Microsoft

Licensing brief
October 2020

# Introduction to Microsoft Core licensing models

This brief applies to all Microsoft Licensing programs.

## Contents



## Summary


The purpose of this brief is to introduce the basics of the different Per Core licensing models for key Microsoft server software products.

# Definitions

**Assigning a license:** Assigning a license means that you designate that license for one device or user. This designation avoids sharing a license across more than one device or user simultaneously. For example, after you have assigned a software license to a server, you are permitted to run the software on that server. You can use whatever manual or technical method that works for you to ensure that you have the correct number of licenses to cover your software use.

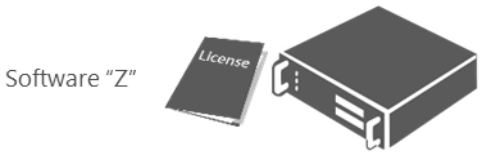


*Figure 1: Assigning a license.*

**Data center:** A building (or multiple buildings) that houses servers and ancillary equipment typically used in a corporate computing environment connected by a local area network (LAN).

**Hardware thread:** A hardware thread is either a physical core or a hyper-thread in a physical processor.

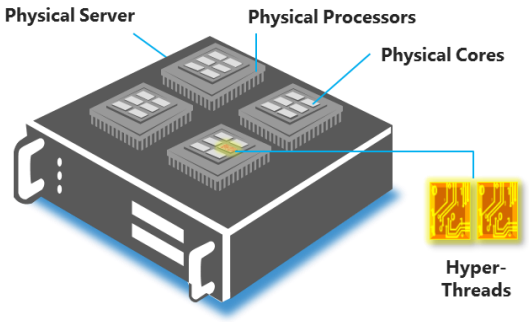


*Figure 2: Physical server showing physical processors, physical cores, and hardware threads.*

**Instance:** An instance of software is the set of files that make up the software, stored in executable form, and ready to run. You create an instance of software by executing the software's setup or install procedure, or by duplicating an existing instance. Instances of software can run on physical or virtual hardware systems.

Examples:

- An installed copy of the Windows Server operating system on a hard disk is an instance of Windows Server.
- An installed copy of Microsoft Exchange Server within a virtual hard drive (VHD) (or other image format) file is an instance of Exchange Server.
- A VHD file with Exchange Server installed on top of Windows Server contains an instance of Windows Server and an instance of Exchange Server. Copying that VHD file creates another instance of Windows Server and another instance of Exchange Server. Deploying that VHD file to another server creates an instance of Windows Server and an instance of Exchange Server on that server.

**Run an Instance:** You run an instance of software by loading it into memory and executing one or more of its instructions. Once this has occurred, an instance is considered to be running (whether or not its instructions continue to execute) until it is removed from memory.

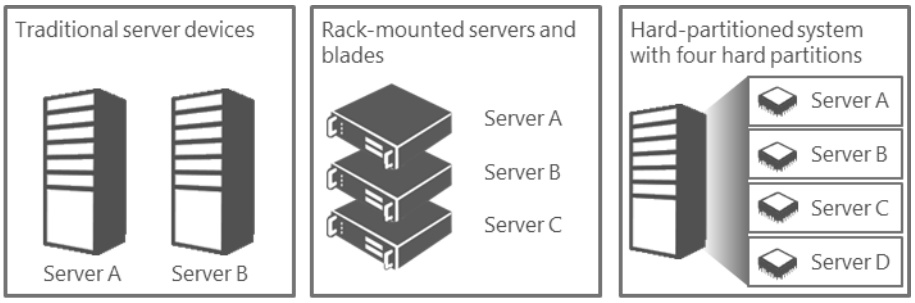


*Figure 3: Different types of servers.*

**Operating system environment (OSE):** all or part of an operating system instance, or all or part of a virtual (or otherwise emulated) operating system instance which enables separate machine identity (primary computer name or similar unique identifier) or separate administrative rights, and instances of applications, if any, configured to run on the operating system instance or parts identified above. There are two types of OSEs, physical and virtual. A physical hardware system can have one physical OSE and/or one or more virtual OSEs.

**Physical core:** Each physical processor contains smaller processing units called physical cores. Some processors have two cores, some four, some six or eight, and so on.

**Physical OSE:** An OSE that is configured to run directly on a physical hardware system. The operating system instance used to run hardware virtualization software (for example, Microsoft Hyper-V Server or similar technologies) or to provide hardware virtualization services (for example, Microsoft virtualization technology or similar technologies) is considered part of the physical OSE.

