Table 5. vSphere guest VM maximums (extract)

Maximums	ESXi 7.0 U2 and later	ESXi 8.0 U1 and later
Virtual VM hardware version [1]	19	21
Virtual CPUs per VM	Up to 768	
RAM per VM	Up to 24TB	
CPU sockets per SAP HANA VM	<= 8	
RAM per SAP HANA VM	<= 12TB	
Virtual SCSI adapters per VM	4	
Virtual NVMe adapters per VM	4	
Virtual disk size	62TB	
Virtual NICs per VM	10	
Persistent Memory per SAP HANA VM	<= 12TB	Not supported

* [1] Review the Hardware Features Available with Virtual Machine Compatibility Settings web page for a detailed list of the guest hardware capacities. You must use hardware version 21 for VMs on (or migrated to) Sapphire Rapids hosts.

Deployment options and considerations

Reference architecture diagram

The following figure shows an overview of a typical VMware software-defined data center (SDDC) for SAP applications. At the center of a VMware SDDC is VMware Cloud Foundation, which includes vSphere, vSAN, and NSX. VCF has VI Workload Domains—each Workload Domain is a logical unit of application-ready infrastructure that groups ESXi hosts managed by a vCenter Server instance with specific characteristics according to VMware recommended practices.

The figure shows the preferred VCF design for non-SAP HANA database VMs and SAP HANA with separate VCF VI Workload Domains. (You can include an optional, isolated VI Workload Domain.) Each VI Workload Domain has a dedicated NSX Manager cluster to provide the benefits of flexible lifecycle management, which includes the option to run different VCF software stack versions across the different VI Workload Domains. A VI Workload Domain can consist of one or more vSphere clusters provisioned by the SDDC Manager.

The red and blue VI Workload Domains are examples of SAP HANA Workload Domains with different storage types. The grey VI Workload Domain is an example of mixed SAP and non-SAP application Workload Domains with different SLAs/requirements, like ESXi hosts that are not SAP HANA-certified.

Figure 2. VMware Cloud Foundation for SAP applications
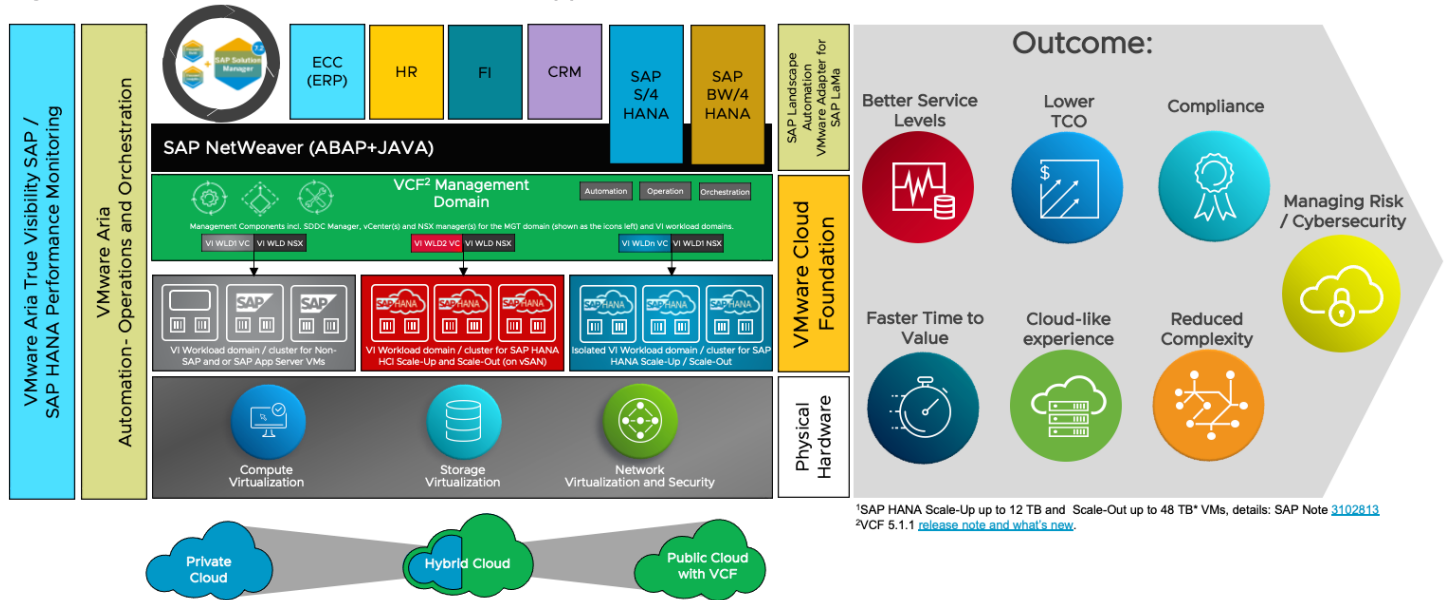
The next table provides an overview of the different Workload Domain types (WLDs) and how best to leverage these for SAP and non-SAP VMs/applications.

