"Web 2.0," Open Standards, Free & Open Source Software Technologies helping to Reinvent Business Strategies

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Web 2.0?

In the beginning ...

- Web 1.0
  - Static plain HTML
  - Annoying animated GIFs, riot of fonts
  - "Hits" counter
  - "Look Ma, I have a home page!"
- Web 1.5 (?)
  - Dynamic HTML pages
  - Content management systems
  - E-commerce and the Dot.com bubble
  - A walled garden

And now we are 2!

- Web 2.0
  - Sites now provide XML interfaces (via RSS perhaps) to allow users to put in and pull out data – no more walled gardens
  - Release Early, Release Often mantra taken to new heights
  - Utilizing the decade old Javascript in clever ways to afford a highly responsive and rich user experience – via AJAX and complemented with microformats.

The Enablers

- Two key pillars:
  - Open Standards
    - Royalty free access to techniques is crucial
    - RAND (Reasonable and Non Discriminatory) licensing is not welcome/needed.
    - OpenDocument Format, Linux Std Base, W3C
  - Free and Open Source Software
    - Delivering the entire business/user experience with a LAMP stack
    - Experiencing the service and offerings on a standards compliant client tool – Firefox for example

How Is the Web Delivered?

- Web 1.x needs beefy servers and systems to send both static and dynamic html pages
- This needed large investments in server capacities irrespective of the audience served – internal or external
- Evolving into the Web 2.0 world means that businesses would need to rearchitect their solutions to allow the offloading of processing on the end user/customer's client system while maintaining or consolidating their server infrastructure

Customer Issues/Pains

- We have too many applications.
- We have too much customization.
- Our hardware is underutilized.
- Critical workloads we can't support...
- Too many servers in too many places, owned by different business and no one wants to share.
- There's pressure to re-allocate or reduce staff requirements.
- We have increasing demand for higher staff expertise.
- Too much of the budget is spent on base hardware, software and maintenance.

Customer priorities

- Applications must be available.

- Planned downtime must be kept to a minimum. No unplanned downtime.

- Performance must meet business needs.

- Security from intruders. Consistent and correct data.

- Business continuity after an external event.

- Sufficient capacity.

- Batch jobs must finish on time.

- ROI: rapid return (months, not years)

- Investments that clearly show positive impacts.

- Today's decisions must be safe for 3-5 years.

Customer needs for infrastructure

- **Flexibility**
  - Adapts to changing business needs
  - Easily handles predictable growth
  - Controlled responses to unpredictable growth

- **Simplicity**
  - Standards-based
  - Common interface
  - Utility-based approach
 - Managed at a high level

What's The Current Setup?

- Multiple CPU/hyperthreading systems
- Load balancing and distributed server farms using clustering and GRID technologies
- All of these mean that enterprises continue to grapple with twin issues of throwing more hardware to meet the requirements and compounding the management/provisioning regime
- Is there an obvious way to do all of this better?

Virtualization

What's Virtualization?

- Running different *Virtual Machines* (VMs) on a single machine.

  - Different isolated *guest operating systems* with different applications on same physical hardware.

- A supervising master program called a *Hypervisor* manages these Virtual Machines.
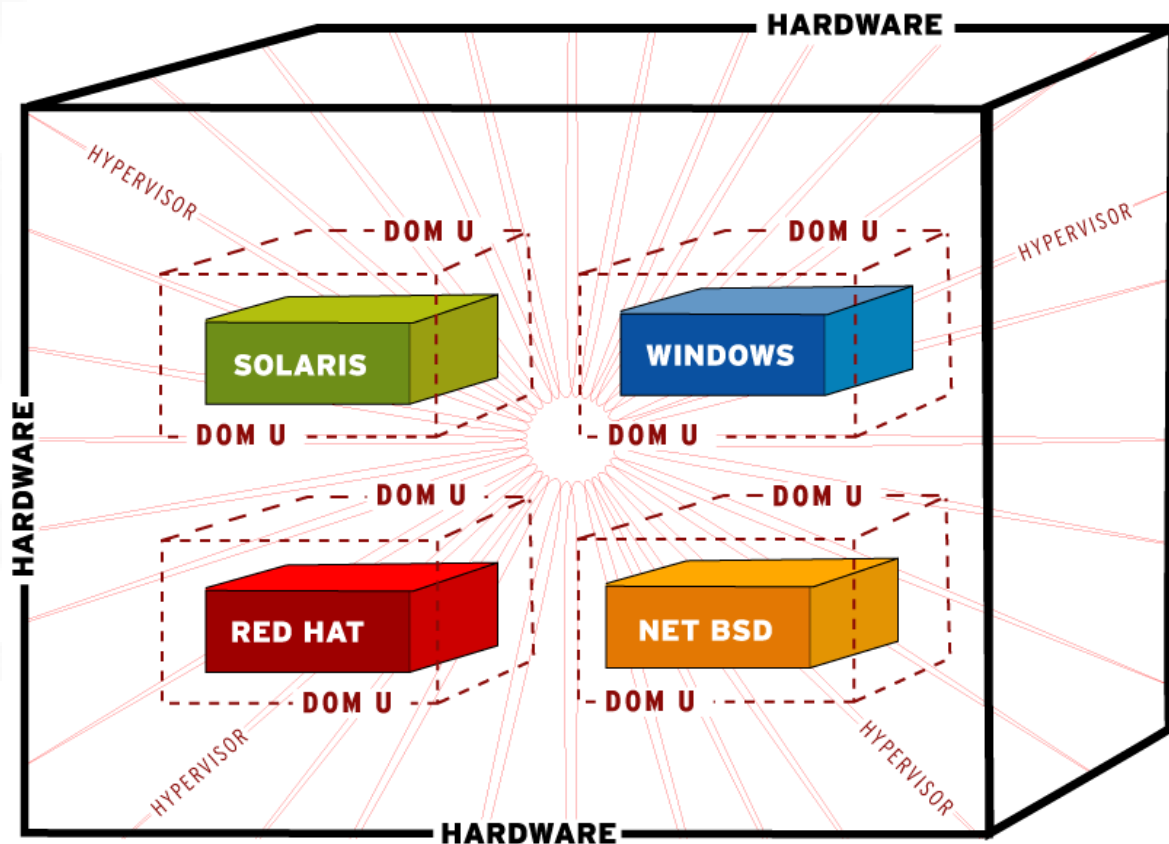
Benefits of virtualization

