# SERVER VIRTUALIZATION

**Isaac Rozenfeld**
Technical Specialist, OS Ambassador
*https://blogs.sun.com/unixman*
Sun Microsystems, Inc.

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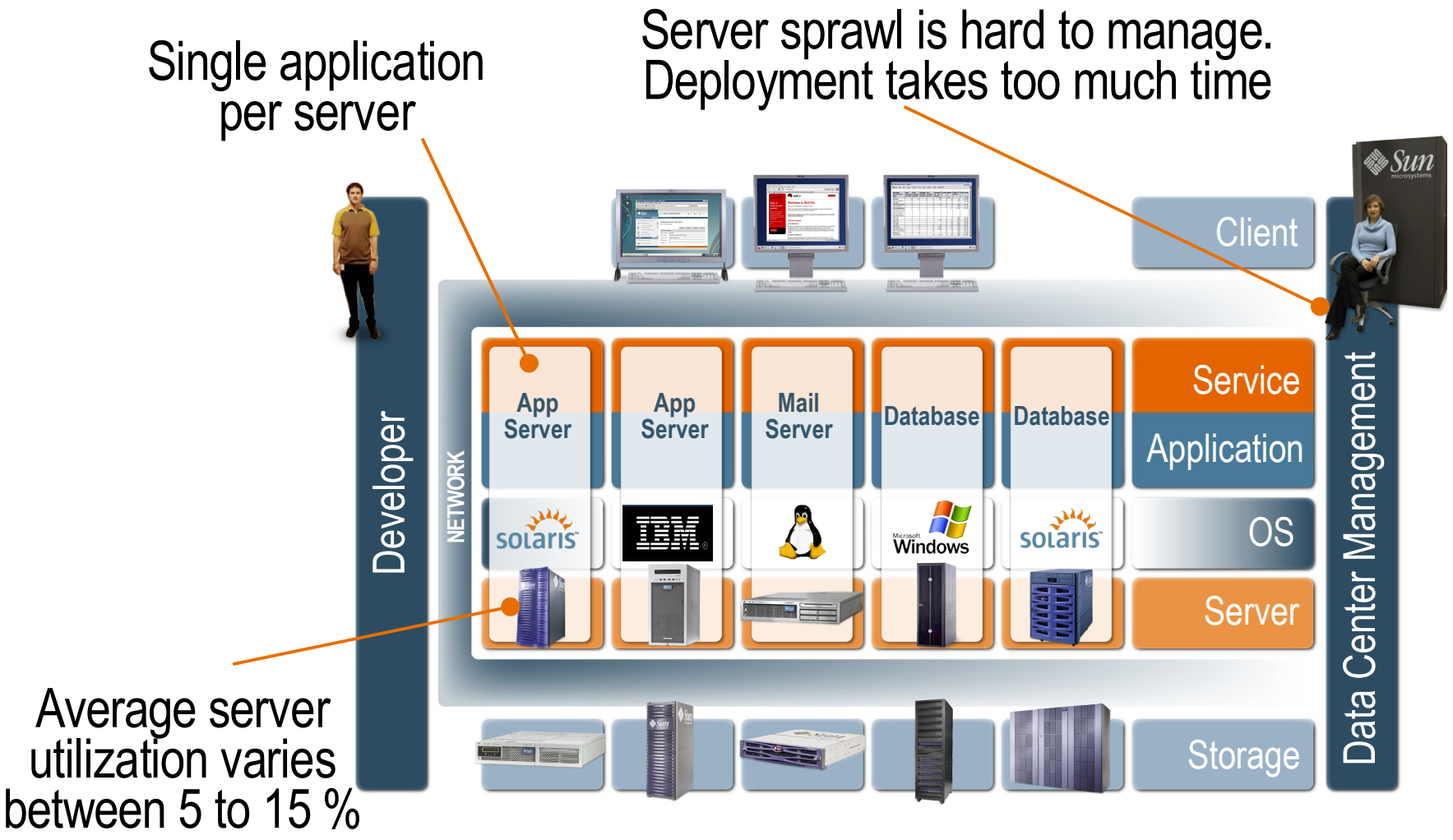
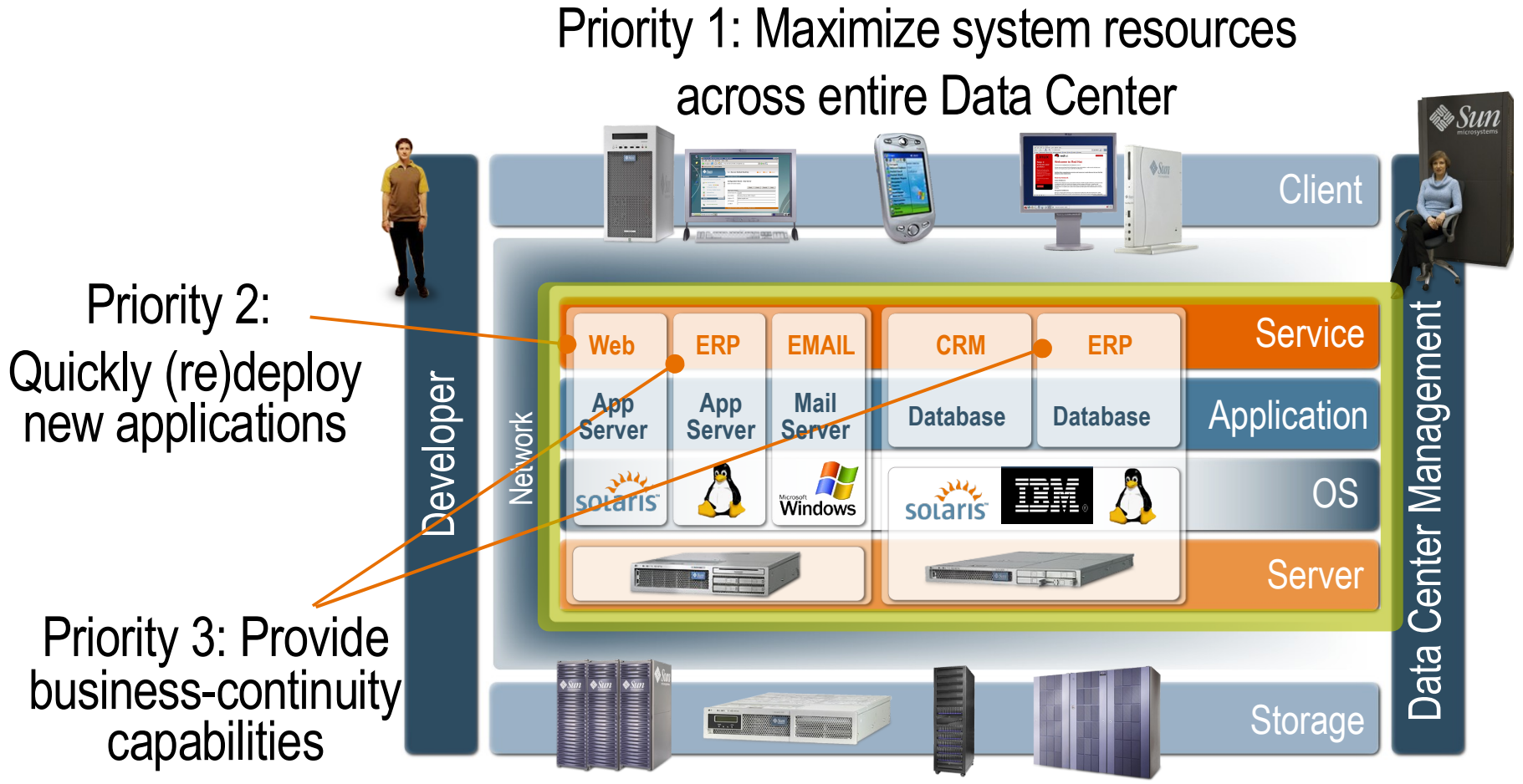
# Agenda

