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shaping tomorrow with you

# Server today and in the future

September 2015

Fujitsu

# Agenda

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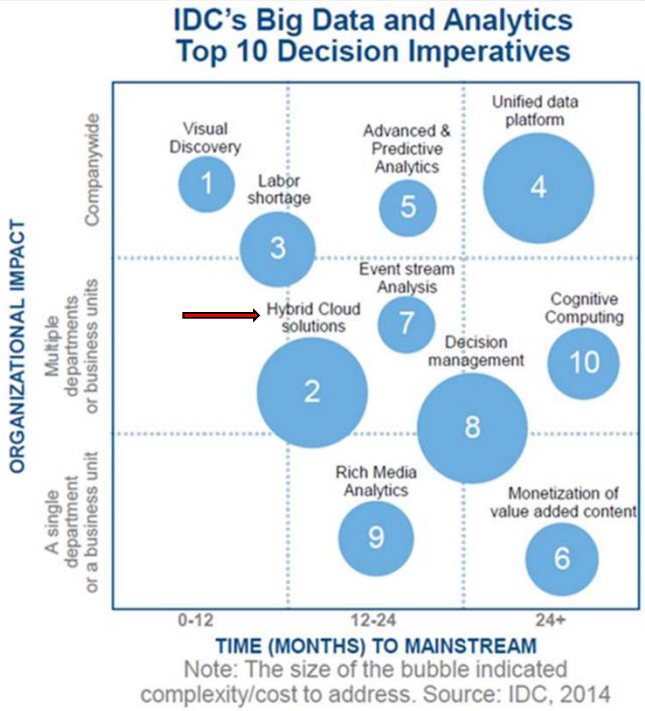
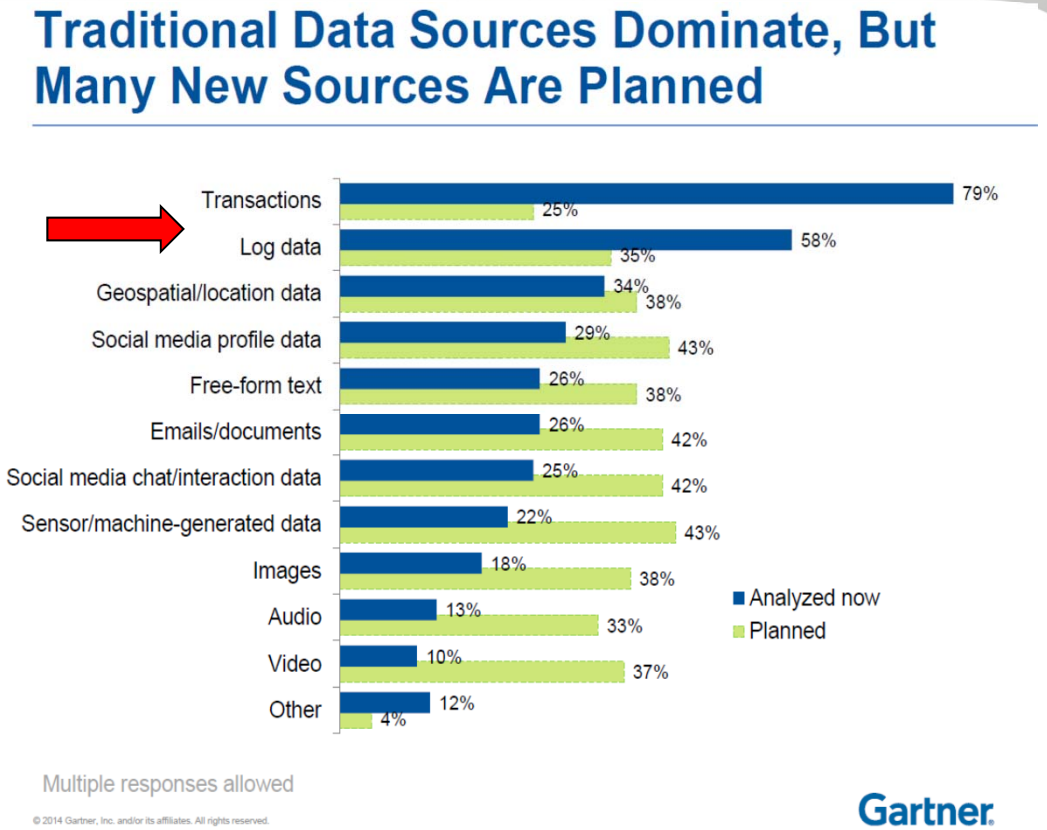
- Servers today
  - Fujitsu M10 and PRIMEQUEST (features to solve the demands)
- DC today and upcoming
  - SW defined and  cloud-oriented
  - Trends (Example): Silicon photonics
  - Appliances and (hyper) converged systems (integrated systems)

