Rapid and Secure Acceleration of Enterprise Applications with Next Generation SPARC Servers and Systems
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.
Transforming the Datacenter

Best-of-Breed System Elements

Optimized Solutions

Engineered Systems

Value Added Custom Environments

Evolutionary Building Blocks

Game Changing Massively Simplified
Oracle Engineered Systems & Appliances

Purpose Built

- Exadata
- Exalogic
- Exalytics

Database Appliance

Big Data Accelerator

General Purpose

SPARC SuperCluster
SPARC SuperCluster
Benefits of A General Purpose Engineered System

- Extreme Performance
  - Optimized performance for Oracle applications
  - Based on world record breaking SPARC T4-4 servers
  - Exadata Storage performance

- Lower TCO
  - Reduced storage requirements
  - Accelerates deployments
  - Leverages existing investments

- Datacenter Consolidation
  - Runs a mix of Solaris 10 and 11
  - Runs multiple databases
  - Runs multiple application tiers
SPARC SuperCluster
Built for Extreme Performance

SPARC T4 Compute Pool
10 World Records over IBM and HP across every tier

Exadata Storage Cells
1.0M IOPS, 32 GB/s query throughput

Exalogic Elastic Cloud
10x Java performance

Integrated ZFS Storage
2x faster and ½ the price of NetApp

Solaris 11
Cloud provisioning in seconds

Cloud Built-In
Near zero virtualization overhead

InfiniBand
5-8x the speed of current networks
SPARC SuperCluster Hardware Architecture
A Complete Infrastructure Solution for Enterprise Apps

- 1,200 CPU threads
- 4 TB DRAM
- 97 to 198 TB Hard Disk
- 8.66 TB Flash

- 1.2M IOPS
- 42 GB/sec Storage Bandwidth
- 896 Gb/sec InfiniBand Interconnect
- Optional Fibre Channel adaptor
SPARC SuperCluster
Software Stack

Database
Oracle Database 11g R2, 10g and other DB

Operating System
Oracle Solaris 11 for Exadata and Exalogic nodes
Solaris 10/11 nodes for applications

Virtualization
Oracle Solaris Zones and Oracle VM Server for SPARC

Clustering
Oracle Solaris Cluster
Oracle Clusterware

Middleware
Oracle Fusion Middleware
Applications
Optional with Exalogic Elastic Cloud

Applications
E-Business Suite, PeopleSoft, SAP, Siebel, and much more

Management
Oracle Ops Center and Enterprise Manager Grid Control
Oracle Optimized Solution for PeopleSoft HCM on SPARC SuperCluster

Delivers Cost Effectiveness, Scalable Performance, and Simplicity

- Fastest payroll processing
  - 3x faster than IBM
  - 4x faster than HP
- Best response time (HR Self Service Apps)
  - 2x faster than IBM
- Highest density solution
  - 30% denser than IBM

* See substantiation slides
Oracle Optimized Solution for WebCenter Content on SPARC SuperCluster

Delivers Extreme Performance Paired with Industry Acclaimed Content Management Software

- **#1 Content Ingestion Rate in the Industry**
  - Over 270 Million docs ingested per day

- **#1 Search Rate speed in the Industry**
  - Over 370 Million searches through entire DB index per day

- **IBM: over 2x more expensive and too complex**
  - IBM FileNet P8: 13 separate products, 10 licenses, two outside partners
  - Oracle WebCenter Content: ONE License, implements in 11 days

- **SuperCluster is 11x faster than x86 based systems**
  - Allows for Massive consolidation and savings
SuperCluster - Ease of Deployment
Start Small, Run Your Existing Applications

Existing Data

+ SPARC SuperCluster Half Rack

Existing Applications
SuperCluster Scalability: Future Upgrades
Scale Today and Tomorrow.

Existing Data + SPARC SuperCluster Full Rack + SPARC T5-4 Future Upgrade
SuperCluster - Highly Scalable
Virtually Unlimited Room to Grow.

Existing Data
Exadata Storage Expansion Rack
SPARC SuperClusters
SuperCluster - Highly Scalable Storage

Easily Expand Storage

Existing Data + SPARC SuperCluster Full Rack + Exadata Storage Expansion Rack + Sun ZFS Storage 7420
Consolidation on SPARC SuperCluster T4-4

- Built-in virtualization
- Runs wide-range of workloads
- Runs Solaris 10 and 11
- Runs multiple databases
- Runs multiple applications and tiers
Comprehensive Management Capabilities
Across the lifecycle for the entire hardware infrastructure

Maintainance
- Health checks
- Remote Management
  - Telemetry
- Phone Home
  - Proactive Support
- SR Management

Discovery and Provisioning
- Discover servers
- Provision Bare Metal servers
- Clone VM templates

