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Deploying SAP S/4HANA in AWS, Google Cloud, and Azure

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Foreword by Alexander Zeier

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To our families, colleagues, and friends.

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About the Authors

André Bögelsack works as Managing Director for Accenture in Switzerland and supports customers of all industries in moving their SAP systems into the cloud and operating those systems in a cost-efficient way on Hyperscaler Cloud platforms. He received a PhD from Technische Universität München in the area of SAP.

Utpal Chakraborty works as Manager for Accenture in India and serves multiple clients across the industries. His main focus is migrating and operating SAP S/4 systems in the Hyperscaler Cloud. He combines a strong understanding of the technology of public clouds as well as SAP technology, which helps to mitigate common risks to such projects.

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Foreword

The constant technological change and the compulsion to digitize have never been more evident than in the past two years when the Corona pandemic changed work habits drastically. It was at this point that Chief Information Officers (CIOs) became Chief Digitization Officers with new challenges and new demands from the wider world of work.

All those CIOs who had already consistently focused on digitization before Corona and had understood the technical change not as a challenge, but as an opportunity, could consider themselves lucky. The companies that had already focused on high flexibility and scaling before the pandemic and had already moved their IT systems to the public cloud were well prepared. They were able to pass on the full potential of the public cloud to their employees.

With the same speed that the Corona pandemic drove cloud adoption, CIOs must now address the second major IT challenge: SAP S/4HANA. The shift from traditional SAP ERP systems to a digital core based on SAP S/4HANA is a daunting task in many organizations and requires close collaboration between business and IT departments.

By combining the use of public cloud services with the transformation to SAP S/4HANA, companies open up new possibilities. Business processes can be redesigned and made more flexible, and companies create a new, highly flexible technological platform for the continued success of the company.

This book shows how companies can easily build a new technical platform for future SAP S/4HANA systems in the public cloud. However, the book does not limit itself to just one of the major public clouds but describes the three most important market players: Microsoft Azure, Amazon Web Services, and Google Cloud. The reader thus receives a comprehensive overview of the individual public clouds and learns how those can best be used for SAP S/4HANA systems.

The book is a must-read before implementation for all companies that are not yet using SAP S/4HANA and are yet to create this technical platform. It is also suitable for all those companies that are already in a public cloud but still want to gain inspiration and see how other companies are making this transition.

I am pleased that the authors have summarized the topic so comprehensively but succinctly in one book. The technical depth is remarkable and reflects the importance of the topic. The book will help you, dear reader, to answer the important questions regarding the deployment, migration, and operation of SAP S/4HANA systems in the public clouds. I hope you enjoy it!

Prof. Dr. Alexander Zeier
1. Cloud Fellow
CTO ASBG
Global Managing Director
Accenture GmbH

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André Bögelsack, Utpal Chakraborty, Dhiraj Kumar, Elena Wolz, Johannes Rank, and **Jessica Tischbierek**

Introduction

The public cloud has existed for more than ten years, and it is impossible to imagine the current IT landscape without it. Many well-known companies rely on services from the public cloud to strengthen their IT, and Hyperscalers now form the backbone of many companies from a wide range of industries. Millions of customers and consumers of the companies use websites or order portals, which are operated on one of the large public clouds, in their daily operations.

SAP systems represent the neuralgic points in the IT operations of companies. Production lines come to a standstill or trucks can no longer leave the warehouses if SAP systems fail. Hardly any other IT system has this importance in today's world. Nevertheless, more and more companies are moving SAP systems to the public clouds. This is done due to cost pressure, pressure to innovate, or simply to expand capacity.

Goal of the Book

With the current pressure among all SAP customers to jump to the new generation of SAP S/4HANA systems, the topic of public clouds is also gaining momentum. Companies are taking advantage of this S/4 momentum to migrate to a public cloud in addition to transforming to SAP S/4HANA.

This book will introduce you to several points of public clouds and SAP S/4HANA systems. Here, in addition to the theoretical constructs, the practical implementations are also shown. The book enables you to directly implement and provision a new SAP S/4HANA system on one of the three big public clouds: Azure, AWS, and Google. The chapters are structured identically, and thus the necessary steps for setting up and operating SAP S/4HANA systems can be compared between the public clouds.