- What is Virtualization?
  - Why virtualize *now?*
- Virtualization Technologies
  - In the Hardware
  - In the Operating System
- Virtualization Business Assessments
  - Chris Theon
- Lessons Learned From in-house Deployments
  - Marcos Merced

# The Data Center Today



# Virtualize Everywhere!



# A (Very) Brief History...

# Some History

- Virtualization technology is NOT a new idea
  - Goes back to 30+ years; now on multiple platforms
- *New* needs, *current* economics – all warrant renewed emphasis
  - Increased server sprawl
  - Rising energy costs
  - Need for rapid re-deployment of *existing* assets
  - Dependencies on software that is no longer supported
  - Modernization of operating environments, architectures
- Solutions vary across different platforms
  - Different benefits (and limitations)

# What Is Involved?

- **Generally:** *An illusion* of a dedicated computer for multiple instances, with no awareness of each other
  - > Of your application service
  - > Of an Operating System
  - > Physical or Logical Partitioning
    - > Hardware and/or firmware capability
  - > Virtual Machines
    - > Host OS (“hypervisor”) software & Guest OS software
  - > I/O Subsystem Layers (disk, network) & Interfaces
  - > Modern CPUs, Memory Address Space management
    - > Examples: AMD-V, Intel VT, SPARC, POWER

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    - > Host OS ("hypervisor") software & Guest OS software
  - > Basic distinction between these: architectural limits on number of OS instances or concurrent environments
- **Goals:**
  - > Secure, isolated boundary for one or more environments formulating all that's necessary for an *illusion* to seem real ;-)

# Motivating Factors

# Use Cases

- Server Consolidation
- Testing and Development
- Fail-over through replication
- Provisioning of compute resources
- Legacy Applications
- Secure Execution

# Case Study: Server Consolidation

- Interest in improving resource utilization
  - Want better ROI and do more with what we already have
- An approach *may* involve:
  - Multiple workloads working concurrently
    - Without awareness of (or interference with) each other
    - Virtualization: UID collisions, naming conventions, port conflicts
  - Analysis of Service Level Agreements (SLAs)
    - Resource Management technologies and Workload Managers help
  - Chargeback Analysis
    - To ensure appropriate distribution of costs for shared services
  - Reliability, Availability and Serviceability (important)
    - Fewer single points of failure introduce the need for stringent process, policies

# Server Consolidation

- Operational Maturity
  - Fewer software/operating system versions (as needed)
    - Different OS, kernels
    - Workload-favorable kernel tunable parameters
    - Helps minimize risk through minimization efforts
      - Auditors will probably buy you lunch!
- Additional Benefits
  - Agile upgradability, deployment, provisioning
  - Use legacy OS application environments on newer hardware
    - Ex: VMware, Xen, Trigence, Parallels, Solaris BrandZ, Microsoft Virtual Server
  - Better performance per watt, per RU
  - Pave the way for workload mobility

# Navigating The Solution Set

# Choosing The Right Solution *For You*

- What is driving the need?
  - Some needs have overlapping solutions
    - Choice or combination of technologies possible
  - Some virtualization technologies do not fit some of the needs
    - Don't belong in the set of solutions you can choose from
- Our Task (as engineers)
  - Find the right combination to solve the problem
- Our Task (as architects)
  - Ensure the “Big Picture” is top of mind
  - Keep things in scope

# Sweet Spots

## *Not an exhaustive representation

### Hard Partitions


### Virtual Machines


### OS Virtualization


### Resource Management


App

OS

Server

Multiple OSes ← → Single OS

Trend to flexibility

Trend to observability

Trend to isolation

- > Very High RAS
- > Very Scalable
- > Mature Technology
- > Ability to run different OS versions or kernel patch revisions

- > Ability to live migrate an OS
- > Ability to run different OS versions and types
- > De-couples OS and HW versions

- > Very scalable and low overhead
- > Single OS to manage
- > Cleanly divides system and application administration
- > Fine grained resource management