A VI Workload Domain (VI WLD) shares a vCenter single sign-on domain and the identity provider configuration with the Management Domain. You can manage all VI WLDs through a single pane of glass.

A VI WLD can share an NSX Manager instance with other VI WLDs. We recommend a dedicated NSX Manager per VI WLD for easier and more flexible lifecycle management.

Small and medium SAP deployments could consolidate SAP HANA and non-SAP HANA database VM workloads into a single VCF VI WLD with one or more vSphere cluster configurations to reduce the required hardware footprint, but this would lose the lifecycle management flexibility between different SAP workloads.

Larger deployments with SAP HANA systems with different operation, hardware, and SLA requirements should not share a VI WLD/cluster with non-SAP HANA VMs. Running these VMs in a dedicated SAP HANA VI WLD/cluster eases lifecycle management and ensures the correct cluster-wide settings for features like HA, DRS, and EVC.

An isolated VI WLD is another option for a distinct vCenter single sign-on domain; this requires an identity provider configuration. VI WLDs of this type cannot yet share an NSX Manager instance with other VI WLDs and, therefore, need a dedicated NSX Manager instance. This allows the independent lifecycle management of isolated VI WLDs and is recommended when strict isolation of user and business data is required.

Small SAP deployments could leverage the consolidated VCF architecture model, which consolidates the VCF Management components (vCenter, NSX Manager, and SDDC Manager) and all SAP workloads (non-SAP HANA database VMs and SAP HANA) with the lowest possible hardware footprint, but this loses the lifecycle management flexibility between the VCF Management Domain and the VI WLD running the different SAP workloads. If you want to deploy SAP HANA production-level VMs in a consolidated WLD, you must ensure these SAP HANA VMs run on SAP HANA TDI-supported systems and do not share a NUMA node with a non-SAP HANA VM. We advise configuring dedicated vSphere clusters to manage VCF VMs and workload VMs. For a consolidated WLD, we recommend separate cluster-wide settings for management and SAP NetWeaver/SAP HANA hosts.

Note: Every vSphere cluster requires at least 2 embedded vCLS VMs or 3 external vCLS VMs. A cluster allows different cluster-wide settings; however, we recommend you add non-SAP HANA hosts to an SAP HANA cluster to offload the vCLS VMs.

Table 6. VMware Cloud Foundation Management and VI Workload Domain types and use cases

VCF Management Domain	
First domain deployed, runs on dedicated ESXi hosts (min. 4) Contains the following management appliances for all Workload Domains: • vCenter Server • NSX Manager • SDDC Manager • Optional: VMware Aria Suite components, Management Domain NSX Edge nodes The VI WLD vCenter and NSX Manager VMs are installed on the Management Domain hosts. Depending on the Workload Domain type, you can scale from 14 to 24 VI WLDs. A total of 1000 ESXi hosts are supported per VCF instance following the VCF standard architecture, where a single VI WLD can scale up to 800 ESXi hosts and up to 4000 registered VMs. A single VCF instance can have multiple availability zones (a stretched deployment).	

Consolidated VCF SAP Domain

Represents a Management Domain that also runs customer workloads. It's limited to 100 hosts per consolidated VI WLD.

Uses resource pools to ensure sufficient resources for management components.

Considers the minimum possible initial hardware and management component footprint (min. 4 hosts). Only with vSAN and SAP HANA HCI certified hosts and the listed configurations for CPU, memory, and storage.

Can be scaled to a standard architecture model.

Management components and customer workloads are not isolated.

SAP HANA production-level workloads must not run on the hosts that run the management components or non-SAP HANA VMs.

