

Virtualization @ SUSE®

An introduction...

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Agenda

Who is SUSE?

Introduction to Virtualization

- Types of Hypervisors
 - Xen
 - KVM
 - libvirt
- Virtualization Tools
- Resources for more information

Who is SUSE?

SUSE

- Software-und System-Entwicklung (S.u.S.E.)

- Founded in 1992
 - Based on Slackware
- Acquired by Novell in 2003
- Currently a division of Micro Focus



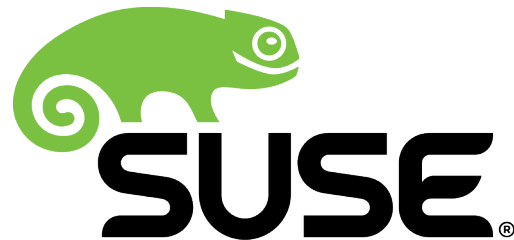
- Pronounced *suu-zah*

- <https://www.youtube.com/watch?v=Tyl8JcW6uno>



SUSE Linux Enterprise Server

- Enterprise class Linux distribution:

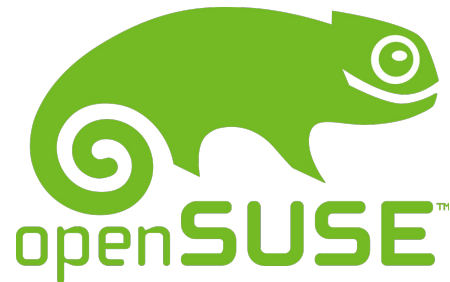


- Over 3,000 packages
 - File and Print, Database, Mail, Web, etc...
 - Virtualization host (Xen and KVM)
- Maintenance based subscription model
- More than two-thirds of the global Fortune 100 use SUSE Linux Enterprise Server



openSUSE

- Community driven Linux distribution:



- Completely free! <http://opensuse.org>
- Over 6,000 packages
- Tumbleweed
 - Bleeding edge software, rapid release cycle
- openSUSE Leap 42.1
 - Stable, SLES-based core plus community packages



The Build Service

- openSUSE Build Service

- Free, automated software build environment

- <http://build.opensuse.org>

- Upload source once, build for multiple environments:

- Distributions: SUSE, Fedora, Debian, Ubuntu...

- Architectures: i586, x86_64, Power8, s390x, IA64

- Packages → Projects → Distributions

- Core part of the development process within SUSE (and other companies)

How does it work?

Virtualization and the Build Service

- Open Build Service process

- Check-in code
 - Source and RPM spec file
- Build worker:
 - Spins up a virtual machine (Xen or KVM)
 - Development environment (specific to the package) is installed
 - Code is compiled, tested, packaged and published
- 75,000 package builds per day!



