redhat.

Red Hat and Xen virtualisation

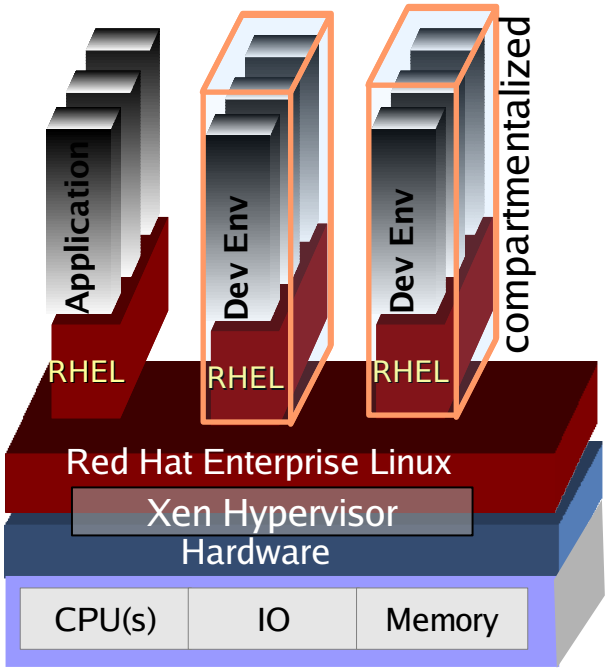
Jan Hedström
Solutions Architect, Red Hat
jan.hedstrom@redhat.com

What is Virtualization?

- Multiplex one machine into different "*Virtual Machines*" VMs; allows running different isolated guest Operating Systems with different applications on same physical hardware.
- Allows a "*Guest*" OS to run under control of a supervising master program that is called:

  "***Hypervisor***" or

  "***Virtual Machine Monitor (VMM)***".
- Hypervisor / VMM Functionality:
  - Virtualizes System Resources
  - Provides Scheduling of host/guests
  - Intra-guest communication



