

Capacity Planning for SAP Systems on AWS

Sizing Guidelines

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Abstract

The goal of this paper is to help Amazon Web Services (AWS) partners size SAP systems for the AWS platform. The paper describes SAP sizing resources and recommendations, and discusses the AWS-specific capacity planning guidelines for SAP systems.

Introduction

AWS SAP sizing is the process of translating business needs into AWS service requirements. This means that resources required by SAP—such as number of data records, users with various roles, and usage of SAP modules—need to be mapped into the appropriate AWS computer, storage, and network resources.

SAP SE has a large portfolio of business solutions. Many applications in this portfolio are sized according to standard SAP guidelines.

SAP applications that originate from SAP company acquisitions may have individual sizing recommendations based on pre-acquisition guidelines. This means that their capacity planning may involve metrics that differ from the metrics for SAP core products.

As a general guideline, AWS instances behave almost like their on-premises counterparts when it comes to CPU, main memory, I/O, and networking requirements. In this paper, we'll discuss AWS-specific sizing considerations for SAP systems.

General Guidelines

Supported End-to-End Stacks

SAP provides end-to-end support for certified solutions stacks. Capacity planning makes sense only for fully supported stacks. A stack typically consists of the following:

- An SAP business solution (for example, SAP Simple Finance)
- An application server kernel (for example, NetWeaver 7.3)

- A relational database (for example, SAP HANA 1.0 SP9)
- An operating system (for example, SUSE Linux Enterprise Server 11 SP3)
- A certified AWS instance type (for example, r3.8xlarge)

Before you deploy your SAP solution on AWS, you should verify that all the components of your solution are certified and work well with the underlying components on the AWS platform by consulting the appropriate [SAP notes](#)¹ and [Product Availability Matrix \(PAM\)](#).²

Note The SAP notes and documentation referenced in this paper require [SAP Service Marketplace](#) credentials.³

Planning Multi-Tier Architectures

The vast majority of SAP solutions adhere to the three-tier client/server architecture. Stacks (as defined in the previous section) can be deployed on a single AWS instance or on multiple AWS instances.

Databases can almost always be operated on individual AWS instances. In many cases, the services of the application server layer can scale horizontally.

SAP HANA, which is the SAP database system, can be distributed to multiple AWS instances as well. For details, consult the [SAP notes](#) and documentation. horizontal scalability options depend on the application you use with the SAP HANA database.

SAP system sizing for multi-tier architectures requires SAP architectural and application-specific expertise to find the best customer solution in regard to:

- Operational complexity (one system vs. multiple systems)
- Cost efficiency
- Future growth path (what to do when the system load grows over time)
- Redundancy for increased availability
- Backup strategy

Planning with the SAP Lifecycle in Mind

The implementation of a given SAP application typically requires many SAP systems with the same application in order to allow a customer to develop, stage, and roll out productive SAP solutions. A customer who implements a SAP application will most likely need:

- Multiple demo and training systems
- Multiple development systems
- One or multiple staging systems
- One production system, which may have to be mirrored with a shadow instance

Customers may decide to run some or all of these systems on AWS.

CPU and main memory requirements may differ significantly across these systems depending on their role (development, QA, production) in the SAP lifecycle. AWS is an excellent platform for resizing systems according to their individual requirements with a few clicks on the AWS console.

Planning with the SAP Infrastructure in Mind

Customers tend to use a number of SAP products exclusively to keep their SAP infrastructure up and running. Examples are:

- SAP Solution Manager, which simplifies deployment management and the interaction with SAP support
- SAP Landscape Virtualization Management, which helps manage fleets of virtualized SAP systems

You'll need to size these systems individually and include them in your planning.

Migration Scenarios

A sizing proposal should incorporate a number of migration scenarios. SAP provides migration tools, and there is also a well-established industry of consulting partners who can perform these migrations.

AWS can recommend Amazon Elastic Compute Cloud (Amazon EC2) instance types that accommodate the future growth of the SAP stack. Typical scenarios are non-Unicode to Unicode migrations and migrations to SAP HANA.

Non-Unicode to Unicode Migrations

SAP recommends that customers migrate from non-Unicode installations to Unicode installations for better internationalization support. However, the new systems generally have an increased main memory footprint and tend to need more database disk space.

Migrations from Other Databases to SAP HANA

SAP NetWeaver-based solutions generally use one of the following database products:

- Oracle Database
- IBM DB6
- Microsoft SQL Server
- SAP MaxDB
- Sybase ASE

SAP recommends that customers migrate to SAP HANA, its in-memory database system that provides enhanced features. This leads to increased requirements for CPU, main memory, disk subsystems, and network interfaces in the database instances used on the AWS platform.

