

# Getting Started With Proxmox



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# Foreword

- I'm Adam, I live and work in Chester County as a Linux systems administrator. This is the third presentation I've done for PLUG and was first seen by a very small crowd at PLUG West in December 2019. I've made lots of edits and additions since then!
- I have been using Proxmox since November 2019 and it, alongside FreeNAS has slowly taken over my home lab. As a "Getting Started..." presentation I intend this mainly for those with my (intermediate) skill level who just want to make a lot of VMs and containers. This means we won't be getting deep into more advanced topics like clustered storage, virtual network hardware, API calls, etc. but I will still try to point out these features wherever applicable

# Introduction – what is Proxmox?

- Proxmox VE (Virtualization Environment) is a Debian-based, open-source server virtualization platform that allows you to quickly provision Linux virtual machines using KVM, or Linux containers using LXC. It can be clustered across multiple servers in an environment, has a flexible storage model, and a web-based management interface similar to oVirt and VMWare ESXi. As powerful and versatile as Proxmox is, it's actually very user friendly and easy to install, which makes it a great way to learn Linux virtualization and containerization.
- Proxmox VE sits alongside oVirt and ESXi in a sort of “middle tier” of virtualization solutions, above workstation/desktop hypervisors like VirtualBox or virt-manager, but below enterprise level solutions like OpenStack, vSphere, public cloud, etc.

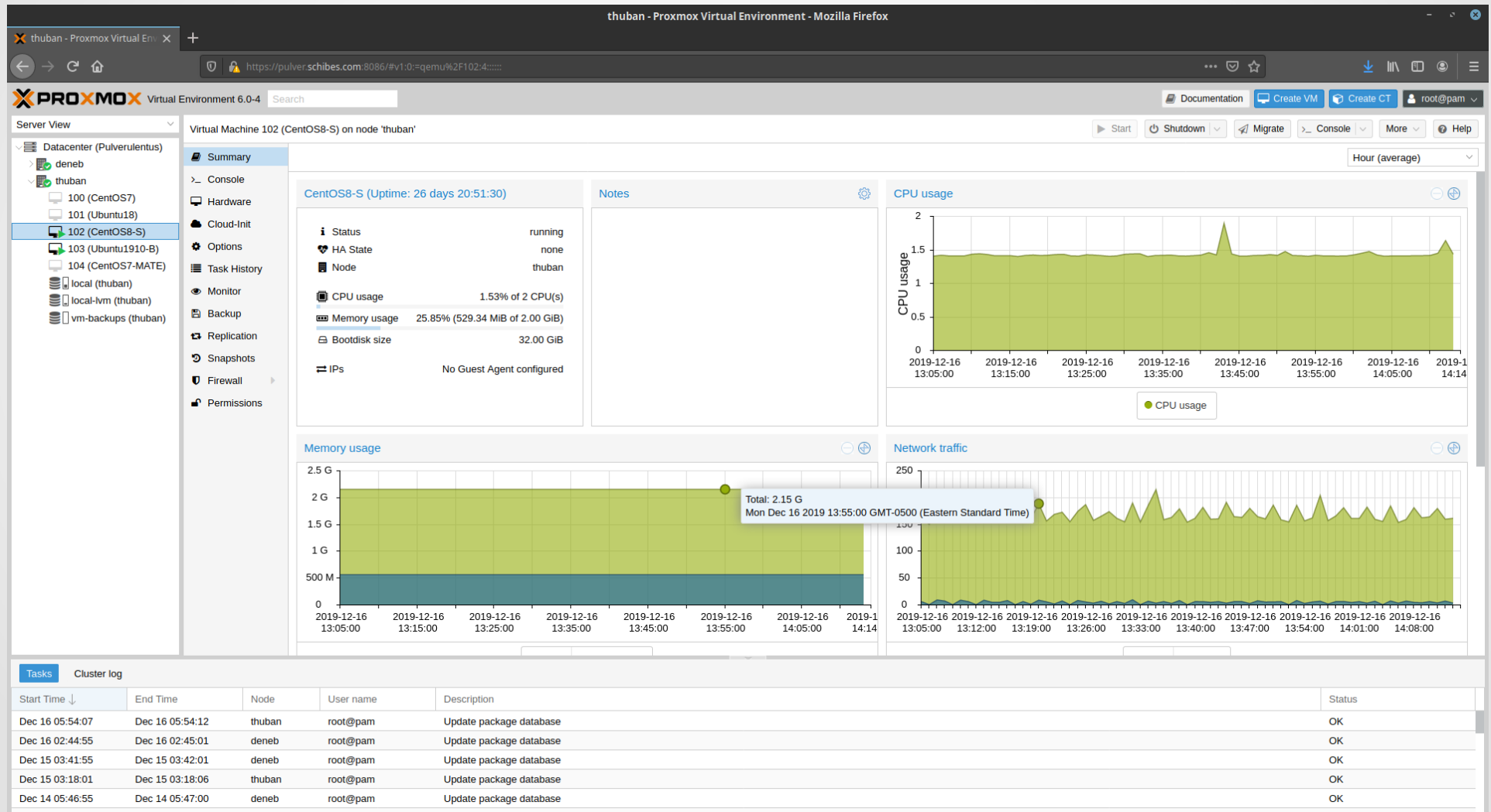
## Why Proxmox at PLUG?

