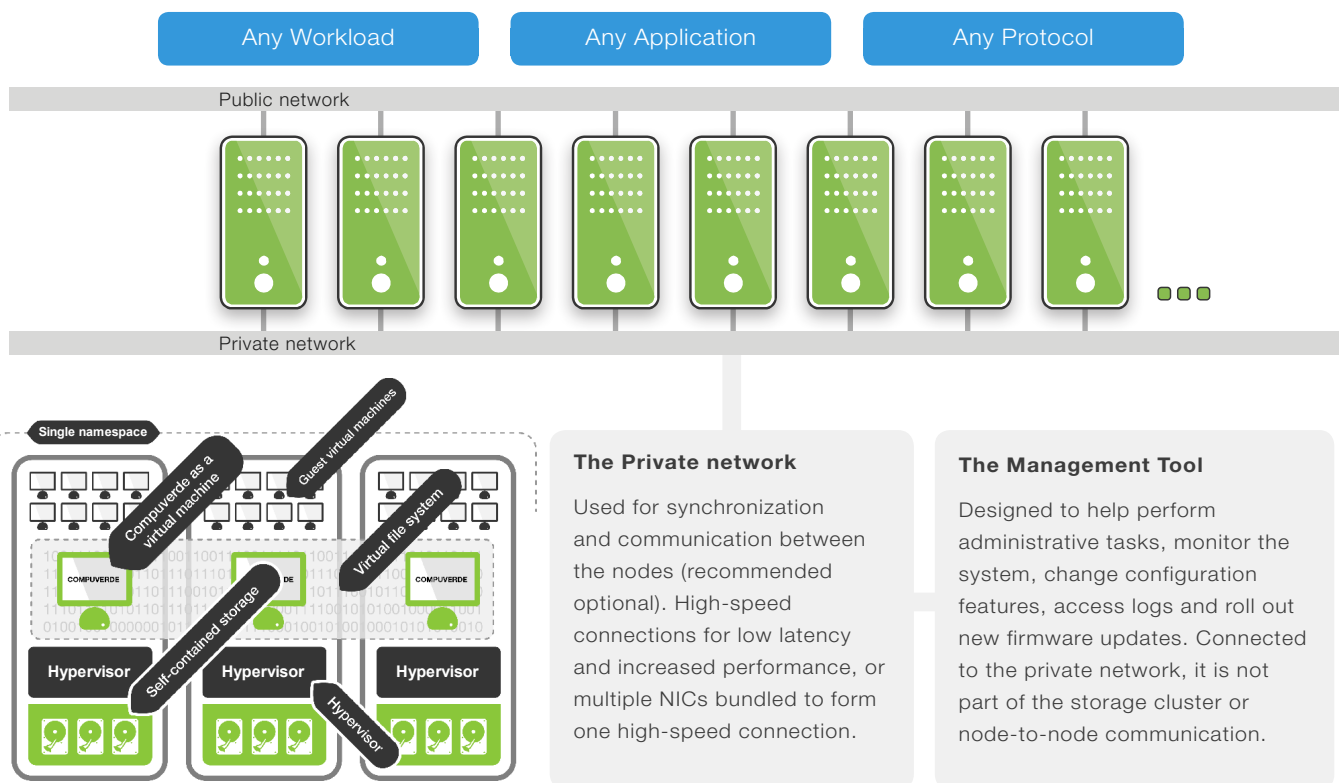
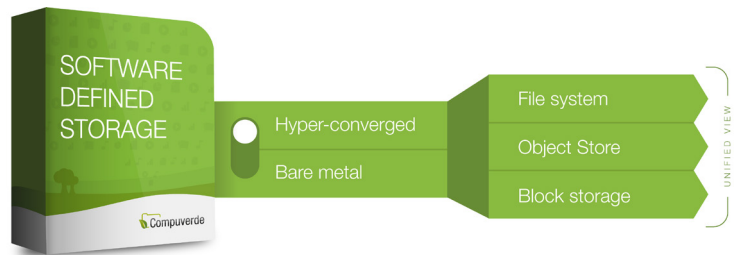


Best practice: Hyper-Converged

Compuverde delivers a unified storage solution with NAS (SMB/NFS), SAN (iSCSI) and Object Store (S3/Swift/Cinder) in one package. Fully software-defined, completely hardware-agnostic and massively scalable, eliminating the cost and worry of future data migrations and hardware replacements.

