Oracle Linux

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Oracle Solaris and Oracle Linux
Why are we investing in both?

ORACLE®
SOLARIS

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LINUX

- By far the most widely used operating systems for Oracle software

- Making both better is essential to our strategy: delivering complete hardware and software stacks engineered together

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Oracle Linux - History

- Launched at Oracle Open World in 2006
- Compatible with Red Hat Enterprise Linux
- Freely available source and binaries
- Freely distributable binaries
- Oracle offers Linux support for RHEL and Oracle Linux
- Oracle's base Linux development platform
- Oracle does not use or test on RHEL
- Customers can switch in minutes – no reinstall needed
- Applications run unchanged
- **No Red Hat compatibility bug has ever been reported to Oracle**

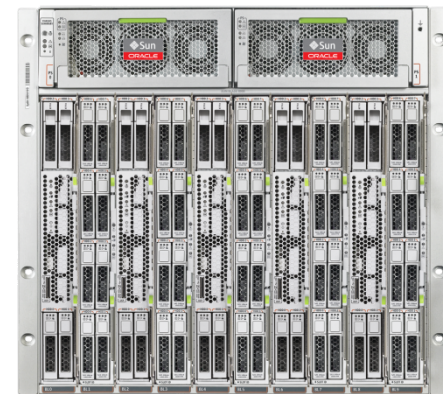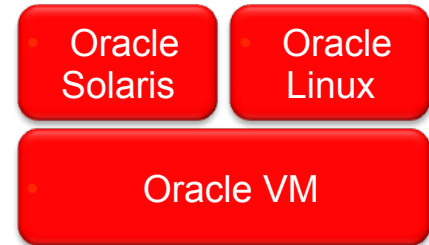# More Than 7000 Customers Use Oracle Linux

Oracle Linux and Sun Hardware

Exalogic

Exadata

Oracle Solaris   Oracle Linux

Oracle VM

x86 Blade Cluster

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Linux Leadership
Oracle Linux Program

#1 Linux Database

Oracle Linux

Development and Support team

Oracle Validated Configurations

Global Support in 145 Countries

Oracle Linux

All Linux code goes to Linus' tree

Pre-installed on Sun x86 blade servers

Oracle Product Development on Linux

Traditional Unix Vendor vs. Linux Vendor

Traditional Unix Vendor	Linux Vendor
•Develops and tests hardware and OS together	•Develops OS only
•Oracle knowledge in development, QA, and support	•No Oracle expertise, staff
•Tests entire Oracle stack (hardware, OS, and Oracle Database)	•Limited testing of OS only
•Provides fixes for OS version customer runs	•Customer encouraged to upgrade to latest release plus fix

Strict Red Hat Compatibility

- Red Hat does not validate releases with Oracle products

  - Oracle spends considerable effort to find and repair regressions introduced by Red Hat

- Red Hat adopts community enhancements slowly

  - The current production Red Hat kernel is based on a four year old community (mainline) version

- Oracle's ability to make Linux better is constrained

  - Much of our work is mainline (OCFS2, BTRFS, RDS, T10-dif, etc.)

  - Delivering these enhancements to users requires either waiting on Red Hat (see above) or back porting them into Red Hat's old kernel

The Unbreakable Enterprise Kernel for Oracle Linux

Fast, Modern, Reliable and Optimized

New: The Unbreakable Enterprise Kernel

- Fast, modern, reliable and optimized for Oracle

- Used by Exadata and Exalogic for extreme performance

- Allows Oracle to innovate without sacrificing compatibility

  - Oracle Linux now includes **both** the Unbreakable Enterprise Kernel **and** our existing Red Hat Compatible Kernel

  - You choose at boot time: a system optimized for running Oracle software **or** strict Red Hat compatibility.