- **Reduced cost**
  - Dramatic lowering of TCO
- **Security**
  - Continuous availability
- **Agility**
  - Operational scalability

FREE

UTILIZED

15%-20% UTILIZED

80% UTILIZED
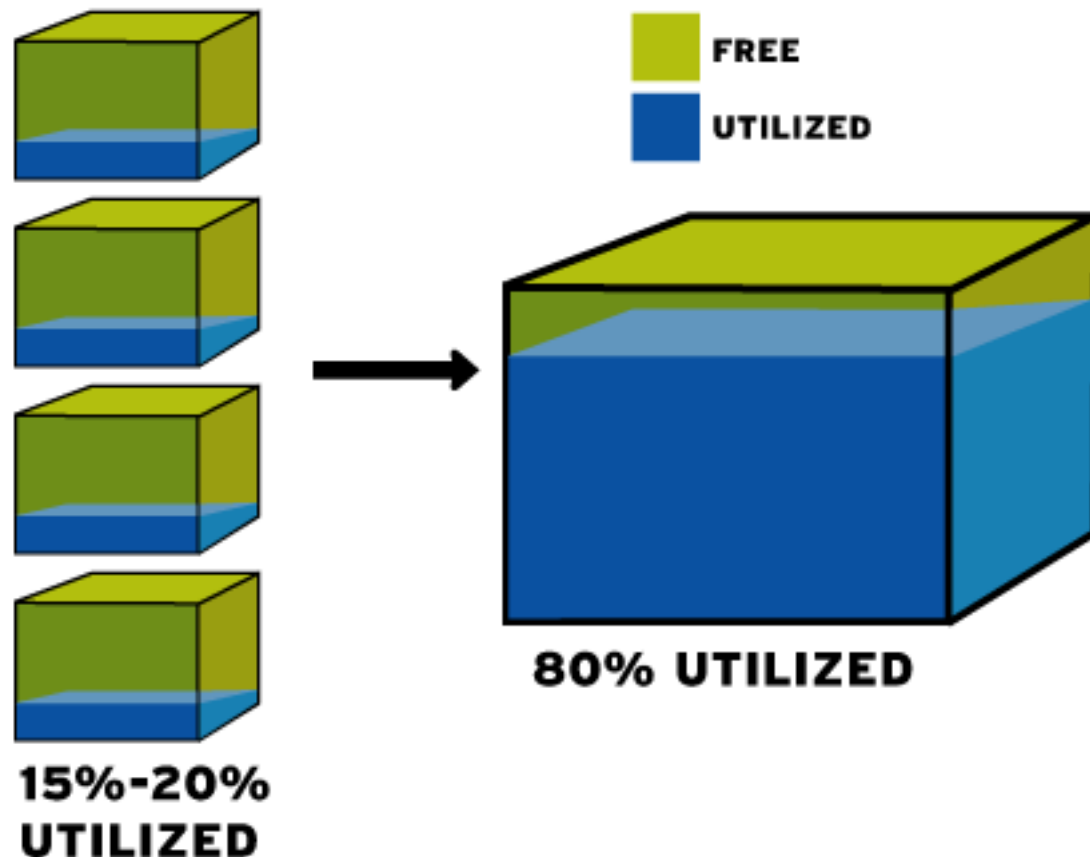
Definitions

- **Para-virtualization**
  - A *modified* guest operating system, performance optimized for virtualized environments. Does not need hardware assistance.
- **Full virtualization**
  - The ability to run an *unmodified* guest operating system on the hypervisor. To do this, Xen requires: virtualization enabled chips (Intel VT, AMD Pacifica)
  - Hardware virtualization assistance
  - New Intel VT (Vanderpool) and AMD SVM (Pacifica) processor enhancements to support unmodified guests (full virtualization).