# Big Data and Analytics




2. Over the next 5 years spending on **cloud-based BDA solutions will grow 3x faster** than spending for on-premise solutions. Hybrid on/off premise deployments will become a requirement.



# Servers today: Customer Challenges

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## Increase Productivity

Improve service levels resulting in higher employee productivity

## Reduce Risk

Ensure continued access to critical data and functions

## Save Money

Reduce capital and operation costs to maximize IT investments

# Servers today: IT demands

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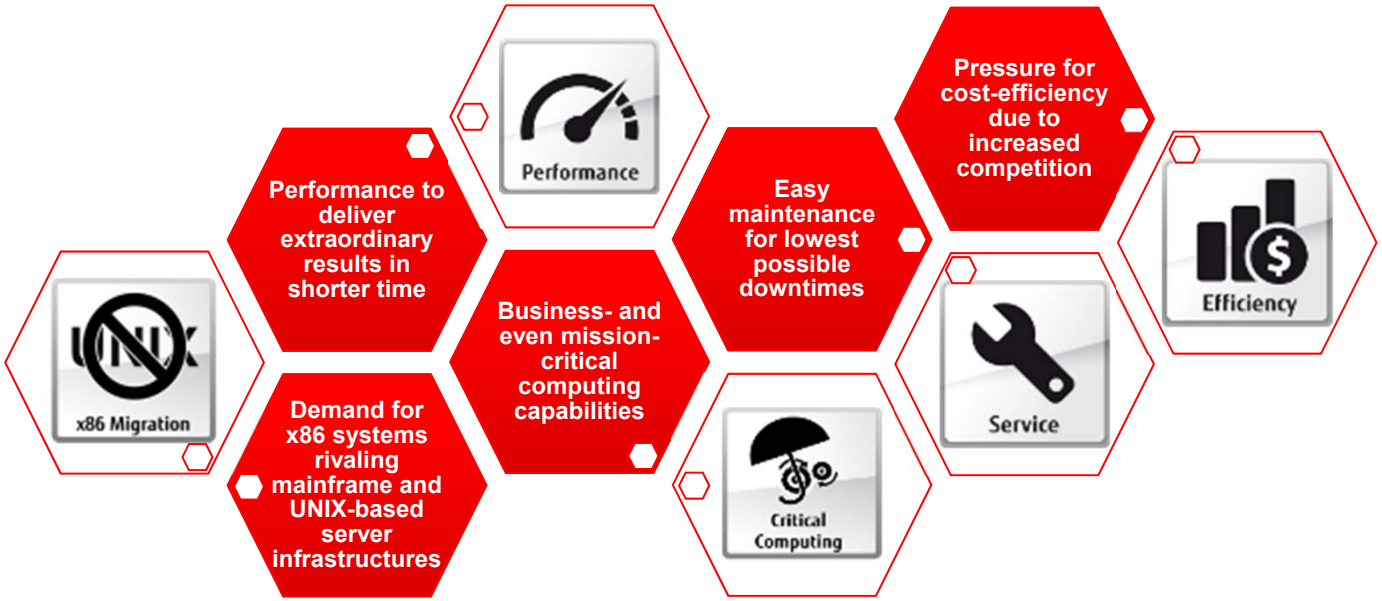
What unites businesses running large scale databases i.e. SAP or Oracle, financial institutions, telecommunication companies, and enterprises processing huge amounts of data in times of IoT and scale-up architectures for big data processing in a hyper-connected world?