This is an option for small deployments or test and dev environments. **Add HANA dedicated hosts as required if you want to deploy production-level SAP HANA VMs.**

VCF Consolidated Domain
Management Domain with customer workloads.

vSphere   vSAN
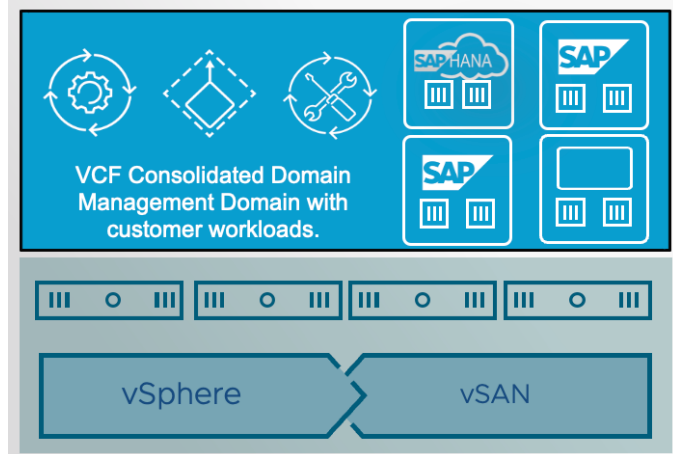
SAP/SAP HANA VI Workload Domain

Represents an additional Workload Domain for running customer workloads. Can scale up to 14 VI Workload Domains per VCF instance.

Shares a vCenter single sign-on domain and the identity provider configuration with the Management Domain. All Workload Domains can be managed through a single pane of glass. Can share an NSX Manager instance with other VI Workload Domains. A dedicated NSX Manager per VI WLD is recommended for easier lifecycle management.

Allows for independent life cycle management of the different VI WLDs.

This Workload Domain type cannot provide distinct vCenter single sign-on domains for customer workloads. For this, an isolated VI WLD is required.

If SAP applications are deployed, only SAP-supported hosts can be used. SAP HANA hosts must also be SAP HANA TDI-supported systems and are limited to 2-, 4-, or 8-socket ESXi hosts with validated Intel CPUs.

This Workload Domain type cannot provide distinct vCenter single sign-on domains for customer workloads. For this, an isolated VI WLD is required.

VI Workload domain / cluster for
SAP HANA Scale-Up and Scale-Out

vSphere   vSAN (HCI) / NAS / SAN
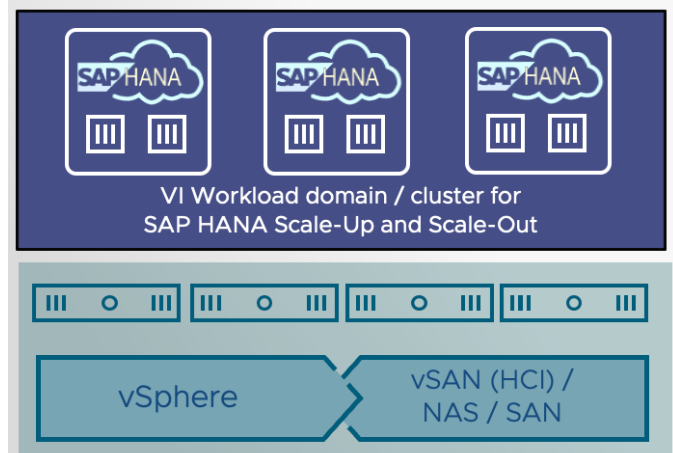
If SAP applications are deployed, then only SAP-supported hosts can be used. SAP HANA hosts must also be SAP HANA TDI supported systems and are limited to 2-, 4- and 8-socket ESXi hosts with validated Intel CPUs. VM maximum host size: ≤ 12TB and 480 vCPUs per single SAP HANA scale-up VM. The smallest size is 0.5 socket with 128GB RAM. Scale-out deployment: VM must be ≥ 4 sockets, maximum 8 sockets, VM vRAM up to 6TB per VM depending on the use. Maximum 8 hosts + HA for a total size of 48TB. For shared ESXi or VM connected SAN or NAS storage w/o vVOLs, the storage must meet HANA KPIs. HCI certified hosts are required when vSAN is used. SAN or NAS deployments require min. 2 hosts; vSAN systems require min. 3 hosts.

SAP NetWeaver and SAP HANA hosts can run consolidated in a VI WLD if the same SLAs and lifecycle management requirements exist. If not, then use dedicated VI WLDs for SAP HANA and NetWeaver or AnyApp.

