vmware®

Configuration Maximums

VMware® vSphere 5.0

When you select and configure your virtual and physical equipment, you must stay at or below the maximums supported by vSphere 5.0. The limits presented in the following tables represent tested, recommended limits, and they are fully supported by VMware.

The limits presented in this document can be affected by other factors, such as hardware dependencies. For more information about supported hardware, see the appropriate ESXi hardware compatibility guide. Consult individual solution limits to ensure that you do not exceed supported configurations for your environment.

The *Configuration Maximums for vSphere 5.0* covers ESXi and vCenter Server.

Virtual Machine Maximums

Table 1 contains configuration maximums related to virtual machines.

Table 1. Virtual Machine Maximums

Item	Maximum
Compute	
Virtual CPUs per virtual machine (Virtual SMP)	32
Memory	
RAM per virtual machine	1TB
Virtual machine swap file size	1TB[1]
Storage Virtual Adapters and Devices	
Virtual SCSI adapters per virtual machine	4[2]
Virtual SCSI targets per virtual SCSI adapter	15[3]
Virtual SCSI targets per virtual machine	60
Virtual Disks per virtual machine (PVSCSI)	60
Virtual disk size	2TB minus 512 bytes
IDE controllers per virtual machine	1[4]
IDE devices per virtual machine	4[5]
Floppy controllers per virtual machine	1
Floppy devices per virtual machine	2[6]
Networking Virtual Devices	
Virtual NICs per virtual machine	10[7]

Table 1. Virtual Machine Maximums (Continued)

Item	Maximum
Virtual Peripheral Ports	
USB controllers per virtual machine	1[8]
USB devices connected to a virtual machine	20
Parallel ports per virtual machine	3
USB 3.0 devices per virtual machine	20[10]
xHCI USB controllers[9]	1
Serial ports per virtual machine	4
Graphics video device	
Video memory per virtual machine	128MB
Miscellaneous	
Concurrent remote console connections to a virtual machine	40

1. Use VMFS3 with blocksize larger than 1MB for swap files larger than 255GB.
2. Any combination of supported SCSI virtual storage controllers. Four Paravirtual SCSI adapters may be used only if the virtual machine boots from a device attached to an IDE controller, or from the network.
3. Any combination of disk, CD-ROM, or VMDirectPath SCSI target.
4. Supports two channels (primary and secondary) each with a master and slave device.
5. Devices can be either CD-ROM or disk.
6. BIOS is configured for one floppy device.
7. Any combination of supported virtual NICs.
8. Supports USB 1.x and USB 2.x devices.
9. Supports USB 1.x, 2.x and 3.0 devices.
10. Guest operating systems might have smaller limits than allowed by vSphere.

ESXi Host Maximums

The following tables contain configuration maximums related to ESXi hosts.

- "Compute Maximums" on page 2
- "Memory Maximums" on page 3
- "Storage Maximums" on page 3
- "Networking Maximums" on page 5
- "Cluster and Resource Pool Maximums" on page 6

Compute Maximums

Table 2 contains configuration maximums related to ESXi host compute resources.

Table 2. Compute Maximums

Item	Maximum
Host CPU maximums	
Logical CPUs per host	160
NUMA Nodes per host	8
Virtual machine maximums	
Virtual machines per host	512
Virtual CPUs per host	2048
Virtual CPUs per core	25[1]
Fault Tolerance maximums	

Table 2. Compute Maximums (Continued)

Item	Maximum
Virtual disks	16
Virtual CPUs per virtual machine	1
RAM per FT VM	64GB
Virtual machines per host	4

1. The achievable number of vCPUs per core depends on the workload and specifics of the hardware. For more information, see the latest version of *Performance Best Practices for VMware vSphere*.

Memory Maximums

Table 3 contains configuration maximums related to ESXi host memory.

Table 3. Memory Maximums

Item	Maximum
RAM per host	2TB
Number of swap files	1 per virtual machine
Swap file size	1TB[1]

1. On VMFS3, use a block size larger than 1MB for swap files larger than 255GB

Storage Maximums

Table 4 contains configuration maximums related to ESXi host storage.