Virtualization Development @ SUSE

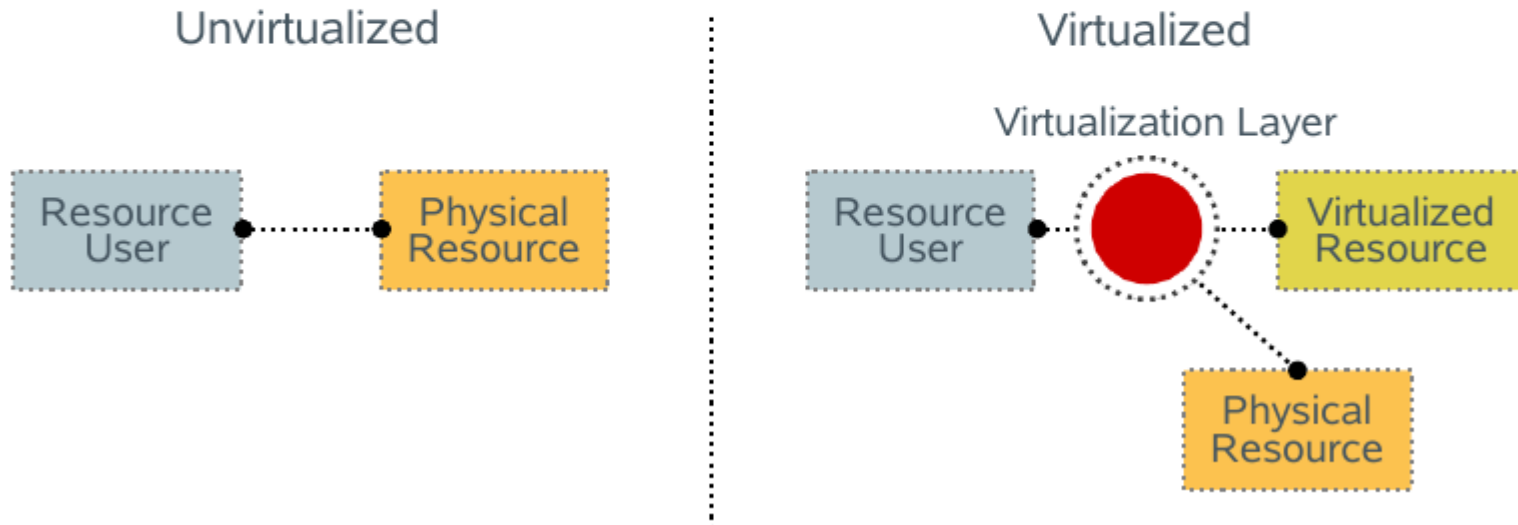
- Global team of developers
 - USA (Provo, UT), Germany, France, China, Czech Republic
- Fully open-source development process
 - Actively contribute to upstream
 - Bug fixes, enhancements, code reviews, testing, discussions, etc...
 - Ensure our components are working in SLES, SUSE OpenStack Cloud, Build Service, openSUSE, etc...
- SUSE is hiring!
 - <http://suse.com/careers>



Intro to Virtualization

What is Virtualization?

Process of replacing a direct interface tying a resource (often hardware) and its user with an indirect, software-mediated connection.



History of Virtualization

- Virtualization has been around a long time...
 - 1959: paper: “Time Sharing in Large Fast Computers”
 - 1961: MIT's CTSS: time sharing on IBM 7094
 - 1963: MIT's project Multics: time sharing, protection, multi-user
 - 1967: IBM's 360 model 67 with virtual memory
 - 1969: UNIX
 - 1972: VM/370
 - 1998: VMware founded, virtualizing x86
 - 2000: Linux on System Z
 - 2003: Xen (same year Novell acquired SUSE)
 - 2007: KVM



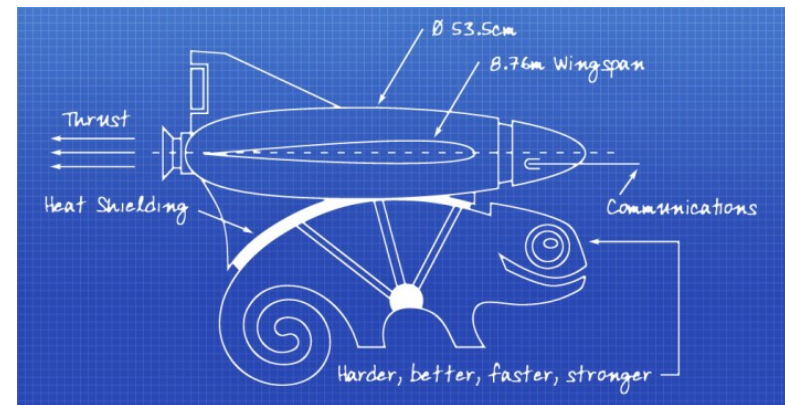
Virtualization or Emulation?

- Emulation tries to make one environment look and behave like another
 - “Compatibility mode”
 - MAME (Multiple Arcade Machine Emulator)
- Virtualization provides an additional interface into physical resources
 - Virtual port on a fibre HBA (NPIV)
 - Virtual CPU, memory, etc...

Why use Virtualization?

