

IT Infrastructure Administration

Day 7 & 8: Server Virtualization Concepts

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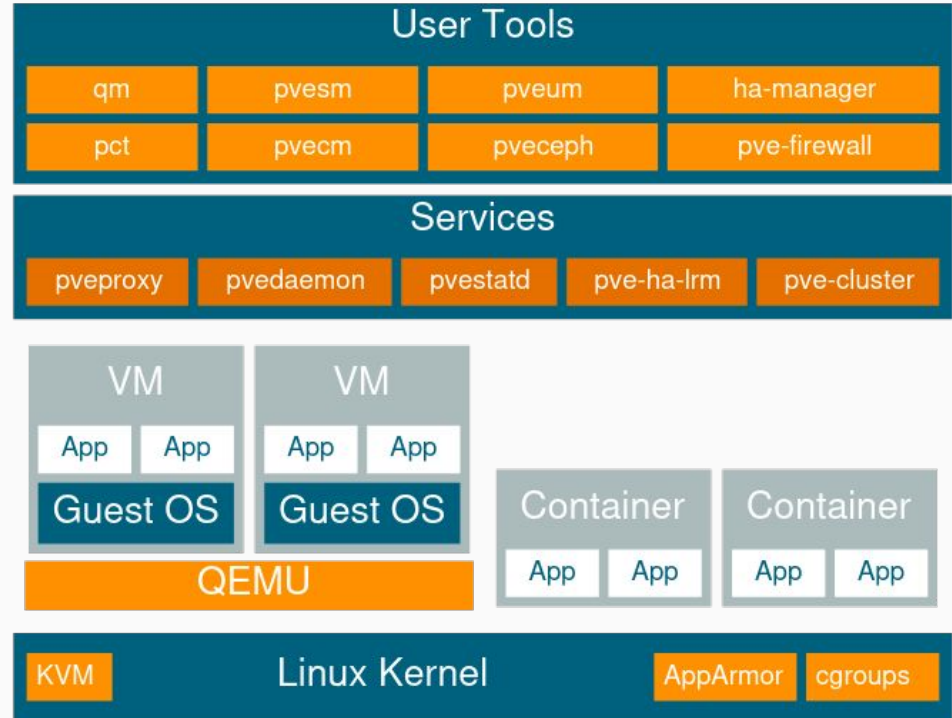
Server Virtualization Concepts

Day 7 & 8
Training Outline

- Proxmox VE
- Benefits of using proxmox VE
- Proxmox VE recommended hardware
- Installation
- GUI Overview
- Proxmox VE Datacenter
- Proxmox VE Node
- Network
- Storage
- Knowledge check

Proxmox VE

- ❑ Proxmox Virtual Environment is an open source virtualization platform to run virtual machines and containers
- ❑ It is based on Debian Linux, and completely open source.
- ❑ It implements two virtualization technologies - Kernel-based Virtual Machine (KVM) and container-based virtualization (LXC).
- ❑ Can be used on a single server, or assemble a cluster of many servers.
- ❑ It includes a rich web-based management interface



Benefits of Using Proxmox VE

- ❑ Open source software
- ❑ No vendor lock-in
- ❑ Linux kernel
- ❑ Fast installation and easy-to-use
- ❑ Web-based management interface
- ❑ REST API
- ❑ Huge active community
- ❑ Low administration costs and simple deployment

Proxmox VE Recommended Hardware

- ❑ Intel 64 or AMD64 with Intel VT/AMD-V CPU flag.
- ❑ Memory: Minimum 2 GB for the OS and Proxmox VE services, plus designated memory for guests. For Ceph and ZFS, additional memory is required; approximately 1GB of memory for every TB of used storage.
- ❑ Fast and redundant storage, best results are achieved with SSDs.
- ❑ OS storage: Use a hardware RAID with battery protected write cache (“BBU”) or non-RAID with ZFS (optional SSD for ZIL).
- ❑ VM storage:
 - ❑ For local storage, use either a hardware RAID with battery backed write cache (BBU) or non-RAID for ZFS and Ceph. Neither ZFS nor Ceph are compatible with a hardware RAID controller.
 - ❑ Shared and distributed storage is possible.
 - ❑ SSDs with Power-Loss-Protection (PLP) are recommended for good performance. Using consumer SSDs is discouraged.
- ❑ Redundant (Multi-)Gbit NICs, with additional NICs depending on the preferred storage technology and cluster setup.


