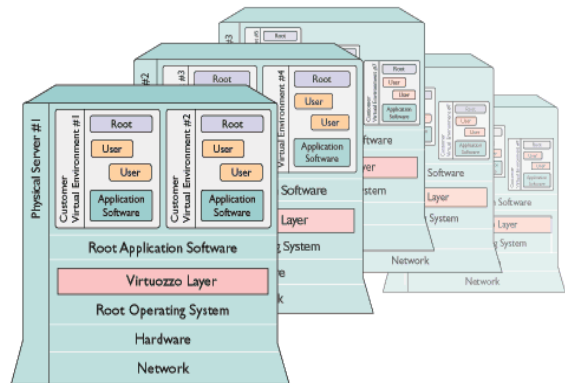




Virtuozzo is the most advanced multi-tenancy, virtualization, resource management and clustering technology on the market. Virtuozzo brings mainframe concepts that were proven in the datacenter for over 30 years to x86 commodity hardware: Dynamic partitioning, Resource Management, OS Virtualization, OS and Application Templating. Virtuozzo is used by hosting service providers as part of HSPcomplete, by enterprise IT administrators with VZMC, and by IT managers that extend the use of the technology with the documented open API.

Virtuozzo can be used to:

- Manage multiple physical servers as a single resource;
- Have multiple (100s) customers with their individual full-featured virtual private servers (Virtual Environments) sharing a single physical server;
- Provide each customer Virtual Environment with guaranteed Quality of Service;
- Transparently move customers and their environments between servers, without any manual reconfiguration.



Multi-tenancy

Multi-tenancy refers to hosting multiple OS instances on a single server. Virtuozzo technology has emerged in response to the expense and lack of scalability in the traditional "single-tenancy" model. With the multitenancy model, application run in isolated server environments replacing the need to use a physical server for every application. This enables enterprises to reduce their IT burden while simultaneously enabling IT staff to manage applications on fewer servers. Virtuozzo gives enterprise the power to achieve real economies of scale, reduce their personnel cost significantly lower their overhead.

Virtualization

Virtualization is a key concept of Virtuozzo. All user-available resources like disk, network and CPU shares are effectively virtualized inside the operating system. This approach gives an ability to achieve maximal performance, keeping users isolated from real hardware and each other. A Virtual Environment (VE), a key unit of Virtuozzo technology, supports each possible isolation level:

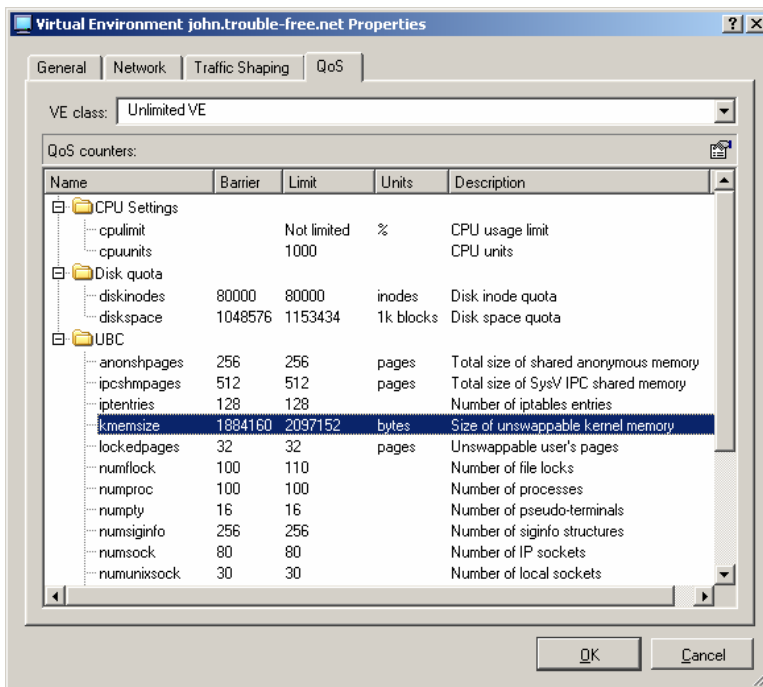
- Fault Isolation
- Performance Isolation
- Address and Security Isolation
- Functional Isolation
- Applications Heterogeneity

Virtual Environments are a set of operating systems inside an operating system – a full-featured server computer that is multiplied inside a single hardware unit. Each VE can run virtually any application, have a separate root file system and effectively share hardware resources such as memory, CPU, disk, etc. In fact, from the VE user's point of view, each VE looks like the only operating system running on the machine. All customer configurations are detached from the physical hardware – allowing easy routine processes automation without manual operations.

Virtuozzo for Hosting Service Providers

Virtuozzo offers carrier-grade levels of reliability and scalability, proven with tens of thousands of Virtual Environments (VEs) in production use. Virtuozzo is the only solution that is designed specifically for carrier-grade servers and offers:

- full isolation of VEs with minimum and maximum control of over 20 resource parameters;
- scaling a single server to over 1,000 VEs;
- transparent scaling of a single VE to 64GB memory and 16CPUs;
- automated migration of live OS, applications and data to another physical server;
- mass deployment of security updates and applications to thousands of hosted VEs.



Resource Management

Virtuozzo provides a mainframe-like level of cluster resources utilization, monitoring and control on standard, inexpensive hardware. In addition to standard CPU, disk space and network I/O, it also manages memory (user, kernel and disk cache) and disk I/O. This technology makes it possible to guarantee high but variable Quality of Service (QoS) to comply with different service-level agreement (SLA) levels across a cluster of computers.

Clustering

Although the term "clustering" has a very wide meaning in computing, the main idea of any cluster of computers is an ability to smoothly integrate the computational power of computers and their data-exchange facilities into a virtual centralized computational center.

The key features of such solutions are usually scalability and fault tolerance. Virtuozzo integrates standard, inexpensive hardware into a solid, highly scalable and layered cluster to achieve the goal of creating a fault tolerant environment with minimal expense. Different configuration options make it suitable for wide range of enterprises, and migration tools make it easy to move VEs between servers for effective resource load balancing and system management.

What is Virtual Environment (VE)?

VE behaves *exactly* like an isolated stand-alone server

- Appears to have its own processes, users, files and provides full root access
- Each can be provisioned with IP addresses, port numbers, tables, filtering and routing rules
- Each could have its own configuration files for the system and application software
- Each could have its own versions of system libraries or modify existing ones
- Each could delete, add, modify any file, including files in /root, and install its own application software or custom configure/modify root application software
- VE runs off-the-shelf software without any changes
- Multiple distributions of Linux can be run on the same box

Quality of Service to provide dedicated SLAs for each VE

- Standard: Includes CPU, disk space and network guarantees
- Unique: Guarantees on memory - user and kernel, physical and virtual
- Unique: Guarantees on disk I/O and many other critical resources (over 20)

Virtual Environment (VE) is not a Virtual Machine (VM)

- Runs only the same OS as root OS – Linux on Linux, Solaris on Solaris, etc.
- 10-100 times better efficiency, dynamic QoS changes for load-balancing and more