# Servers today: What does the market say?

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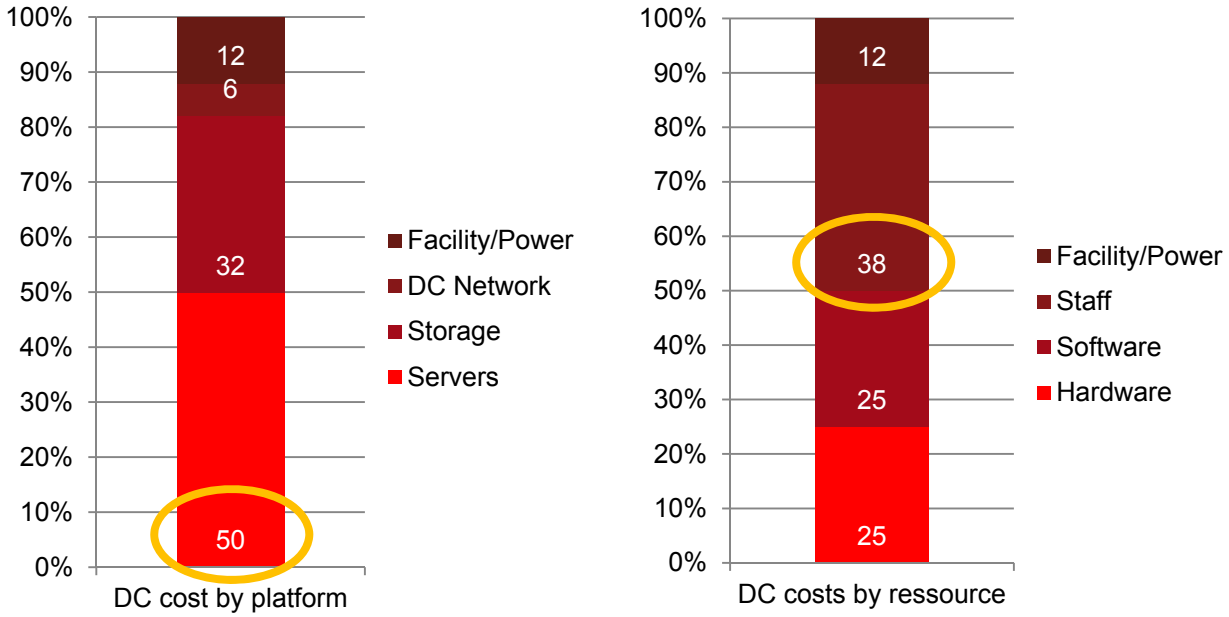
Pressure for cost-efficiency due to increased competition

The main cost drivers in a data centers are servers and staff.
This is where potential can be unlocked most effectively.