Installation

- ❑ Prepare a usb with proxmox iso
- ❑ Configure storage
- ❑ Configure region and timezone
- ❑ Configure management network
- ❑ Accessing the Management Interface with
 - ❑ <https://<your-server-ip>:8006>



Installation



 Proxmox VE Installer

Location and Time Zone selection

The Proxmox Installer automatically makes location based optimizations, like choosing the nearest mirror to download files. Also make sure to select the right time zone and keyboard layout.

Press the Next button to continue installation.

- **Country:** The selected country is used to choose nearby mirror servers. This will speedup downloads and make updates more reliable.
- **Time Zone:** Automatically adjust daylight saving time.
- **Keyboard Layout:** Choose your keyboard layout.

Country


Time zone

Keyboard Layout

Abort

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 Proxmox VE Installer

Administration Password and E-Mail Address

Proxmox Virtual Environment is a full featured highly secure GNU/Linux system based on Debian.

Please provide the *root* password in this step.

- Password:** Please use a strong password. It should have 8 or more characters. Also combine letters, numbers, and symbols.
- E-Mail:** Enter a valid email address. Your Proxmox VE server will send important alert notifications to this email account (such as backup failures, high availability events, etc.).

Press the Next button to continue installation.

Password


Confirm

E-Mail

Abort

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 Proxmox VE Installer

Management Network Configuration


Please verify the displayed network configuration. You will need a valid network configuration to access the management interface after installation.

Afterwards press the Next button. You will be shown a list of the options that you chose during the previous steps.

- **IP address:** Set the IP address for your server.
- **Netmask:** Set the netmask of your network.
- **Gateway:** IP address of your gateway or firewall.
- **DNS Server:** IP address of your DNS server.

Management Interface:	ens18 - ba:33:cf:2f:a9:2f (virtio_net) ▼
Hostname (FQDN):	nodes1.yourdomain.tld
IP Address:	192.168.30.57
Netmask:	255.255.240.0
Gateway:	192.168.16.1
DNS Server:	10.10.0.1

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 Proxmox VE Installer

Summary

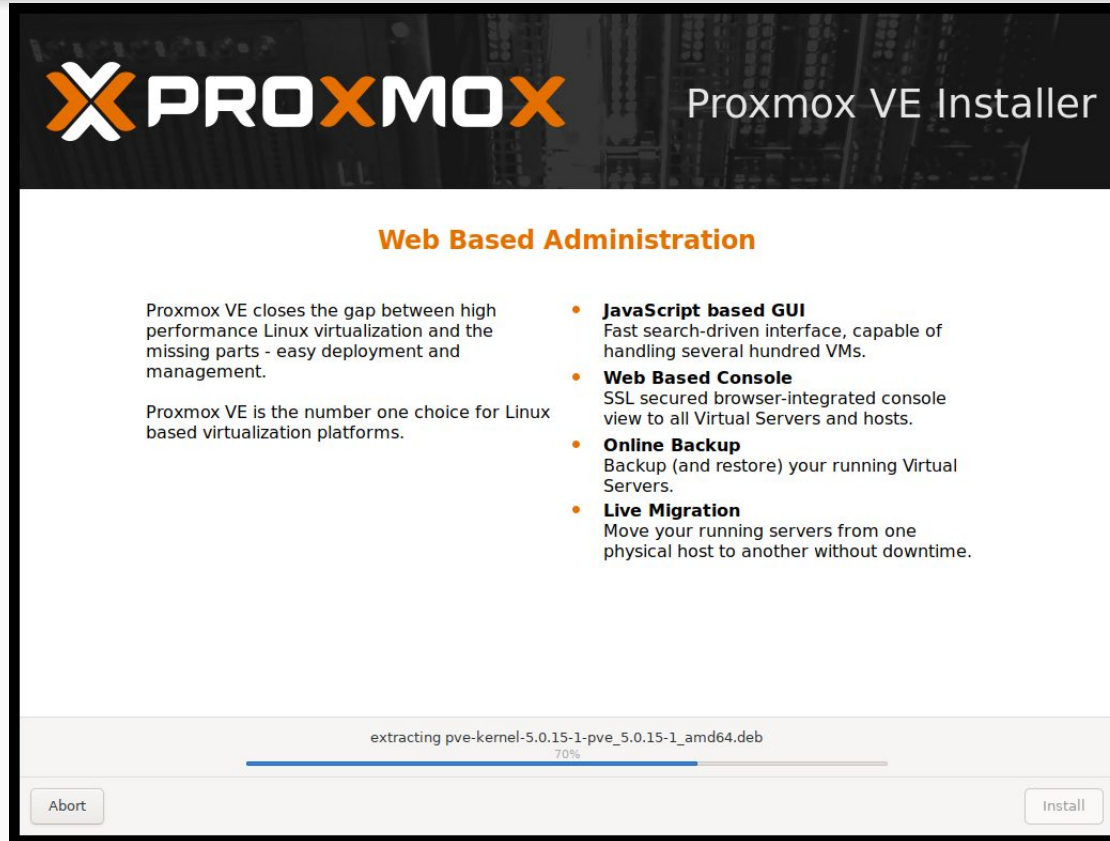
Please verify the displayed informations. Once you press the **Install** button, the installer will begin to partition your drive(s) and extract the required files.