**Physical processor:** A processor in a physical hardware system. Physical OSEs (see "Operating System Environment (OSE)") use physical processors.

**Server:** A server is a physical hardware system capable of running server software. A hardware partition or blade is considered to be a separate physical hardware system, and, therefore, a separate server.

**Server farm:** A server farm consists of up to two data centers each physically located in the following areas:

- In a time zone that is within four hours of the local time zone of the other (Coordinated Universal Time [UTC] and not Daylight Saving Time [DST]), and/or
- Within the European Union (EU) and/or European Free Trade Association (EFTA)

Each data center can be part of only one server farm. You can reassign a data center from one server farm to another, but not on a short-term basis (that is, not within 90 days of the last assignment).

**Service provider:** A service provider is an organization that provides services, such as software or hosting services, to other organizations.

**Virtual core:** The unit of processing power in a virtual (or otherwise emulated) hardware system. A virtual core is the virtual representation of one or more hardware threads. Virtual OSEs use one or more virtual cores.

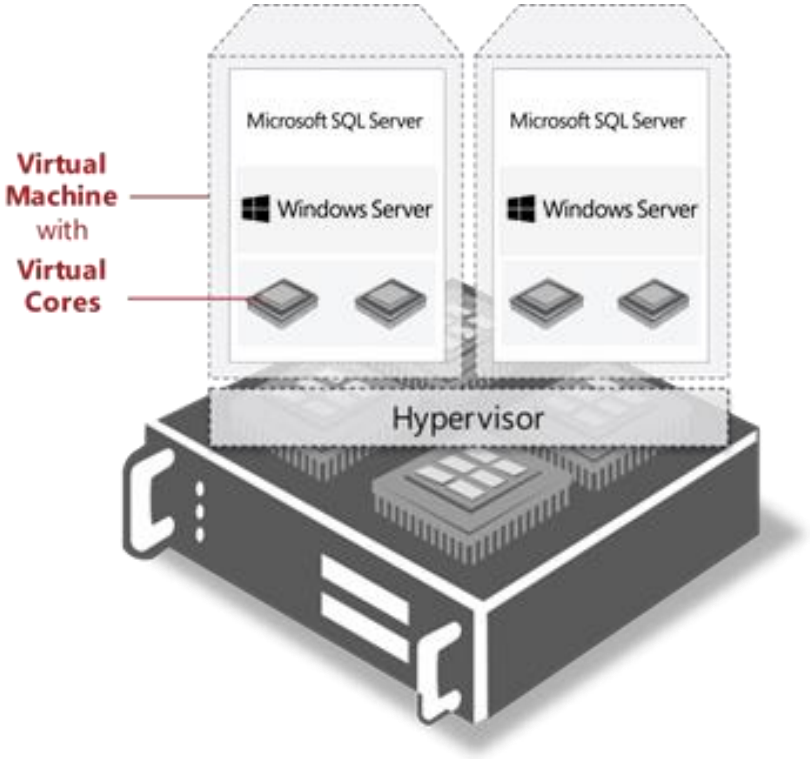


*Figure 4: Virtual Machine (VM) using virtual cores.*

**Virtual OSE:** An OSE that is configured to run on a virtual (or otherwise emulated) hardware system.

# Introduction to Per Core Licensing

With the release of Microsoft SQL Server 2012, Microsoft server licensing shifted the measure of computing power from physical processors to cores. Core-based licensing provides a more precise measure of computing power and a more consistent licensing metric, regardless of whether solutions are deployed on physical servers on-premises, or in virtual or cloud environments. Core-based licensing enables multi-cloud environments, improving workload portability and helping remove friction across different licensing models, making it easier for customers to migrate to the cloud at their own pace.

Today, there are primarily three licensing models that apply Per Core licensing:

1) The Per Core model used by SQL Server and BizTalk Server.
2) The Per Core/CAL licensing model used by Windows Server (Standard and Datacenter edition) following the release of Windows Server 2016.
3) The Management Servers (core-based) licensing model used by System Center (Standard and Datacenter edition) following the release of System Center 2016.

## Per Core licensing model

There are two ways to license the Per Core licensing model:

- Licensing by Physical Core on a Server
- Licensing by Individual Virtual OSE

The number of core licenses needed depends on whether customers are licensing by Physical Core on a Server or by Individual Virtual OSE.

