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Virtualizing with Proxmox® VE

This following article is about building and running pfSense® software on a virtual machine under Proxmox Virtual Environment (VE). The guide also applies to any newer Proxmox VE version. Article covers Proxmox VE networking setup and firewall virtual machine setup process. The guide does not cover how to install Proxmox VE.

A basic, working, virtual machine will exist by the end of this article.

Assumptions

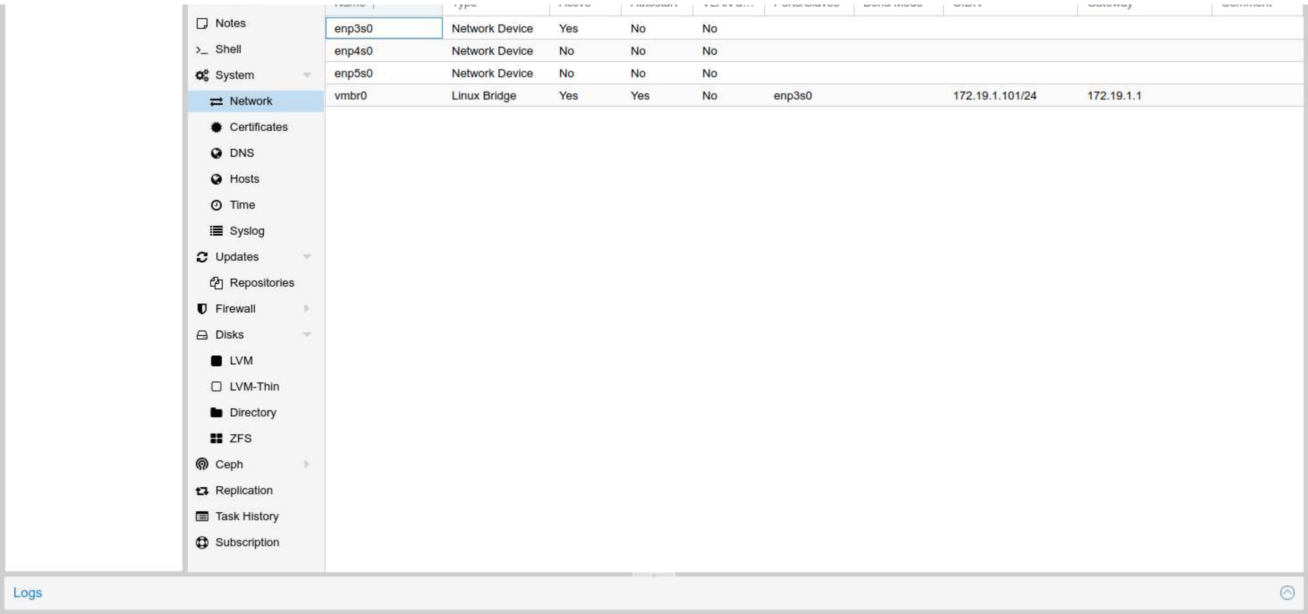
- Proxmox VE host is up and running
- Host has at least two network interfaces available for WAN and LAN.
- pfSense software ISO image is present on the Proxmox VE host

Basic Proxmox VE networking

First create two Linux Bridges on Proxmox VE, which will be used for LAN and WAN on the firewall VM.

