

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.



**ORACLE®**

## **Virtualisierung mit Oracle SPARC T4-Systemen**

Detlef Drewanz

Principal Sales Consultant

# Agenda

- Überblick aktuelle Oracle SPARC T4-Server
- Ausblick SPARC Server
- Oracle VM Server for SPARC

# Transforming The Technology Stack

Compute, Storage, Network  
Building Blocks



Co-Engineered with  
Enterprise Software



Engineered  
Systems



Investing in  
Best of Breed

End-to-end  
Engineering

HW/SW Engineered  
to Work Together

ORACLE

# Oracle's Integrated Technology Stack

**Reliability** ● — — — — —

**Performance** ● — — — — —

**Manageability** ● — — — — —

**Security** ● — — — — —

**Support** ● — — — — —



# The Unique Oracle Advantage

Hardware and Software Engineered to Work Together

One Engineering Team



vs



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# Oracle Enterprise Manager Ops Center

- Complete Management for Oracle Hardware, OS & Virtualization
  - Data Center Discovery
  - Virtualization Management
    - Oracle VM for x86/SPARC, Zones, Containers
  - Configuration Management
    - Patch OS, Update Firmware, Configuration Compliance
  - Operating System Analytics
  - Maintenance
    - Health Checks, Remote Management, Phone Home



**ORACLE**  
ENTERPRISE MANAGER  
OPS CENTER

**12<sup>c</sup>**

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# Oracle Enterprise Manager Ops Center

Complete Management for Oracle Hardware, OS & Virtualization

Included at No Additional Cost



ORACLE<sup>®</sup>  
ENTERPRISE MANAGER  
OPS CENTER

**12<sup>c</sup>**

- Maintenance
  - Health Checks, Remote Management, Phone Home

ORACLE<sup>®</sup>

# SPARC T4 Server

- New Brain. Same Body.

## Unheard of generation to generation acceleration

- Starts at \$16K – Virtualization and Security included!
- Up to \$160K – 1 TB of memory included!
- Up to 5x per thread performance compared to T3 servers



### T4 Processor

- 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 10 GbE
- Solaris binary compatibility

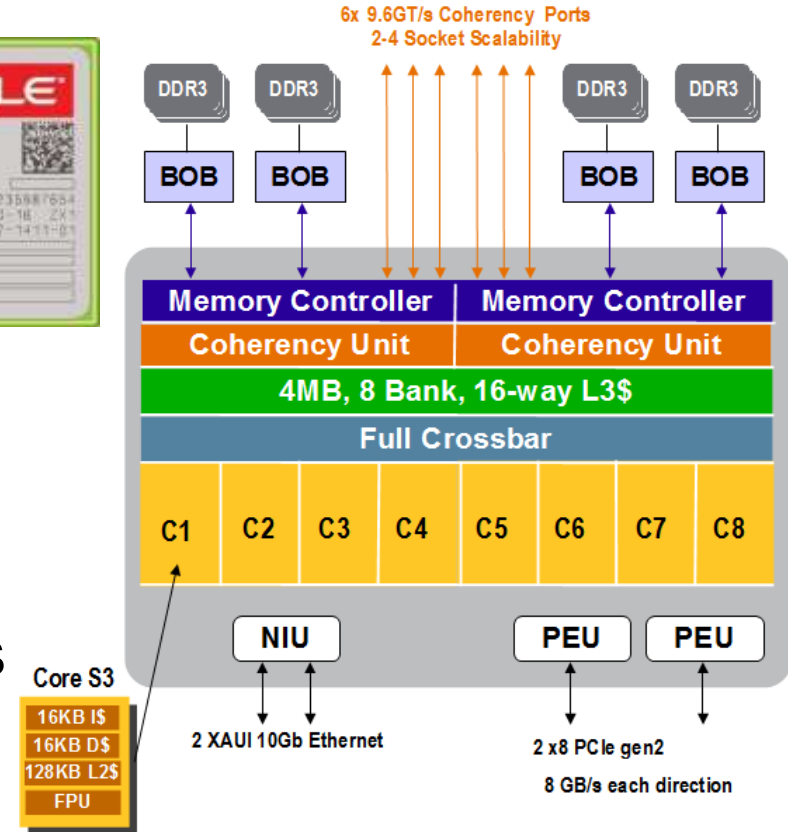


**Over 12 World  
Records ...  
and counting**

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# SPARC T4 - Overview

- 8 S3 cores
  - 8 Threads @ up to 3Ghz
  - Dynamic Threading
  - Out of Order Execution
  - 16 On Chip Crypto algorithms
- Single or multi-threaded
- System scalability to 4 sockets
- 4MB Shared L3\$



# SPARC T4: **Cryptographic** Algorithms Implemented in Hardware

- AES
- Camellia
- CRC32c
- DES
- 3DES
- ECC
- Kasumi
- MD5
- RSA
- DSA
- SHA-1
- SHA-224
- SHA-256
- SHA-384
- SHA-512

INTEL Xeon : AES only

IBM p7 : none

# SPARC T4 Servers



	SPARC T4-1B	SPARC T4-1	SPARC T4-2	SPARC T4-4
Processor	SPARC T4 2.85GHz	SPARC T4 2.85GHz	SPARC T4 2.85GHz	SPARC T4 3.0GHz
Max Processor Chips	1	1	2	4
Max Cores/Threads	8, 64	8, 64	16, 128	32, 256
DIMM Slots	16	16	32	64
Max Memory	256 GB	256 GB	512 GB	1 TB
Drive Bays	2	8	6	8
I/O Slots	2 x PCIe 2.0 EM, 2 NEM, 1 REM, 1 FEM slots	6 LP x 8 PCIe 2.0, 4 x 1 GbE ports, 2 x 10 GbE XAUI ports	10 x PCIe 2.0, 4 x 1 GbE ports, 4 x 10 GbE XAUI ports	16 x PCIe 2.0 EM, 4 x 1 GbE ports, 8 x 10 GbE XAUI ports
Form Factor/RU	Blade	Rack 2U	Rack 3U	Rack 5 U

## Key Differentiators of SPARC T4

- 5x single thread performance increase over SPARC T3 processor while retaining throughput performance of SPARC T3
- Expanded application workload fit to meet requirements for both multi thread and single thread applications

# Key SPARC T4 System Advantages

Feature	Attribute	Benefit
2.85 & 3.0 GHz clock	Faster single threaded processing	Shorter application boot times, rapid batch processing for quicker results
Integrated encryption engines	Up to 3x faster security for data encryption	Reduced cost for secure datacenter operation without a performance penalty
Multithreaded architecture	Preserve T3 system levels of throughput	Time savings due to no application changes for T4 systems
Binary compatibility	Existing SPARC/Solaris applications run unmodified	Rapid time to adoption of new systems and new service deployment
Built-in Virtualization with OVM Server for SPARC	Flexible logical partitioning and live application mobility	Improved uptimes for critical services and higher system utilization rates
Oracle Solaris 11	Reliable, secure and streamlined operation	Faster system updates and reboots to improve datacenter operations

