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PROXMOX VIRTUAL ENVIRONMENT

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, 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.

BENEFITS

Streamlined IT Infrastructure
A single platform to manage VMs, containers, storage, and networks.

Unified Operations
Seamlessly deploy and monitor VMs and containers with the intuitive REST API, GUI, and CLI for easy operation and integration.

Software-Defined Storage
SDS made simple – Thanks to built-in support for Ceph, ZFS, and other storage backends.

Scale without Limits
Build highly available clusters in minutes and easily scale clusters to support your growing workloads.

100% Open-Source
No hidden licensing fee and full access to source code for customization.

Made for Production
Keep your business running smoothly with Enterprise-grade services & technical support from Proxmox.

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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, howto guides, and much more.

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.
- Supported by a global network of 3,000 official Proxmox integration partners for deployment, migration, and professional services.

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.

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), including dynamic mode with real-time node and guest resource utilization. NEW
- 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.
- HA node and resource affinity rules.
- Dynamic Load Balancer for HA-managed guests to reduce node imbalance across the cluster. NEW
- Preserves HA resource state during planned maintenance workflows. NEW
- HA arm/disarm workloads. NEW

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.
- Custom CPU models to tailor virtual CPU features for specific workloads and compatibility requirements. NEW
- 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/OVA files) directly via the GUI from file-based storages.
- 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).

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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, TurnKey Linux templates, and support for OCI images.
- 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).

Live/Online Migration

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

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 (clusterwide).

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 multi-tenant setups via GUI.
- Separate the different network areas into zones consisting of virtual networks (VNets), optionally including IP address management (IPAM).
- 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 EVPN infrastructures.
- Cluster-wide synchronization of the configuration.
- Live reload after a configuration is changed.
- Dynamic routing protocols including OpenFabric, OSPF and BGP. NEW

Linux Network Stack

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

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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.
- Support for 3rd party backup provider plugins.

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.

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 2nd 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 pass-through/cluster-wide mapping of PCI/USB devices.

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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 filtering rules applied on each node.
- Cluster-wide IP sets, aliases, and security groups.
- Tight integration with the SDN functionality (access of IPAM information as IP-sets).
- 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. Group virtual guests by assigned tags.
- 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.
- Modern web interface for cluster management on mobile devices.
- Integrated documentation.

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.
- Webhooks for the notification system enable system events to trigger HTTP requests.
- Secure boot compatibility.
- Kernel pinning: select preferred kernel version.
- Automated and unattended installation for full automation of the setup of bare-metal nodes.
- Tailored installation ISO offering installation via GUI, terminal, or serial port.

Android App

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

GPU workloads

- GPU Passthrough.
- Officially supported plattform for NVIDIA vGPU.

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DATASHEET

PROXMOX VIRTUAL ENVIRONMENT V9.2

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Project page: **pve.proxmox.com**
Bugtracker: **bugzilla.proxmox.com**
Code repository: **git.proxmox.com**

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SALES INQUIRIES?

Please contact our team:
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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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