Virtualization models - I

- Three types of virtualization
- **Full-Virtualization (FV):** Transparent virtualization
  - Creates entire Virtual Machine with complete system emulation.
  - Virtual Machine appears to be generic system to the operating system.
  - Requires no modifications to the operating system.
  - Offers significant performance impact *without* hardware-enabled virtualization.
  - Examples:
    - VMware
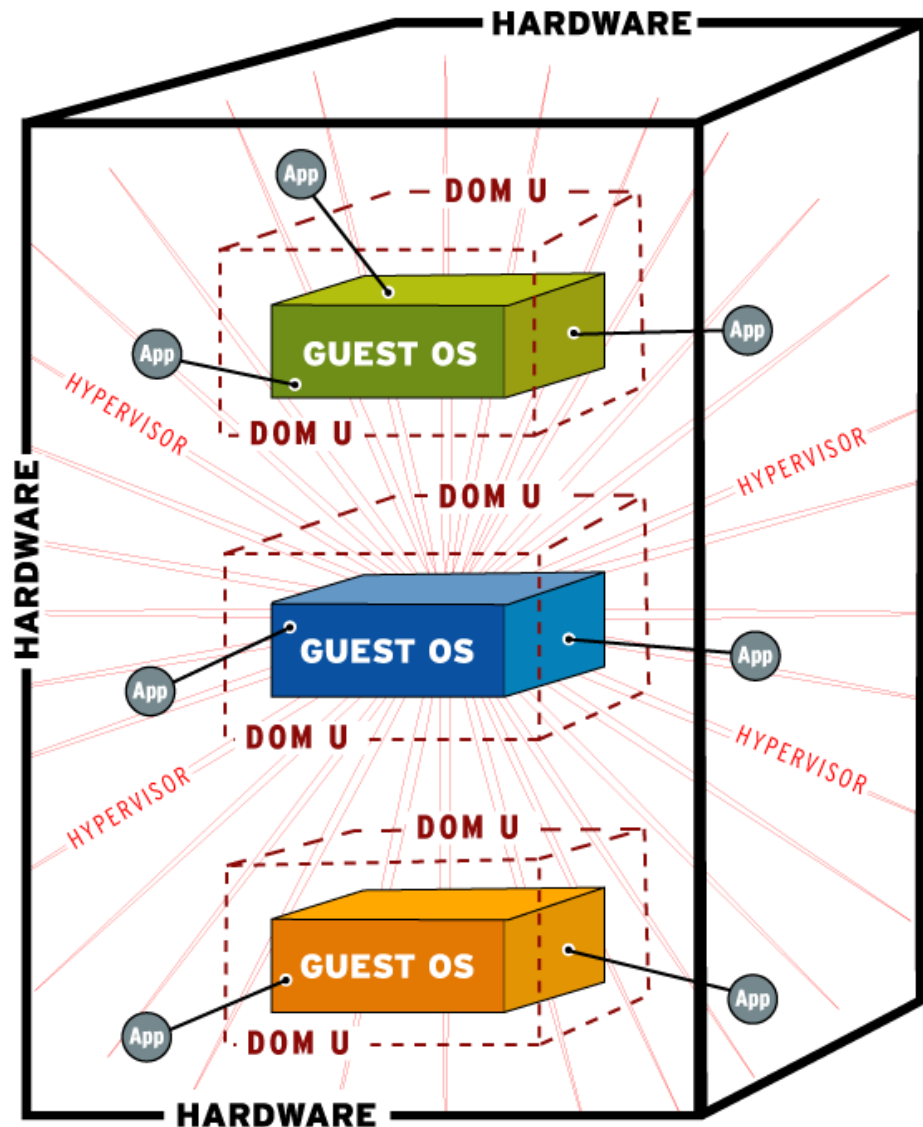   - Xen w/Hardware Support

Virtualization models - II

- **Single Kernel Image (SKI):**
  - Light weight virtualization where a shared host operating system spawns multiple user spaces.
  - Each virtual operating system must be identical.
  - Examples:
    - Solaris Zones
    - SWsoft Virtuozzo

Virtualization models - III

- **Para-Virtualization (PV):** Low-Overhead FV
  - Attempts to reconcile the two approaches.
  - Requires minor changes to the guest operating system
  - Resolves the performance impact of Full-Virtualization by allowing direct access to the hardware resources as managed by the Hypervisor.

Xen virtualization technology

- **Almost native performance**.
- Creates an "apparent" independent server for each guest operating system.
  - **Completely and securely isolated**
  - Allows **multiple workloads to co-exist** safely.
- **Migrate guests** quickly as required.
- **Clone guests** to add redundancy or capacity without adding cost or complexity.

Xen Architecture – The Base/Host

Domain 0
The master domain, which provides hardware support as well as interfacing to guests and management tools.

