

Dynamics 365 for Finance and Operations, Enterprise edition (on- premises) system requirements

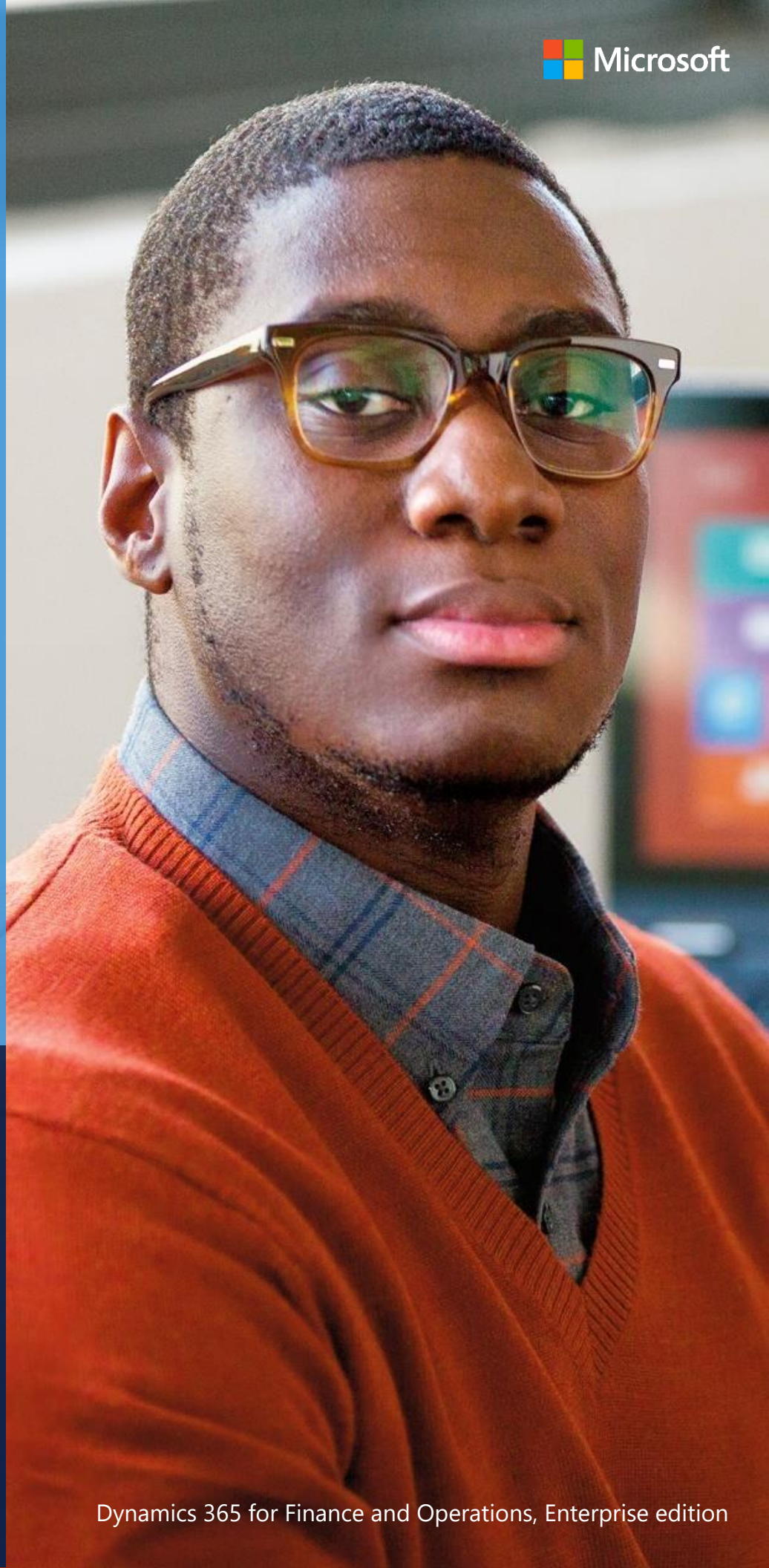
This document describes the various system requirements for Microsoft Dynamics 365 for Finance and Operations, Enterprise edition (on-premises). It also includes an overview of the system architecture and data storage.