Oracle now recommends only the Unbreakable Enterprise Kernel for all Oracle software on Linux

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The Facts

- Based on a stable 2.6.32 kernel
  - Includes a number of enhancements already in 2.6.32 contributed by Oracle
  - Plus brand new optimizations from Oracle that are all open source

- Free download via public yum server

- Covered as part of Oracle's Unbreakable Linux support program

  - No change in pricing

- Easy installation on top of Oracle Linux 5

- Existing applications run unchanged

The Unbreakable Enterprise Kernel: Fast

Benchmark	Red Hat compatible kernel	Unbreakable Enterprise Kernel	Gain
8kb flash cache reads (IOPS)	197 thousand	1 million	**400%**
Solid State Disk access	4GB/second	9.5GB/second	**137%**
Infiniband RDS messages, single card (IOPS)	89 thousand	273 thousand	**200%**
8 socket database OLTP (transactions per minute)	**1.8 million**	**3.2 million**	**75%**

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The Unbreakable Enterprise Kernel: Modern

- Bigger servers
  - Up to 4096 CPUs and 2 TB of memory
  - Up to 4 PB (petabyte) clustered volumes with OCFS2
  - Advanced NUMA support
- Power management
  - CPUs to stay in low power state when the system is idle
  - ACPI 4.0
- Fine grained CPU and memory resource control

The Unbreakable Enterprise Kernel tracks mainline Linux – users get community and Oracle enhancements faster

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The Unbreakable Enterprise Kernel: Reliable

- Eliminates silent data corruption using Data Integrity; stops corrupt data from being written;

- Reduces system crashes and improves application uptime via Hardware Fault Management;

- Improved Diagnostics Tools

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The Unbreakable Enterprise Kernel:
Optimized for Oracle

- Result of collaboration between Oracle's Linux, Database, Middleware, and Hardware engineering teams
  - **No compromises**
  - **The best Linux performance and reliability we can deliver**
- The only Linux kernel running in Oracle's development and test farms going forward
- Oracle will continue to certify our software with the Red Hat Compatible Kernel at least through Oracle Linux version 5.

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Installing Unbreakable Enterprise Kernel

- Requires Oracle Linux 5.5 or RHEL5.5 x86-64
- Register system with ULN
- Subscribe to Oracle Linux 5 Latest channel
- Unbreakable Enterprise Kernel and recommended packages
  - `up2date oracle-linux`
- Unbreakable Enterprise Kernel and recommended packages for Oracle Database installation
  - `up2date oracle-validated`
- **`Alternative download method (free for anyone)`**
  - Source and binary both available for download
  - Go to public-yum.oracle.com

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New Features

Fast, Modern, Reliable and Optimized

Improved InfiniBand and RDS Performance

- OFED stack updated to 1.5.1
- Reduced lock contentions
- Spread interrupts over CPUs

Task Control Groups

- Fine grained control over CPU, memory
- Subset the resources of a larger system
- Limit CPU and memory available an application or group of applications
- Control access to devices
- Works inside virtual guests

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Improved Power Management

- Tickless kernel
- Timer interrupts are performed on demand rather than at a predetermined frequency
- Enables CPUs to stay in low power state when the system is idle
- Reduced overall power consumption
- ACPI 4.0

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OCFS2 1.6

- Reflink
  - Writeable snapshots
  - Unlimited snapshots of snapshots
- User space cluster stack support
- JBD2 support
- POSIX ACL support
- Quota support
- Extended attributes

Data Integrity

- Data Integrity Field

  - protects path between HBA and storage device

- Data Integrity eXtensions

  - protects path between application and HBA

- Traditional filesystems don't detect corruption

- If checksumming is used at all, could be months after the data is written

- Detect in-flight data corruption

- Prevent corrupt data from being written

- Works with DIF/DIX aware Host Bus Adapter

- Data integrity-enabled ASM kernel driver will protect against data corruption from application to disk platter

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Improved Hardware Fault Management

- Hardware errors detected and logged before they affect OS or application
- Automatic isolation of defective CPUs and memory
- Avoids system crashes
- Improves application uptime

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Performance Improvements

- Improved asynchronous write-back performance
  - Keeping up with fast storage
- Improved buffered write accounting
  - Reduces stalls and inefficient writeback when mixing devices of different speeds
- IO affinity
  - ensures processing of a completed IO is handled by the same CPU that initiated the IO
- Receive Packet Steering (RPS)
  - distributes the load of received packet processing across multiple CPUs
- RDS
- Improved scalability on fast storage such as solid state drives
- NUMA improvements
  - Reduced page cache contention
  - Improves performance for large systems under load

