ORACLE

From Desktop to Data Center - Oracle Virtualization

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The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.

Desktop To Data Center Virtualization

- **Most complete virtualization offering**
  - **Storage, Server, Desktop**
  - **Linux, Solaris, Windows**
  - **x86/x64, SPARC**
- **Integrated management**
  - **“Application to Disk”**
- **Single point of support**
- **Fully tested and integrated with enterprise apps**
  - **Rapidly deploy and manage apps**
- **In the “cloud”**

Industry's Most Complete Virtualization Portfolio

STORAGE VIRTUALIZATION

- Oracle Exadata
- Oracle Automatic Storage Management
- Oracle VM Storage Connect
- Open Storage

SERVER VIRTUALIZATION

- Oracle VM Server for x86
- Oracle VM Server for SPARC
- Oracle Solaris Containers
- Dynamic Domains

DESKTOP VIRTUALIZATION

- Oracle Virtual Desktop Infrastructure
- Sun Ray Clients
- Oracle Secure Global Desktop
- Oracle VM VirtualBox

Desktop to Data Center Virtualization

- **Virtualization offers key cost savings benefits**
  - Server consolidation
  - Lower energy, facility and labor costs

- **Oracle's virtualization strategy offers much more:**
  - Most comprehensive desktop to data center product portfolio
  - Integrated management of the full hardware and software stack from applications to disk
  - Integrated support

Thin Client - Sun Ray

The Thinner, The Better

Lower Complexity Helps Reduce Cost

PC

Local Apps,
Local OS,
Memory, CPU,
Hard Drive

Embedded OS thin client

Local Apps,
Local OS,
Memory,
CPU

Sun Ray client

Nothing to Manage!

New Sun Ray 3 Series Clients

Next Generation Thin Clients

- Sun Ray 3, 3+ and Sun Ray 3i
- Energy Efficient:
  - As low as 6 watts consumption
  - Up to 98% recyclable
  - EPEAT Silver + Energy Star 5.0 Qualified
- Integrated 21.5 inch HD 1920 x 1080 on Sun Ray 3i
- Support 1920 x 1200 on Sun Ray 3
- 5 USB 2.0 ports
- Gigabit Ethernet
- Completes our Sun Ray 3 line-up

ORACLE®
VIRTUALIZATION

Sun Ray Technology

Sun Ray 3 Product Family

- Choice
- Security
- Manageability
- Reliability
- Mobility
- Value
- World-class Windows Desktop

Choice

- Windows, Linux or Oracle Solaris virtual desktops
- x64 or SPARC servers
- Installs on Oracle Solaris, and Oracle Linux

Manageability

- Centrally-deployed applications
- No local install, updates, or patches
- No local OS management
- No local memory upgrades
- Plug-and-go clients

Security

- No local data (corporate, intellectual property protection)
- Data is never cached and never leaves the server
- No local harddisk or writable flash memory
- No viruses, spyware, worms or local operating system
- Smart card enabled for 2-factor authentication
- Integrated VPN

Reliability

- Applications and data are centrally managed and backed up
- Included fail-over and load balancing capabilities
- HW mean time before failure 200,000 hours or about 22 years(1)
- Solid state; no moving parts
- Long product lifecycle means less money and less waste in landfills

Mobility

- Unique hot-desk architecture
- Secure LAN and WAN mobility
- Global access

World Class Desktop

- Full screen Windows desktops on Sun Ray clients
- Windows Server, Windows Vista, Windows XP Professional or Windows 7
- Two-factor smart card authentication to Windows
- Hot desk Windows sessions between devices
- RDP-based, excellent performance
- Adding RDP-7 enhancements

Software Client

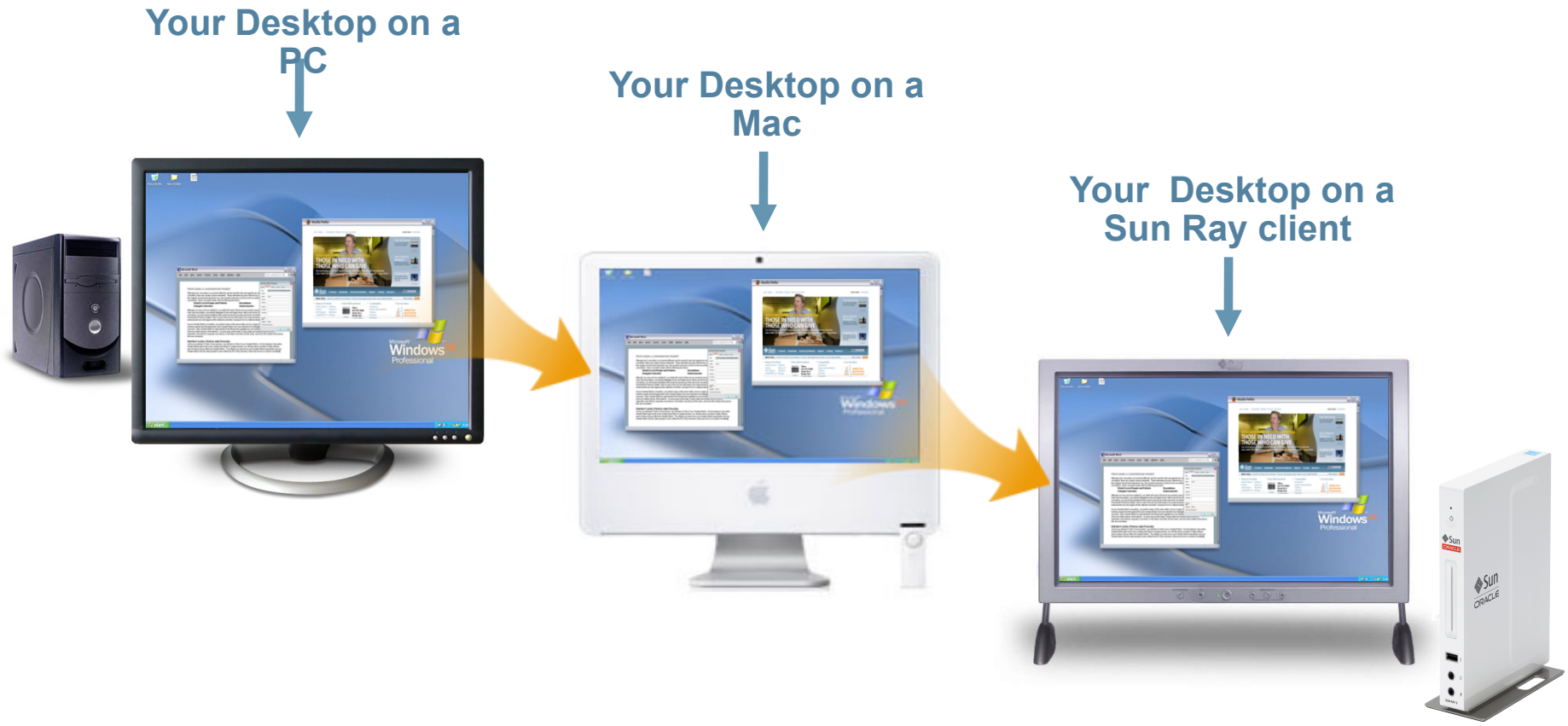
- Sun Ray Software includes a software client that provides access to centralized virtual desktops from Oracle's desktop virtualization portfolio
  - Installs on common client operating systems
  - Provides connectivity to same OS environments as Sun Ray hardware clients
  - Administrators control access privileges
  - No additional cost, included with Sun Ray Software
  - Use existing desktops as thin clients as you move to VDI

Software Client Features

- Drop-in compatibility with Sun Ray clients
  - Windows, MacOSX and Linux client
  - Uses Sun Ray ALP protocol
  - Access Windows, Oracle Linux, and Oracle Solaris desktops
  - View streaming video at native frame rates
  - Watch Adobe Flash video at native frame rates
  - Seamlessly access your live desktop session from any supported device
  - Work in fullscreen or windowed mode, working alongside your local desktop

Oracle Virtual Desktop Infrastructure (VDI)

