CLOUD COMPUTING CONFERENCE & EXPO

Virtual Infrastructure: What Is Required for the Cloud?

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Agenda

- What's New About 'Cloud'?
- Implications for Your Virtualization Architecture
- Practical Considerations

What's Different About Cloud Computing*?

It's Model and Goals

- Intersection & extension of two previous concepts:
  - "Utility Computing" (pay-as-you-go) and
  - "SaaS" (software as a service rather than binaries)
- To derive greater benefits through:
  - Far greater IT elasticity
    - Ability to both scale up *and* scale down
    - Increased business agility and responsiveness
  - Transference of risk
    - Increased "liquidity" in managing risk (manage dollars not servers)
    - Reduce the risk of over-provisioning (e.g. high costs)
    - Reduce the risk of under-provisioning (e.g. lost / unhappy users)

*Paraphrasing UC Berkeley Reliable Adaptive Distributed Systems Laboratory (http://radlab.cs.berkeley.edu/)

What's Different About Cloud Computing*?

IT Implications

Users expect a cloud infrastructure to support:

1. *The illusion of infinite computing resources available on-demand*
2. *The elimination of up-front commitment by users*
3. *The ability to pay for use of computing resources on a short-term, as-needed basis*

How does this affect or drive your virtualization infrastructure implementation and operation?

Does virtualization need to be done in a different way vs. a 'traditional' enterprise architecture?

*Paraphrasing UC Berkeley Reliable Adaptive Distributed Systems Laboratory (http://radlab.cs.berkeley.edu/)

Server Virtualization Infrastructure:

‘Traditional’ Architecture

Traditional virtualization infrastructure:
Storage & Network: Consolidated servers with local / direct, static and inflexible connections
Resource Management: no dynamic resource management / automation
Admin / Operations Model: Traditional (sysadmins, storage admins, network react to tickets to provision VMs, storage, network…)
VM Provisioning: Traditional manual creation & deployment (e.g. no appliances)
Chargeback Model: Traditional, e.g. static, user-owned physical servers

IT Implications: What's Different about Cloud?

Again, users expect a cloud infrastructure to support*:

1. The illusion of infinite computing resources available on-demand
   - Capacity always needs to be there through automation and proactive operations before users perceive a constraint ("infinite")
   - Users need to be able to self-serve ("on-demand")
2. The elimination of up-front commitment by users
   - Fine-grained, actual usage/allocation-based chargeback rather than purchase ahead of time ("no up front commitment")
3. The ability to pay for use of computing resources on a short-term, as-needed basis
   - Dynamic capacity management scale up or down ("short-term / no commitment")

And all of the above needs to be cost-effective

*Paraphrasing UC Berkeley Reliable Adaptive Distributed Systems Laboratory (http://radlab.cs.berkeley.edu/)

Server Virtualization Infrastructure:

'Traditional' vs. 'Cloud' Architectures

Traditional virtualization infrastructure:	Virtualization designed for 'Cloud' support
Storage & Network: Consolidated servers with local / direct, static and inflexible connections	Shared storage, flexible networking to create server pools
Resource Management: no dynamic resource management / automation	Policy automation to dynamically load-balance VMs across / between pools of resources
Admin / Operations Model: Traditional (sysadmins, storage admins, network react to tickets to provision VMs, storage, network…)	Automation supports self-service provisioning of VM with Administrators pro-actively manage general pool scaling
VM Provisioning: Traditional manual creation & deployment (e.g. no appliances)	Library of virtual appliances / assemblies for rapid, low-risk VM creation & deployment
Chargeback Model: Traditional, e.g. static, user-owned physical servers	Dynamic chargeback based on actual, fine-grained resource alloc

Practical Considerations for Virtual Infrastructure in Cloud Environments

- Storage and Networks
- Resource Management & HA
- Administration & Provisioning Model
- Chargeback Model
- Performance Considerations
- Platform Choice Considerations