Option	Value
Filesystem:	zfs (RAID1)
Disk(s):	/dev/nvme0n1 /dev/nvme1n1
Country:	Austria
Timezone:	Europe/Vienna
Keymap:	de
E-Mail:	admin@yourdomain.tld
Management Interface:	ens18
Hostname:	nodes1
IP:	192.168.30.57
Netmask:	255.255.240.0
Gateway:	192.168.16.1
DNS:	10.10.0.1

Abort

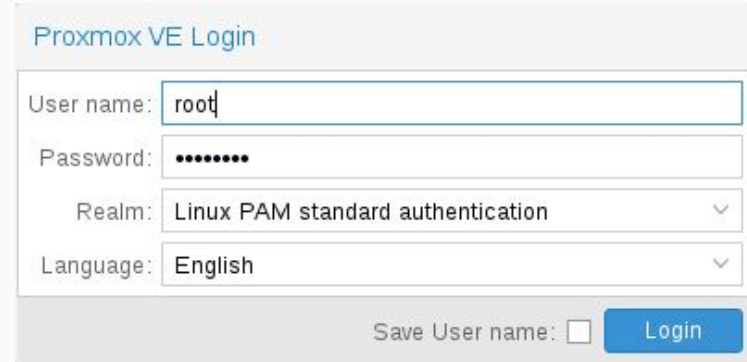
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Install



Accessing the Management interface Post installation

- ❑ After a successful installation and reboot of the system you can use the Proxmox VE web interface for further configuration.
- ❑ Point your browser to the IP address given during the installation and port 8006, for example: `https://youripaddress:8006`
- ❑ Log in using the root (realm PAM) username and the password chosen during installation.



The screenshot shows the Proxmox VE Login page. It has a title 'Proxmox VE Login' in blue. Below the title are four input fields: 'User name:' with 'root' entered, 'Password:' with masked dots, 'Realm:' with 'Linux PAM standard authentication' selected in a dropdown, and 'Language:' with 'English' selected in a dropdown. At the bottom right, there is a checkbox for 'Save User name:' and a blue 'Login' button.

GUI Overview

Header:

- Documentation
- Create VM
- Create CT
- User Menu

Resource Tree

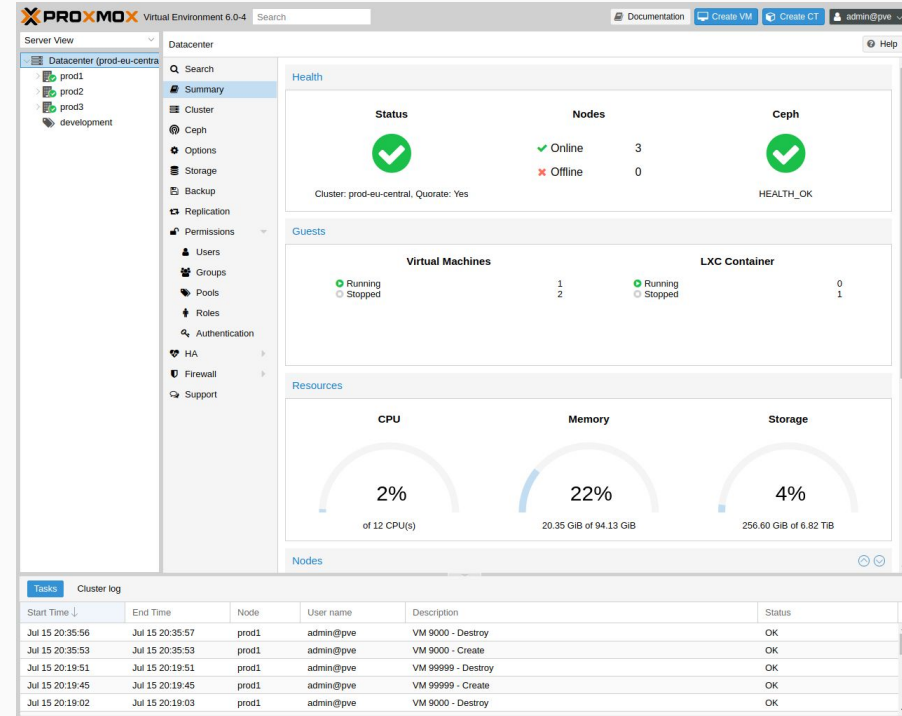
- Datacenter
- Node
- Guest
- Storage
- Pool

Log Panel: show you what is currently going on in your cluster.

Content Panels: When you select an item from the resource tree, the corresponding object displays configuration and status information in the content pane

The following view types are available

- Server View
- Folder View
- Pool View
- Tag View



Proxmox VE Datacenter

On the datacenter level, you can access cluster-wide settings and information.

- ❑ **Search:** perform a cluster-wide search for nodes, VMs, containers, storage devices, and pools.
- ❑ **Summary:** gives a brief overview of the cluster's health and resource usage.
- ❑ **Cluster:** provides the functionality and information necessary to create or join a cluster.
- ❑ **Options:** view and manage cluster-wide default settings.
- ❑ **Storage:** provides an interface for managing cluster storage.
- ❑ **Backup:** schedule backup jobs. This operates cluster wide, so it doesn't matter where the VMs/containers are on your cluster when scheduling.
- ❑ **Replication:** view and manage replication jobs.
- ❑ **Permissions:** manage user, group, and API token permissions, and LDAP, MS-AD and Two-Factor authentication.
- ❑ **HA:** manage Proxmox VE High Availability.
- ❑ **ACME:** set up ACME (Let's Encrypt) certificates for server nodes.
- ❑ **Firewall:** configure and make templates for the Proxmox Firewall cluster wide.
- ❑ **Metric Server:** define external metric servers for Proxmox VE.
- ❑ **Notifications:** configure notification behavior and targets for Proxmox VE.
- ❑ **Support:** display information about your support subscription.

Proxmox VE Nodes

Nodes in your cluster can be managed individually at this level.

- ❑ **Search:** search a node for VMs, containers, storage devices, and pools.
- ❑ **Summary:** display a brief overview of the node's resource usage.
- ❑ **Notes:** write custom comments in Markdown syntax.
- ❑ **Shell:** access to a shell interface for the node.
- ❑ **System:** configure network, DNS and time settings, and access the syslog.
- ❑ **Updates:** upgrade the system and see the available new packages.
- ❑ **Firewall:** manage the Proxmox Firewall for a specific node.
- ❑ **Disks:** get an overview of the attached disks, and manage how they are used.
- ❑ **Ceph:** is only used if you have installed a Ceph server on your host. In this case, you can manage your Ceph cluster and see the status of it here.
- ❑ **Replication:** view and manage replication jobs.
- ❑ **Task History:** see a list of past tasks.
- ❑ **Subscription:** upload a subscription key, and generate a system report for use in support cases.