Oracle Virtual Desktop Infrastructure

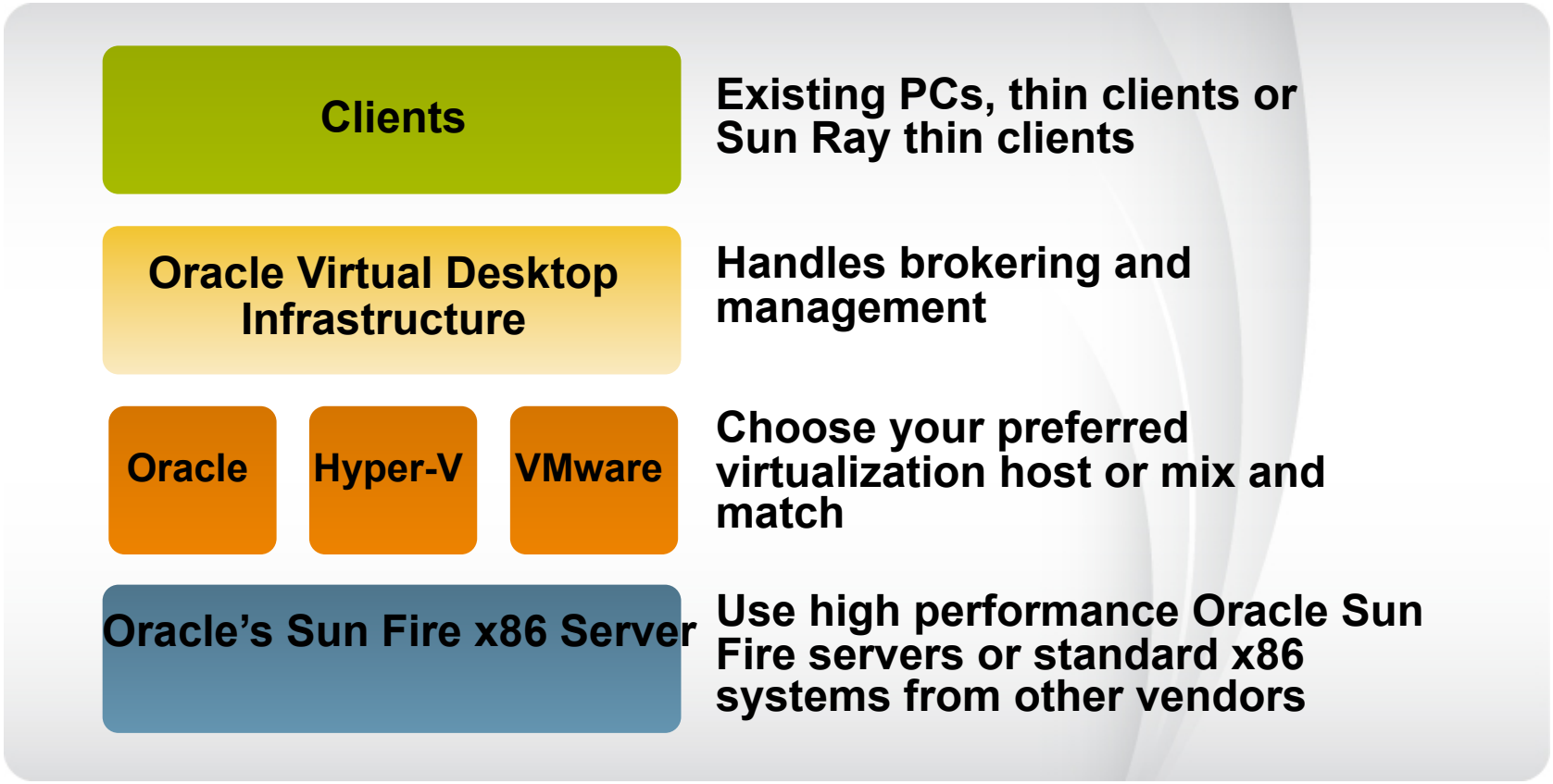


Oracle Virtual Desktop Infrastructure

- Virtual desktop access, brokering, and hosting
- Provides a highly manageable desktop environment for IT and a productive desktop environment for end users
- Enables a choice of virtualization host platforms (Oracle built-in, Microsoft Hyper-V, & VMware vSphere)
- Built-in support for Sun Ray clients or use nearly any modern PC
- Enables virtual desktops based on Windows, Oracle Linux, Ubuntu, SUSE Linux Enterprise Desktop
- Consumes dramatically less storage than previous solutions and increases performance of virtual desktop cloning
- Simple Active Directory and LDAP integration

Open Architecture for Choice and Flexibility

Basic Architecture



Top 5 Cool Features

1) Mix and match Oracle built-in, Microsoft Hyper-V, & VMware hypervisors in the same deployment

2) Generate virtual desktops with Windows Remote Desktop Services and manage VDI & server-based computing desktops from the same interface

3) Instant virtual machine cloning

4) Hotdesk virtual desktop sessions between Sun Ray clients and existing PCs

5) Choose your favorite OS for virtual desktops: Windows, Oracle Linux, Ubuntu or SUSE Linux Enterprise Desktop

Oracle Virtual Desktop Infrastructure (VDI)

Server Hosted Desktops

Oracle Desktop Virtualization

Virtual Desktop Infrastructure Software

- VDI style desktops to users on any client device
- Brokering, management, hosting, and access all-in-one

Secure Global Desktop Software

- Presents applications and data residing on nearly any server, any OS to nearly any client device or virtual desktop
- Highly secure, remote access

Sun Ray Thin Clients

- The highest security endpoint device for a Windows, Linux or Solaris desktop
- Outstanding mobility with integrated smart card session access

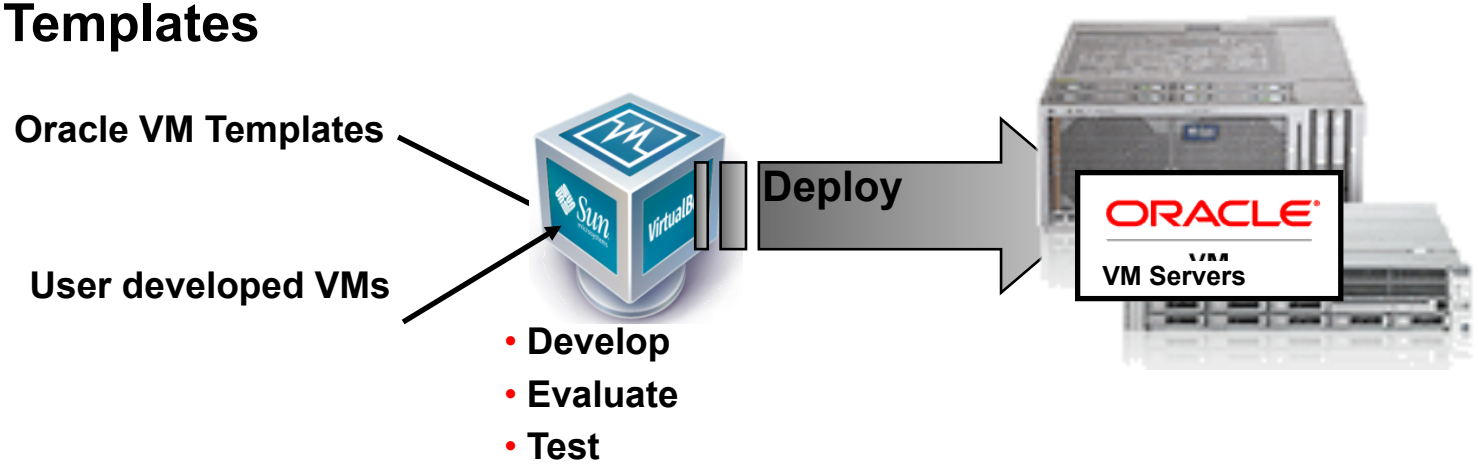
Oracle VM VirtualBox

Oracle VM VirtualBox Workstation

- Support for x86/x64 hardware
- Support for Solaris, Linux, Windows, Mac OS hosts and guests

Roadmap:

- Oracle VM x86 / x64 Server and VirtualBox workstation VM interoperability
- Oracle VM VirtualBox workstations to support running Oracle VM Templates



Oracle VM Server

Oracle VM Server Virtualization

- High performance 86 and SPARC (CMT) virtualization
- Virtualization solution for both Oracle and non-Oracle applications
- The only server virtualization software supported and certified for all Oracle software

ORACLE VM

Enterprise-quality support

Real-world deployment testing

Risk-free virtualization

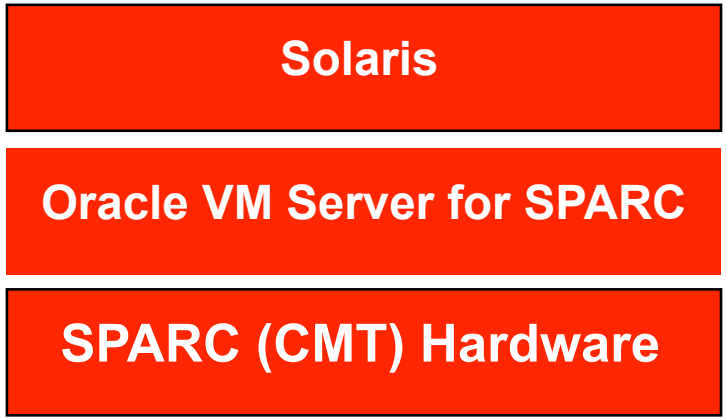
Oracle VM Server for SPARC 2.0

Advanced Virtualization For SPARC T3 Servers

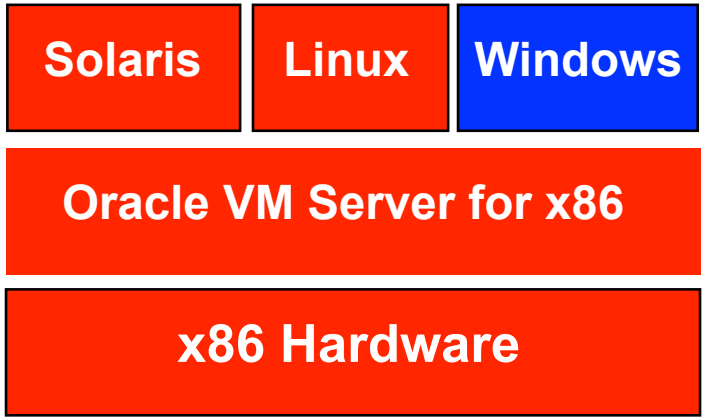
- **PCIe Direct I/O**
  - Native throughput for guest domains
- **Dynamic memory reconfiguration**
  - Grow and shrink domains as required
- **Throttle CPUs and memory based on utilization**
  - Reduce power consumption
- **Set system power limit**
  - Automatically reduce power state for system resources if the limit is reached

Oracle VM Server Virtualization

Platform Choice & Flexibility



- Evolution of Solaris Logical Domains; Integration with Oracle VM family
- Highly efficient hypervisor for Sun Chip Multithreading (CMT) servers
- Multiple, independent Solaris OS instances



- High performance hypervisor for x86/x64 architecture
- Supported guests: Linux, Windows, Solaris

Solaris Server Virtualization

Complete Portfolio Meets Broad Enterprise Demands

Oracle Solaris Containers

- Available for all Solaris – x86/x64, SPARC CMT, M-Series
- Native, bare metal performance
- High SMP scalability
- Consolidate older Solaris versions

Dynamic Domains

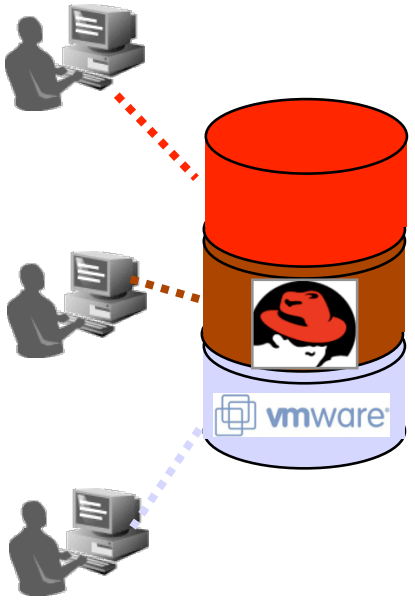
- Available for M-Series
- Highest isolation – dedicated hardware
- Bare metal level performance & high SMP scalability
- No software single point of failure
- Run multiple OS versions on the same system

Committed to continued development and support

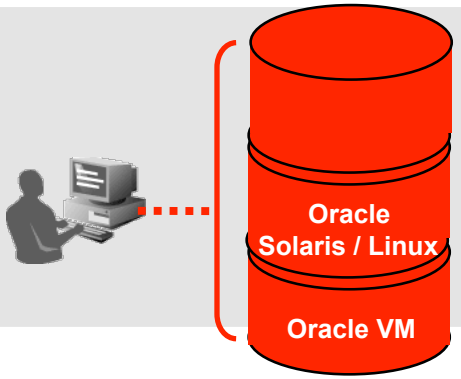
Oracle VM Support

Full-Stack Knowledge

- Compute platform issues a complex interaction of OS, virtualization, and drivers
- Can be challenging to isolate between these layers, particularly in a multi-vendor environment
  - Resolution may require involvement from each vendor
  - Multiple “round-trips” for information to every vendor to resolve