Typical reasons include:

- Consolidation
- Redundancy
- Mobility
- Update-ability
- Scale Up
- “Green”



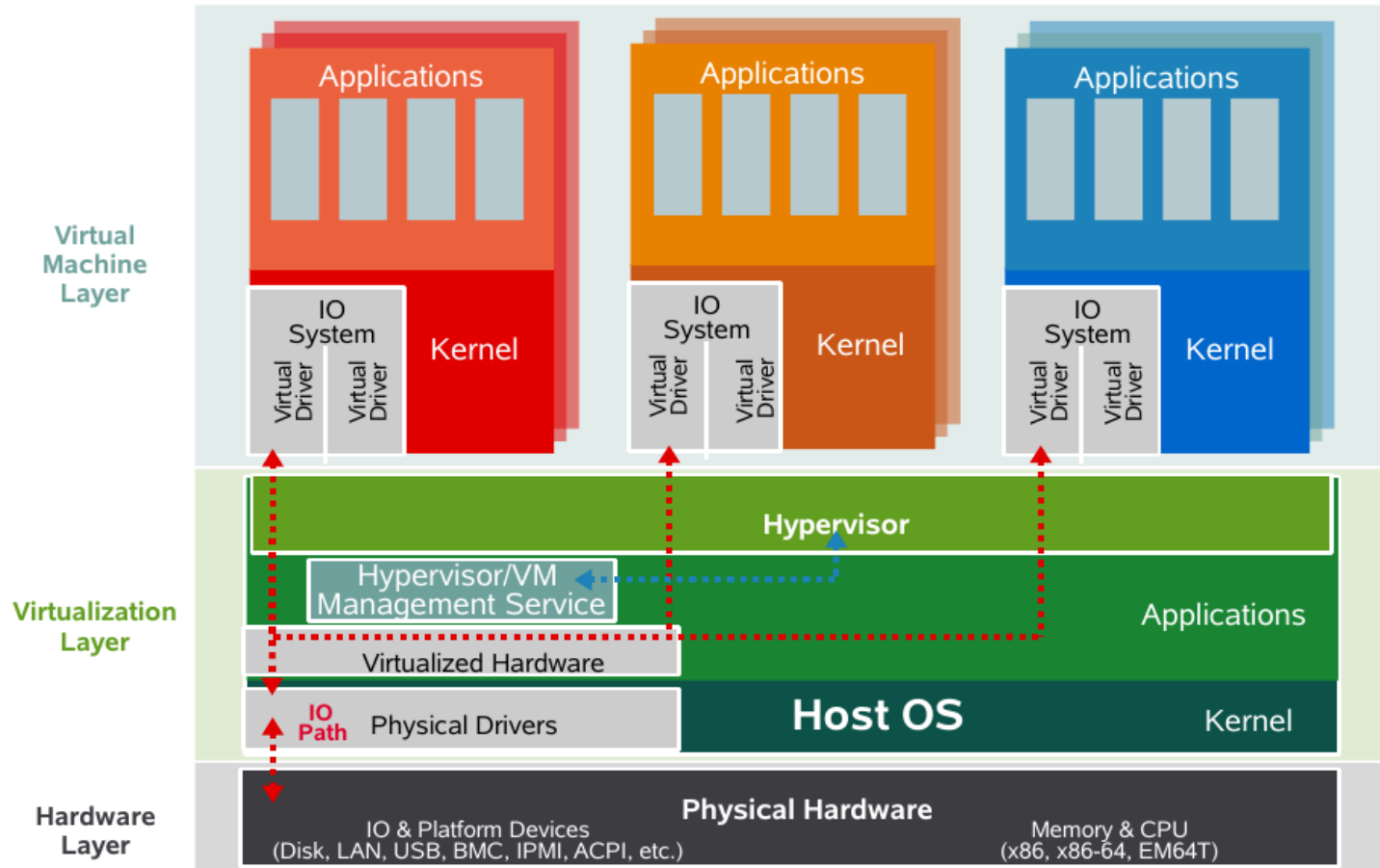
Virtualization Hypervisors

- Hypervisors manage virtual machines/domains/guests
 - Loosely grouped into two types:
 - Type 1 (Bare-metal hypervisor)
 - Xen, VMware ESXi, Microsoft Hyper-V, KVM?
 - Type 2 (Hosted hypervisor)
 - VMware Workstation, VirtualBox, KVM?
- What about Containers?
 - Shared OS environment, instead of hypervisor
 - Essentially, a chroot jail
 - LXC, libvirt-lxc, or Docker