In all chapters, the authors provide real-world examples to make the content tangible and applicable. The book will detail the following aspects:

- The emergence of public clouds and the three largest Hyperscalers: Microsoft Azure, Amazon Web Services, and Google Cloud
- The offerings available from SAP for the use of cloud services

- The architecture of SAP S/4HANA systems
- The key drivers and use cases for SAP S/4HANA systems on a public cloud
- The provisioning and operations of SAP S/4HANA systems on the three main public clouds: Microsoft Azure, Amazon Web Services, and Google Cloud

After completing all chapters, you will know what to look for when deploying public clouds and how to efficiently run SAP S/4HANA systems on public clouds without getting out of line with the effort required to run them or, alternatively, the cost of running them on public clouds.

Organization and Structure

The book guides you through the typical life cycle of an SAP S/4HANA system, highlighting the important aspects of selecting a public cloud, provisioning SAP S/4HANA systems, and operating them on the public clouds:

- Chapter 1 provides an overview of the most important terms, such as private, public, and hybrid clouds. It also presents the three most important public clouds in detail and outlines the current market of cloud providers with, for example, the IBM Cloud. Chapter 1 then sheds light on SAP's cloud strategy, the SAP RISE program, as well as the SAP HANA Enterprise Cloud, which is present in the market as a private cloud.
- Chapter 2 describes the architecture of the SAP S/4HANA systems, which will later be taken up again and again in the following chapters. It also contains the important aspects for operating SAP S/4HANA systems on the public cloud, such as sizing, backup, high availability, and automation. The following chapters on the respective public clouds show the implementations of these points.
- Chapter 3 describes the general procedures for deploying and migrating SAP S/4HANA systems and explains, for example, points such as greenfield and brownfield deployments, but also shows possible migration scenarios for the systems. It also discusses the most important factors when selecting a new Hyperscaler.

- Chapter 4 is the first part of the book to describe the deployment of Amazon Web Services. To this end, the chapter first explains the most important terminology, which is AWS specific. It goes into the types of machines available, but also explains the basic concepts of networking and storage.
- Chapter 5 is the practical part on AWS and shows how to create and control an SAP S/4HANA system on AWS. For this purpose, the chapter shows the system to be implemented and then describes the steps that can be taken to build the system on AWS. The important typical use cases, such as recovery after a disaster case, are described successively.
- Chapter 6 is the first chapter on Microsoft Azure and describes how Azure can be used as a public cloud solution and which important basic concepts exist for the operation and provisioning of SAP S/4HANA systems.
- Chapter 7 builds on the foundation previously established in Chapter 6 on Microsoft Azure and illustrates the provisioning of a new SAP S/4HANA system and shows the implementation of the important use cases from Chapter 2.
- Chapter 8 highlights the important concepts and architectures of Google Cloud and describes how SAP S/4HANA systems are scheduled in Google Cloud.
- Chapter 9 uses the previously described concepts of the Google Cloud to show the concrete implementation of an SAP S/4HANA system in the Google Cloud.
- In the concluding chapter, Chapter 10, all the important points from the previous chapters are summarized, and an outlook is given on developments in the coming years.

After completing all chapters, you, dear reader, will have a comprehensive overview of all aspects of the topic "SAP S/4HANA systems on Hyperscaler clouds" and will know how to plan, conceptualize, implement, and control these systems on public clouds.

CHAPTER 1

Introduction to Public Cloud and Hyperscalers

Before entering the world of SAP S/4HANA systems on the public cloud, this chapter first describes the basic features of cloud computing and introduces the most important terms. This makes it easier to understand the rest of the book.

Important Features of Public Cloud

Cloud computing emerged in the mid-2000s and was developed on the basis of excess capacity in data centers. Originally, the approach was to allocate excess computing capacity to other customers. The goal was to achieve consistently high utilization throughout the year.

Cloud computing is, on the one hand, about a new way of delivering services to customers and businesses. For example, cloud services and services from the cloud can be used *without major prior contract negotiations*. Only the general terms and conditions (GTCs) have to be accepted and a valid payment option has to be deposited, and then the services can already be used.