- Oracle VM and Oracle Solaris/Linux: One company to call for full-stack support
  - Vs. one for virtualization, one for OS, one for app…
- Minimized resolution time, maximum uptime



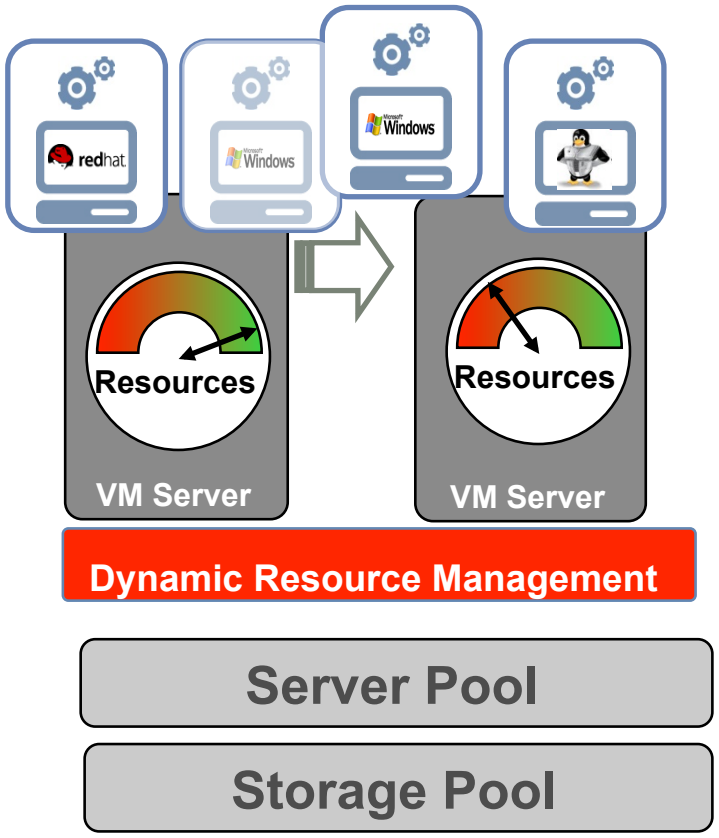
Oracle VM Roadmap

- Oracle VM 3.0
  - Incorporation of Virtual Iron technology
  - Dynamic resource management
  - Dynamic server power management
  - Powerful integration APIs: open, comprehensive and scriptable
  - Rich, dynamic management console
  - Centralized, advanced storage and network configuration

- Oracle VM Server for SPARC
  - Integration of Logical Domains in the Oracle VM family
  - Management via Oracle VM Manager
  - Storage Connect advanced storage management
  - Live migration

Policy-Based Resource Automation

- Distributed resource scheduling (DRS) 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
- Distributed Power Management (DPM) to optimize server pool for minimal power consumption
- Benefits:
  - Lower operating costs per server
  - Increase admin:server ratios dramatically
  - Improve SLAs via “instant” problem detection and remediation
  - Higher resource utilization



Integrate with Oracle VM

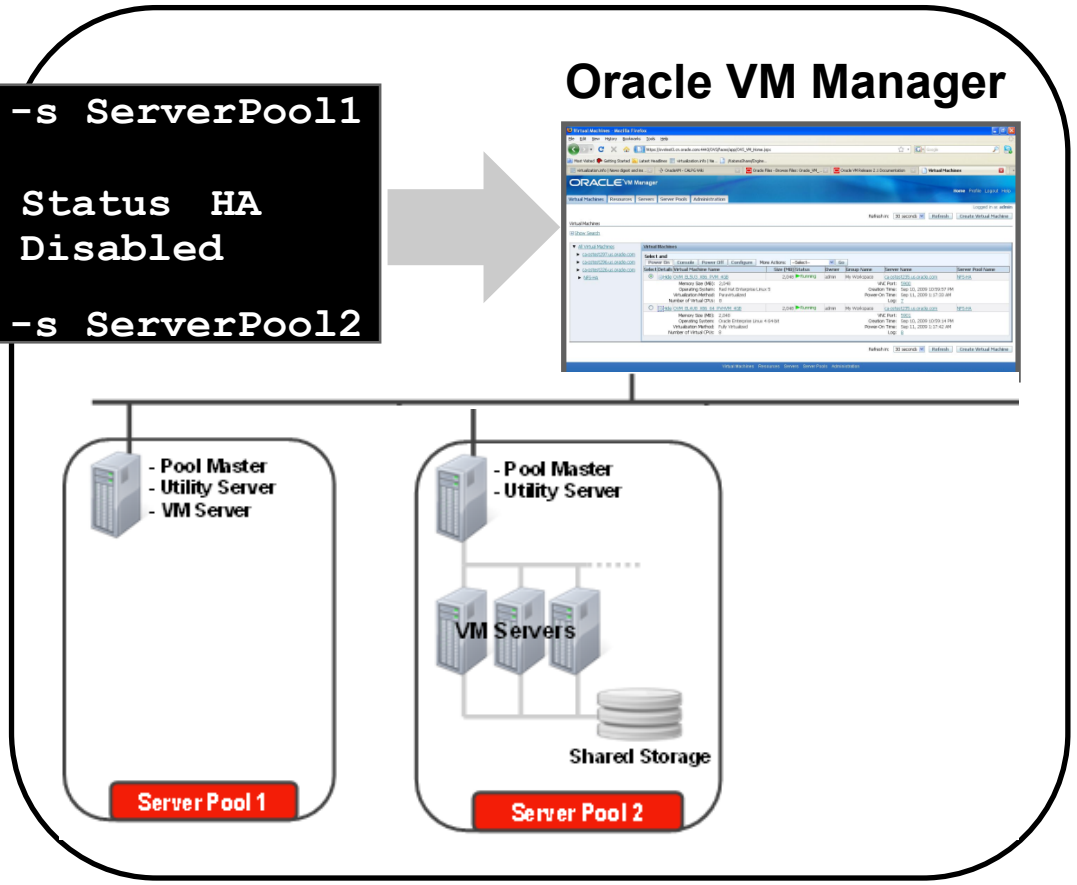
Oracle VM Manager CLI and Web Services API

```
ovm>serverpool_create -s ServerPool1
ovm> serverpool_list
Server Pool Name        Status  HA
ServerPool1     Active  Disabled

ovm>serverpool_create -s ServerPool2
```

Partner product integrations

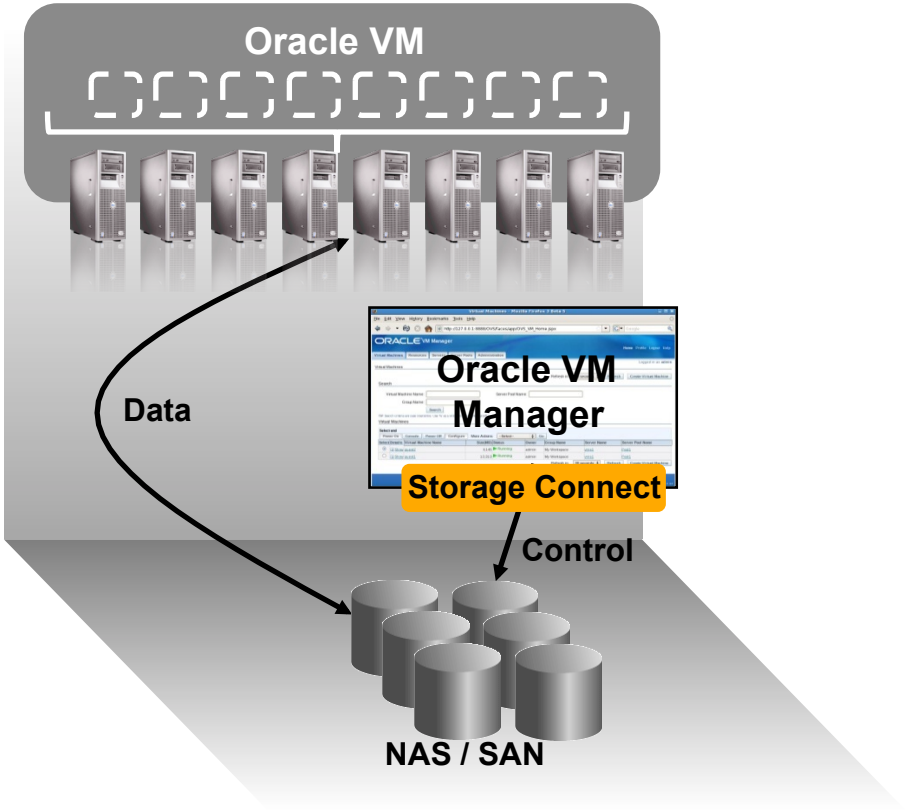
Custom integrations



- Full CLI & API
- Equivalent to GUI
- Easy integration with 3rd parties
- Easy integration with custom automation, scripts, etc.

Oracle VM Storage Connect Framework
Integrated Server and Storage Management

- Integrated virtualization and storage management for Sun and 3rd party storage via a common interface
- Storage provisioning and discovery API for Oracle VM 3.0
- Leverage all the resources and functionality of existing storage systems in the Oracle VM environment.
- Reduce cost and complexity in virtual and cloud environments.



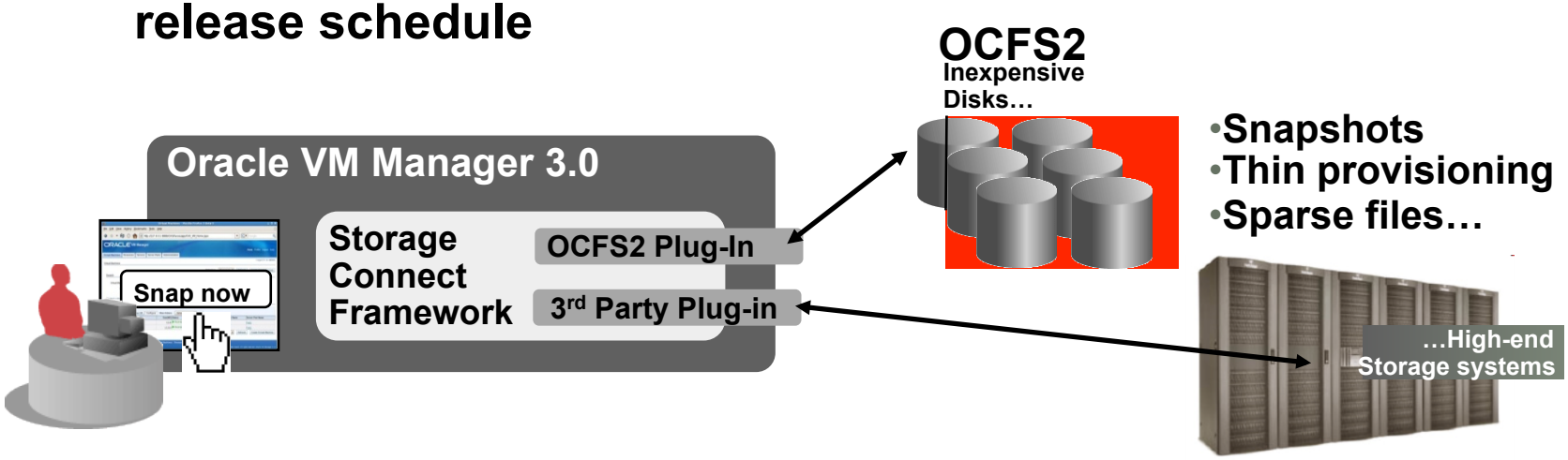
More choice for users, an open ecosystem for partners