White paper

June 2017

[Send feedback.](#)

[Learn more about Finance and Operations.](#)



Contents

Architecture	3
Data storage	5
System requirements for on-premises environments	5
Network requirements	5
Telemetry data transfer to the cloud	7
Domain requirements	7
Hardware requirements	7
Minimum infrastructure requirements	8
Processor and RAM requirements	8
Storage	10
Virtual host requirements	10
Software requirements for all server computers	10
Supported server operating systems	11
Software requirements for database servers	11
Software requirements for client computers	11
Software requirements for Active Directory Federation Services	11
Hardware and software requirements for Retail components	12
Hardware sizing for on-premises environments	12
Factors that affect sizing	12
Sizing your Finance and Operations environment	13
SQL Server (OLTP)	13
Active Directory Federation Services (AD FS)	14
AOS (Online and batch)	14
Management reporter	15
SQL Server Reporting Services	15
Environment Orchestrator	15
Virtualization and oversubscription	15

Dynamics 365 for Finance and Operations, Enterprise edition (on-premises) system requirements

Microsoft Dynamics 365 for Finance and Operations, Enterprise edition, now supports running business processes in customer data centers with the on-premises deployment option. With this deployment option, application servers and the Microsoft SQL Server database will run in the customer's data center, providing a local business data implementation. Customers and partners will utilize Microsoft Dynamics Lifecycle Services (LCS) to manage their on-premises deployments. LCS is an application management portal that provides tools and services for managing the application lifecycle of your Microsoft Dynamics 365 for Finance and Operations implementations in the cloud and on-premises. LCS features, such as business process modeling, software deployment and patching, and monitoring and diagnostics, are used to help support on-premises deployments.

Architecture

The on-premises deployment option uses Finance and Operations cloud components running on-premises using Microsoft Azure Server Service Fabric standalone clusters. Service Fabric is the next-generation Microsoft middleware platform for building and managing enterprise-class high-scale applications. Service Fabric standalone clusters can be deployed on any computer that is running Windows Server.

On-premises deployment defines two types of Service Fabric standalone clusters: clusters for production environments and clusters for sandbox environments. The following roles or node types are deployed into both types of clusters:

- **Application Object Servers (AOS)** – Provides the ability to run the Finance and Operations application functionality in client, batch, and import/export scenarios.
- **Management Reporter (MR)** – Provides financial reporting functionality.
- **SQL Server Reporting Services (SSRS)** – Provides document reporting functionality.
- **Environment Orchestrator** – Enables on-premises environment management from LCS.

Note: Retail Server is not supported in on-premises deployments at this time.

Figure 1 shows a logical diagram of the node types deployed in a Service Fabric standalone cluster.