- Proxmox has links (both direct and indirect) to several other presentations given by others in PLUG over the last year:
- John Karr's 2019 talks on KVM (Central in April, North in June)
  - Proxmox uses the KVM hypervisor and makes it easier than ever to set up
- Keith Perry's 2019 talks on Apache Guacamole (Central in August, North in September) – while Proxmox actually uses NoVNC as its default web console, this provides the same ease of web-based console management that Guacamole does
- Joshua Charles' February 2020 talk at PLUG Central on "Homelab"

## Proxmox use cases

- make lots of VMs
- make lots of containers
- "pushbutton hyperconverged storage" (if you're really into that)
- reuse old hardware
- build a "home lab" or even a "home cloud"
- build small to medium sized IT infrastructure on a shoestring budget

# Proxmox web GUI (demo to follow)



# Proxmox (the company, the product) – Part I

- Proxmox GmbH is based in Austria and first released Proxmox VE in 2008
- The name doesn't mean anything, they just liked how it sounds
- The platform was originally based on OpenVZ but switched to KVM and LXC fairly early on.
- It's mostly written in Perl (with some JS for the front end)
- Proxmox VE is open source and GPL licensed (the AGPL, specifically)
- Although it's officially based off Debian (and hits primarily Buster stable repos in apt) its kernel is currently a new(ish) Ubuntu kernel from the 5.x line that includes "more features" (their words, not mine) for containerization and hypervisors

## Proxmox (the company, the product) – Part II

- Besides Proxmox VE, Proxmox (the company) has one other product, an email gateway/proxy, which is available as a container to install inside PVE.
- The company's business model is paid support subscriptions and early/priority access to their repos for updates (updates show up on a separate repo for non-subscribers a couple days later)
  - Non-subscribers need to add in this repo manually in `/etc/apt/sources.list.d`
- There is a once-per-login "nagware" popup in the web management interface asking you to become a subscriber
  - If this annoys you there is a simple Bash one-liner that removes this:
    - `sed -i.bak "s/data.status != 'Active'/false/g" /usr/share/javascript/proxmox-widget-toolkit/proxmoxlib.js && systemctl restart pveproxy.service`



# Proxmox Installation

- Proxmox is meant to run as a "headless" server
- It has a graphical installer with relatively few options to tweak, and once it's done that's it, you have a plaintext console and most management is meant to run thru its web GUI
- This is a server distro, there is no desktop environment (GNOME/KDE/XFCE/etc) to speak of, although you are free to install desktops on your VMs (and in fact they run quite nicely)

# Creating VMs in Proxmox

- Log in to the web management interface and upload the ISO image(s) from your client PC's hard drive
- Or for faster results, just scp/wget the ISOs directly into the `/var/lib/vz/template/iso` folder
- VM creation is an 8 step wizard almost identical to what you see in virt-manager (standalone Linux desktop GUI for KVM) and analogous to virsh (command line).
- In each step you define another virtual resource for the VM to utilize (CPU, RAM, storage, network, etc.)