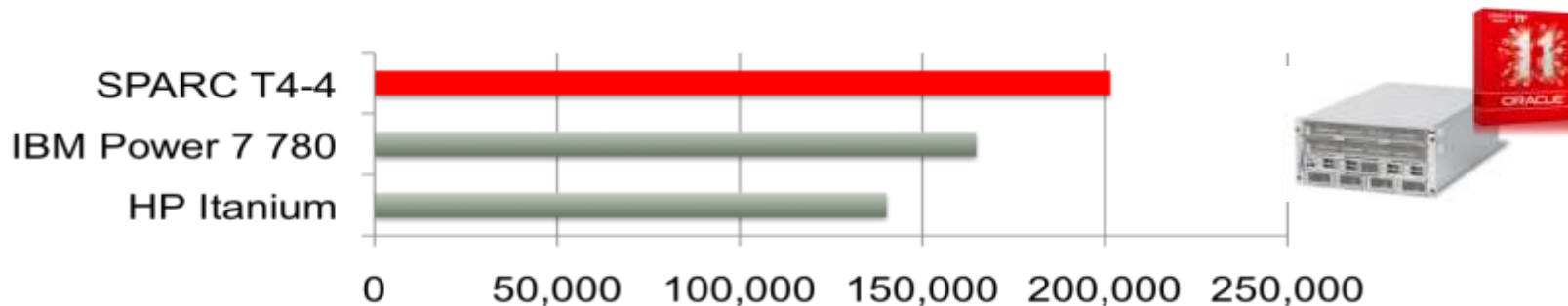
# World Record TPC-H

Beats IBM's Claims of 4:1 Core Performance Advantage

**\$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

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# Virtualize Applications with SPARC T4 Servers



"We have tested the new **SPARC T4-4** system against our current Siebel infrastructure on the SPARC M5000 and the performance of the T4 system was very positive.

The moving of the applications from the current infrastructure to the new T4-4 was flawless with no need for a porting plan or specific tuning.

Using virtualization with Solaris Zones in the T4-4 system against a non virtualized Solaris environment in M5000—this was most impressive. Performance has doubled from our current servers. We think the SPARC T4-4 is the ideal platform for **virtualizing** and consolidating Siebel and other applications, from the web server down to the database server tier."

Umberto Angelucci, CTO, SKY Italia

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"Our beta testing of **Oracle's SPARC T4 server** demonstrated impressive performance and an architecture that reduced complexity and operating costs. This excellent performance on our mixed throughput needs, combined with the SPARC T4's attractive software licensing terms, led to our decision to use the SPARC T4 system for our next generation archiving system."

Mr. Hans-Juergen Wolf, Archive Manager, DLR

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"Because we develop content management systems for many German federal and local governments, it is critical that Materna base its solutions on the most scalable and high performance technology. We are beta testing **Oracle's SPARC T4-1B** blades with our "Government Site Builder" application and seeing throughput and single thread performance improvements of 5-7 times in comparison to the previous generation SPARC blades."

Dr. Georg Kösters, Head of Business Process Management - Business Division Applications, MATERNA GmbH



# Oracle SPARC T4-4 System

## 4-Socket, 5RU Enterprise-Class Datacenter Server



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# SPARC T4-2 Mid-Range T-Series Server

## 2-Socket Enterprise-Class Datacenter Consolidation & Back-Office Server



# Oracle SPARC T4-1 System

## 1-Socket, Enterprise-Class Datacenter Server



# Netra SPARC T4-1

## High-Performance, Energy-Efficient Carrier-Grade Server

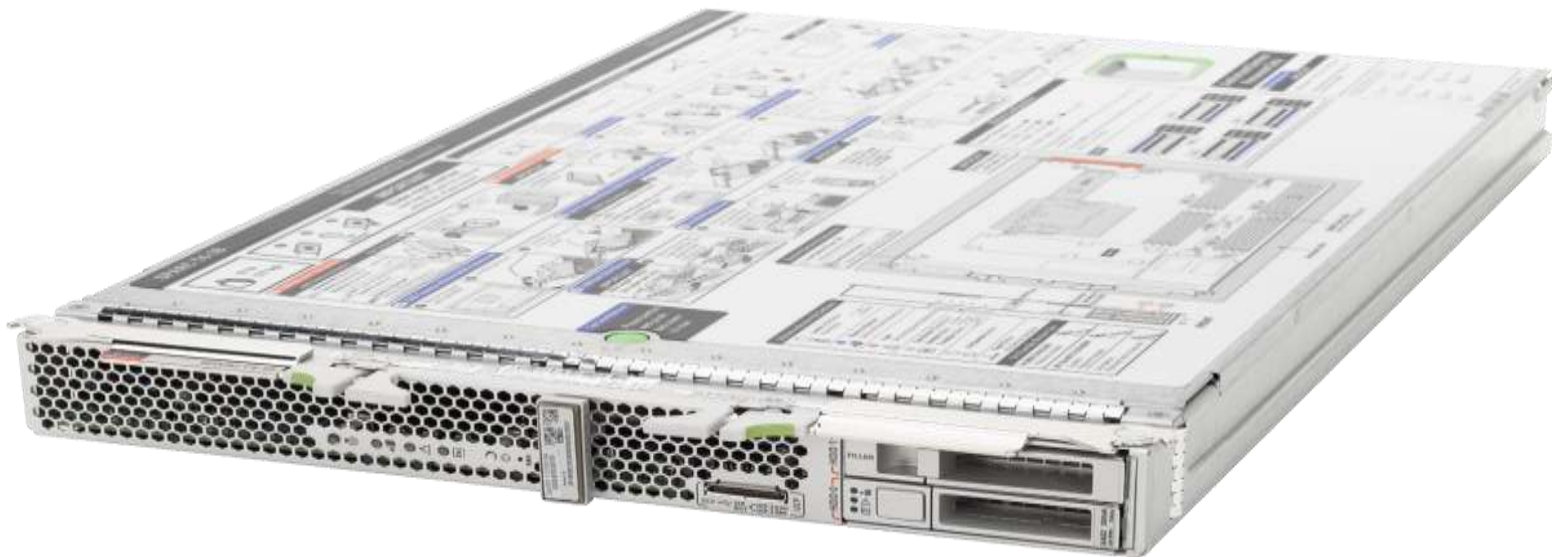
- Single Socket, SPARC T4, 2.85 GHz, 4 and 8 core, up to 64 threads
- Compact 2U 20" deep telco chassis
- Up to 256 GB of memory
- 4 HDD storage with DVD
- 5 PCIe 2.0 slots (2x FH/HL)
- AC and DC power options
- Oracle Solaris support