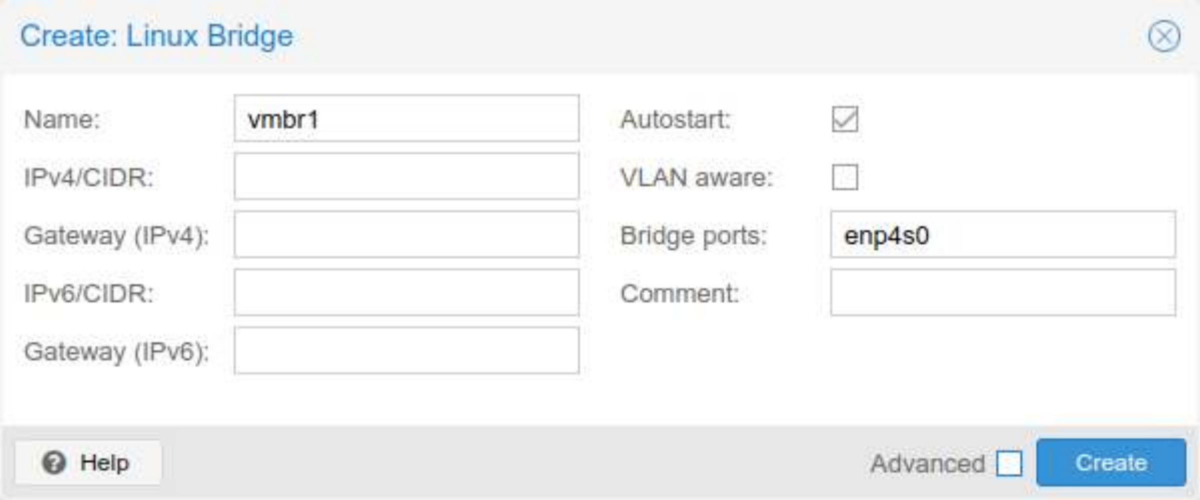
- Select the host from the server view
- Navigate to **System > Network**

This example uses `enp4s0` and `enp5s0` interfaces for the firewall, while `enp3s0` is for Proxmox VE management. The naming of interfaces will vary depening on the hardware involved (interface type, bus location, etc.).



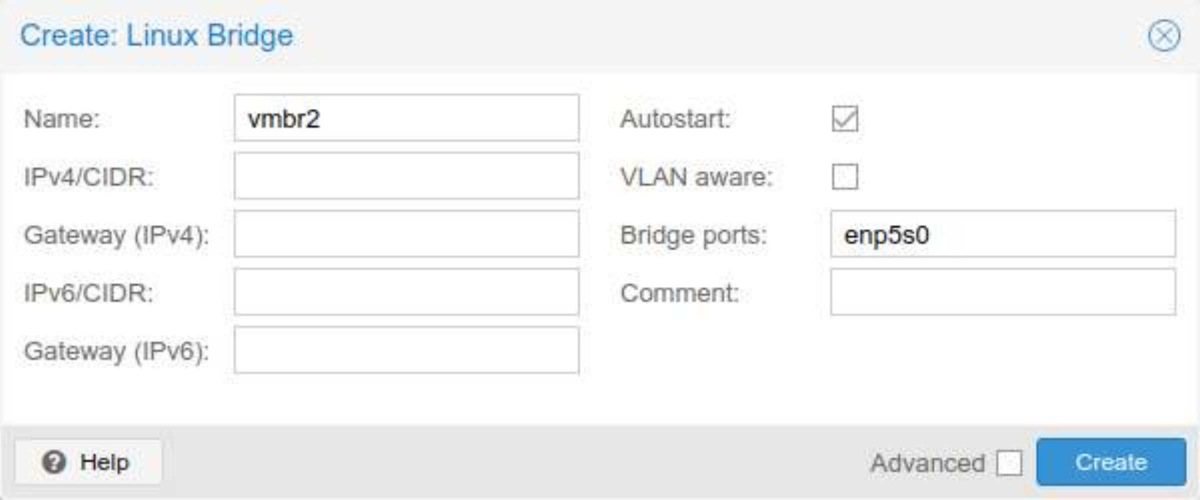
enp3s0	Network Device	Yes	No	No					
enp4s0	Network Device	No	No	No					
enp5s0	Network Device	No	No	No					
vmbr0	Linux Bridge	Yes	Yes	No	enp3s0		172.19.1.101/24	172.19.1.1	

- Click **Create**
- Select Linux Bridge
- Enter `enp4s0` under **Bridge ports**


Create: Linux Bridge

Name: vmbr1
IPv4/CIDR:
Gateway (IPv4):
IPv6/CIDR:
Gateway (IPv6):
Autostart: ☑
VLAN aware: ☐
Bridge ports: enp4s0
Comment:

Repeat the process to add another Linux Bridge, this time add `enp5s0` under **Bridge ports**.