***Licensing by Physical Core on a Server***

When running an instance of the software in a physical OSE, all physical cores on the server must be licensed. Software partitioning or custom system bios control does not reduce the number of core licenses required, except when licensing individual virtual machines (VMs). A minimum of four core licenses is required for each physical processor on the server.

Unlike the Server+CAL licensing model, the Per Core model allows access for an unlimited number of users or devices to connect from either inside or outside an organization's firewall. With the Per Core model, customers do not need to purchase additional client access licenses (CALs) to access the Server software.

**Enterprise editions:** For each server to which you have assigned the required number of licenses, you can run on the licensed server any number of instances of the server software in a number of physical and/or virtual OSEs equal to the number of licenses assigned to that server. Thereafter, for each additional license that you assign to the licensed server, you can run instances of the server software in an additional OSE on that licensed server.

**Standard and other editions:** For each server to which you have assigned the required number of licenses, you can run on the licensed server any number of instances of the server software in the physical OSE.

***Licensing by Individual Virtual OSE***

Similar to the Per Core licensing model in physical OSEs, all virtual cores (v-cores) supporting virtual OSEs that are running instances of SQL Server core edition software must be licensed accordingly. A virtual OSE is sometimes referred to as a virtual machine (VM). To license individual virtual OSEs using the Per Core model, customers must purchase a core license for each v-core (or virtual CPU, virtual thread) allocated to the virtual OSE, subject to a four-core license minimum per virtual OSE. For licensing purposes, a v-core maps to a hardware thread.

**Enterprise editions:** For each server to which a customer assigns the required number of licenses, they may run any number of instances of the server software in a virtual OSE. The licenses are assigned to the physical server and allocated to a virtual OSE to allow running instances of the software. The licenses are not assigned to the virtual OSE.

**Standard and other editions:** For each server to which a customer assigns the required number of licenses, they may run any number of instances of the server software in a virtual OSE. The licenses are assigned to the physical server and allocated to a virtual OSE to allow running instances of the software. The licenses are not assigned to the virtual OSE.

## Per Core/CAL licensing model

The Per Core/CAL license model requires the customer to license all the physical cores on the server they run an instance of the software on. The licensed server must be assigned a minimum of 16 core licenses subject to a minimum of eight core licenses per physical processor. The greater of these two minimum requirements would equal the minimum number of licenses any server running an instance of the software must have.

**Datacenter edition:** For each server to which a customer assigns the required number of licenses, they may run instances of the software the physical OSE and any number of virtual OSEs on the licensed server.

**Standard edition:** For each server to which a customer assigns the required number of licenses, they may run instances of the software in up to two OSEs on the licensed server. If a customer runs the software in two virtual OSEs, they may also run the software in the physical OSE if the physical OSE is used solely to host and manage the virtual OSEs.

Windows Server Standard edition has rights to use two OSEs or two Windows Server containers with Hyper-V isolation and unlimited Windows Server containers without Hyper-V isolation when all cores on the server are licensed (subject to license minimums. Once a server is licensed, customers may wish to license the server for additional OSEs or Windows Servers with Hyper-V isolation. This practice is often referred to as "stacking," and is allowed with Standard edition. If a customer needs to run the software in more than two OSEs on the licensed server, they may assign additional Standard edition licenses to the server equal to the same minimum core license requirements explained above. For each additional set of required core licenses, the customer may run instances of the software in up to two additional OSEs on the licensed server. Alternatively, if the customer has active Software Assurance on their Standard edition licenses, they may choose to purchase Step Up licenses to Datacenter edition.

***Access Licenses***

In addition to licensing the server with core licenses, access to the server also requires a Client Access License (CAL). CALs are available as device CALs or user CALs and each device or user is required to be licensed to directly or indirectly (e.g. multiplexing) access the server.

CALs are not required to access the server by another licensed server, a server running a Web Workload or HPC Workload, or to access a physical OSE that is being used solely for hosting and managing Virtual OSEs.

## Management Servers licensing model

Licensing servers under the Management Server license model is similar to the Per Core/CAL model and requires the customer to license all the physical cores on the server in order to manage OSEs on that server. The licensed server must be assigned a minimum of 16 core licenses subject to a minimum of eight core licenses per physical processor. The greater of these two minimum requirements would equal the minimum number of licenses any server with managed OSEs must have.

**Datacenter edition:** For each server to which a customer assigns the required number of licenses, they may manage any number of OSEs on the licensed server.

**Standard edition:** For each server to which a customer assigns the required number of licenses, they may manage up to two OSEs on the licensed server. If a customer manages two virtual OSEs, they may also manage the physical OSE if the physical OSE is used solely to host and manage the virtual OSEs.