Xen Hypervisor
Provides low-level hardware control, scheduling, and communications. This allows transparent sharing of resources and enforcing resource limits.
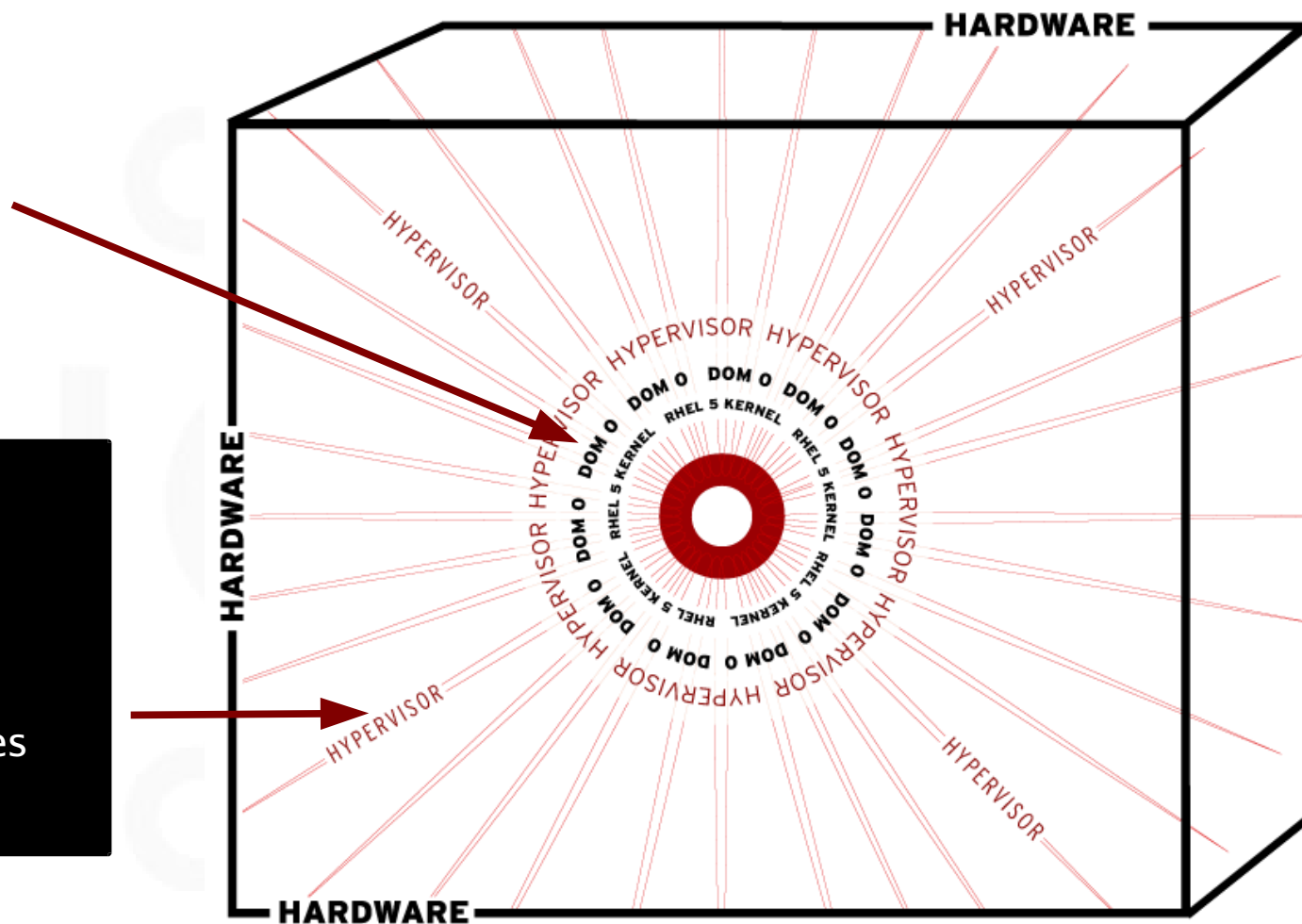
Xen Architecture – The Guests

Dom U
The Virtual Machine that runs the guest operating system.