- ✓ Combines computing, network, virtualization and storage
- ✓ Efficient and prolonged storage solution
- ✓ Avoids VM boot storms and similar issues
- ✓ Extreme high IOPS and low latency
- ✓ Reduces power and space consumption



In a Hyper-Converged setup, each node is a virtual machine installed together with other VMs on a hypervisor host. The node utilizes the cache and storage directly and passes it on to the clients.

One single namespace or file system spans all the nodes and is consistently available to applications and users inside the virtualized environment and to the outside through Ethernet. It keeps itself internally synchronized, horizontally throughout the cluster and vertically down to the physical storage.

Data and VMs are automatically distributed and replicated for protection. Full compatibility with hypervisors such as VMware, Hyper-V, KVM and Xen is provided.

Make sure that IGMP is properly configured for all switches that are affected by private network traffic. All the switches should have IGMP Snooping enabled and only one switch in the group has both IGMP Querier and IGMP Snooping enabled.

- Installation**
1. Create a virtual machine for Compuverde
 2. Upload and mount the Compuverde ISO
 3. Restart the virtual machine to install

Everything is embedded into a Compuverde installation, simplifying the installation and securing reliability and integration between protocols, file system and object store. No open source or third-party libraries are used.

Setup – web-scale storage made simpler

1. Create a VM and Install the Compuverde software on each hypervisor host
2. Allocate available storage to the VM
3. Install the Compuverde Management Tool
4. Run the setup wizard to create a cluster
5. Run the file system wizard to create a file system

For VMware hypervisor, the Management Tool for Windows is not required. The VMware plugin will automate and assist you in creating VMs on all the hosts, and it makes logs, information and settings available, all in one place.

Authentication services provide a layer of security by verifying users' credentials or applications before allowing access to read or modify data. Compuverde supports Active Directory, NIS, Kerberos and more.

Multitenancy: With Compuverde Multitenancy, you can add any number of file systems within a single storage cluster, where each file system has its unique domain, shares, users and groups. This allows for reduced overhead, easier administration and cost-savings on power consumption and hardware. The file systems and everything inside are isolated from each other. Disk Quotas can be set for file systems, shares and folders, by using the Management Tool.

Upgrades: To increase capacity and throughput, simply add nodes of any size to the cluster – on-the-fly with no need to take the service offline. Mixed sizes are supported, so if you later decide to add larger nodes than what is used today, there is no need for “forklift” upgrades. The storage cluster will automatically rebalance, distribute existing data and utilize the new capabilities. Similarly, firmware upgrades and hardware replacements are done on-the-fly using Virtual IP to ensure continuous service.

Erasure coding provides almost complete data redundancy and reduced footprint compared to mirroring. Compuverde

distributes slices of data across nodes and locations so that data and services stay protected and sustained in case of failure. Each node will contain a mix of both data and parity from other node's data so that hot spots are avoided and all data is equally secured.

For example, erasure 2+1 requires minimum 3 nodes to operate, has a data footprint of 150 % and allows one node to fail. Erasure 10+2 allows two nodes to fail and has a footprint of 120 %, i.e. a storage efficiency of 83 %. Combine with **Virtual IP** to secure both data and services.

CPU: 64-bit (x64) is required for a Compuverde node. We recommend 4 cores or more for each node. Choosing between CPU clock speed and number of cores, more cores are favored.

RAID is not required, as redundancy lies within the system through cache replication, object copies and erasure coding. Performance is mainly achieved by the architecture being balanced; there is no master node, and all nodes are working in parallel. RAID can still be used in the following way:

Cache drives: One high speed SSD or NVMe. RAID 1 can be used for improved redundancy within the node: in case of failure to one cache drive, the node will continue to operate by using the remaining drives. Compuverde cache replication could be used to keep cache safe in case the node goes down.

Recommended hardware specifications

CPU	x64 (4+ cores)
RAM	32+ GB
Boot disk	60+ GB
Cache disk	100+ GB SSD
Storage disk	SAS / SATA disks
Network	2 x 10 Gigabit
Network switch	2 x switches
Number of nodes	Scale out from 4 nodes

For hypervisor hosts other than VMware, the Compuverde Management Tool requires a Windows VM or computer (64-bit Windows 7 or later, 100 MB for installing the Management software) on the same subnet as the storage cluster back-end interface.