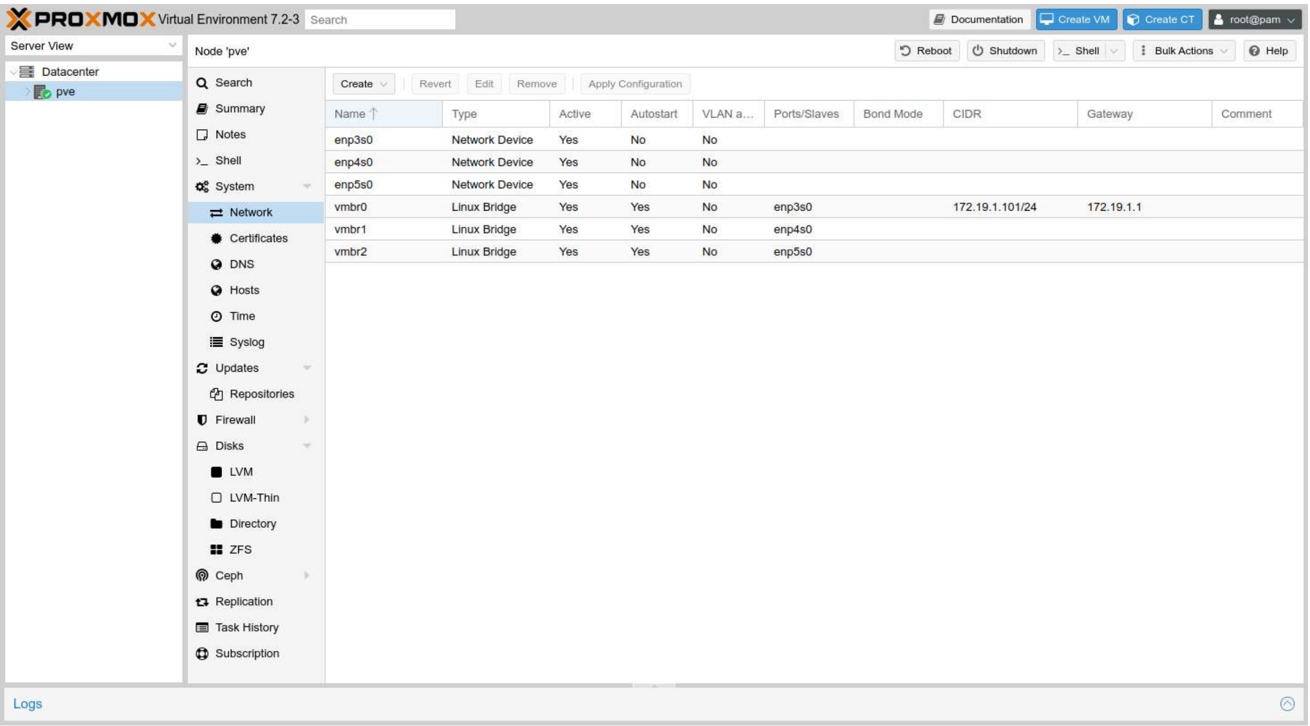

Create: Linux Bridge

Name: vmbr2
IPv4/CIDR:
Gateway (IPv4):
IPv6/CIDR:
Gateway (IPv6):
Autostart: ☑
VLAN aware: ☐
Bridge ports: enp5s0
Comment:

Proxmox VE networking should now display two Linux bridges like on the following screenshot.

Note

If the interfaces do not show as **Active**, reboot the Proxmox VE host.



Name ↑	Type	Active	Autostart	VLAN a...	Ports/Slaves	Bond Mode	CIDR	Gateway	Comment
enp3s0	Network Device	Yes	No	No					
enp4s0	Network Device	Yes	No	No					
enp5s0	Network Device	Yes	No	No					
vmbr0	Linux Bridge	Yes	Yes	No	enp3s0		172.19.1.101/24	172.19.1.1	
vmbr1	Linux Bridge	Yes	Yes	No	enp4s0				
vmbr2	Linux Bridge	Yes	Yes	No	enp5s0				

Creating a Virtual Machine

After creating WAN and LAN Linux bridges, now proceed to create a new virtual machine.

- Click **Create VM** from the top right section to display the new virtual machine wizard
- Navigate to the **General** tab
- Enter a **Name** for the VM (e.g. `firewall`)
- Navigate to the **OS** tab
- Set the following options:

  Use CD/DVD disc image file:

  Selected

  Storage:

  local

  ISO image:

  Select the previously uploaded ISO image

  Guest OS Type:

- Navigate to the **System** tab
- Set the following options:

  Graphic card:

  SPICE

  Note

  The SPICE console uses less CPU when idle and supports more advanced console features than the default console. It is compatible with the VNC Proxmox VE console as well as the more advanced virt-viewer console application.