# Creating Linux containers in Proxmox

- LXC containerization is tightly integrated into PVE and seems to be the major focus of current development efforts in the distro
- LXC is Linux-ONLY. It comes from an “older” container paradigm like BSD jails or Solaris zones rather than the newer, ephemeral breed of container popularized by Docker and Kubernetes.
  - (Although, FWIW which is not much these days, Docker is in fact a distant descendant of LXC)
- Use the “pveam” command to browse and add container templates into your Proxmox cluster. 8 major distros are available (Debian, Ubuntu, Fedora, CentOS, Arch, Gentoo, OpenSUSE, Alpine) alongside the Proxmox mail gateway and dozens of “Turnkey Linux” Debian re-rolls
  - **pveam update**
  - **pveam available**
  - **pveam download** <storage> <template>

# Proxmox clustering for management

- PVE uses “corosync” for multi-master clustering, which allows admins to manage multiple Proxmox servers from inside a single (identical) web interface common to all cluster nodes
- Clustering is also required for distributed storage in Proxmox (more on this in a couple slides)
- Proxmox recommends dedicated NICs for cluster traffic (as a “home lab” user I’m getting by OK without one for now)
- While clustering is one of the most powerful and useful features in Proxmox, documented max cluster size (~36 nodes according to recent forum chatter) show the scalability limits of the platform

# Proxmox Security

- If you are going to have multiple users in your environment, Proxmox VE offers a familiar (to sysadmins, anyway) role based authentication (RBAC) scheme where you can lock down access to specific VMs or hypervisors throughout the environment along with types of user actions (create VM, delete VM, and so on).
- Besides traditional Unix and PAM logins, Proxmox VE also offers support for LDAP authentication and multifactor (such as one-time passwords, YubiKeys, etc).

# Proxmox Networking

- ...One of the "pain points" I (and other PLUG presenters) often run into when installing KVM on stock Linux distros is networking (particularly Ubuntu 18.04/Netplan)
- However Proxmox defaults to a "sane default" bridged network configuration intended to "just work" (with RJ45 copper) out of the box, usually without the need for additional setup
- You can of course customize to your heart's content (particularly with virtual network devices such as OVS) but in the default bridging setup, all new hosts automatically appear as separate machines on your LAN and are not hidden behind NAT as is the common default in desktop-level virtualization.
- Wireless bridging of VMs over Proxmox is theoretically possible with additional setup (documented solutions use hostapd) but for quickest, easiest setup it's best to use physical (copper/fiber) network connections.

# Proxmox Storage

- The default storage model for Proxmox is LVM which makes it easy to add additional local volumes to a virtualization host for more (and larger) VM images
- However there is ample support for more advanced storage options (ZFS, NFS, Ceph, Gluster).
  - PVE nodes in my home lab quickly outgrew their local storage and I began adding NFS shares backed by FreeNAS/ZFS. Initial setup was a bit tricky but since then performance and reliability has been solid. I have also had good results with the ZFS features inside PVE itself
- The support for storage is so extensive in Proxmox that many users do nothing with Proxmox BUT storage - as their projects/organizations scale they will move their containers and VMs into the cloud, and use Proxmox solely to manage NFS shares and/or Ceph clusters.

## Install Screenshots / Live Demo

- Proxmox VE takes around 5 minutes to install on bare metal and has a total of 9 screens (screenshot slideshow to follow)
- We'll conclude with a live demo where I create a new LXC container or VM (if there's time)



Proxmox VE 6.0 (iso release 1) - <http://www.proxmox.com/>



# Welcome to Proxmox Virtual Environment

- Install Proxmox VE
- Install Proxmox VE (Debug mode)
- Rescue Boot
- Test memory





## Proxmox VE Installer

### END USER LICENSE AGREEMENT (EULA)

#### END USER LICENSE AGREEMENT (EULA) FOR PROXMOX VIRTUAL ENVIRONMENT (PROXMOX VE)

By using Proxmox VE software you agree that you accept this EULA, and that you have read and understand the terms and conditions. This also applies for individuals acting on behalf of entities. This EULA does not provide any rights to Support Subscriptions Services as software maintenance, updates and support. Please review the Support Subscriptions Agreements for these terms and conditions. The EULA applies to any version of Proxmox VE and any related update, source code and structure (the Programs), regardless of the the delivery mechanism.