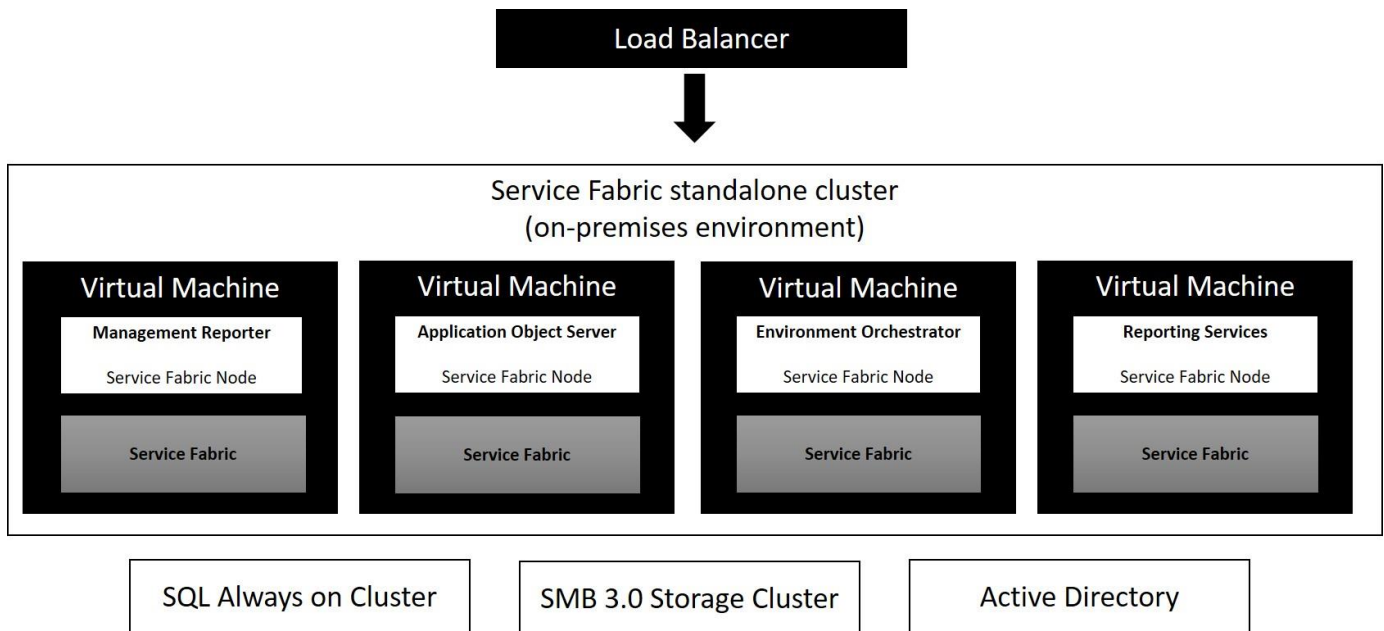


Figure 1: Logical view of on-premises Service Fabric standalone cluster

Application lifecycle management for on-premises deployments is orchestrated through LCS. Customers can use the proven tools and methodologies in LCS to help manage their on-premises deployments (Figure 2). The development experience continues to be the same as in cloud deployments through 1-box VHDs per developer.

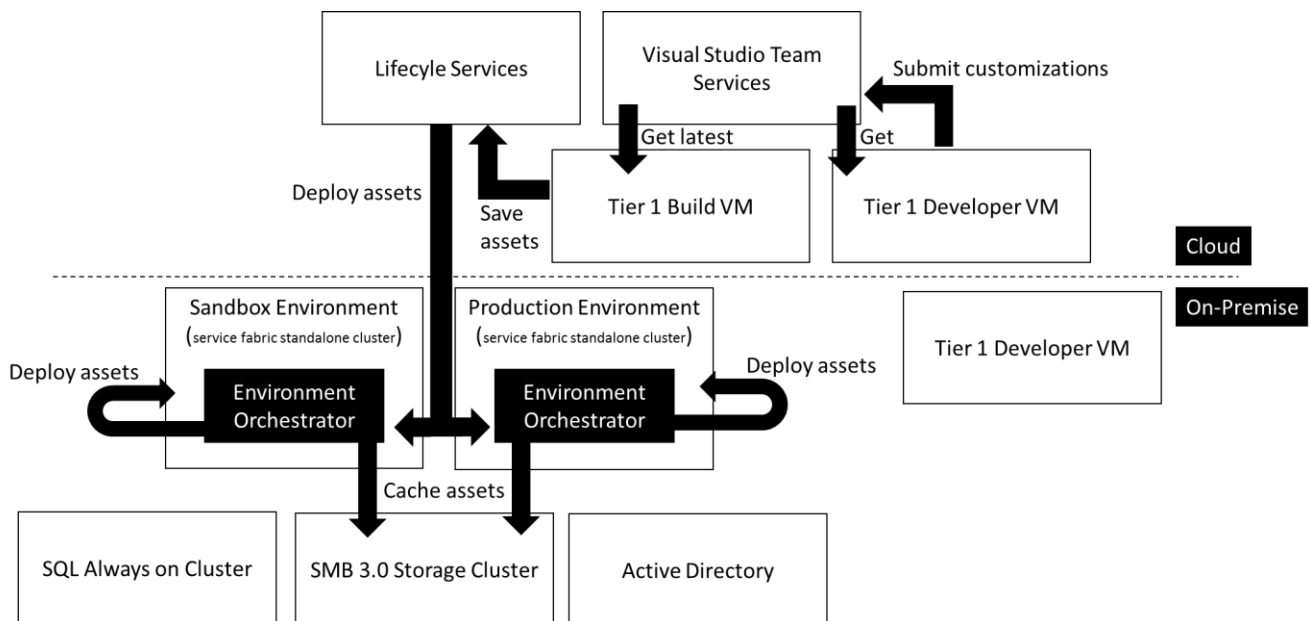


Figure 2: Application lifecycle management for on-premises deployments

Data storage

The on-premises deployment option stores core customer data on-premises. Core customer data is a subset of the customer data definition provided in the [Microsoft Trust Center](#). Table 1 outlines the categories of customer data that are stored in Microsoft Azure data centers located in the United States by services such as LCS, Azure Active Directory, and Microsoft Office signup portal. All other customer data, referred to as core customer data, is stored on-premises.

Table 1: Customer data stored in Microsoft Azure data centers located in the United States by services supporting on-premises environments. These services enable initial onboarding, initiation, and tracking of support incidents, and service updates and upgrades.