If a customer needs to manage more than two OSEs on the licensed server, they may assign additional Standard edition licenses to the server equal to the same minimum core license requirements explained above. This is often referred to as "stacking" licenses. For each additional set of required core licenses, the customer may manage up to two additional OSEs on the licensed server. Alternatively, if the customer has active Software Assurance on their Standard edition licenses, they may choose to purchase Step Up licenses to Datacenter edition.

Licensing for the management of client OSEs is subject to different terms. See the Microsoft Product Terms site Server software products that apply Per Core licensing.

# SQL Server

Under the Per Core licensing model, each server running SQL Server software or any of its components (such as Reporting Services or Integration Services) that are not included as Additional Software must be assigned an appropriate number of SQL Server core licenses that are the same version as the software being run or newer versions.

- When to use Per Core licensing model Deploying the SQL Server Enterprise Core edition (including using the SQL Server Parallel Data Warehouse deployment option), SQL Server Standard Core edition, or SQL Server Web Core edition (available through service provider hosting only) software, and SQL Server Big Data Node Core licenses.
- Deploying Internet or extranet workloads, systems that integrate with external-facing workloads (even if external data goes through one or more other systems), or when the number of users/devices cannot be counted easily.
- Implementing centralized deployments that span a large number of direct and/or indirect users/devices.
- The total licensing costs for licensing SQL Server Core editions software are lower than those incurred using the Server+CAL licensing model.

**Note:** The use of hyper-threading technology does not affect the number of core licenses required when running SQL Server software in a physical OSE.

**Licensing by Physical Core on a Server:** To determine and acquire the correct number of core licenses needed, customers must:

1) Count the total number of physical cores per physical processor in the server.
2) Purchase the appropriate number of core licenses required for the server. SQL Server Core licenses are sold in packs of two (each licensing SKU includes two core licenses), so customers must divide the number of licenses required by two to determine the actual number of line items (licensing SKUs) to order.

**Note:** Licensing individual VMs is the only licensing option available for SQL Server Standard Core edition customers who are running the software in a virtualized environment under the Per Core model.

| | **4-Processor Server with 4 physical cores per processor** | | **4-Processor Server with 6 physical cores per processor** | | **4-Processor Server with 10 physical cores per processor** | |
|---|---|---|---|---|---|---|
| | Required # Cores Licenses | Required # 2-Pack SKUs | Required # Cores Licenses[1] | Required # 2-Pack SKUs | Required # Cores Licenses | Required # 2-Pack SKUs |
| **SQL Enterprise Core edition** | 16 | 8 | 24 | 12 | 40 | 10 |
| **SQL Server Standard Core edition** | 16 | 8 | 24 | 12 | 40 | 10 |

[1]*Per core—physical cores on a server. The number of licenses required equals the number of physical cores on the server subject to a minimum requirement of four licenses per processor. The SQL Server Core Factor Table is no longer used to calculate the required number of core licenses needed for SQL Server 2016 and later versions. For earlier versions of SQL Server, the number of licenses required equals the number of physical cores on the server multiplied by the applicable core factor located in the SQL Server Core Factor Table (PDF, 304 KB).*

**Licensing by Individual Virtual OSE:** To determine and acquire the correct number of core licenses needed, customers must:

1) Count the number of virtual cores allocated to the virtual OSE (minimum of four) an instance of the software will run in.
2) Purchase the appropriate number of core licenses required for the server. SQL Server Core licenses are sold in packs of two (each licensing SKU includes two core licenses), so customers must divide the number of licenses required by two to determine the actual number of line items (licensing SKUs) to order.

| | **1 Virtual OSE: 8 virtual cores** | | **1 Virtual OSE: 10 virtual cores** | | **2 Virtual OSEs: VM 1 = 8 virtual cores, VM 2 = 12 virtual cores** | |
|---|---|---|---|---|---|---|
| | Required # Cores Licenses | Required # 2-Pack SKUs | Required # Cores Licenses | Required # 2-Pack SKUs | Required # Cores Licenses | Required # 2-Pack SKUs |
| **SQL Enterprise Core edition** | 8 | 4 | 10 | 5 | 20 | 10 |
| **SQL Server Standard Core edition** | 8 | 4 | 10 | 5 | 20 | 10 |

## SQL Server licensing options for highly virtualized environments

Customer that need to deploy large numbers of virtual OSEs running instances of SQL Server on one server or across many servers may benefit from greater flexibility provided with Software Assurance (SA). SQL Server Enterprise Core edition with SA provides customers with Unlimited Virtualization rights on the licensed server. Both SQL Server Enterprise Core and Standard Core editions with SA also provide customers with License Mobility Across Server Farms.