Storage Management: Enabling Better Choices

Oracle VM Storage Connect Architecture

FUTURE

- Manage all types of storage from Manager (NFS, OCFS2, iSCSI, FC/SAN)
- Use advanced storage features of OCFS2 or directly leverage 3rd party storage system capabilities
- Allows use of advanced "intelligent" devices or more basic, lower-cost devices with OCFS2
- Storage management updates independent of Oracle VM release schedule



Oracle VM 2.2: In a Word…Performance

Feature	Benefit
Update to Xen 3.4 hypervisor with support for hardware assisted paging (Intel EPT / AMD RVI), etc.	Performance: Significant performance improvements for hardware virtualized guests such as Microsoft Windows
Update to dom0 kernel: OL 5.3 base	Performance: Updated driver support for the latest hardware
Support for the Intel® Xeon 5500 Series CPU (code named Nehalem) and AMD Opteron “Istanbul” features.	Performance: Significant advances in virtualization support for hardware virtualized guests
OCFS2 filesystem 1. 4 support	VM creation speed: Permits sparse file creation, deployment, and cloning of VMs
Server Pool Master auto fail over / HA	Availability: no single point of management failure
Shared storage and cluster configuration scripts	Ease-of-installation: reduce set up complexity

The New, Combined Oracle VM

Oracle VM 3.0

FUTURE

Dynamic Management and Automation

Improved network and storage configuration

Top-down full stack management

- Dynamic management and automation
- Capacity and power management
- Open, comprehensive and scriptable API
- Improved ease of use
- Richer, dynamic html UI
- Comprehensive job and event tracking
- Centralized, automated network and storage configuration
- Pool-level bridging, bonding, multi-pathing
- Storage Connect plug-ins for GUI access to advanced 3rd party functionality
- Snapshots, thin provisioning / cloning
- Enhancements to Oracle VM Templates to easily deploy multi-tier Oracle and non-Oracle software

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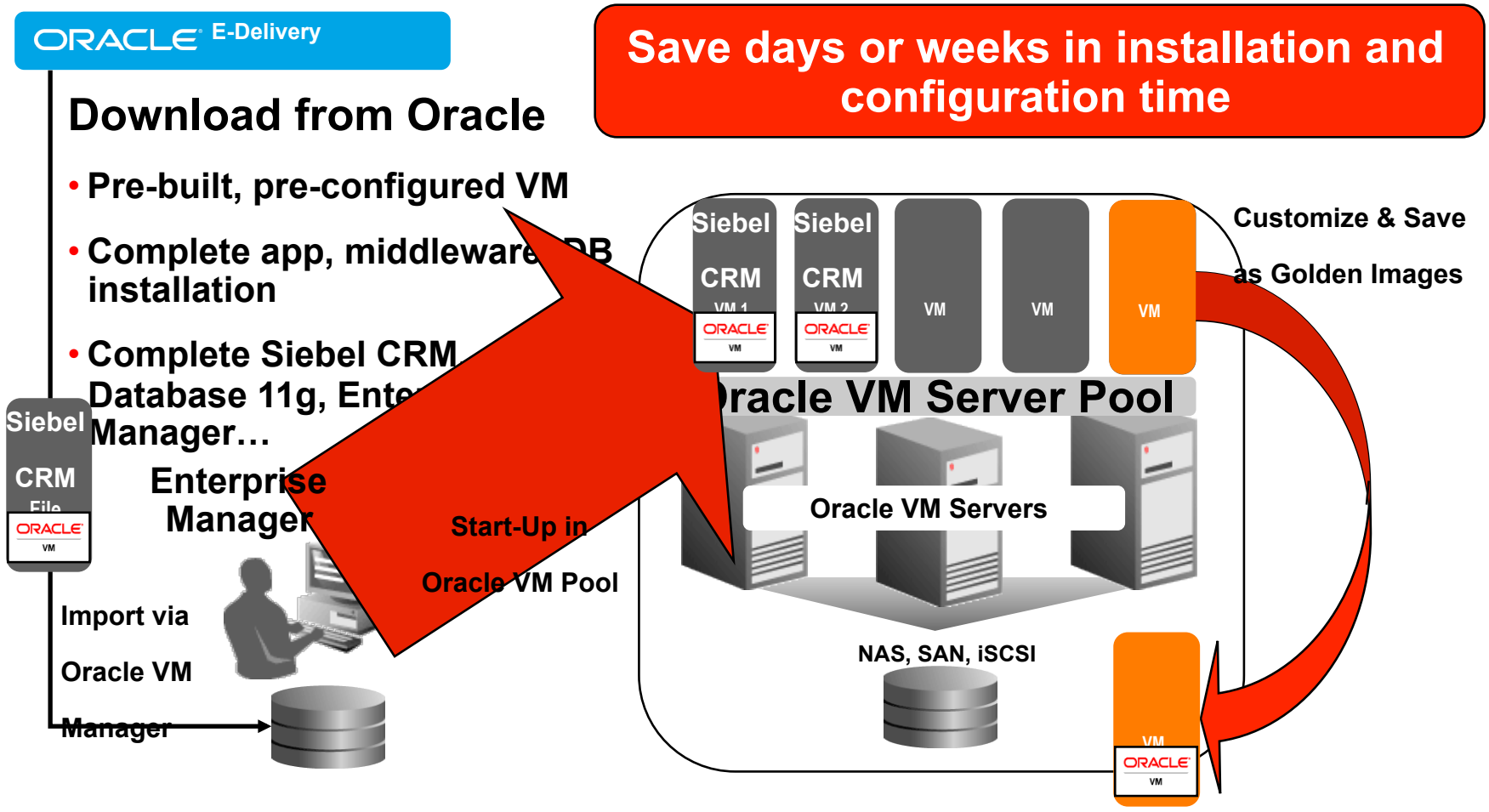
Oracle VM Templates

Rapid Application Deployment

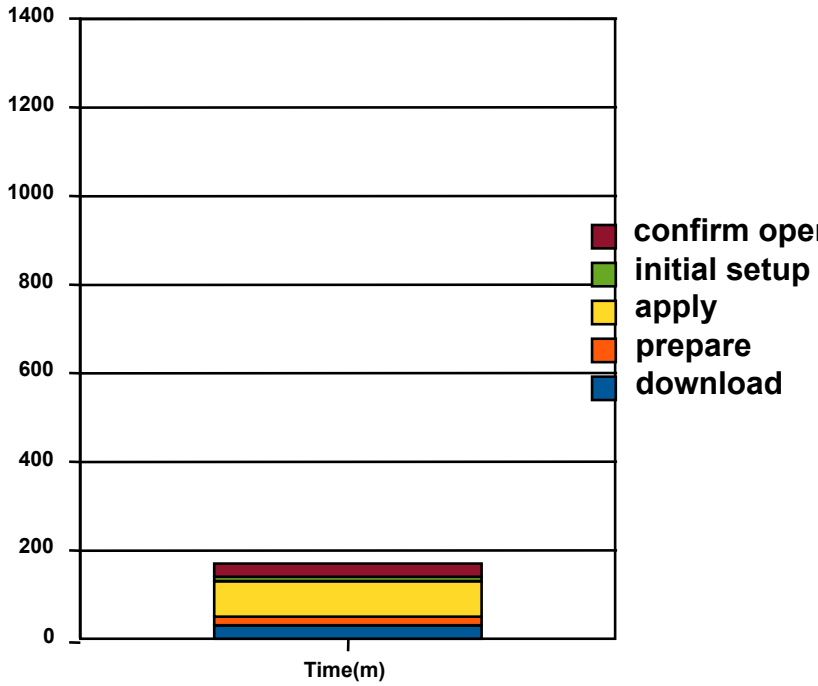


Oracle VM Templates Save Time

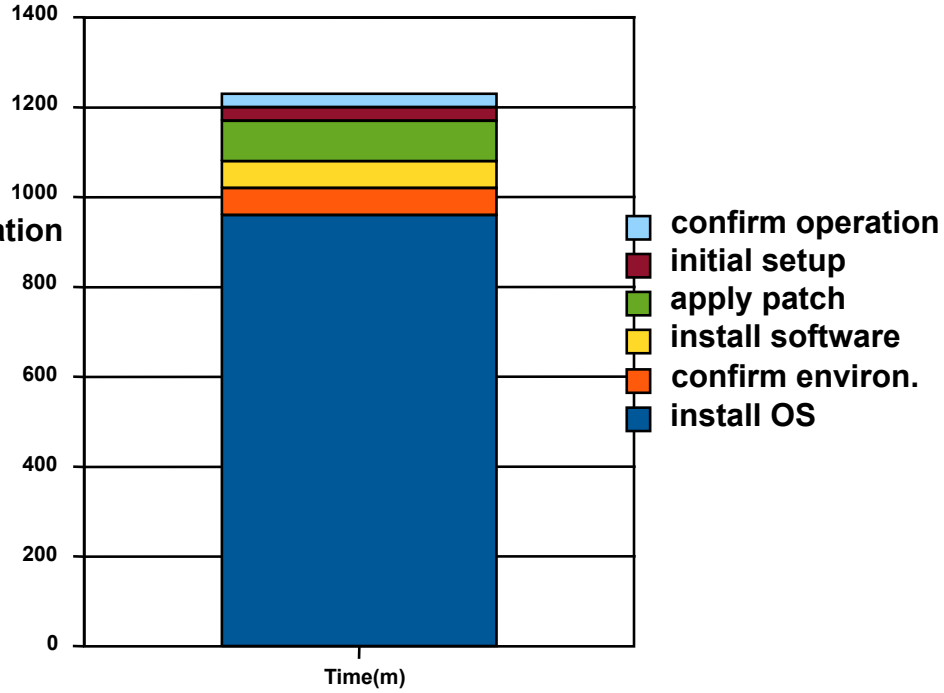
Templates enable the set up of applications within Oracle VM partitions by using scripts that pre-set many of the necessary settings to run within a virtualized environment.

- **Implementation time for using Oracle VM Templates**
  - ✓ **Required only 1/6 of the usual time required for set up a major reduction in man hours.**

Using Oracle Enterprise Manager Templates



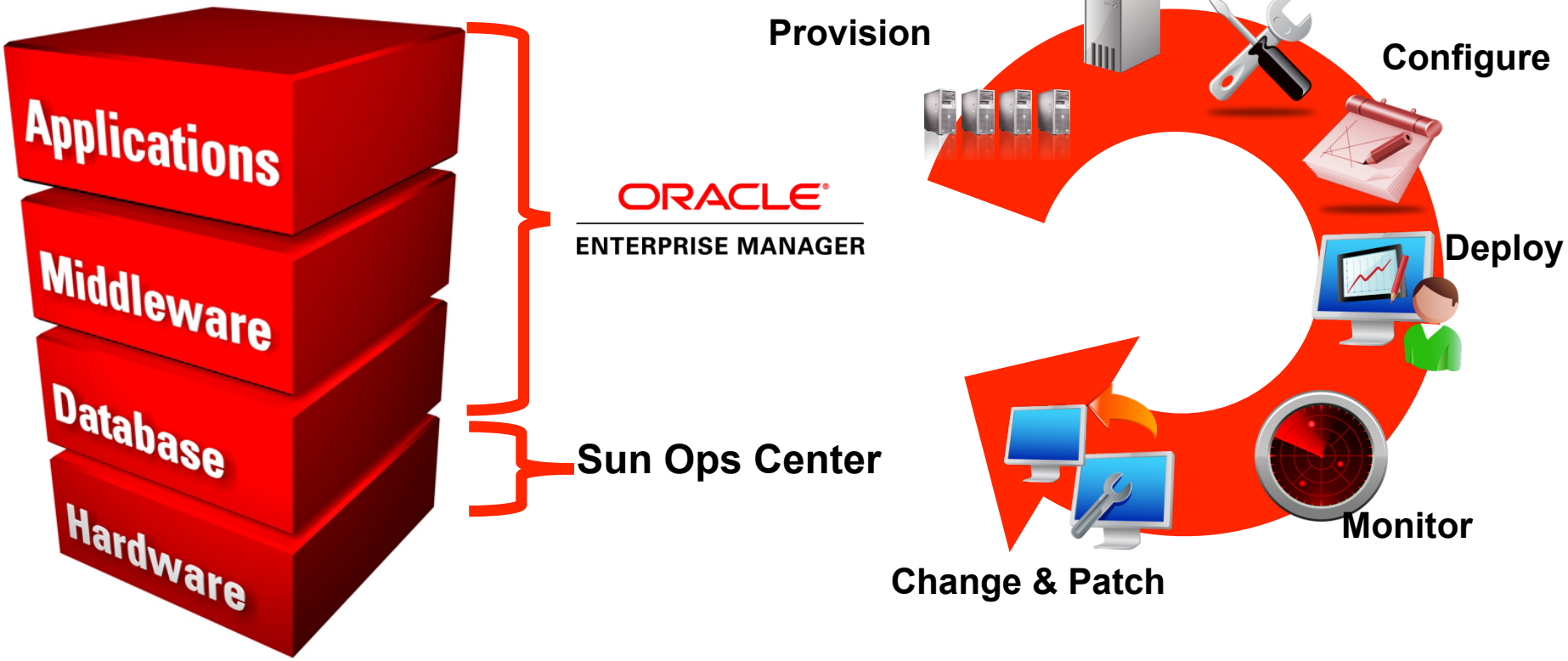
Using normal physical environment



Management Products

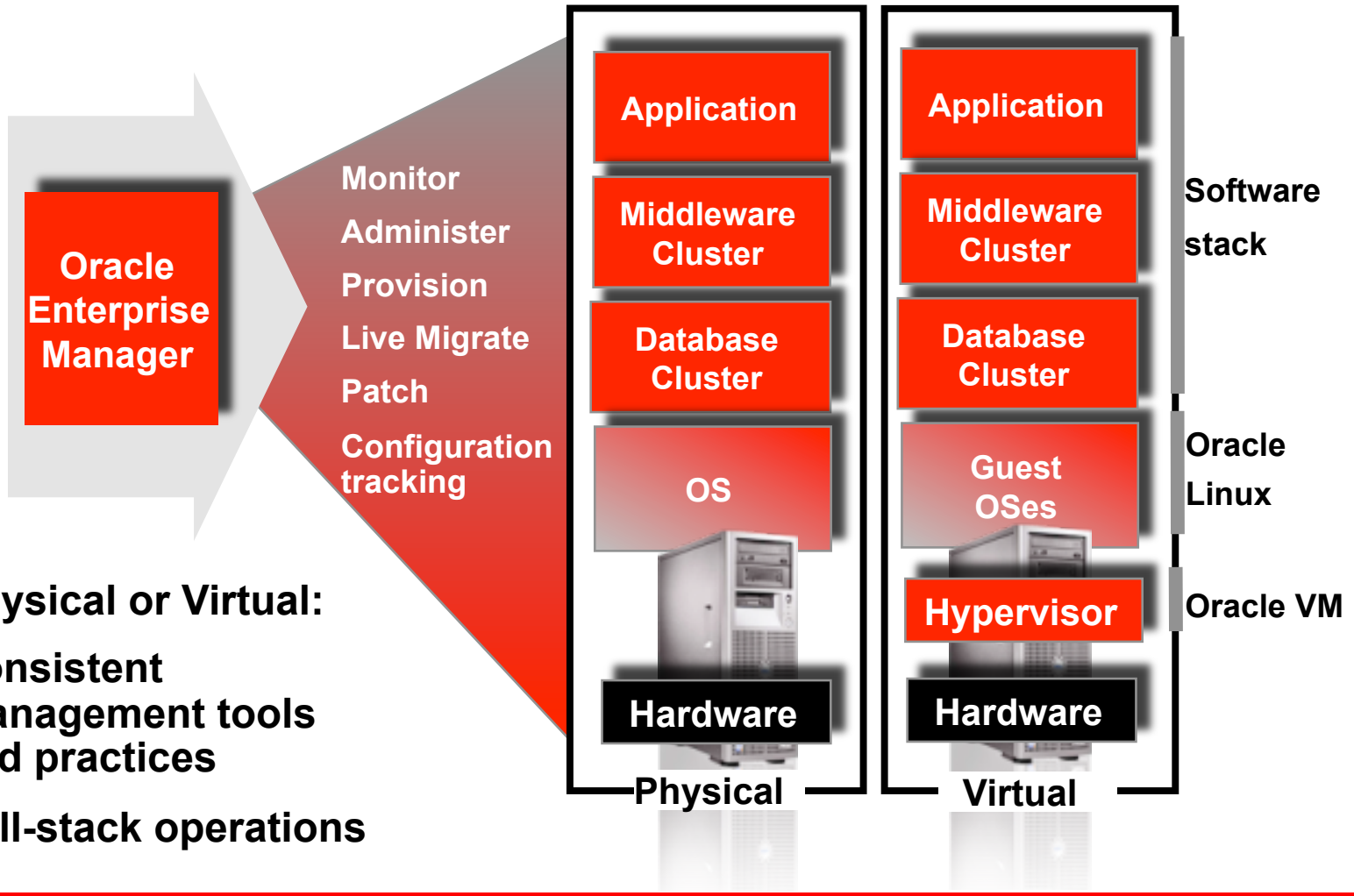
Comprehensive Full-Stack Management

Applications to Disk



Oracle Enterprise Manager

Integrated Management for Physical and Virtual Environments

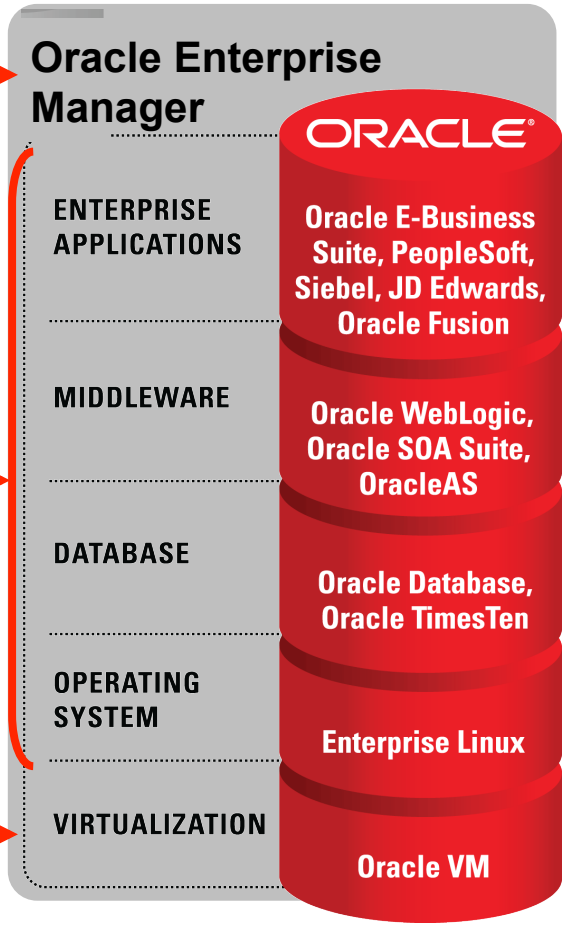


- **Physical or Virtual:**
- **Consistent management tools and practices**
- **Full-stack operations**

A Superior High Availability Environment

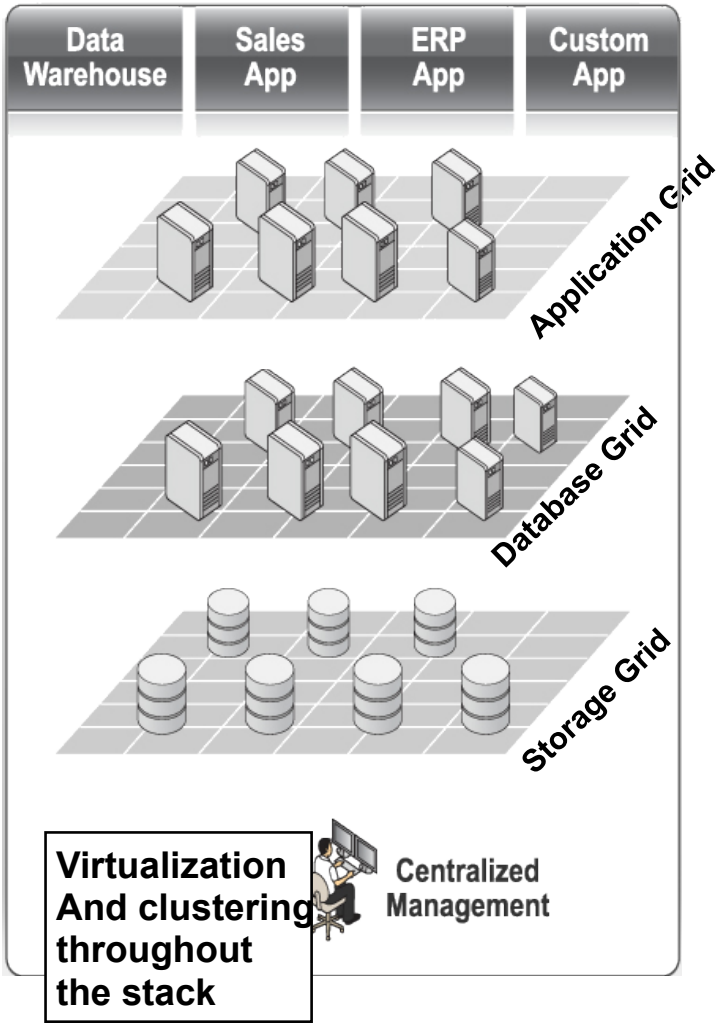
Earlier Warning, Better Context, Minimized Impact

- Earlier Warning: Enterprise Manager
  - Monitors & detects application issues to address *before* they become problems
  - Avoid HA events, minimized impact
- Better Context: Guest Clustering
  - Application-aware response
  - Middleware clustering
  - Real Application Clusters
  - Oracle HA Clusterware
- Virtualization Layer-HA
  - Only HA available from virtualization products: not application aware
  - Simple, reliable, automated restart after complete VM failure



Oracle's Full Grid Infrastructure

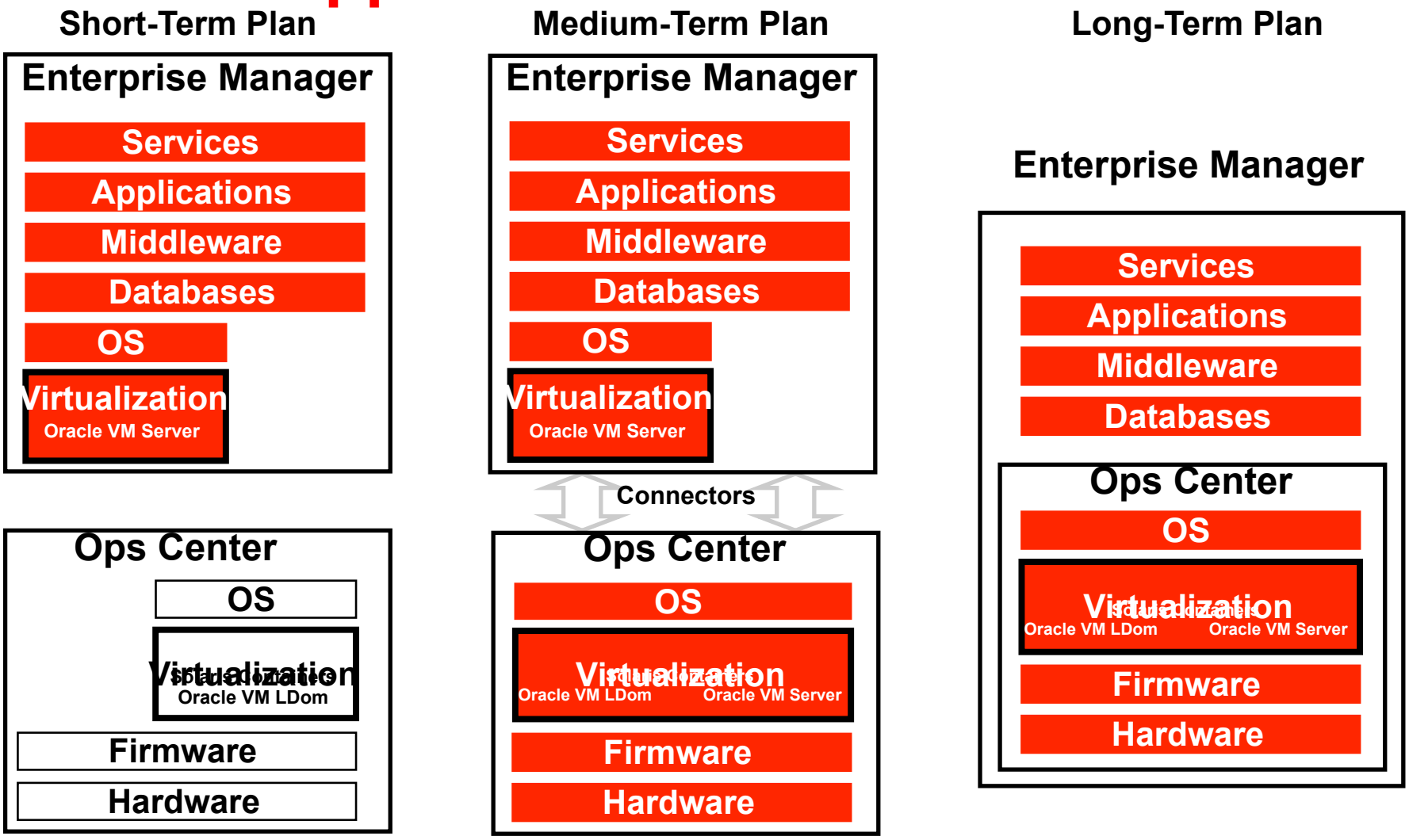
Virtualization, Clustering and Dynamic Provisioning



- Shared pools of resources for high efficiency/utilization
- Dynamic resource provisioning
- Rapid deployment using ready-to-run Oracle VM Templates
- Superior high availability
- Automated, full-stack monitoring & management
- Low cost platform:
- Virtualization
- Operating system
- Clustering
- Filesystems

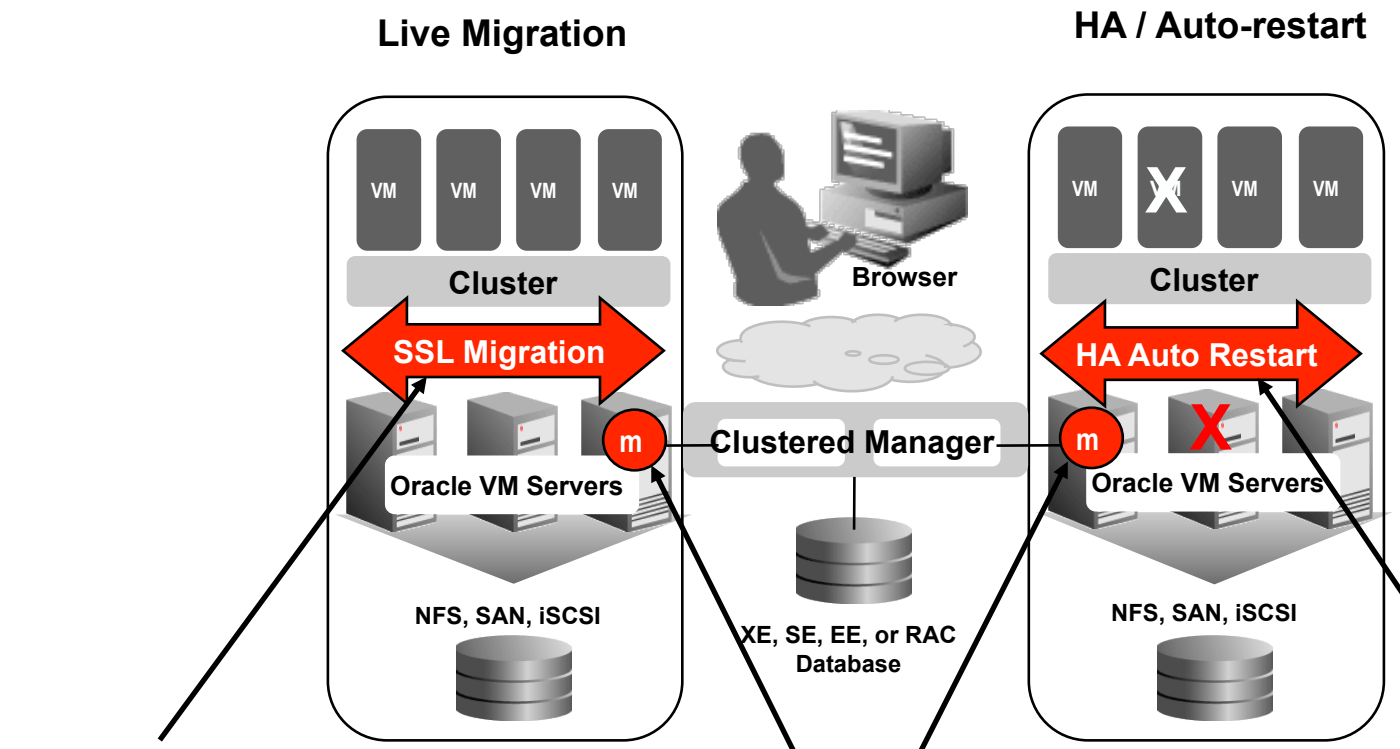
Comprehensive Full-Stack Management

From Applications to Disk



Oracle VM Manager

Advanced Functionality Included

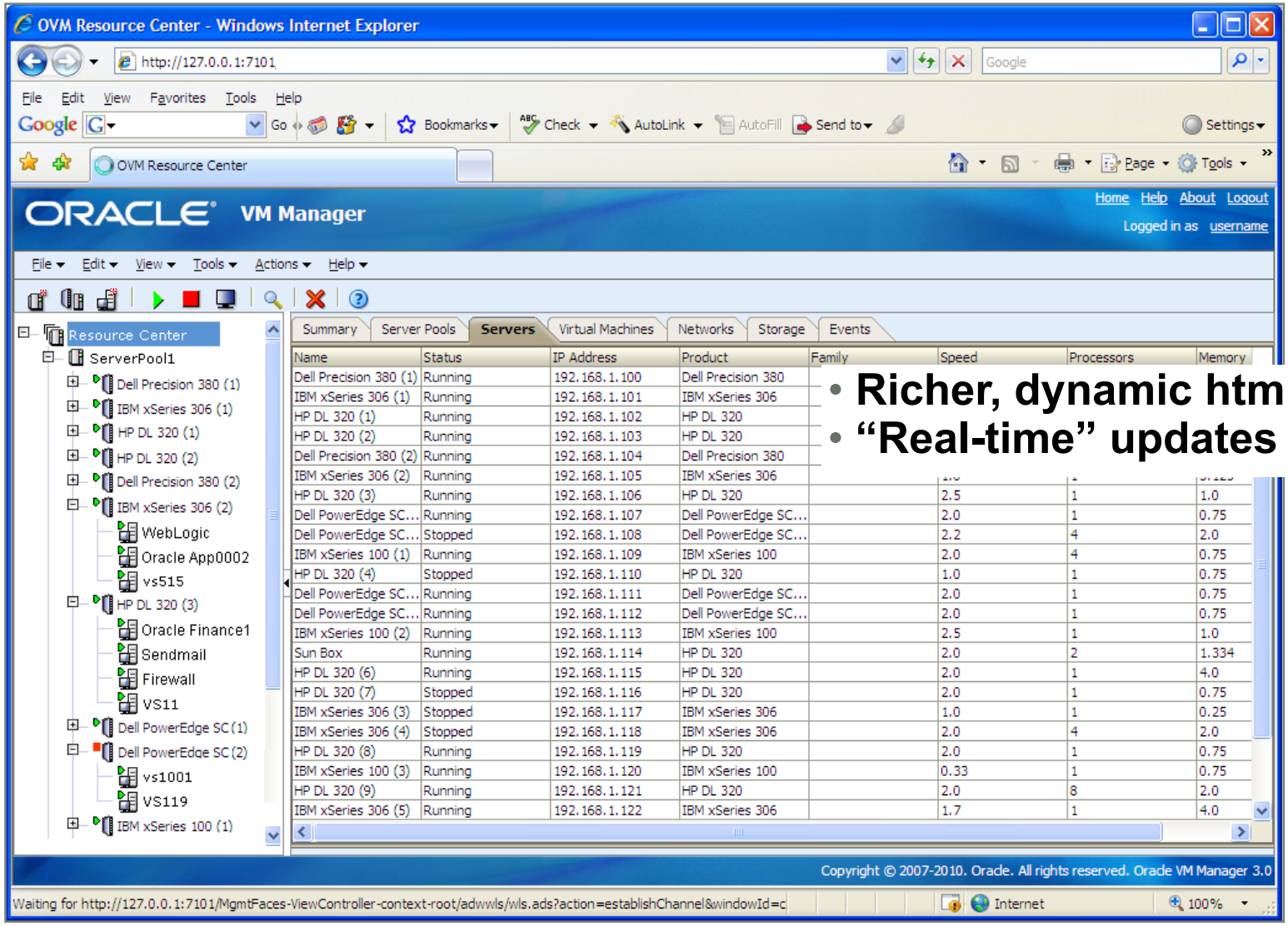


Planned Events:
- E.g. maintenance or upgrades
- Secure Live Migration
- Zero interruption

Pool Masters assure Secure Migration or HA restarts complete in the event of a Manager outage

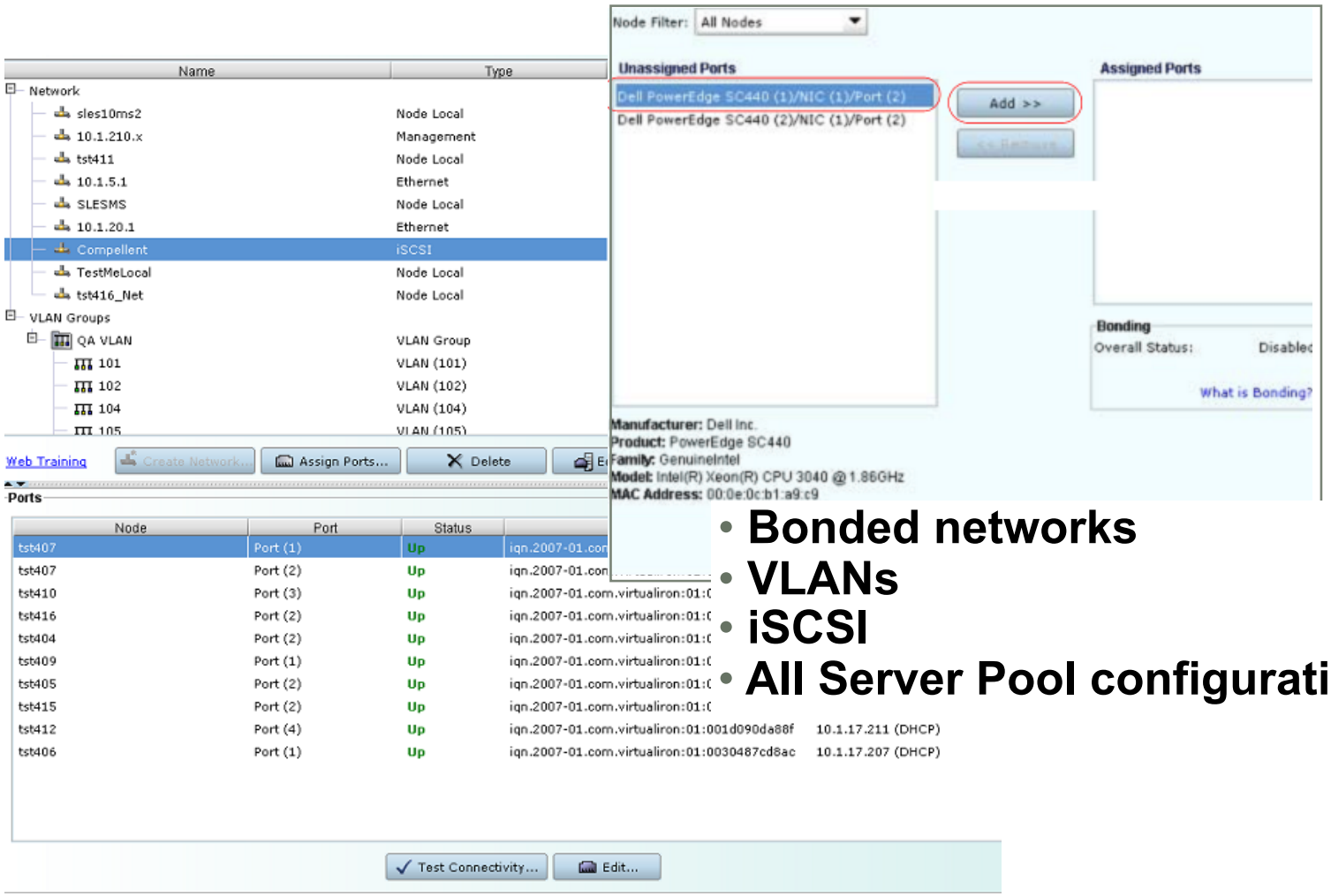
Unplanned Events
- E.g. Server or VM failure
- HA Auto-restart in pool
- No manual intervention

Significant GUI Enhancements



- Richer, dynamic html UI
- "Real-time" updates

Centralized Network Management



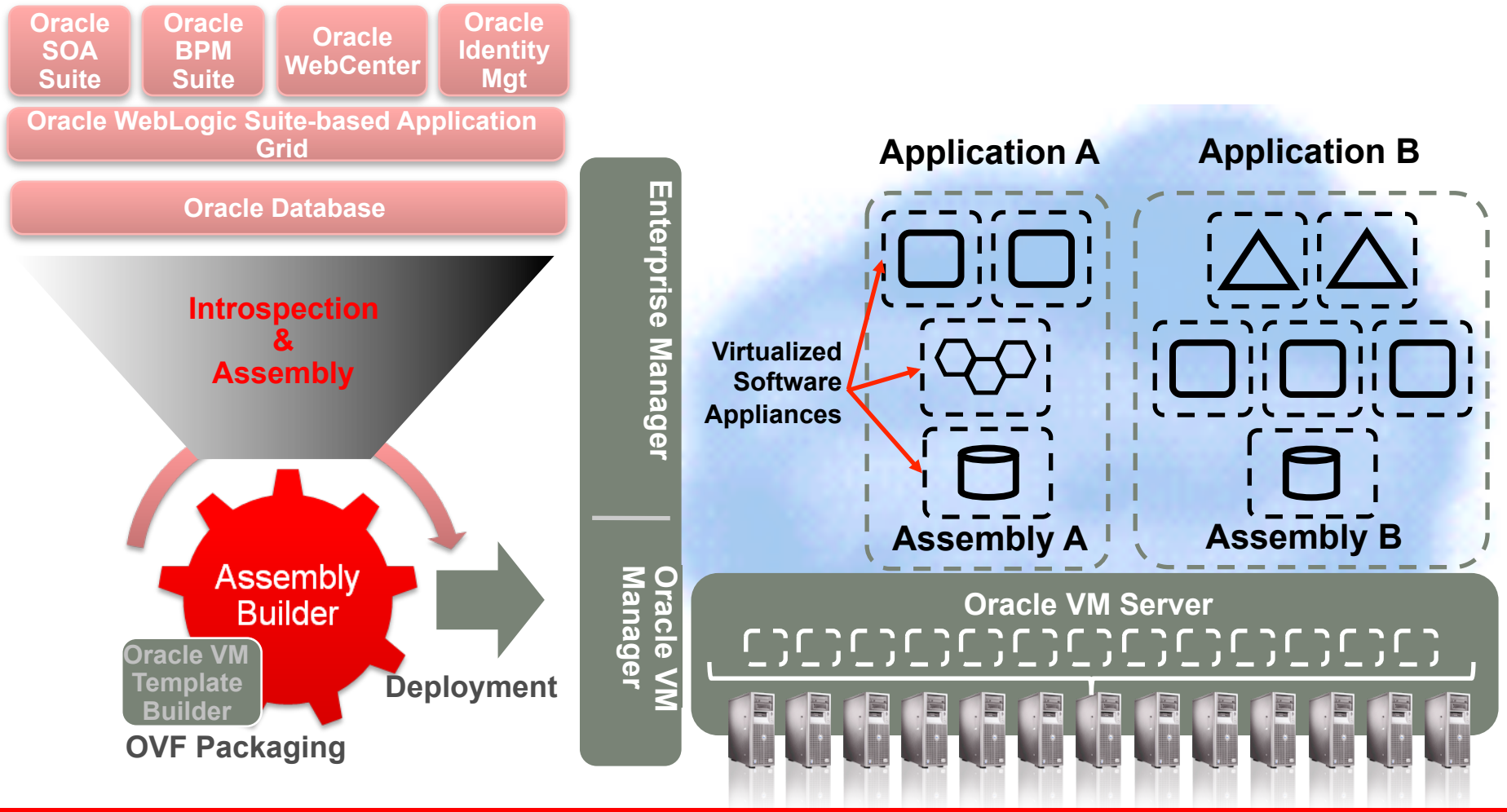
- Bonded networks
- VLANs
- iSCSI
- All Server Pool configuration

NOT ACTUAL UI

Add-ons

Oracle Virtual Assembly Builder

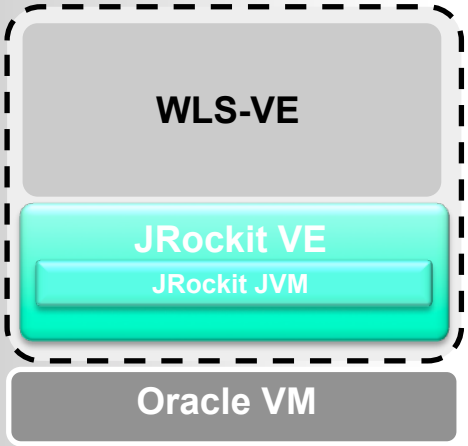
Package Multi-Tier Applications



Oracle WebLogic Suite Virtualization Option

Key Benefits

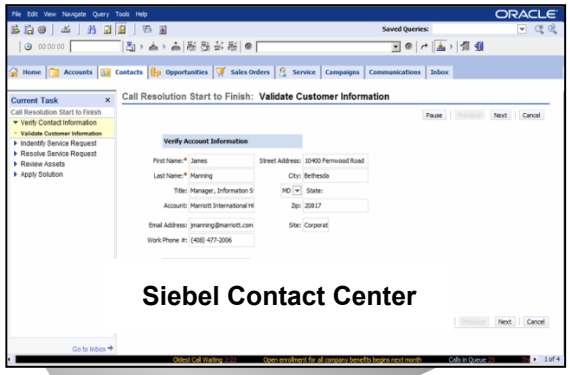
- **Management Simplicity: "no OS!"**
- **Eliminate requirement for provisioning Guest OS**
- **Only application administration, no OS**
- **Assembly Builder delivers simplified deployment of entire domain onto virtualized resources**
- **Higher Performance with JRockit VE**
- **500x smaller vs. general purpose OS**
- **Improved performance**
- **Simplified configuration, increased security**
- **Only on Oracle VM**
- **Better physical hardware utilization**
- **Eliminating the OS reduces consumption of system resources such as memory and CPU cycles**



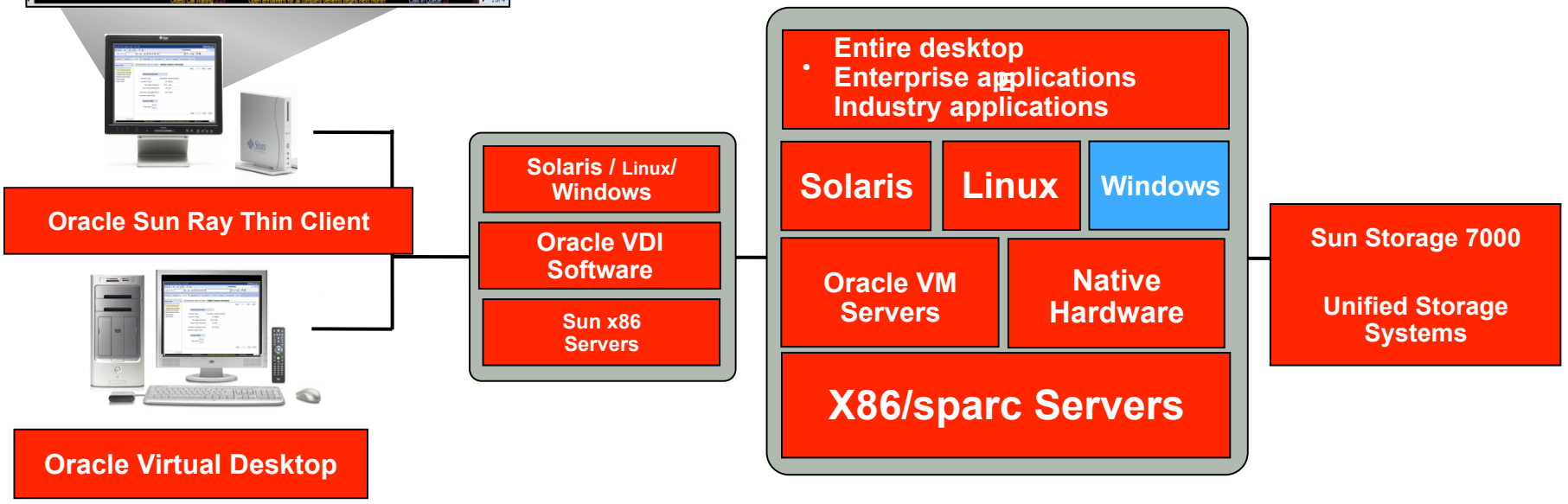
Total Packaged Solutions

Oracle Virtualization

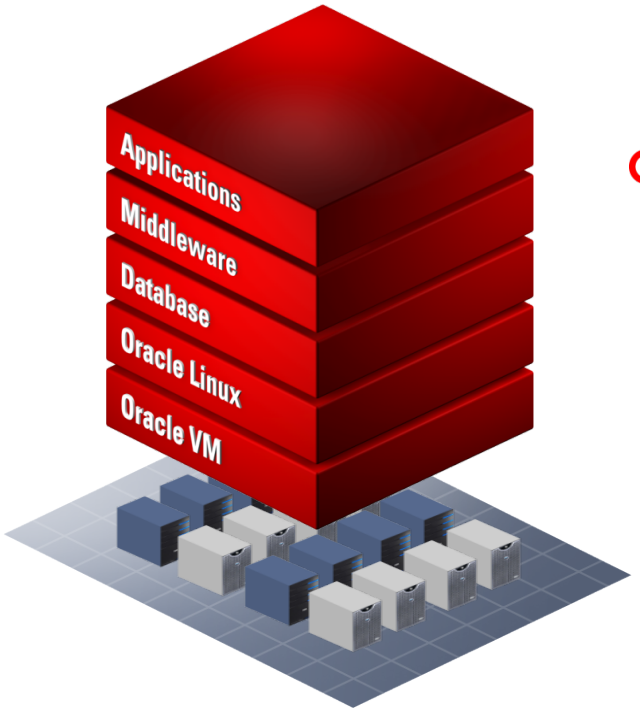
End-to-End, Application to Disk Solutions



- **Unique delivery of complete, open, integrated solutions**



Full Oracle Software Stack Certified and Supported on Oracle VM on Amazon EC2



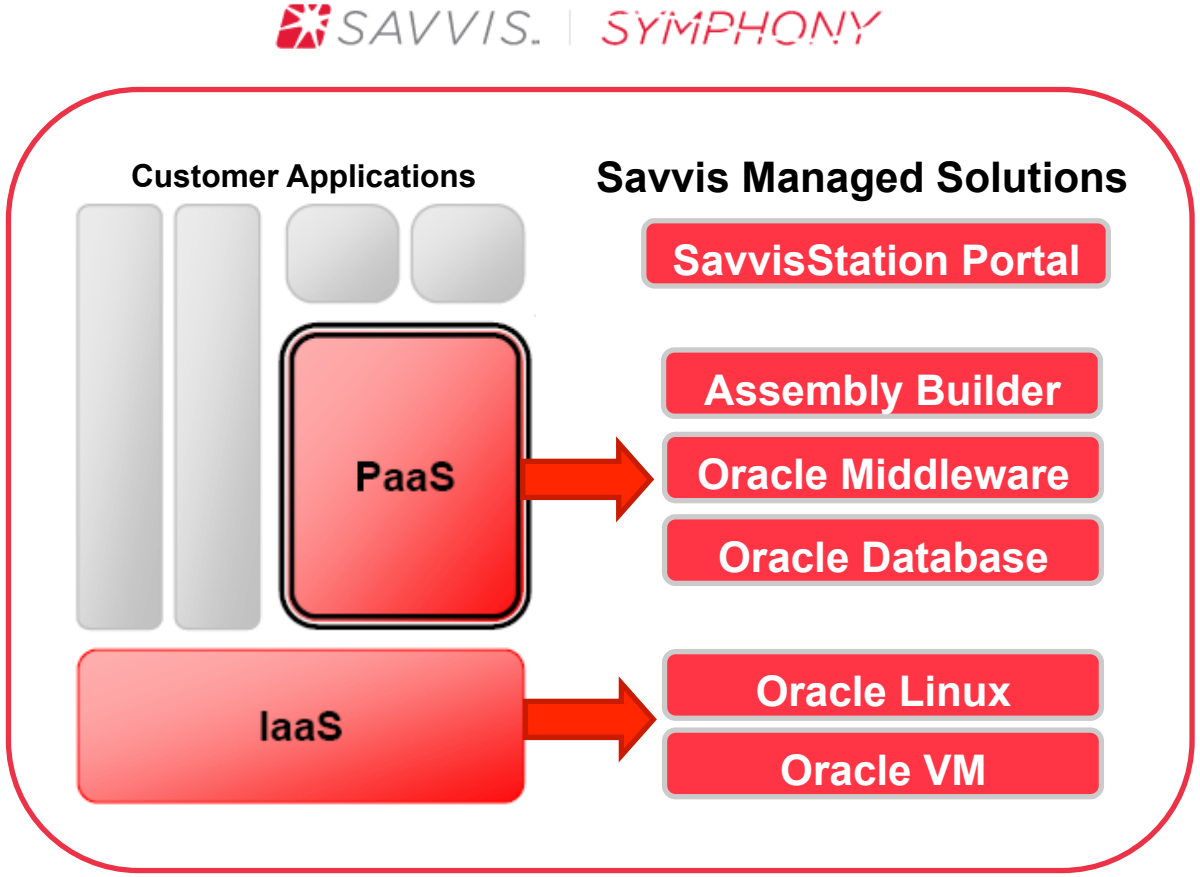
amazon web services™

ORACLE

Certified & supported

- Amazon EC2 now supports Oracle VM
- Fully certified and supported: Oracle Database, Oracle Fusion Middleware, Oracle applications (EBS, PeopleSoft, Siebel)
- Oracle license portability
- Oracle Linux support and Amazon Premium Support
- Amazon Machine Images (AMIs) based on Oracle VM Templates

Oracle PaaS Hosted by Savvis



- **Savvis Management Portal**
- **SavvisStation**

- **PaaS customer interface**
- **Oracle Virtual Assembly Builder**

- **PaaS solution options**
- **WebLogic Server Enterprise Edition & Standard Edition**
- **Oracle Database Enterprise Edition & Standard Edition**

- **IaaS solution options**
- **Oracle Linux**
- **Oracle VM**

Oracle Virtualization

Fast Paced Innovation (since March 2010)

- Oracle VM Server for x86 2.2.1
- New: Oracle VM Server for SPARC 2.0
- New: Sun Ray 3, 3i and 3 Plus Clients
- Sun Ray Software 5
- Oracle Virtual Desktop Infrastructure 3.1.1 & 3.2
- Oracle Secure Global Desktop 4.6
- Oracle VM VirtualBox 3.1.4 & 3.2.x
- New: Cloud offerings
- New: Oracle VM Templates

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