

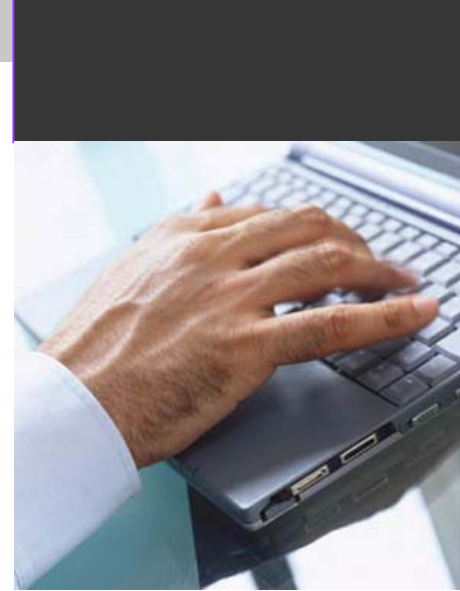


Grid Solutions from Sun-Oracle-AMD



Agenda

- Transforming Data Center Infrastructure with AMD Opteron™ Processor Technology
- Enterprise Grid Computing
- Sun – Oracle - AMD Grid Solutions





Transforming Data Center Infrastructure with AMD Opteron™ Processor Technology

Roger Wheatly, Business Development Manager

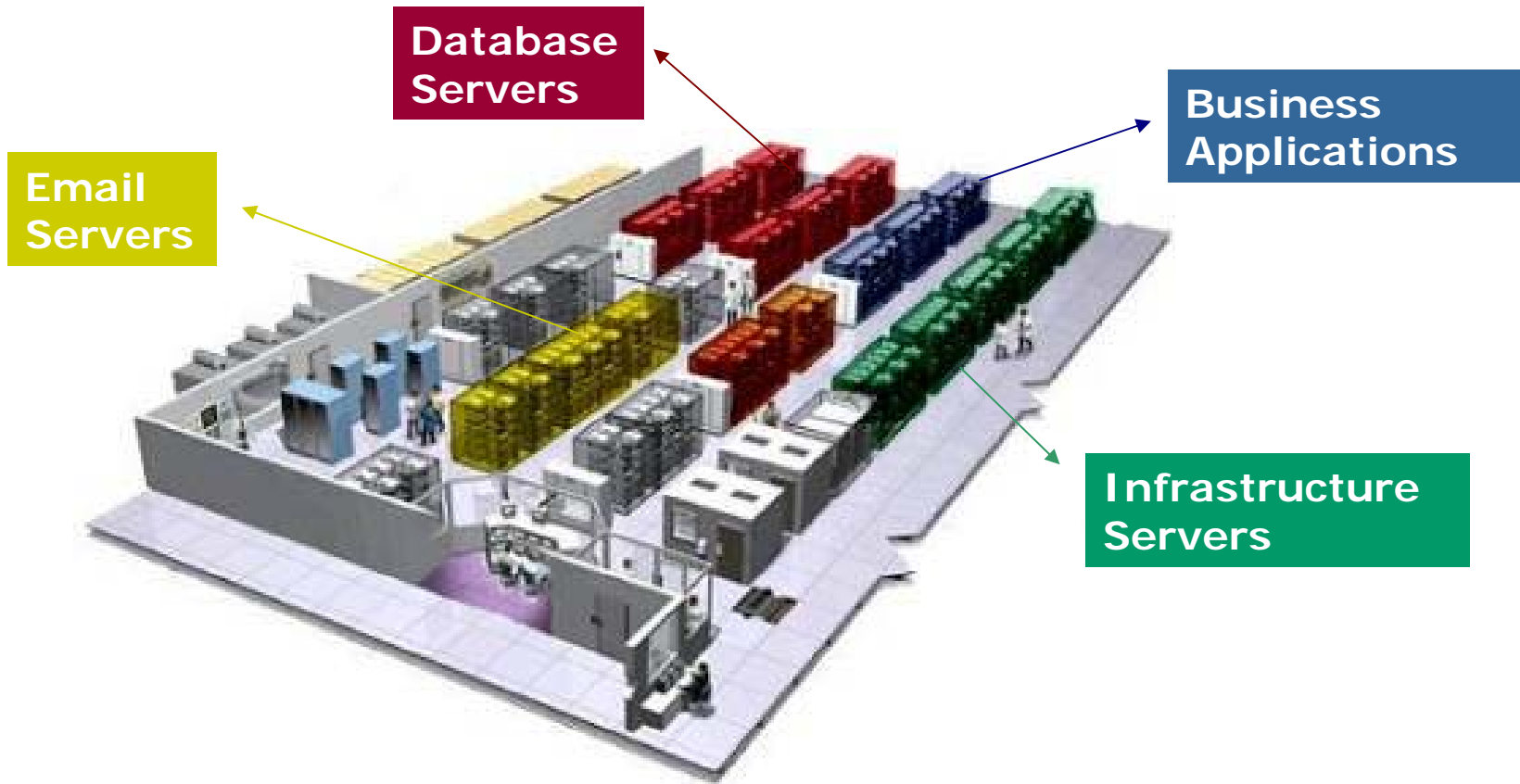


Transforming the IT Infrastructure

- Advances in x86-based processors are enabling smaller, denser servers and blades with high-end performance
- This, in turn, is fueling the maturation of x86-based technologies that are transforming the data center



Architecture of Today's Data Center



Silos of single-purpose,
underutilized servers

Data Center Infrastructure Challenges

- Consolidate underutilized resources
- Stay within power, cooling, and space constraints
- Keep computing infrastructure well managed and secure
- Remove disruptions that decrease user productivity



Transforming the Data Center Infrastructure

Dedicated Infrastructure



Shared Infrastructure



- Significant unused capacity
- Inflexible
- Many legacy technologies

- Higher rates of utilization
- Reconfigure dynamically
- Unified resources "managed as one"

The AMD Advantage

Technology Leadership

Enhances performance while offering the flexibility to support both 32- and 64-bit applications

64-bit and Multi-Core

Assists data centers in controlling power consumption and heat output

Performance-per-watt



Direct Connect Architecture

AMD Virtualization

Eliminates the 20-year old front-side bus, increasing system efficiency and scalability

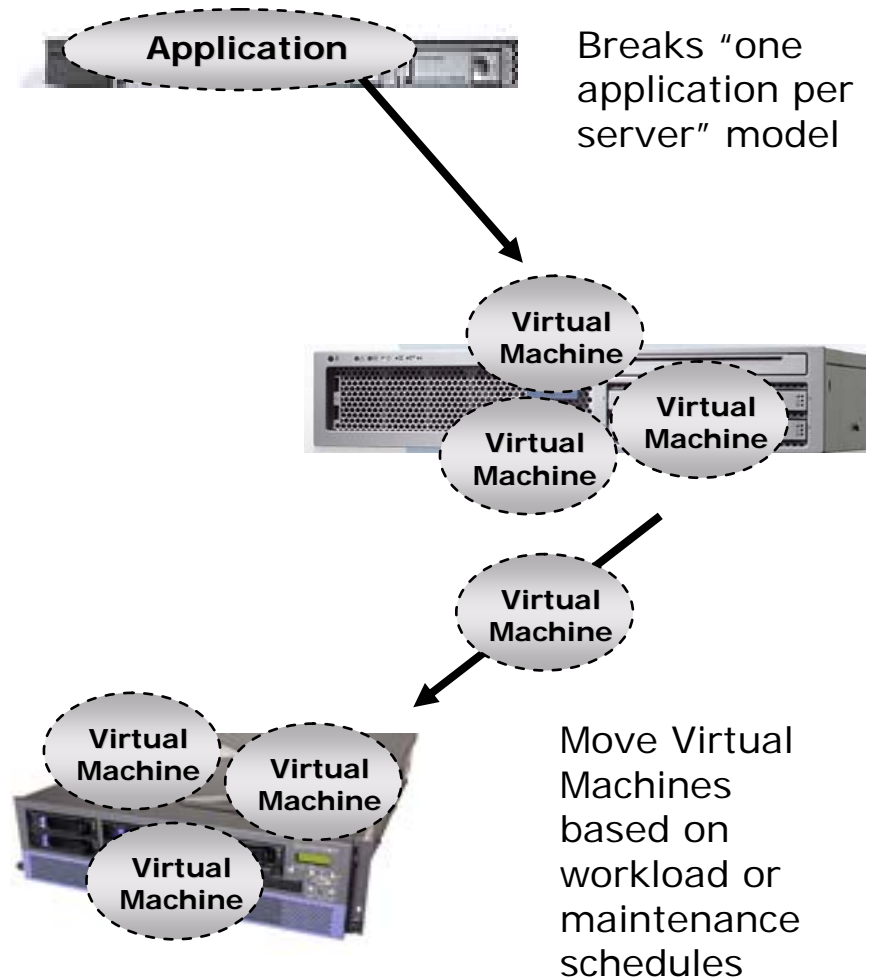
Increases utilization by enabling the running of separate, secure operating environments



Enabling a Dynamic Data Center

Virtualization

- Virtualization takes physical boundaries and makes them logical
- You can still have your special function servers – they're just sharing physical resources with each other
- Once servers are virtual, it becomes easy to move them between physical machines, dynamically reconfiguring your data center



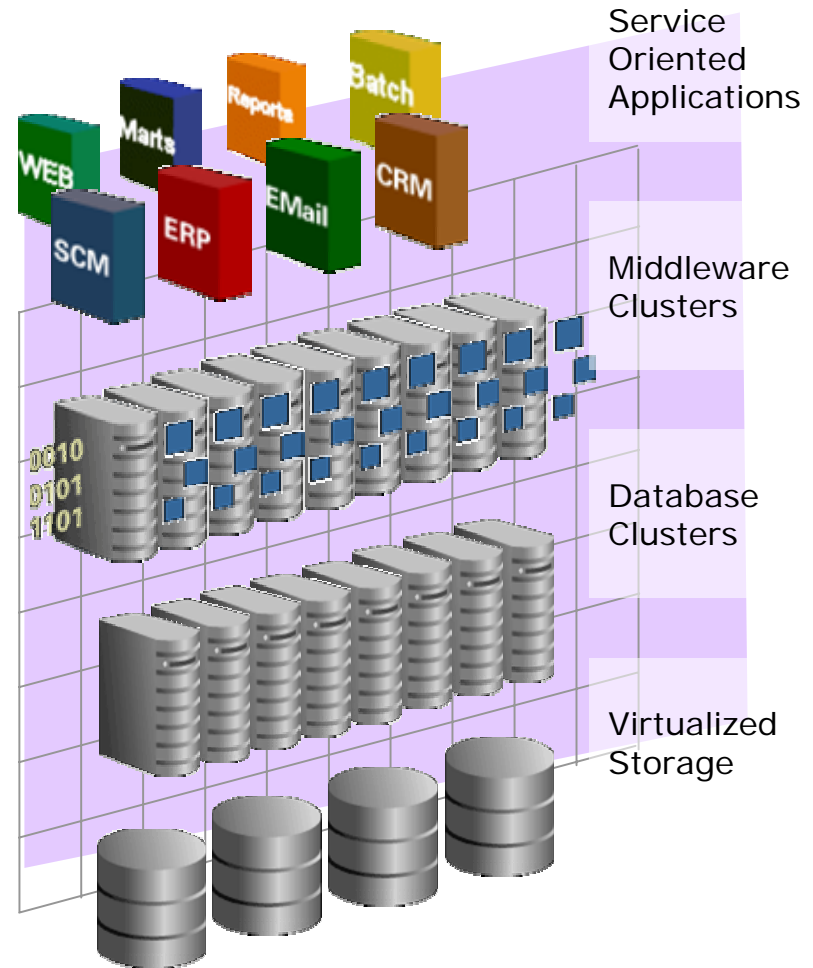
Enabling a Dynamic Data Center

Grid Computing

Configuration of industry-standard 2P and/or 4P servers

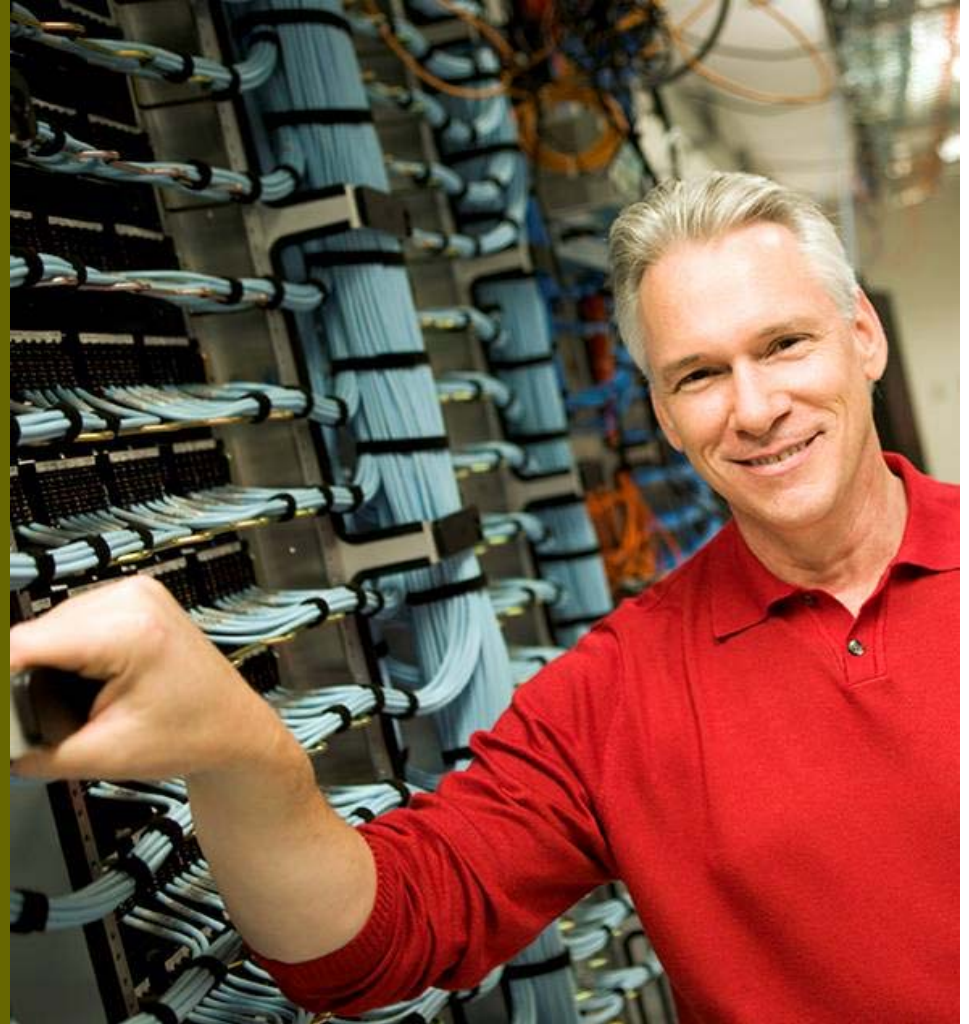
Creates a virtualized set of shared services that can be dynamically allocated to meet demands

