



Cisco Secured Network Server 3500/3600 Series Appliances and Virtual Machine Requirements

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Hardware and Virtual Appliance Requirements for Cisco ISE

Cisco Identity Services Engine (Cisco ISE) can be installed on Cisco Secure Network Server (SNS) hardware or virtual appliances. To achieve performance and scalability comparable to the Cisco ISE hardware appliance, the virtual machine should be allocated system resources equivalent to the Cisco SNS hardware appliances. This section lists the hardware, software, and virtual machine requirements required to install Cisco ISE.



Note For Cisco SNS 3600 series appliance support (SNS-3615-K9, SNS-3655-K9, and SNS-3695-K9), you must use only the new ISO file (`ise-2.4.0.357.SPA.x86_64_SNS-36x5_APPLIANCE_ONLY.iso`). Cisco ISE 2.4 Patch 9 or above must be applied after installation. We recommend that you do not use this ISO file for SNS 3500 series appliance, VMware, KVM, or Hyper-V installation.



Note Harden your virtual environment and ensure that all the security updates are up-to-date. Cisco is not liable for any security issues found in hypervisors.



Note Cisco ISE does not support VM snapshots for backing up ISE data on any of the virtual environments (VMware, Linux KVM, Microsoft Hyper-V, and Nutanix AHV) because a VM snapshot saves the status of a VM at a given point in time. In a multi-node Cisco ISE deployment, data in all the nodes are continuously synchronized with current database information. Restoring a snapshot might cause database replication and synchronization issues. We recommend that you use the backup functionality included in Cisco ISE for archival and restoration of data. Using snapshots to back up ISE data results in stopping Cisco ISE services. A reboot is required to bring up the ISE node.



Caution If the Snapshot feature is enabled on the VM, it might corrupt the VM configuration. If this issue occurs, you might have to reimage the VM and disable VM snapshot.

Cisco Secured Network Server Hardware Appliances

For Cisco Secured Network Server (SNS) hardware appliance specifications, see "Table 1, Product Specifications" in the [Cisco Secure Network Server Data Sheet](#).

For Cisco SNS 3500 series appliances, see [Cisco SNS-3500 Series Appliance Hardware Installation Guide](#).

For Cisco SNS 3600 series appliances, see [Cisco SNS-3600 Series Appliance Hardware Installation Guide](#).

VMware Virtual Machine Requirements for Cisco ISE

Cisco ISE supports the following VMware servers and clients:

- VMware Version 8 (default) for ESXi 5.x (5.1 U2 minimum)



Note If you are installing Cisco ISE on an ESXi 5.x server, to support RHEL 7 as the Guest OS, update the VMware hardware version to 9 or later. RHEL 7 is supported with VMware hardware version 9 and later.

- VMware version 11 (default) for ESXi 6.x
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Cisco ISE supports the VMware cold migration feature that allows you to migrate virtual machine (VM) instances (running any persona) between hosts. For the cold migration feature to be functional, the following condition must be met:

- Cisco ISE must be shutdown and powered off: Cisco ISE does not allow to stop or pause the database operations during migration. This might lead to data corruption issues. Hence, ensure that Cisco ISE is not running and active during the migration.



Note

- You must use the application stop command before using the halt command or powering off the VM to prevent database corruption issues.
- Cisco ISE VM does not support hot migration (vMotion).

Refer to your VMware documentation for more information on vMotion requirements.

Cisco ISE offers the following OVA templates that you can use to install and deploy Cisco ISE on virtual machines (VMs):

- ISE-2.4.0.xxx-virtual-Eval.ova
- ISE-2.4.0.xxx-virtual-SNS3515-Small-200GBHD-16GBRAM-12CPU.ova

- ISE-2.4.0.xxx-virtual-SNS3515-Small-600GBHD-16GBRAM-12CPU.ova
- ISE-2.4.0.xxx-virtual-SNS3595-Medium-200GBHD-64GBRAM-16CPU.ova
- ISE-2.4.0.xxx-virtual-SNS3595-Medium-1200GBHD-64GBRAM-16CPU.ova
- ISE-2.4.0.xxx-virtual-SNS3595-Large-1200GBHD-256GBRAM-16CPU.ova

The 200 GB OVA templates are sufficient for Cisco ISE nodes that serve as dedicated Policy Service or pxGrid nodes.

