



openQRM + Proxmox Solution Data Sheet

Overview

openQRM is the most intuitive and powerful solution to building your Private Cloud and managing Data Centre virtualisation based on VMware, KVM, and HyperV. Its integration with Microsoft Azure offers flexibility in creating hybrid cloud infrastructures, as well as with bare-metal providers like Puppet for the effortless deployment of computing resources.

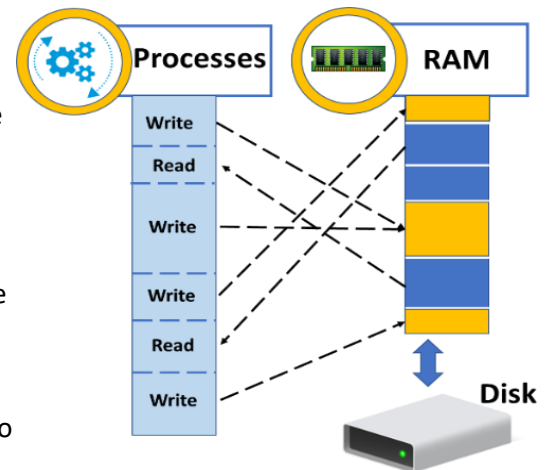
Our platform works on a modular structure; we provide a growing list of plugins for our framework allowing you to tweak the functionality and compatibility of the framework. This framework structure gives users the ultimate customizability they need to best suit their purpose.

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What is Proxmox?

Proxmox is an open-source platform, which provides a virtualised enterprise solution for easy management of storage, network, and virtual machine by tightly integrating KVM hypervisor and containers (LXC). By combining the two technologies on a single platform, Proxmox provides a sophisticated and unique design to maximum flexibility to your data centre.



The centralized user-friendly platform has increasingly become popular for easy installation, management, and monitoring of infrastructures. Ensuring multiple authentication mechanisms combined with role-based user permissions to cater to the needs of the environment. Allowing REST API integration with third-party management tools to hosting environments to have maximum flexibility and Security.

The Diskless Solution



openQRM has partnered with Proxmox to bring a diskless solution, that will enable the administrator to create a more automated and easily configurable platform. The ATU plugin manages server configuration provisioning. When a server reboots, the ATU Plugin will push the latest configuration file it detects on to the rebooted server.

This allows the operator to convert their legacy network which boots from attached or network storage to run their data centre with the ability to Disklessly boot the server and run the server with no local or network storage to operate the server. The system boots from an Image (which is read-tmp only) and the system then runs from a RAM disk which is like a hard disk, but much faster. This allows for seamless application deployment.

The platform can also boot Centos, Fedora, Ubuntu, and Debian. Debian is the preferred choice. We have created several images to allow specific application deployment including Layer 2 Aggregators, Routers, Application Server (LAMP), and Layer 3 containers.

Diskless Booting

All servers running the OpenQRM + Proxmox solution have a diskless boot

Application Images

Servers boot by utilizing application images by not installing an operating system per server

Complete Control

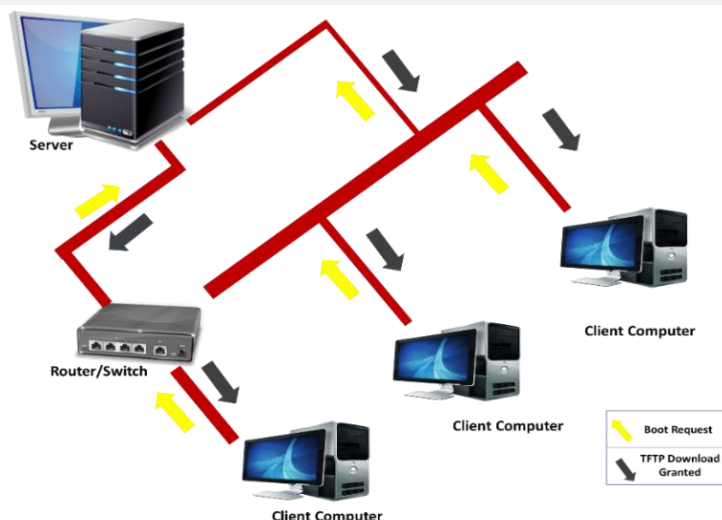
Administrators to monitor every facet of the server

Diskless Router

This is the same as a diskless application or a Virtual Machine (VM). This VM can be deployed to any physical diskless systems such as Proxmox.

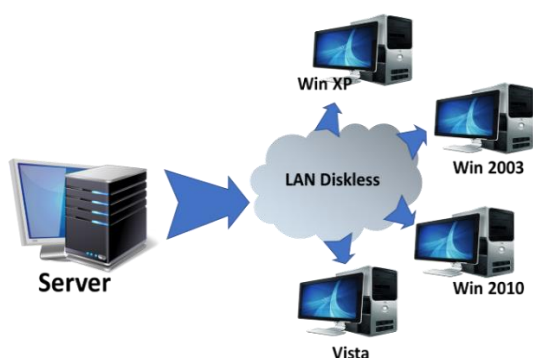
This platform allows (the router) to remotely work without using a hard disk nor a USB or any storage source. All the file access is done through the LAN.

All the servers are competent and highly configured to provide the remote file access for read/write operations of the file system.



Benefits of Disklessly

- ▶ Uses network booting to load Operating System
- ▶ Easy management of resources and infrastructure
- ▶ Significant Reduction in the overall capital investment and implementation costs.
- ▶ Reduces the overall cost of LAN
- ▶ Faster access of data from large remote files
- ▶ Easy management and minimizes complexity and risk.
- ▶ Accelerates and eases upgrades, deployments, and server configurations.
- ▶ Enhanced Disaster Recovery solutions.



Why the Diskless Boot is better than VMWare and Openstack



Reduction on overall initial roll-out and ongoing maintenance of infrastructure



Allows ease of configuration, implementation, and management of resources



Effective and efficient management of the deployment of VMs onto physical hosts



Faster scale up and down of their computing needs



Provides a framework structure for users to customize the infrastructure as per requirement



Its integration with Microsoft Azure offers flexibility in creating hybrid cloud

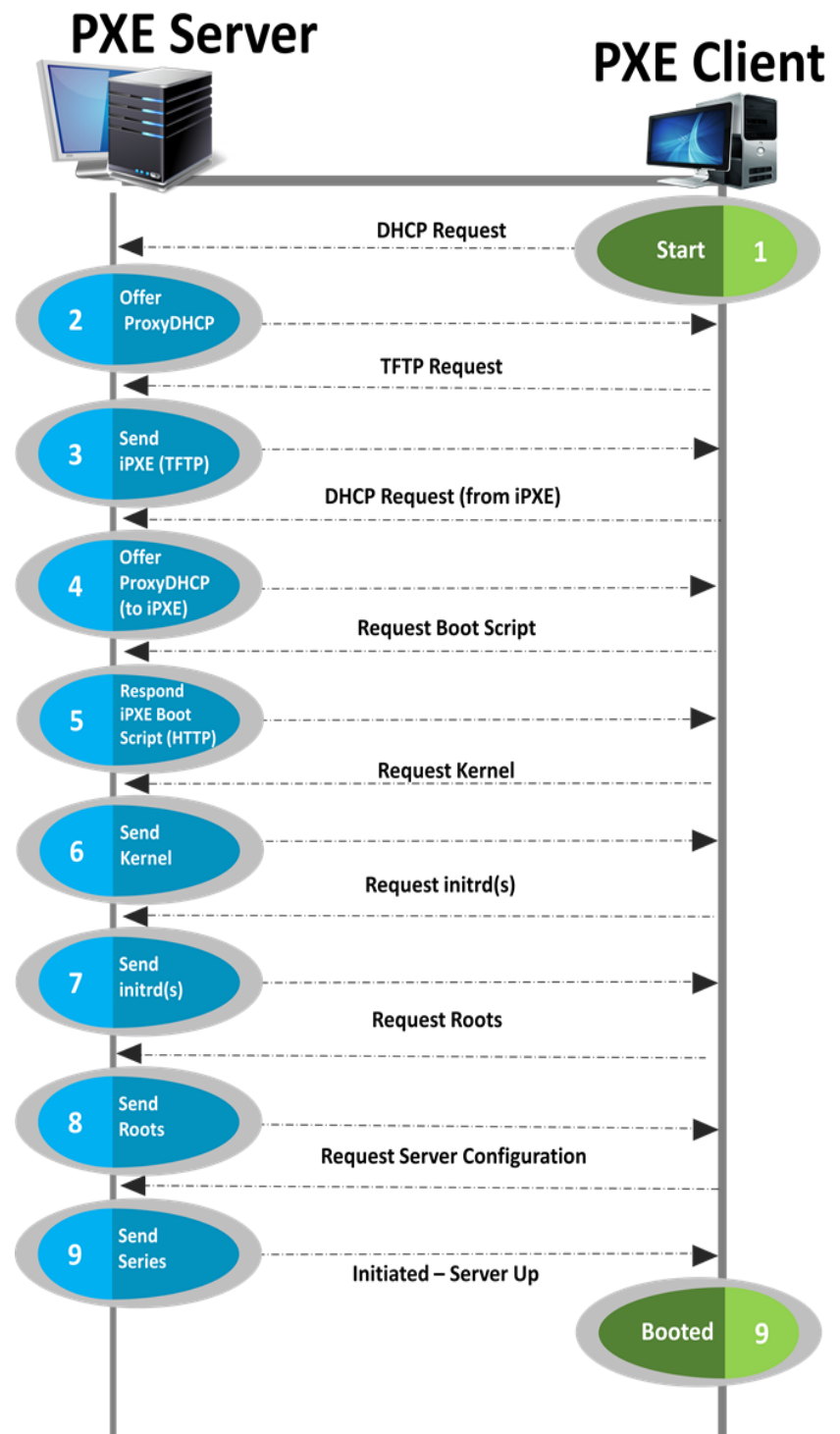
The Preboot Execution Environment (PXE) Booting Sequence

The PXE is one of the widely used standard client/server interface channels. PXE is automated provisioning of servers, where the server administrator remotely accesses, configures, and boots the client, which does not have a self-managed controlling operating system. It does this by remotely bootstrapping the machine.

A PXE code is used by the client and server to remotely communicate and configure the client's operating system and boot as needed. The communication and configuration are done in a succession process, where the client pings the server notifying the server, the server sends a reply with a list of boot servers. The client takes assistance from one of these servers to configure and boot start.

Below is the PXE Booting Sequence:

1. The Client sends a Dynamic Host Configuration Protocol (DHCP) notification through the network channel to the server.
2. The Server replies with a set of boot servers.
3. The client identifies one of the boot servers and communicates for the Trivial File Transfer Protocol (Trivial File Transfer Protocol).
4. After receiving the iPXE TFTP, the client requests DHCP to receive the file(s) for configuration and booting.
5. On receiving the Proxy DHCP (iPXE) from the client, The DHCP server responds with the IP information and the location of the TFTP server.
6. The client contacts the TFTP Server and downloads all the files it needs (kernel, root file system, and other files), and then loads them.
7. Using the configuration files, the client boots the kernel.



Network Boot Process using iPXE

The Network booting is a process of initiating the booting using Local Area Network (LAN). This is an automated process that allows a client to start up and load an operating system directly from the LAN without taking external support from a storage device such as a floppy, CDROM, USB stick, hard drive, and others. The PXE standards extend the features of the BIOS, which enables to run the operating system directly from the network

The iPXE is a highly sophisticated boot script that extends the traditional PXE booting process by loading a Network Boot Program (NBP) from an existing PXE option using ROM, or BIOS, or any local storage media, like floppy, USB, CD, or HDD via TFTP. Depending on how iPXE is configured, it can load additional boot code from several different sources in addition to TFTP.

What is a Memory-based file system?

The memory-based file system is a unique mechanism of creating a storage area directly on the computer's volatile storage unit – **Random Access Memory (RAM)**.

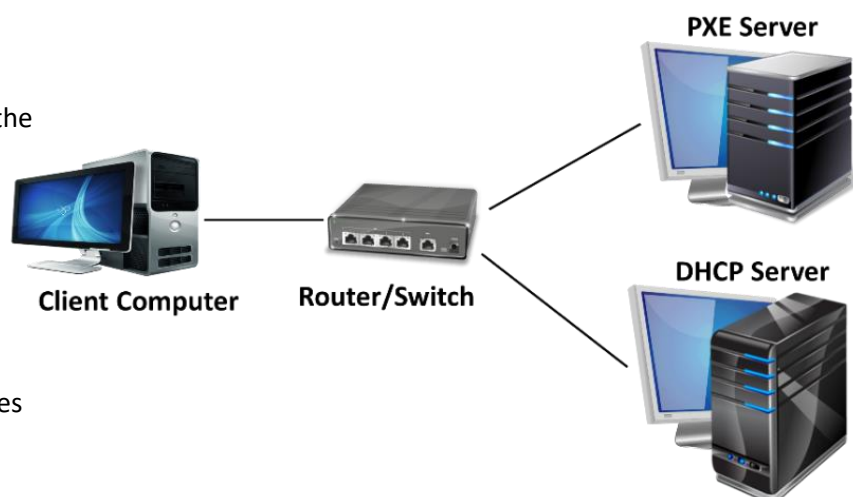
The benefit of using RAM is, it is the fastest to access, this memory-based file system works –10s times faster than modern SSDs. This massively increases the read and write operations for all types of workloads.

Because of its fast storage and operations, RAM is ideally suited for applications, which utilize minimal data for caching and/or temporary storage space.

However, RAM is a volatile memory, and the data is usually lost when the machine reboots/ shutdown/ crashes. Backups also do not guarantee that the data be replicated or preserved or can be retrieved.

The two main RAM-based file system types are tmpfs and ramfs. ramfs is the older version and has been replaced in most operations by tmpfs.

Due to multi-tasking and multi-thread operations, memory sometimes becomes drastically slow because disk reads and writes, ramfs or tmpfs file systems ease the operations allowing usage of RAM for writing files. tmpfs and ramfs provide the advantage of fast reading and writing files from and to the primary memory (RAM).



ramfs

ramfs is a mechanism of creating an in-memory file system. This allows to have the storage space and file system cache to provide the exception that it is not removed when the memory uses excessive threshold storage space set by the system.

ramfs allows to continuing using the storage space until the system drains out RAM, which sometimes crashes or becomes unresponsive.

tmpfs

tmpfs is a more advanced mechanism of using the RAM file system which overcomes many drawbacks of using ramfs.

Instead of waiting for a threshold storage space, a specific memory size limit is provided and, an error is displayed 'disk full', when the limit is reached.

Debian is a cross-platform, open-source operating system developed to focus on storage management, enterprise security updates, and capabilities for integration, security, and usability. A separate management layer facilitates managing and monitors all the virtual machines with a built-in storage replication framework. Comprehensive data availability without using shared storage and minimal data loss in the case of a failure.

openQRM + Proxmox solution for professional Cloud Computing



The openQRM Enterprise Cloud front-end interface allows us to manage the IaaS, PaaS, SaaS private & public cloud with self-service front-end and also provides an integrated billing system for billing the utilization.

Using the openQRM Enterprise Cloud Zones allows to manage multiple data centre locations. Here multiple logical zones are created for cloud management.

openQRM IaaS Cloud allows the Dev-Teams to collaborate on a secured channel and work consistently on the same codebase with others.

Key Features of Proxmox



INDUSTRY-LEADING ENTERPRISE VIRTUALISATION

- Provides support to Linux and Windows servers and all the 32 and 64 bit operation systems
- Provides support to the latest Intel and AMD server chip sets
- The Management layer has been devised to have all the capabilities to manage and monitor an open-source software defined data centre



WEB-BASED MANAGEMENT INTERFACE

- User-Friendly menu-driven and navigation
- Fast, search-driven interface, able to handle thousands of VMs.
- This is based on the JavaScript framework.
- Provides support to Secure HTML5 console and supporting SSL
- Fast and easy creation of VMs and containers.



VIRTUALISED NETWORKING

- Supports bridged networking model
- Allows TCP/IP configuration support
- Supports IPv4 and IPv6
- Support to Open vSwitch



OPEN-SOURCE SOFTWARE

- Published under the free and open-source GNU Affero General Public License, version 3
- Designed specifically for community usage
- Provides facility for Public code repository (Git)
- Facilitates a bug-tracker for issue tracking



SOFTWARE-DEFINED STORAGE

- Provides Local storage such as ZFS (encryption possible), LVM, LVMthin, ext4, and XFS.
- Shared storage such as FC, iSCSI or NFS.
- Distributed storage such as Ceph RBD or CephFS
- Unlimited number of storage definitions (clusterwide)



COMMAND LINE (CLI)

- Manage all components of your virtual environment
- CLI with intelligent tab completion



HIGHLY AVAILABLE (HA) CLUSTER

- Manage Multi-master cluster
- Manage the HA settings for KVM and LXC via GUI
- pmxcfs— database-driven file system for storing configuration files replicated in real-time on all nodes using Corosync
- Provides Resource agents for KVM and containers (LXC)



BACKUP AND RESTORE

- Provides a full backup of VMs and containers.
- Multiple schedules and backup storage
- "Backup Now" and restore via GUI
- Allows manual scheduling of backup jobs in the GUI
- Allows monitoring of all jobs from all nodes via the GUI tab "Tasks"



PROXMOX VE FIREWALL

- Provides support to IPv4 and IPv6 and high bandwidth with Stateful firewall
- Facilitates 3 levels of configuration (data centre, host, VM/CT)



ROLE-BASED ADMINISTRATION

- Interface to manage user and permission management for all objects (VMs, storage systems, nodes, etc.)
- Provides predefined roles (lists of privileges)
- Permissions to control access to objects



REST API

- Allows easy integration for third-party management tools.
- REST like API (JSON as primary data format)
- Provide full support for API tokens
- Automatic generation of the API documentation



FENCING

- The Proxmox VE HA Manager uses self-fencing
- No simultaneous data access or corruption
- Works "out-of-the-box"

openQRM Enterprise - Plug-Ins

openQRM Enterprise offers extensive out-of-the-box functionality. The following plug-ins are included in the openQRM Enterprise Edition.

DEPLOYMENT

ATU Plug-In	Provisioning for server configurations.
Linuxcoe Plug-In	Automated provisioning and lifecycle support of Linux systems.
Puppet Plug-In	Integrates Puppet for fully automated Configuration Management and Application deployment.

DOCUMENTATION

Idoit Plug-In	Automatic System Documentation (CMDB) with I-doit.
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MONITORING

Collectd - Nagios3 Plug-In	Monitor systems with Collected providing long-term statistics and graphs. Automated systems and service monitoring.
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MANAGEMENT

Device-Manager Plug-In	Managing LVM (Logical Volume Manager).
LCMC Plug-In	Integrates LCMC (Linux Cluster Management Console) to manage Service-High availability.
Novnc Plug-In	Integrates NoVNC providing a remote web-console for Virtual Machines and Physical Systems.
Sshterm Plug-In	Integrates WebShell providing a secure login to the openQRM-server and the managed resources through the Web-interface.

MISCELLANEOUS

Development Plug-In	API Documentation for your own Plugin-Development
Event-Mailer Plug-In	Configure and triggers event emails. Notification of critical event by email.
Local-Server Plug-In	Integrates existing, local-installed Servers into openQRM (Includes Remote Server).
Support Plug-In	Support by openQRM Enterprise.
Template Plug-In	A Template for Plugin-Development providing a complete Skeleton for your new Plugin.

NETWORK

Dhcpd Plug-In	Automatically manages IP-Addresses for the openQRM managed network.
Dns Plug-In	Automatically manage the DNS Service for the openQRM managed network.
Ip-Management Plug-In	Network-management for the Appliances public IP-addresses.
Network-Manager Plug-In	A Network-manager to preconfigure network-bridges.
Tftpd Plug-In	Automatically managed TFTP server providing the PXE/TFTP network-deployment environment (in combination with the dhcpd plugin).

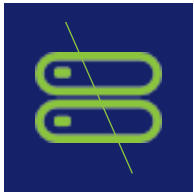
STORAGE

Aoe-Storage Plug-In	Integrates AOE (ATA over Ethernet) as Storage technology (network-deployment).
Iscsi-Storage Plug-In	Integrates iSCSI Enterprise Target as Storage technology (network-deployment).
Lvm-Storage Plug-In	Network-deployment. Integrates LVM2 with NFS/iSCSI/AOE as Storage technology.
Nfs-Storage Plug-In	Integrates NFS as Storage technology (network- deployment).
Sanboot-Storage Plug-In	Network-deployment. Integrates gPX to boot Windows Systems directly from an iSCSI or AOE SAN
Tmpfs-Storage Plug-In	Network-deployment. Deploys Physical Systems and Virtual Machines 'in-Memory'.

VIRTUALISATION

KvmVirtualisationPlug-In	Support and connector for KVM virtualization technology. Profit from the technical benefits of KVM like hardware support, memory support and a high-security level all at the lowest ongoing cost.
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openQRM Key Features



WE ARE DISKLESS

We aim to make your workflow as efficient as physically possible, that's why our data centres are diskless. This minimizes processing times for file transfers, program deployment and virtual machine testing



COUNTLESS CONFIGURATIONS

openQRM offers an ever-growing library of plugins for the openQRM framework. This gives you the ultimate customisable experience, you can change the platforms functionality and compatibility with just a few steps.

We offer a free library of plugins on the openQRM website, and we also include a handful more with your license purchase. You can get a glance out our plugin library with the included Spec sheet.



HYPERVISOR COMPATIBILITY

The openQRM platform wants to fulfil all needs for our clients. So, we are developing a framework that's compatible with all big-name Hypervisor programs; HyperV, VMWare and KVM, just to name a few



CREATE A HYBRID CLOUD

openQRM is moving towards being compatible with the most highly demanded third-party Cloud Computing services. The development team is currently working to redevelop AWS and OpenStack compatibility, and will be available in the future.



MONITOR PERFORMANCE

Make sure your network and systems are performing as intended; our Enterprise Edition includes the Nagios and Collected monitoring software. With these two programs included in the framework, you can monitor system performance, networks and even the infrastructure itself.

You can have the system alert users when a problem is detected, or something has changed, that way you can maintain the infrastructures condition to keep your workflow in tip-top shape.