

# Recommended Computing Resources for SD-WAN Control Components Release 26.2.x

**Note** Starting from Cisco Catalyst SD-WAN Control Components Release 20.9.x, the recommended computing resources are specified for single tenant and multitenants according to the instance type definitions. Prior to Cisco Catalyst SD-WAN Control Components Release 20.9.x, the recommended computing resources were specified based the deployment modes.


- Single Tenant (ST), on page 1
- Multitenant (MT), on page 13


# Single Tenant (ST)

The supported instance specifications for the Cisco SD-WAN Manager, Cisco SD-WAN Validator, and Cisco SD-WAN Controller are as follows:

**Note** The control components and the device software versions should be the same, to achieve the following scale.

***Table 1: Instance Type Definitions***

| Instance Type | Specifications (Approximation) | | | Qualified Instance Type | |
|---|---|---|---|---|---|
| | vCPUs* | RAM* | Storage Size* | Azure | AWS |
| Small | 16 vCPUs | 32 GB RAM | 500 GB | Standard_F16s_v2 | c5.4xlarge and c6i.4xlarge |
| Medium | 32 vCPUs | 64 GB RAM | 1 TB | Standard_F32s_v2 | c5.9xlarge and c6i.8xlarge |
| Large | 32 vCPUs | 128 GB RAM | 5 TB | Standard_D32ds_v5 | m6i.8xlarge, c6i.16xlarge, and c5.18xlarge** |

* vCPU, RAM, and Storage Size numbers are on per Cisco Catalyst SD-WAN Manager basis. The Storage Size numbers can be sized up to 10 TB for on-prem and customer cloud hosted.

** This deployment supports the m6i.8xlarge, c6i.16xlarge, and c5.18xlarge AWS instance types. Cisco recommends using m6i.8xlarge.

*Table 2: Instance Types with Number of Devices, Nodes and Deployment Models*

| Devices | Nodes and Deployment Models with Instance Type | Data Processing Factor | Number of days the data can be stored | Max Daily Processing Volume | DR Supported*** | Cisco Cloud | On-Prem (UCS - ESXi/KVM) | On-Prem (UCS - Nutanix)**** | Customer Cloud |
|---|---|---|---|---|---|---|---|---|---|
| ** Cisco Catalyst SD-WAN Application Intelligence Engine (SAIE) Disabled | | | | | | | | | |
| <250 | One Node Small Cisco Cisco SD-WAN Manager | NA | NA | NA | No | Yes | Yes | No | Yes |
| <1000 | One Node Large Cisco SD-WAN Manager | NA | NA | NA | Yes | Yes | Yes | Yes | Yes |
| 1000-1500 | One Node Large Cisco SD-WAN Manager | NA | NA | NA | Yes | Yes | Yes | No | Yes |
| 1000-2500 | Three Node Large Cisco SD-WAN Manager Cluster (All Services) | NA | NA | NA | Yes | Yes | Yes | Yes | Yes |

| Devices | Nodes and Deployment Models with Instance Type | Data Processing Factor | Number of days the data can be stored | Max Daily Processing Volume | DR Supported*** | Cisco Cloud | On-Prem (UCS - ESXi/KVM) | On-Prem (UCS - Nutanix)**** | Customer Cloud |
|---|---|---|---|---|---|---|---|---|---|
| 1500-2000 | Three Node Medium Cisco SD-WAN Manager Cluster (All Services) | NA | NA | NA | No | Yes | Yes | No | Yes |
| 2000-5000 | Three Node Large Cisco SD-WAN Manager Cluster (All Services) | NA | NA | NA | Yes | Yes | Yes | No | Yes |
| 2000-5000 | Six Node Large Cisco SD-WAN Manager Cluster (3 Nodes with ConfigDB) and all nodes messaging server, stats and AppServer | NA | NA | NA | Yes | Yes | Yes | No | Yes |

| Devices | Nodes and Deployment Models with Instance Type | Data Processing Factor | Number of days the data can be stored | Max Daily Processing Volume | DR Supported*** | Cisco Cloud | On-Prem (UCS - ESXi/KVM) | On-Prem (UCS - Nutanix)**** | Customer Cloud |
|---|---|---|---|---|---|---|---|---|---|
| 5000-12500 | Six Node Large Cisco SD-WAN Manager Cluster (3 Nodes with ConfigDB) and all nodes messaging server, stats and AppServer | NA | NA | NA | Yes | Yes | Yes | No | Yes |
| ** Cisco Catalyst SD-WAN Application Intelligence Engine (SAIE) Enabled | | | | | | | | | |
| <250 | One Node Medium Cisco SD-WAN Manager | 25 GB/Day | 20 Days | 25 GB/Day | No | Yes | NA | NA | NA |
| <250 | One Node Large Cisco SD-WAN Manager | 50 GB/Day | 30 Days | 50 GB/Day | Yes | NA | Yes | Yes | Yes |
| 250-1000 | One Node Large Cisco SD-WAN Manager | 50 GB/Day | 30 Days | 50 GB/Day | Yes | Yes | Yes | Yes | Yes |

