virtualizationhowto.com

Blueprint

2026

Purpose: A modern home lab reference guide distilled from years of real-world experimentation — covering hardware selection, virtualization, networking, containers, automation, and AI workloads.

Philosophy: Build around open-source fundamentals. Favor power efficiency over raw scale. Design the network before deploying workloads. Everything in Git. Automate aggressively. Back up from day one.

// INFRASTRUCTURE_FOUNDATION

01 / HARDWARE

Efficient Mini PCs over Big Iron

Modern mini PCs deliver enterprise-class virtualization performance at a fraction of the power draw and cost of rack servers.

- **RAM:** 64–128 GB DDR5 per node
- **Storage:** Dual NVMe M.2 drives
- **Network:** 2.5 GbE minimum, 10 GbE preferred
- **Form factor:** 10-inch mini rack for organization
- **Target:** 2–3 nodes as a starting cluster
- **Example:** Minisforum MS-01 (5-node cluster)

// FURTHER READING

- ↗ Why Mini PC Clusters Are Taking Over Home Labs
- ↗ Minisforum MS-01 Review: Best Home Server Mini PC
- ↗ Best Mini PCs for Home Labs in 2025 (Ranked)
- ↗ Inside My Mini Rack Proxmox & Kubernetes Home Lab 2026

02 / HYPERVISOR

Proxmox VE as the Core Platform

Open-source, no licensing costs, no Broadcom surprises. Proxmox scales from a single beginner node to full HA clusters.

- **VMs & LXC** containers in one interface
- **High availability** clustering built-in
- **Ceph** distributed storage integration
- **SDN** for software-defined networking
- **API-first** for automation workflows
- **GPU passthrough** for AI workloads

// FURTHER READING

- ↗ The Tools That Quietly Run My Home Lab Every Day in 2026
- ↗ 5 Proxmox Management Tools I Use in My Home Lab
- ↗ 15 Best Proxmox Tools and Scripts
- ↗ Run Proxmox Inside Docker: Learn Clustering & HA

03 / STORAGE

ZFS First, Then Add Complexity

Local NVMe + ZFS beats premature clustered storage. Master ZFS concepts before moving to Ceph or HCI.

- **ZFS boot mirror** for Proxmox itself
- **Snapshots** — instant, space-efficient

04 / NETWORK

Design Network Before Workloads

The most costly mistake: deploying services before the network is solid. Get this right first and everything else is easier.

- **Managed switch** — minimum requirement

- **Compression** — transparent, lossless
- **Replication** — built-in dataset sync
- **Data integrity** — checksums on every block
- **Next tier:** Ceph for clustered distributed storage

// FURTHER READING

- ↗ 5 Storage Projects to Supercharge Your Home Lab
- ↗ Why NVMe, ZFS, and 10GbE Are Non-Negotiable in 2025
- ↗ RAIDZ Calculator: Find ZFS Capacity and Cost
- ↗ ZFS Required for Proxmox Replication? I Was Wrong

- **VLANs** — segment traffic by purpose
- **VPN access** — secure remote entry
- **Internal DNS** — name resolution everywhere
- **Reverse proxy** — single ingress for services
- **Document** VLAN scheme before first deploy

// FURTHER READING

- ↗ Best Home Lab Networking Architecture in 2025
- ↗ Home Lab Networking 101: VLANs, Subnets & Segmentation
- ↗ 5 Home Lab VLAN Mistakes That Will Break Your Network
- ↗ Top Home Lab Networking Mistakes to Avoid

// SERVICES & WORKLOADS

05 / DNS

Technitium DNS as Critical Infrastructure

It's always DNS. Treat it like critical infrastructure, not just another app. Deploy with redundancy from day one.

- **Native clustering** — no community sync hacks
- **Recursive DNS** — no upstream dependency
- **Authoritative DNS** — own your zones
- **DNS filtering** — block at the resolver
- **API integration** — automate record management
- **Rule:** minimum 2 servers, always replicated

// FURTHER READING

- ↗ Technitium DNS Server in Docker: Best Home Server DNS?
- ↗ Stop Using Pi-Hole Sync Tools: Use Technitium Clustering
- ↗ Why I Run Multiple DNS Servers in My Home Lab
- ↗ Technitium DNS Cluster: Settings That Were the Real Problem

06 / CONTAINERS

Docker → Swarm → Kubernetes (Talos)

Not a one-size-fits-all decision. Use the right tool for the workload. Build skills progressively, not all at once.