Reduces space, power, hardware, and administration costs while providing an efficient and secure computing infrastructure



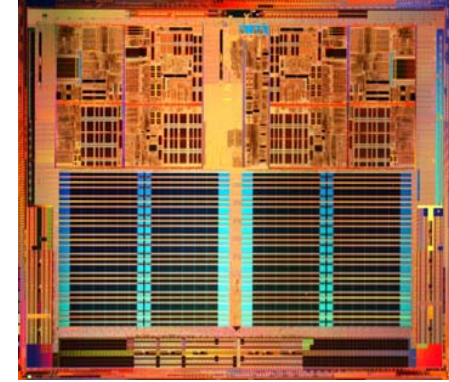
The AMD Advantage for Grid Computing Maximizing Compute Density

- Within the Microprocessor...
 - Multi-Core solutions
- Within the Server...
 - Direct Connect Architecture
 - Efficient, linear scalability
 - More performance within a given form factor
 - AMD Virtualization technology
 - Server consolidation
 - Secure virtual environments
- Within the Data Center...
 - Power efficiency
 - Increased rack utilization
 - AMD Virtualization technology
 - Dynamic management
 - Secure virtual environments

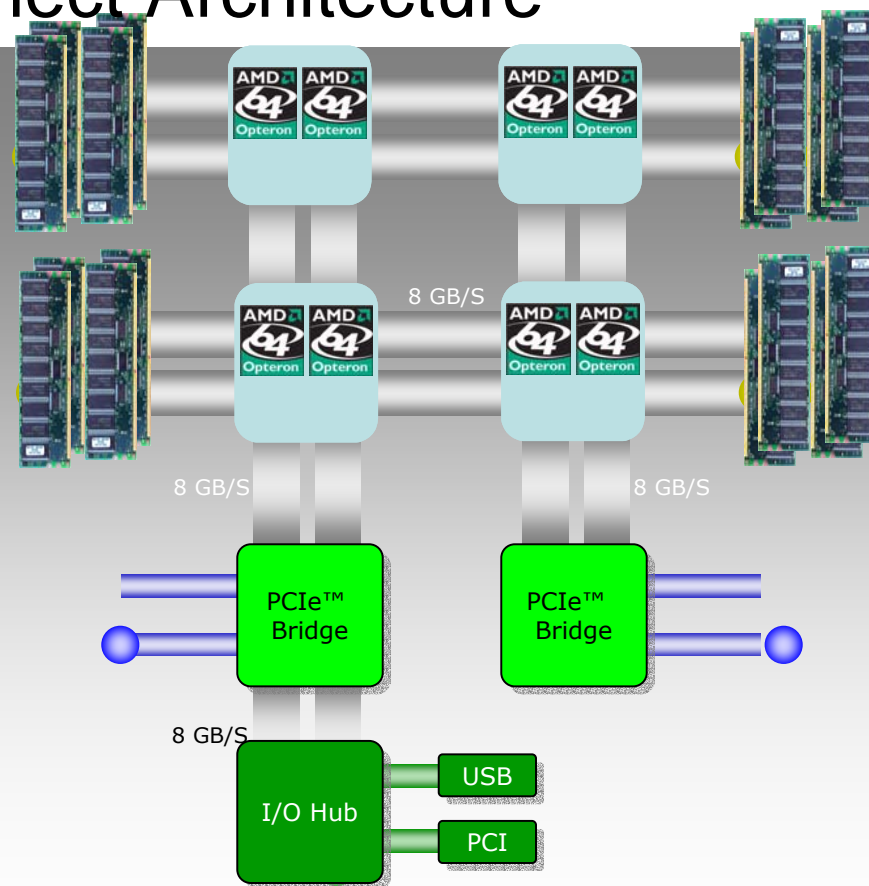
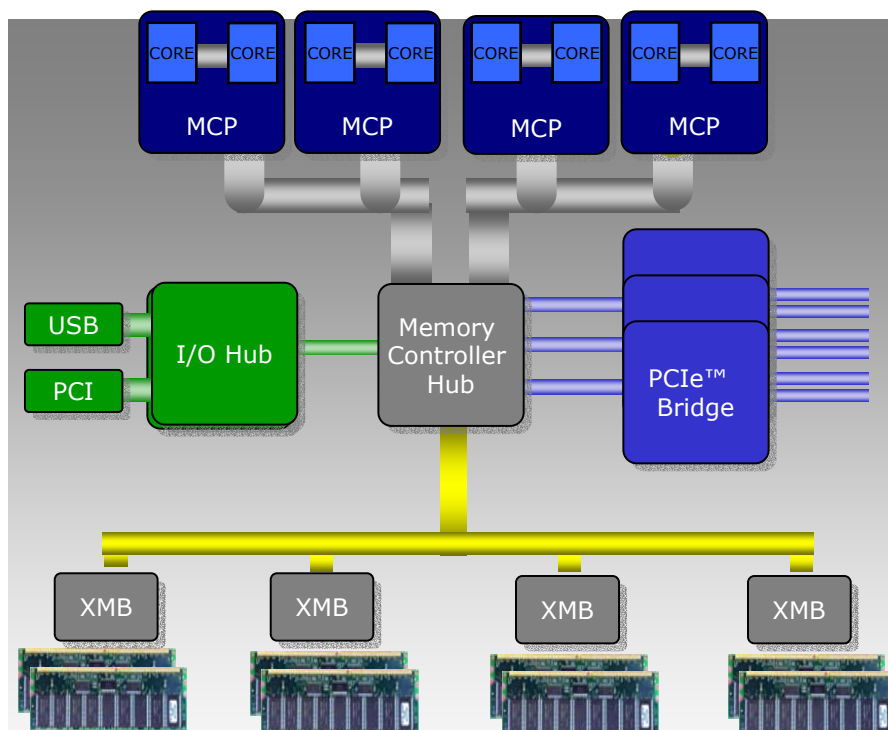


A Closer Look at the Next-generation AMD Opteron™ Processor

- Continued performance-per-watt leadership
 - High-performing, lower-power DDR2 memory
 - Consistent 95W standard power and low-power options
- Advanced leadership in x86 virtualization
 - AMD Virtualization hardware-assisted support
 - Industry-leading Direct Connect Architecture
- Reduced total cost of ownership
 - One transition to a new socket infrastructure
 - Seamless Dual-Core to Quad-Core upgradeability in same thermal envelope



A Closer Look at Direct Connect Architecture



Legacy x86 Architecture

- 20-year old front-side bus architecture
- CPUs, Memory, I/O all share a bus
- Major bottleneck to performance
- Faster CPUs or more cores \neq performance

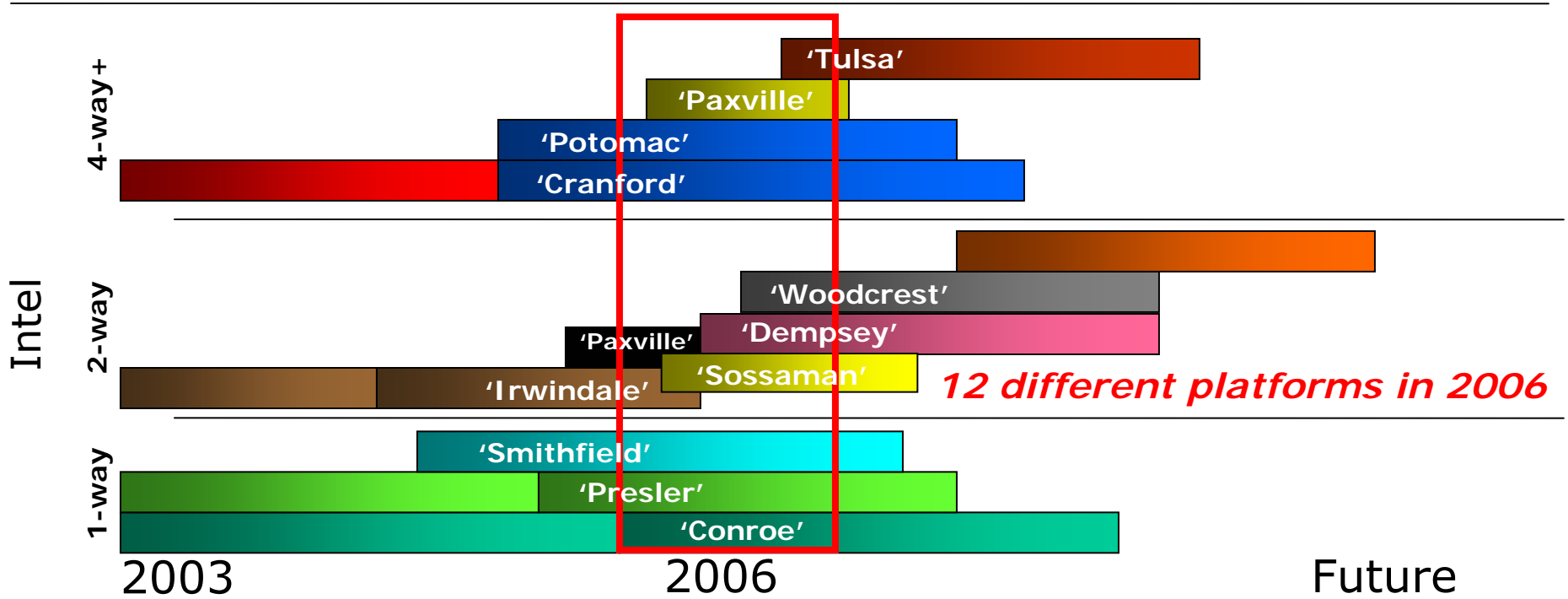
AMD64 Direct Connect Architecture

- Industry-standard AMD64 technology
- Eliminate bottlenecks of traditional front-side bus architecture
- HyperTransport™ technology interconnect for high bandwidth and low latency



Simplifying Customer Transitions

Next-Generation AMD Opteron™ Processor

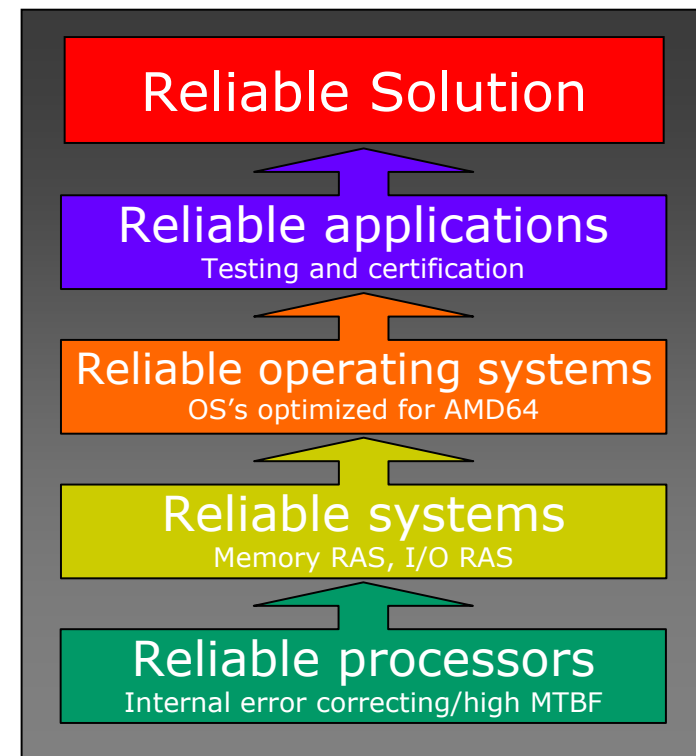


12 different platforms in 2006



Reliability and Availability *Online, All the Time*

- Helping increase availability by addressing system uptime at multiple levels
- AMD works with leading OS and application vendors to help ensure greater availability
- AMD adds error-checking and correcting across multiple data paths
- Rock-solid AMD Opteron™ processors drive more than half 4-way x86 applications in the US¹