Resource Monitoring and Management
- Monitor Servers, Storage, Network
- Exception driven Alarms
- Integrate with Incident Management systems

Virtualization Management
- Manage Oracle VM, Containers
- Template Provisioning
- Live migrate workloads

*Live migration not supported on Supercluster

Configuration Management
- Manage configuration drifts
- Patch Operating System
- Update Firmware
- Track Patch Compliance
SPARC T4 Servers
Best In Class Computing

Unprecedented generation-to-generation improvements
- Up to 5x per thread performance
- High performance across a wide range of workloads
- Built in virtualization, security and networking
- Solaris 10 and 11 support

T4 Processor
- 2.85 or 3.0 GHz with OOO execution
- Dedicated L2 128KB cache
- Shared L3 4MB cache
- 8 Cores with Private L2 Cache
- Dynamic Threading
- Enhanced Built-in Encryption
- Built-in Virtualization

T4 Systems
- Up to 1 TB of memory
- Built-in, no-cost virtualization
- High-bandwidth and high-capacity I/O
- Integrated 10GbE
- Solaris binary compatibility

9 World Records
## SPARC T4 Server family

<table>
<thead>
<tr>
<th></th>
<th>SPARC T4-1B</th>
<th>SPARC T4-1</th>
<th>SPARC T4-2</th>
<th>SPARC T4-4</th>
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<tr>
<td>Processor</td>
<td>SPARC T4 2.85GHz</td>
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<td>SPARC T4 2.85GHz</td>
<td>SPARC T4 3.0GHz</td>
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<td>Max Processor Chips</td>
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<td>1</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Max Cores/Threads</td>
<td>8, 64</td>
<td>8, 64</td>
<td>16, 128</td>
<td>32, 256</td>
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<tr>
<td>DIMM Slots</td>
<td>16</td>
<td>16</td>
<td>32</td>
<td>64</td>
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<td>Max Memory</td>
<td>256 GB</td>
<td>256 GB</td>
<td>512 GB</td>
<td>1 TB</td>
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<tr>
<td>Drive Bays</td>
<td>2</td>
<td>8</td>
<td>6</td>
<td>8</td>
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<tr>
<td>I/O Slots</td>
<td>2 x PCIe 2.0 EM, NEM, 1 REM, 1 FEM slots</td>
<td>6 LP x 8 PCIe 2.0, x 1 GbE ports, 2 x 10 GBE XAUI ports</td>
<td>10 x PCIe 2.0, x 1 GbE ports, 4 x 10 GBE XAUI ports</td>
<td>16 x PCIe 2.0 EM, x 1 GbE ports, 4 x 10 GBE XAUI ports</td>
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<tr>
<td>Form Factor/RU</td>
<td>Blade</td>
<td>Rack 2U</td>
<td>Rack 3U</td>
<td>Rack 5 U</td>
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</table>
Leadership in Application Performance
Delivering General Purpose Computing

**JD Edwards**
50% faster vs IBM z10
No show for HP

**PeopleSoft**
2.5x faster vs HP Itanium
2.8x faster vs IBM z10

See performance substantiation slides
World Record TPC-H

Best Combination of Price and Performance

$800K cheaper and 22% faster than Power7 & Sybase

$125K cheaper and 3.6x faster than HP Superdome & Oracle 11g

TPC-H @1000GB

See performance substantiation slides
World Record Java and Database Performance
SPECjEnterprise2010

2.4x faster than Power7 with DB2 and WebSphere
7x better price performance for Java

SPARC T4
IBM Power7

IBM: One Power 780
$1,297,956
See performance substantiation slides

T4-4 Servers
$467,856
Leading Security


Transparent Database Encryption
43% faster secure queries

ZFS Encryption: Encrypted Filesystem
3x faster encryption

Encryption: In-memory
1.8x better throughput
(reduced time)

See performance substantiation slides
2011 SPARC Server Roadmap

Maximizing Results

5 Year Trajectory

- Cores: 4x
- Threads: 32x
- Memory Capacity: 16x
- Database TPM: 40x
- Java Ops Per Second: 10x

<table>
<thead>
<tr>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
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<tr>
<td>Solaris 11 Express</td>
<td>Solaris 11</td>
<td>Solaris 11 Update</td>
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<td>✓ Software Lifecycle</td>
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<td>High-Availability</td>
<td>System Management</td>
<td>Core Scalability</td>
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<tr>
<td>Scalability, Networking</td>
<td>Scalability, Networking</td>
<td>Memory Scalability</td>
<td>IO Scalability</td>
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<tr>
<td>Security</td>
<td>Virtualization</td>
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</tbody>
</table>

M-Series
- 16-64 Sockets
- +6x Throughput
- >1x Single Strand

T-Series
- 1-8 Sockets
- +2.5x Throughput
- >1x Single Strand

T-Series
- 1-8 Sockets
- +5x Single Strand

NEW

Faster!