Supporting services	Customer data definition
Microsoft Dynamics Lifecycle Services	Project content and files are stored in a project. This includes application configuration data, code, metadata, and data assets that comprise the application and business process models. Also included is anonymized user activity logs and information that is collected during the onboarding process.
Microsoft Office signup portal	Customer information that is collected during the onboarding process.
Microsoft Azure Active Directory	Authentication for LCS and Microsoft Visual Studio Team Services.
Additional services or components can be configured to extend an on-premises deployment as needed; however, configuration choices may cause core customer data to be transferred outside of the customer's data center. For example, configuring data management features that are used to integrate external services with an on-premises deployment may result in the transfer of core customer data outside the on-premises deployment.	

System requirements for on-premises environments

Before you install an on-premises deployment of Microsoft Dynamics 365 for Finance and Operations, Enterprise edition, verify that the system that you're working with meets or exceeds the minimum network, hardware, and software requirements listed below.

Network requirements

Finance and Operations (on-premises) can work on networks that use Internet Protocol Version 4 (IPv4) or Internet Protocol Version 6 (IPv6). Consider the network environment when you plan your system and use the following guidelines.

Network response time

The following table lists the minimum network requirements for the connection between the web browser and Application Object Server (AOS), and for the connection between AOS and the database in an on-premises system.

Value	Web browser to AOS	AOS to database
Bandwidth	50 KBps per user	100 MBps
Latency	< 250–300 ms	< 1 ms (LAN only). AOS and database need to be co-located.

- Finance and Operations (on-premises) is designed for networks that have a latency of 250–300 milliseconds (ms) or less. This latency is the latency from a browser client to the data center that hosts Finance and Operations.
- Bandwidth requirements for Finance and Operations (on-premises) depend on your scenario. Typical scenarios require a bandwidth of more than 50 kilobytes per second (KBps) between the browser and the Finance and Operations server. However, for scenarios that have high payload requirements, such as workspaces or scenarios that involve extensive customization, higher bandwidth is recommended and depends on use.

Deployments where the AOS and the SQL Server Database are in different data centers are not supported. The AOS and the SQL Server database need to be co-located.

In general, Finance and Operations is optimized to reduce browser-to-server round trips. The number of round trips from a browser client to the data center is either zero or one for each user interaction, and the payload is compressed.

Warning: Do not calculate bandwidth requirements from a client location by multiplying the number of users by the minimum bandwidth requirements. The concurrent usage of a given location is very difficult to calculate. We suggest using a real-life simulation against a non-production environment of Finance and Operations as the best gauge of performance for your specific case.

LAN environments

In local area network (LAN) environments, Microsoft Remote Desktop in Microsoft Windows Server is not required to connect to Finance and Operations. However, it might be required for servicing operations on the VMs that make up the server deployments.

WAN environments

In wide area network (WAN) environments, Remote Desktop in Windows Server is not required to connect to Finance and Operations.

Internet connectivity requirements

Finance and Operations (on-premises) does not require Internet connectivity from end user work stations. However, some features will not be available without Internet connectivity.

Browser client	An intranet scenario without Internet connectivity is a design point for the on-premises deployment option. Some features that require cloud services will not be available, such as Help and Task guide libraries in LCS.
Server	The AOS or Service Fabric tier must be able to communicate with LCS. The on-premises browser-based client does not require Internet access.
Telemetry	Telemetry data might be lost if there are long interruptions in connectivity. Interruptions in connectivity to LCS do not affect the on-premises application functionality.
LCS	Connectivity to LCS is required for deployment, code deployment, and servicing operations.

Telemetry data transfer to the cloud

Most telemetry is stored locally and can be accessed by using Event Viewer in Microsoft Windows. A small subset of telemetry events is transferred to the Microsoft telemetry pipeline in the cloud for diagnostics. Customer data and end user identifiable data are not part of the telemetry sent to Microsoft. VM names are sent to Microsoft to aid in environment management and diagnostics from the LCS portal.

Domain requirements

Consider the following domain requirements when you install Finance and Operations (on-premises):

- Virtual machines that host Finance and Operations (on-premises) components must belong to an Active Directory Domain. Active Directory Domain Services (AD DS) must be configured in native mode.
- Virtual Machines that run Finance and Operations (on-premises) components must have access to each other configured in Active Directory Domain Services.
- The domain controller must run on Microsoft Windows Server 2016.

Hardware requirements

This section describes the hardware that is required to run Finance and Operations (on-premises).