The 600 GB and 1.2 TB OVA templates are recommended to meet the minimum requirements for ISE nodes that run the Administration or Monitoring persona.

If you need to customize the disk size, CPU, or memory allocation, you can manually deploy Cisco ISE using the standard .iso image. However, it is important that you ensure the minimum requirements and resource reservations specified in this document are met. The OVA templates simplify ISE virtual appliance deployment by automatically applying the minimum resources required for each platform.

The OVA template reservations for the base SNS platforms are provided in the table below.

Table 1: OVA Template Reservations

OVA Template	Memory	CPU
Virtual Eval OVA	16 GB RAM	2300 MHz (no reservation)
Virtual SNS-3515 OVA (Small)	16 GB RAM	12 GHz
Virtual SNS-3595 OVA (Medium)	64 GB RAM	16 GHz
Virtual SNS-3595 OVA (Large) The large node is only for use as a performance-enhanced MnT node. You cannot use the Large VM as a PAN, PSN, or pxGrid node.	256 GB RAM	16+ GHz

We strongly recommend that you reserve CPU and memory resources to match the resource allocation. Failure to do so may significantly impact ISE performance and stability.

For information about the product specifications for Cisco SNS appliance, see [Cisco Secure Network Server Data Sheet](#).

The following table lists the VMware virtual machine requirements.

Table 2: VMware Virtual Machine Requirements

Requirement Type	Specifications
CPU	<ul style="list-style-type: none"> • Evaluation <ul style="list-style-type: none"> • Clock speed: 2.0 GHz or faster • Number of CPU cores: 2 CPU cores • Production <ul style="list-style-type: none"> • Clock speed: 2.0 GHz or faster • Number of cores: <ul style="list-style-type: none"> • SNS 3500 Series Appliance: <ul style="list-style-type: none"> • Small: 12 • Medium: 16 • Large: 16 <p>Note The number of cores is twice of that present in equivalent of the Cisco Secure Network Server 3500 series, due to hyperthreading. For example, in case of Small network deployment, you must allocate 16 vCPU cores to meet the CPU specification of SNS 3515, which has 8 CPU Cores or 16 Threads.</p> <p>See Table 1: OVA Template Reservations for CPU Reservations.</p>
Memory	<ul style="list-style-type: none"> • Evaluation: 16 GB • Production <ul style="list-style-type: none"> • Small: 16 GB for SNS 3515 and 32 GB for SNS 3615 • Medium: 64 GB for SNS 3595 and 96 GB for SNS 3655 • Large: 256 GB for SNS 3695 <p>The Large memory size is only for use as a performance-enhanced MnT node. You cannot use the Large VM as a PAN, PSN, or pxGrid node.</p> <p>See Table 1: OVA Template Reservations for Memory Reservations.</p>

Requirement Type	Specifications
Hard Disks	<ul style="list-style-type: none"> • Evaluation: 200 GB • Production 200 GB to 2.4 TB of disk storage (size depends on deployment and tasks). See the recommended disk space for VMs in the following link: Disk Space Requirements. We recommend that your VM host server use hard disks with a minimum speed of 10,000 RPM. <p>Note When you create the Virtual Machine for Cisco ISE, use a single virtual disk that meets the storage requirement. If you use more than one virtual disk to meet the disk space requirement, the installer may not recognize all the disk space.</p>
Storage and File System	<p>The storage system for the Cisco ISE virtual appliance requires a minimum write performance of 50 MB per second and a read performance of 300 MB per second. Deploy a storage system that meets these performance criteria and is supported by VMware server.</p> <p>You can use the show tech-support command to view the read and write performance metrics.</p> <p>We recommend the VMFS file system because it is most extensively tested, but other file systems, transports, and media can also be deployed provided they meet the above requirements.</p>
Disk Controller	<p>Paravirtual (default for RHEL 7 64-bit) or LSI Logic Parallel</p> <p>For best performance and redundancy, a caching RAID controller is recommended. Controller options such as RAID 10 (also known as 1+0) can offer higher overall write performance and redundancy than RAID 5, for example. Additionally, battery-backed controller cache can significantly improve write operations.</p> <p>Note Updating the disk SCSI controller of an ISE VM from another type to VMware Paravirtual may render it not bootable.</p>
NIC	<p>1 NIC interface required (two or more NICs are recommended; six NICs are supported). Cisco ISE supports E1000 and VMXNET3 adapters.</p> <p>Note We recommend that you select E1000 to ensure correct adapter order by default. If you choose VMXNET3, you might have to remap the ESXi adapter to synchronize it with the ISE adapter order.</p>
VMware Virtual Hardware Version/Hypervisor	<p>VMware Virtual Machine Hardware Version 8 or higher on ESXi 5.x (5.1 U2 minimum) and 6.x.</p> <p>Note If you are installing Cisco ISE on an ESXi 5.x server, to support RHEL 7 as the Guest OS, update the VMware hardware version to 9 or later. RHEL 7 is supported with VMware hardware version 9 and later.</p>