**Delivers extreme performance  
and scalability in a compact 2U  
NEBS-certified package**

# SPARC T4-1B Overview

Single Socket, Dense and Scalable Blade Server

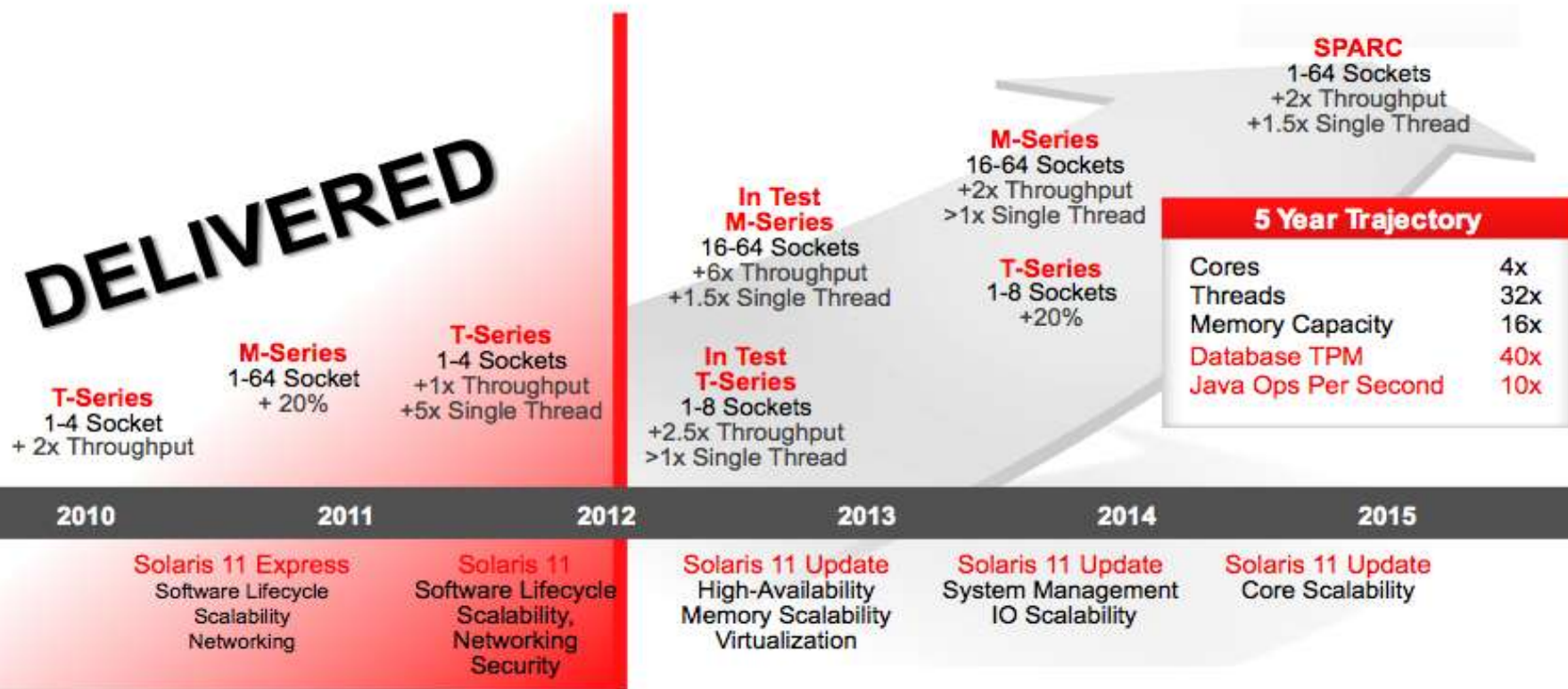


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# Agenda

- Überblick aktuelle Oracle SPARC T4-Server
- **Ausblick SPARC Server**
- Oracle VM Server for SPARC

# SPARC/Solaris Roadmap



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# SPARC T5 Servers

## Next Generation T-series Introduction Plans

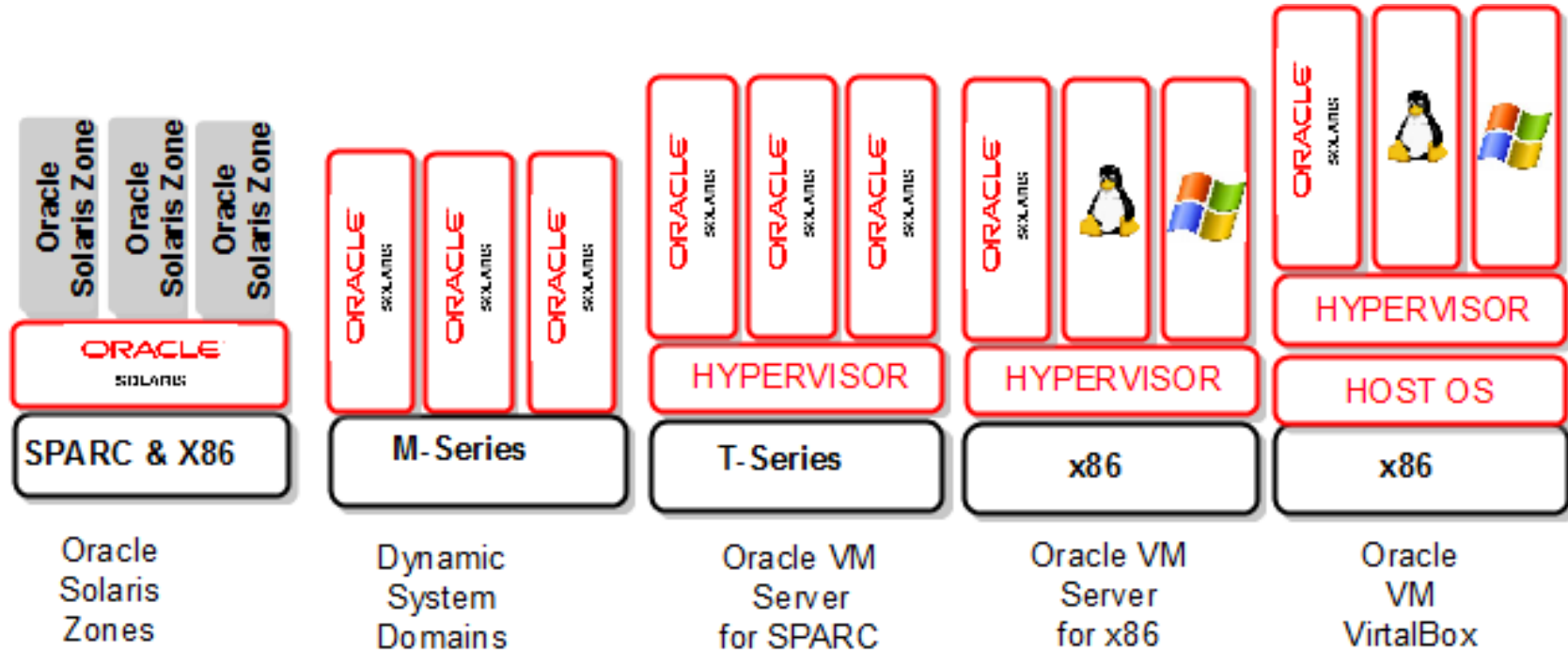
- Improves the price performance leadership established by T4
  - 2x Throughput improvement
  - 20% Clock frequency increase
  - 4x Increase in overall scalability
- Expands the range of SPARC T-series servers
  - Ranging from 4-core and 8-core (T4) to 16-core (T5) servers
  - Increase socket scalability to 8-sockets (32 ➡ 128 cores)
- Longer lifecycle for SPARC T4 Servers
  - SPARC T4-1, T4-1B, T4-2, T4-4, and Netra SPARC T4-1 will have extended lifecycles