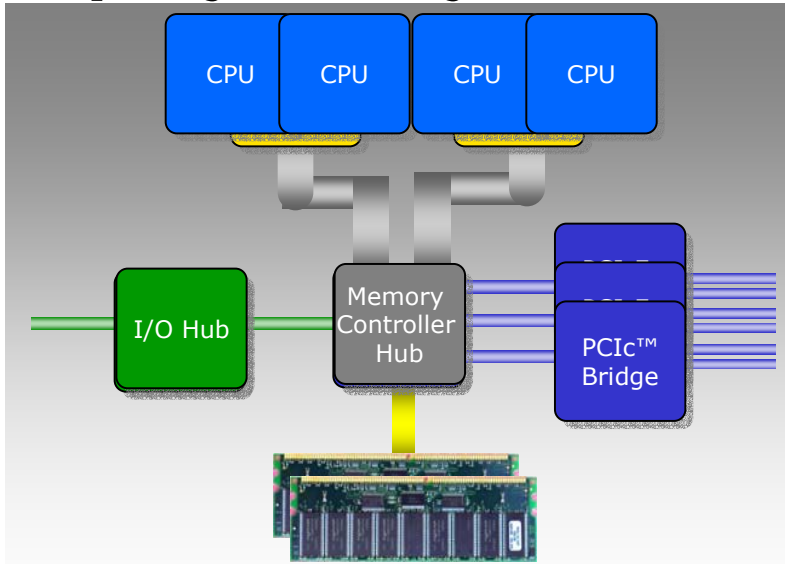


Helping ensure availability and reliability for critical applications

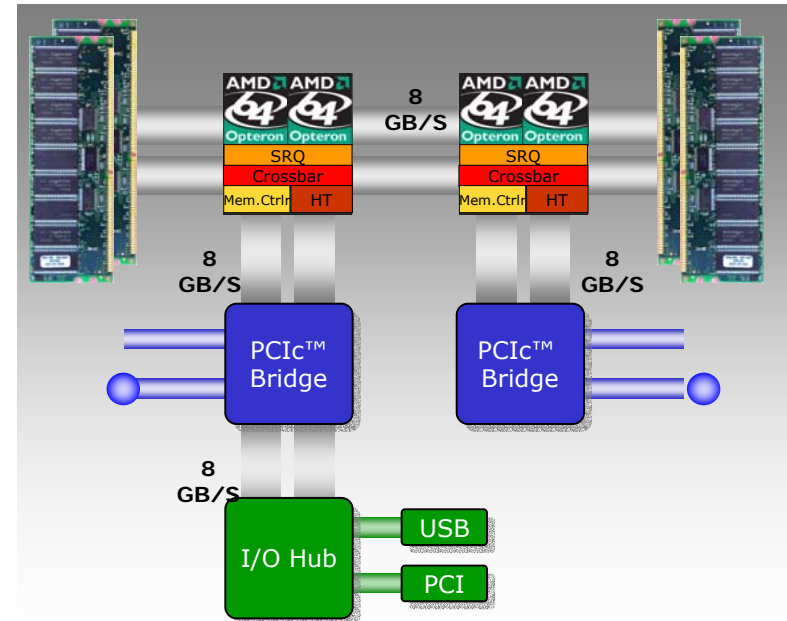


Scalability for the Future

Deploy Today, Grow in the Future



Front Side Bus Architecture



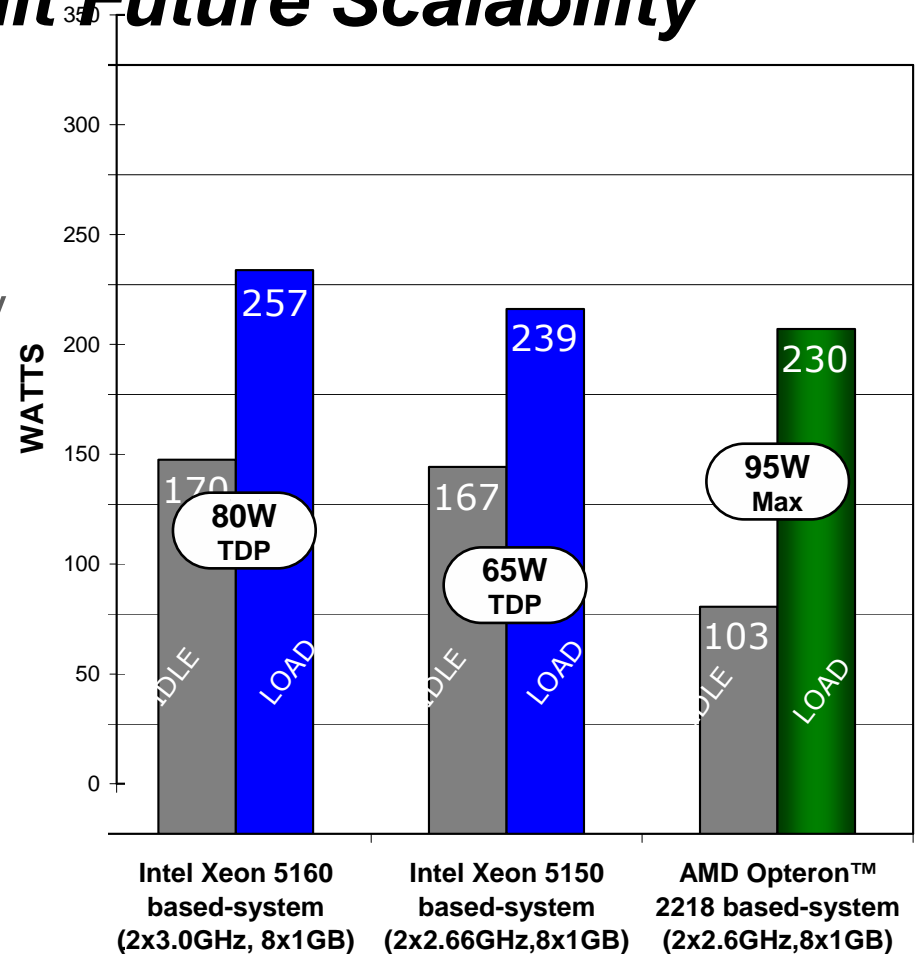
Direct Connect Architecture

- Designed for scalability: Direct Connect Architecture
- Deploy AMD Opteron™ processors today and seamlessly scale in the future
- Upgrade to quad-core in the same power/thermal range as dual core while not compromising on performance or scalability

Designed for Lower Power Consumption

Power and Heat Can Limit Future Scalability

- AMD Opteron™ has always focused on minimizing power consumption
- Consistent power/thermal strategy across all AMD Opteron processors
- AMD Opteron HE products are designed to reduce power Consumption
- AMD PowerNow!™ technology actively reduces power based on system utilization



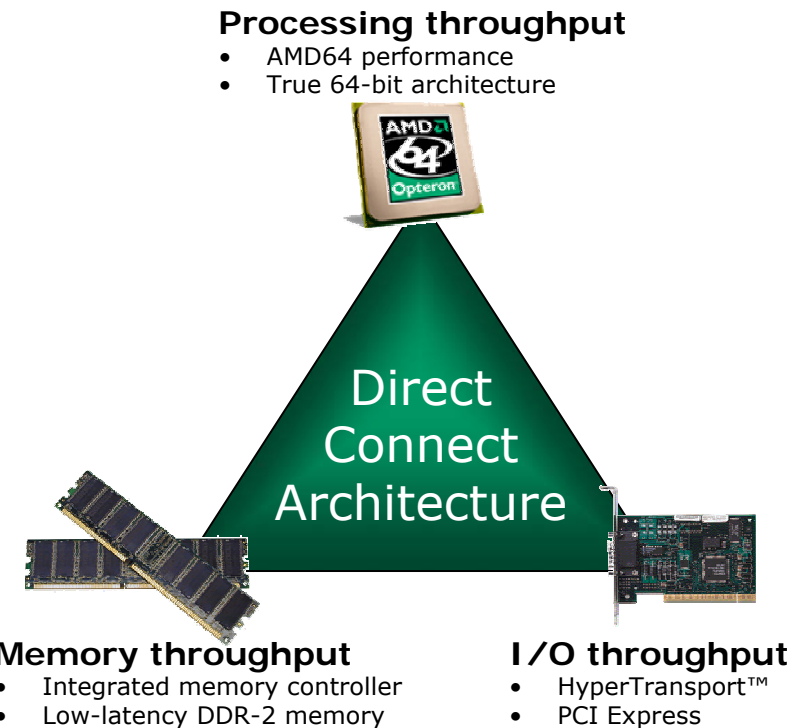
A holistic approach designed to reduce power costs



Real-world Performance

AMD Opteron™ - the Balanced Platform Approach

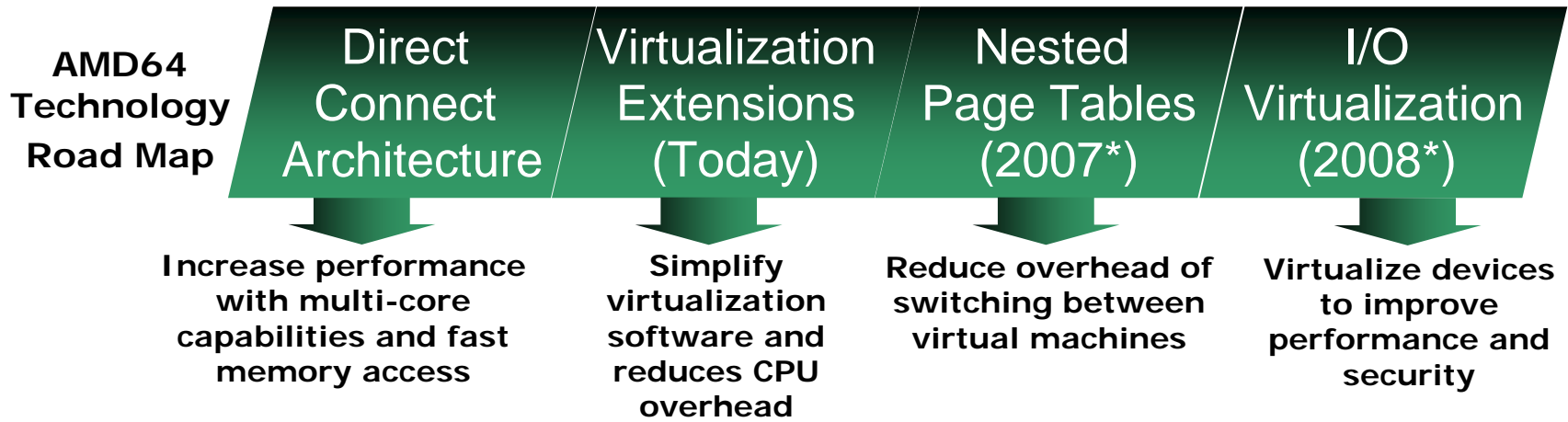
- Enterprise-class performance across leading applications
 - Database
 - ERP/CRM
 - Web
- Outstanding performance in I/O and memory-intensive applications
- Best-in-class virtualization performance
- Collaboration with leading application providers to tune performance



The best representation of performance is the actual application and data



AMD Virtualization



Novell

Microsoft



AMD is developing a robust virtualization ecosystem that provides users with innovation and choice



VirtualIron



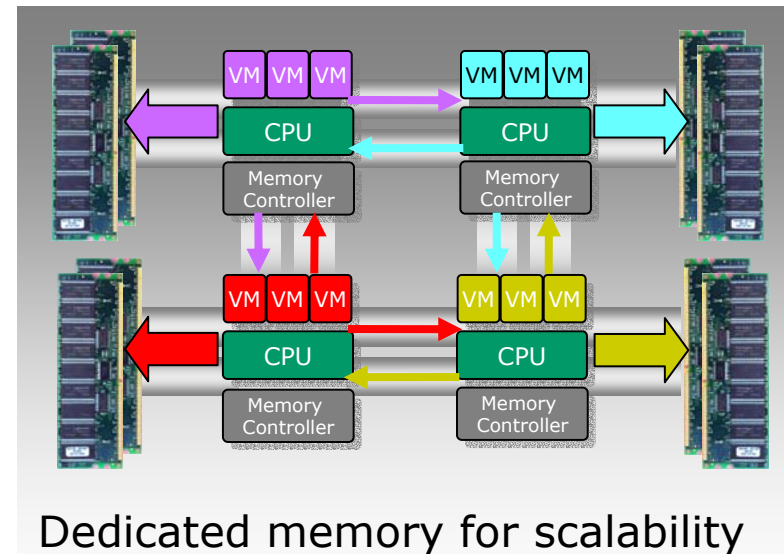
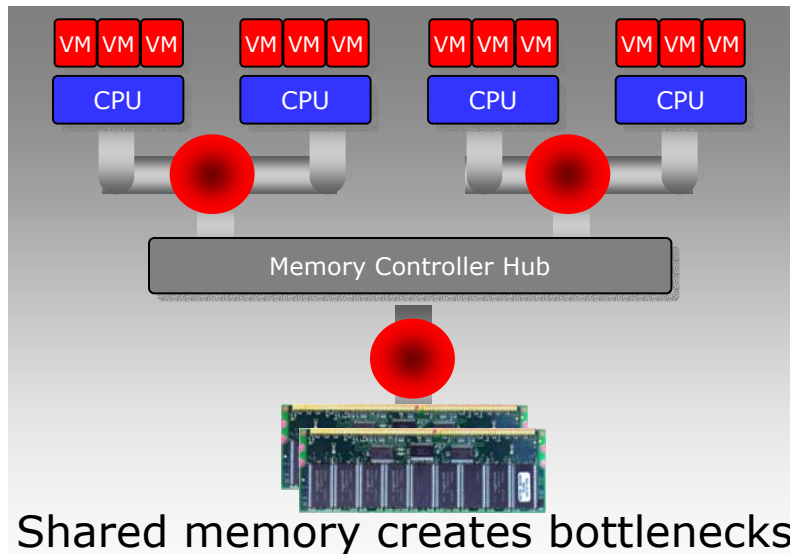
AMD



ORACLE

A Closer Look at AMD Virtualization™

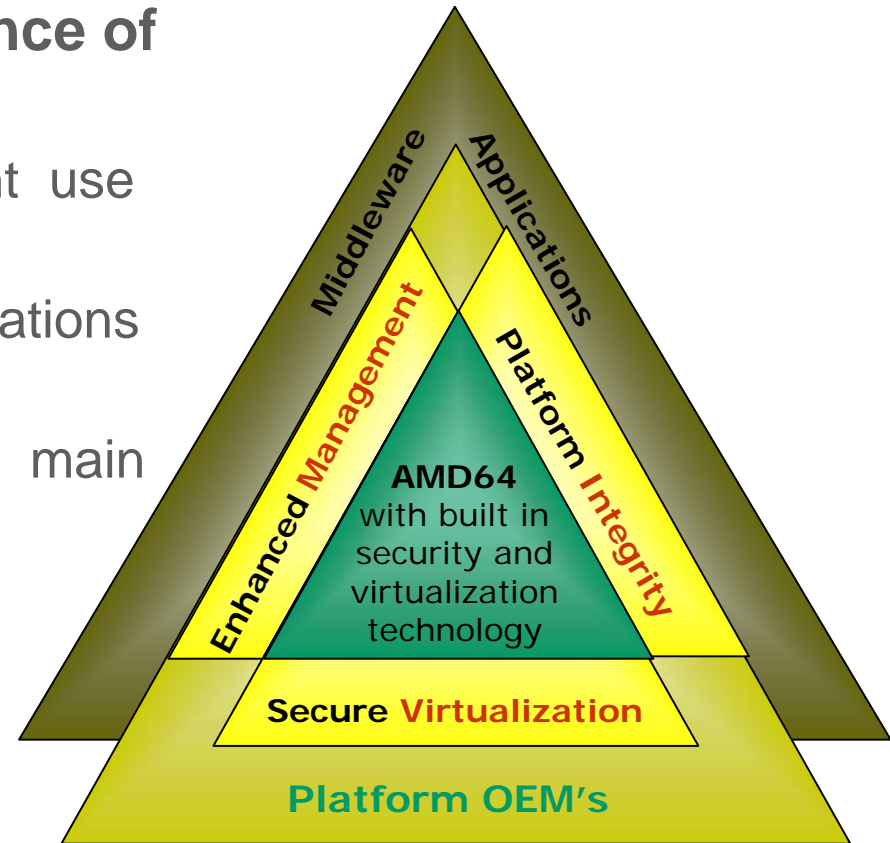
Designed for Virtualized Memory Access



- Instructions added to help **reduce complexity**
- **Reducing overhead** by selectively intercepting guest information
- Guest OS runs unmodified for **easier implementation and support**
- Increased isolation to **improve security** of virtual machines
- Architectural enhancements improve **efficiency of switching** between hypervisor and the guest OS's