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New Diagnostic Tools

- Performance Counters for Linux (PCL)
  - kernel subsystem keeps track of hardware and software events
  - Tracing and analysis without affecting system performance
  - Find application and kernel CPU bottleneck

- Latencytop
  - Find what actions or operations that are causing latency in applications or in the kernel

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Miscellaneous

- Initial NFS IPv6 support
- RAID5 to RAID6 restripe support
- I/O topology support
  - Kernel tells application what drive requirements are
  - Improves write performance
- SSD detection
  - Block layer will try harder to dispatch IO when it knows storage device is fast
- Fallocate
  - Speed up reserving space for large files
- New floating point and cryptographic features

Roadmap: Storage Connect Framework for Oracle Linux
Directly Leverage Advanced Storage Vendor Features

- Automated management of storage features, e.g:
  - Native storage services, such as LUN creation, deletion, expansion, and snapshot
  - Execute thin provisioning to minimize storage utilization
  - Leverage existing investments in storage systems
- Leverage all the resources and functionality of existing storage systems within Oracle Linux

New Contributions

ALL Linux kernel enhancements described earlier for The Unbreakable Enterprise Kernel are open source and have been made available to the Linux community.

Oracle Linux: Summary

- Choice of two kernels
  - Red Hat Compatible Kernel
  - Oracle's Unbreakable Enterprise Kernel
- Both kernels open source and are free to download; Difference is in functionality
- Support pricing is same for both
  - Oracle Linux Support Program
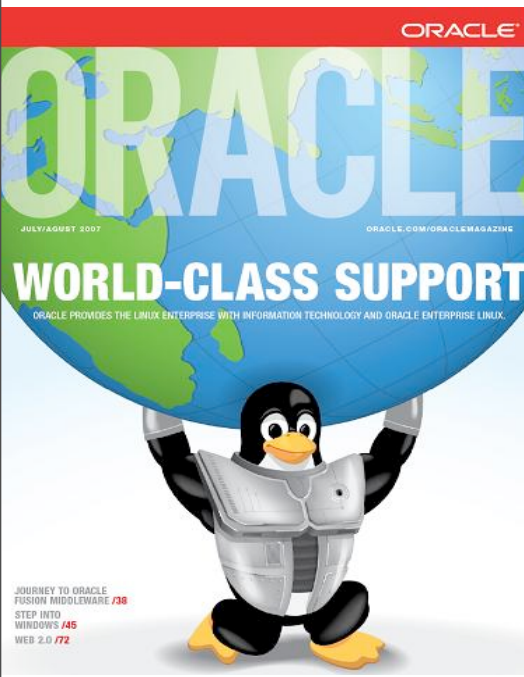- **Oracle recommends using the Unbreakable Enterprise Kernel**

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Oracle Linux Support Program

Enterprise-Class, Global, 24x7 Linux Support

Oracle Linux Support

Enterprise-class support for the Linux operating system with premier backports, comprehensive management, indemnification, testing and more – all at significantly lower cost.

- 24x7 global coverage, 145 countries, 27 local languages
- Dedicated engineering and delivery team
- Backed by world's largest support team
- Enterprise-quality, Lower cost
- Service Excellence in Integrated Services (TSIA)
- 2008 Service Excellence in Mission Critical Support Award (SSPA)
- 2006 J.D. Powers and Associates Global Certification for Outstanding Customer Support

What is Premier Backporting?

- **Traditional Backporting** = A specific bug fix produced for the latest version of a package may be retroactively created and introduced as part of an earlier release or update level (e.g. a bug fix released in RHEL5 or Oracle Linux 5 is also released as part of RHEL4 or Oracle Linux 4)

- Only Oracle offers **Premier Backporting**, which goes far beyond traditional backporting. For example:
  - Customer runs RHEL5 or Oracle Linux 5 Update 3 release and encounters a bug;
  - Although EL5 Update 4 is already released, the customer prefers not to upgrade;
  - With **Premier Backporting**, Oracle will provide a specific bug fix for the version the customer is running without forcing an upgrade;
  - In sharp contrast, a Red Hat support customer <u>must</u> wait to upgrade to the <u>entire</u> Update release to get just the one bug fix they need.