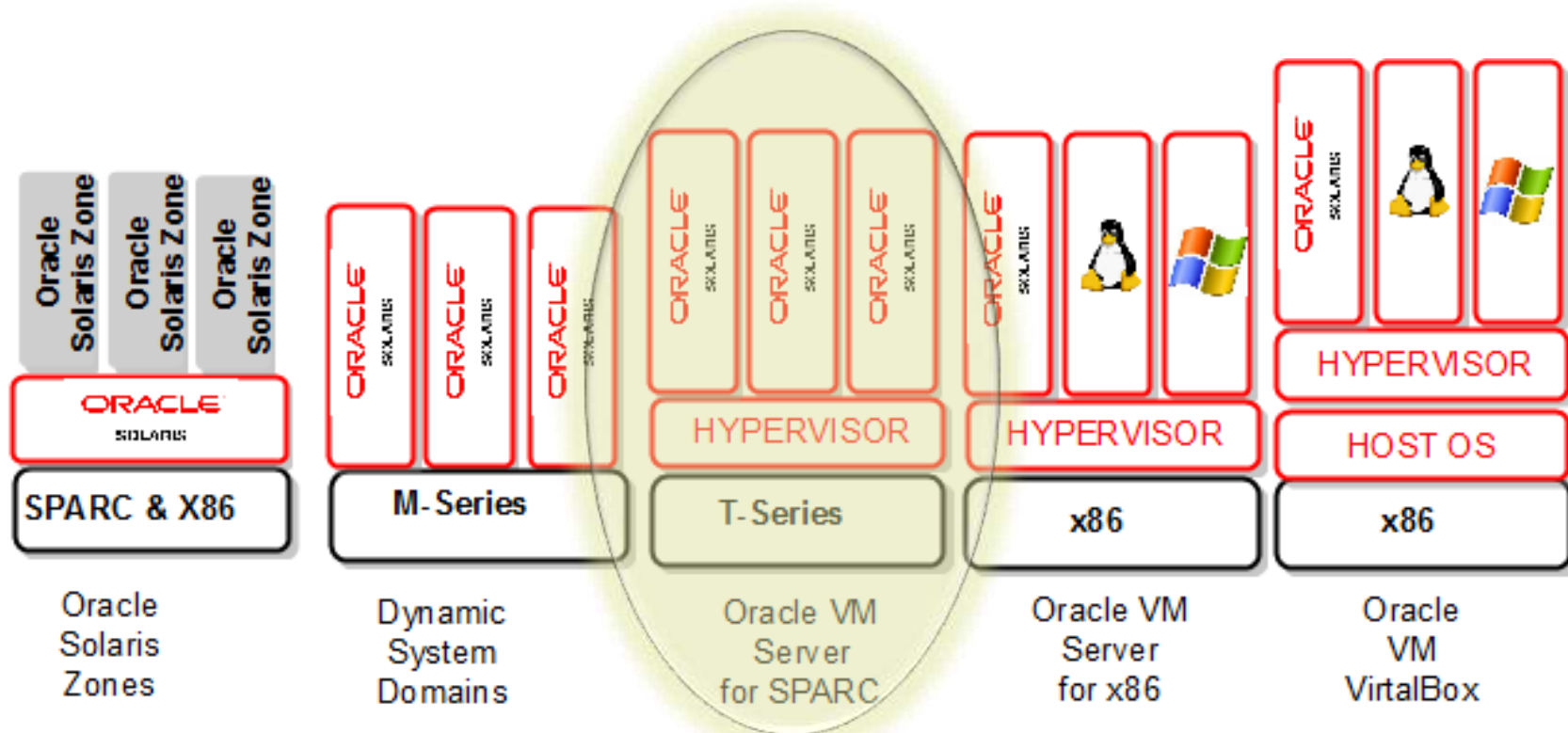
# Agenda

- Überblick aktuelle Oracle SPARC T4-Server
- Ausblick SPARC Server
- **Oracle VM Server for SPARC**

# Oracle Virtualization Overview



# Oracle Virtualization Overview



# OVM Server for SPARC - Key Features

- Secure Live Migration
- Dynamic Reconfiguration
- Redundant Virtual IO
- Static Direct IO
- Virtualized Crypto Acceleration
- Lowest Overhead
- Useable as as hard partitions to optimize licenses
- No Additional Cost

# Oracle VM Server for SPARC

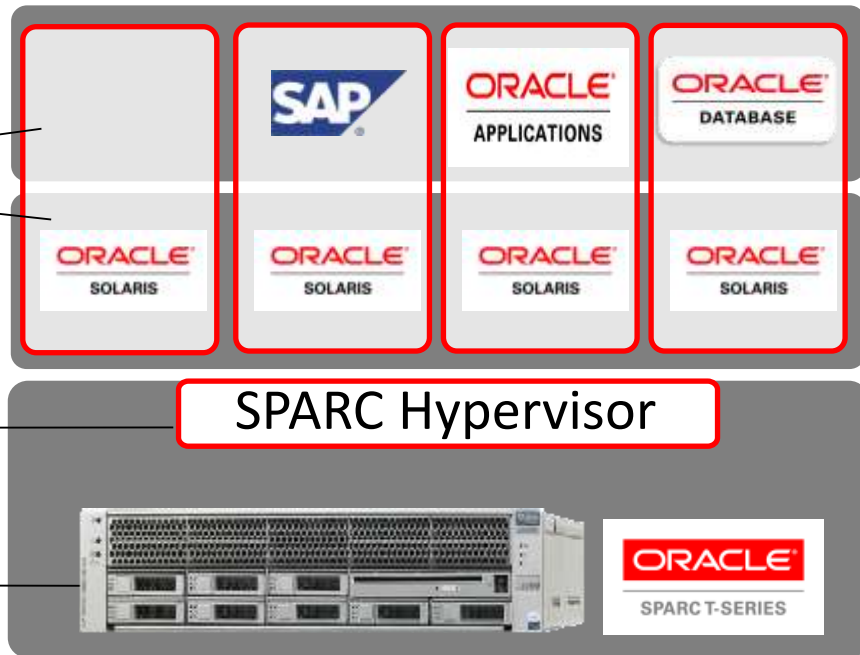
The Virtualization Platform combining the best of Oracle Solaris and SPARC for Your Enterprise Server Workloads