AMD's Trinity Initiative

- **Trinity consists of convergence of three core technologies**
 - Virtualization: enables efficient use of IT resources
 - Security: driven by strict regulations and hostile world pressure
 - Management: continues to be main cost driver for IT
- **Trinity applies to**
 - Hardware, firmware, and software
 - Client to Server
 - Enterprise to Consumer



Building the Oracle Grid

- Multi-Core AMD Opteron™ processors provide the perfect balance of 64-bit performance, power, and cost
- Blades and 1U systems from Sun increases server density
- Oracle Business Applications designed specifically for grid computing
- Network Storage Technologies for reduced disk storage costs
- Gigabit Ethernet for a cost efficient method of connecting clusters of servers

Sun Fire
x2100



Sun Blade
X8400



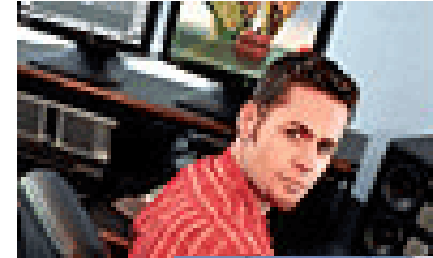
Grid Computing: Building a Well-managed Secure, and Trusted Environment



- Consolidate workloads to reduce hardware and space requirements
- Run multiple applications simultaneously
- Run legacy software on reliable, power-efficient hardware
- Isolate operating environments to improve security and fault tolerance
- Provide redundancy to support disaster recovery

AMD and Oracle - Bringing X86 Economics to Business Computing

- **Driving the evolution of technology**
 - Oracle a featured partner at AMD Opteron™ processor launch in April 2003
 - AMD64 a core technology of Oracle's Grid Computing efforts
- **Delivering business alternatives**
 - x86-based servers instead of proprietary systems
 - Scale-out computing instead of scale-up
- **Addressing IT challenges**
 - Rising operational costs
 - Power, cooling, and space constraints
 - Underutilization of resources
 - Lack of business flexibility



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Enterprise Grid Computing Overview

ORACLE®

Mike Reed

Director, Application Server Enablement

North American Technology Business Unit

AMD 

 **Sun**
microsystems

ORACLE®

Nicholas Carr, Author

“Does IT Matter? Information Technology and the Corrosion of Competitive Advantage”

“There’s a point where pursuing distinctiveness in IT can backfire because the great power of IT now comes from its becoming a shared infrastructure that allows you to transact business easily with other companies.

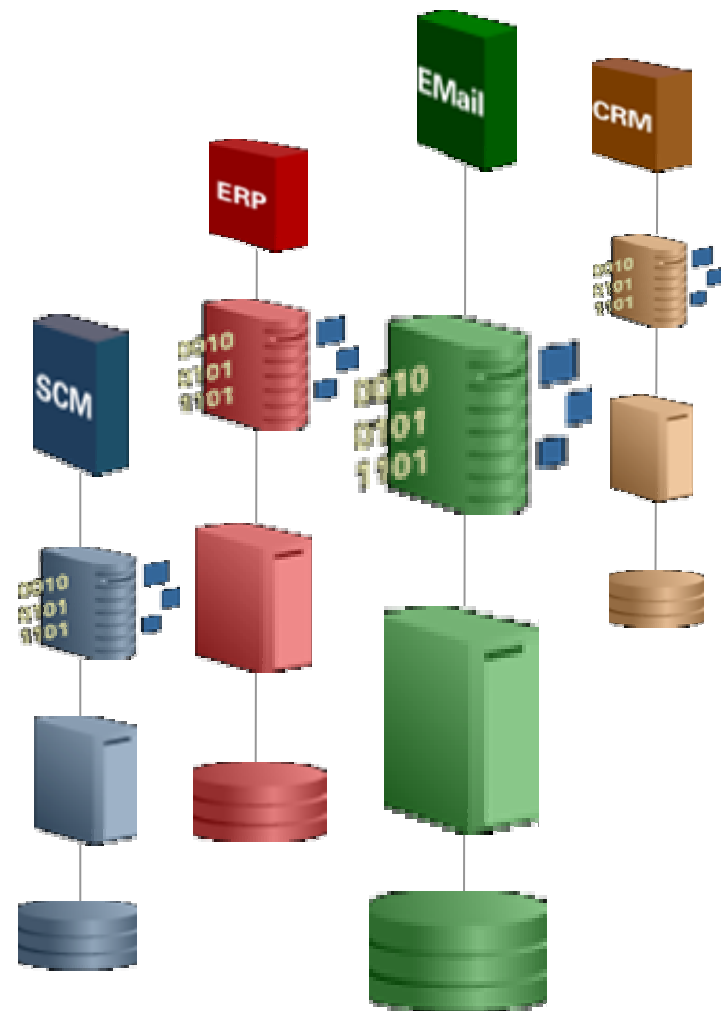
For more and more companies, the right path is to go toward a more standardized, less distinctive IT. You don’t want to be an IT island as companies used to be, when they were all out developing their own architectures and infrastructures.

One of my core thrusts is that it’s to the advantage of the company to stop thinking about IT as a way to gain advantage. Once you accept that position, you can begin to tap into the great productivity gains and effectiveness gains that come with building your business on top of a common, shared, cheap, and reliable infrastructure.



Today: Business and IT

- Ever-changing business priorities
- Islands of Data
- Islands of Computation
- Under-utilization
 - “My storage is 30% utilized and growing by 50% a year”
 - 15% of CPU is normal
- Over-utilization
 - DBAs, System Administrators



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Imagine an IT Environment Where...

- Any Server can run any application or database
- All Servers can Access All Data
- Servers Assigned to Apps / DBs as Needed
- Providing New Environments Takes Minutes
- Avg Utilization > 50%, peak is always less than 100%
- ALL applications enjoy 100% availability
- Expanding capacity doesn't require budget approval
 - Basic expansion unit cost < \$3,000

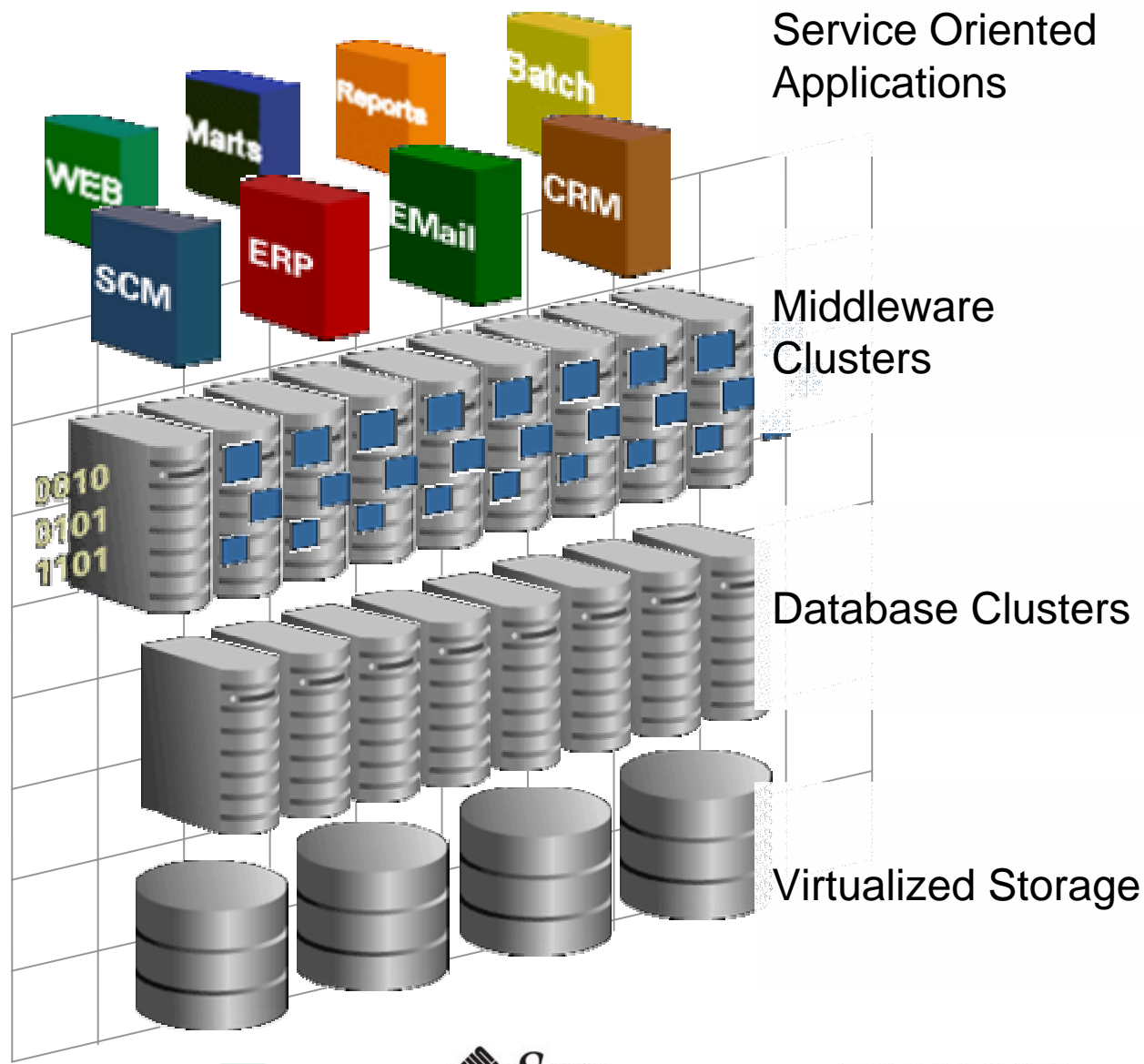
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Oracle's Grid Vision

- Standardization
- Replication
- Virtualization
- Provisioning
- Central Mgmt

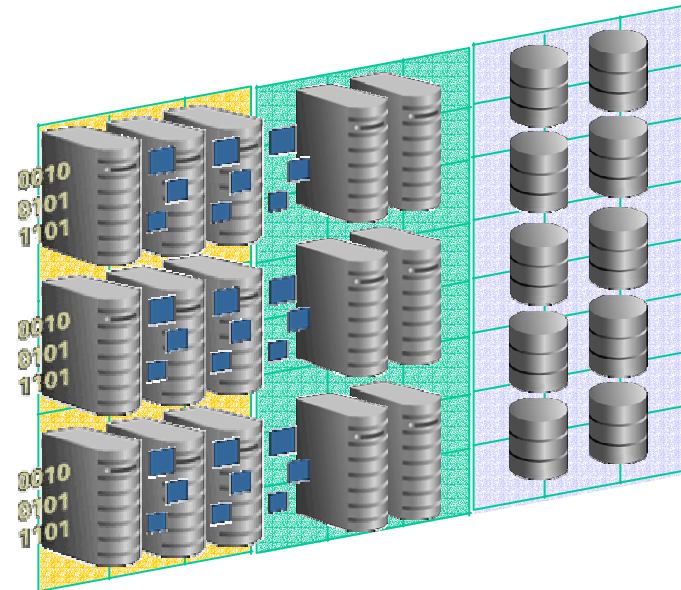


Reducing IT Costs

Large Dedicated Server



Oracle Grid



- Expensive costly components
- High incremental costs
- Single point of failure
- Enterprise service at high cost

- Low cost modular components
- Low incremental costs
- No single point of failure
- Enterprise service at low cost

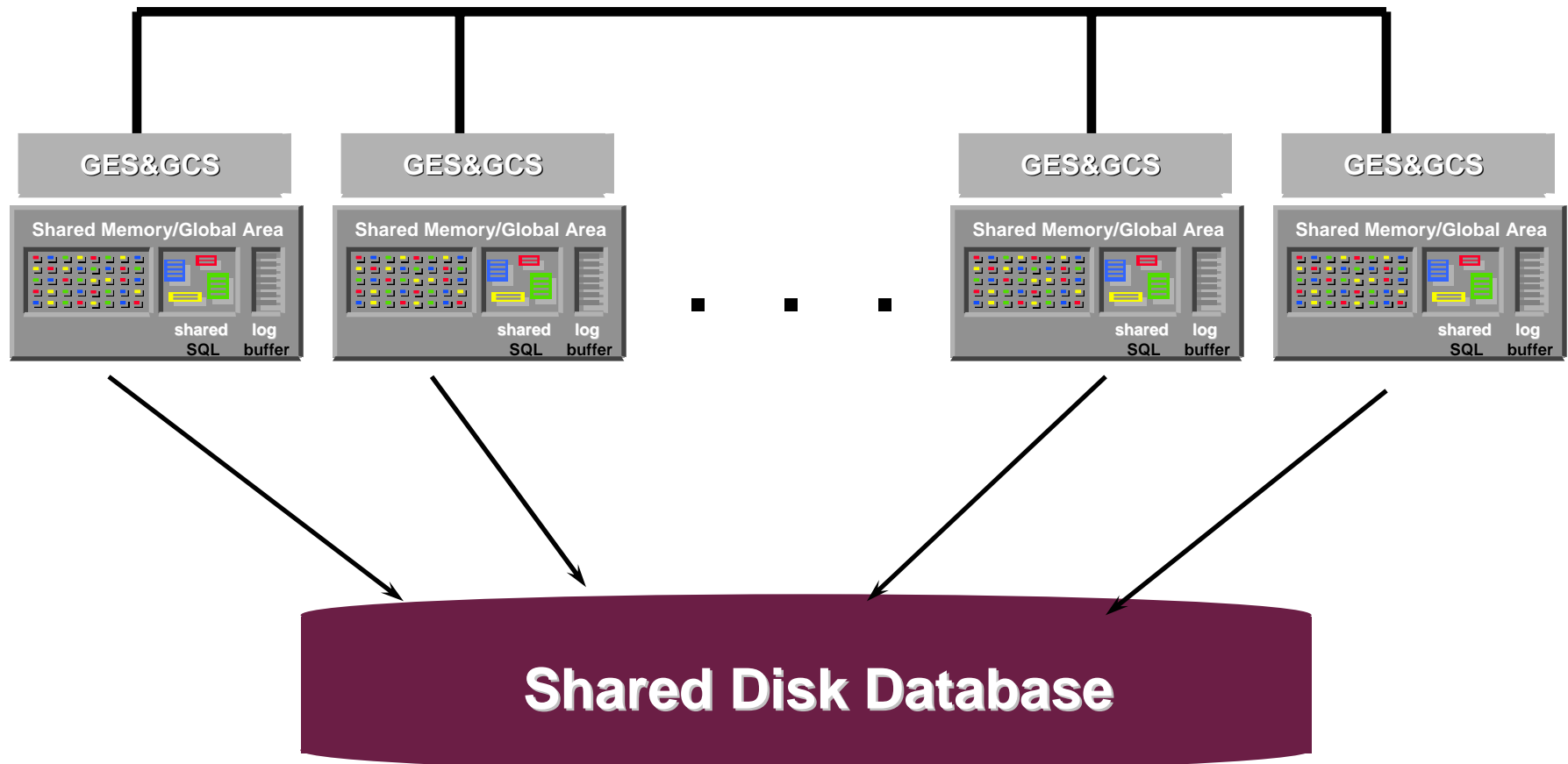


Real Application Clusters - what is it?