Virtual Machine Types

- Fully virtual machine (Hardware Virtual Machine)
 - Unmodified guest, with no knowledge of the hypervisor
- Paravirtual machine
 - Guest running a modified kernel which is aware of, and modified to take advantages of virtual environment
 - Xen only
- PV HVM (paravirtual hardware virtual machine)
 - Fully virtual machine, with paravirtual drivers

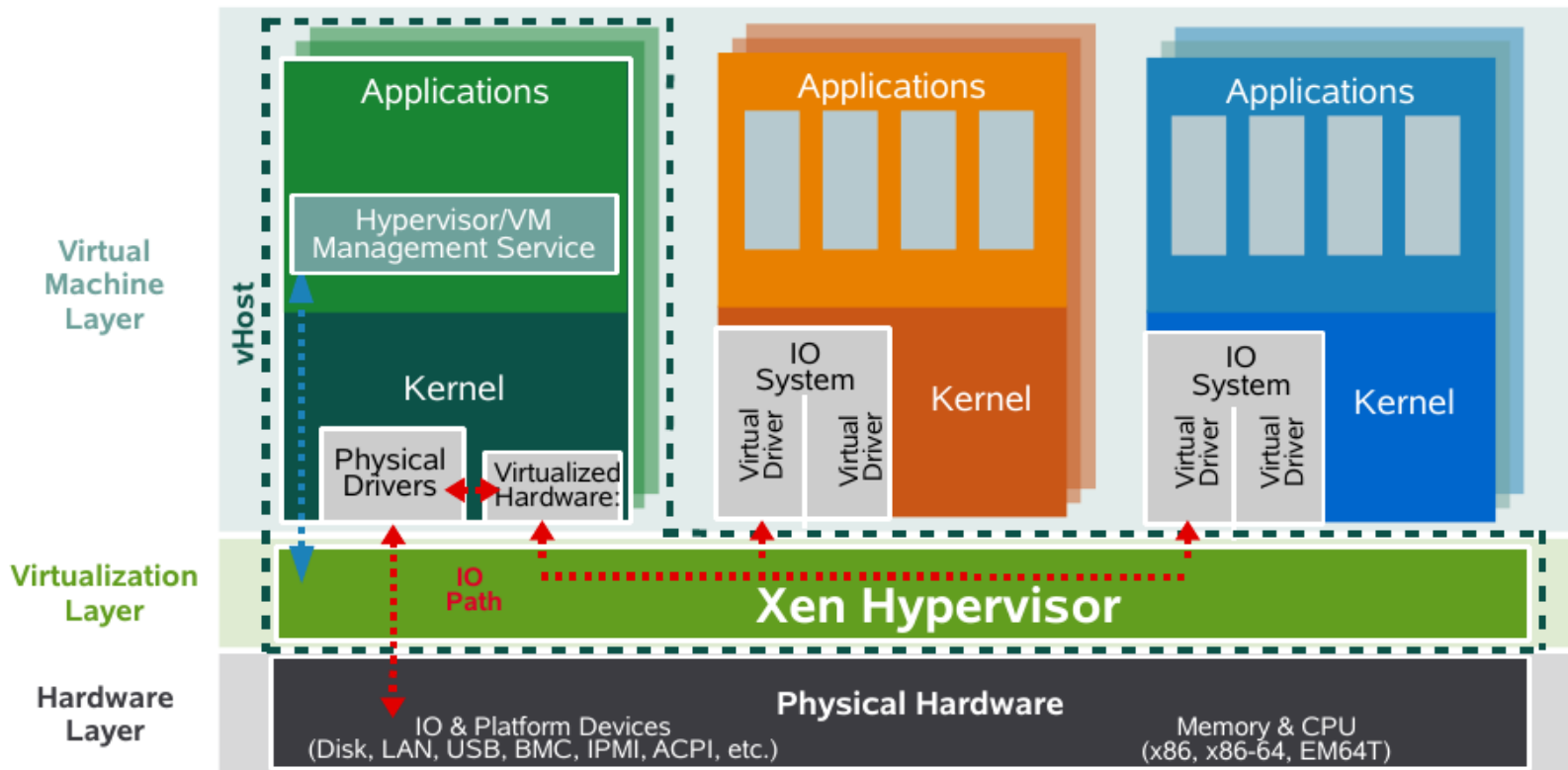
Type 2 Hypervisor Architecture



Using a Type 2 Hypervisor

- Install hypervisor software
 - VMware Workstation/Player/Fusion
 - VirtualBox
 - Virtual PC
- Start virtualization software
- Create a new virtual machine from within the application