Isolated OS and applications in each Logical Domain

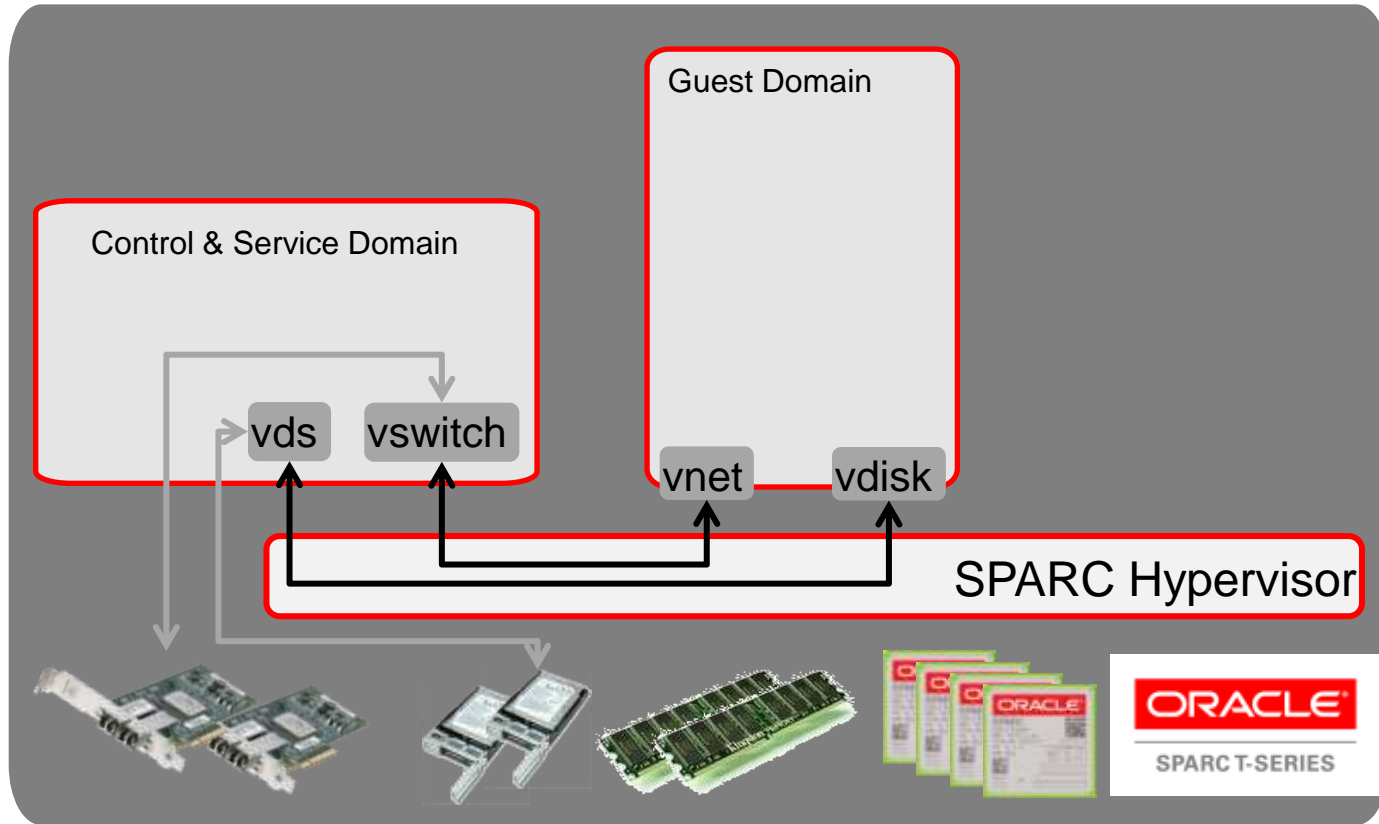
Firmware-based hypervisor

Each logical domain runs in dedicated CPU thread(s)

Optimized for SPARC / Oracle Solaris

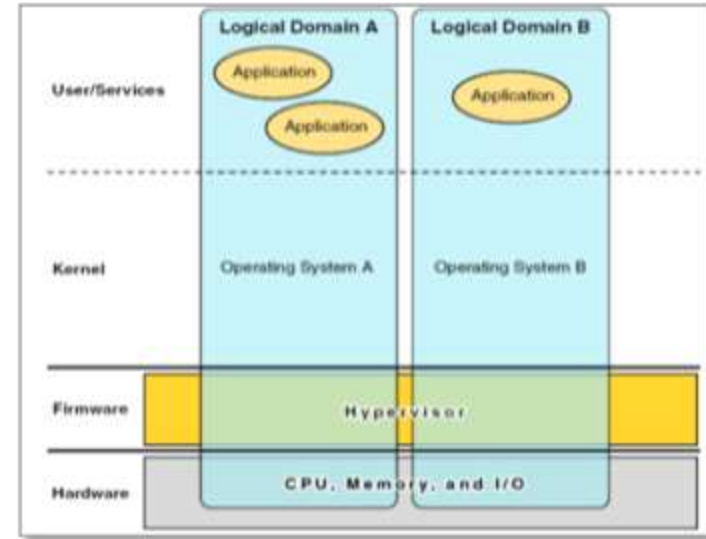


# Domain Components



# SPARC T4 Hypervisor

- SPARC Hypervisor is a thin firmware layer that provides a stable Virtual Machine architecture for Solaris
- A Logical Domain is a VM that uses Hypervisor provided hardware
  - E.g. CPU, Memory, and I/O
- Domains can be added or removed, and hardware resources can be added or removed, on-the fly
- Domains are flexible and can be configured to carry out different 'Roles'
  - i.e. Control, I/O, Service, Root, or Guest