Based on the system configuration, data composition, and the applications and features that you decide to use, the actual hardware requirements will vary. Here are some of the factors that could affect the choice of appropriate hardware for Finance and Operations (on-premises):

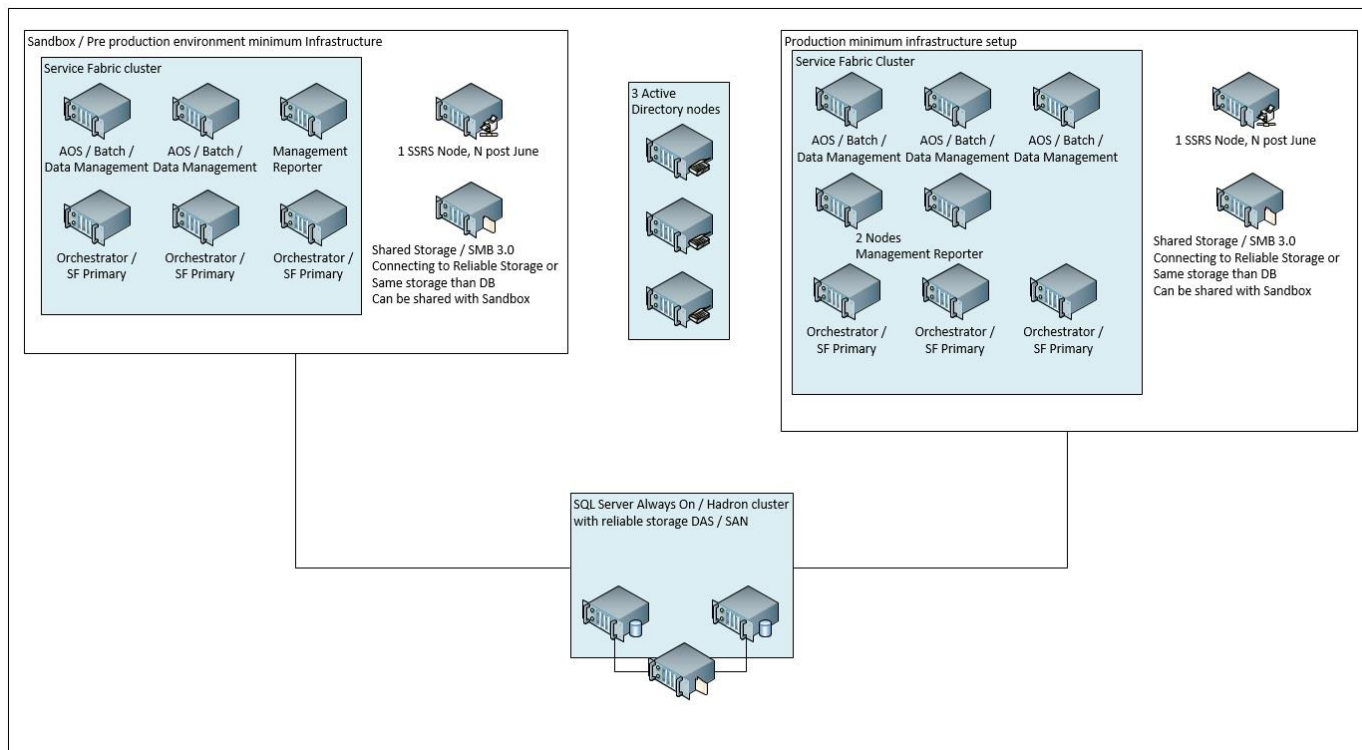
- The number of transactions per hour.
- The number of concurrent users.

Minimum infrastructure requirements

Finance and Operations (on-premises) uses Microsoft Azure Service Fabric to host the AOS, Batch, Data management, Management reporter, and Environment orchestrator services. Microsoft SQL Server Reporting Services (SSRS) are not hosted in the Service Fabric cluster.

SQL Server must be set up in a high-availability HADRON setup that has at least two nodes for production use.

The following figure shows the minimum recommended number of nodes in your Service Fabric cluster.



Processor and RAM requirements

The following table lists the number of processors and the amount of random-access memory (RAM) that are required for each of the roles required to run this deployment option. For more information, read the minimum requirements recommendation for Service Fabric standalone cluster, [Plan and prepare your Service Fabric cluster](#).

Note: If other Microsoft software is installed on the same computer, the system must also comply with the hardware requirements for that software. We recommend that you limit other server applications on the same computer as AOS to 1 gigabyte (GB) of RAM.