Linux KVM Requirements for Cisco ISE

Table 3: Linux KVM Virtual Machine Requirements

Requirement Type	Minimum Requirements
CPU	<ul style="list-style-type: none"> • Evaluation <ul style="list-style-type: none"> • Clock Speed: 2.0 GHz or faster • Number of Cores: 2 CPU cores • Production <ul style="list-style-type: none"> • Clock Speed: 2.0 GHz or faster • Number of Cores: <ul style="list-style-type: none"> • SNS 3500 Series Appliance: <ul style="list-style-type: none"> • Small: 12 • Medium: 16 • Large: 16 <p>Note The number of cores is twice of that present in equivalent of the Cisco Secure Network Server 3500 series, due to hyperthreading. For example, in case of Small network deployment, you must allocate 16 vCPU cores to meet the CPU specification of SNS 3515, which has 8 CPU Cores or 16 Threads.</p> <p>See Table 1: OVA Template Reservations for CPU Reservations.</p>
Memory	<ul style="list-style-type: none"> • Evaluation: 16 GB • Production <ul style="list-style-type: none"> • Small: 16 GB for SNS 3515 and 32 GB for SNS 3615 • Medium: 64 GB for SNS 3595 and 96 GB for SNS 3655 • Large: 256 GB for SNS 3695 <p>See Table 1: OVA Template Reservations for Memory Reservations.</p>

Requirement Type	Minimum Requirements
Hard disks	<ul style="list-style-type: none"> • Evaluation: 200 GB • Production 200 GB to 2.4 TB of disk storage (size depends on deployment and tasks). See the recommended disk space for VMs in the following link: Disk Space Requirements. We recommend that your VM host server use hard disks with a minimum speed of 10,000 RPM. <p>Note When you create the Virtual Machine for Cisco ISE, use a single virtual disk that meets the storage requirement. If you use more than one virtual disk to meet the disk space requirement, the installer may not recognize all the disk space.</p>
KVM Disk Device	Disk bus - virtio, cache mode - none, I/O mode - native Use preallocated RAW storage format.
NIC	1 NIC interface required (two or more NICs are recommended; six NICs are supported). Cisco ISE supports VirtIO drivers. We recommend VirtIO drivers for better performance.
Hypervisor	KVM on RHEL 7.0

Microsoft Hyper-V Requirements for Cisco ISE

Table 4: Microsoft Hyper-V Virtual Machine Requirements

Requirement Type	Minimum Requirements
CPU	<ul style="list-style-type: none"> • Evaluation <ul style="list-style-type: none"> • Clock speed: 2.0 GHz or faster • Number of cores: 2 CPU cores • Production <ul style="list-style-type: none"> • Clock speed: 2.0 GHz or faster • Number of Cores: <ul style="list-style-type: none"> • SNS 3500 Series Appliance: <ul style="list-style-type: none"> • Small: 12 • Medium: 16 • Large: 16 <p>The number of cores is twice of that present in equivalent of the Cisco Secure Network Server 3500 series, due to hyperthreading. For example, in case of Small network deployment, you must allocate 16 vCPU cores to meet the CPU specification of SNS 3515, which has 8 CPU Cores or 16 Threads.</p> <p>See Table 1: OVA Template Reservations for CPU Reservations.</p>
Memory	<ul style="list-style-type: none"> • Evaluation: 16 GB • Production <ul style="list-style-type: none"> • Small: 16 GB for SNS 3515 and 32 GB for SNS 3615 • Medium: 64 GB for SNS 3595 and 96 GB for SNS 3655 • Large: 256 GB for SNS 3695 <p>See Table 1: OVA Template Reservations for Memory Reservations.</p>

Requirement Type	Minimum Requirements
Hard disks	<ul style="list-style-type: none"> • Evaluation: 200 GB • Production 200 GB to 2.4 TB of disk storage (size depends on deployment and tasks). See the recommended disk space for VMs in the following link: Disk Space Requirements. We recommend that your VM host server use hard disks with a minimum speed of 10,000 RPM. <p>Note When you create the Virtual Machine for Cisco ISE, use a single virtual disk that meets the storage requirement. If you use more than one virtual disk to meet the disk space requirement, the installer may not recognize all the disk space.</p>
NIC	1 NIC interface required (two or more NICs are recommended; six NICs are supported).
Hypervisor	Hyper-V (Microsoft)

Virtual Machine Appliance Size Recommendations for Cisco ISE

Cisco ISE 2.4 introduces a large VM for Monitoring nodes. Deploying a Monitoring persona on a large VM offers the following advantages:

- Improves performance in terms of faster response to live log queries and report completion.
- Will be able to support the deployments that can handle more than 500, 000 sessions when the support is provided in future ISE releases.



Note This form factor is available only as a VM in Release 2.4 and later, and requires a large VM license.

The virtual machine (VM) appliance specifications should be comparable with physical appliances run in a production environment.

Keep the following guidelines in mind when allocating resources for the appliance:

- Failure to allocate the specified resources might result in performance degradation or service failure. We highly recommend that you deploy dedicated VM resources and not share or oversubscribe resources across multiple guest VMs. Deploying Cisco ISE virtual appliances using the OVF templates ensures that adequate resources are assigned to each VM. If you do not use OVF templates, then ensure that you assign the equivalent resource reservations when you manually install Cisco ISE using the ISO image.



Note If you choose to deploy Cisco ISE manually without the recommended reservations, you must assume the responsibility to closely monitor your appliance's resource utilization and increase resources, as needed, to ensure proper health and functioning of the Cisco ISE deployment.

- If you are using the OVA templates for installation, check the following settings after the installation is complete:
 - Ensure that you assign the resource reservations that are specified in the [VMware Virtual Machine Requirements for Cisco ISE, on page 2](#) section in the CPU/Memory **Reservation** field (under the **Virtual Hardware** tab in the **Edit Settings** window) to ensure proper health and functioning of the Cisco ISE deployment.
 - Ensure that the CPU usage in the **CPU Limit** field (under the **Virtual Hardware** tab in the **Edit Settings** window) is set to **Unlimited**. Setting a limit for CPU usage (for example, setting the CPU usage limit as 12000 MHz) will impact the system performance. If limit has been set, you must shutdown the VM client, remove the limit, and the restart the VM client.
 - Ensure that the memory usage in the **Memory Limit** field (under the **Virtual Hardware** tab in the **Edit Settings** window) is set to **Unlimited**. Setting a limit for memory usage (for example, setting the limit as 12000 MB) will impact the system performance.
 - Ensure that the **Shares** option is set as **High** in the **Hard Disk** area (under the **Virtual Hardware** tab in the **Edit Settings** window).

Admin and MnT nodes rely heavily on disk usage. Using shared disk storage VMware environment might affect the disk performance. You must increase the number of disk shares allocated to a node to increase the performance of the node.

- Policy Service nodes on VMs can be deployed with less disk space than Administration or Monitoring nodes. The minimum disk space for any production Cisco ISE node is 200 GB.
- VMs can be configured with 1 to 6 NICs. The recommendation is to allow for 2 or more NICs. Additional interfaces can be used to support various services such as profiling, guest services, or RADIUS.



Note RAM and CPU adjustments on VM do not require re-image.

Disk Space Requirements for VMs in a Cisco ISE Deployment

The following table lists the Cisco ISE disk-space allocation recommended for running a virtual machine in a production deployment.



Note You must change the firmware from **BIOS** to **EFI** in the boot mode of VM settings to boot GPT partition with 2 TB or above.

Table 5: Recommended Disk Space for Virtual Machines

Cisco ISE Persona	Minimum Disk Space for Evaluation	Minimum Disk Space for Production	Recommended Disk Space for Production	Maximum Disk Space
Standalone Cisco ISE	200 GB	600 GB	600 GB to 2.4 TB	2.4 TB
Distributed Cisco ISE, Administration only	200 GB	600 GB	600 GB	2.4 TB
Distributed Cisco ISE, Monitoring only	200 GB	600 GB	600 GB to 2.4 TB	2.4 TB
Distributed Cisco ISE, Policy Service only	200 GB	200 GB	200 GB	2.4 TB
Distributed Cisco ISE, pxGrid only	200 GB	200 GB	200 GB	2.4 TB
Distributed Cisco ISE, Administration and Monitoring (and optionally, pxGrid)	200 GB	600 GB	600 GB to 2.4 TB	2.4 TB
Distributed Cisco ISE, Administration, Monitoring, and Policy Service (and optionally, pxGrid)	200 GB	600 GB	600 GB to 2.4 TB	2.4 TB



Note Additional disk space is required to store local debug logs, staging files, and to handle log data during upgrade, when the Primary Administration node temporarily becomes a Monitoring node.

Disk Space Guidelines for Cisco ISE

Keep the following guidelines in mind when deciding the disk space for Cisco ISE:

- Cisco ISE must be installed on a single disk in virtual machine.
- Disk allocation varies based on logging retention requirements. On any node that has the Monitoring persona enabled, 60 percent of the VM disk space is allocated for log storage. A deployment with 25,000 endpoints generates approximately 1 GB of logs per day.

For example, if you have a Monitoring node with 600-GB VM disk space, 360 GB is allocated for log storage. If 100,000 endpoints connect to this network every day, it generates approximately 4 GB of logs per day. In this case, you can store 76 days of logs in the Monitoring node, after which you must transfer the old data to a repository and purge it from the Monitoring database.

For extra log storage, you can increase the VM disk space. For every 100 GB of disk space that you add, you get 60 GB more for log storage.

If you increase the disk size of your virtual machine after initial installation, perform a fresh installation of Cisco ISE. A fresh installation helps properly detect and utilize the full disk allocation.

The following table lists the number of days that RADIUS logs can be retained on your Monitoring node based on the allocated disk space and the number of endpoints that connect to your network. The numbers are based on the following assumptions: Ten or more authentications per day per endpoint with logging suppression enabled.

Table 6: Monitoring Node Log Storage—Retention Period in Days for RADIUS

No. of Endpoints	200 GB	600 GB	1024 GB	2048 GB
5,000	504	1510	2577	5154
10,000	252	755	1289	2577
25,000	101	302	516	1031
50,000	51	151	258	516
100,000	26	76	129	258
150,000	17	51	86	172
200,000	13	38	65	129
250,000	11	31	52	104
500,000	6	16	26	52

The following table lists the number of days that TACACS+ logs can be retained on your Monitoring node based on the allocated disk space and the number of endpoints that connect to your network. The numbers are based on the following assumptions: The script runs against all NADs, 4 sessions per day, and 5 commands per session.

Table 7: Monitoring Node Log Storage—Retention Period in Days for TACACS+

No. of Endpoints	200 GB	600 GB	1024 GB	2048 GB
100	12,583	37,749	64,425	128,850
500	2,517	7,550	12,885	25,770
1,000	1,259	3,775	6,443	12,885
5,000	252	755	1,289	2,577
10,000	126	378	645	1,289
25,000	51	151	258	516
50,000	26	76	129	258
75,000	17	51	86	172
100,000	13	38	65	129

Increase Disk Size

If you find that context and visibility functions are slow, or you are running out of room for logs, you must allocate more disk space.

To plan for more log storage, for every 100 GB of disk space that you add, 60 GB is available for log storage.

In order for ISE to detect and utilize the new disk allocation, you must deregister the node, update the VM settings, and reinstall ISE. One way to do this is to install ISE on a new larger node, and add that node to the deployment as high availability. After the nodes have synchronized, make the new VM the primary and deregister the original VM.

Decrease Disk Size

After you install Cisco ISE on a VM, you must not reduce the VM reservations. If you reduce the VM memory to less than what Cisco ISE services require, Cisco ISE services fail to come up due to insufficient resources.

After you install Cisco ISE, if you must reconfigure your VM, then carry out the following steps:

1. Perform backup of Cisco ISE.
2. Reimage Cisco ISE with the changed VM configuration as needed.
3. Restore Cisco ISE.

