drives agility and productivity. Solve new business challenges with the combined suite of SAP, Azure, Office 365, and Business Analytics and Insights.
- **Take advantage of SAP and Azure integration.** Enable end-to-end business process integration and data insights through secure scalable data integration and extraction patterns.
- **Create a secure and compliant SAP ecosystem.** Secure and protect sensitive SAP data in an industry-recognized manner while meeting compliance and regulatory requirements.

Migration

Migration to Azure was a big job, but not as big as it could’ve been. Because we were already using server virtualization in our on-premises datacenters, we were able to leverage the virtualized state of our infrastructure into a new virtualized state in Azure with minimal change to the server operating system (OS) and OS level configuration, or overall configuration of SAP applications. We used a “lift-and-shift” strategy to take servers from the on-premises environment and re-create them as Azure virtual machines that had roughly the same available resources and configuration.
Assessing migration strategies

Our migration, like most Azure migration patterns we’ve experienced in the past, was a phased operation. We took two approaches to system migration, horizontal migration, and vertical migration:

- **Horizontal migration strategy.** Horizontal migration involves migrating multiple applications at once that exist within a single environment, as indicated in Figure 2. Because we run several test and development environments, we were able to use the horizontal strategy on these environments as test cases or mini pilot-migrations. We found the horizontal strategy best suited for initial experimentation and migration of low-risk, low impact systems. The horizontal strategy allowed us to redefine our operational, deployment, and approval processes for subsequent SAP to Azure migration phases.

- **Vertical migration strategy.** Vertical migration involves taking an entire application, across all environments, and migrating to Azure. Our migration processes used the vertical strategy to adjust our internal processes for Azure and train team members. It was also great way to spot any issues in production early on.

![Figure 2. The simplified SAP landscape in Microsoft](image)

In the figure, the rows, columns, and blocks illustrate the horizontal and vertical strategies that we use for our SAP landscape. Here are some things to note:

- Typically, enterprises have SAP systems for business functions like sales, global trade, supply chain management, business intelligence (BI), and others. Within those systems are environments like sandbox, development, test, and production.

- Each row (the horizontal dimension) in the figure is an environment. Most companies have sandbox, development, test, and production environments, and possibly business continuity. Larger companies might have more.

- Each column (the vertical dimension) is an SAP application for a business function (for example, ERP and BI).

- The rows or layers at the bottom are environments of lower risk and are less critical. Those toward the top are higher risk and more critical. As you move up the stack, there’s more risk involved in the migration process. So, production is our most critical environment, and user acceptance testing (UAT)—which we also use for business continuity—is our second most critical.

- The systems at the bottom are smaller, in that they have fewer computing resources, lower availability and size requirements, and less throughput. However, in most cases, they have the same amount of storage as the production database.

Adoption

Adoption of SAP for Azure began before a single server was migrated. There’s an important set of steps that we follow with all our Azure migrations at Microsoft, and this is how they applied to SAP.
1. **Decide what we could retire.** Of our systems running on over 600 servers/virtual machines, were there ones that we weren’t using often or that had few users? Could we consolidate functionality into one app? It was the perfect time to streamline, right-size, and eliminate physical servers and on-premises virtual machines. To assess our SAP requirements for Azure, we looked at performance and capabilities of our physical servers and virtual machines.

2. **Decide what we could replace.** We looked to see if there were systems that we could replace with a SaaS solution. For example, SAP has SaaS solutions like Concur, SuccessFactors, Ariba, and others. Microsoft has SaaS products like Dynamics CRM Online that provide integration into SAP business processes.

3. **Migrate.** Migration is a big step, and we focused on using lift-and-shift to migrate our SAP environment to Azure quickly and effectively. To learn more about our SAP to Azure migration, see [Strategies for migrating SAP systems to Microsoft Azure](#).

4. **Optimize in Azure.** This step is where we made some significant improvements through two processes: right-sizing and tight-sizing.

**Optimizing SAP on Azure**

Optimizing SAP on Azure involves calculating our hardware requirements like CPU resources, storage space, memory, I/O, and network bandwidth. When optimized, we sized to match ongoing demand. We optimized our infrastructure, resources, and costs, and then sized the virtual machines to meet the current resource demand. As demand increases and decreases, so do the virtual machines. We’re working to fully automate this process within SAP on Azure to allow full-platform auto-scaling as conditions change.

Optimization plays a huge part in gaining business and cost efficiencies with SAP on Azure. Because our systems can scale up and out to meet demand in a rapid fashion, we no longer experience underutilized resources in our high-performance systems. Likewise, when demand is low, our systems scale down to minimize resource usage and save costs.

To learn more about how we optimized SAP on Azure, see [Optimizing SAP for Azure](#).

**Running SAP on Azure**

As of February 2018, 100 percent of our SAP applications run on Azure at Microsoft. Our SAP migration is complete and our ongoing optimization efforts are continually decreasing our operating costs and increasing efficiency and reliability for our SAP ecosystem. Figure 3, below, summarizes our SAP usage.

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**Figure 3. SAP on Azure**

[microsoft.com/itshowcase](microsoft.com/itshowcase) | May 2019
With virtual machine SKUs big enough to handle a Microsoft-sized SAP ERP system, Azure hosts the largest-scale virtual machines in cloud computing. With the flexibility and scalability of the Azure infrastructure in mind, the Azure team developed the M-Series specifically to address the enterprise market demand for larger virtual machines capable of running SAP landscapes at companies just like Microsoft. With Azure M64s and M128s SKUs in hand, we were able to migrate our largest and most complex SAP systems to Azure over a weekend.