SAP doesn't currently provide production support for AWS-based SAP systems on Oracle Database. If you want to migrate from Oracle Database to another database product, AWS can provide guidance and point you to partners who can help with the migration. Significant resizing is needed for migrations to SAP HANA DB.

Required Skills and Authorizations

To size SAP systems, you must meet the following requirements:

- [Register for an SAP S user ID](#) at the SAP website to access the following:

- SAP notes with sizing information
- SAP sizing guidelines
- SAP Quick Sizer tool
- Have a solid understanding of the SAP architectures and SAP product names, which tend to change frequently

SAP Capacity Planning Resources

[SAP Quick Sizer Portal](#): The Quick Sizer tool gathers business information and generates the main memory, CPU, and disk requirements for a target system. The tool is complex. It includes questionnaires for many SAP applications and allows you to transfer a project ID with the required information to a hardware partner.⁴

Introduction to SAP Sizing

- [The sizing guidelines in the SAP Service Marketplace](#) provide an excellent introduction to SAP sizing⁵
- [Introduction to HANA Sizing](#)⁶
- [Decision Tree for Sizing](#)⁷

SAP Sizing Fundamentals

SAP recommends a maximum resource utilization of 65% of the results of the SAP Quick Sizer.

General SAP Product Notes for AWS Sizing

- *SAP on AWS supported SAP DB OS and EC2 products* ([SAP Note 1656099](#))⁸
- *SAP Business One, version for SAP HANA on public Infrastructure-as-a-Service (IaaS) platforms* ([SAP Note 2058870](#))⁹
- *SAP HANA on AWS: Supported AWS EC2 products* ([SAP Note 1964437](#))¹⁰

AWS-Specific Sizing

I/O Subsystems for Amazon EC2 Instances

Amazon Elastic Block Store (Amazon EBS) volumes are already hardened against media corruption as part of the service that AWS provides. There is no need to mirror them to achieve higher availability.

Amazon EBS offers three volume types: General Purpose (SSD), Provisioned IOPS (SSD), and Magnetic. The following table provides performance data for each volume type.

	General Purpose (SSD)	Provisioned IOPS (SSD)	Magnetic
Volume size	1 GiB – 16 TiB	4 GiB – 16 TiB	1 GiB – 1 TiB
Maximum throughput	160 MiB/s	320 MiB/s	40-90 MiB/s
IOPS performance	3 IOPS/GiB with the ability to burst to 3,000 IOPS for volumes under 1 TiB	Consistently performs at provisioned level, up to 20,000 IOPS maximum	Averages 100 IOPS, with the ability to burst to hundreds of IOPS
API and CLI volume name	gp2	io1	standard

Note The information in this table is based on July 2015 data. Performance data is subject to change. For current information and full details, see [Amazon EBS Volume Types](#) in the AWS documentation.¹¹

The IOPS number mentioned in the [AWS documentation](#) typically refers to operations with a 256 KiB size.¹² I/O operations that have larger block sizes will lower the total number of IOPS proportionally.

There are two important aspects of sizing file systems for SAP systems:

- Standard (magnetic) volumes do not provide enough IOPS to serve as file systems for database server file systems.

- The I/O performance of Amazon EBS volumes scales with their size. In some cases, you might have to choose larger volumes to meet the I/O requirements of an SAP product.

Also note that there are maximum limits of I/O, which vary from instance type to instance type, as specified in the [AWS documentation](#).¹³

CPU Sizing for SAP Systems

SAP-certified Amazon EC2 instance types have an SAPS performance rating, which is documented in [SAP Note 1656099](#) (*SAP on AWS Supported SAP DB OS and AWS EC2 products*).¹⁴ The SAPS rating documented in this note will be reached only if a given instance has enough memory, uses file systems with sufficient performance, and provides a network interface that meets the SAP product requirements.

Sizing for Future Growth

Traditional SAP systems operate over a period of 5 to 8 years, during which their hardware needs may fluctuate due to growth or contraction. Hardware migration for a production system is typically costly, time-consuming, and potentially risky. To avoid these costs and risks, on-premises vendors typically factor an annual growth rate into the size of the server, resulting in oversized, expensive systems that cannot easily be scaled up or down to match actual needs.