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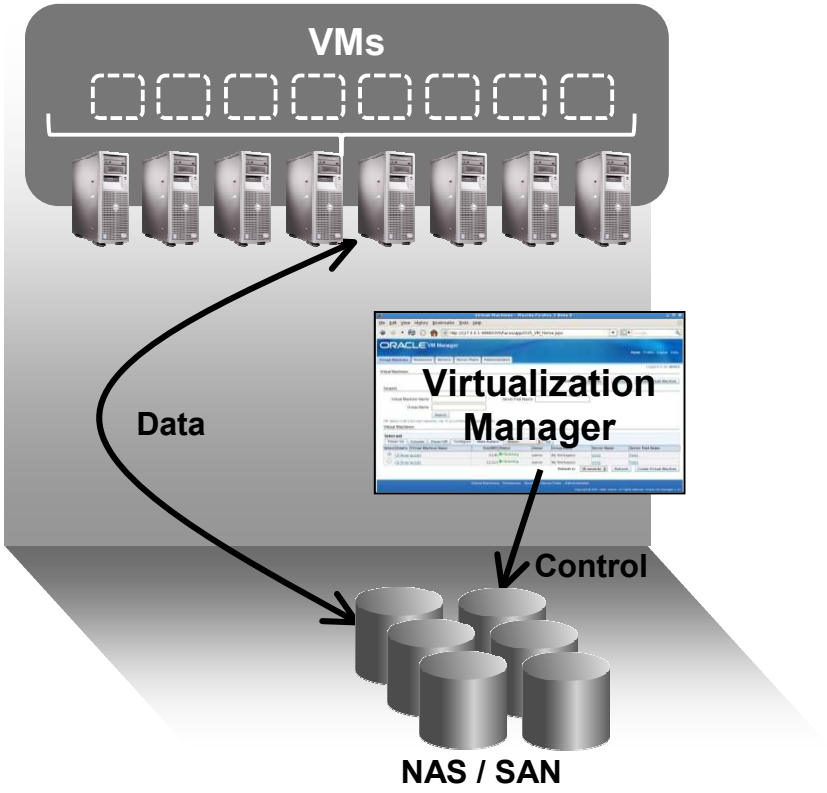
Storage & Network Challenges

- **Technical:** Storage & Network scaling one of the biggest challenges. Ideally…
  - Highly- and easily scalable & not overly sensitive to latencies due to locality
  - Accessible from "anywhere", yet…highly and easily secured
  - Allows (controlled) user self-provisioning (quotas, etc.)
  - Consider trade-offs between (simplistically…) file-based ease-of-use and performance-oriented SANs
- **Cultural:** Automated and/or self-provisioning of compute, network, and storage resources by a single actor is "scary"
  - Doesn't fit well in traditional 'silo'd' admin models
  - But need to work in this direction to get efficiencies

Integrated Management

Virtual and Physical Resources

- Many advanced storage features can make virtualization and Cloud much more efficient
- For example:
  - Native storage services, such as LUN creation, deletion, expansion, and snapshot
  - Execute thin provisioning to minimize storage utilization
  - Leverage existing investments in storage systems
- Need to access from virtualization management
- Examples: Oracle VM Storage Connect, Citrix XenServer StorageLink™, etc.



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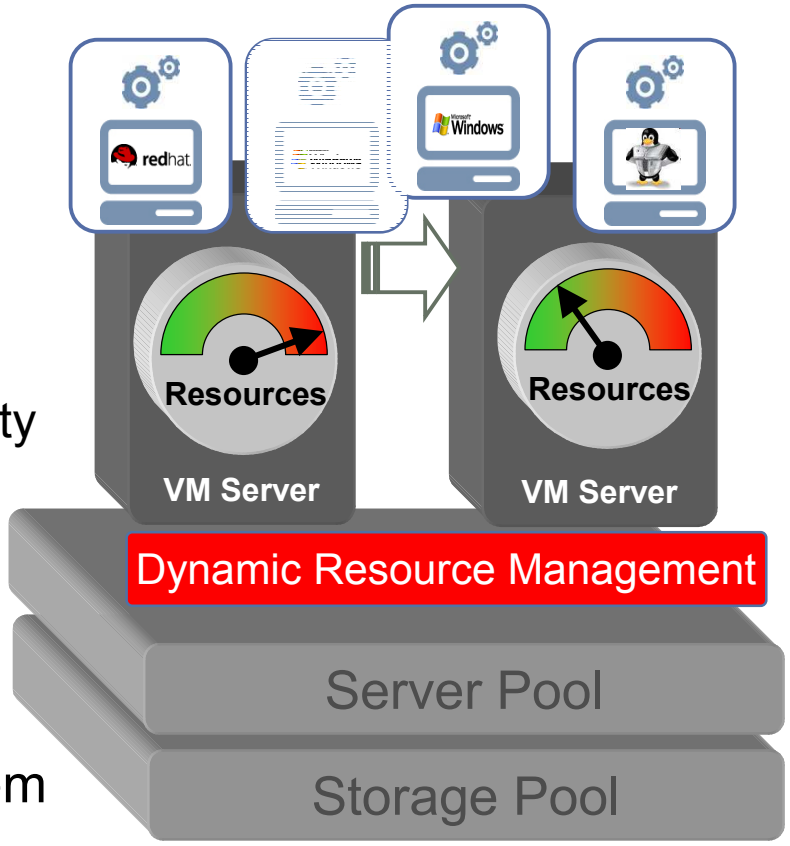
Dynamic Resource Management Critical