- Modeled after the way we support traditional Oracle products

## No pressure to upgrade to the latest Update release

Focus on Linux Testing

- Real-world regression and stress testing
- Customer-centric testing:
  - Test Linux features that matter to Oracle customers
  - Oracle and non-Oracle workloads (e.g. backup) running concurrently
  - Adverse conditions (low memory, low disk space, etc.)
  - Long, continuously running stress tests (detect memory leaks)
  - Check for performance regression and degradation

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Testing: Oracle Validated Configurations

- Pre-tested, validated, and supported Linux architectures, including
- Software, hardware, storage, drivers, networking components
- Best practices for Linux deployment
- Real-world testing of complete stack
- More than 120 configurations published, freely available for download

oracle.com/linux

| Oracle Database Fusion Middleware |
| Oracle Linux Oracle VM |
| Server |
| Storage |
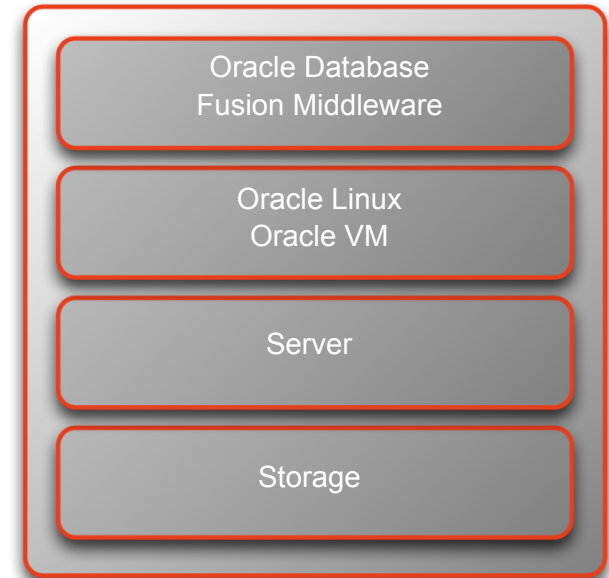
Oracle Validated Configurations offer faster Linux deployments while lowering infrastructure costs

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Certification: Unbreakable Enterprise Kernel

• No need to certify if your application doesn't have any kernel module dependencies

• Installing the Unbreakable Enterprise Kernel changes only the box labeled "Kernel."

• Installing a kernel does not change system libraries such as *glibc*

• The glibc version is 2.5 before and after you install the Unbreakable Enterprise Kernel on Oracle Linux 5.5.

User space

Applications

system libraries, including glibc

Kernel

drivers, modules

Hardware
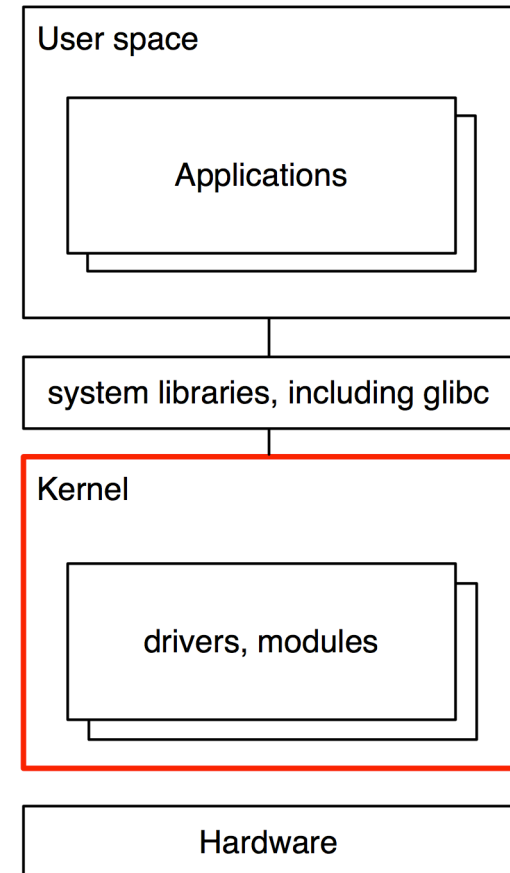
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Industry's Most Complete Virtualization Portfolio