AWS virtualized instances can help mitigate the costs and risks associated with hardware changes. Most of the SAP-certified Amazon EC2 instances belong to Amazon EC2 instance families such as C3, C4, R3, and M4. Each instance type within a family generally provides double the CPU power and main memory of the previous instance type, so an instance family is able to accommodate a range of compute needs.

In SAP sizing, customers don't have to account for future growth as long as the Amazon EC2 instance they target isn't the largest instance in the family. Instead, they can scale up to a larger instance within the same family when their needs change, with only minutes of down time. They pay for the larger instances when, and not before, they need the extra compute power.

The same sizing strategy can also be applied in the other direction. Customers can start out with a large instance and then adjust and scale back to a smaller instance if they realize that the initial instance is getting under-used.

Customers should install their SAP systems with AMIs that are HVM-virtualized. This is the default for all Windows AMIs. Red Hat Enterprise Linux (RHEL) and SUSE Linux Enterprise Server (SLES) users should pick an HVM-virtualized AMI. The advantage of HVM-virtualized AMIs is that customers can generally migrate to any future Amazon EC2 instance types by simply stopping and restarting the instance.

General Sizing Requirements for SAP Business Suite

There is no generally accepted method for determining the number of I/O operations needed for a given SAP system. The following table provides general recommendations.

Total SAPS	DB SAPS of total	I/Os of DB SAPS	Application Type
ERP-ECC	30%	60%	OLTP
CRM	30%	60%	OLTP
BW	30%	90%	OLAP

These sizing recommendations are typically based on 8-KiB blocks, whereas AWS uses 16-KiB blocks in the Amazon EC2 console. This means that Amazon EBS volumes will most likely need only half of the I/O operations.

Sizing Requirements for SAP HANA on AWS

I/O Sizing for SAP HANA

The SAP HANA database has very specific requirements for the I/O subsystem (see section 2.8, “Hardware Checks for Tailored Data Center Integration,” in the [HANA Administration Guide](#)).¹⁵

HANA file systems need to be striped in a volume group to achieve the required performance. At the minimum, we recommend that customers use one of these volume groups:

- gp2: Four Amazon EBS volumes with a size of at least 334 GiB, or

- `i101`: One Amazon EBS volumes with a size of at least 400 GiB

Network Interface Sizing

The HANA database that will be used in production will need a 10-GiB network interface. The `r3.8xlarge` instance type is the only certified instance type that provides this network performance, and therefore should be used for production.

The other instance types of the R3 instance family are suitable for non-production usage, but they can't be sized for production usage. Customers may stop these instances, switch to the `r3.8xlarge` instance, and restart the instance at any point in time. The smaller instances of the `r3` family provide a very cost-efficient option for saving money in the ramp-up phase of a project.

Summary

Capacity planning for SAP systems on AWS is a complex task with many aspects to take into consideration. Sizing for the AWS platform fits very well into general SAP sizing guidelines. The AWS onsite engineering team at SAP works with SAP to assure that customers will get the highest quality solutions with the lowest cost on the AWS platform.

The agility of the AWS platform allows SAP customers to fine-tune their SAP systems to their specific needs without having to make investments for potential future requirements, which might be up to five years out.

SAP and AWS engineers update these sizing guidelines on a regular basis. For the latest recommendations, please make sure that you are using the current version of this guide from the <http://aws.amazon.com/sap/whitepapers> website as well as the latest versions of the SAP notes it references.

Contributors

The following individuals and organizations contributed to this document:

- Stefan Schneider, solutions architect, Amazon Web Services

Notes

¹ <http://service.sap.com/sap/support/notes/>

² <https://support.sap.com/release-upgrade-maintenance/pam.html>

³ <https://websmp201.sap-ag.de/>

⁴ <http://service.sap.com/quicksizing>

⁵ <https://service.sap.com/sizing>

⁶ <https://websmp201.sap-ag.de/hanaqs>

⁷ https://websmp201.sap-ag.de/~form/sapnet?_SHORTKEY=00200797470000098101&

⁸ <http://service.sap.com/sap/support/notes/1656099>

⁹ <http://service.sap.com/sap/support/notes/2058870>

¹⁰ <http://service.sap.com/sap/support/notes/1964437>

¹¹

<http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/EBSVolumeTypes.html>

¹² <http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ebs-io-characteristics.html>

¹³ <http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ebs-ec2-config.html>

¹⁴ <http://service.sap.com/sap/support/notes/1656099>

¹⁵ http://help.sap.com/hana/SAP_HANA_Administration_Guide_en.pdf