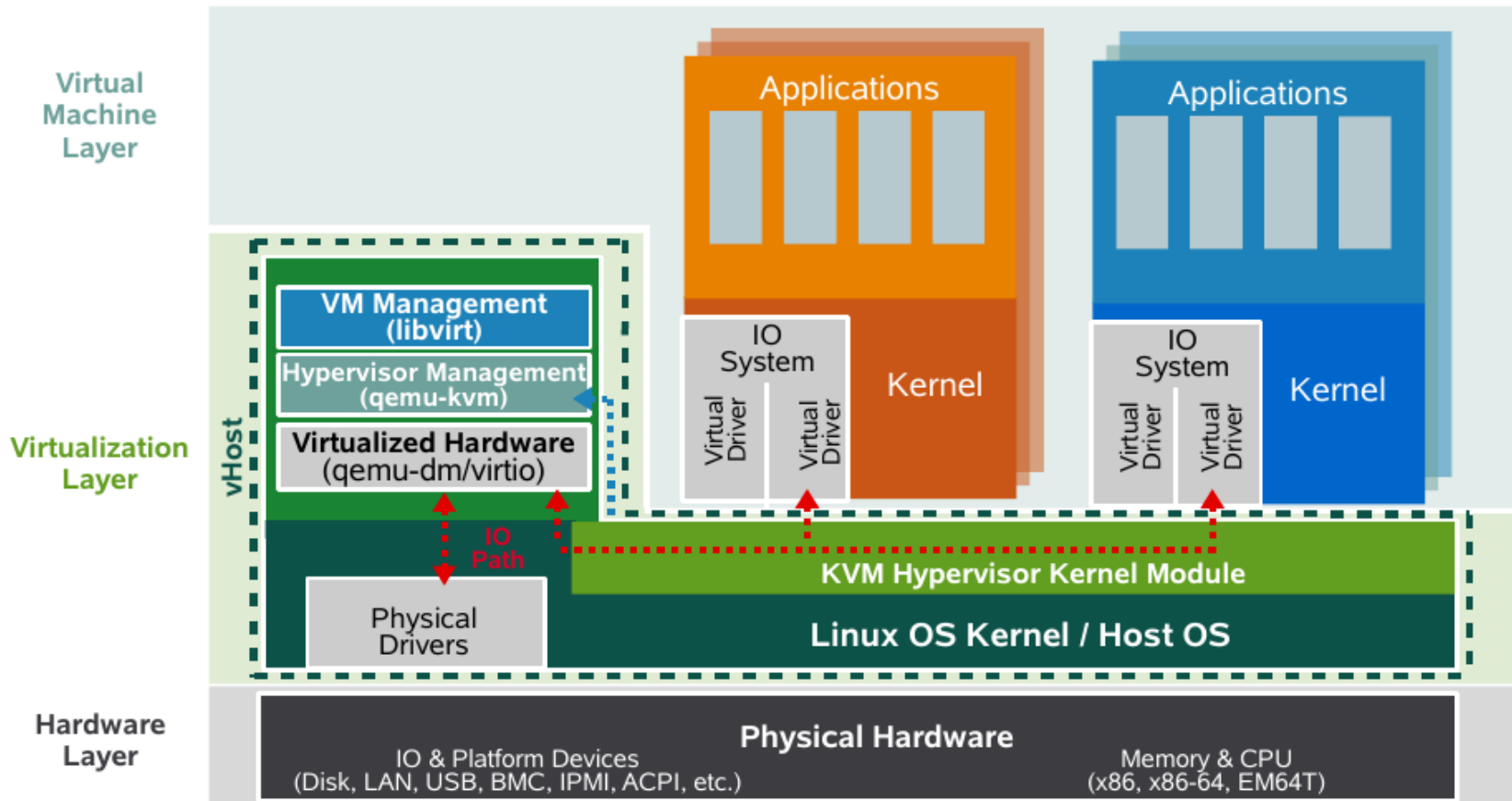
Xen (Type 1) Architecture



Using Xen on openSUSE

- Install “Xen Virtual Machine Host Server” pattern
- Reboot into Xen kernel
 - Management domain (domain0) will automatically start
- Use virtualization tools to create a new domain
 - libxenlight (libxl): Lightweight interface to Xen
 - libvirt: Toolkit to interface with Xen, and other virtualization providers

KVM (Kernel Virtual Machine) Architecture



Using KVM on openSUSE