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**

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 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**

Enterprise-quality support

Real-world deployment testing

Risk-free virtualization

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VM

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Oracle VM Server Virtualization

Platform Choice & Flexibility

Solaris

Oracle VM Server for SPARC

SPARC (CMT) Hardware

Solaris	Linux	Windows

Oracle VM Server for x86

x86 Hardware

- **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**

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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 Solaris / Linux
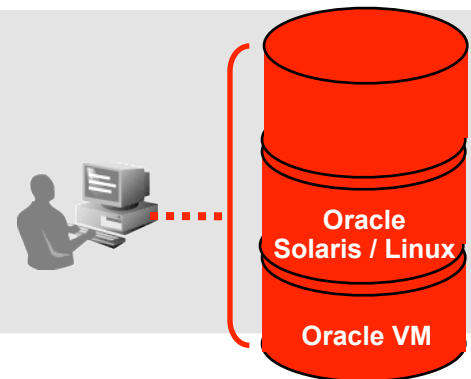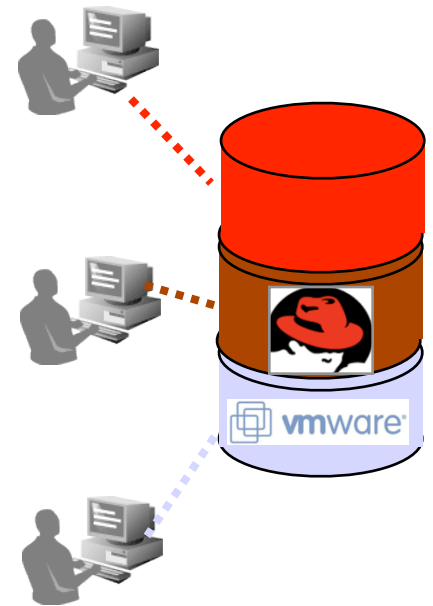
Oracle VM