Benefits of virtualization

Reduced cost

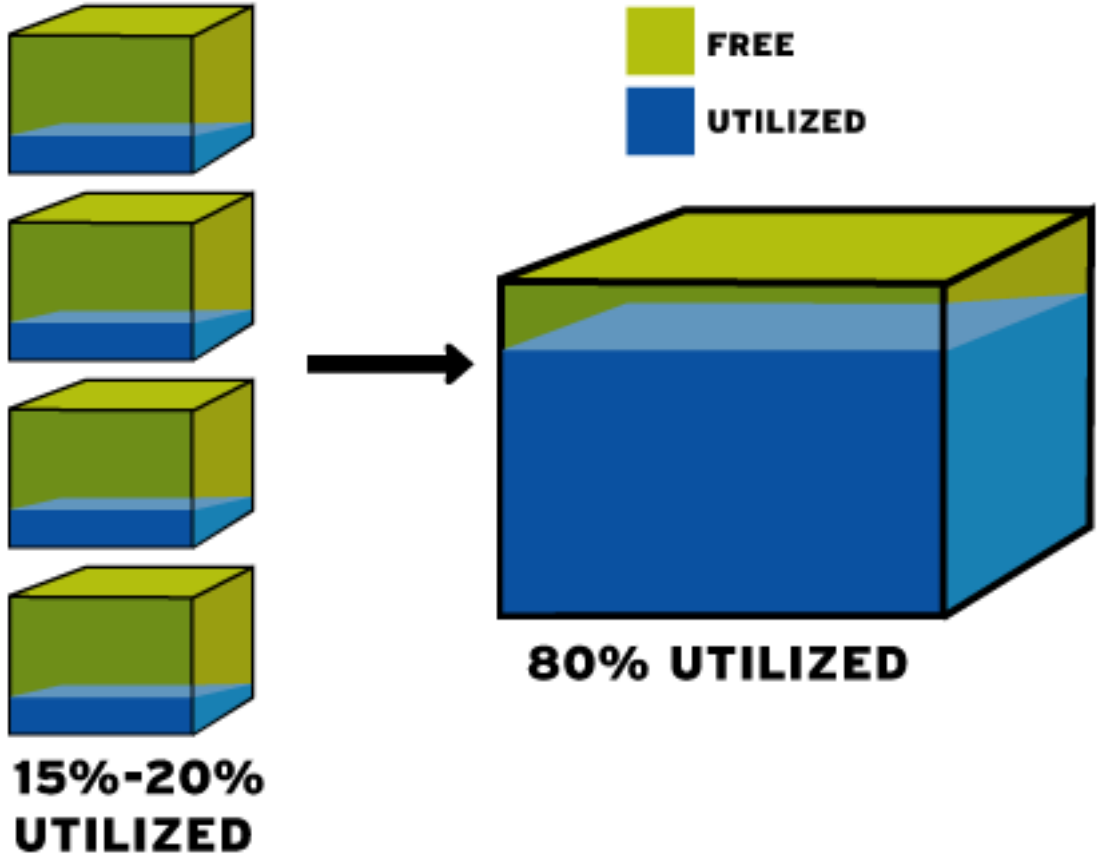
Dramatic lowering of TCO

Security

Separate operating systems on one big machine = separate root users

Agility

Deploy new “machines” in minutes, no tools needed.



redhat

New, hot technology?

- Less than 40 years old
- IBM,
- IBM,
- IBM,
- 1990's: VMware
- ...and many more

redhat

Virtualization models

Three types of virtualization

1. Full-Virtualization (FV): Transparent virtualization

- VMware
- Xen w/Hardware Support (Intel VT, AMD Pacifica)

2. Single Kernel Image (SKI)

- Light weight virtualization where a shared host operating system spawns multiple user spaces.
- Each virtual operating system must be identical.
- Solaris Zones
- SWsoft Virtuozzo

3. Para-Virtualization (PV)

- IBM VM
- Xen

redhat

Para... what?

- Full virtualisation emulates an entire platform
  - Guests are not aware of the virtualised environment
  - Normal operating systems in the guests

- Paravirtualization avoids most of the overhead of full virtualization
- Runs a slightly modified guest OS kernel
  - Uses hypervisor services, to avoid hardware simulation
    - In Xen, services running in domain 0
    - Time, device access, memory management
  - User programs are unmodified from what runs on native Linux.
  - Calls no unvirtualizable instructions, so no rewriting or emulation is required.
- Xen can do full virtualization, with hardware support such as Intel VT

redhat

Server virtualisation with Xen

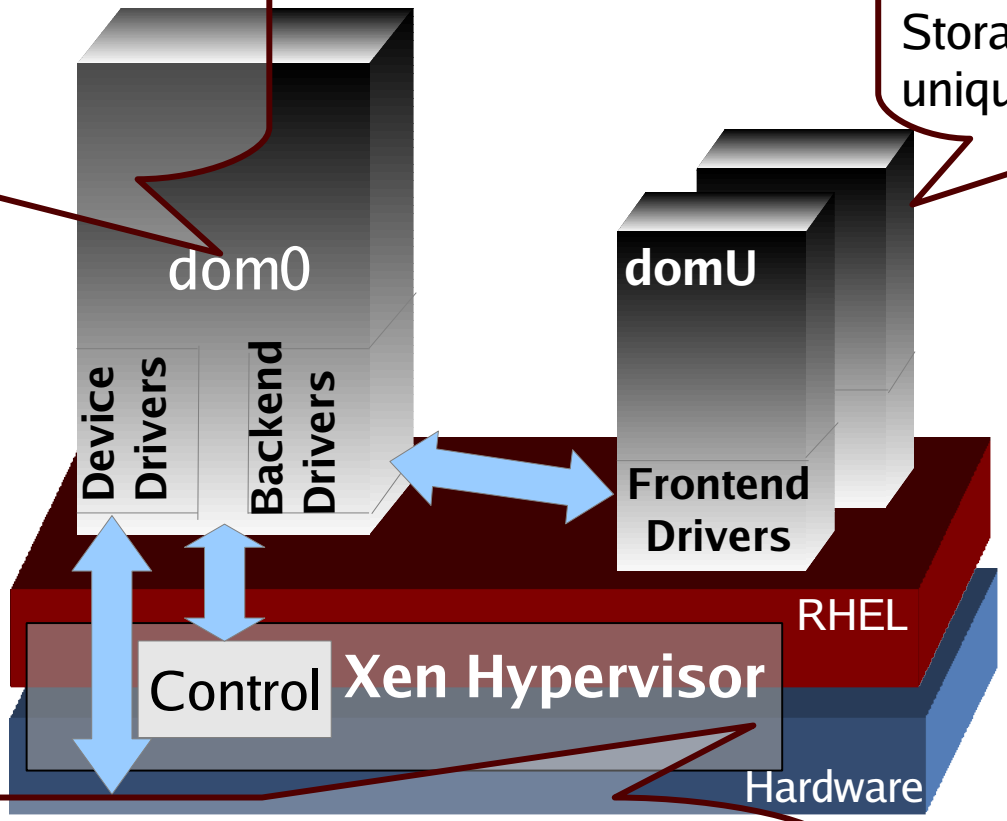
What is Xen, and how does it compare to other virtualization software?