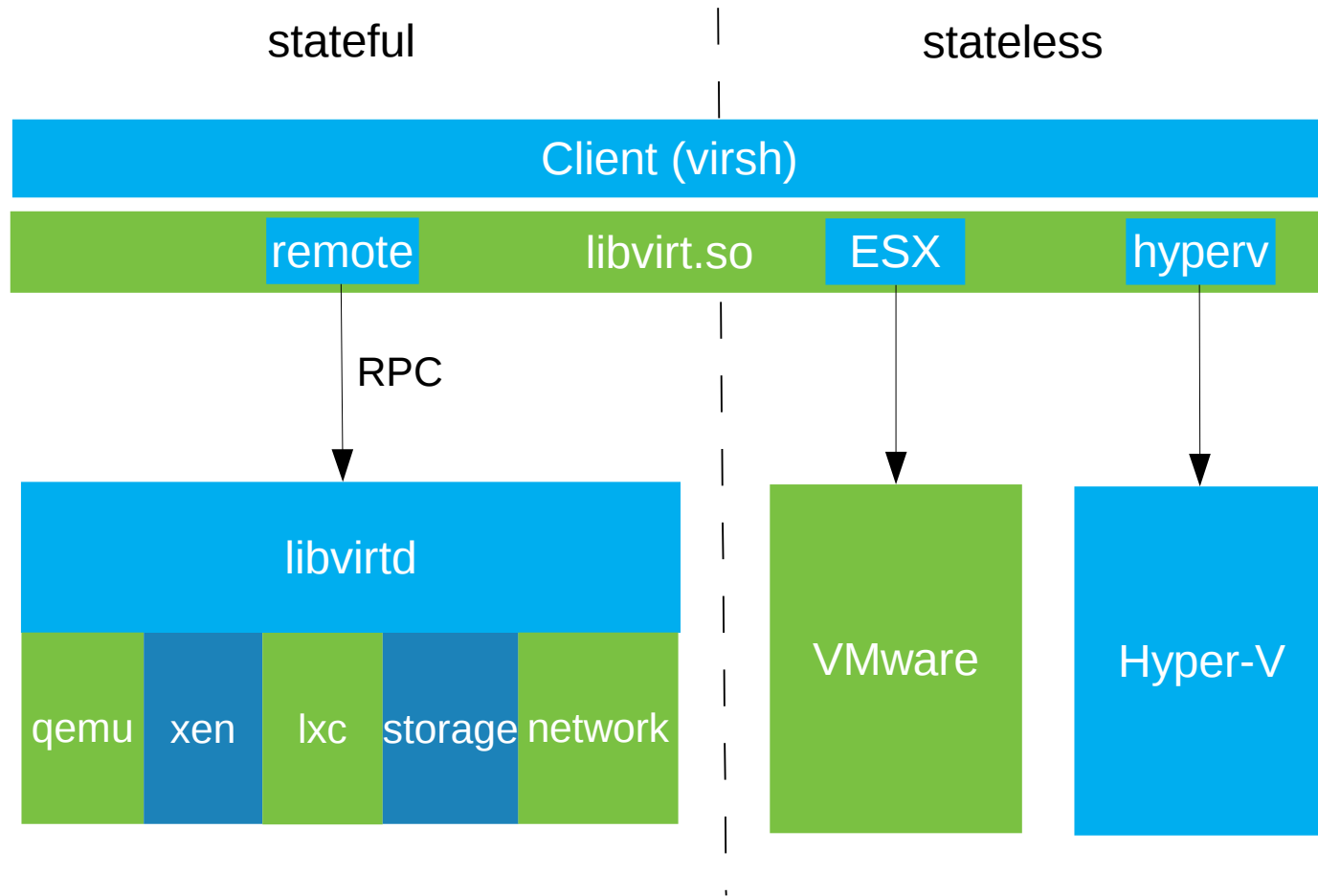
- Install “KVM Host Server” pattern
 - KVM kernel module will automatically load
 - VT or AMD-V enabled CPU is required!
- Use virtualization tools to create a new domain
 - libvirt: Toolkit to interface with Xen, and other virtualization providers
 - qemu-kvm: Direct interface to virtualization layer
 - qemu is both an emulator and a virtualizer
 - Under KVM, qemu handles hardware resources and KVM handles privileged instructions