1. License. Proxmox Server Solutions GmbH (Proxmox) grants to you a perpetual, worldwide license to the Programs pursuant to the GNU Affero General Public License V3. The license agreement for each component is located in the software component's source code and permits you to run, copy, modify, and redistribute the software component (certain obligations in some cases), both in source code and binary code forms, with the exception of certain binary only firmware components and the Proxmox images (e.g. Proxmox logo). The license rights for the binary only firmware components are located within the components. This EULA pertains solely to the Programs and does not limit your rights under, or grant you rights that supersede, the license terms of any particular component.

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3. Limitation of Liability. To the maximum extent permitted under applicable law, under no

Abort

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I agree





# Proxmox VE Installer

## Proxmox Virtualization Environment (PVE)

**The Proxmox Installer** automatically partitions your hard disk. It installs all required packages and finally makes the system bootable from hard disk. All existing partitions and data will be lost.

Press the Next button to continue installation.

- **Please verify the installation target**  
The displayed hard disk is used for installation.  
Warning: All existing partitions and data will be lost.
- **Automatic hardware detection**  
The installer automatically configures your hardware.
- **Graphical user interface**  
Final configuration will be done on the graphical user interface via a web browser.

Target Harddisk: /dev/sda (111GB, SATA SSD) ▼

Options

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A screenshot of the 'Hard disk options' dialog box. It features a title bar with standard window controls. The 'Filesystem' is set to 'ext4' in a dropdown menu. Below this, 'hdspace' is set to '111.0' with minus and plus buttons for adjustment. There are input fields for 'swapspace', 'maxroot', 'minfree', and 'maxvz', all of which are currently empty. An 'OK' button with a mouse cursor icon is located at the bottom right.





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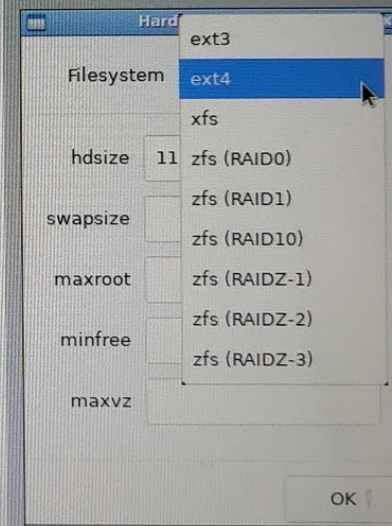
Target Harddisk: /dev/sda (111GB, SATA SSD) ▼

Options

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## 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 United States

Time zone America/New\_York

Keyboard Layout U.S. English

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

spamgoeshere@dev.null|

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: eno1 - 18:03:73:49:3f:41 (e1000e) ▼

Hostname (FQDN): justabox.dev.null

IP Address: 172.18.13.224

Netmask: 255.255.255.0

Gateway: 172.18.13.1

DNS Server: 172.18.13.1

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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:	ext4
Disk(s):	/dev/sda
Country:	United States
Timezone:	America/New_York
Keymap:	en-us
E-Mail:	spamgoeshere@dev.null
Management Interface:	eno1
Hostname:	justabox
IP:	172.18.13.224
Netmask:	255.255.255.0
Gateway:	172.18.13.1
DNS:	172.18.13.1

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## Proxmox VE Installer

### Virtualize your IT Infrastructure

Proxmox VE is ready for enterprise deployments.

The role based permission management combined with the integration of multiple external authentication sources is the base for a secure and stable environment.

Visit [www.proxmox.com](http://www.proxmox.com) for more information about commercial support subscriptions.

- **Commitment to Free Software**  
The source code is released under the GNU Affero General Public License.
- **RESTful web API**  
Resource-oriented architecture (ROA) and declarative API definition using JSON Schema enable easy integration for third party management tools.
- **Virtual Appliances**  
Pre-installed applications - up and running within a few seconds.

configuring fontconfig-config  
85%

Abort

Install



## Proxmox VE Installer

### Installation successful!

The Proxmox Virtual Environment is now installed and ready to use.

- **Next steps**

Reboot and point your web browser to the selected IP address.

Also visit [www.proxmox.com](http://www.proxmox.com) for more information.

Abort

Reboot