Efficiency



# Servers today: The mission-critical approach

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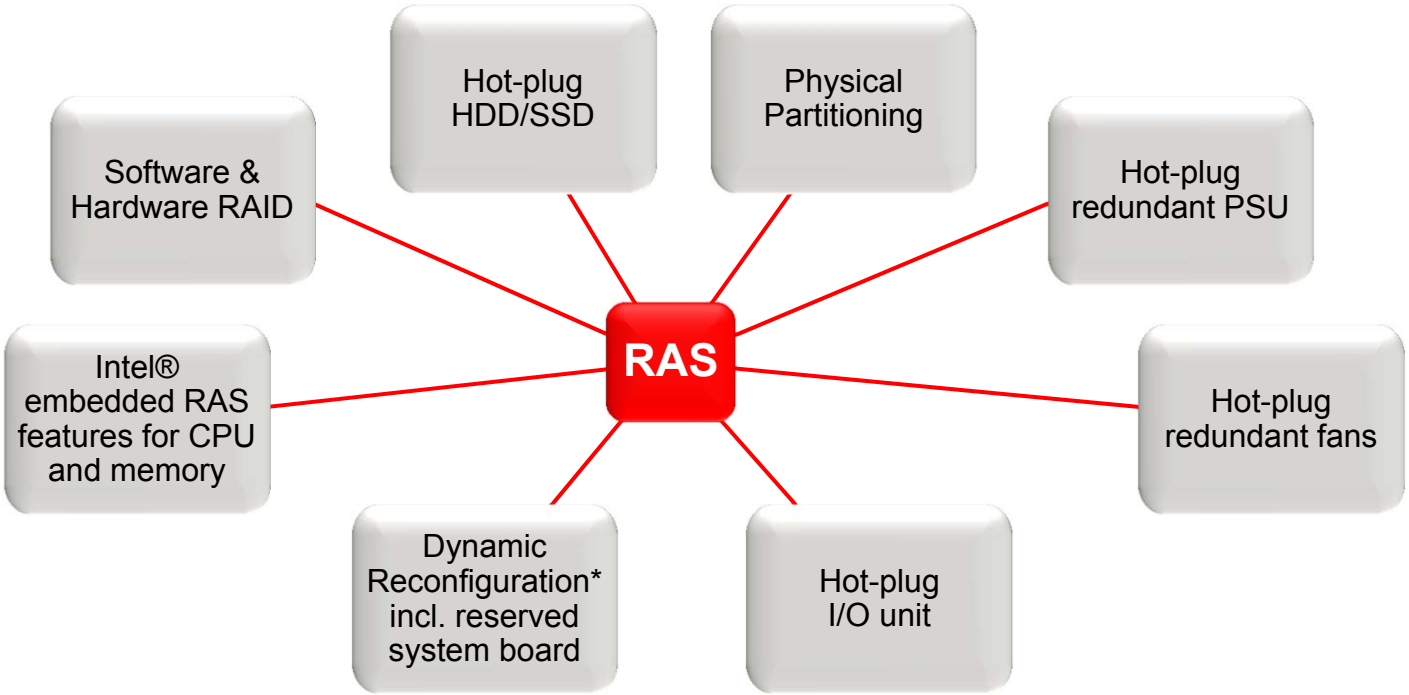
Mission- and business-critical computing capabilities

The extended RAS features of PRIMEQUEST minimize this number significantly.



# Fujitsu Mission-Critical Heritage with SPARC

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Fujitsu's DNA: **60-years** of mainframe development ✖ State-of-the-art technologies → Further evolution of M-series

| | |
|---|---|
| Evolution of Mission-Critical Servers | ✓ **Zero** downtime on H/W expansion<br>✓ **Zero** downtime on maintenance<br>✓ **Zero** single point of failure |
| Ultimate Data Integrity | ✓ **15×** error checkers (over SPARC Enterprise M-series' processor)<br>✓ Robust self-healing features |

2013 Fujitsu M10

1954 Relay Computer

# Fujitsu and Oracle's Collaboration

## One Big Result

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- SPARC64 processor
- Supercomputer technologies
- Mission-critical technologies

New SPARC Servers

**Fujitsu M10**

Extreme performance increase with Software on Chip developed via Fujitsu and Oracle's collaboration

ORACLE

- #1 UNIX OS Oracle Solaris
- #1 Database software
- Innovative technologies

# Fujitsu M10 Systems Product Lineup

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- Small to Huge Capacity
- Core Activation
- Building Block Architecture
- Mission-critical RAS
- XSCF System management