SAP/SAP HANA Isolated VI WLD

Represents an additional Workload Domain for running customer workloads. Can scale up to 24 VI Workload Domains per VCF instance

Has a distinct vCenter single sign-on domain and identity provider configuration. Workload domain vCenter Server instances are managed through different panes of glass. Can provide distinct vCenter single sign-on domains for customer workloads.
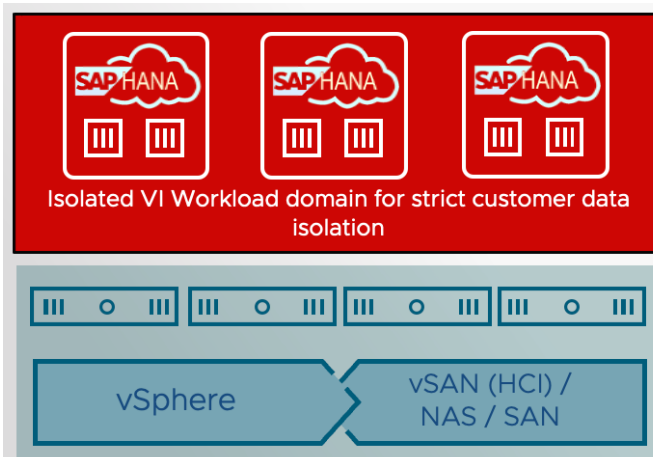
Workload domains of this type cannot share an NSX Manager instance with other VI Workload Domains.

Allows for independent life cycle management of the isolated VI WLDs and is the recommended option when a strict isolation of user and business data is required.

If SAP applications are deployed, then only SAP-supported hosts can be used. SAP HANA hosts must also be SAP HANA TDI supported systems and are limited to 2-, 4-, and 8-socket ESXi hosts with validated Intel CPUs.

VM maximum host size: ≤ 12TB and 480 vCPUs per single SAP HANA scale-up VM. Smallest size is 0.5 socket with 128GB RAM.

Scale-out deployment: VM must be ≥ 4 sockets, maximum 8 sockets, VM vRAM up to 6TB per VM depending on the use. Maximum 8 hosts + HA for a total size of 48TB.

Isolated VI Workload domain for strict customer data isolation

For shared ESXi or VM-connected SAN or NAS storage w/o vVOLs, the storage must meet HANA KPIs. HCI certified hosts are required when vSAN is used. SAP NetWeaver and SAP HANA hosts can run consolidated in a VI WLD if the same SLAs and lifecycle management requitements exist. If not, then use dedicated VI WLDs for SAP HANA and NetWeaver or AnyApp.	

Depending on the Workload Domain type, you can scale from 14 (ELM) to 24 (isolated) VI WLDs. Refer to Maximums and Configuration Limitations, VCF Deployment Options (for example, deployments in multiple availability zones), and vSphere Design for VMware Cloud Foundation.

In total, 1000 ESXi hosts are supported per VCF instance following the VCF standard architecture, where a single VI WLD can scale up to 800 ESXi hosts and up to 4000 registered VMs.

As shown in the figure and table above, the VI WLD vCenter and the NSX Manager VMs are installed in the VCF Management Domain among the vCenter and the NSX Manager VMs to manage the VCF Management Domain.

Review the Maximums and configuration limitations and VCF Deployment Options (for example, deployments in multiple availability zones for configuration details).

As previously explained, virtualized SAP HANA systems are currently supported on VMware vSphere with up to 448 vCPUs and 12 TB RAM per VM on Intel Cascade / Cooper Lake and with up to 480 vCPUs and 8 TB on Intel Sapphire Rapids systems; the vSphere 7.0 U2 and vSphere 8.0 U1 VM guest limits are 768 vCPUs and 24 TB per VM. Only the ESXi host systems shown in table 2 are validated on SAP HANA.

Note: The following may limit the maximum number of vCPUs and vRAM available for a VM:

- The selected CPU type

- The virtualized SAP HANA workload type (OLTP or OLAP)

- An SAP HANA use case of network-heavy OLTP workloads with thousands of concurrent users, which may be required to reserve CPU threads to handle such an intensive network load.

- The implemented design options in VCF, like vSAN or NSX networking and security features, will reduce the available memory per SAP HANA VM.

Larger SAP HANA systems can leverage SAP HANA extension nodes or be deployed as SAP HANA scale-out configurations. In a scale-out configuration, up to 16 nodes (more upon SAP approval) work together to provide larger memory configurations. A scale-out SAP HANA node's memory size depends on the selected CPU generation, and 4- or 8-socket systems with memory sizes per host and up to 6TB can be chosen. Refer to the relevant SAP Notes (3102813 and 3372365) for detailed information on supported host configurations. In addition, the SAP HANA on vSphere SAP Help Portal page provides an overview of supported configurations and is a good starting point.