Proxmox VE – Advanced Management and High Availability

Kód kurzu: PVEP

The Advanced Proxmox VE Administration Course is designed for administrators who already have experience with basic environment management and want to advance their skills to a higher level. The course focuses on advanced topics such as building multi-node clusters, deploying distributed Ceph storage, implementing High Availability (HA), data replication, automation, and backup using Proxmox Backup Server.Each topic is supported by practical hands-on exercises, where participants will configure real-world scenarios including failure simulation, recovery, and performance tuning. The course will help participants effectively design and manage a robust virtualization infrastructure suitable for production environments.

Pre koho je kurz určený
- System administrators and IT specialists who already have experience with basic Proxmox VE management
- Architects and DevOps engineers planning to deploy a cluster or transition to an HCI environment
- Administrators responsible for high availability operations, backup, disaster recovery, or virtualization management automation

Čo Vás naučíme
- Understand the architecture of a Proxmox cluster and the operation of its key components (pmxcfs, Corosync)
- Deploy and manage a Ceph cluster to achieve robust and scalable storage
- Properly configure High Availability (HA) and prepare for failures and disaster recovery scenarios
- Automate tasks using the REST API or command-line interface
- Gain insight into asynchronous replication, including the benefits and challenges of different strategies
- Learn to work with Proxmox Backup Server, including encryption, deduplication, and recovery

A ako prebieha školenie?
- In-person in Prague or Brno
- Or online, with direct access to a lab environment
- Hands-on practice – each participant works in their own environment
- The instructor guides you step by step and answers all your questions

Osnova kurzu

Proxmox VE Cluster – Architecture and Components of a Proxmox VE cluster
- Detailed network, storage, and hardware requirements for cluster operation
- Common cluster topologies and best practices for environment design
- Importance of time synchronization and DNS within the cluster

Proxmox Cluster File System (pmxcfs) and Corosync
- Principles of pmxcfs (RAM-based distributed configuration filesystem)
- Corosync roles – quorum, membership, vote tracking
- Tuning and monitoring Corosync (latency, failures)

Cluster Networking and SDN
- Cluster network setup and redundancy (bonding, LACP)
- VLANs and their use with virtual switches
- SDN basics in Proxmox: zones, vnets, bridges

Advanced Storage Management
- Shared storage backends (NFS, iSCSI, ZFS over iSCSI, Ceph)
- Examples of storage deployment in clusters
- Storage redundancy and failover

Ceph deployment in a Proxmox environment
- Hyper-converged infrastructure (HCI) – architecture and benefits
- Ceph RBD for VM disk storage

GOPAS®

- CephFS for shared file systems between hosts
- Ceph cluster management, maintenance, and best practices

Asynchronous Disk Replication

- Setting up and scheduling replication between nodes
- Timing options and replication granularity
- Recovery scenarios and integrity checks

Advanced User Management and Authentication

- Integration with directory services
- Creating and managing user accounts across clusters
- Defining user roles and permissions

Advanced High Availability (HA)

- Detailed HA group configuration for VMs and LXC containers
- Preferred nodes, host failures, and automatic failover
- Service dependencies and anti-affinity

Failure scenarios and hands-on exercises

- Failure Simulation and Recovery
- Node, network, and storage outage simulation
- Recovery processes: manual vs. automatic interventions
- Integration with alerting and monitoring

Minimum 2-Node Setup and QDevice

- Importance of the third vote (quorum)
- Deployment and configuration of QDevice
- Split-brain scenarios and prevention

Automation – REST API and CLI

- REST API overview – authentication, endpoints, examples
- CLI tools (pvesh, qm, pct) – scripting and automation
- Introduction to automation with Ansible in a Proxmox environment

Troubleshooting Common Issues

- Diagnosing performance, network, and replication problems
- Monitoring system logs and CLI outputs
- Recommended tools and support procedures

Proxmox Backup Server

- Installation and integration with the main cluster
- Deduplication principles and backup planning
- Backup encryption, offsite replication, and recovery