Sizing by role and topology type			
Topology	Role (node type)	Recommended processor cores	Recommended memory (GB)
Production	AOS, Data management, Batch	8	24

Sizing by role and topology type			
Sandbox	Management Reporter	4	16
	SQL Server Reporting Services	4	16
	Orchestrator	4	16
	AOS, Data management, Batch	4	24
Sandbox	Management Reporter	4	16
	SQL Server Reporting Services	4	16
	Orchestrator	4	16
	AOS, Data management, Batch	4	24

Minimum sizing estimates for production and sandbox deployments*		
Topology	Role	Number of instances
Production	AOS (Data management, Batch)	3
	Management Reporter	2
	SQL Server Reporting Services	1
	Orchestrator**	3
Sandbox	AOS (Data management, Batch)	2
	Management Reporter	1
	SQL Server Reporting Services	1
	Orchestrator	3
<i>Summary Production and Sandbox topologies</i>		16

* These numbers are being validated by our preview customers and may be adjusted as needed based on that feedback.

** Orchestrator is designated as the primary node type and will be used to run the Service Fabric services as well.

Backend SQL Server and AD initial estimates

	Role	VMs/Instances	Cores	Total cores	Memory per instance	Total memory
Shared infrastructure	SQL Server*	2	8	16	32	64
	File server/Storage area network/Highly available storage	The Backend storage needs to be SSD-based on a runtime SAN. Size and IOPS throughput is based on the workload size.				
	Active Directory	3	4	12	16	48

Backend SQL Server and AD initial estimates

Summary shared infrastructure		5		28		112
-------------------------------	--	---	--	----	--	-----

*SQL Server sizes are highly dependent on workloads. For more information, see the “Hardware sizing for on-premises environments” section.

Storage

- **AOS** – Finance and Operations (on-premises) will use a Server Message Block (SMB) 3.0 share to store unstructured data. For more information, see [Storage Spaces Direct in Windows Server 2016](#).
- **SQL** – Viable options:
 - A highly available solid-state drive (SSD) setup.
 - A storage area network (SAN) optimized for OLTP throughputs.
 - High performance Direct-attached storage (DAS)
- **SQL and data management IOPS** – The storage for both data management and SQL Server should have at least 2,000 input/output operations per second (IOPS). Production IOPS depends on many factors. For more information, see the “Hardware sizing for on-premises environments” section.
- **Virtual machine IOPS** – Each virtual machine should have at least 100 write IOPS.

Virtual host requirements

When you set up the virtual hosts for a Finance and Operations (on-premises) environment, refer to the following guidelines: [Plan and prepare your Service Fabric cluster](#) and [Describing a service fabric cluster](#). Each virtual host should have enough cores for the infrastructure that is being sized. Multiple advanced configurations are possible, where SQL Server resides on physical hardware but everything else is virtualized. If SQL Server is virtualized, the disk subsystem should be a fast SAN or the equivalent. In all cases, make sure that the basic setup of the virtual host is highly available and redundant. In all cases, when virtualization is used, no VM snapshots should be taken.

Software requirements for all server computers

The following software must be present on a computer before any Finance and Operations (on-premises) components can be installed:

- Microsoft .NET Framework 4.5.1 or higher
- Service Fabric

For more information, see [Plan and prepare your Service Fabric cluster](#).

Supported server operating systems

The following table lists the server operating systems that are supported for Finance and Operations components.

Operating system	Notes
Microsoft Windows Server 2016 Datacenter or Standard	These requirements are for the database and the Service Fabric cluster that hosts AOS.

Software requirements for database servers

- Only 64-bit versions of SQL Server 2016 SP1 are supported.
- In a production environment, we recommend that you install the latest cumulative update (CU) for the version of SQL Server that you're using.
- Finance and Operations (on-premises) supports Unicode collations that are case-insensitive, accent-sensitive, kana-sensitive, and width-insensitive. The collation must match the Windows locale of the computers that are running AOS instances. If you're setting up a new installation, we recommend that you select a Windows collation instead of a SQL Server collation. For more information about how to select a collation for a SQL Server database, see the [SQL Server documentation](#).

The following table lists the SQL Server versions that are supported for the Finance and Operations databases. For more information, see the minimum hardware requirements for [SQL Server](#).

Requirement	Notes
Microsoft SQL Server 2016 SP1 Standard Edition or Enterprise Edition	For the hardware requirements for SQL Server 2016 SP1, see Hardware and Software Requirements for Installing SQL Server 2016 .