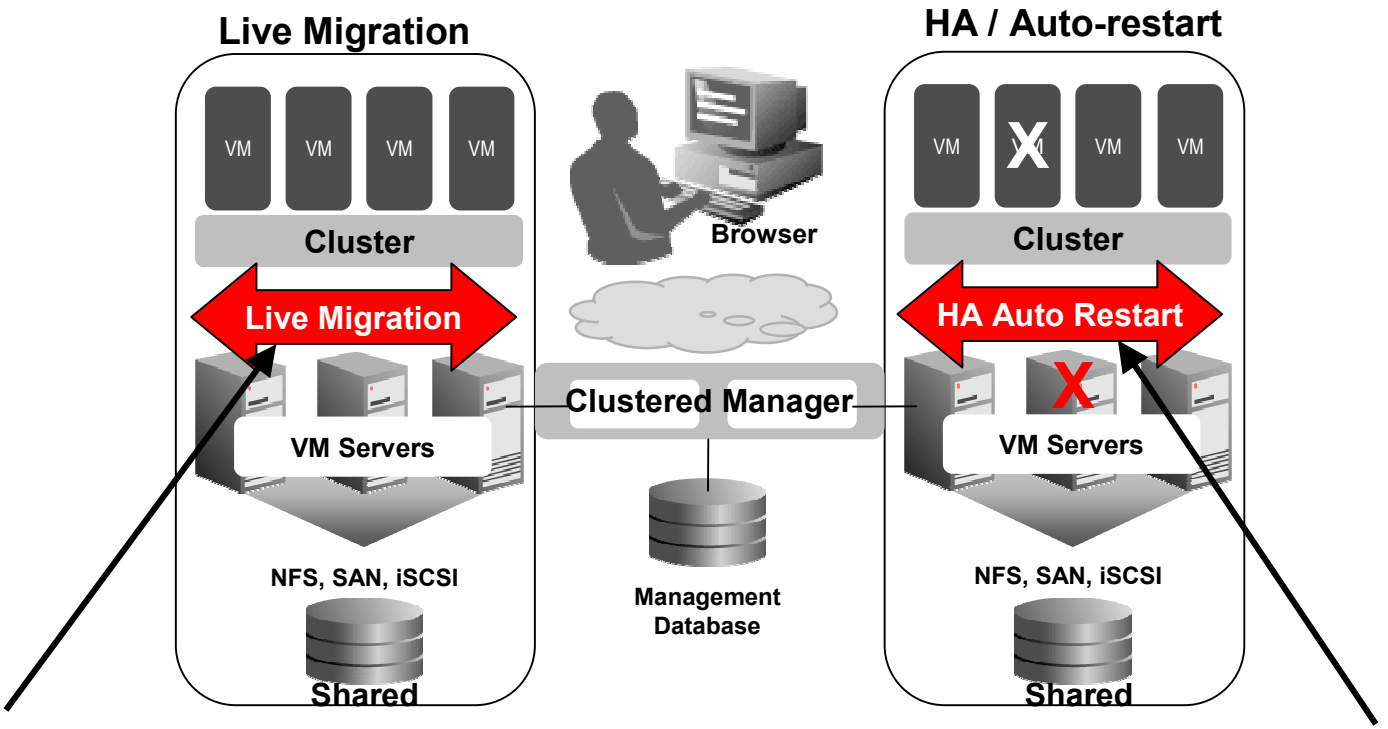
- Cloud's economic feasibility built on highly efficient use of people and physical infrastructure:
  - Automation required at this level
- Demands maximized economies of scale
  - Multi-plexing of demand peaks & valleys across large pools
  - Consistent environment across a wider infrastructure
  - But without compromising security or performance
- Demands rapid, repeatable, predictable, yet dynamic management of resources
  - Despite many highly variable 'local' environments
- Need policy-based resource management automation

Policy-Based Resource Automation

- Distributed resource scheduling for capacity management
  - Real-time monitoring of server utilization
  - Policy-based automation to rebalance Server Pool
    - Migrate load away from heavily loaded servers
    - Automatically powering up capacity as needed
- Benefits:
  - Lower operating costs per server
  - Increase admin:server ratios dramatically
  - Improve SLAs via “instant” problem detection and remediation
  - Higher resource utilization



Virtualization-Level VM HA Essential



Planned Events:

- E.g. maintenance or upgrades
- Secure Live Migration
- Zero interruption

Unplanned Events

- e.g. Server or VM failure
- HA Auto-restart in pool
- No manual intervention

- Outside the guest / non-intrusive: Works with any workload
- Quality of product implementation varies: from simple IP pings to full clusterware logic
- Note: Fault Tolerance promising but needs to mature for most use cases

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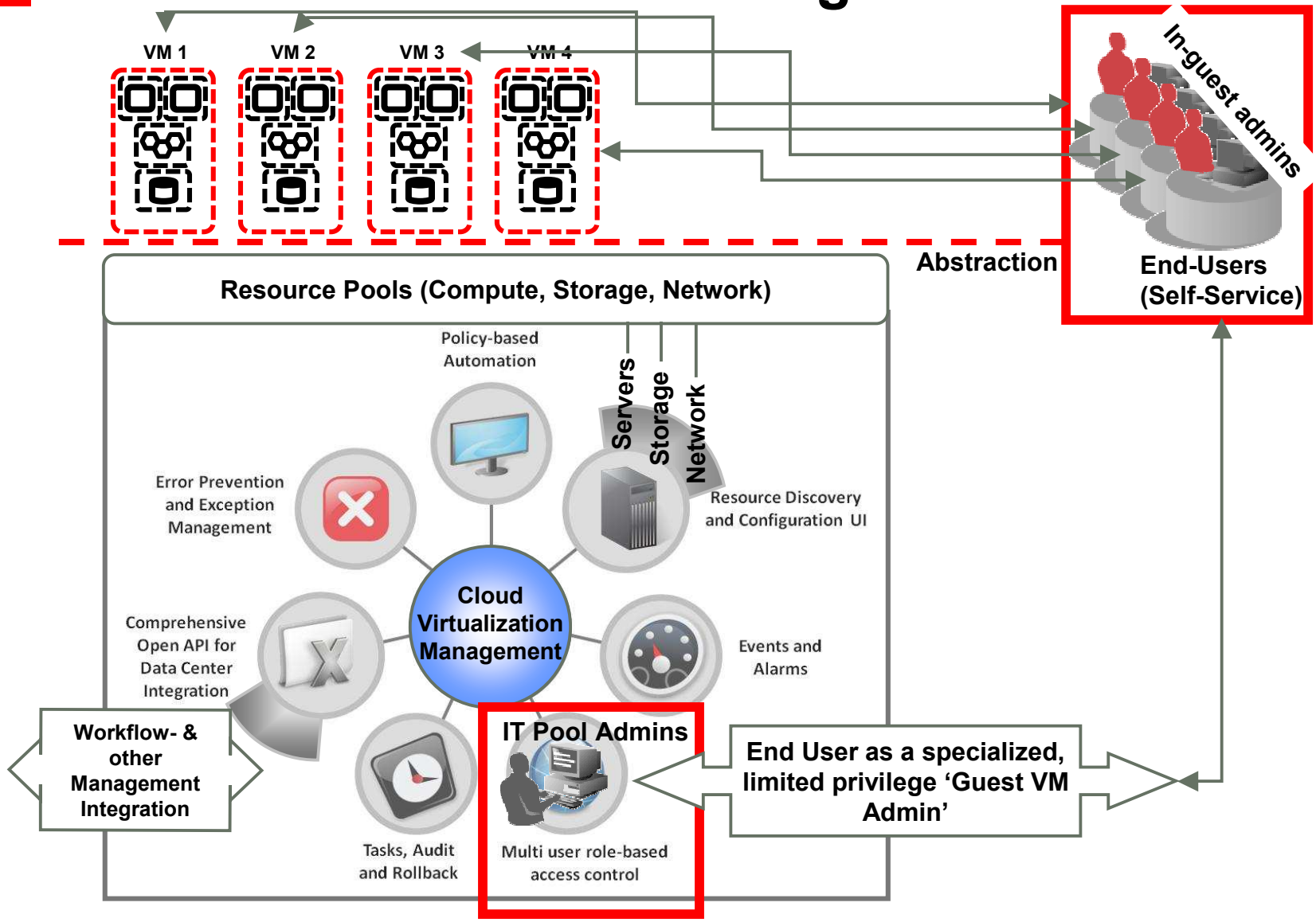
Evolving the Administration Model

- Three major changes to capitalize on Cloud
  - Evolution of traditional IT admin orientation:
    - From silo'd and reactive to process-oriented and pro-active
    - From discrete element oriented to pool oriented, e.g. server or storage "pool administrator"
    - Abstraction from workload enables focus on pool-level scalability
  - End-user self-service
  - Virtual appliances

Virtual Infrastructure Management



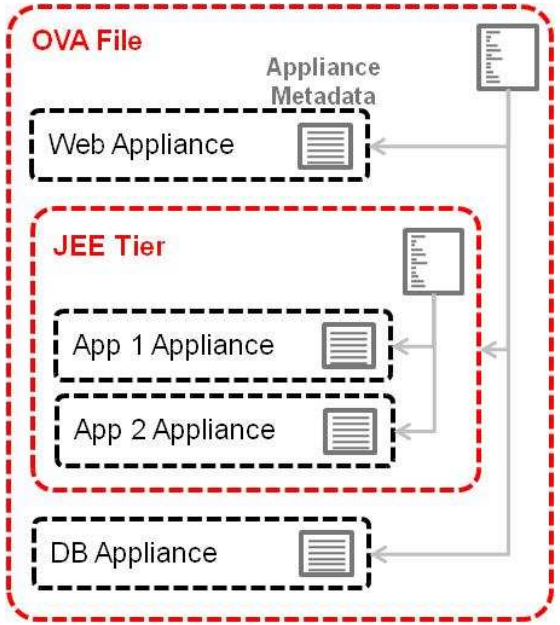
Self-Service: Blessing or Curse?

- End-user self-service
  - From “open ticket and wait” to “do it yourself”
  - Permits more agile/responsive business
  - Aligns admin labor costs more directly with business
  - Operational scalability
- But…
  - Need to control growth: VM sprawl a big threat
  - Lot’s of “zombie” VMs no longer needed/used
    - Consider “Time-bombs” and automated “garbage collection” of abandoned VMs
  - License management challenges
- However can be very powerful
  - Especially in connection with VM appliances

Virtual Appliances & Assemblies

Speed Deployments and Reduce Errors

- Appliances: Pre-configured virtual machines
  - Ready-to-run full product stack package
    - JeOS: pre-configured, small footprint, pre-tuned, pre-prepared
    - Application system disk(s) pre-installed
    - User-configurable /customizable at first boot
- Assemblies: multiple appliances
  - Multiple VMs to support composite apps
- Growing support for industry-standard OVF (Open Virtualization Format)
  - Standardized metadata about VMs (resources required, how to scale…)

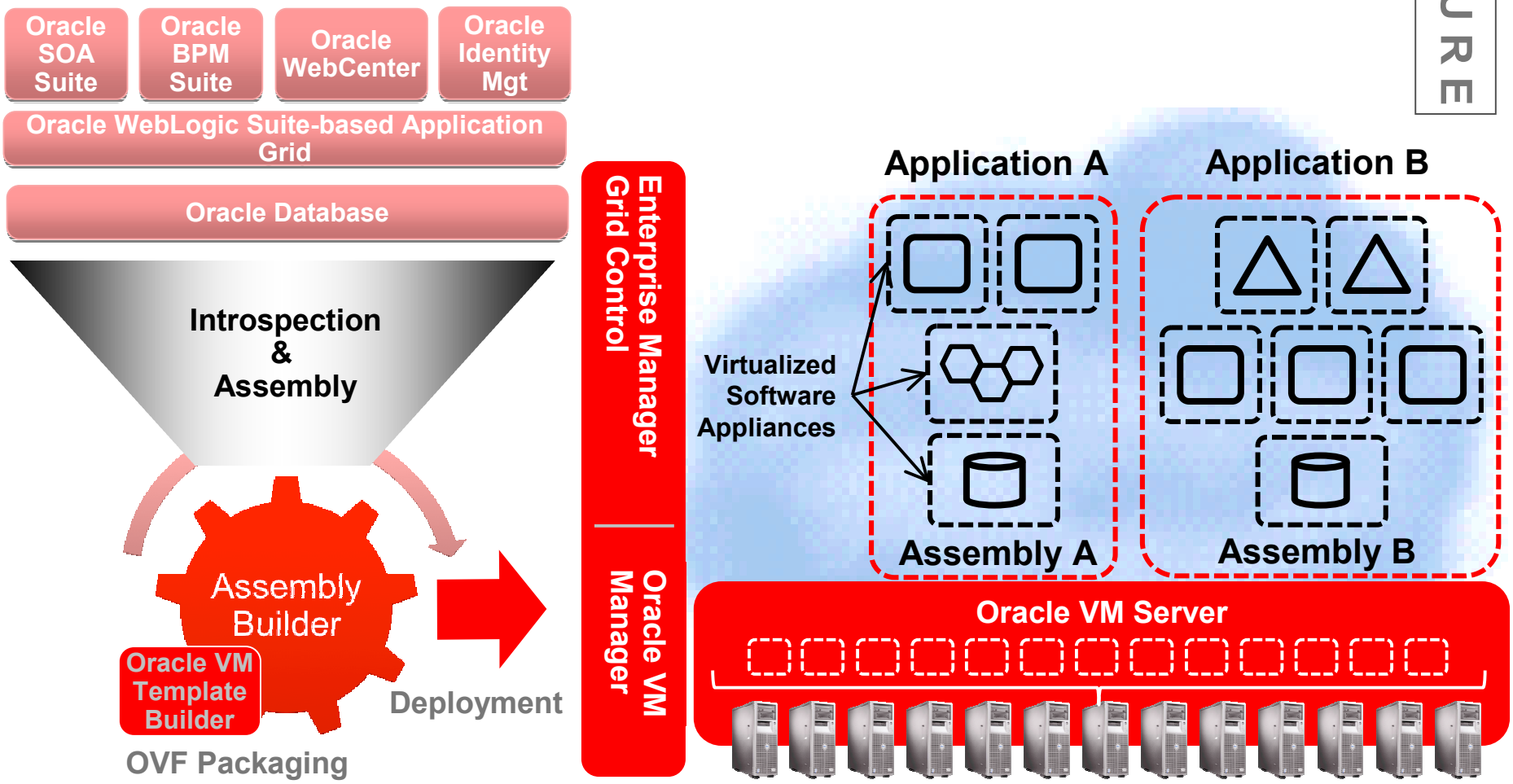


Ready-to-Run Assembly

Example: Oracle Assembly Builder

Full N-Tier Deployment and Management

FUTURE



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Chargeback:

Accurately Aligning Costs to User

- Can be layered on top of virtualization
  - But infrastructure must provide appropriate accounting stats: amount of resources, execution time, per VM, per user, etc.
  - Also to provision to appropriate granularity vs. charging units
- By using Clouds, users are transferring risks to IT
  - Risk of over- or under provisioning due to unexpected events or planning mistakes
  - Rates should appropriately reflect risk to encourage sensible risk management by users
- Units need to be simple, predictable, and transparent to users while clearly scaling with the benefits derived
  - User's still need to understand, budget, and forecast

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Performance: Consistency and Flexibility

- For general purpose cloud, want to have broadest support for diverse workloads
  - Can handle many different needs through “sm/med/lg” standard configs
  - Dev/test vs. production configs
  - I/O intensive vs. CPU intensive configs
- Think about locality of data to server
  - May rule out public cloud use for some
- Balance ease-of-operations vs. max. performance
  - File- vs. FC SANs…
  - Virtualized I/O vs. Direct I/O…
  - Shared-mem / overcommit or not
- In general, VMs very memory hungry

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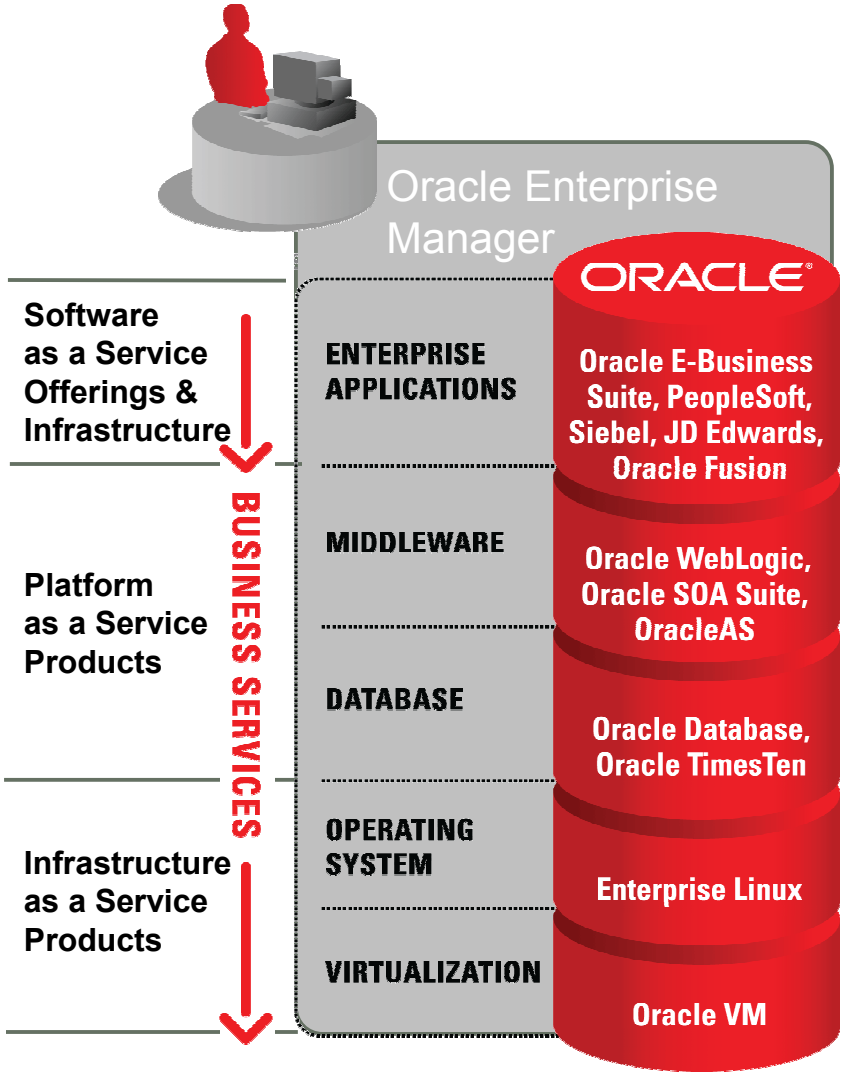
Xen Platforms Dominate Clouds Today

- Most public clouds built on Xen-based products today:
  - Important if you need interoperability, e.g. public-private migrations and/or “cloud-bursting” hybrid models
- **Economics**: Low/no license expense: faster profitability
- **Performance**: Best architecture for the broadest workloads
- **Open**: Easy to customize and integrate
- **Mainstream support**: Rapid, easy availability of drivers for just about anything
- **Interoperable**: Open interfaces and APIs plus a common codebase simplifies development efforts
- **Momentum**: Many large contributors, lots of reference sites
- **Industry Initiatives**: OVF, CIM, Xen Cloud Project (XCP)
- XCP aims to iron-out existing differences across various Xen product offerings to make interoperability more seamless
- VMware and others have also initiated public cloud programs

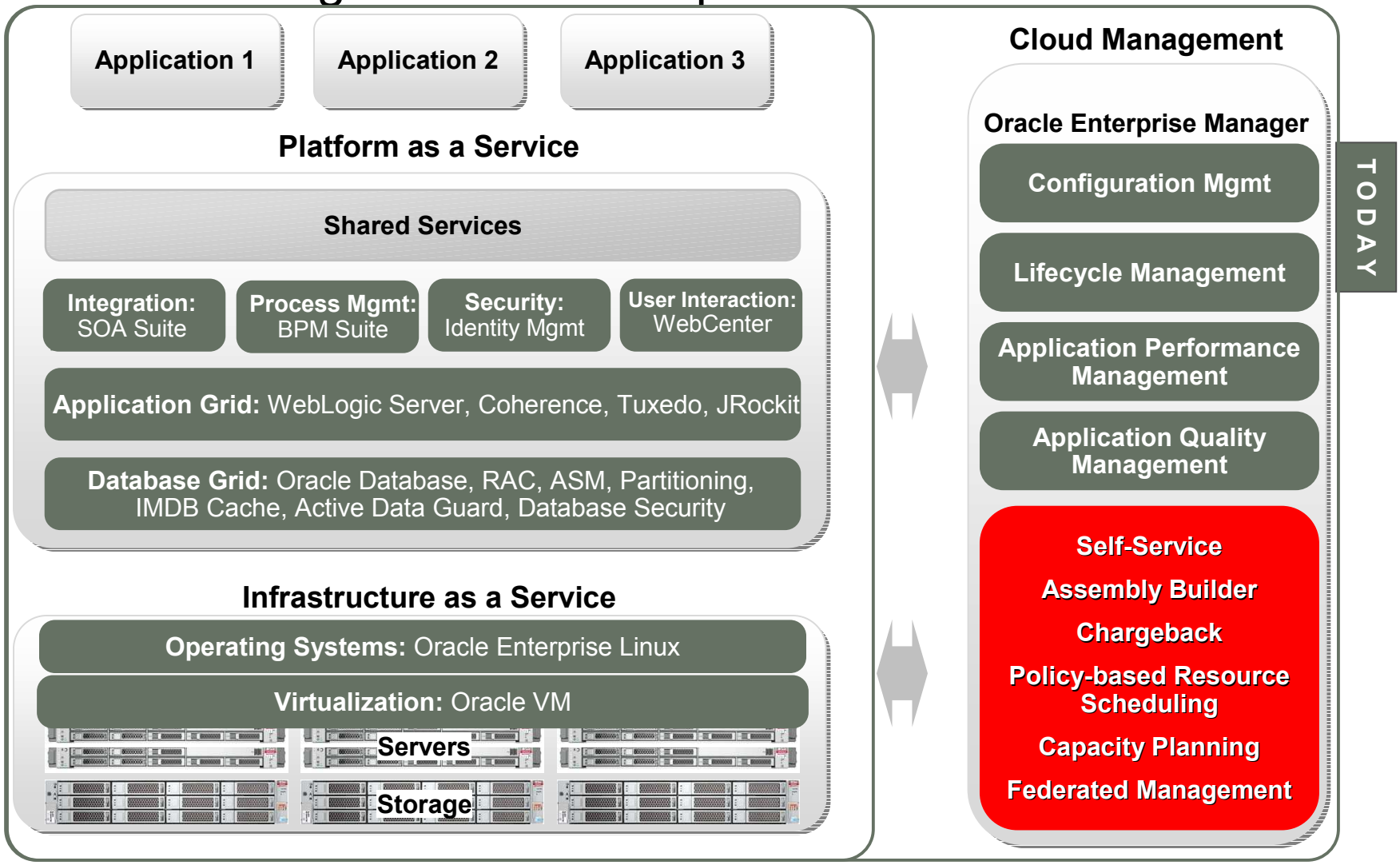
Virtualization from Oracle Today

- Oracle is the only vendor to provide an integrated “full-stack” management solution
  - Virtualization *and* enterprise workloads managed together
  - Management solution for private- and public cloud providers
- End-to-end provisioning and management of enterprise application workloads
  - GUI & APIs for bare-metal provisioning of physical servers to guest creation, deployment, & management
  - Virtual appliances with Oracle VM Templates and Oracle Assembly Builder



Oracle Enterprise Manager Grid Control

Cloud Management Roadmap



Summary

- Economics matter: fundamentally about efficiency
- Cloud drives new efficiencies via advances in modularization, scale, and automation
- Improving server:admin ratios keeps management costs down in the face of explosive VM growth
- Don’t neglect the process components of change which will be difficult but necessary
- Look for virtual infrastructure that provides the foundation required for cloud computing

More Sessions: Oracle @ CLOUD COMPUTING CONFERENCE & EXPO

Sessions

Day 1 – Nov 2 3:25 – 4:10pm	Unlocking the Cloud with Enterprise Private PaaS Mohamad Afshar, Sandeep Banerjie, Chris Cassidy	Track 1
Day 1 – Nov 2 6:35 – 7:20pm	Cloud Computing Drives Real World Enterprise IT Value Rani Urbas, Director, Product Strategy	Track 1
Tues – Nov 3 **4:50 – 5:35pm**	Virtual Infrastructure: What Is Required for the Cloud **Adam Hawley, Director, Product Management**	Track 6
Weds – Nov 4 **7:30 – 8:15am**	Cloud Computing: Separating Hype from Reality **Richard Sarwal, SVP Development**	Keynote
Weds – Nov 4 **8:20 – 9:05am**	The Enterprise Private Cloud – From Infrastructure to Applications **Sudip Datta, Sr. Director Product Management**	General Session

Exhibits

Day 2 – Nov 3 **10:00 – 12:00n, 3:00 – 5:00pm, 7:15 – 8:45pm** Day 3 – Nov 4 **10:00 – 12:00n, 2:30 – 4:30pm**	▪ Oracle Private PaaS ▪ Oracle Cloud Management ▪ Oracle in Public Clouds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