libvirt



- Stable API for managing virtualization on a host
 - Storage, network interfaces, networks, host devices, hypervisors, and virtual machines
- XML schema for describing configuration of managed entities
- Wide hypervisor support
 - KVM/QEMU, Xen, LXC, ESX, Hyper-V, XenServer, VirtualBox, and UML available in openSUSE
- Used by a wide variety of tools and products
 - <http://libvirt.org/apps.html>

libvirt Architecture



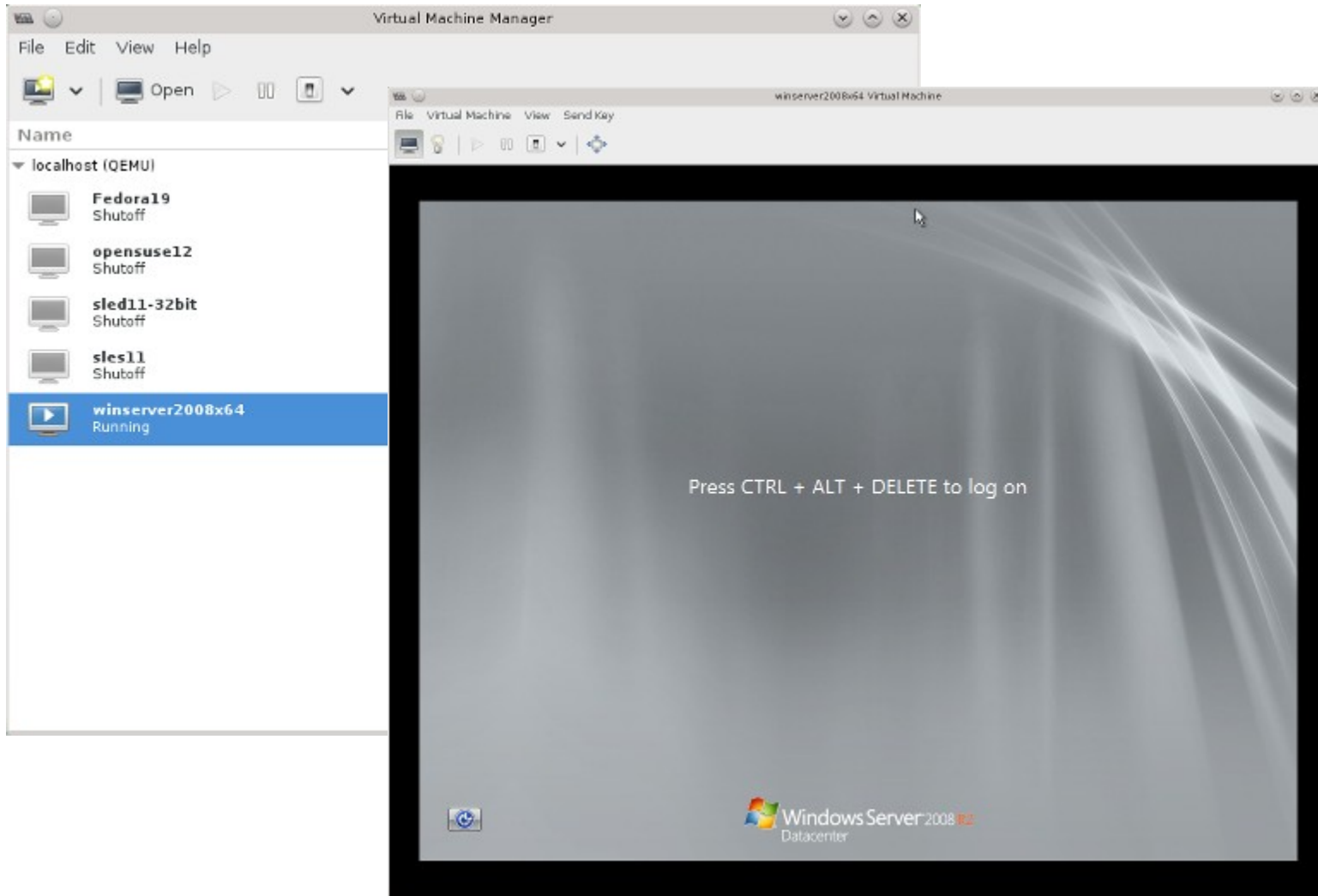
Why use libvirt?