Software requirements for client computers

The Microsoft Dynamics 365 for Operations web application can run on any device with an HTML5.0 compliant web browser. Specific device/browser combinations that Microsoft has confirmed include:

- Microsoft Edge (latest publicly available version) on Windows 10
- Internet Explorer 11 on Windows 10, Windows 8.1, or Windows 7
- Google Chrome (latest publicly available version) on Windows 10, Windows 8.1, Windows 8, Windows 7, or Google Nexus 10 tablet
- Apple Safari (latest publicly available version) on Mac OS X 10.10 (Yosemite), 10.11 (El Capitan) or 10.12 (Sierra), or Apple iPad

Software requirements for Active Directory Federation Services

Use Active Directory Federation Services (AD FS) 3.0.

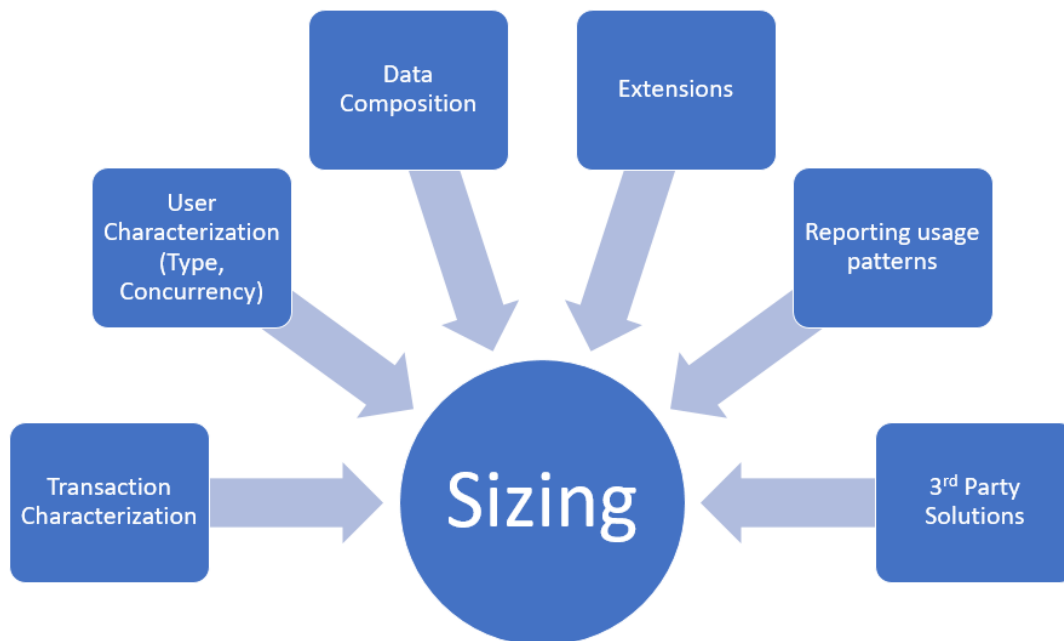
Hardware and software requirements for Retail components

Finance and Operations (on-premises) does not include the Retail components at this time.

Hardware sizing for on-premises environments

Factors that affect sizing

All the factors shown in the following illustration contribute to sizing. The more detailed information that is collected, the more precisely you can determine sizing. Hardware sizing, without supporting data, is likely to be inaccurate. The absolute minimum requirement for necessary data is the peak transaction line load per hour.



Viewed from left to right, the first and most important factor needed to accurately estimate sizing is a transaction profile or a transaction characterization. It's important to always find the peak transactional volume per hour. If there are multiple peak periods, then these periods need to be accurately defined.

As you understand the load that impacts your infrastructure, you also need to understand more detail about these factors:

- **Transactions** - Typically transactions have certain peaks throughout the day/week. This mostly depends on the transaction type. Time and expense entries usually show peaks once per week, whereas Sales order entries often come in bulk via integration or trickle in during the day.
- **Number of concurrent users** – The number of concurrent users is the second most important sizing factor. You cannot reliably get sizing estimates based on the number of concurrent users, so if this is the only data you have

available, estimate an approximate number, and then revisit this when you have more data. An accurate concurrent user definition means that:

- Named users are not concurrent users.
- Concurrent users are always a subset of named users.
- Peak workload defines the maximum concurrency for sizing.
- Criteria for concurrent users is that the user meets all the following criteria:
 - Logged on.
 - Working transactions/inquiries at the time of counting.
 - Not an idle session.
- **Data composition** – This is mostly about how your system will be set up and configured. For example, how many legal entities you will have, how many items, how many BOM levels, and how complex your security setup will be. Each of those factors may have a small impact on performance, so these factors can be offset by using smart choices when it comes to infrastructure.
- **Extensions** – Customizations can be simple or complex. The number of customizations and the nature of complexity and usage has a varied impact on the size of the infrastructure needed. For complex customizations, it's advised to conduct performance evaluations to ensure that they are not only tested for efficiency but also help understand the infrastructure needs. This is even more critical when the extensions are not coded according to best practices for performance and scalability.
- **Reporting and analytics** – These factors typically include running heavy queries against the various databases in the Finance and Operations database systems. Understanding and reducing the frequency when expensive reports run will help you understand the impact of them.
- **Third-party solutions** – These solutions, like ISVs, have the same implications and recommendations as extensions.