HARDWARE

HYPERVISOR

DOM U

DOM U

SOLARIS

WINDOWS

DOM U

DOM U

HARDWARE

DOM U

DOM U

RED HAT

NET BSD

DOM U

DOM U

HYPERVISOR

HYPERVISOR

HYPERVISOR

HARDWARE
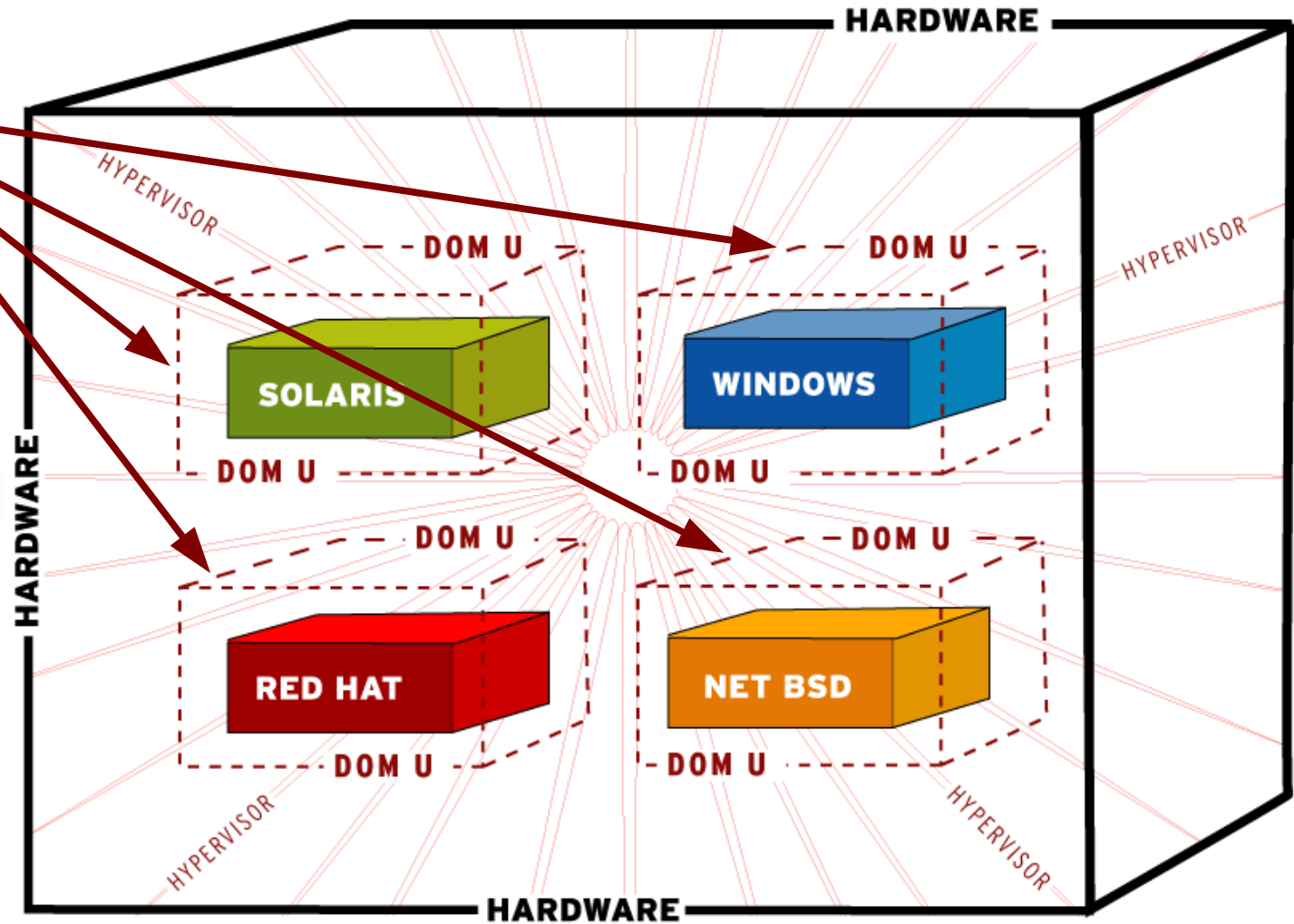
Red Hat's Added Value - I

- **Server/operating system virtualization**
  - Xen (integrated into kernel and OS platform)
- **Storage virtualization**
  - Red Hat Global File System/CLVM
- **System management, provisioning, resource management**
  - Red Hat Network, libvirt
- **Application environment consistency with non-virtualized environments**

Red Hat's Added Value - II

- **Installation tools**
  - Anaconda
    - The "Red Hat Installer" is virtualization-aware.
    - Eases virtualization setup and installation
- **ISV and IHV Certification**
  - World's leading open source Linux provider has the largest network of certified software applications and hardware systems

Solving real business problems

Failure isolation

- **Failing mail server does no impact the other servers.**
  - Prevent major crashes.
  - In the event of a security failure, contain leaks or theft.
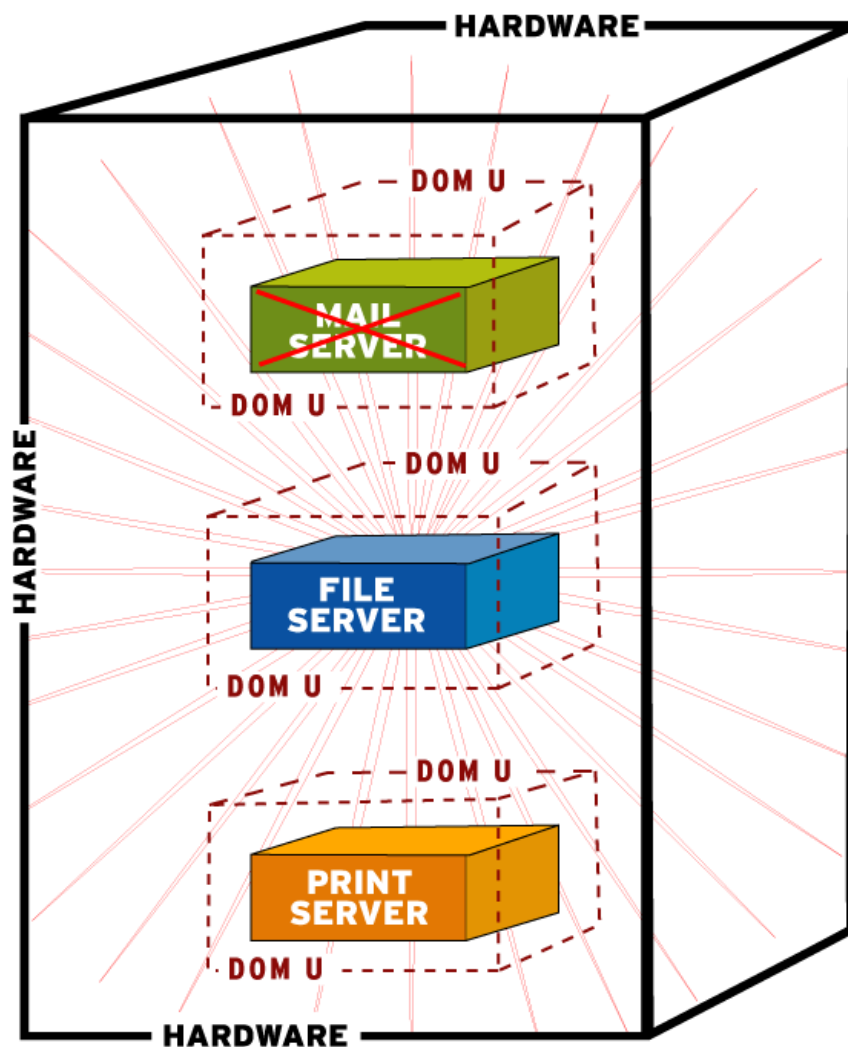
Solving real business problems