On the other hand, cloud computing is an important factor in *innovations* and the introduction of completely new services. In the meantime, not very much has remained of the original idea of making surplus capacities available. Cloud providers are constantly making new services available and regularly also new versions of the services. Customers benefit from this because new services do not have to be explicitly requested but come automatically with the use of the cloud.

In addition to the *simplicity* of using the services and the very high level of innovation, another point is in focus. In principle, the cloud knows no limits, and so customers and companies can assume limitless capacities in a cloud. This distinguishes clouds from conventional providers, where resources are usually limited.

A. Bögelsack et al., *SAP S/4HANA Systems in Hyperscaler Clouds*, https://doi.org/10.1007/978-1-4842-8158-1_1

The *high scaling* of the clouds, that is, the large number of customers, means that the economy of scales applies in full. Here, customers benefit from providing the same services to other customers and achieving a very low price.

If the most important features of a cloud are summarized, the following characteristics are the key points of clouds:

- Simplicity of use and access
- High level of innovation through new services
- Very large capacities/infinite capacities
- Very high price attractiveness

In the context of Hyperscalers, such as Amazon, Microsoft, and Google, the preceding criteria apply, and companies can take advantage of the benefits. However, the many advantages are also paired with some disadvantages when using the clouds. Here, it is not so much technical, but rather organizational and process-related points that can be interpreted as disadvantages.

Although the use of clouds is very simple, the use must also be constantly and continuously controlled. Very often, a "shadow IT" exists alongside the actual IT, in which specialist departments have provided themselves with IT services from the cloud. This contradicts central IT and efficient control of the entire IT.

Although the prices of the cloud are very good, the use of the cloud in a first step can become more expensive than if a company had continued to work without a cloud. So, to a certain extent, the use of the cloud must be accompanied by a transformation of IT. Simply transferring IT services to the cloud without transformation usually does not bring the hoped-for effects.

Unlimited resources in a cloud were a reality for a very long time. There were never any reports of bottlenecks or unavailability of resources. Since the Corona crisis, however, it has become clear that clouds are also "just" data centers with conventional capacities. At the latest since the Microsoft Azure Cloud ran out of spare capacity for certain SAP workloads in March 2020, the myth of infinite resources has been disproved.

Companies have to do a lot themselves when using clouds. This is very different from using services from a service provider. Here, the provider does a lot of tasks and takes responsibility for the tasks and results. A cloud provider will only do this for the services that are their responsibility. In contrast to a service provider, however, these are much fewer. Therefore, the customers have to take over tasks or commission another provider with them.

When operating SAP systems on a cloud, the difference to the service providers must be taken into account. This is illustrated in Table 1-1.

Table 1-1. *Responsibilities in the Public Cloud*

Component	Responsibility with Customer	Responsibility with Cloud Provider	Responsibility with Service Provider
Data center			
Compute/storage/ network			
Security and compliance			
Operations of infrastructure			
Stack design			
Operating system			
Operations of SAP basis			
Operations of non-SAP applications			

All dark fields in the table show the responsibilities of the respective parties. It is clear that the typical service provider can map the complete stack and provide all services in a traditional hosting. When using the cloud, customers must provide services themselves, as the cloud provider does not.

Public, Private, and Hybrid Cloud

The cloud computing market is very heterogeneous and permeated by many trends. Three main clouds are used for SAP workloads and operations in a cloud: the public cloud, the private cloud, and the hybrid cloud.

The **public cloud** is a cloud that most companies are familiar with. It is the type of cloud which is offered by all Hyperscalers (i.e., Amazon, Microsoft, and Google). The name public already implies the most important feature of the cloud – it is public and equally accessible to every customer. However, this does not mean that all companies can see all workloads and all data of all other companies. It simply means that the cloud is available to all companies equally and that the cloud has not been built dedicatedly for just one company. The providers of the public cloud have implemented mechanisms for this, which also make access to the resources of a company possible only for the actual company.

In contrast to a public cloud, the **private cloud** is set up exclusively for one company. All resources of this private cloud are only available to one company and can also only be used by the company. However, the private cloud has a decisive disadvantage. The built-up resources of the private cloud can be used until the capacities are reached and must then be expanded. Private cloud operators implement such expansions in a similar way to normal service providers: hardware resources are acquired exclusively for the customer and therefore also invoiced. Another disadvantage of private clouds is the strong focus on the intended use. The providers of private clouds do not enrich the clouds with new services, but leave them as they are.