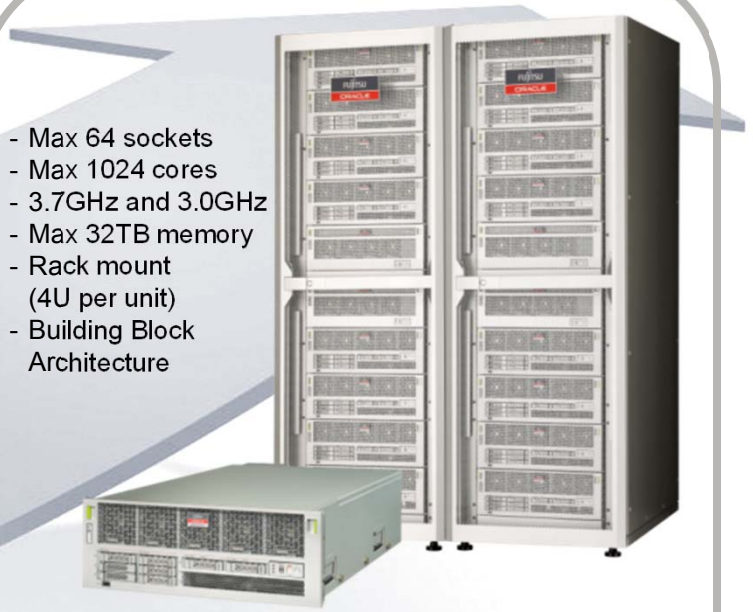
- 1 socket
- 3.7 GHz, Max 8 cores
- 3.2 GHz and 2.8 GHz, Max 16 cores
- Max 512GB memory
- Rack mount (1U)

**Fujitsu M10-1**

- Max 4 sockets
- 3.7 GHz, Max 32 cores
- 3.4 GHz and 2.8 GHz, Max 64 cores
- Max 2TB memory
- Rack mount (4U)

**Fujitsu M10-4**

- Max 64 sockets
- Max 1024 cores
- 3.7GHz and 3.0GHz
- Max 32TB memory
- Rack mount (4U per unit)
- Building Block Architecture



**Fujitsu M10-4S**

# Fujitsu M10: Designed to Run Oracle Stack

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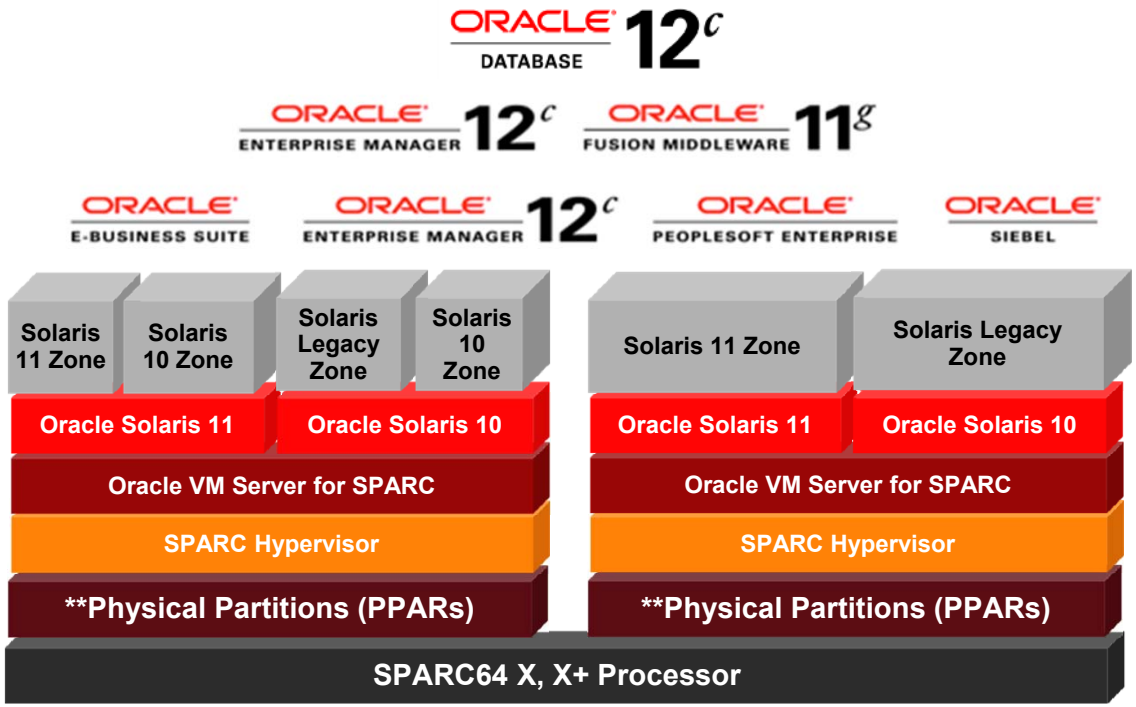
## Complete from Infrastructure to applications