### *SQL Server Enterprise Core Unlimited Virtualization*

Customers that license a server with SQL Server Enterprise Core edition with active SA may run any number of instances of the software in the physical OSE and any number of virtual OSEs on the licensed server.

### *License Mobility Across Server Farms*

For customers with highly virtualized environments who want to move VMs dynamically across servers to reallocate resources as needed, Microsoft permits License Mobility Across Server Farms as an exclusive SA benefit available for all SQL Server editions.

# BizTalk Server

Effective with the 2013 software release, BizTalk Server (BTS) is licensed under the same Per Core model as SQL Server. This model provides a precise measurement of computing power and a consistent licensing metric, regardless of whether your BTS solution is deployed across servers on-premises, virtually or physically, or cloud environments under License Mobility with Software Assurance. Under the Per Core licensing model, each server running BTS software must be assigned an appropriate number of BTS core licenses. The number of core licenses needed depends on whether you are licensing the physical server or individual virtual operating system environments (OSEs).

## Per Core license model

**Licensing by Physical Core on a Server:** To determine and acquire the correct number of core licenses needed, customers must:

1) Count the total number of physical cores per physical processor in the server.
2) Purchase the appropriate number of core licenses required for the server. BTS Core licenses are sold in packs of two (each licensing SKU includes two core licenses), so customers must divide the number of licenses required by two to determine the actual number of line items (licensing SKUs) to order.

**Licensing by Individual Virtual OSE:** To determine and acquire the correct number of core licenses needed, customers must:

1) Count the number of virtual cores allocated to the virtual OSE (minimum of four) an instance of the software will run in.
2) Purchase the appropriate number of core licenses required for the server. SQL Server Core licenses are sold in packs of two (each licensing SKU includes two core licenses), so customers must divide the number of licenses required by two to determine the actual number of line items (licensing SKUs) to order.

## BizTalk Server licensing options for highly virtualized environments

Customer that need to deploy large numbers of virtual OSEs running instances of BizTalk Server on one server or across many servers may benefit from greater flexibility provided with Software Assurance (SA). BizTalk Server Enterprise Core edition with SA provides customers with Unlimited Virtualization rights on the licensed server. Both BizTalk Server Enterprise Core and Standard Core editions with SA also provide customers with License Mobility Across Server Farms.

***BizTalk Server Enterprise Core Unlimited Virtualization***

Customers that license a server with BizTalk Server Enterprise Core edition with active SA may run any number of instances of the software in the physical OSE and any number of virtual OSEs on the licensed server.

***License Mobility Across Server Farms***

For customers with highly virtualized environments who want to move VMs dynamically across servers to reallocate resources as needed, Microsoft permits License Mobility Across Server Farms as an exclusive SA benefit available for all BizTalk Server editions.

# Windows Server

With the launch of Windows Server 2016 Datacenter edition and Windows Server 2016 Standard edition, Windows Server licensing transitioned from being processor-based to being core-based.

For both Standard and Datacenter editions, Windows Server is licensed by the Per Core/CAL license model. Like other Per Core licenses, Windows Server core licenses are sold in packs (2 core pack and 16 core pack). Each license SKU includes the 2 or 16 core licenses per pack.

| | Datacenter | Standard |
|---|---|---|
| **Licensing Model** | Per Core/CAL[1] | Per Core/CAL[1] |
| **License Type** | Core License | Core License |
| **OSEs/Hyper-V containers** | Unlimited | Two[2] |
| **Windows Server containers** | Unlimited | Unlimited |

*[1]All physical cores on the server must be licensed, subject to a minimum of 8 core licenses per physical processor and a minimum of 16 core licenses per server.*

*[2]Windows Server Standard edition permits use of one running instance of the server software in the physical OSE on the licensed server (in addition to two virtual OSEs), if the physical OSE is used solely to host and manage the virtual OSEs.*

## Minimum core license requirements for Standard and Datacenter Editions

The table below provides examples for various server configurations, and the minimum number of core licenses required.