Oracle VM Templates
Rapid Application Deployment

ORACLE E-Delivery

Download from Oracle

- **Pre-built, pre-configured VM**

- **Complete app, middleware, DB installation**

- **Complete Siebel CRM, Database 11g, Enterprise Manager…**

Siebel CRM File ORACLE VM

Enterprise Manager

Import via Oracle VM Manager

Save days or weeks in installation and configuration time

Siebel CRM VM 1 ORACLE VM

Siebel CRM VM 2 ORACLE VM

VM

VM

VM
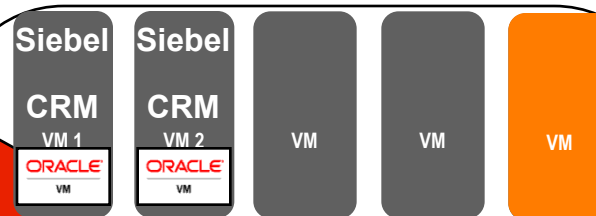
Customize & Save as Golden Images

Oracle VM Server Pool

Oracle VM Servers
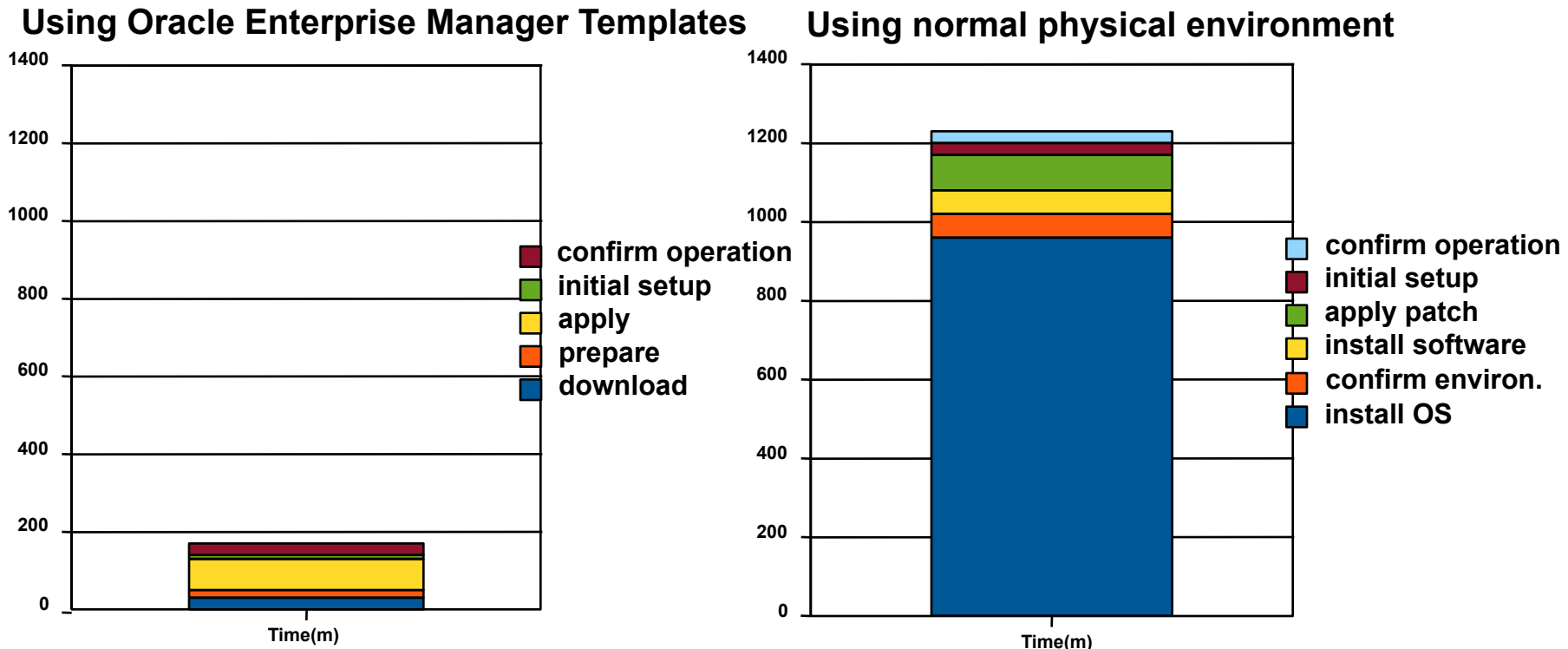
Start-Up in Oracle VM Pool