**Fujitsu M10-4S only

# Oracle SPARC Server Portfolio

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**Reliable, Scalable, Efficient, and Secure Solaris**

| | T4-1 | M10-1 | T5-2 | T5-4 | M10-4 | T5-8 | M6-32 | M10-4S |
|---|---|---|---|---|---|---|---|---|
| Processor | SPARC T4 2.85 GHz | SPARC64 X+ 3.7 GHz & 3.2GHz & SPARC64 X 2.8 GHz | SPARC T5 3.6 GHz | SPARC T5 3.6 GHz | SPARC64 X+ 3.7 GHz & 3.4 GHz & SPARC64 X 2.8 GHz | SPARC T5 3.6 GHz | SPARC M6 3.6 GHz | SPARC64 X+ 3.7 GHz & SPARC64 X 3.0 GHz |
| Sockets | 1 | 1 | 1 / 2 | 4 | 2 or 4 | 8 | 32 | 2 to 64 |
| Max Cores Threads | 8/64 | 8/16 (3.7GHz) 16/32 | 16/128 32/256 | 64/512 | 32/64 (3.7GHz) 64/128 | 128/1,024 | 384/3,072 | 1024/2,048 |
| Max Memory | 512 GB | 512 GB | 1 TB | 2 TB | 2 TB | 4 TB | 32 TB | 32 TB |
| Size | 2 RU | 1 RU | 3 RU | 5 RU | 4 RU | 8 RU | Stand-Alone Chassis | 4 RU to 80 RU |
| Entry Price | $20K | ***$22K / $15.7K / $9.8K*** | $29K / $44K | $96K | ***$60K / $41K / $37K*** | $165K | $427K | ***$88K / $60K*** (one Building Block) |

# Fujitsu M10 Hardware Technology

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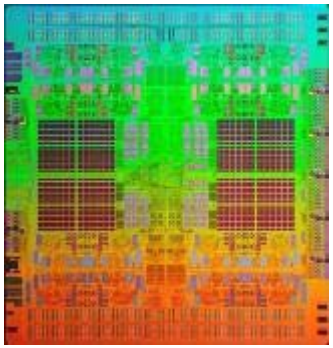
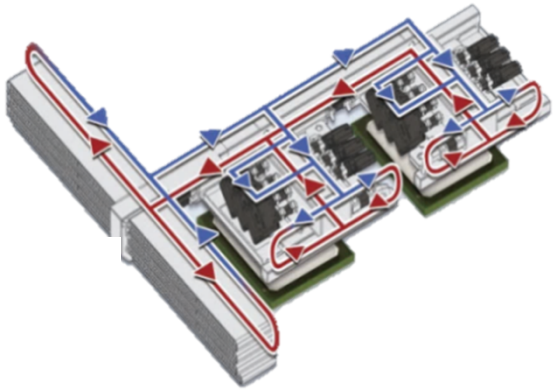
## A Chip