- Hypervisor platform for x86, x86-64, IA64 and PPC64
- Very low overhead
- Open Source (GPL)
- Originally developed by the University of Cambridge
- Full virtualization on
  - x86 and x86-64 with VT or Pacifica hardware assisted virtualization
  - PPC64 with HV enabled
- Paravirtualized on x86, x86-64 and IA64

Xen Architecture

Domain 0 – Privileged Domain, the host. Provides hardware support (backend drivers) interfaces for guests control and management tools

Unprivileged Domain: The guest or the Virtual Machine. CPU, Memory, Storage appears to be unique to the guest.



Xen Hypervisor provides IRQ routing, Scheduling, memory management, and inter-domains communications. The Hypervisor with the Dom0 Device Drivers provide transparent sharing of resources. It also enforces strict resource limitations (example: RAM).

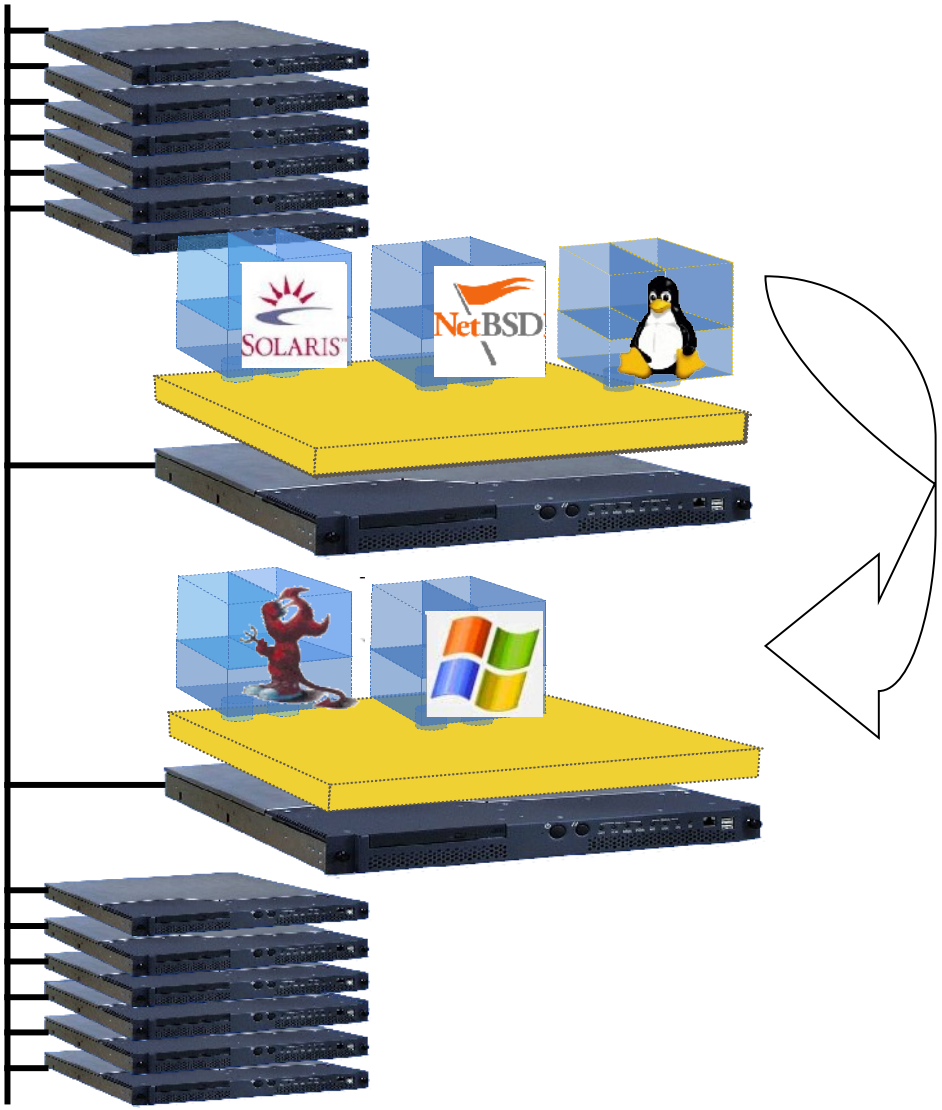
Virtualization with Red Hat

*Red Hat integrates **everything** necessary for complete virtualization.*

1. **Server/operating system virtualization**
    - Xen 3.x (integrated into kernel and OS platform)
2. **Storage virtualization:** Global data
    - Red Hat Global File System/CLVM
    - Several guests can share the same file system, even for /
3. **System management, resource management, provisioning**
    - Virtual Machine Manager (GUI)
    - Libvirt (API for heterogenous environments)
    - Red Hat Network
4. **Application environment consistency with non-virtualized environments**
    - Only kernel code (drivers) can see the difference

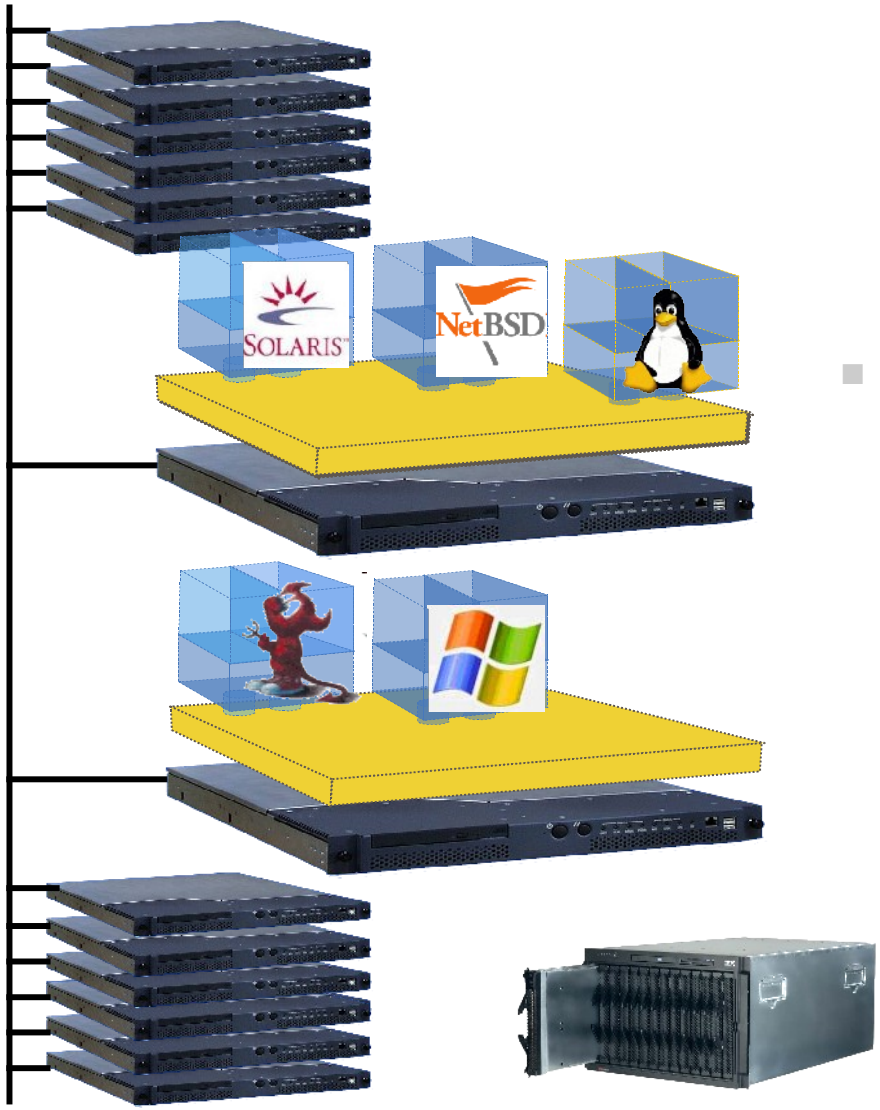
Live migration

-What is it good for?



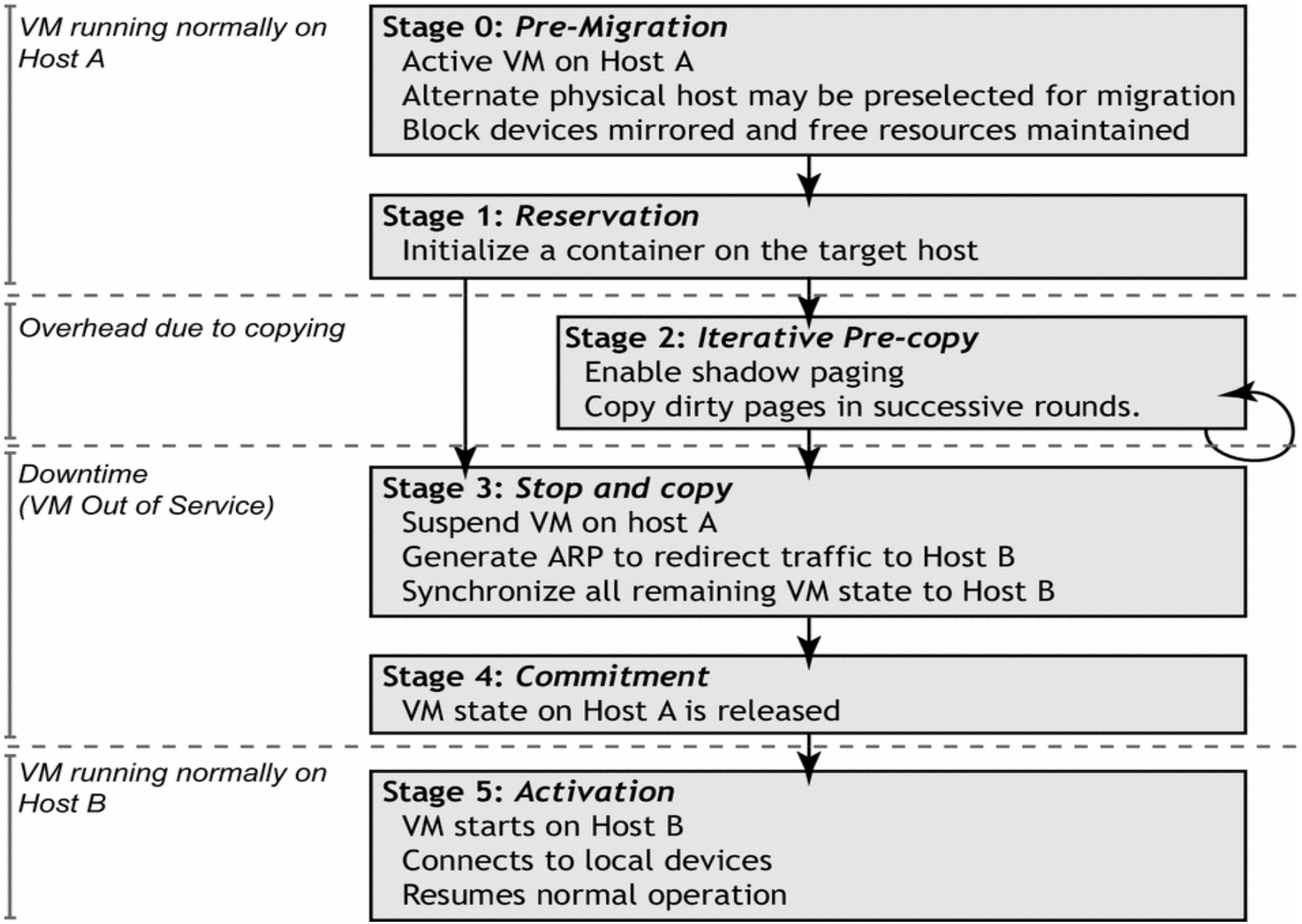
- VM relocation enables:
  - High-availability
    - Machine maintenance
  - Load balancing
    - Statistical multiplexing gain