- Benefits

- Normalized API for managing virtual machines
- Stable API and configuration format (XML)
- Insulate users from changes in underlying components
- Secure migration protocols
- Integration with other subsystems used in the virtualization ecosystem
 - For example, High Availability environments

Ok, so how do I use it? (demo)



Managing and Viewing VMs

- virt-manager
 - Desktop application for managing virtual machines through libvirt
 - Summary view of running virtual machines
 - Performance and resource utilization statistics
 - Wizards to enable creating new virtual machines and modifying existing ones
- virt-viewer:
 - Lightweight interface for interacting with graphical display of virtual machines
 - Supports Virtual Network Computing (VNC) and Simple Protocol for Independent Computing Environments (SPICE)
 - virt-viewer [--connect=URI] vm-name



Virtualization Tools

- libguestfs

- Set of tools for accessing and modifying virtual machine disk images
- Supports all types of Linux file systems
 - Ext2/3/4, XFS, btrfs, etc
- Supports Windows file system
 - VFAT and NTFS
- Supports Mac OS X and BSD file systems
- Supports many disk image formats
 - Raw, qcow2, VMDK, VHD/VHDX

libguestfs

- Includes several useful tools
 - guestfish, guestmount, virt-rescue, virt-cat, virt-copy-in, virt-copy-out, virt-df, virt-edit, virt-format, virt-inspector, virt-resize, virt-sparsify, etc
- Provides a library for use in your custom applications and includes several language bindings
 - Perl, Python, Ruby, Java, etc.
 - Note – guestfs tools work differently depending on who you are logged in as!
 - root: `qemu:///system`
 - user: `qemu:///session`

Creating your own VMs

- Perform an installation using original ISO images
 - Works for Windows or Linux
 - Other environments (OS-X, Solaris, etc.) may also work, but additional effort is likely required ;-)
- Use an existing disk image
 - SUSE Studio
 - Free way to easily create a custom Linux virtual machine
 - Download image for use in any virtual environment
 - <http://susestudio.com>

Virtualization Resources

Where to find more information

- SUSE: <http://www.suse.com>
 - Virtualization Documentation:
 - https://www.suse.com/documentation/sles-12/singlehtml/book_virt
- Xen: <http://www.xenproject.org>
- KVM: <http://www.linux-kvm.org>
- qemu: <http://wiki.qemu.org>
- libvirt: <http://libvirt.org>
- libguestfs: <http://libguestfs.org>

Q&A

Thank you.





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