**SAP SaaS solution integrations**

We’re also using SAP SaaS solutions integrated with our SAP on Azure deployment. We’re using the following SaaS modules alongside SAP on Azure:

- Integrated Business Planning
- Success Factors for learning and succession
- Ariba for sourcing and direct networking
- Concur for travel and expense management

**Benefits**

There are many benefits of SAP on Azure. Some of the more tangible benefits we’ve experienced from migrating and optimizing SAP for Azure include:

- **Lower total cost of ownership.** We pay for only what we need, when we need it. We save on costs of unused hardware and ongoing server maintenance. We’ve experienced a 15 percent decrease in overall cost.

- **Minimum risk and downtime.** With Azure, we have the ability to instantly scale and build out infrastructure. For example, if we need to build out a virtual machine in parallel, we simply bring up another virtual machine, temporarily duplicate the virtual machine, do any required installations or upgrades on the new virtual machine, and remove the old virtual machine. If we need the old virtual machine, we can use it and decommission it later. We can quickly switch between the old and new virtual machines with virtual server names in Windows Server. The SAP application layer knows only the virtual server/alias name, and it doesn’t have to be reconfigured when the name is moved between virtual machines.

- **More agility and time savings.** We can deploy a system architecture with one or more virtual machines, storage, and virtual networks, and quickly adjust sizing. When we adjusted the size of our virtual machine for our archiving system, we did it in minutes instead of weeks it would take to set up on-premises hardware. We quickly scale up for high performance requirements—and afterward, we rapidly scale down again to save costs.

- **More self-sufficient.** We don’t have to rely on other teams for hardware or resources. We quickly add virtual machines and adjust resources as we need them.

- **Easier processes.** Maintaining our SAP apps in the cloud has simplified many of our processes. For example, we don’t wait weeks for physical hardware or on-premises virtual machines, and we have end-to-end visibility for our SAP environment.

**Lessons learned**

Along with tangible benefits, we’ve also learned a few things along the way that could help you if you’re considering SAP on Azure for your company:

- Understand migration strategies and how they can be best applied to your environment. Understanding what to move and when is a big part of moving SAP to Azure. The horizontal and vertical strategies discussed in this article give you practical, business-friendly guidance on migration strategies.

- Consider optimizing your SAP environment before and after moving to Azure. Although we’ve talked a lot about Azure-native optimization, you can also optimize your environment before migrating by ensuring that retired systems aren’t migrated, your SAP infrastructure inventory is accurate, and your DRP strategies are tested and in place. You don’t want to waste migration time on systems or data that you don’t need.
• Be mindful of real time latency-critical traffic between SAP Systems – they may have to move as one. This also applies to upstream and downstream applications and services.
• Determine Azure region strategy before moving. Azure regions have truly global reach, so make sure that your resources are hosted in an Azure region or regions that provides the best connectivity for your company.
• Ensure SAP third party or custom applications such as tax calculation engines are certified for Azure and/or properly tested.
• Archive and compress databases. Database space for SAP can be immense, and Azure resources can be used very efficiently to lower the storage space used and the cost associated with it.

Moving forward

We're continuing to grow SAP on Azure in many ways. Along with ongoing optimization efforts, we're beginning to leverage other Azure IaaS and PaaS functionality to create an even more agile, stable, and cost-effective platform for SAP on Azure. We're building automation and reusability into the platform to enable more efficient deployment and snoozing.

Azure provides so many opportunities to make SAP even better. We're also working using Azure Machine Learning to create intelligent behavior within the platform like invoice error prediction and resolution. We're examining Azure Data Lake for opportunities to handle our SAP data more efficiently and gain greater insight into what our SAP data can tell us. There's a lot coming for SAP on Azure, and we're excited to take advantage of all of it. To stay informed with updates on the Microsoft SAP on Azure solution, go to Azure.com.

By running SAP on Azure, we’re future-proofing our SAP footprint, and this enables additional options for us like running S/4 HANA. Azure provides the largest scale cloud infrastructure anywhere, and its built for SAP HANA. We're also continuing to incorporate SAP SaaS solutions into our Azure based platform, creating SAP and Azure cloud secure interfaces and other next-generation SAP solutions.

We're working on moving our production SAP systems to Azure Availability Zones for improved resiliency. Azure offers an easy and quick way for you to migrate your VMs to Azure Availability Zones with no additional cost.

We're running SAP on the preferred platform for SAP: Microsoft Azure. With SAP on Azure, our technology platform can adapt to our business needs and grow as our business changes. We're more business efficient, more cost efficient, and better on Azure, and you can be too.

Lift and shift your SAP apps to Azure. You'll immediately get speed, scale, and cost benefits of the cloud. Start your company’s journey to SAP on Azure by signing up for your free Azure trial today.
For more information

Microsoft IT Showcase

microsoft.com/itsshowcase

Hello Azure: Unpacking how Microsoft moved its SAP workload to the cloud

Optimizing SAP for Azure

Strategies for migrating SAP systems to Microsoft Azure

Running SAP Applications on the Microsoft Platform

Using Azure for hosting and running SAP workload scenarios

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