Control without constraints

- **IT locks down one guest, user is empowered to manage the other.**
  - The value of user-based innovation.
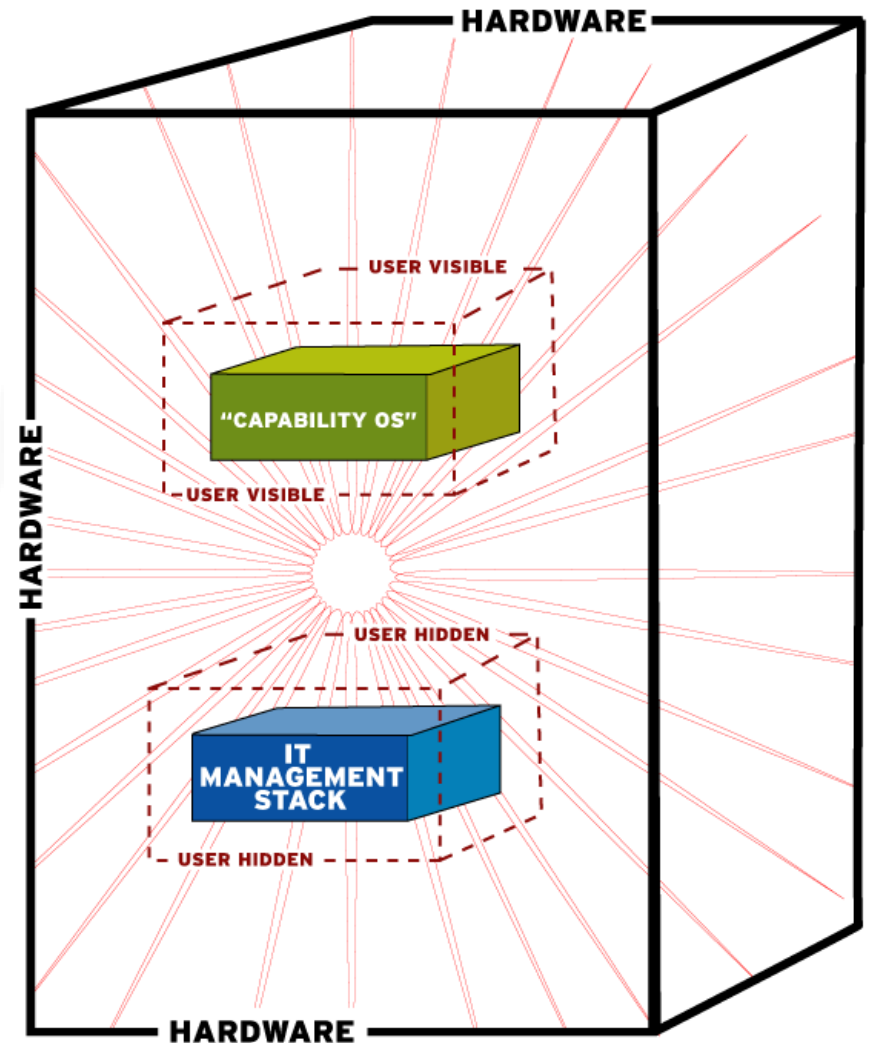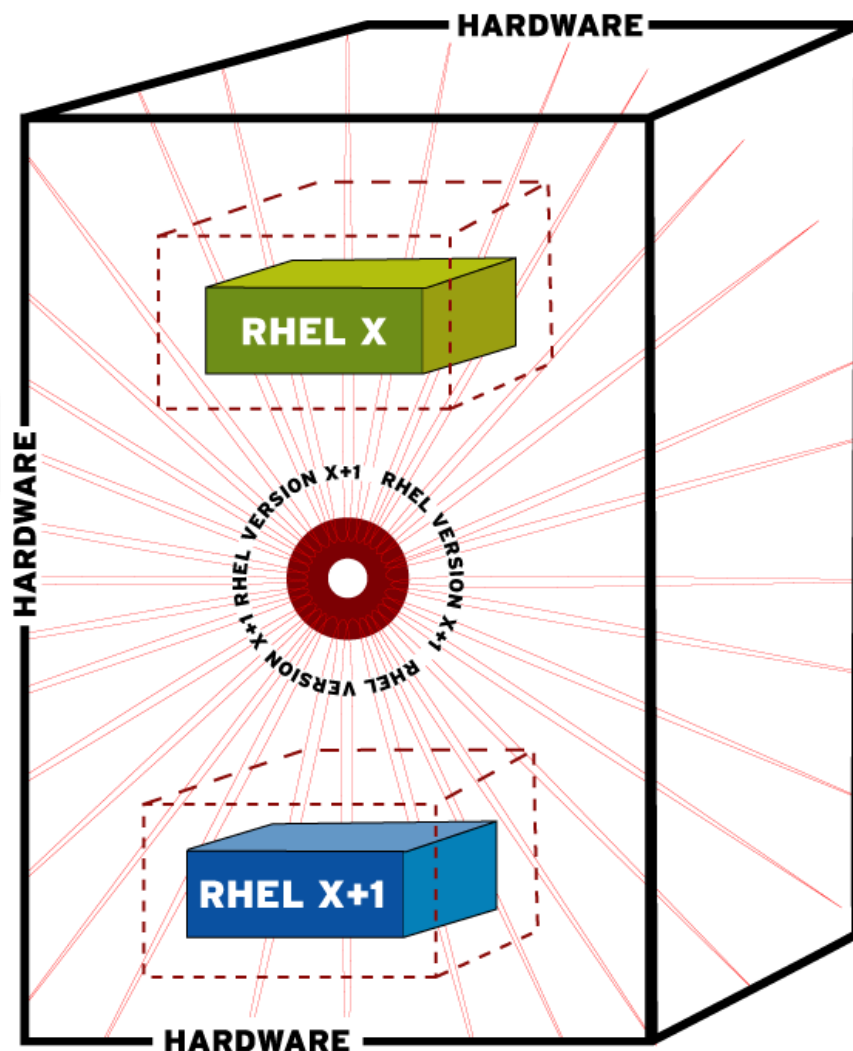
Solving real business problems