NAS, SAN, iSCSI

VM ORACLE VM
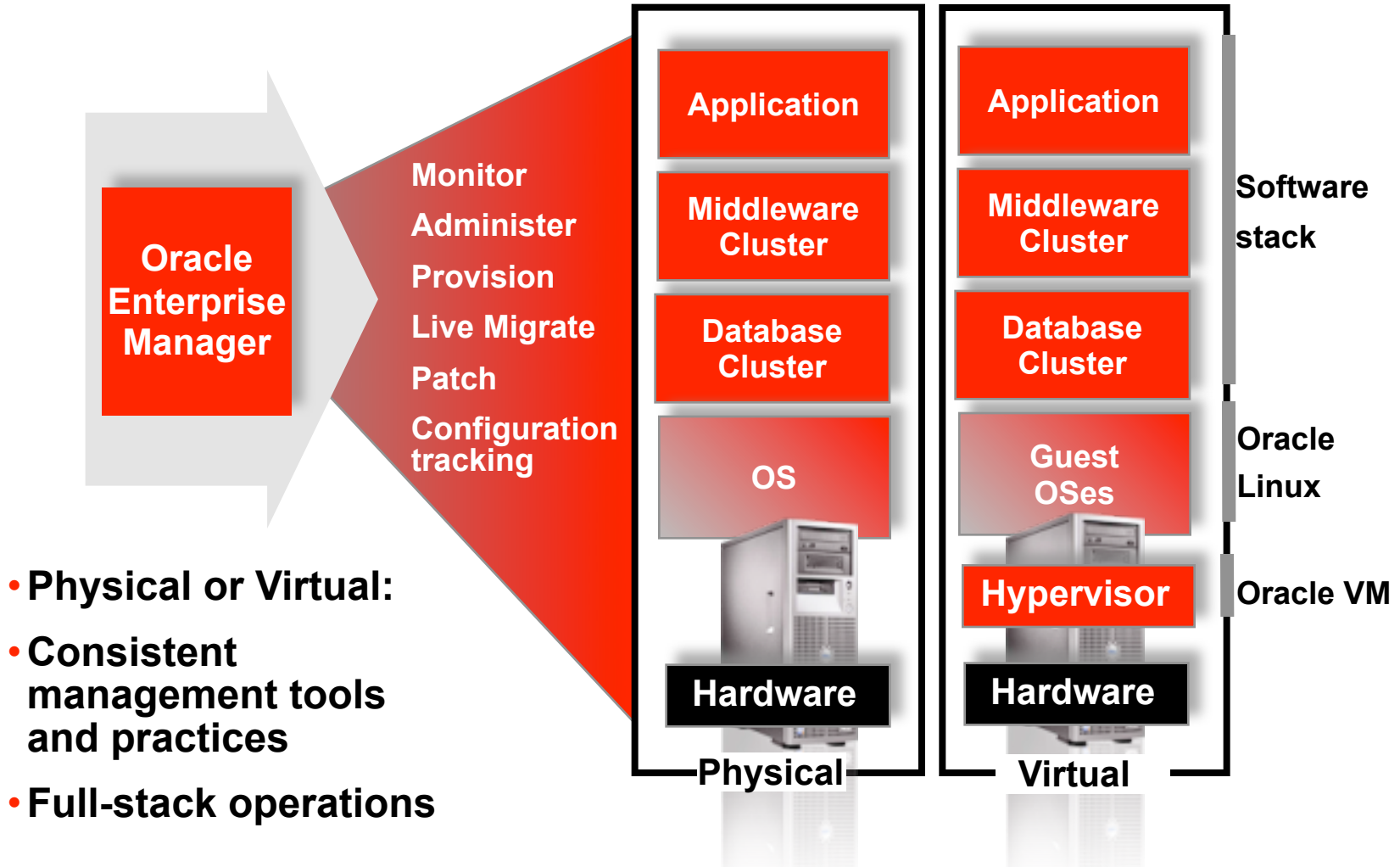
Oracle VM Templates Save Time

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

🟥	confirm operation
🟩	initial setup
🟨	apply
🟧	prepare
🟦	download

Time(m)

Using normal physical environment

🟦	confirm operation
🟥	initial setup
🟩	apply patch
🟨	install software
🟧	confirm environ.
🟦	install OS

Time(m)

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Oracle Enterprise Manager

Integrated Management for Physical and Virtual Environments

Oracle Enterprise Manager

Monitor
Administer
Provision
Live Migrate
Patch
Configuration tracking

Physical:

| Application |
| Middleware Cluster |
| Database Cluster |
| OS |
| Hardware |

Virtual:

| Application |
| Middleware Cluster |
| Database Cluster |
| Guest OSes |
| Hypervisor |
| Hardware |

Software stack

Oracle Linux

Oracle VM

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

Oracle Virtualization
End-to-End, Application to Disk Solutions

Siebel Contact Center
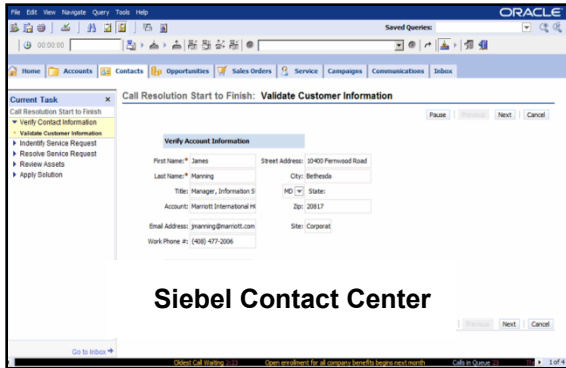
- **Unique delivery of complete, open, integrated solutions**