Network

Key Networking Components

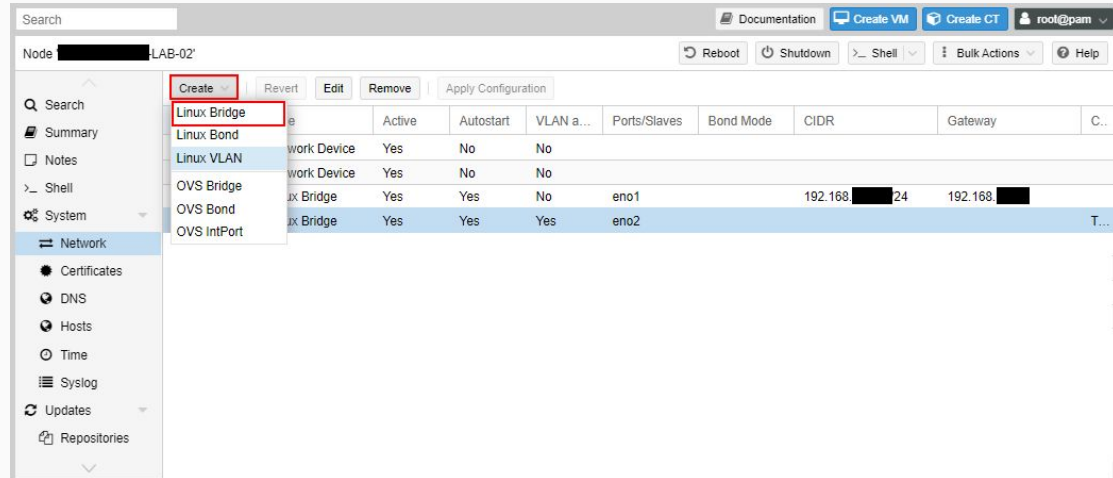
- ❑ **Bridge (vbr):** Acts like a virtual switch to connect VMs/CTs to physical network.
- ❑ **Bond:** Combines multiple NICs for redundancy or performance (NIC teaming).
- ❑ **VLAN:** Allows multiple virtual networks on a single physical interface.

We can configure the network via web interface

Datacenter → Node → System → Network

All Proxmox VE related network configuration is stored within a single text file at

/etc/network/interfaces



Storage

Storage Types

- **Local Storage:** On the node itself (e.g., ext4, ZFS, LVM).
- **Shared/Networked Storage:** Accessible by multiple nodes (e.g., NFS, iSCSI, Ceph). Required for Live Migration and High Availability.

Storage Technologies

- **LVM/LVM-Thin:** Block-level storage, supports thin provisioning.
- **Directory:** Simple local folder (e.g., `/var/lib/vz`).
- **Ceph:** Distributed, redundant storage integrated into Proxmox.
- **ZFS:** Local file system with snapshots, compression, replication.
- **NFS / iSCSI:** Network-attached storage for shared access.

Content: A storage can support several content types

- Images: QEMU/KVM VM images.
- Rootdir: Allow to store container data.
- Vztmpl: Container templates.
- Backup: Backup files (vzdump).
- Iso: ISO images
- Snippets: Snippet files, for example guest hook scripts

We can configure storage in

Datacenter - Storage

All Proxmox VE related storage configuration is stored within a single text file at `/etc/pve/storage.cfg`.

Knowledge Check

Which of the following storage types is shared and supports live migration in Proxmox VE?

- A) LVM
- B) ZFS Local
- C) NFS
- D) Directory

Which network bridge is commonly used in Proxmox VE to provide VMs access to the physical network?

- A) vmbr0
- B) eth0
- C) tap0
- D) eno1

What is the default web interface port for Proxmox VE?

- A) 443
- B) 8006
- C) 22
- D) 8080

Knowledge Check

Which file contains VM configuration details in Proxmox VE?

- A) /etc/proxmox.conf
- B) /etc/pve/qemu-server/<VMID>.conf
- C) /etc/vm.conf
- D) /var/lib/pve/vms/<VMID>.cfg

What is the main purpose of vzdump in Proxmox?

- A) Load balancing
- B) Disk partitioning
- C) VM backup
- D) Installing packages

What is a requirement before enabling live migration of VMs?

- A) Same hostname
- B) Local disk only
- C) Shared storage
- D) Static IP

Knowledge Check

How does Proxmox VE handle container virtualization?

- A) QEMU
- B) Docker
- C) LXC
- D) VBox

Which of these allows Proxmox VMs to communicate over an internal network only?

- A) NAT
- B) vmbr0
- C) Host-only networking
- D) Internal bridge without uplink

Which of the following describes fencing in a Proxmox cluster?

- A) Preventing VMs from being migrated
- B) Automatically isolating or powering off failed nodes
- C) Blocking users from certain nodes
- D) Resetting firewall rules

Thank You

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