| Devices | Nodes and Deployment Models with Instance Type | Data Processing Factor | Number of days the data can be stored | Max Daily Processing Volume | DR Supported*** | Cisco Cloud | On-Prem (UCS - ESXi/KVM) | On-Prem (UCS - Nutanix)**** | Customer Cloud |
|---|---|---|---|---|---|---|---|---|---|
| 1000-2500 | Three Node Large Cisco SD-WAN Manager Cluster (All Services) | 100 GB/Day | 14 Days | 300 GB/Day | Yes | Yes | Yes | Yes | Yes |
| 2500-4000 | Three Node Large Cisco SD-WAN Manager Cluster (All Services) | 100 GB/Day | 14 Days | 300 GB/Day | Yes | Yes | Yes | No | Yes |
| 2500-5000 | Six Node Large Cisco SD-WAN Manager Cluster (3 Node with ConfigDB) and all nodes messaging server, stats, and AppServer | 100 GB/Day | 14 Days | 500 GB/Day | Yes | Yes | Yes | No | Yes |

| Devices | Nodes and Deployment Models with Instance Type | Data Processing Factor | Number of days the data can be stored | Max Daily Processing Volume | DR Supported*** | Cisco Cloud | On-Prem (UCS - ESXi/KVM) | On-Prem (UCS - Nutanix)**** | Customer Cloud |
|---|---|---|---|---|---|---|---|---|---|
| 4000-7000 | Six Node Large Cisco SD-WAN Manager Cluster (3 Node with ConfigDB) and all nodes messaging server, stats, and AppServer | 100 GB/Day | 14 Days | 2 TB/Day* | Yes | Yes | Yes | No | Yes |
| 7000-12500 | Six Node Large Cisco SD-WAN Manager Cluster (3 Node with ConfigDB) and all nodes messaging server, stats, and AppServer | 100 GB/Day | 14 Days | 1 TB/Day* | Yes | Yes | Yes | No | Yes |

**Note**

- *For a larger dataset per day, run Stats on all the servers.
- ** Along with SAIE, the following statistics are also considered in the recommendations:
  - Approute
  - Performance Monitor
- *** Consider the following points when choosing deployment models for Disaster Recovery:
  - Ensure the data center to disaster recovery (DC-DR) link has a minimum bandwidth of 1 Gigabit.
  - The latency between data centers should be 50 milliseconds (ms) or lower to ensure optimal performance.
- ****Nutanix:
  - We recommended operating each UCS server as an independent, single-node Nutanix cluster with dedicated compute, storage, and management.
  - If using a Nutanix cluster deployment, you must pin VMs must to specific UCS servers using strictly enforced VM affinity policies to ensure each VM consumes only the compute and storage resources of its assigned host.
- For DR deployments beyond the supported scale, please contact a Cisco representative for further assistance.

***Table 3: Supported Scale on Cisco HyperFlex (HX), SAIE Disabled***

| Devices | Nodes and Deployment Models with Instance Types |
|---|---|
| 0-2000 | Three Node Medium Cisco SD-WAN Manager Cluster |
| 2000-5000 | Three Node Large Cisco SD-WAN Manager Cluster |

To achieve scale beyond the numbers mentioned in the tables above, deploy multiple overlays.

**Note**

- The number of days the data can be stored in Cisco Catalyst SD-WAN Manager, depends on per-day processing volume of the device nodes. To store the data for a longer time or to accommodate the increase in per-day processing volume, use the following formulas to calculate the required Cisco Catalyst SD-WAN Manager disk size:
- Formula to calculate the Cisco Catalyst SD-WAN Manager disk size required for single node and cluster deployments: (Data per day × number of days) + 500 GB buffer. For example, if the data per day is 100 Gigabytes and the number of days the data must be stored is 10, then the required Cisco Catalyst SD-WAN Manager disk size is 1.5 Terabytes.
- Starting with Cisco Catalyst SD-WAN Manager Release 20.15.x, the statistics database requires less storage than in previous releases. After the statistics migration completes, adjust the sizing value based on your deployment:
  - 3-node or 6-node cluster: Divide the previous sizing value by 30.
  - Single-node deployment: Divide the previous sizing value by 10.