Oracle Sun Ray Thin Client

Oracle Virtual Desktop

Solaris / Linux/ Windows

Oracle VDI Software

Sun x86 Servers

Entire desktop
Enterprise applications
Industry applications

Solaris Linux Windows

Oracle VM Servers

Native Hardware

X86/sparc Servers

Sun Storage 7000

Unified Storage Systems

ORACLE®

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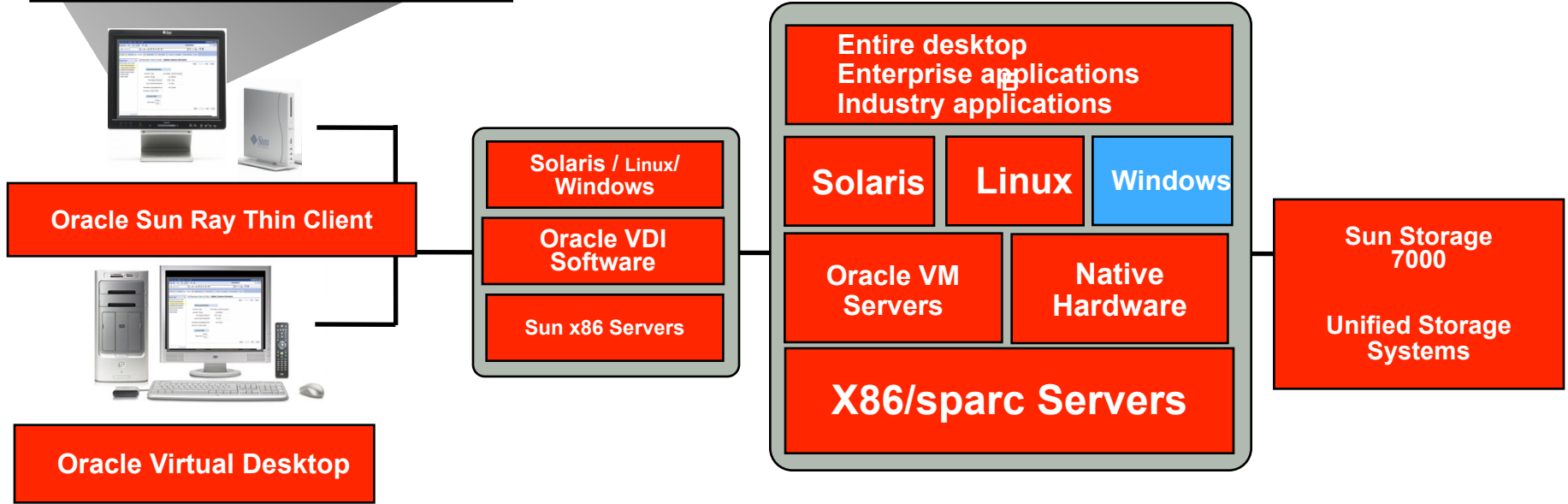
External Resources

- **Linux Home Page**
  oracle.com/linux

- **Follow us on Twitter**
  www.twitter.com/ORCL_Linux

- **Free Download: Oracle Linux**
  edelivery.oracle.com/linux

- **OPN Linux Knowledge Zone**
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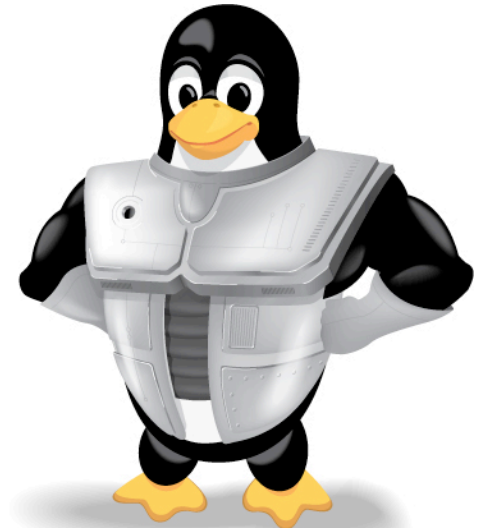
Unbreakable

Linux

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