- Navigate to the **Hard Disk** tab
- Set the following options:

  Bus/Device:

  VirtIO Block

  Disk Size:

  Enter an appropriate disk size, no less than `8` GB.

- Navigate to the **CPU** tab
- Set the following options:

  Socket:

  `1`

  Cores:

  `1` or more cores as needed

  Type:

  Host to match the CPU on the hypervisor hardware.

  Extra CPU Flags:

  These settings adjust the CPU capabilities and behavior of the guest. If using **Host** for **Type** these can likely be left at the default.

  When setting a CPU type other than **Host**, consider setting the **AES** flag to **+** (**On**) which allows the guest to use AES-NI (Cryptographic Accelerator Support).

- Navigate to the **Memory** tab
- Set the following options:

  Memory:

  At least `1024` MB

Bridge:

vmbr1

Model:

VirtIO (paravirtualized)

- Navigate to the **Confirm** tab
- Review the settings and make any final corrections if necessary
- Click **Finish**
- Wait for the VM creation process to finish

Now add another network adapter to the VM:

- Expand the **Server View** list on the left to show the contents under **Datacenter** and the name of this hypervisor node (e.g. **pve**, **proxmox**, etc.)
- Select the newly created virtual machine from list
- Click **Hardware** in the right pane
- Click **Add**
- Click **Network Device**
- Set the following options:

  Bridge:

  vmbr2

  Model:

  VirtIO (paravirtualized)
- Click **Add**

Review the hardware list for the VM and confirm it now contains two network interfaces.

Starting and configuring the virtual machine

After creating a new virtual machine and adding network interfaces, it is time to start the virtual machine.

- Expand the **Server View** list on the left to show the contents under **Datacenter** and the name of this hypervisor node (e.g. **pve**, **proxmox**, etc.)
- Select the newly created virtual machine from list
- Click **Start**
- Click **Console** on the left, under **Summary**

  Note

  The **Console** button at the top will launch the console in a new window, which

When the VM starts it will boot into the installer automatically. From there, follow the installation steps as usual, and reboot when finished.

> ❗ **See also**
>
> See Installation Walkthrough for a detailed walkthrough of the installation process.

After the virtual machine reboots, the console will stop at an interfaces assignment prompt.

- Type `n` and press `Enter` to skip VLAN configuration
- Enter `vtnet0` for WAN
- Enter `vtnet1` for LAN
- Press `Enter` if prompted for additional interfaces
- Type `y` and press `Enter` to complete the interface assignment

After interfaces have been assigned, the VM will complete the boot process.

Disable Hardware Checksums with Proxmox VE VirtIO

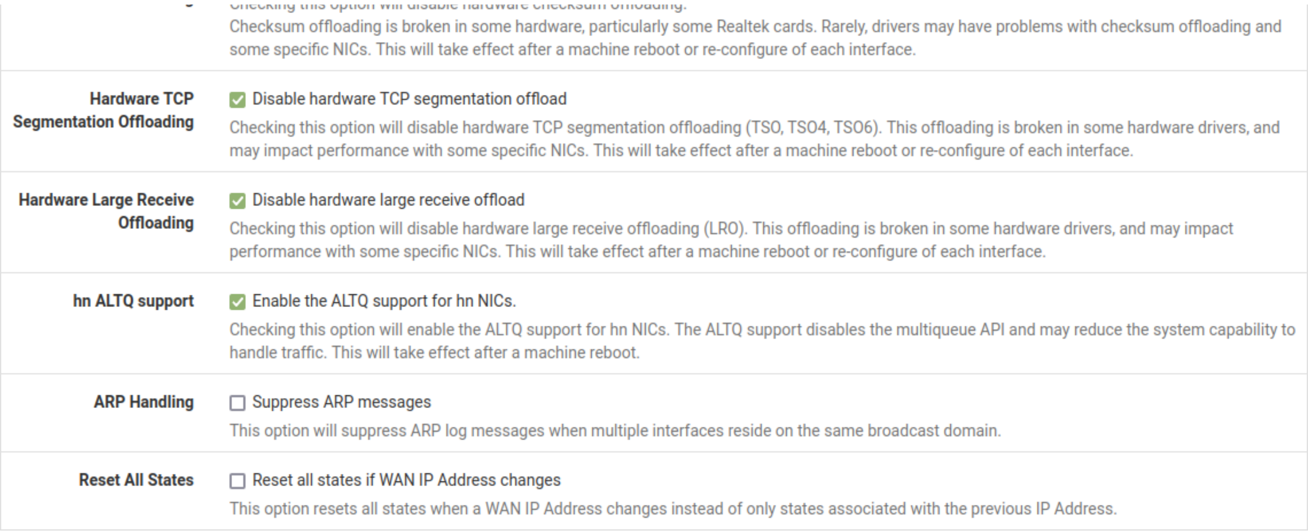
When using VirtIO interfaces in Proxmox VE, network interface hardware checksum offloading **must** be disabled. Current versions of pfSense software attempt to disable this automatically for `vtnet` interfaces, but the best practice is to double check the setting in case changes in Proxmox VE result in the automatic process failing.