- **Docker:** standalone dev/test services
- **Docker Compose:** multi-service stacks
- **Swarm:** production HA middle ground
- **Kubernetes:** complex orchestration at scale
- **Talos Linux:** immutable K8s OS for production
- **ArgoCD:** GitOps delivery for K8s workloads

// FURTHER READING

- ↗ I Replaced Docker with Kubernetes: What I Expected vs. Reality
- ↗ Best Kubernetes Distributions for Home Lab in 2025
- ↗ Install Talos Omni On-Prem for Kubernetes Management
- ↗ Docker Containers I Still Run Every Day in 2026

07 / VERSION CONTROL

Everything Lives in Git

If it's not in Git, it doesn't exist. Infrastructure as code is not a destination — it's the starting point.

- **Docker Compose** files and overrides
- **Kubernetes** manifests and Helm values
- **DNS zone** configurations
- **Reverse proxy** config (Traefik, Nginx)
- **Automation scripts** and playbooks
- **Mirror** self-hosted GitLab → cloud GitLab

08 / AUTOMATION

Automate Repetitive Tasks

Every hour invested in automation compounds. The time cost is real but short-lived; the consistency gains are permanent.

- **GitLab CI/CD** — pipeline-driven deployments
- **GitHub Actions** — event-triggered workflows
- **ArgoCD** — GitOps for Kubernetes
- **Targets:** cert renewals, backups, validation
- **Targets:** config deployment, notifications

// FURTHER READING

- ↗ Best Automation Projects for Proxmox in a Home Lab 2026
- ↗ Tools That Quietly Run My Home Lab Every Day in 2026
- ↗ Top 10 Automation Scripts Every Home Lab Should Have

- › **Targets:** infrastructure drift detection

// FURTHER READING

- ↗ Best Automation Projects You Can Build for Proxmox 2026
- ↗ Top 10 Automation Scripts Every Home Lab Should Have
- ↗ 9 Home Lab Services to Deploy First on a Fresh Proxmox Install

// CONTAINER LEARNING PROGRESSION

Docker → Compose → Git → Automation → Swarm → Kubernetes

// OPERATIONS & OBSERVABILITY

09 / MONITORING

Alert on What Actually Matters

Dashboards look great. Alerts fix problems. Invest in proactive notification, not passive visualization.

- › **Uptime Kuma** — service availability
- › **Pulse** — Docker container health
- › **Netdata** — real-time host metrics
- › **Alert on:** host down, backup failure
- › **Alert on:** cert expiry, storage capacity
- › **Alert on:** DNS health, internet connectivity

// FURTHER READING

- ↗ The Tools That Quietly Run My Home Lab Every Day in 2026
- ↗ 5 Proxmox Management Tools (incl. Pulse & ProxMenux)
- ↗ 9 Home Lab Services to Deploy First on Proxmox

10 / BACKUPS

Proxmox Backup Server from Day One

Backups aren't real until recovery has been tested. Storage failure is when — not if. PBS is enterprise-grade and free.

- › **PBS** — VMs and containers (free)
- › **PBS 4.x** — S3 offsite storage support
- › **Git** — all infrastructure configs
- › **GitLab mirror** — on-prem → cloud redundancy
- › **Kasten K10** — Kubernetes workload backups
- › **Rule:** every service needs a documented RTO

// FURTHER READING

- ↗ Proxmox Backup Server Settings I Wish I Knew Earlier
- ↗ Ultimate Home Lab Backup Strategy (2025 Edition)
- ↗ PegaProx: Built-In PBS Monitoring Added

// ADVANCED_WORKLOADS

11 / AI WORKLOADS

Add AI Capabilities Intentionally

The barrier to running local AI has fallen dramatically. Use the home lab to learn GPU infrastructure — not just to consume AI.

RUN LOCALLY

- › **Ollama** — local LLM runtime
- › **Open WebUI** — chat interface
- › **OpenCode** — AI coding assistant

INFRASTRUCTURE SKILLS

- › GPU passthrough in Proxmox VMs
- › GPU passthrough in LXC containers
- › VRAM sizing for model selection

WHY IT MATTERS

- › Learn GPU infra without cloud cost
- › Experiment with inference stacks
- › AI will manage lab services soon

- › Self-hosted model serving
- › External GPU dock integration
- › Privacy — data stays on-prem

// FURTHER READING

- ↗ Local AI Coding Agent with OpenCode & Ollama
- ↗ eGPU on Proxmox Mini PC via OCuLink
- ↗ 10 Open-Source AI Models to Try in Your Home Lab
- ↗ Best Budget GPU for AI in Your Home Server 2025
- ↗ 5 Best LLM Models on Low-Power Hardware via Docker

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Blueprint reflects a production home lab running Proxmox VE, Talos K8s, Docker Swarm, Ceph, and Veeam B&R across Minisforum MS-01 nodes.