Live migration: Assumptions

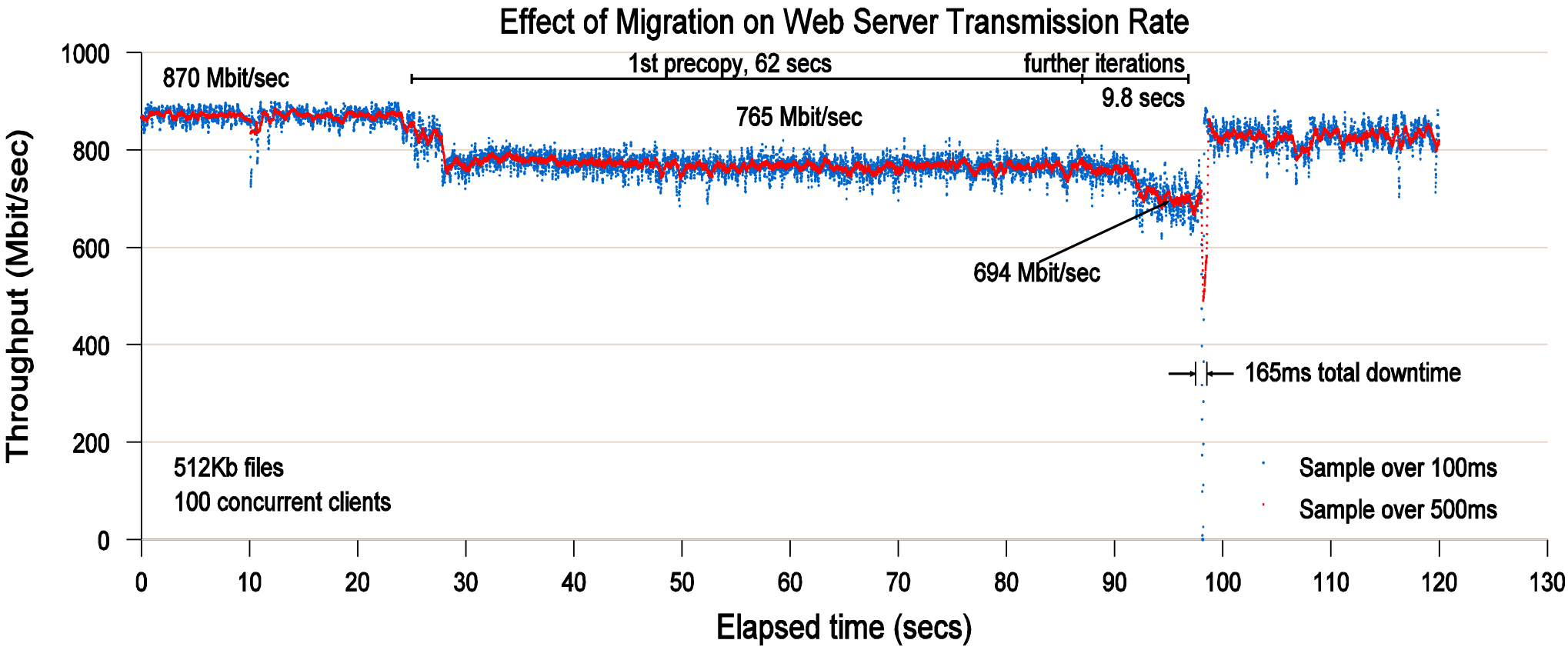


- Networked storage
  - NAS: NFS, CIFS
  - SAN: Fibre Channel
  - iSCSI, network block dev
  - drdb network RAID
- Good connectivity
  - common L2 network
  - L3 re-routeing