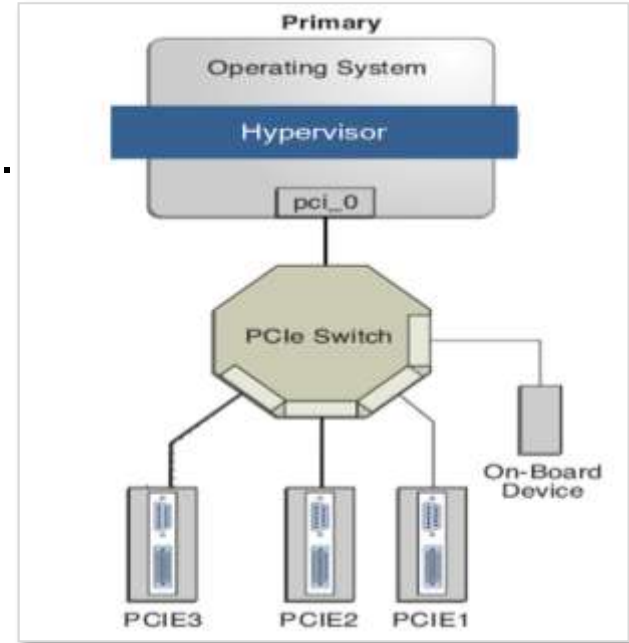
# Virtualization - Terminology

- Control domain
  - Domain creation and assignment of physical resources
- Service domain
  - Offers virtual I/O services for guest domains
- I/O domain
  - Direct, physical access to input/output devices
- Guest domain



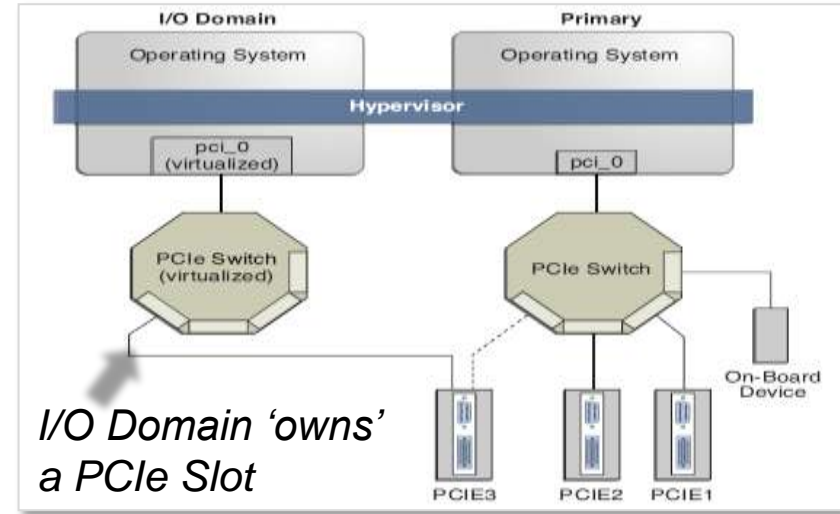
# The Control Domain

- The Primary Domain is the first domain created when you install LDOM the software.
- It is the only **Control Domain**, and runs the Logical Domain Manager (LDM)
- It allows you to create and manage other domains, and to allocate virtual resources to them.
- It can be the only domain on a server, or the first of many



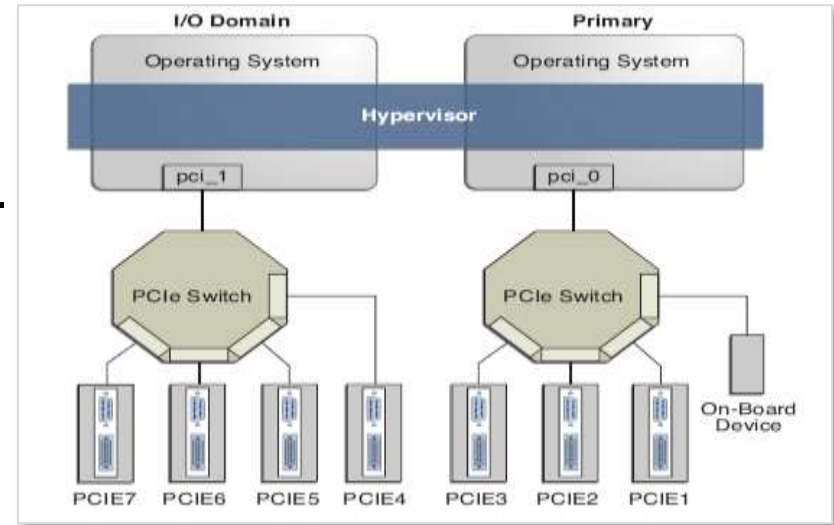
# I/O and Service Domains

- **I/O Domains** have direct access to physical I/O devices. They can own PCIe slots or on-board devices by using *direct I/O*.
- I/O Domains that share their physical I/O devices with other domains as virtual devices (e.g. virtual switch or virtual disk) are known as **Service Domains**



# Root Domains

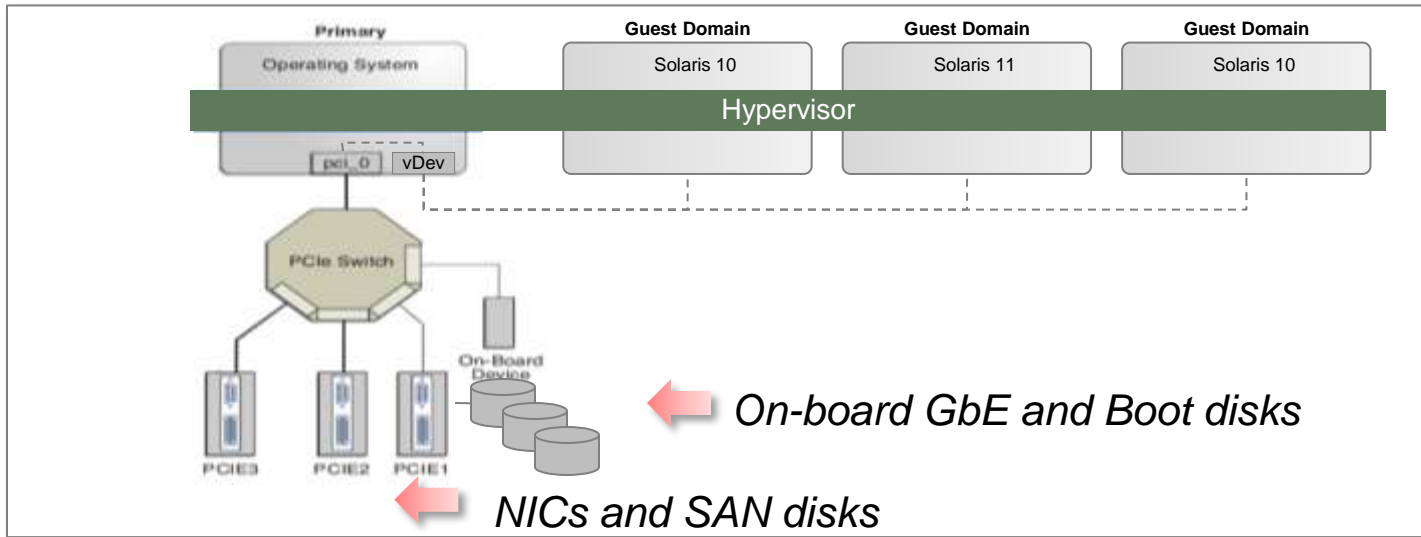
- A **Root Domain** is a type of I/O domain that has an entire **PCIe Root Complex** assigned to it. It owns a PCIe fabric and provides all fabric-related services, such as fabric error handling.
- The maximum number of Root Domains depends on your platform
  - T4-4 server has 4 complexes, and can have up to four root domains