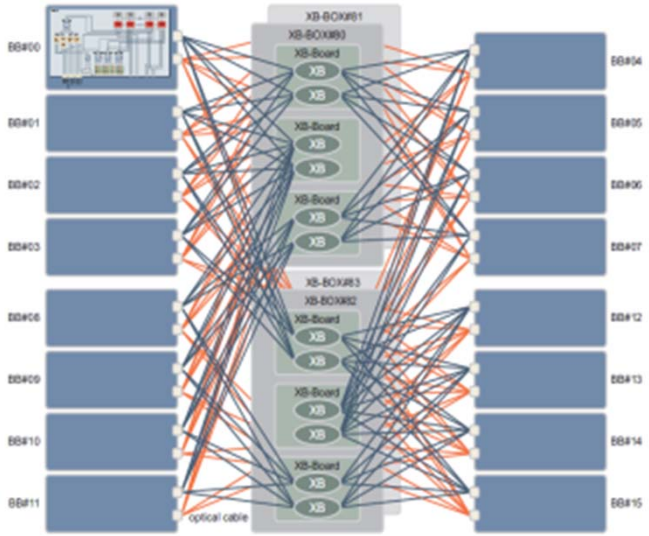
SPARC64 X/X+

## Some Liquid



Liquid Loop Cooling for M10-4 and M10-4S

## An Interconnect




Fujitsu XB Technology

# SPARC64 X / SPARC64 X+ Processor Overview

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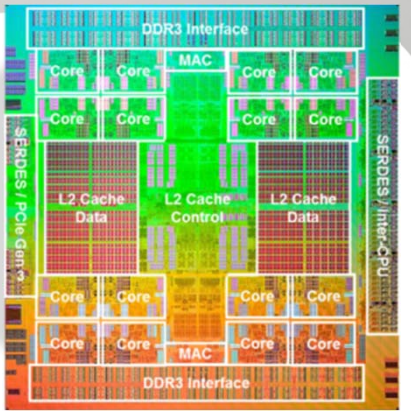
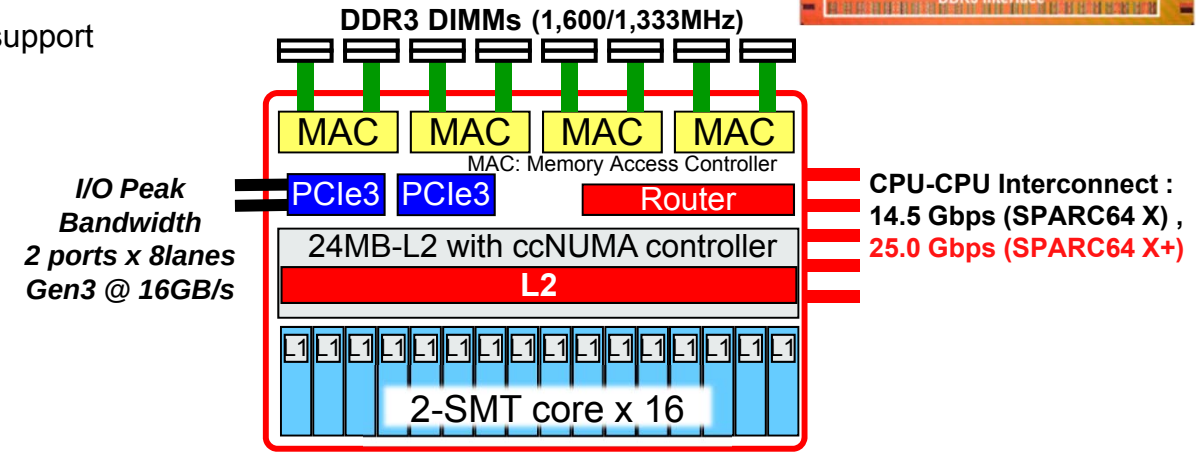
- **CPU Core and Thread**
  - Max 8 or 16 cores, