



## Datasheet

# Proxmox Virtual Environment

### AT A GLANCE

- Complete, open-source platform for enterprise virtualization
- Control via web-based management interface
- 100% software-defined architecture
- Two virtualization technologies supported: KVM hypervisor & Linux Container (LXC)
- Easy management with web-based user interface & CLI
- High-Availability (HA) Cluster Manager
- Live/Online Migration
- Integration of Proxmox Backup Server
- Built-in services: firewall, backup/restore, storage replication, etc.
- Open-source license (GNU AGPLv3)
- Enterprise support available

### OVERVIEW

Proxmox Virtual Environment is a complete, open-source solution for enterprise virtualization, that integrates the KVM hypervisor and Linux containers (LXC), software-defined storage (SDS) and networking (SDN), on a single platform. From the central user interface, you can manage VMs and containers, storage resources, simple or advanced network configuration, and high availability for clusters. The interface also provides access to multiple out-of-the-box tools for tasks such as backup/restore, live-migration, storage replication, and firewall configuration.

Proxmox VE is designed to scale to cluster-level and enables you to virtualize even the most demanding of Linux and Windows application workloads. By combining two virtualization technologies on a single platform, Proxmox VE provides maximum flexibility for your data center. It includes strong high-availability (HA) support and—thanks to the unique multi-master design—you don't need any additional management server, thus saving resources and allowing HA without a single point of failure (SPOF).

### ENTERPRISE-READY

Enterprises use the powerful Proxmox VE platform to easily install, manage, and monitor their hyper-converged (HCI) data centers. Multiple authentication sources, combined with role-based user and permission management enable flexible control of HA clusters. The REST API enables easy integration of third-party management tools, such as custom hosting environments.

The future-proof and open-source development model of Proxmox VE guarantees full access to the product's source code as well as maximum flexibility and security.

## KEY FEATURES

### INDUSTRY-LEADING

#### ENTERPRISE VIRTUALIZATION

- Linux and Windows servers, 32- and 64-bit operating systems.
- Support for the latest Intel and AMD server chip sets – for great VM performance.
- Near bare-metal performance for real-world enterprise workloads.
- Management layer containing all the capabilities to manage and monitor an open-source, software-defined data center.
- Import wizard for VMware ESXi VMs.

#### FREE & OPEN-SOURCE SOFTWARE

- Licensed under the GNU AGPL, v3.
- Debian-based, using the Proxmox kernel with OpenZFS support.
- Designed for community cooperation.
- Public code repository (Git).
- Open development on transparent mailing list.
- Bug tracker for issue tracking.
- Community support forum.
- Documentation, project page, video tutorials, how-to guides, ...

#### ENTERPRISE SUPPORT AGREEMENT

- Avoid hidden costs with clear subscription model.
- Flexible support options that grow with your needs.
- Access to the stable and extensively tested Enterprise Repositories for Proxmox VE and Ceph.
- Updates and version upgrades via GUI.
- Proxmox Offline Mirror tool to keep air-gapped systems up-to-date.
- Premium technical support from the highly-skilled Proxmox support team.
- Large network of resellers & partners who help with your project.

#### HIGHLY AVAILABLE (HA) CLUSTER

- No single point of failure (no SPOF).
- Multi-master cluster.
- Manage the HA settings for KVM and LXC via GUI.
- Cluster Resource Scheduling (CRS).
- pmxcfs—unique Proxmox VE Cluster File System: database-driven file system for storing configuration files, replicated in real-time across all nodes using Corosync.

- Based on proven Linux HA technologies, providing stable and reliable HA service.
- Resource agents for KVM and containers (LXC).
- Watchdog-based fencing.

#### SELF-FENCING

- The Proxmox VE HA Manager uses self fencing, provided by hardware watchdog or kernel softdog timers.
- No simultaneous data access or corruption.
- Works „out-of-the-box“.
- Includes Proxmox VE HA Simulator for testing.

#### UNIFIED VIRTUAL GUESTS OPERATION

- Create and maintain VMs and containers on a single platform.
- Set hard and soft limits for CPU and Memory.
- Pin virtual guests to a set of CPU cores.
- Migrate to any cluster node.

#### VIRTUAL MACHINES WITH QEMU/KVM

- Independent from OS: Run unmodified Windows, Linux, BSD, or others.
- QEMU/KVM for low overhead.
- Snapshot a full VM; optionally with memory (live).
- Hot-plug network devices, USB devices, disks, CPUs, and memory to a running VM.
- PCI(e) pass-through using the GUI.
- Import VMs from other hypervisors (via OVF).
- Setup UEFI with secure boot and a Trusted Platform Module (TPM) to run modern guest OS.
- View guest display from anywhere with noVNC HTML5 web console or SPICE client (virt-viewer).

#### CONTAINERS WITH LXC

- Proxmox Container Toolkit (pct) provides easy and flexible management of Linux Container (LXC).
- Ready-to use images of most common Linux distributions and TurnKey Linux templates available.
- Fine-grained memory and CPU resource control.
- Shares the host kernel: Almost zero overhead.
- Security features like AppArmor, seccomp, Cgroups, and kernel namespaces.
- Snapshot and rollback the full container state at any time.
- Quick maintenance with web console (xterm.js).

## KEY FEATURES

### LIVE/ONLINE MIGRATION

- Move QEMU VMs from one physical host to another with zero downtime.
- Local storage live-migration.

### FLEXIBLE STORAGE OPTIONS

- Local storage such as ZFS, Btrfs, LVM, and LVMthin.
- Shared storage such as CIFS, iSCSI or NFS.
- Distributed storage such as Ceph RBD and CephFS.
- Encryption support for Ceph OSD and ZFS.
- Unlimited number of storage definitions (cluster-wide).

### STORAGE REPLICATION STACK (ZFS)

- Built-in, open-source storage replication framework.
- Redundancy for guests using local storage.
- Data availability without using shared storage.
- Asynchronous replication.
- Minimize data loss in the case of a failure.
- Improve reliability, fault-tolerance, and accessibility of your data.
- Enables fast, live migration (sync only delta since last replication).
- Flexible scheduling options with the calendar events format.

### SOFTWARE-DEFINED STORAGE (SDS) WITH CEPH

- Integrated Ceph, a distributed object store and file system.
- Management via GUI or CLI.
- Easy-to-use installation wizard.
- Run Ceph RBD and CephFS directly on the Proxmox VE cluster nodes.
- Proxmox delivers its own Ceph packages.
- Ceph support is included in the support agreement.
- Add external Ceph clusters as storage via GUI.

### SOFTWARE-DEFINED NETWORK (SDN)

- Manage and control complex networking configurations and multitenancy setups via GUI.
- Separate the different network areas into zones consisting of virtual networks (VNETs).
- Applicable to all sizes of networks, from a simple routed NAT setup, traditional separation into 802.1q VLANs, to features like QinQ, VXLAN tunneling, and BGP-based EVNP infrastructures.
- Cluster-wide synchronization of the configuration.
- Live reload after a configuration is changed.

### LINUX NETWORK STACK

- Flexible options to manage local nodes.
- Well-known tool with configuration via the GUI.
- IPv4 and IPv6 support.
- Support for VLANs, bonds, and bridges.

### BACKUP AND RESTORE

- Full backups of VMs and containers.
- Live snapshot backups.
- Define flexible backup job schedules with the calendar event format.
- Configure multiple backup storages.
- GUI and CLI integration.
- Backup and restore via GUI.
- Set up backup retention policies via GUI.
- Run scheduled backup jobs manually in the GUI.
- Monitor backup jobs in the GUI via the tab "Tasks".
- Automatically add notes to backups using a template.
- Backup fleecing using fast local storage as a buffer for I/O-heavy guests with slow backup targets.

### INTEGRATION OF PROXMOX BACKUP SERVER

- Full support for the open-source, enterprise backup solution from Proxmox.
- Incremental, fully deduplicated backups of VMs, containers, and physical hosts.
- QEMU dirty-bitmaps for extremely fast VM backup.
- Strong encryption on the client-side, with easy encryption key management.
- Single-file and directory restore.
- With live-restore, guests start as soon as the restore does.



## KEY FEATURES

### DISK MANAGEMENT

- View all disks and their partitions.
- Check S.M.A.R.T health status of disks.
- Wipe all data from a partition or disk via the GUI.
- Create ZFS (RAID-Z, dRAID, RAID 0/1/10), LVM(-thin) and file based (ext4, XFS) storages.

### TWO-FACTOR AUTHENTICATION

- Providing high security.
- Support for multiple 2<sup>nd</sup> factors for a single account.
- Ability to use a hardware token (Webauthn, TOTP, Yubikey-OTP).
- Generate single-use recovery codes.
- TFA/TOTP lockout to protect against brute-force attacks.

### MULTIPLE AUTHENTICATION SOURCES

- Proxmox VE supports multiple authentication realms.
- Linux PAM standard authentication (e.g., 'root' and other local users).
- Built-in Proxmox VE authentication server.
- Microsoft Active Directory (MS ADS).
- LDAP
- Single Sign-On (SSO) with OpenID Connect.
- Regular and automated user synchronization for LDAP/AD realms

### FLEXIBLE ACCESS CONTROL

- User and permission management for all objects (VMs, storage systems, nodes, hardware resources, networking zones, etc.) .
- Proxmox VE comes with a number of predefined roles (groups of privileges) which cover common use cases. The contained privileges can be seen in the GUI.
- Permissions to control access to objects (access control lists). Each permission specifies a subject (user or group) and a role (set of privileges) on a specific path.
- Create API Tokens and lock them further down for secure, and easily revocable access.
- Restricted by default: new users or API tokens do not have any permissions.

### VM TEMPLATES AND CLONES

- Deploying VMs from templates is blazing fast, very convenient, and if you use linked clones, highly storage efficient.
- Linked and full clones.

### VM HARDWARE PASSTHROUGH

- Assign PCI(e) or USB devices to VMs and containers via the GUI.
- Hot-plug USB devices and ports into running VMs.
- Use virtual functions to share a single device with multiple guests.
- Pass through whole disks using the CLI.
- Resource mappings for VMs, with hardware passthrough/cluster-wide mapping of PCI/USB devices.

### PROXMOX VE FIREWALL

- Supporting IPv4 and IPv6.
- Linux-based netfilter technology. Stateful firewall for easy, dynamic filtering.
- Distributed: configurations in Proxmox VE cluster file system, with iptables rules applied on each node.
- Cluster-wide IP sets, aliases, and security groups.
- 3 levels of configuration (data center, host, VM/CT).
- Support for custom 'raw' tables; enable SYN flood attack protection.

### WEB-BASED MANAGEMENT INTERFACE

- Integrated - no need to install a separate management tool nor any additional management node.
- Fast and easy creation of VMs and containers.
- Seamless integration and easy management of an entire cluster.
- Fast, search-driven interface able to handle thousands of VMs and containers.
- Based on the Ext JS JavaScript framework.
- Secure HTML5 console, supporting SSL.
- Let's Encrypt TLS certificates via the ACME-based DNS or HTTP challenge mechanism.
- Subscription management via GUI.
- Simple management of APT package repositories, and upgrades via GUI.
- Integrated documentation.
- Available in multiple languages.



## KEY FEATURES

### COMMAND LINE (CLI)

- Manage all components of your virtual environment.
- CLI with intelligent tab completion.
- Full UNIX man page documentation.

### REST API

- Easy integration for third-party management tools.
- REST API (JSON as primary data format).
- Alternative human-readable API format with interactive browser, as built-in documentation.
- Full support for API tokens.
- Automatic JSON Schema powered parameter verification.
- Easy means of creating command line tools (use the same API).
- Resource Oriented Architecture (ROA).
- Declarative API definition using JSON Schema.

### MODERN LINUX SERVER EXPERIENCE

- Flexible notification system: rule-based notifications sent as email via local Postfix MTA or authenticated SMTP, or sent via a Gotify instance.
- Secure boot compatibility.
- Kernel pinning: select preferred kernel version.
- Automated and unattended installation for full automation of the setup of bare-metal nodes.

### ANDROID APP

- Connect to Proxmox VE instances.
- Manage clusters, nodes, VMs, and containers.
- Access SPICE and HTML5 consoles.
- Based on the Flutter framework.



## LEARN MORE

Project page: <https://pve.proxmox.com>

Bugtracker: <https://bugzilla.proxmox.com>

Code repository: <https://git.proxmox.com>

## HOW TO BUY

Visit the Proxmox Online Shop to purchase a subscription: <https://shop.proxmox.com>

Find an authorized reseller in your area:  
<https://www.proxmox.com/partners/explore>

## SALES INQUIRIES

[office@proxmox.com](mailto:office@proxmox.com)

## HELP AND SUPPORT

Proxmox Customer Portal:

<https://my.proxmox.com>

Community Support Forum:

<https://forum.proxmox.com>

## TRAINING PROXMOX VE

Learn Proxmox VE easily – Visit a training:

<https://www.proxmox.com/services/training>

## ABOUT PROXMOX

Proxmox Server Solutions GmbH is a software provider dedicated to developing powerful and efficient open-source server solutions. The privately held company is based in Vienna (Europe).

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