Table 4. Storage Maximums

Item	Maximum
Virtual Disks	
Virtual Disks per Host	2048
iSCSI Physical	
LUNs per server	256
Qlogic 1Gb iSCSI HBA initiator ports per server	4
Broadcom 1Gb iSCSI HBA initiator ports per server	4
Broadcom 10Gb iSCSI HBA initiator ports per server	4
NICs that can be associated or port bound with the software iSCSI stack per server	8
Number of total paths on a server	1024
Number of paths to a LUN (software iSCSI and hardware iSCSI)	8
Qlogic iSCSI: dynamic targets per adapter port	64
Qlogic iSCSI: static targets per adapter port	62
Broadcom 1Gb iSCSI HBA targets per adapter port	64[1]
Broadcom 10Gb iSCSI HBA targets per adapter port	128
Software iSCSI targets	256[1]
NAS[2]	
NFS mounts per host	256
Fibre Channel	
LUNs per host	256
LUN ID	255

Table 4. Storage Maximums (Continued)

Item	Maximum
Number of paths to a LUN	32
Number of total paths on a server	1024
Number of HBAs of any type	8
HBA ports	16
Targets per HBA	256
FCoE	
Software FCoE adapters	4
VMFS	
Volumes per host	256
Hosts per volume	64
Powered-on virtual machines per VMFS volume	2048
VMFS3	
Volume size	64TB[5]
Raw device mapping size (virtual compatibility)	2TB minus 512 bytes
Raw Device Mapping size (physical compatibility)	2TB minus 512 bytes[6]
Block size	8MB
File size (1MB block size)	256GB
File size (2MB block size)	512GB
File size (4MB block size)	1TB
File size (8MB block size)	2TB minus 512 bytes
Files per volume	Approximately 30,720
VMFS5	
Volume size	64TB[7]
Raw Device Mapping size (virtual compatibility)	2TB minus 512 bytes
Raw Device Mapping size (physical compatibility)	64TB
Block size	1MB[3]
File size	2TB minus 512 bytes[4]
Files per volume	Approximately 130,690
Concurrent Operations	
Concurrent vMotion operations per datastore	128
Concurrent Storage vMotion operations per datastore	8
Concurrent Storage vMotion operations per host	2
Concurrent non-vMotion provisioning operations per host	8

1. The sum of static targets (manually assigned IP addresses) and dynamic targets (IP addresses assigned to discovered targets) may not exceed this number.
2. Contact your storage array vendor or NFS server vendor for information about the maximum NFS volume size.
3. 1MB is default block size. Upgraded VMFS5 volumes will inherit the VMFS3 block size value.
4. Maximum file size for upgraded VMFS5 is 2TB minus 512 bytes, irrespective of the file-system block size.
5. For VMFS3 volumes with 1MB block size, the maximum is 50TB.
6. If the presented LUN is greater than 2TB.
7. The actual maximum will depend on the RAID controller or adapter driver that is being used. Contact your vendor to find the maximums.

Networking Maximums

The following limits represent achievable maximum configuration limits for networking in environments where no other more restrictive limits apply (for example, vCenter Server limits, the limits imposed by features such as HA or DRS, and other configurations that might impose restrictions must be considered when deploying large scale systems).

Table 5 contains configuration maximums related to ESXi host networking.

Table 5. Networking Maximums

Item	Maximum
Physical NICs	
e1000 1Gb Ethernet ports (Intel PCI-x)	32
e1000e 1Gb Ethernet ports (Intel PCI-e)	24
igb 1Gb Ethernet ports (Intel)	16
tg3 1Gb Ethernet ports (Broadcom)	32
bnx2 1Gb Ethernet ports (Broadcom)	16
forcedeth 1Gb Ethernet ports (NVIDIA)	2
nx_nic 10Gb Ethernet ports (NetXen)	8
ixgbe 10Gb Ethernet ports (Intel)	8
bnx2x 10Gb Ethernet ports (Broadcom)	8
be2net 10Gb Ethernet ports (Emulex)	8
Combination of 10Gb and 1Gb Ethernet ports	Six 10Gb and Four 1Gb ports
Infiniband ports (refer to VMware Community Support)	N/A[1]
VMDirectPath limits	
VMDirectPath PCI/PCIe devices per host	8
VMDirectPath PCI/PCIe devices per virtual machine	4[2]
vSphere Standard and Distributed Switch	
Total virtual network switch ports per host (VDS and VSS ports)	4096
Maximum active ports per host (VDS and VSS)	1016
Virtual network switch creation ports per standard switch	4088
Port groups per standard switch	256
Distributed virtual network switch ports per vCenter	30000
Static port groups per vCenter	5000
Ephemeral port groups per vCenter	256
Hosts per VDS	350
Distributed switches per vCenter	32
Concurrent Operations	
Concurrent vMotion operations per host (1Gb/s network)	4
Concurrent vMotion operations per host (10Gb/s network)	8

1. Mellanox Technologies InfiniBand HCA device drivers are available directly from Mellanox Technologies. Refer to Mellanox for support status of InfiniBand HCAs with ESXi.
   http://www.mellanox.com
2. A virtual machine can support 6 devices, if 2 of them are Teradici devices.