Live Migration

- **Virtual Machine relocation enables**

  - **High Availability**:
    machine maintenance

  - **Load Balancing**:
   statistical multiplexing gain
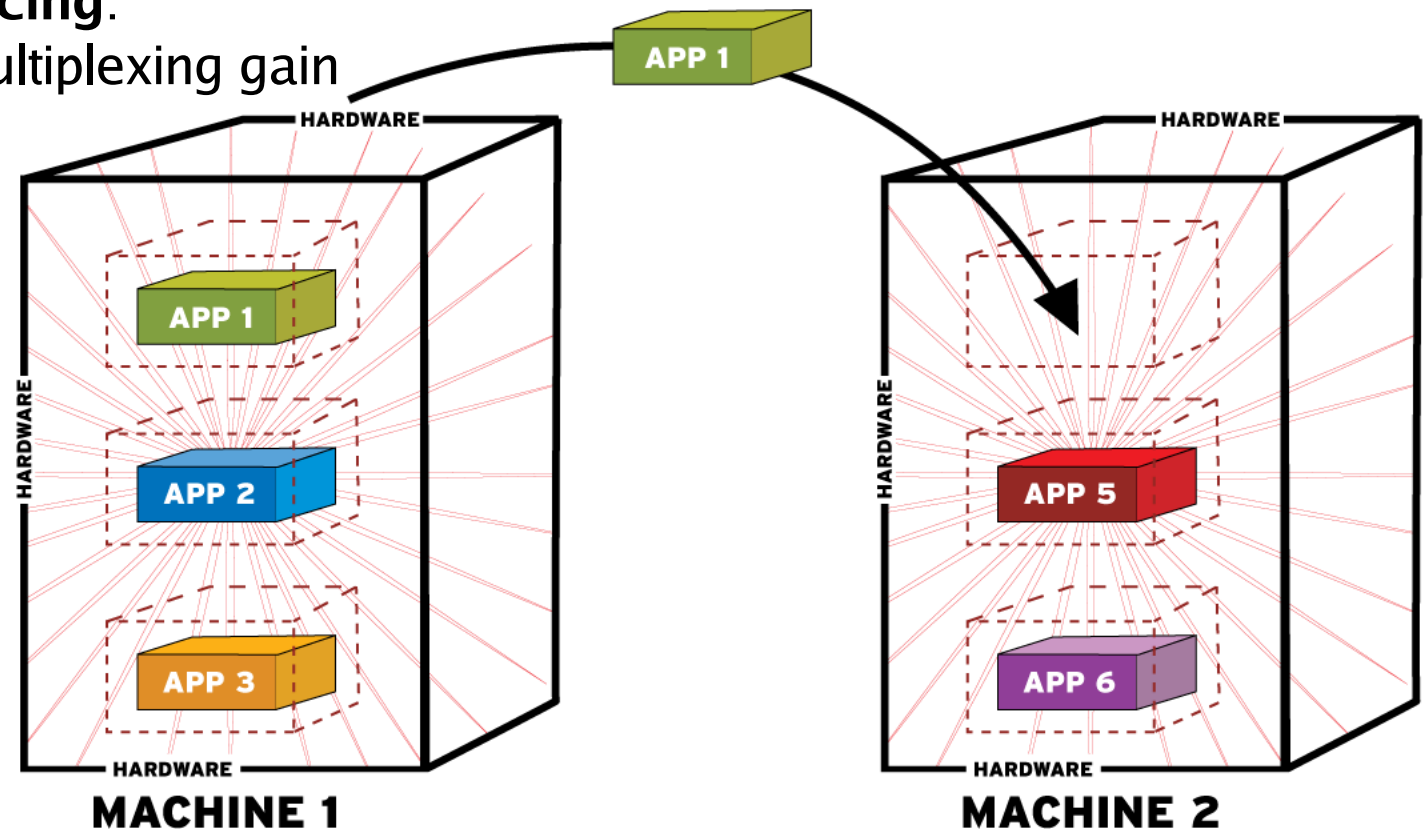
Solving real business problems

Freedom from upgrades

- Preserve the version X environment and its applications,
  deploy on version X+1 when it makes sense.

- The hypervisor runs on version X+1 to gain maximum benefit from the new hardware and software.