Live migration Life Cycle



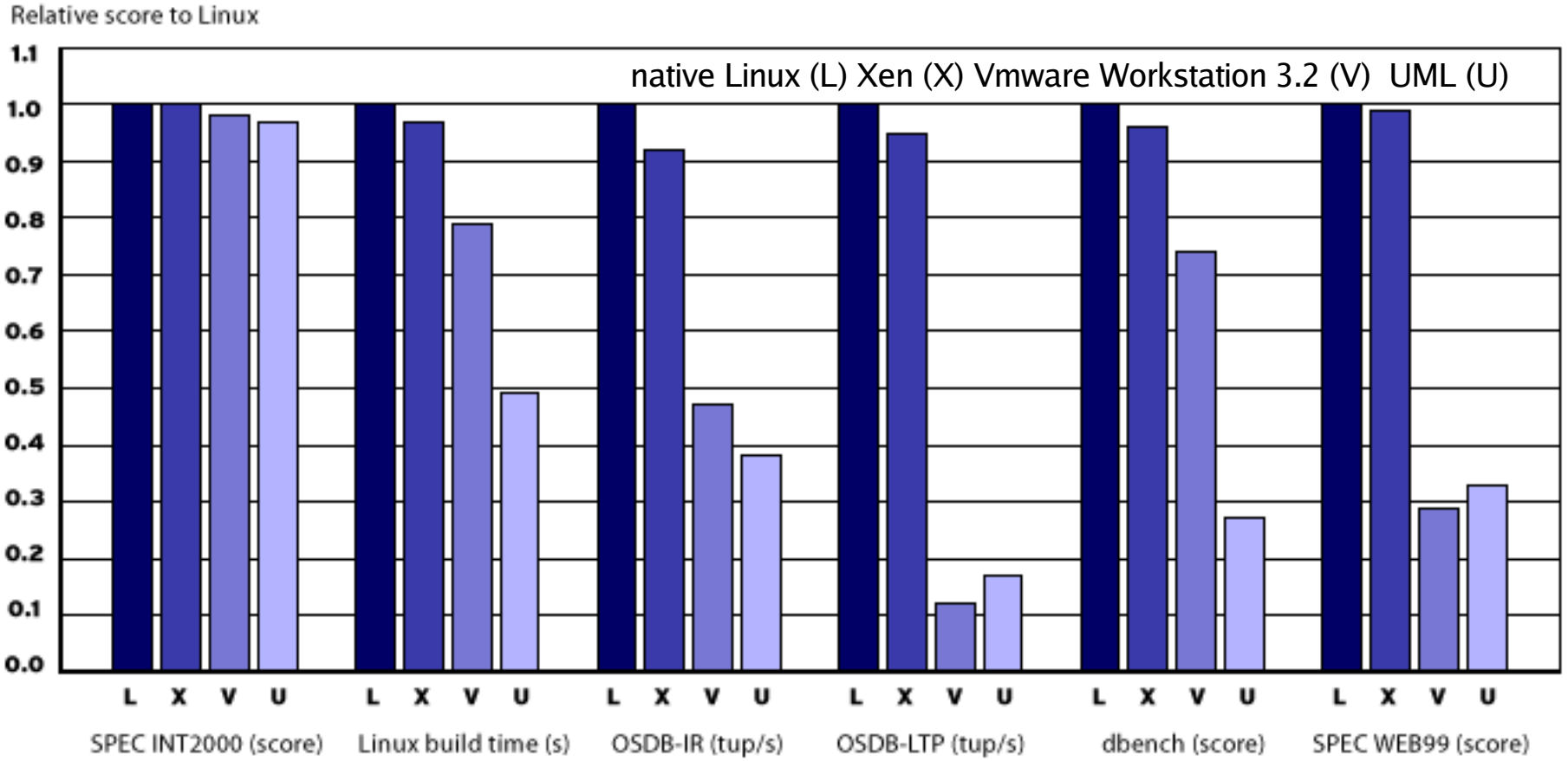
Web Server Relocation



Source: Ian Pratt's Xen Presentation May 2006

Xen performance

- Outperforms other virtualization technologies.
- Provides very close to native performance for paravirtualized environments.

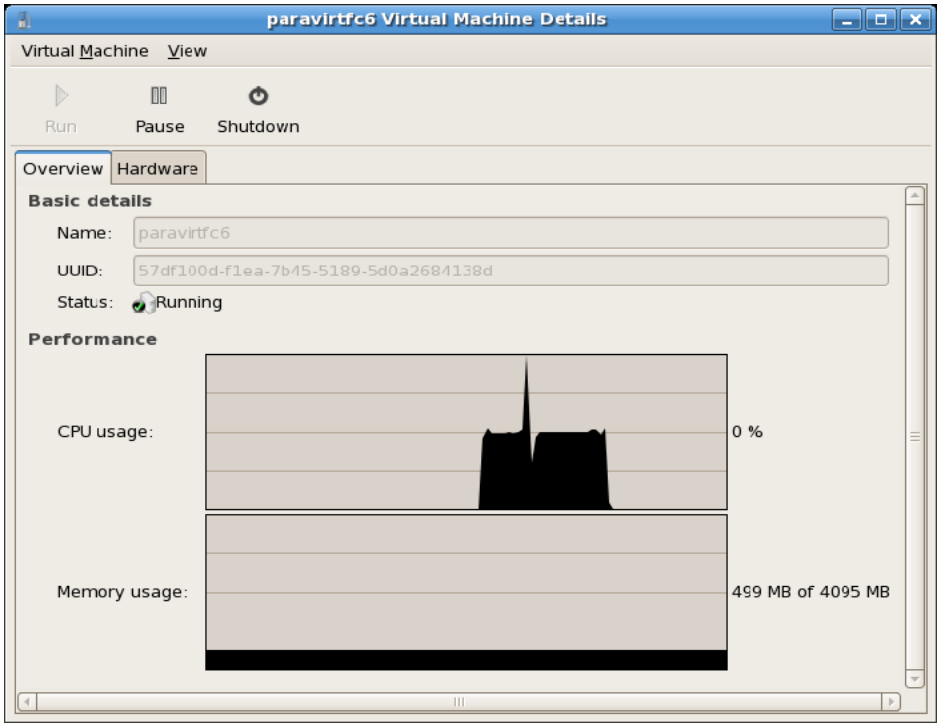


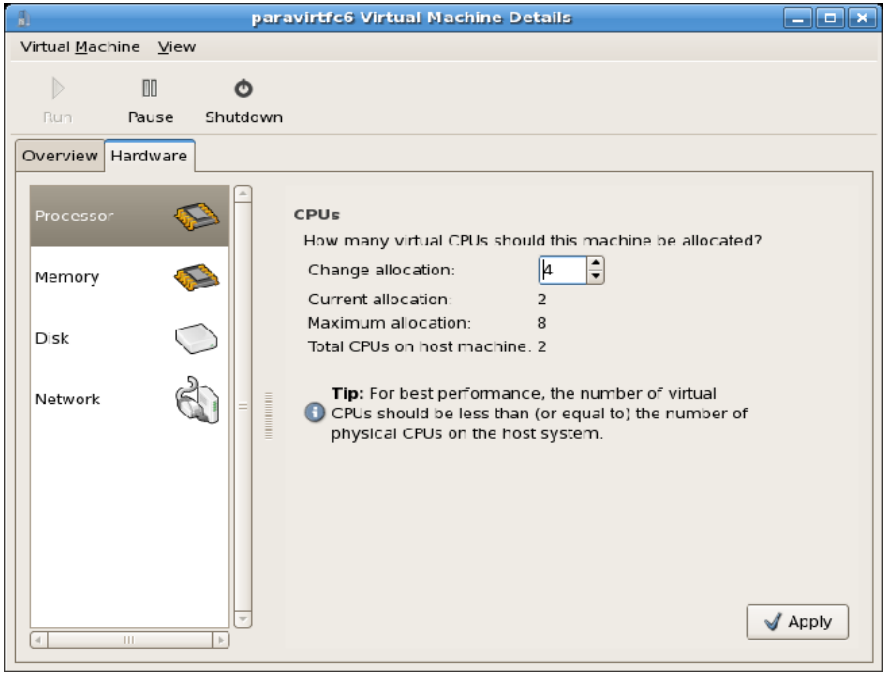
redhat

Where do I start?

- Get Fedora Core 6 now!
  - http://fedoraproject.org/
  - ...or Bittorrent
- Read the instructions on http://www.fedoraproject.org/wiki//Tools/Xen
  - Install Base -> Xen group
  - Install Xen kernel
  - Configure network, etc
  - Run virt-manager

Gnome Virtualisation Manager





redhat

Summary

- Xen is a paravirtualizing hypervisor system.
- Xen supports Full Virtualization with appropriate CPUs.
- Common use cases: consolidation, security, management, testing.
- Xen will be supported in RHEL 5 (late this winter)
- Xen is in Fedora Core 5/6 NOW.