> ❗ **Warning**
>
> Do not skip this step, otherwise the virtual machine will not properly pass traffic. Accessing the firewall may be sluggish at first, but changing this setting will correct that as well.

After the installation and interfaces assignment processes are complete, connect to the assigned LAN port from another computer or VM on the LAN-side bridge.

To disable hardware checksum offload:

- Navigate to **System > Advanced**, **Networking** tab
- Locate the **Networking Interfaces** section
- Check **Disable hardware checksum offload**
- Click Save
- Reboot the firewall from **Diagnostics > Reboot** or the console menu



	Checking this option will disable hardware checksum offloading. Checksum offloading is broken in some hardware, particularly some Realtek cards. Rarely, drivers may have problems with checksum offloading and some specific NICs. This will take effect after a machine reboot or re-configure of each interface.
Hardware TCP Segmentation Offloading	☑ Disable hardware TCP segmentation offload Checking this option will disable hardware TCP segmentation offloading (TSO, TSO4, TSO6). This offloading is broken in some hardware drivers, and may impact performance with some specific NICs. This will take effect after a machine reboot or re-configure of each interface.
Hardware Large Receive Offloading	☑ Disable hardware large receive offload Checking this option will disable hardware large receive offloading (LRO). This offloading is broken in some hardware drivers, and may impact performance with some specific NICs. This will take effect after a machine reboot or re-configure of each interface.
hn ALTQ support	☑ Enable the ALTQ support for hn NICs. Checking this option will enable the ALTQ support for hn NICs. The ALTQ support disables the multiqueue API and may reduce the system capability to handle traffic. This will take effect after a machine reboot.
ARP Handling	☐ Suppress ARP messages This option will suppress ARP log messages when multiple interfaces reside on the same broadcast domain.
Reset All States	☐ Reset all states if WAN IP Address changes This option resets all states when a WAN IP Address changes instead of only states associated with the previous IP Address.

Congratulations, the virtual machine installation and configuration on Proxmox VE is now complete.

Booting UEFI

pfSense software can boot UEFI in a Proxmox VE guest but doing so requires a few extra steps.

When creating the VM:

- Set **Machine** to **q35**
- Set **BIOS** to **OVMF (UEFI)**
- Add an EFI disk when prompted
- Pick the storage for the EFI disk, other settings can remain at defaults

> **Note**
>
> An existing non-UEFI VM can be reconfigured to boot UEFI with these settings on its **Hardware** but the process is more error prone. For example, the EFI disk is a separate manual process and not semi-automated as it is when creating a VM.

After creating the VM:

- Edit the VM Hardware and add a serial port device

  > **Note**
  >
  > On some versions of pfSense software the EFI boot process for a ProxMox VE VM works more reliably with a serial port present in the VM hardware, even if the OS is not actively using the port.

- Hit `Esc` while the boot splash screen is visible
- Select **Device Manager**
- Select **Secure Boot Configuration**
- Uncheck **Attempt Secure Boot**
- Press `F10` to save
- Press `Esc` to exit
- Reset the VM

With secure boot disabled the VM can now boot with UEFI from the ISO as well as after installation.