Solving real business problems

- Development and QA environments
  - Secure and compartmentalized instances; think "chroot" jail.
  - Simplify test scripting and execution for qualifications.
  - Simplify test simulation.
  - Carve out resources and return when finished.
- Advantages
  - Rapid deployment and adoption
  - Multi OS, multi version, multi system (scale)
- Automate certification process
- Advanced monitoring in DOM 0
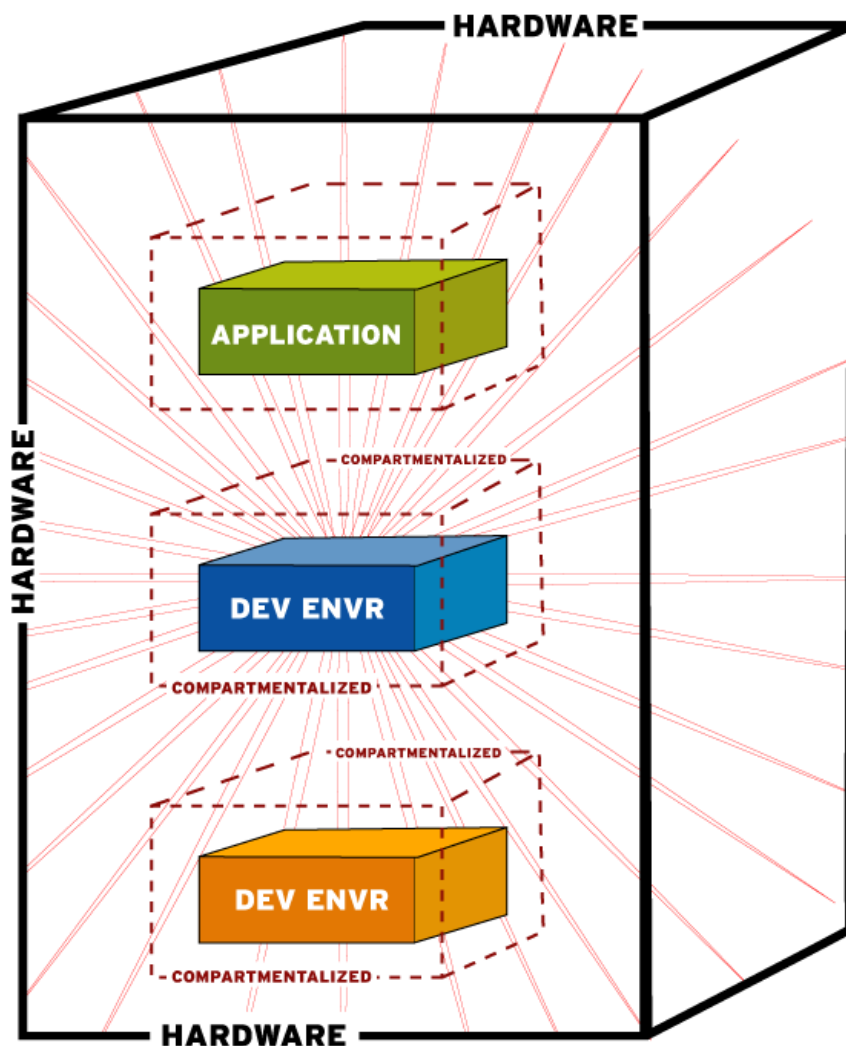
Consider the possibilities...
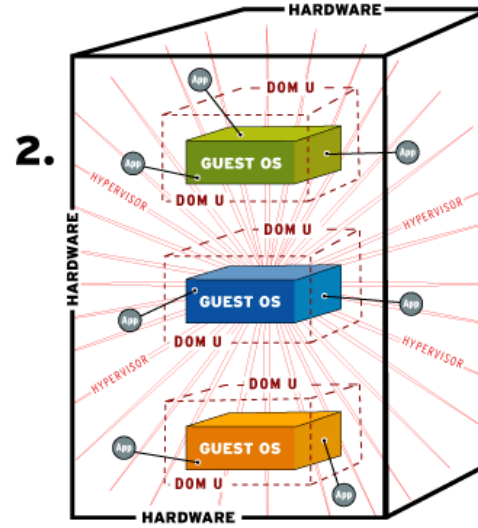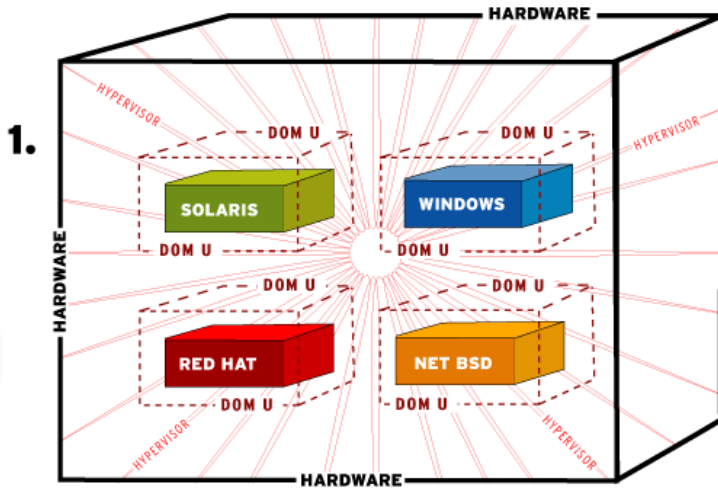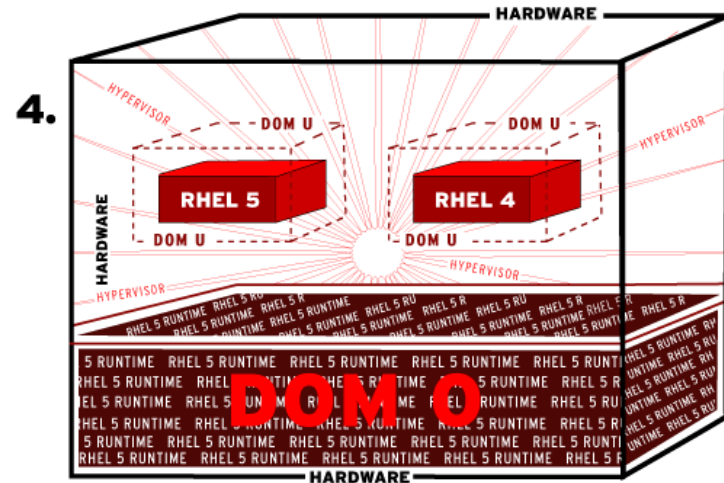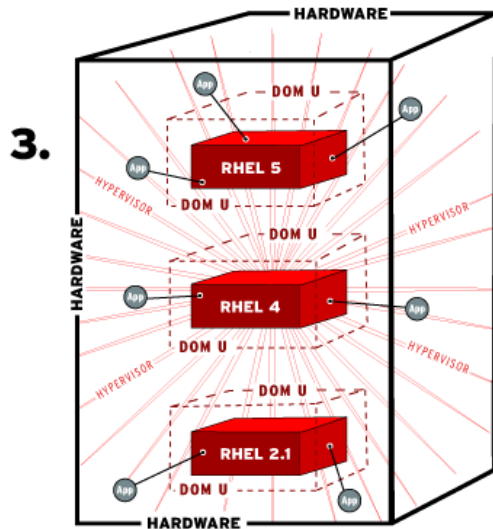
Summary

- Web 2.0 – what ever that means
- Open and unencumbered standards to promote more FOSS innovations
- Virtualization on COTS hardware
- Common use cases: consolidation, security, management, testing.

Resources

- http://www.openvirtualization.com
- http://108.redhat.com
- http://www.redhat.com/solutions/leap
- http://fedora.redhat.com
- http://www.odfalliance.com
- http://www.freestandards.org

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Thank you!

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