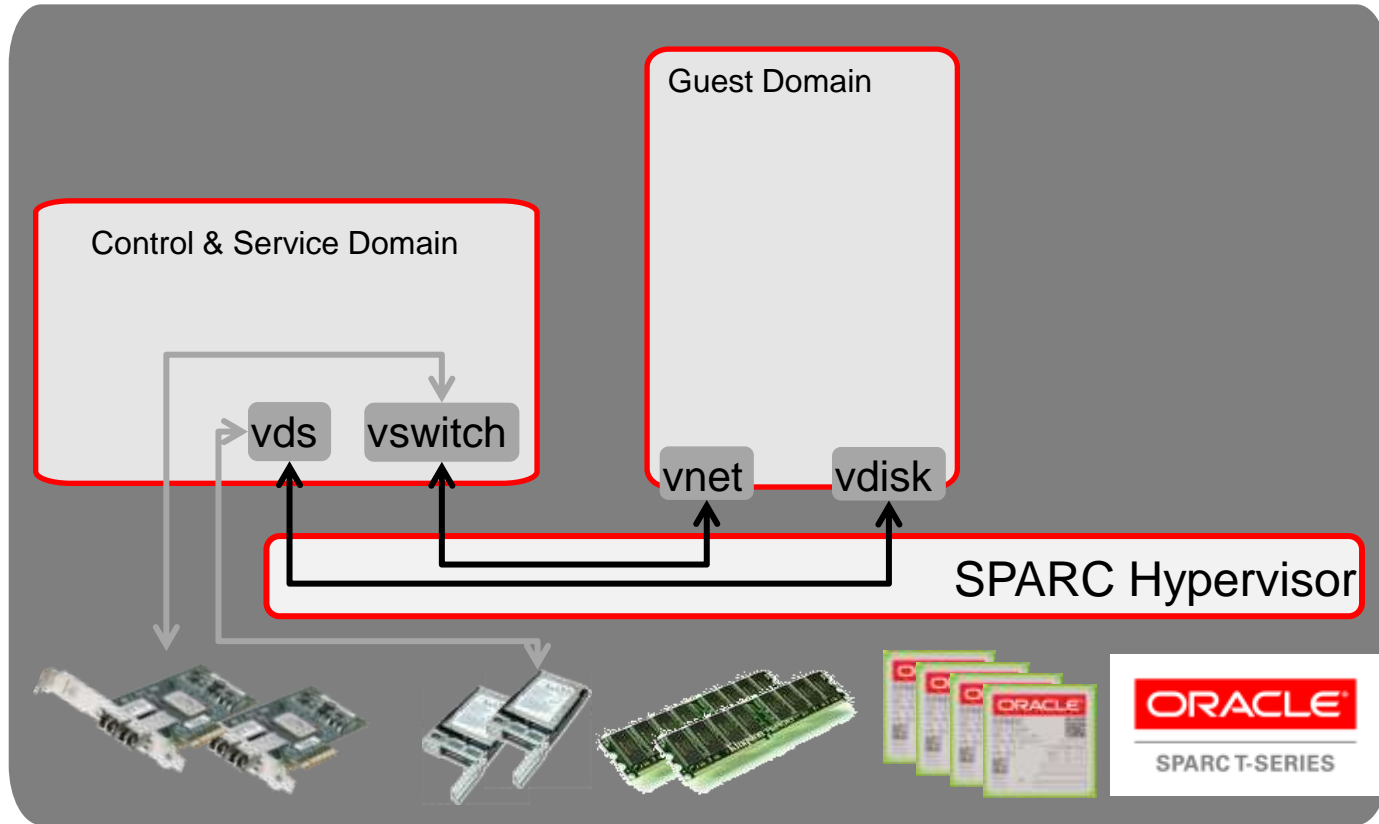
*I/O Domain 'owns' a  
PCI Root Complex*

# Guest Domains

- Guest Domains use virtual device services that are provided by one or more service domains.
- They only access the virtual I/O devices provided by one or more service domains



# Domain Components



# Oracle VM Server for SPARC

## Advanced Virtualization For SPARC T-Series Servers

- Leading Price / Performance
  - **Meet the most aggressive business requirements**
- Secure Live Migration
  - **Increase application service level**
- PCIe Direct I/O
  - **Native I/O throughput!**
- Dynamic Reconfiguration
  - **Change resources on the fly!**
- Advanced RAS
  - **Higher availability across all levels**
- Physical-to-virtual (P2V) Conversion
  - **Easily move legacy Solaris to virtualized environment**

DR Feature	Supported
CPU DR	✓
Memory DR	✓
Virtual I/O DR	✓
Crypto Unit DR	✓

# Oracle VM Server for SPARC

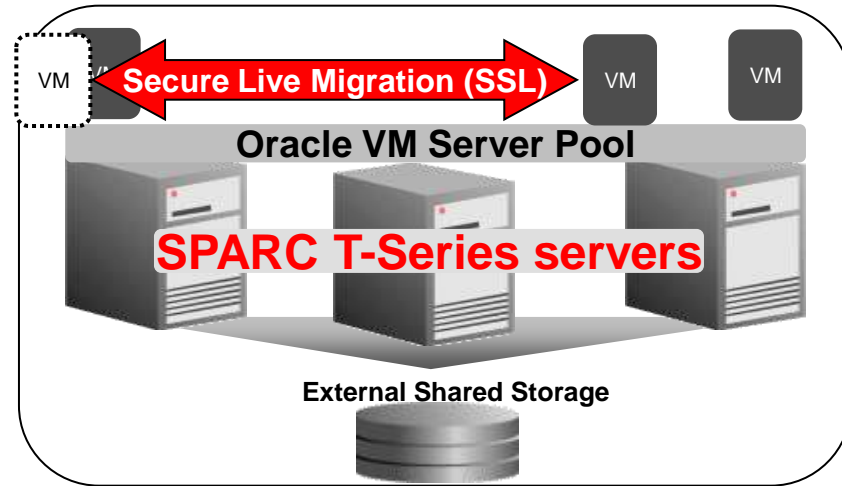
## Advanced Virtualization For SPARC T-Series Servers (Cont'd)