  For example, if a 3-node or 6-node cluster previously required 30 GB, the new database requires 1 GB.

**Note** Maximum tested disk size for On-prem is 10 TB per instance.

**Note** Starting from Cisco vManage Release 20.6.1, you can achieve the above mentioned storage size numbers by modifying the aggregated SAIE size. The aggregated SAIE size is unidimensional and varies when the deployment includes edge devices that run on a mix of releases (Cisco SD-WAN Release 20.6.x and earlier releases). The aggregated SAIE also varies when on-demand troubleshooting is enabled for the devices.

Ensure that both the SAIE and aggregated SAIE index sizes are configured to enable on-demand troubleshooting.

To modify the aggregated SAIE value,

1. From the Cisco SD-WAN Manager menu, choose **Administration** > **Settings**.
2. Click **Edit** next to **Statistics Database Configuration**.
3. Modify the **Aggregated SAIE** size to the desired value based on your SAIE traffic, the default disk size allocation is 5 GB.

**Note** When SAIE is enabled, you must set the Statistics Collection timer to 30 minutes or higher.

To set the Statistics Collection timer,

1. From the Cisco SD-WAN Manager menu, choose **Administration** > **Settings**.
2. Click **Edit** next to **Statistics Configuration**.
3. Modify the **Collection Interval** minutes to the desired value based on your SAIE traffic, the default collection interval is 30 minutes.
4. Click **Save**.

*Table 4: Supported scale on Nutanix Hyperconverged Infrastructure (HCI) platform*

| Devices | Nodes and deployment models with instance type | Data processing factor | Number of days the data can be stored | Maximum daily processing volume | DR support |
|---|---|---|---|---|---|
| Up to 1000 | One node large SD-WAN Manager | 50 GB/day | 30 days | 50 GB/day | Yes |
| 1000-2500 | Three node large SD-WAN Manager cluster (all services) | 100 GB/day | 14 days | 300 GB/day | Yes |

**Note** To achieve scale beyond the numbers mentioned in the tables above, deploy multiple overlays.

*Table 5: Cisco Catalyst SD-WAN Validator Recommended Computing Resources*

| Devices | Number of Cisco SD-WAN Validators | vCPU | RAM | OS Volume | vNICs | Azure | AWS |
|---|---|---|---|---|---|---|---|
| 0-50 | 2 | 2 | 4 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_F2s_v2 | t3.medium |

| Devices | Number of Cisco SD-WAN Validators | vCPU | RAM | OS Volume | vNICs | Azure | AWS |
|---|---|---|---|---|---|---|---|
| 51-1000 | 2 | 2 | 4 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_F2s_v2 | c5.large and c6i.large |
| 1000-4000 | 2 | 4 | 8 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_F4s_v2 | c5.xlarge and c6i.xlarge |
| 4000-8000 | 4 | 4 | 8 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_F4s_v2 | c5.xlarge and c6i.xlarge |
| 8000-12500 | 6 | 4 | 8 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_F4s_v2 | c5.xlarge and c6i.xlarge |

*Table 6: Cisco Catalyst SD-WAN Controller Recommended Computing Resources*

| Devices | Number of Cisco SD-WAN Controllers | vCPU | RAM | OS Volume | vNICs | Azure | AWS |
|---|---|---|---|---|---|---|---|
| <250 | 2 | 4 | 8 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_F4s_v2 | c5.xlarge and c6i.xlarge |
| 250-1000 | 2 | 4 | 16 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_D4ds_v5 | c5.2xlarge and c6i.2xlarge |
| 1000-2500 | 2 | 8 | 16 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_F8s_v2 | c5.2xlarge and c6i.2xlarge |

| Devices | Number of Cisco SD-WAN Controllers | vCPU | RAM | OS Volume | vNICs | Azure | AWS |
|---|---|---|---|---|---|---|---|
| 2500-5000 | 4 | 8 | 16 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_F8s_v2 | c5.2xlarge and c6i.2xlarge |
| 5000-7500 | 6 | 8 | 16 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_F8s_v2 | c5.2xlarge and c6i.2xlarge |
| 7500-10000 | 8 | 8 | 16 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_F8s_v2 | c5.2xlarge and c6i.2xlarge |
| 10000-12500 | 10 | 8 | 16 GB | 10 GB | 2 (one for tunnel interface, one for management) | Standard_F8s_v2 | c5.2xlarge and c6i.2xlarge |