Cluster and Resource Pool Maximums

Table 6 contains configuration maximums related to ESXi host clusters and resource pools.

Table 6. Cluster Maximums

Item	Maximum
Cluster (all clusters including HA and DRS)	
Hosts per cluster	32
Virtual machines per cluster	3000
Virtual machines per host	512
Maximum concurrent host HA failover	31
Failover as percentage of cluster	100%
Powered on VMs per datastore in a HA cluster[1]	2048
Resource Pool	
Resource pools per host	1600
Children per resource pool	1024
Resource pool tree depth	8[2]
Resource pools per cluster	1600

1. This limit does not apply to virtual disks.A virtual machine enabled with Fault Tolerance counts as two virtual machines.
2. Additional 4 resource pools are used by system internals

Using Maximum Values for More than One Configuration Option

If any one of the configuration options listed in the above tables is used at its maximum limit value, the ESXi host and vCenter Server with default configuration should be able to withstand the values.

If more than one configuration options (such as number of virtual machines, number of LUNs, and number of VDS ports) are used at their maximum limit, some of the processes running on the host might run out of memory. This might cause the host to keep disconnecting from the vCenter Server. In such a case, you need to increase the memory pool for these host processes so that the host can withstand the workload you are planning. You need to increase your memory pool size in correlation to the number of configuration options you are using at the maximum value.

vCloud Director Maximums

Table 7 contains configuration maximums related to vCloud Director.

Table 7. vCloud Director Maximums

Item	Maximum
Virtual machine count	20000
Powered-On virtual machine count	10000
Organizations	10000
Virtual machines per vApp	64
vApps per organization	500
Number of networks	7500
Hosts	2000
vCenter Servers	25
Virtual Data Centers	10000
Datastores	1024

Table 7. vCloud Director Maximums

Item	Maximum
Catalogs	1000
Media	1000
Users	10000

vCenter Server Maximums

Table 8 contains configuration maximums related to vCenter Server.

Table 8. vCenter Server Maximums

Item	Maximum
vCenter Server Scalability	
Hosts per vCenter Server	1000
Powered-on virtual machines per vCenter Server	10000
Registered virtual machines per vCenter Server	15000
Linked vCenter Servers	10
Hosts in linked vCenter Servers	3000
Powered-on virtual machines in linked vCenter Servers	30000
Registered virtual machines in linked vCenter Servers	50000
Concurrent vSphere Clients	100
Number of host per datacenter	500
MAC addresses per vCenter Server	65536
User Interface	
USB devices connected at vSphere Client	20

vCenter Server Extensions

The following tables contain configuration maximums related to vCenter Server extensions.

- "VMware vCenter Update Manager" on page 7
- "VMware vCenter Orchestrator" on page 8
- "vCenter VASA" on page 8
- "Storage DRS" on page 8

VMware vCenter Update Manager

Table 9 contains configuration maximums for vCenter Update Manager.

Table 9. vCenter Update Manager Maximums

Item	Maximum
vCenter Update Manager Scalability	
Host scans in a single vCenter Server	1000
Virtual machine scans in a single vCenter Server	10000
Cisco VDS update and deployment	70
Concurrent Operations	
VMware Tools scan per ESXi host	90

Table 9. vCenter Update Manager Maximums

Item	Maximum
VMware Tools upgrade per ESXi host	24
Virtual machine hardware scan per host	90
Virtual machine hardware upgrade per host	24
VMware Tools scan per VUM server	75
VMware Tools upgrade per VUM server	75
Virtual machine hardware scan per VUM server	75
Virtual machine hardware upgrade per VUM server	75
ESXi host scan per VUM server	75
ESXi host remediation per VUM server	71
ESXi host upgrade per VUM server	71
ESXi host upgrade per cluster	1

VMware vCenter Orchestrator

Table 10 contains configuration maximums for vCenter Orchestrator.

Table 10. vCenter Orchestrator Maximums

Item	Maximum
Connected vCenter Server systems	10
Connected ESXi instances	100
Connected virtual machines	15000
Concurrent running workflows	150

vCenter VASA

Table 11 contains configuration maximums for vCenter VASA.

Table 11. vCenter VASA Maximums

Item	Maximum
Storage providers	10

Storage DRS

Table 12 contains configuration maximums for Storage DRS.

Table 12. Storage DRS

Item	Maximum
Virtual disks per datastore cluster	9000
Datastores per datastore cluster	32
Datastore clusters per vCenter	256