- **A Single Database**
- Many instances of Oracle running on many nodes
- Multiple instances share a single physical database
- All instances have common data, control, and initialization files
- Each instances has individual, shared log files and rollback segments or undo tablespaces
- All instances can simultaneously execute transactions against the single database
- Caches are synchronized using Oracle's Global Cache Management technology (Cache Fusion)



RAC uses a Shared Data Model

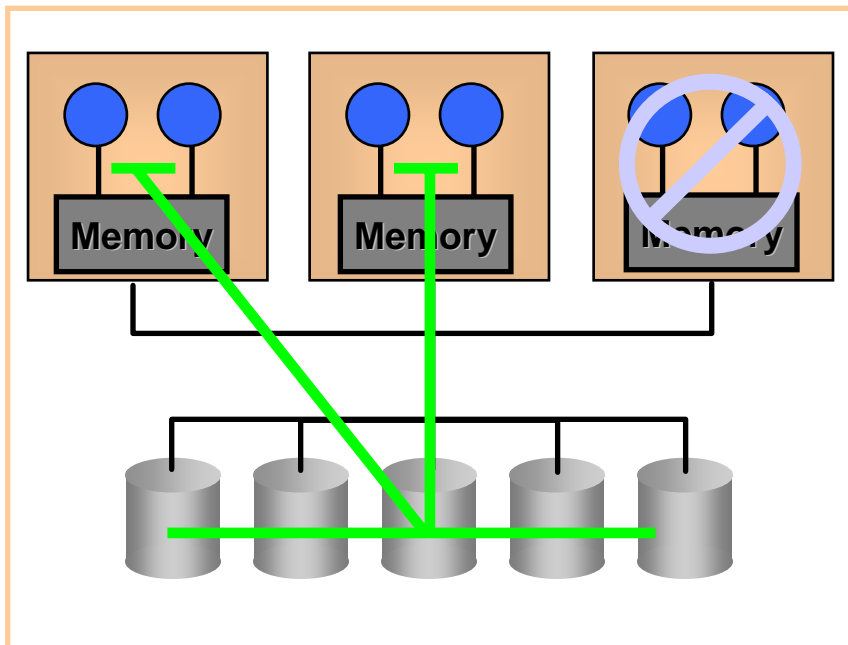


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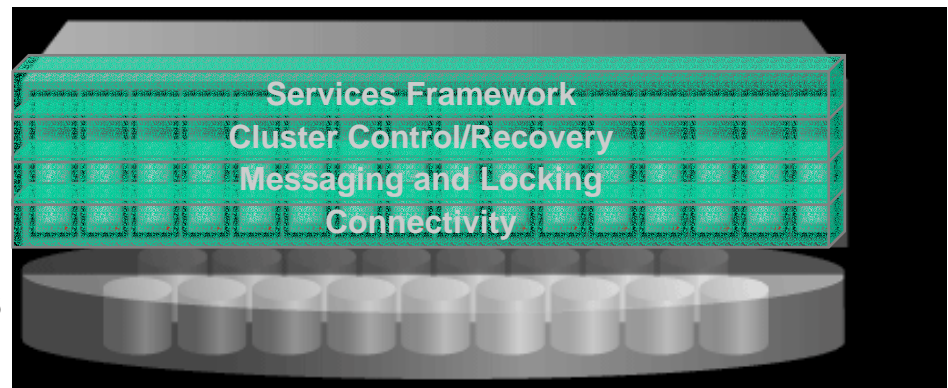
RAC Provides Very High Availability



- Failure of a node does not render data inaccessible
- Graceful Fault Degradation
 - Retains $(N-1)/N$ of original processing power
 - All remaining nodes can participate in processing all data

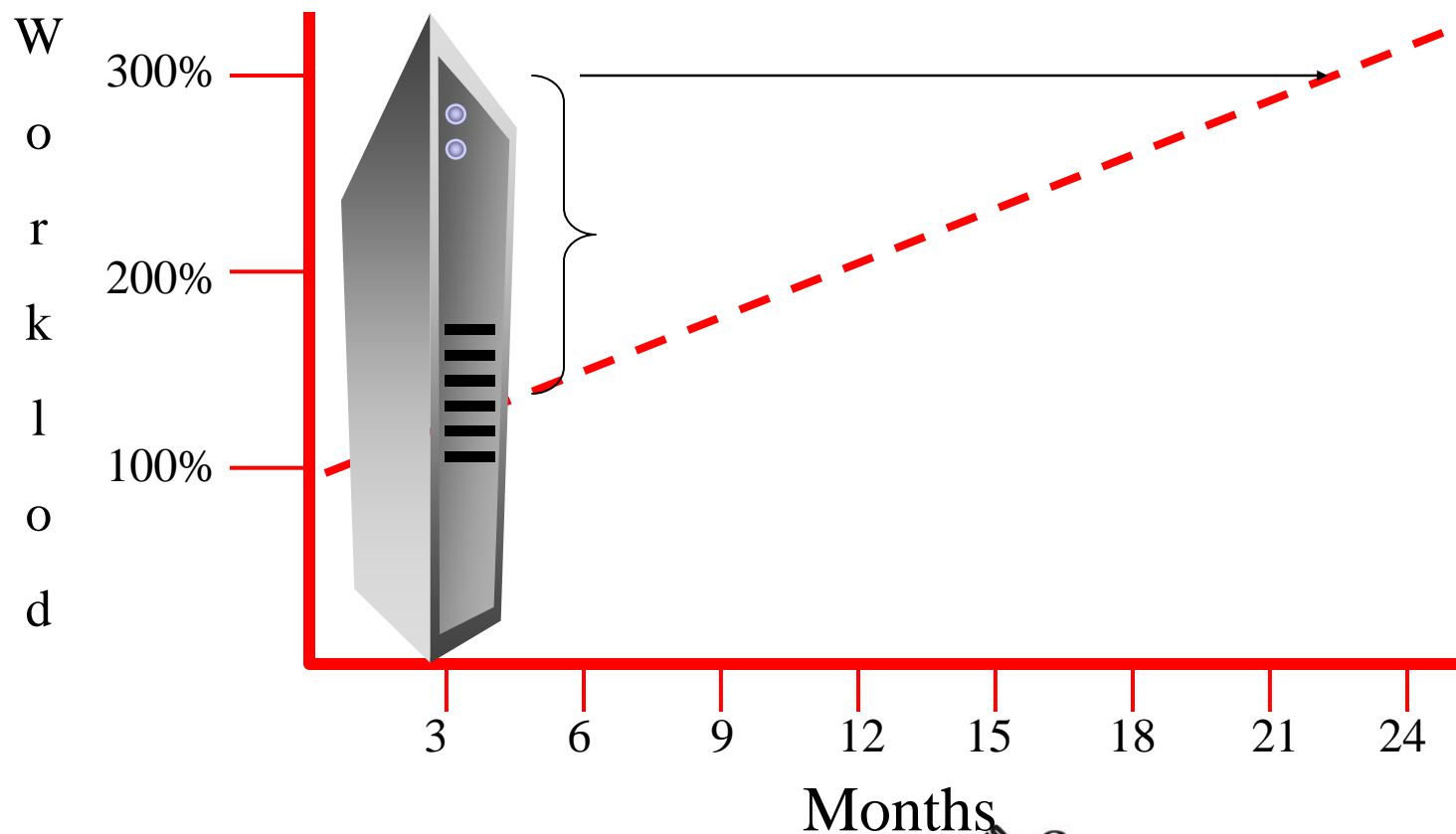
Oracle10g Cluster Ready Services Complete, Integrated Clusterware

- Complete Oracle cluster software solution
- Single-vendor support
- Low Cost
 - No need to purchase additional software
 - Easy to install, manage
- High quality and functionality across all platforms
- Common event and management API's
 - Multi-tier HA & minimal MTTR
- Support for third-party clusterware



Capacity Planning

- Planning to handle workload



AMD

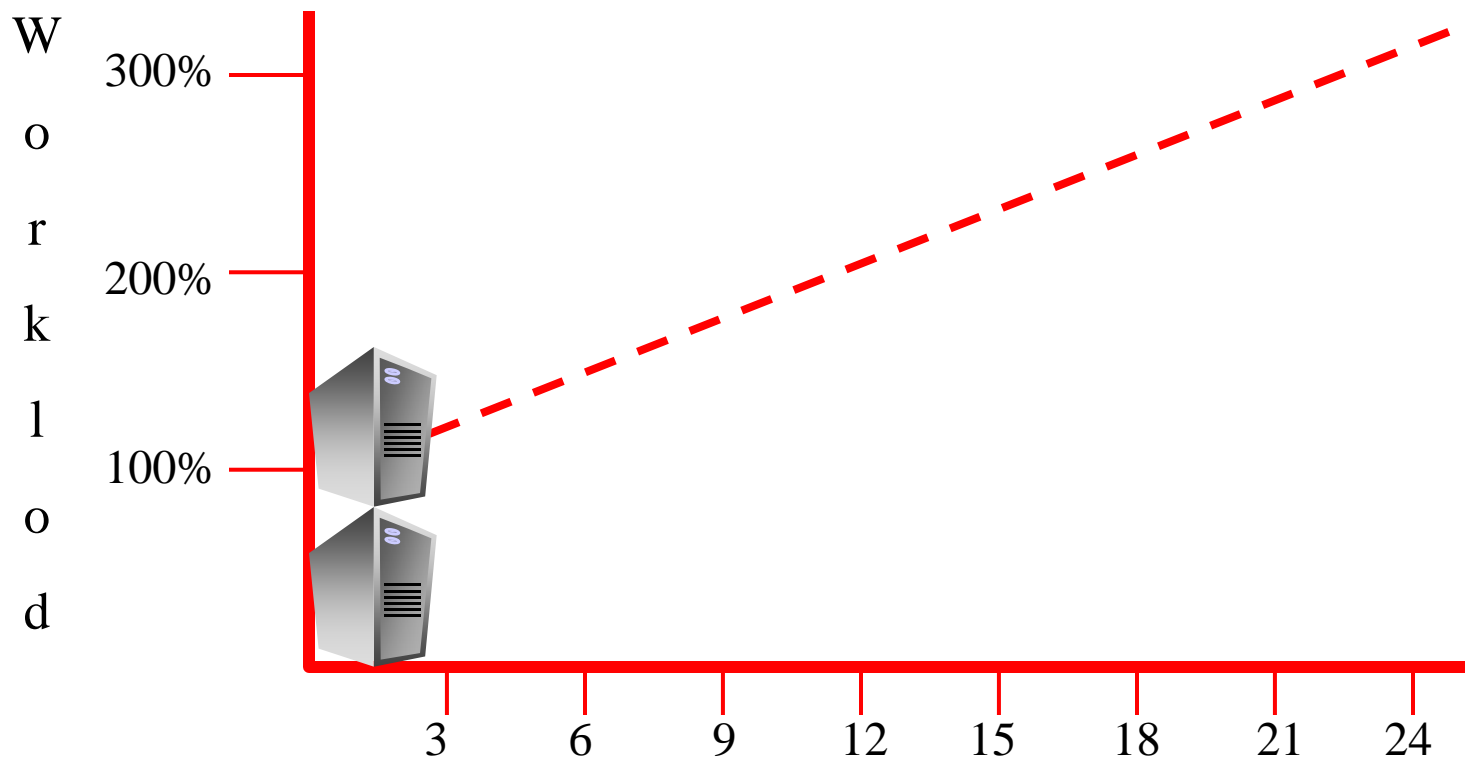
Months

Sun
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... vs Capacity on Demand

- Initial workload with RAC



Months

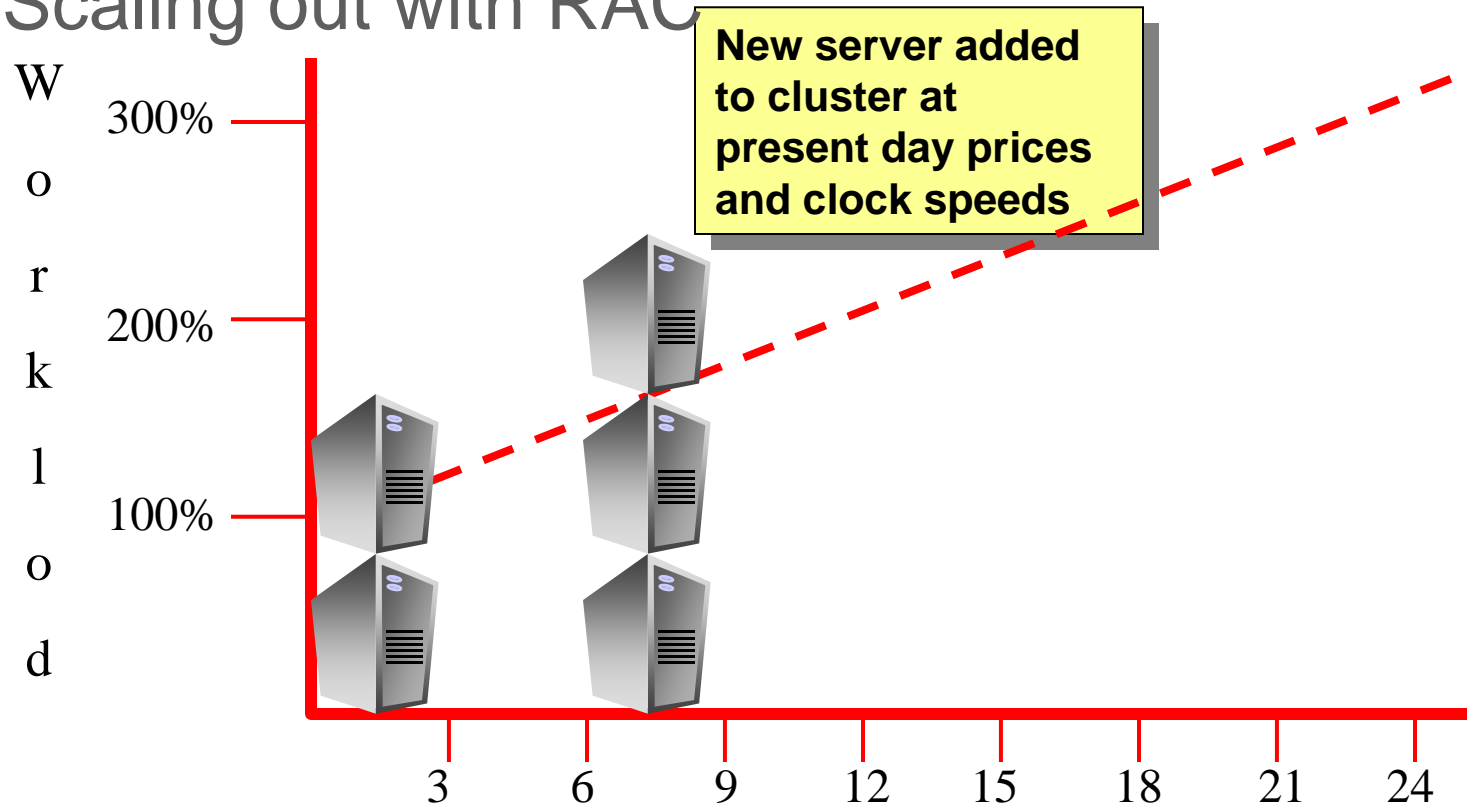
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... etc ...

- Scaling out with RAC

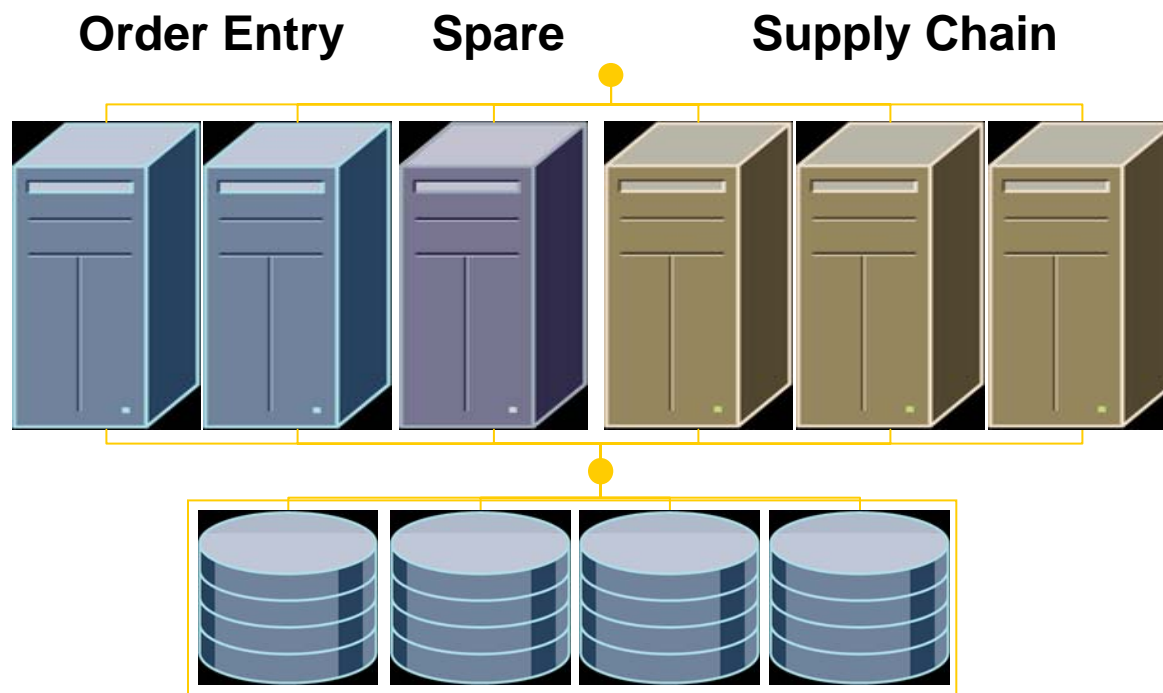


Automatic Workload Management

- *Application workloads can be defined as Services*
 - Individually managed and controlled
 - Assigned to instances during normal startup
 - On instance failure, automatic re-assignment
 - Service performance individually tracked
 - Finer grained control with Resource Manager
 - Integrated with other Oracle tools / facilities



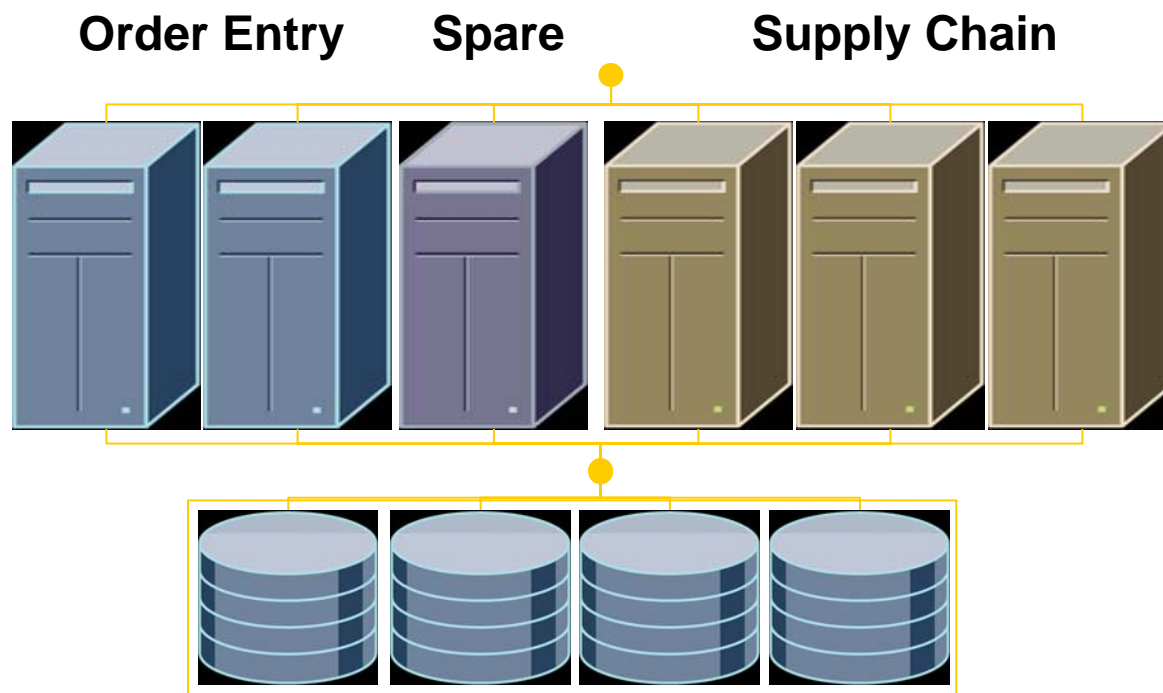
Automatic Workload Management



Normal Server Allocation



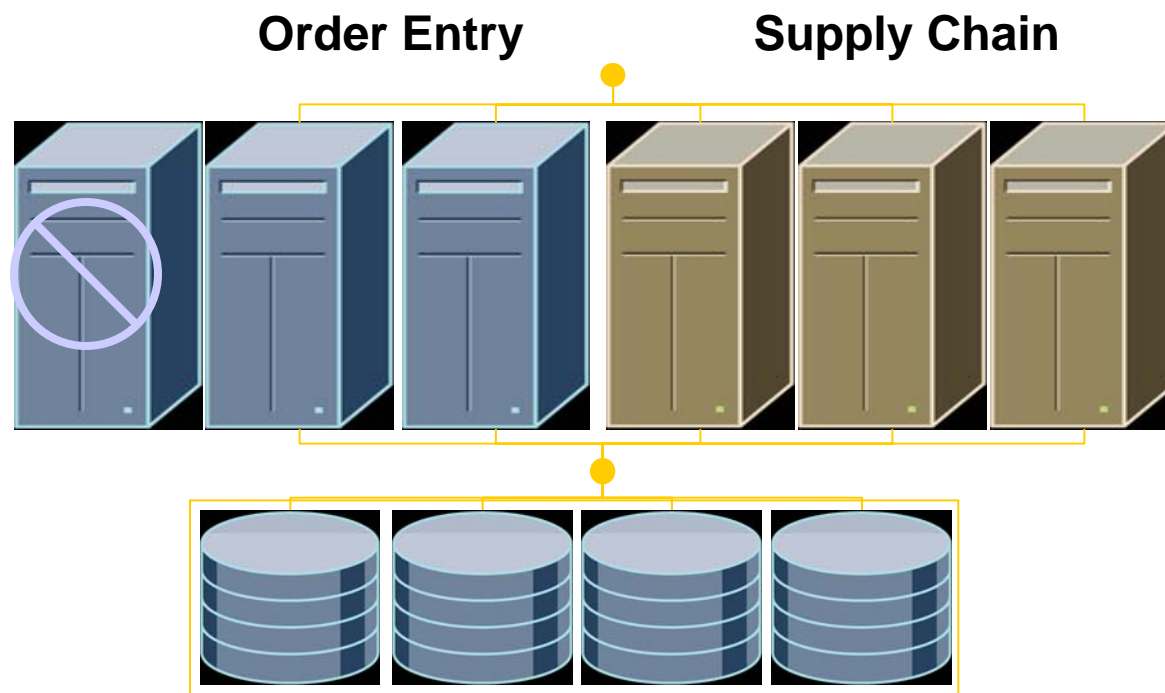
Automatic Workload Management



Normal Server Allocation



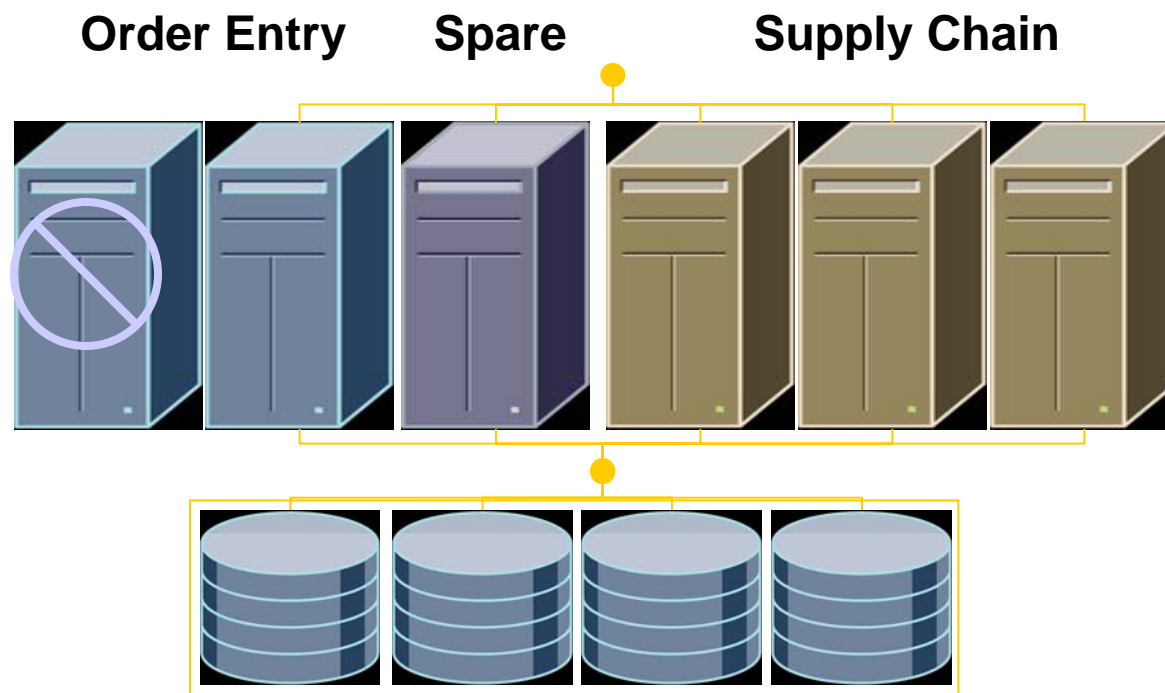
Automatic Workload Management



Reallocate Spare server to Order Entry



Automatic Workload Management

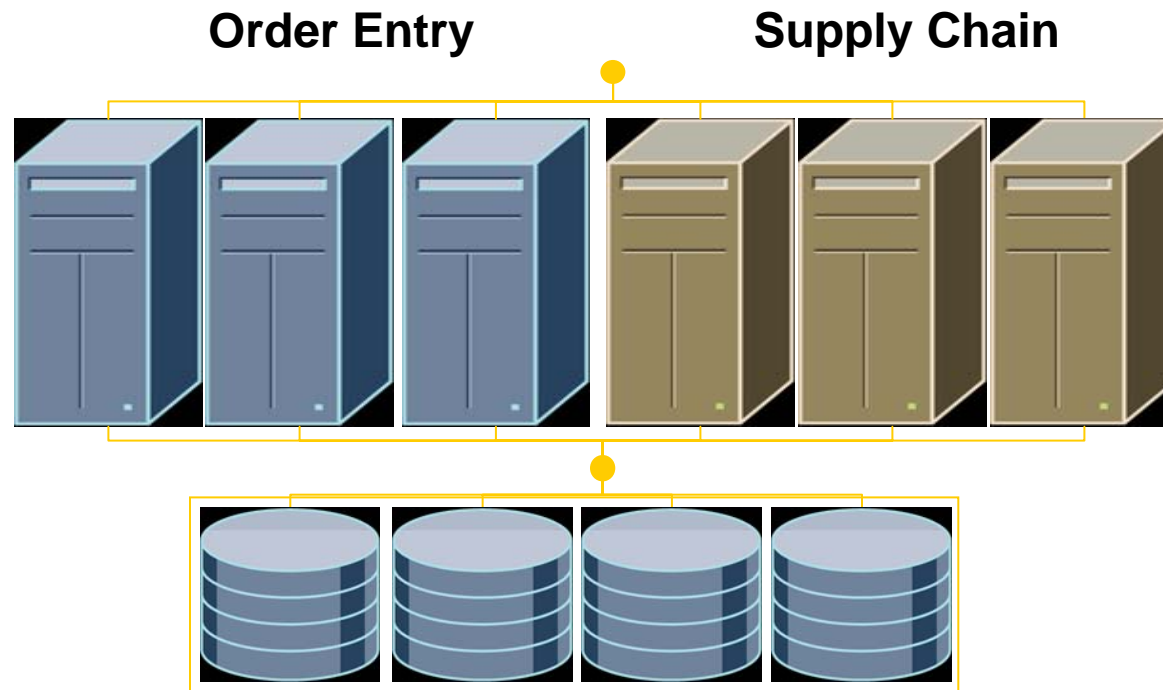


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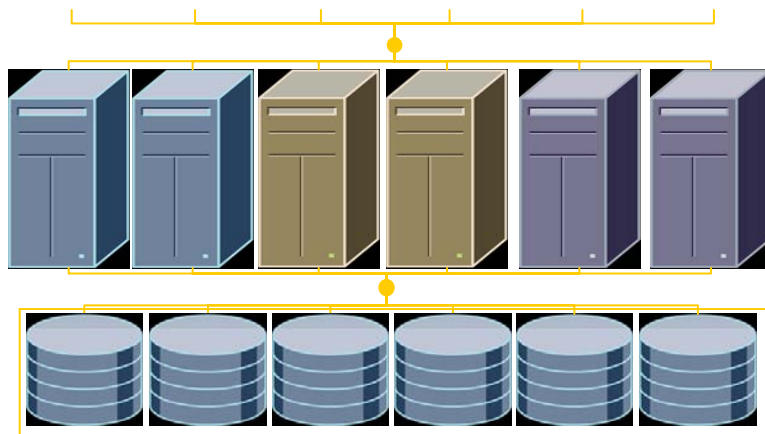
Automatic Workload Management



End of Quarter



Automatic Storage Management (ASM)

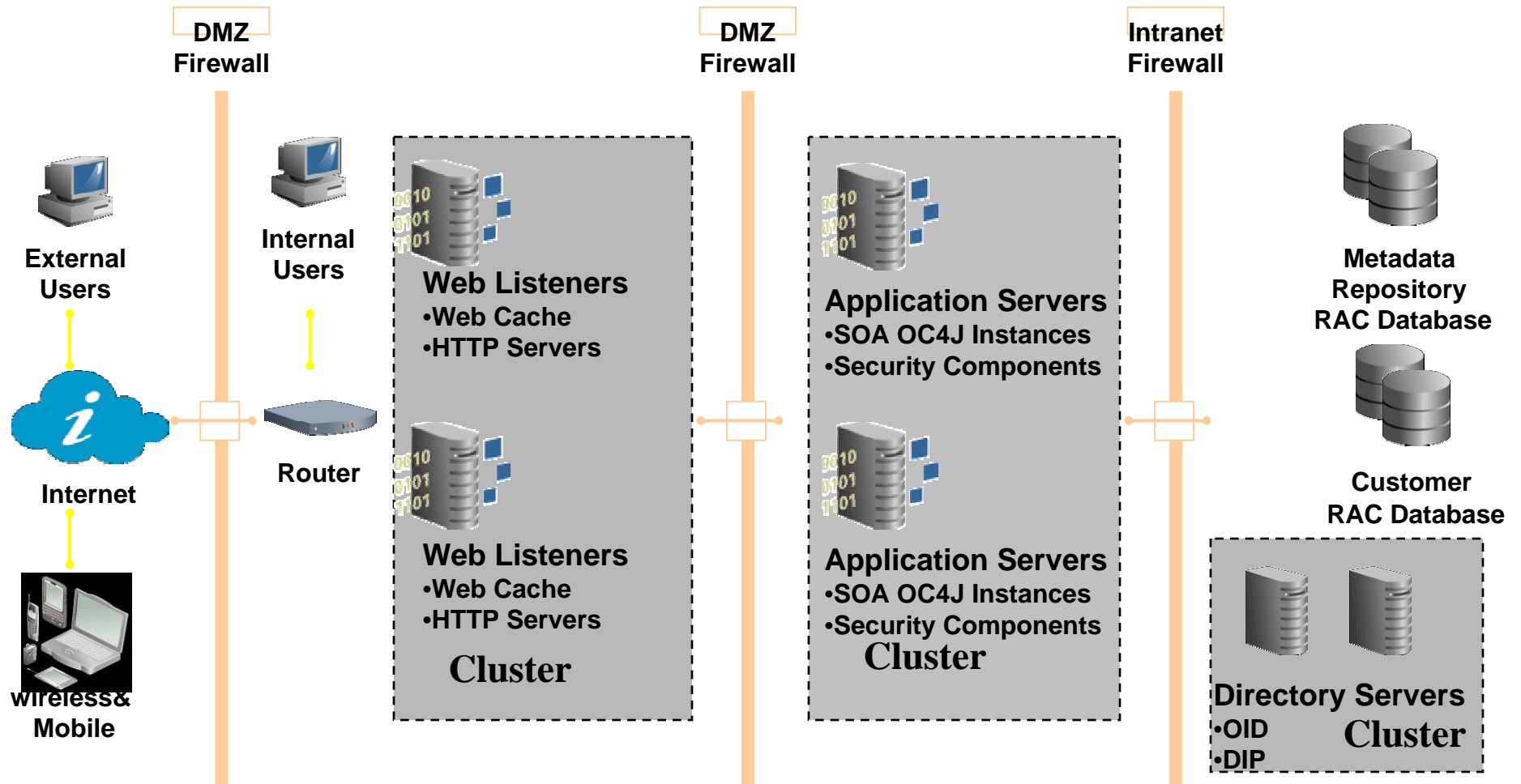


**Automatic Storage
Management**

- Portable, high performance cluster disk management
- Data is spread across disks to balance load
- Integrated mirroring across disks
- Automatic I/O re-balancing
- Complete on-line operations
- Removes need for third-party cluster volume manager and file system

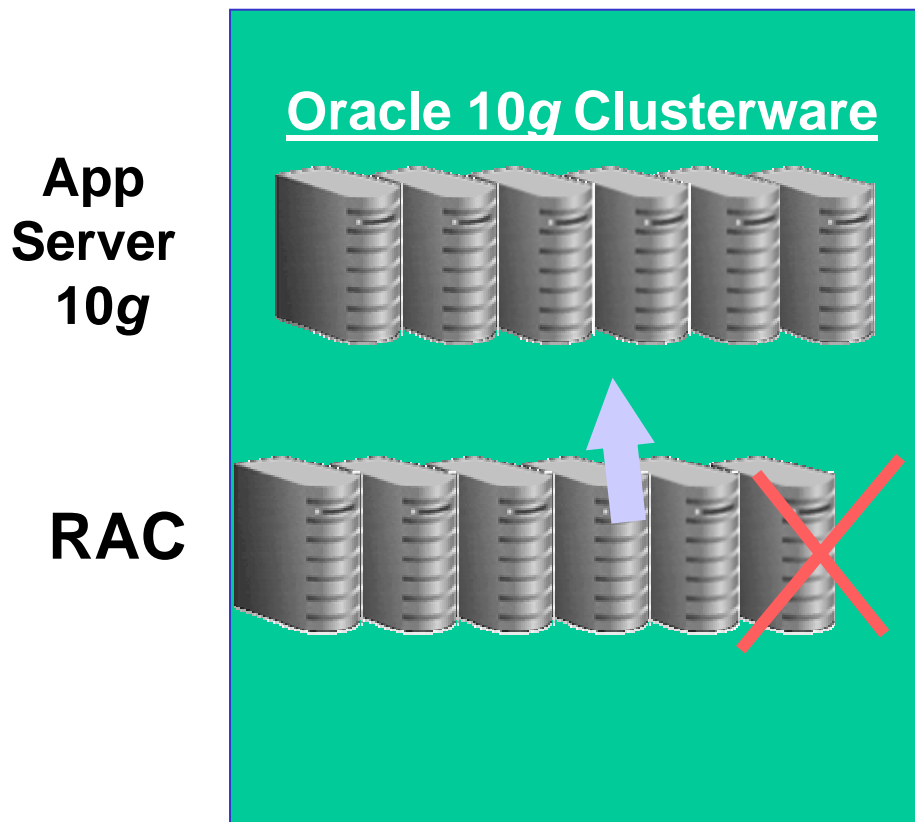
Oracle Fusion Middleware Grid

Maximum Availability Architecture (MAA)



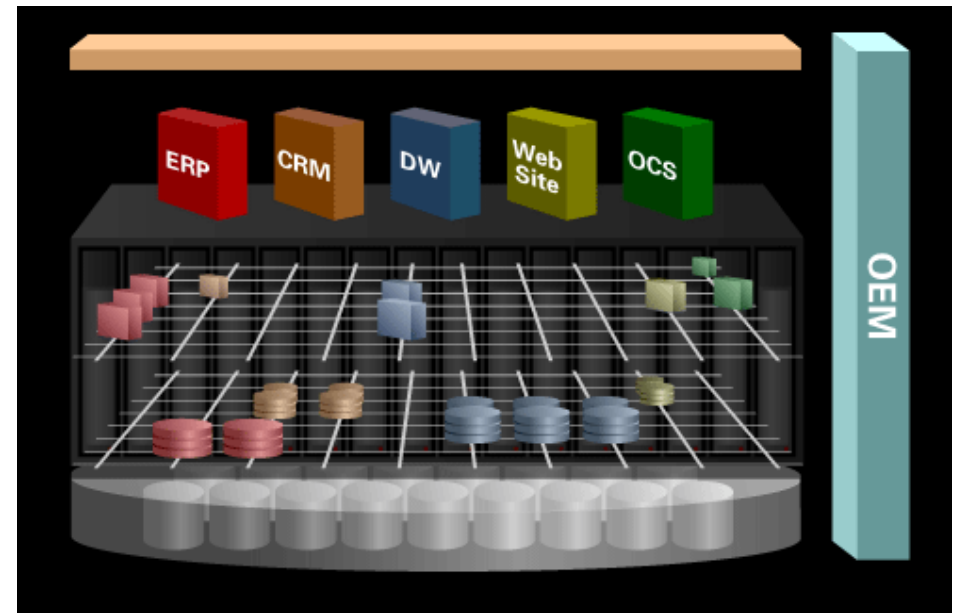
Fast Connection Failover with Oracle 10g AS

- End to end recovery without human intervention
 - Oracle RAC 10g signals 10g JDBC Fast Connection Failover when instance failure occurs (up & down signals)
 - < 8 second recovery time for database
 - Immediate recovery for mid-tiers
 - < 4 seconds from 15 minutes Self Correcting
 - Notification Callouts available



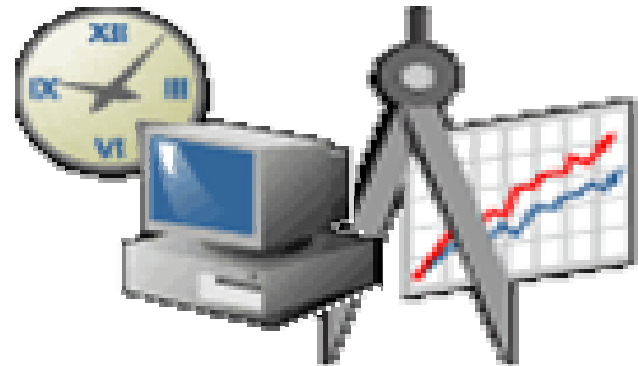
Oracle10g Management – Grid Control

- Self-Managing, Self-Tuning, Self-Learning Database
- OEM Grid Control provides Grid-wide operations
 - Single cluster image
 - Entire stack
 - User Provisioning
 - Cloning
 - Patch Management



Oracle10g System Management Built-In Intelligent Infrastructure

- **Automatic Workload Repository**
 - Automatically collects statistics, SQL workload, Feature usage
 - Base-lining capability
- **Automatic Maintenance Tasks**
 - Pre-packaged, resource controlled
- **Server-Generated Alerts**
 - Out-of-the-box, Push vs. Pull, Just-in-time



Configuration Management: Capacity-on-Demand



1

Load increase identified -- additional resources required

2

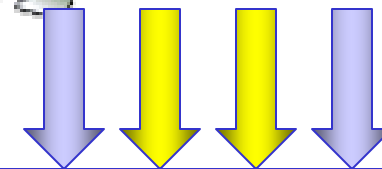
Systems chosen for deployment from available hardware

3

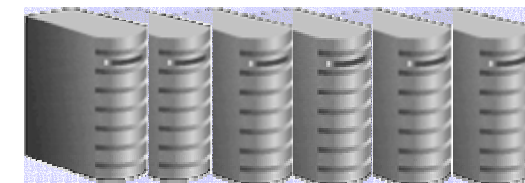
New servers added to application

- Image/Clone OracleAS
- Instantiate the new OracleAS instance:
 - Associate OracleAS with Infrastructure
 - Add OracleAS to cluster

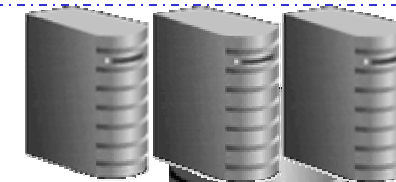
Production Application



New Hardware



Application Servers

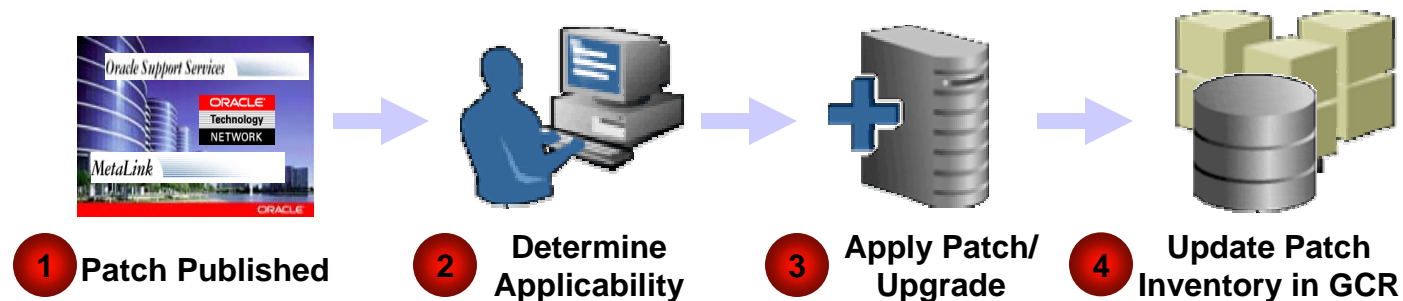


RAC DB



Patch and Update Management

- Real-time discovery of new patches
- Automated staging and application of patches
- Rolling application upgrades
- Patch history tracking



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A Process, Not a Project



Basic Building Blocks

2-4 CPU Servers

Standard OS

(Not always Linux)

Standard Database

Storage (SAN)

Servers

Databases

Build Clusters

Test Scalability, Availability

Re-Define HW Strategy

(Horizontal Scalability)

Failover policies

Cloning SW configs

Provisioning

Node allocation policies

Diagnostics

Event notification

Availability

Security

EAI

Web Services



See it live @

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Enterprise Technology Center



- **The objectives of the Enterprise Technology Center are:**

- Ensure our joint customers and partners are successful in implementing highly scalable and mission critical solutions

- Focus on Mission Critical Computing:

 - Oracle 10g technology and solutions including Database, Fusion Middleware, Grid Control, and Technology Options

- Showcasing the latest Oracle solutions on Sun to our partners and customers

- Work with customers for Proof of Concepts

AMD 

 Sun
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For More Information

<http://search.oracle.com>



Or

www.oracle.com/grid





Sun-Oracle-AMD Grid Solutions

Paul Milo

**Director, Technology Adoption and Partner Marketing
Sun Microsystems**



Agenda

- IT challenges today
- The benefits of Grid Computing
- The Sun-Oracle-AMD advantage
- Sun-Oracle-AMD 10g Grid Reference Architecture
- Reference Architecture benefits
- Components from Sun-Oracle-AMD
- Where to go for more information



Today's IT Challenges

- Provide a greater variety of services
- Deploy reliable, high performance database solutions
- Use fewer resources
- Stay within constrained capital and expense budgets



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The Benefits of Grid Computing

- Adapt to changing business needs
- Deliver greater efficiency
- Minimize costs
- Provide investment protection
- Deliver rapid return on investment

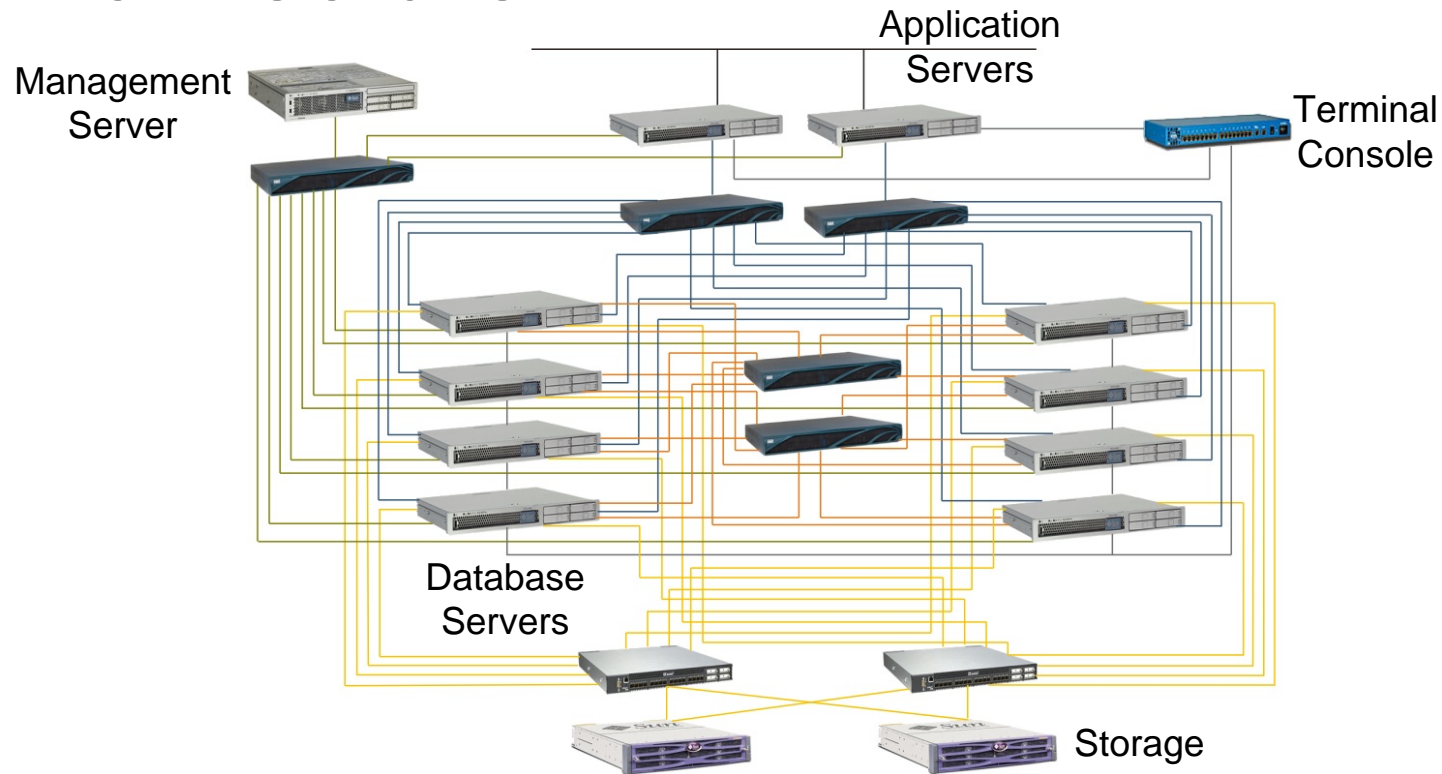


Build a Better Grid Infrastructure with Sun and Oracle

- Oracle is the world leader in database solutions
- Sun is the thought leader and platform of choice for mission-critical computing
- Together Sun-Oracle-AMD deliver proven infrastructures tailored to the needs of grid computing



Sun and Oracle 10g Grid Reference Architecture

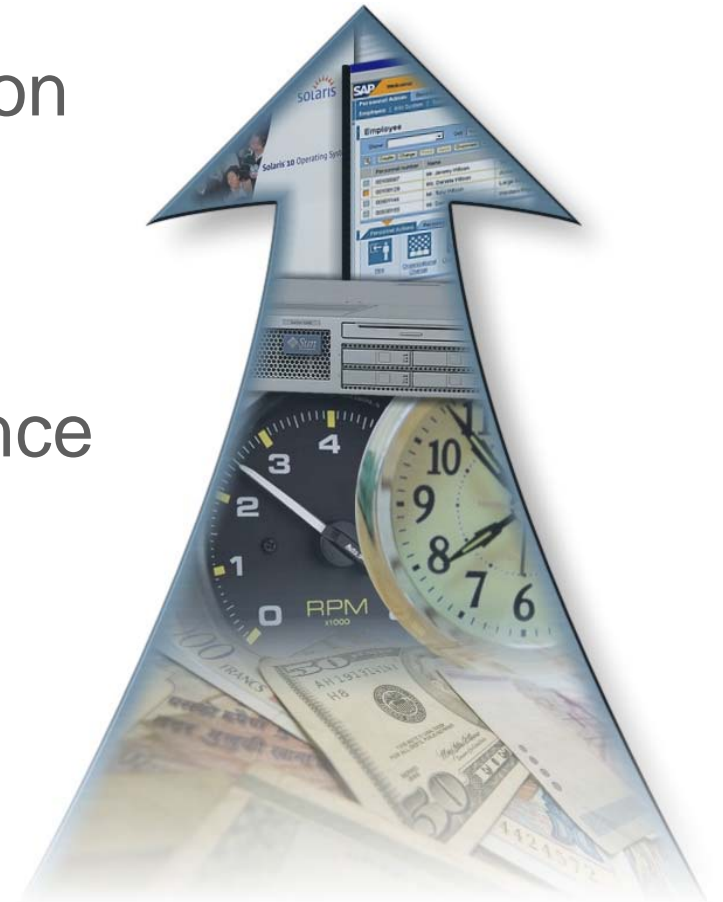


A high performance, highly available database infrastructure in a cost-effective grid environment



Reference Architecture Benefits

- Utilize a proven portfolio solution
- Maximize availability
- Maximize reliability
- Experience extreme performance
- Take advantage of flexible scalability
- Minimize costs
- Simplify management

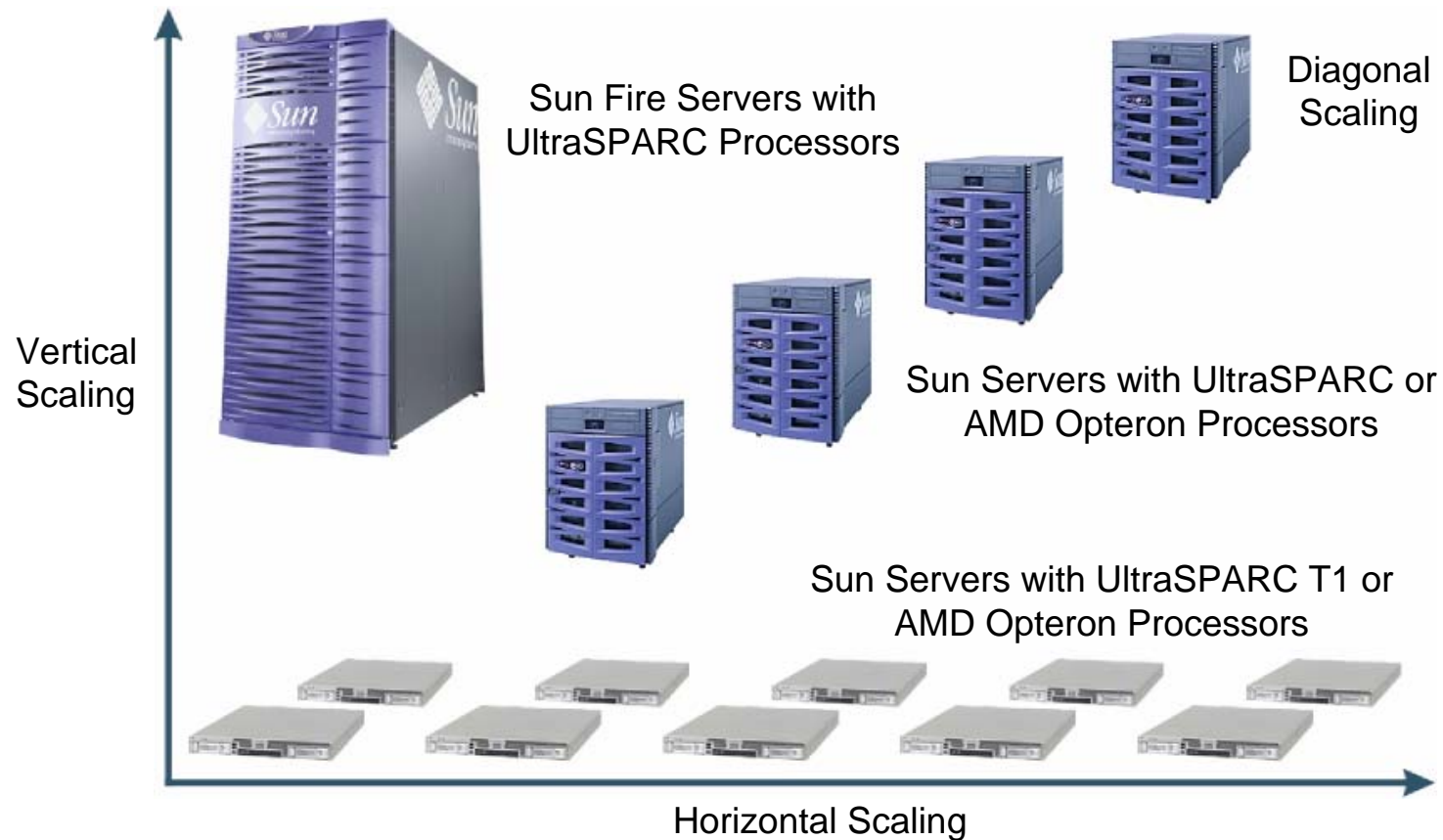


Components from Sun-Oracle-AMD

- Sun servers
- Solaris 10 Operating System
- Sun StorageTek
- Oracle Real Application Clusters 10g
- Sun Cluster Advanced Edition for Oracle RAC
- InfiniBand switching technology
- Management software



The Sun Server Family



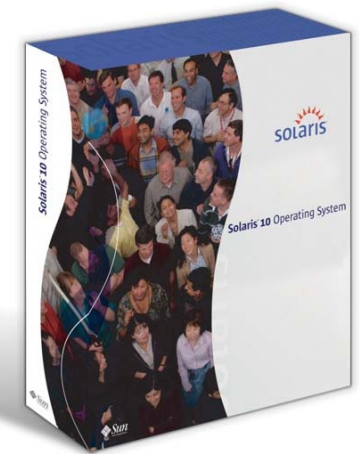
Sun-AMD x64 Servers

- Scale from very low cost single rackmount servers to integrated solutions
- Feature up to 16 single- or dual-core Next-Generation AMD Opteron processors
- Bring extreme performance and a new level of energy efficiency to the x86 market
- **Support the Solaris OS, Linux, Windows, VMware**



Solaris 10 Operating System

- Offers over 600 exciting new features
- Supports horizontal or vertical scaling
- Provides relentless availability
- Delivers extreme performance
- Provides unparalleled security
- Offers interoperability with Linux, Windows
- Facilitates leveraging of low cost hardware
- Enables standardization on a single OS



Summary

- Designed, tested, implemented, tuned at the Sun Competency Center for Oracle
- Consists of recommended components for a proven grid database solution
- Reduces the risks, uncertainty, costs of deployment
- Helps deliver the highest service levels
- Helps satisfy demanding business requirements of a database grid



Schedule Free Grid Workshop

- Complimentary Grid/Virtualization Workshop
 - Learn to how leverage thousands of hours of joint engineering investment by Sun and Oracle
- Learn Best Practices
 - receive specific instructions how reference architectures can be applied to your specific environment and requirements.
- Predict Results
 - Customers will be able estimate expected results and create the appropriate grid architecture.



For More Information

- Sun Web sites
 - www.sun.com/oracle
 - www.sun.com/solutioncenters/services
 - www.sun.com/servers
 - www.sun.com/software
 - www.sun.com/third-party/global/oracle/collateral
- Oracle and AMD Web sites
 - www.oracle.com/technologies/grid
 - www.oracle.com/applications
 - www.oracle.com/technology/products/database/oracle10g
 - <http://enterprise.amd.com/us-en/partnerships/sun.aspx>
 - <http://enterprise.amd.com/us-en/partnerships/oracle/oracle.aspx>
- Presenter
 - Paul.Milo@Sun.com / 650-786-8117





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