- CPU Whole Core Allocation and Core Affinity
  - **Higher application performance!**
- CPU Dynamic Resource Management (DRM)
  - **Better alignment of IT and business priorities**
- CPU Power Management
  - **Greater power efficiency and lower cost!**
- Advanced Network Configuration
  - **Flexibility to meet networking requirements**
- Enhanced SNMP MIB
  - **Interoperate with 3<sup>rd</sup> party management software**
- Official Certification and Full Stack Support
  - **Cover hardware, firmware, virtualization, OS and the software stack**

# Secure Live Migration

Eliminates Application Downtime

- Live migration available on SPARC T-Series systems
  - SPARC T4
  - SPARC T3
  - UltraSPARC T2 Plus
  - UltraSPARC T2
- On-chip crypto accelerators deliver secure, wire speed encryption for live migration
  - No additional hardware required
  - Eliminates requirement for dedicated network
- More secure, more flexible

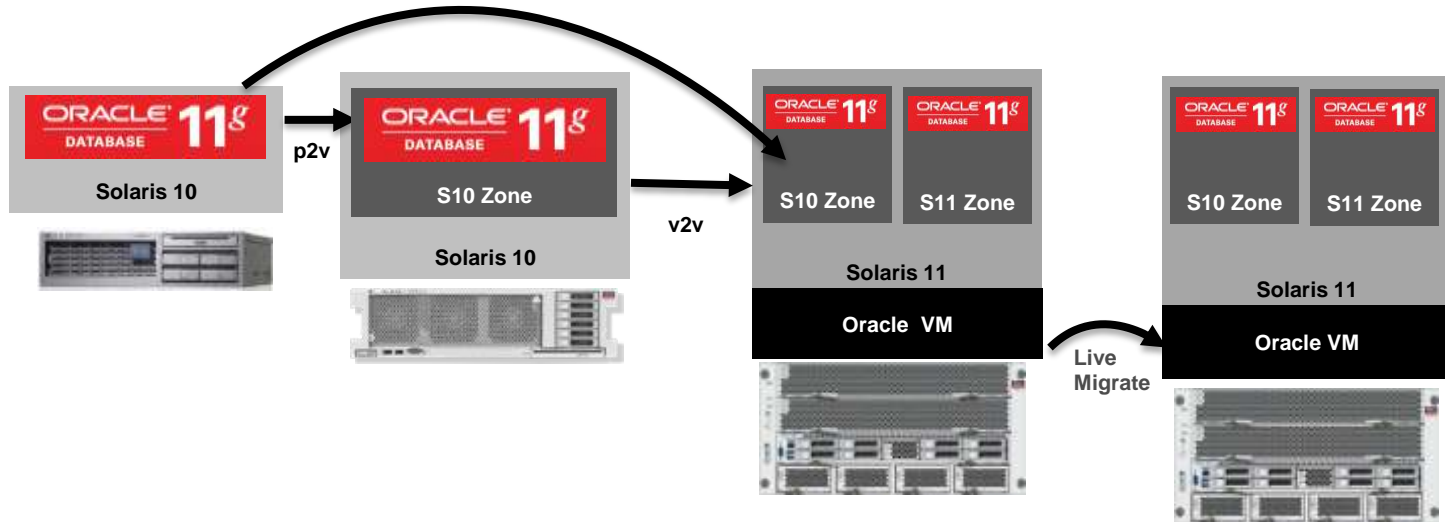




# Seamless Upgrades

## Oracle Solaris 11 Zones, Oracle VM

- Seamless upgrades from previous version
  - Assisted with a built-in pre-flight checker
- Live migration with OVM SPARC



# Why you should care

## 30 x 8 way systems

### Before



- 240 Cores
- 63.5 kW
- 510 RU
- 216,480 BTU/h (max)
- OS support: \$126,000

## 1 x 32 way system

### After



- 32 Cores
- 2.5 kW
- 5 RU
- 9554 BTU/h (max)
- OS support: \$12,200

## Total Savings

### Total



- 87% less Cores
- 96% less power
- 99% less space
- 96% less heat
- 90% support savings

Domains and Solaris Zones recognized as a license boundary for Oracle and IBM

# Why Customers Choose SPARC Solaris

- Top Reasons for Investing in Oracle SPARC Solaris Systems
1. Reliability: SPARC Systems have the best uptime
  2. Performance: Proven in application benchmarks
  3. Roadmap: Exciting path to future performance gains

10 of the 10 Top Governments  
Run SPARC Solaris

10 of the 10 Top Banks  
Run SPARC Solaris

10 of the 10 Top Telcos  
Run SPARC Solaris

10 of the 10 Top Pharmas  
Run SPARC Solaris

# Q&A

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# 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 9/26/1011. 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](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](http://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, 20,593 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 / 20,593 QphH@1000GB per socket = 2.44

[http://www.tpc.org/results/individual\\_results/Oracle/Oracle\\_T4-4\\_1TB\\_TPCH\\_ES\\_092611.pdf](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. The Sun ZFS Storage 7420 appliance outperformed the NetApp FAS3270A by 2.5x on price/performance on the SPC-1 benchmark. SPC-1, SPC-1 IOPS, \$/SPC-1 IOPS reg tm of Storage Performance Council (SPC). More info [www.storageperformance.org](http://www.storageperformance.org). Oracle Sun ZFS Storage 7420 Appliance

[http://www.storageperformance.org/results/benchmark\\_results\\_spc1#a00108](http://www.storageperformance.org/results/benchmark_results_spc1#a00108) As of October 3, 2011

**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](http://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 than 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://xmllisnotaprocol.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.

**JD Edwards:** (T4-2) JD Edwards - "Day in Life" online+batch - T4-2 (9.0.2 DIL) 2.5x faster than IBM P750 Power7 (9.0.1 DIL) - 10,000 users with sub-second response time

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

**Comms Service Broker:** (T4-1) 2.7x more performance (400 CAPS) than an Intel Nehalem-based system (150 CAPS).

**Security 3x v x86:** (T4) 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.

**Data Warehousing:** (SuperCluster) Based on internal testing of full rack SPARC SuperCluster T4-4 vs full rack 16 CPU HP Itanium Superdome 2 system.