In addition to the public cloud and the private cloud, there is also the *hybrid cloud*. This is not so much a cloud but a merger of a public cloud with a private cloud or with an existing data center of a company. This already shows that the majority of companies are directly in a hybrid cloud scenario as soon as the first services from the public cloud are consumed.

Many companies still operate SAP systems in their own data centers. These data centers often reach their capacity limits or are heading to end of support because they have become too old. This also happened at a large German manufacturing company. The data centers on the same campus were to be demolished to make room for new office buildings.

The company had several options open to it. It could use an external service provider with data center capacity, it could buy temporary data center capacity and operate it itself, or it could use the public cloud. The company strategically opted for the public cloud. Due to many projects and project activities, various numbers of SAP systems were required. When the company started provisioning these systems in the public cloud, it moved into the hybrid cloud scenario. Many systems still exist in the two data centers to be demolished, but the new systems are in the public cloud. This scenario is a hybrid one.

The preceding example shows that by simply using the first service from the public cloud, a company goes into the hybrid cloud scenario. This is what happens to all companies that go to the cloud with the first service.

Companies that combine two public clouds, for example, Google and Amazon, can also create a hybrid cloud. For example, some companies decide to move SAP workloads to one public cloud and the non-SAP workloads to another public cloud. In this way, two public clouds are combined with each other, and a large hybrid cloud is created.

Overview of the Clouds of the Major Market Players

Currently, the public cloud market is dominated by three Hyperscalers. These are Amazon Web Services, Google Cloud, and Microsoft Azure. All three Hyperscalers are presented in this chapter. In addition, the other cloud providers, which currently have small footprints such as IBM or Oracle, are also described.

Amazon Web Services

History

Amazon Web Services was the first real cloud provider on the market and is still one of the leading providers of cloud computing services. There are several versions to the reasons why Amazon Web Services started.

One version is based on a situation of excess capacity. In the early 2000s, Amazon's business was developing steadily, and due to the strong sales activities on Amazon's platform, the demands for computing power to provide the platform and its services became enormous. Particularly due to seasonal effects, such as Black Friday in the United States, demand increased dramatically and then dropped rapidly back to normal levels. Amazon reacted to this and built the platform accordingly in such a way that the load peaks were cushioned by the seasonal events and the platform ran in a performant and stable manner. This focus on maximum performance led to a steady overcapacity in Amazon's data centers during the rest of the year – outside of the seasonal effects. This excess capacity was made available as resources for customers. Then, in 2006, Amazon launched its Amazon Web Services subsidiary, which made capacity from Amazon's data center available externally through an open access portal.

Another version of the emergence of cloud computing at AWS is based on the internal processes and workflows within Amazon. Here, Amazon faced recurring issues due to the steady growth of its platform, where web developers had to repeatedly coordinate with data center teams on network, capacity, and availability. To eliminate this dependency, a type of commodity IT was introduced (AWS) that allowed web developers to assemble the necessary resources themselves. In other words, they became independent of data center teams. Amazon realized that any web developer would appreciate such capabilities and decided to make these new services available as Amazon Web Services.

Regardless of the version to emerge, the launch of Amazon Web Services was a resounding success. Within a few years, AWS managed to create a large customer base and thus achieve high usage of the platform – even if it was initially relatively complicated to get your own SAP systems up and running on AWS.

Current Market Position

AWS is the market leader and serves a very large number of customers from global corporations, as well as small- and medium-sized businesses and home users. AWS serves this broad abundance of customers by offering a very wide range of products.

AWS stands out among customers because of the following:

- High density of AWS data centers in many different countries with availability zones
- Continuous updates of the cloud services with new features on a regular basis
- High availability of services with no major impact on a large number of customers so far
- Very large ecosystem with many third-party providers offering additional services
- Ease of adoption

However, AWS' clientele also sees some negative points:

- All services are paid, and in some cases the prices for cloud services are very high. This can lead to very high bills for using AWS.
- Strict contracts between customers and AWS with no flexibility to customize for businesses.