**Note**

- This image can be deployed on standard F8_v2; however, standard F8s_v2 is the recommended instance type.
- The tested and recommended limit of supported Cisco Catalyst SD-WAN Validator instances in a single Cisco Catalyst SD-WAN overlay are eight, similarly the maximum number of tested Cisco SD-WAN Controller instances is twelve.
- The required number of vCPUs and RAM for Cisco Catalyst SD-WAN Validator and Cisco Catalyst SD-WAN Controller devices for Cisco Cloud Hosted overlays are determined by the Cisco Cloud Ops and provisioned accordingly.
- The number of Cisco Catalyst SD-WAN Controller and Cisco Catalyst SD-WAN Validator instances recommended in the table above assumes a deployment with Cisco Catalyst SD-WAN controllers in two locations (i.e. data centers) designed for redundancy – with half the controllers in one data center and half the controllers in another data center. In other words, the table above already considers the 1:1 redundancy in the number of Cisco Catalyst SD-WAN Controller and Cisco Catalyst SD-WAN Validator instances recommended to be deployed across the two data centers – without considering any Cisco Catalyst SD-WAN Controller group/affinity configuration.

  If you are deploying Cisco Catalyst SD-WAN Controller and Cisco Catalyst SD-WAN Validator instances with a different set of assumptions, for example, across three data centers, or if you are using Cisco Catalyst SD-WAN Controller controller groups/affinity within your deployment, refer to the Points to Consider chapter for additional guidance.

***Table 7: Testbed Specifications for UCS Platforms***

| Hardware SKU | Specifications |
|---|---|
| UCSC-C240-M5SX | UCS C240 M5 24 SFF + 2 rear drives without CPU, memory cards, hard disk, PCIe, and PS. |
| UCS-MR-X16G1RT-H | 16GB DDR4-2933-MHz RDIMM/1Rx4/1.2v |
| UCS-CPU-I6248R | Intel 6248R 3GHz/205W 24C/35.75MB DDR4 2933MHz<br>Intel(R) Xeon(R) Gold 6330N CPU @ 2.20GHz |
| UCS-SD16T123X-EP | 1.6TB 2.5in Enterprise Performance 12G SAS SSD (3X endurance) |

**Note**

- Any UCS Platform (Fifth generation and sixth generation above) with the same or higher hardware specifications mentioned in the above table supports Cisco Catalyst SD-WAN Controllers with similar scale numbers mentioned in this document.
- The CPU specifications are not tied to any brand, both AMD and Intel brands with specifications above are supported.

*Table 8: Testbed Specifications for HX Platforms*

| Hardware SKU | Specifications |
|---|---|
| HXAF240-M5SX | Cisco HyperFlex HX240c M5 All Flash Node |
| HX-MR-X32G2RT-H | 32GB DDR4-2933-MHz RDIMM/2Rx4/1.2v |
| HX-CPU-I6248 | Intel 6248 2.5GHz/150W 20C/24.75MB 3DX DDR4 2933 MHz |
| HX-SD38T61X-EV | 3.8TB 2.5 inch Enterprise Value 6G SATA SSD |
| HX-NVMEXPB-I375 | 375GB 2.5 inch Intel Optane NVMe Extreme Performance SSD |

**Note**

- The tested replication factor is three.
- The default compression on the HX system is applicable to all cases. This compression is automatically determined by the system and cannot be configured.

# Multitenant (MT)

The supported instance specifications for the Cisco SD-WAN Manager, Cisco SD-WAN Validator, and Cisco SD-WAN Controller are as follows:

*Table 9: Instance Type Definitions*

| Instance Type | Specifications (Approximation) | | | Qualified Instance Type | |
|---|---|---|---|---|---|
| | vCPUs | RAM | Storage Size | Azure | AWS |
| Large | 32 vCPUs* | 128 GB RAM | 5 TB | Standard_F64s_v2 | m6i.8xlarge, c6i.16xlarge, and c5.18xlarge** |

* requires 64 vCPU for multi-tenant deployment in the Cisco Catalyst SD-WAN Manager Specifications table for deploying beyond 2500 devices.

** This deployment supports the m6i.8xlarge, c6i.16xlarge, and c5.18xlarge AWS instance types. Cisco recommends using m6i.8xlarge.

*Table 10: Cisco Catalyst SD-WAN Manager Specifications*

| Max Tenants (T) and Devices (D) | Nodes and Deployment Models with Instances Type | Data Processing Factor | Number of Days the Data Can be Stored | DR Supported | Cisco Cloud | On-Prem (UCS) | Customer Cloud |
|---|---|---|---|---|---|---|---|
| 24 (T) and 1000(D)* | One Node Large Cisco SD-WAN Manager | 50 GB/Day | 14 Days | Yes | Yes | Yes | Yes |
| 75(T) and 2500(D)* | Three Node Large Cisco SD-WAN Manager | 100 GB/Day | 14 Days | Yes | Yes | Yes | Yes |
| 150(T) and 5000(D)* | Six Node Large Cisco SD-WAN Manager (64 vCPUs required) | 100 GB/Day | 14 Days | Yes | No | Yes | Yes |
| 150(T) and 7500D)* | Six Node Large Cisco SD-WAN Manager (64 vCPUs required) | 100 GB/Day | 14 Days | Yes | No | Yes | Yes |

**Note** For DR deployments beyond the supported scale, please contact a Cisco representative for further assistance.

***** indicates that a pair of Cisco SD-WAN Controllers supports 24 tenants and 1000 devices across all the tenants.

*Table 11: Cisco Catalyst SD-WAN Validator Recommended Computing Resources*

| Devices | Number of Cisco Catalyst SD-WAN Validator | vCPU | RAM | OS Volume | vNICs | AWS | Azure |
|---|---|---|---|---|---|---|---|
| <1000 | 2 | 2 | 4 GB | 10 GB | 2 (one for tunnel interface, one for management) | c5.large and c6i.large | Standard_F2s_v2 |

| Devices | Number of Cisco Catalyst SD-WAN Validator | vCPU | RAM | OS Volume | vNICs | AWS | Azure |
|---|---|---|---|---|---|---|---|
| 1000-4000 | 2 | 4 | 8 GB | 10 GB | 2 (one for tunnel interface, one for management) | c5.xlarge and c6i.xlarge | Standard_F4s_v2 |
| 4000-7500 | 4 | 4 | 8 GB | 10 GB | 2 (one for tunnel interface, one for management) | c5.xlarge and c6i.xlarge | Standard_F4s_v2 |

*Table 12: Cisco Catalyst SD-WAN Controller Recommended Computing Resources*

| Devices | vCPU | RAM | OS Volume | vNICs | AWS | Azure |
|---|---|---|---|---|---|---|
| < 250 | 4 | 8 GB | 10 GB | 2 (one for tunnel interface, one for management) | c5.xlarge and c6i.xlarge | Standard_F4s_v2 |
| 250-2500 | 8 | 16 GB | 10 GB | 2 (one for tunnel interface, one for management) | c5.2xlarge and c6i.2xlarge | Standard_F8s_v2 |
| 2500-5000 | 8 | 16 GB | 10 GB | 2 (one for tunnel interface, one for management) | c5.2xlarge and c6i.2xlarge | Standard_F8s_v2 |
| 5000-7500 | 8 | 16 GB | 10 GB | 2 (one for tunnel interface, one for management) | c5.2xlarge and c6i.2xlarge | Standard_F8s_v2 |



**Note** This image can be deployed on standard F8_v2; however, standard F8s_v2 is the recommended instance type.

*Table 13: Cisco Catalyst SD-WAN Validator and Cisco Catalyst SD-WAN Controller Specifications*

| Devices | Number of Cisco Catalyst SD-WAN Validator Required | Number of Cisco Catalyst SD-WAN Controller Required |
|---|---|---|
| 24 Tenants or 1000 Devices | 2 | A pair for every 24 tenants |
| 75 Tenants or 2500 Devices | 2 | A pair for every 24 tenants |
| 150 Tenants or 7500 Devices | 2 (additional 2 if deployment goes beyond 4000 devices) | A pair for every 24 tenants |



**Note**

- A pair of Cisco SD-WAN Controller supports 24 tenants and 1000 devices across all the tenants. For example, 24 tenants require 2 Cisco SD-WAN Controllers, 50 tenants require 6 Cisco SD-WAN Controllers, and 150 tenants require 14 Cisco SD-WAN Controllers.
- The SAIE numbers are for the entire multi-tenant (cluster) deployment and there is no per tenant SAIE limitation.
- If SAIE is enabled, we recommend that the aggregated SAIE data (across all Cisco SD-WAN Manager nodes and all tenants in the multitenant system) does not exceed 350 GB per day. If the SAIE data exceeds 350 GB per day, increase the Hard Disk capacity of each Cisco SD-WAN Manager node up to 10 TB.
- A pair of Cisco SD-WAN Controllers supports 24 tenants and 1000 devices across all tenants.
- A tenant can add a maximum of 1000 devices.
- The tested and recommended limit of supported Cisco SD-WAN Validator instances in a single Cisco SD-WAN Manager fabric is eight.