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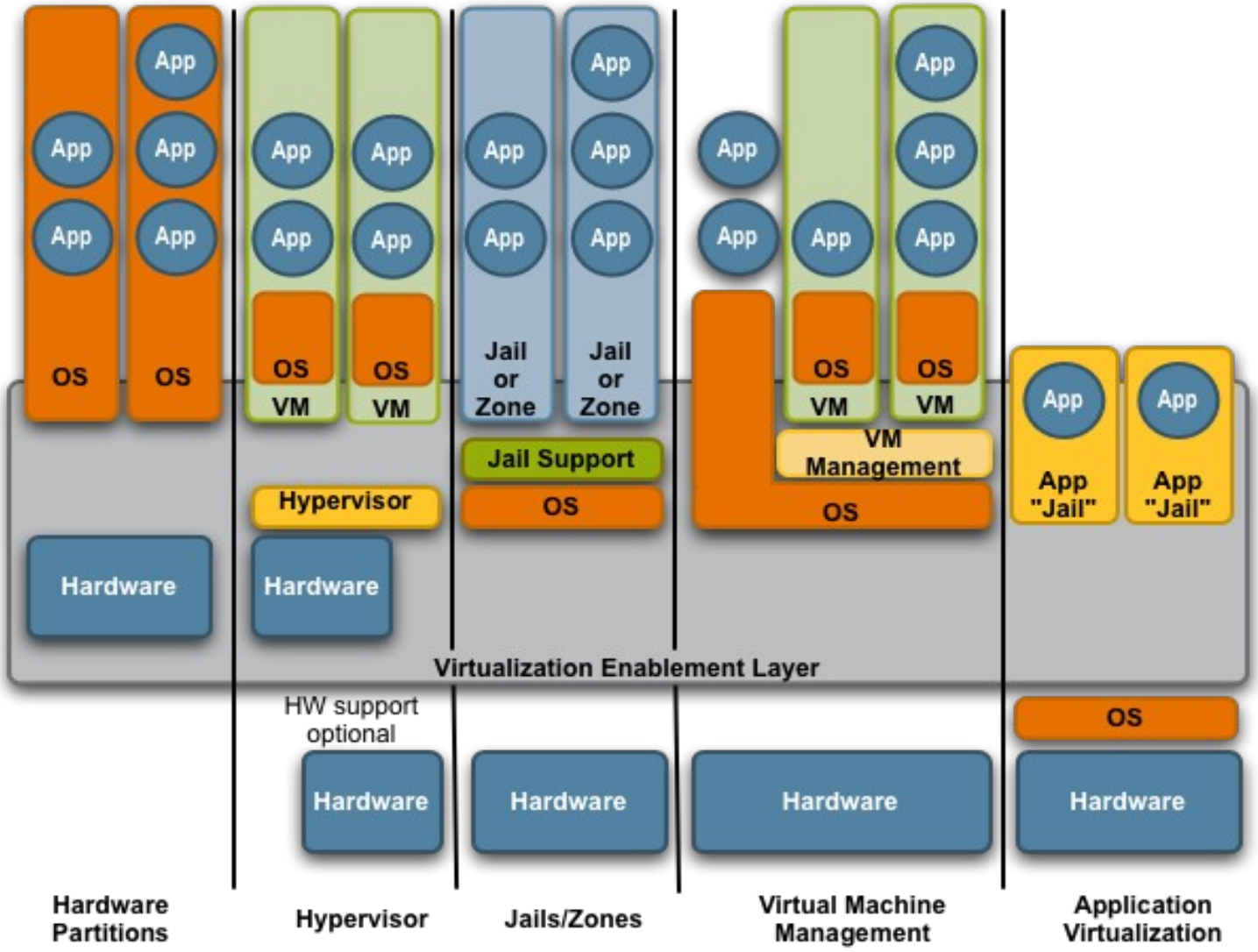
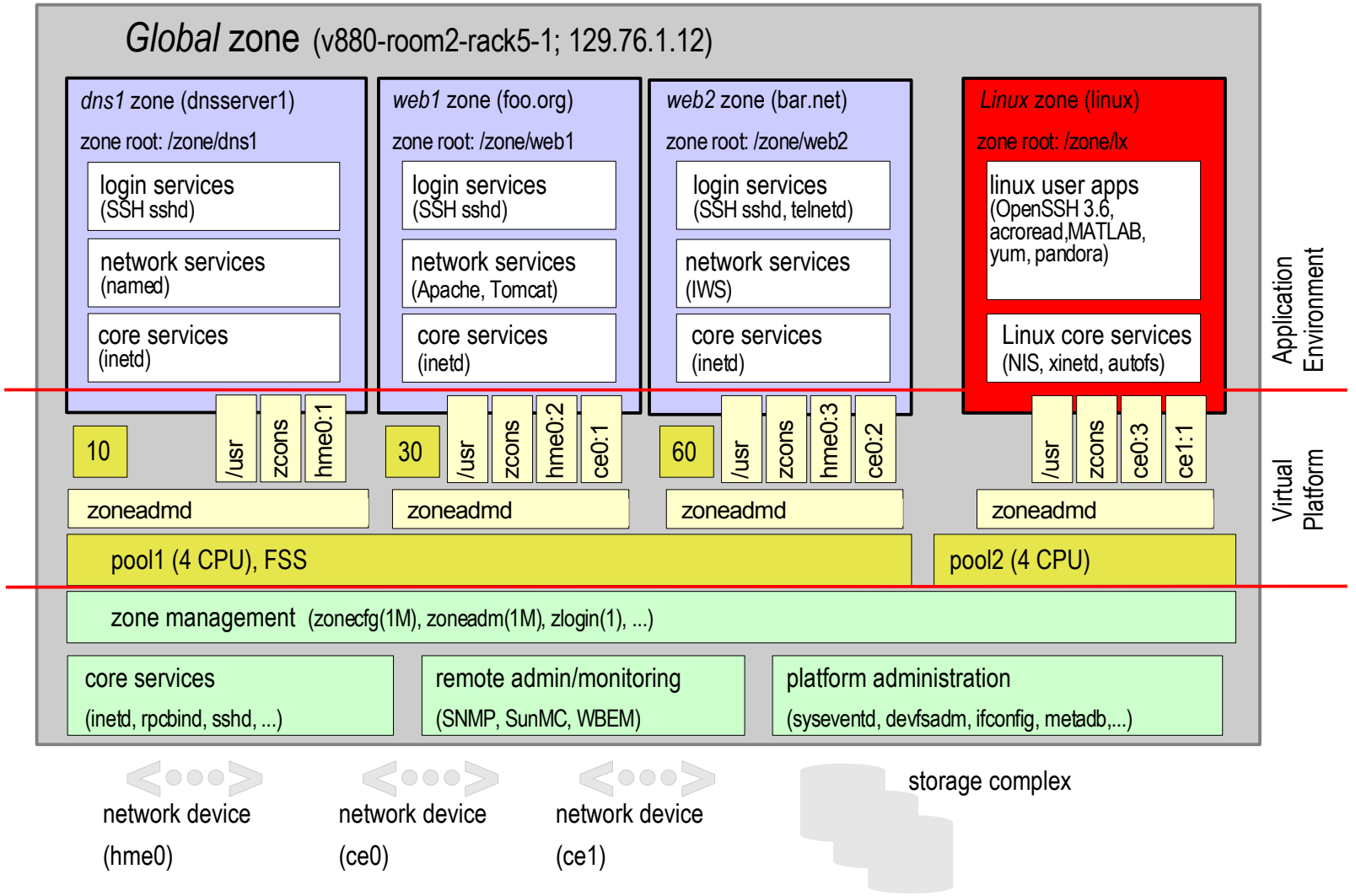
# Application (Service) Perspective



# Example: BrandZ (Branded Zones)



# In Summary

## Important Considerations

- Security, Privileges, Isolation
  - Network services in virtualized environments, limiting risks that can affect other workloads, systems in case of a security violation
  - Applications requiring exclusive access can be virtualized and ran concurrently on the same system
- Capacity Planning
  - Virtualized environments and newer hardware *may* require newer approaches; resource modeling tools help
- Management & Infrastructure ISVs
  - While a virtualized environment is presented to applications, certain pieces of the infrastructure stack may need to be virtualization-aware (i.e. *newer versions*)

# Q & A

- Additional Resources:
  - Slicing and Dicing Servers: A Guide to Virtualization and Containment Technologies – Dr. Harry Foxwell, Isaac Rozenfeld – October 2005
    - *http://www.sun.com/blueprints/1005/819-3734.pdf*
  - Jeff Savit's "Virtually All The Time" Blog
    - http://blogs.sun.com/jsavit/
  - Various vendors' websites
  - Various open-source communities
- Questions?
- Thank You!

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