| Server Licensing | 1-Processor Server | | 2-Processor Server | | 4-Processor Server | |
|---|---|---|---|---|---|---|
| **Windows Server Standard & Datacenter** | Required # Cores Licenses[1] | Required # 2 core - Pack SKUs | Required # Cores Licenses[1] | Required # 2 core - Pack SKUs | Required # Cores Licenses[1] | Required # 2 core - Pack SKUs |
| **2 cores per processor** | 16 | 8 | 16 | 8 | 32 | 16 |
| **4 cores per processor** | 16 | 8 | 16 | 8 | 32 | 16 |
| **6 cores per processor** | 16 | 8 | 16 | 8 | 32 | 16 |
| **8 cores per processor** | 16 | 8 | 16 | 8 | 32 | 16 |
| **10 cores per processor** | 16 | 8 | 20 | 10 | 40 | 20 |

*[1]Core licenses are sold in 2-packs.*

## Licensing Requirements of Additional OSEs for Standard Edition

The table below provides examples of "stacking" scenarios for various server configurations, the minimum number of licenses required, and the resulting number of OSEs or Hyper-V containers provided. As a rule, for each additional set of two OSEs or two Hyper-V containers the customer wishes to use, the server must be relicensed for the same number of core licenses. Note that Datacenter edition has rights to unlimited virtualization so "stacking" therefore is not required.

| "Stacking" Standard | 1-Proc Server with 16 cores | | 2-Proc Server with 16 cores | | 4-Proc Server with 32 cores | |
|---|---|---|---|---|---|---|
| **OSEs or Hyper-V Containers** | Required # Cores Licenses[1] | Required # 2-Pack SKUs | Required # Cores Licenses[1] | Required # 2-Pack SKUs | Required # Cores Licenses[1] | Required # 2-Pack SKUs |
| **2 per server** | 16 | 8 | 16 | 8 | 32 | 16 |
| **4 per server** | 32 | 16 | 32 | 16 | 64 | 32 |
| **6 per server** | 48 | 24 | 48 | 24 | 96 | 48 |
| **8 per server** | 64 | 32 | 64 | 32 | 128 | 64 |
| **10 per server** | 80 | 40 | 80 | 40 | 160 | 80 |

*[1]Core licenses are sold in 2-packs.*

# System Center

With the launch of System Center 2016 Datacenter edition and System Center 2016 Standard edition, System Center Server Management has transitioned from being processor-based to being core-based, in alignment with Windows Server 2016.

For both Standard and Datacenter editions,. System Center Server Management Licenses (Server MLs) are licensed under the Management Servers license model. Like other Windows Server Per Core licenses, System Center Server Management core licenses are sold in packs (2 core pack and 16 core pack). Each license SKU includes the 2 or 16 core licenses per pack.

| | Datacenter | Standard |
|---|---|---|
| **Licensing Model** | Management Servers[1] | Management Servers[1] |
| **License Type** | Core License | Core License |
| **OSEs/Hyper-V containers** | Unlimited | Two[2] |
| **Windows Server containers** | Unlimited | Unlimited |

*[1]All physical cores on the server must be licensed, subject to a minimum of 8 core licenses per physical processor and a minimum of 16 core licenses per server.*

*[2]System Center Standard edition permits management of the physical OSE on the licensed server (in addition to two virtual OSEs), if the physical OSE is used solely to host and manage virtual OSEs.*

### Minimum core license requirements for Standard and Datacenter Editions

The table below provides examples for various server configurations, and the minimum number of core licenses required.

| Server Licensing | 1-Processor Server, 2 Cores per processor | | 2-Processor Server, 6 Cores per processor | | 4-Processor Server, 10 cores per processor | |
|---|---|---|---|---|---|---|
| **Edition - OSEs required** | Required # Cores Licenses[1] | Required # 2 core - Pack SKUs | Required # Cores Licenses[1] | Required # 2 core - Pack SKUs | Required # Cores Licenses[1] | Required # 2 core - Pack SKUs |
| **Standard edition – 2 OSEs** | 16 | 8 | 16 | 8 | 40 | 10 |
| **Standard edition – 4 OSEs required** | 16 | 8 | 32 | 16 | 80 | 40 |
| **Datacenter edition – 10 OSEs required** | 16 | 8 | 16 | 8 | 40 | 10 |

# Additional resources

- For details about licensing SQL Server , refer to the SQL Server 2019 Licensing Guide.
- For details about licensing BizTalk Server, refer to the BizTalk Server 2020 Licensing Datasheet.
- For details about licensing Windows Server, refer to the Windows Server Licensing Guide and the Windows Server 2019 licensing datasheet.
- For details about licensing System Center, refer to the System Center MS.com licensing page.