Available Now

In Test

On Track

SPARC

1-64 Sockets
+2x Throughput
+1.5x Single Strand

Software in Silicon Feature Set

Solaris 11 Update
High-Availability
Memory Scalability
Virtualization

On Track

M-Series
16-64 Sockets
+2x Throughput
+1.5x Single Strand

Software in
Silicon Feature
Set

Solaris 11 Update
System Management
IO Scalability

Test in October

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On Track
SPARC SuperCluster and SPARC T4 Systems

In Conclusion

A key element of Datacenter transformation is delivering accelerated application performance

SPARC SuperCluster provides:
• An ideal platform consolidating and deploying multi-tiered applications that offers the benefits of an Oracle engineered system

SPARC T4 Servers provide
• 5x speedup of key application workloads
• Balanced application performance with rich set of integrated enterprise capabilities
Hardware and Software

Engineered to Work Together
Benchmark Disclosure

SPEC and the benchmark name SPECjEnterprise are registered trademarks of the Standard Performance Evaluation Corporation. Other names may be trademarks of their respective owners. Competitive data obtained from http://www.spec.org as of the date located next to the respective claim and this report. See the Website for latest results. SPARC T4-4 cluster: 40,104.86 SPECjEnterprise2010 EjOPS; 1,671 SPECjEnterprise2010 EjOPS performance per processor across the configuration. IBM Power 780 and IBM Power 750 Express: 16,646.34 SPECjEnterprise2010 EjOPS; 1,387 SPECjEnterprise2010 EjOPS performance per processor across the configuration. SPECjEnterprise2010 models contemporary Java-based applications that run on large Java EE (Java Enterprise Edition) servers, backed by network infrastructure and database servers. The Application tier cost of acquisition for four SPARC T4-4 servers with Solaris 10 is $467,856 or $11.67/SPECjEnterprise2010 EjOPS. Oracle pricing from https://shop.oracle.com/ on 9/26/11. The Application tier cost of acquisition for IBM Power 780 (3.86GHz Power7, 512GB RAM, AIX 7.1) is $1,297,956 or $77.97/SPECjEnterprise2010 EjOPS. IBM system pricing is from http://tpc.org/results/FDR/TPCH/TPC-H_1TB_IBM780_Sybase-FDR.pdf, adjusted to license 64 cores (w/o TurboCore). AIX 7.1 pricing is from http://www-304.ibm.com/easyaccess3/fileserve?contentid=214347. $77.97/$11.67=6.7x. Oracle app. tier configuration occupies 20RU of space, 40,104.86/20=2005 SPECjEnterprise2010 EjOPS/RU. IBM app. tier configuration occupies 16RU of space, 16,646.34/16=1040 SPECjEnterprise2010 EjOPS/RU. 2007/1040=1.92x round nearest 2x.

Source: Transaction Processing Performance Council (TPC) www.tpc.org as of September 24, 2011. SPARC T4-4 server (4 sockets/32 cores/256 threads) 201,487 QphH@1000GB, $4.60/QphH@1000GB, 50,371 QphH@1000GB/per socket, available 10/30/11. IBM Power 780 Model 9179-MHB server (8 sockets/32 cores/128 threads) 164,747.2 QphH@1000GB, $6.85/QphH@1000GB, 20,539 QphH@1000GB per socket, available 3/31/11.
HP Integrity Superdome 2 server (16 sockets/64 cores/64 threads) 140,181 QphH@1000GB, $12.15/QphH@1000GB, 8,761 QphH@1000GB per socket, available 10/20/10. 50,371 QphH@1000GB per socket / 20,539 QphH@1000GB per socket = 2.44

http://www.tpc.org/results/individual_results/Oracle/Oracle_T4_4_1TB_TPCH_ES_092611.pdf
Performance Substantiation

1M IOPS: Based on internal measurement of Exadata Storage cells
10x Java performance: Based on internal measurement of Exalogic
ZFS 2x faster, ½ the price of NetApp: Demonstrates the performance of ZFS Storage via the Oracle Sun ZFS Storage 7420 appliance which delivered outstanding performance and price/performance on the SPC Benchmark 1, beating results published on the NetApp FAS3270A. The Sun ZFS Storage 7420 appliance delivered 137,066.20 SPC-1 IOPs at $2.99 $/SPC-1 IOPs on the SPC-1 benchmark. The Sun ZFS Storage 7420 appliance outperformed the NetApp FAS3270A by 2x on the SPC-1 benchmark.
Cloud provisioning, unmatched scalability: Scalability of Solaris 11, leader in scaling to 512 threads
Near zero virtualization overhead: Solaris Zones, based on internal tests
InfiniBand: 5-8x speed of current networks
Enterprise Manager reduction of downtime: white paper including description of reduced downtime: http://www.oracle.com/oms/enterprisemanager11g/application-to-disk-067846.html