Sizing your Finance and Operations environment

To understand your sizing requirements, you need to know the peak volume of transactions that you need to process. Most auxiliary systems, like Management Reporter or SSRS, are less mission critical. As a result, this document focuses mostly on AOS and SQL Server.

Note: In general, the compute tiers scale out and should be set up in an N+1 fashion, meaning if you estimate three AOS, add a fourth AOS. The database tier should be set up in an Always On highly-available setup.

SQL Server (OLTP)

Sizing

- 3K to 15K transaction lines per hour per core on DB server.
- Typical AOS-to-SQL core ratio 3:1 for the primary SQL Server. Additional cores are required based on the chosen high availability configuration.
 - Processing database-heavy operations may regress this to 2:1.
- The following factors influence variations:

- Parameter settings in use.
- Levels of extensions.
- Usage of additional functionality, such as database log and alerts. Extreme database logging will further reduce throughput per hour per core below 3K lines.
- Complexity of data composition – A simple chart of accounts versus a detailed fine-grained chart of accounts has implications on throughput (as an example).
- Transaction characterization.
- 2 GB to 4 GB memory for each core.
- Auxiliary databases on DB server such as Management reporter and SSRS databases.
- TempDB = 15% of DB size, with as many files as physical processors.
- SAN size and throughput based on total concurrent transaction volume/usage.

High availability

We recommend always utilizing SQL Server in either a cluster or mirroring setup. The second SQL node should have the same number of cores as the primary node.

Active Directory Federation Services (AD FS)

For AD FS sizing, see the [AD FS Server Capacity documentation](#).

A [sizing spreadsheet](#) is available for planning the number of instances in your deployment.

AOS (Online and batch)

Sizing

- Sizing by transaction volume/usage
 - 2K to 6K lines per core
 - 16 GB per instance
 - Standard box – 4 to 24 cores
 - 10 to 15 Enterprise users per core
 - 15 to 25 Activity users per core
 - 25 to 50 Team members per core
- Batch
 - 1 to 4 batch threads per core
 - Size based on batch window characterization
- Note that the AOS, Data management, and Batch are on the same role in the Service Fabric. You need to size for these three workloads combined, and not separate these like in Microsoft Dynamics AX 2012.
- The same variability factors for SQL Server apply here.

High availability

- Ensure that you have at least 1 to 2 more AOS available than you estimate.
- Ensure that you have at least 3 to 4 virtual hosts available.

Management reporter

In most cases, unless used extensively, the recommended minimum requirements using two nodes should work well. Only in cases where there is heavy use will you need more than two nodes. Please scale in case needed.

SQL Server Reporting Services

For the general availability release, only one SSRS node can be deployed. Monitor your SSRS node while testing and increase the number of cores available for SSRS on a need basis. Make sure that you have a preconfigured secondary node available on a virtual host that is different than the SSRS VM. This is important if there is an issue with the virtual machine that hosts SSRS or the virtual host. If this the case, they would need to be replaced.

Environment Orchestrator

The Orchestrator service is the service that manages your deployment and the related communication with LCS. This service is deployed as the primary Service Fabric service and requires at least three VMs. This service is co-located with the Service Fabric orchestration services. This and should be sized to the peak load of the cluster. For more information, see [Service Fabric cluster capacity planning considerations](#).

Virtualization and oversubscription

Mission critical services like the AOS should be hosted on Virtual hosts that have dedicated resources – cores, memory, and disk.

[Send feedback.](#)

Microsoft Dynamics is a line of integrated, adaptable business management solutions that enables you and your people to make business decisions with greater confidence. Microsoft Dynamics works like and with familiar Microsoft software, automating and streamlining financial, customer relationship, and supply chain processes in a way that helps you drive business success.

United States and Canada toll-free: (888) 477-7989

Worldwide: (1) (701) 281-6500

www.microsoft.com/dynamics

© 2017 Microsoft Corporation. All rights reserved.

This document is provided “as-is.” Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it.

Some examples are for illustration only and are fictitious. No real association is intended or inferred.

This document does not provide you with any legal rights to any intellectual property in any Microsoft product. You may copy and use this document for your internal, reference purposes.