Leading security:
--Comparison is based on internal testing of data warehousing queries that accessed tablespaces encrypted with Oracle transparent data encryption(AES-256-CFB).
--Based on internal testing of ZFS on Oracle Solaris 11 Express 2010.11 using AES with key lengths of 256, 192, and 128 in the CCM and GCM operation modes.
Performance Substantiation

Java Enterprise: TPC-H, QphH, $/QphH are trademarks of Transaction Processing Performance Council (TPC). For more information, see www.tpc.org. SPARC T4-4 201,487 QphH@1000GB, $4.60/QphH@1000GB, avail 10/30/2011, 4 processors, 32 cores, 256 threads; SPARC Enterprise M8000 209,533.6 QphH@1000GB, $9.53/QphH@1000GB, avail 09/22/11, 16 processors, 64 cores, 128 threads; IBM Power 780 QphH@1000GB, 164,747.2 QphH@1000GB, $6.85/QphH@1000GB, avail 03/31/11, 8 processors, 32 cores, 128 threads; HP Integrity Superdome 2 140,181.1 QphH@1000GB, $12.15/QphH@1000GB avail 10/20/10, 16 processors, 64 cores, 64 threads.

WebCenter Content: (SuperCluster) 11x faster claim based on internal testing showing 8x cores of x86 ingesting approx 150 docs/sec compared to 8x cores of SuperCluster at 1700 docs/sec.

PeopleSoft 3x faster than Itanium: (T4) Compared to the best published PeopleSoft Enterprise Payroll 9.0 (non-UNICODE version) result by HP, the SPARC T4-4 server result with PeopleSoft Enterprise Payroll 9.1 (UNICODE version) is 3.1 times faster that the Itanium-based HP Integrity rx7640 server result of 96.17 minutes. HP has not published results with Unicode version of this benchmark.

Oracle Database 3x IBM P7: (SuperCluster) Based on internal testing of full rack SPARC SuperCluster T4-4 vs full rack 16 CPU IBM POWER 7 system.

Web 1M http: (SuperCluster) Based on extensive internal testing of Exalogic that was done during product development.

Security 5x v P7: (T4) Comparison is based on internal testing of AES-256-CBC encryption at 8K using OpenSSL against published test results for IBM: http://xmlisnotaprotocol.blogspot.com/2010/10/openssl-098-benchmark-on-power7-35ghz.html.

Database Refresh: Based on TPC-H@1000GB benchmark result of 201,487 QphH@1000GB, the SPARC T4-4 server is up to 3.8 times faster than the IBM server for the Refresh Function. More details at: http://www.oracle.com/us/solutions/performance-scalability/default-495351.html

Communications Billing: The SPARC T4-4 servers running the Oracle Communications Billing and Revenue Management benchmark and Oracle Solaris Containers delivered 2.2x the performance and a 4x reduction in the number of servers, for customers migrating from eight quad-core Intel Xeon E5335 servers and twelve dual-core AMD Opteron servers.

Java 2.2M JMS: (SuperCluster) Based on extensive internal testing of Exalogic that was done during product development.

PeopleSoft 2.8x faster than z10: (T4-4) Compared to the best published PeopleSoft Enterprise Payroll 9.0 (UNICODE version) result by IBM, the SPARC T4-4 server result with PeopleSoft Enterprise Payroll 9.1 (UNICODE version) is 2.8 times faster than the IBM z10 EC 2097 mainframe result of 87.4 minutes.

Oracle Database 2.3M IOPs: (SuperCluster) Based on extensive internal testing of Exadata that was done during product development.

Communications Service Broker 2.7x more performance (400 CAPS) than an Intel Nehalem-based system (150 CAPS).
Title: **Rapid and Secure Acceleration of Enterprise Applications with Next Generation SPARC Enterprise Servers and Systems** (T4 servers, Superclusters, and Solaris)

Abstract: Establish a robust and flexible foundation for a next generation datacenter while dramatically improving application performance and reducing operational overhead with Oracle’s new SPARC T4 systems and SPARC Superclusters running Oracle Solaris. Learn how the greatly improved performance of SPARC T4 servers running Oracle Solaris make them the most scalable, secure and integrated computing platforms for enterprise applications. See how Oracle has utilized SPARC T4 servers as the building blocks of the new SPARC Superclusters - multi-purpose engineered solutions that integrate optimized Exadata storage and Exalogic software into a flexible, highly available and cost-effective application consolidation platform. This presentation will examine how you can improve the reliability, security and adaptability of your data center by deploying the latest innovations of Oracle Solaris and Oracle Optimized Solutions running on SPARC T4 servers and SPARC Superclusters.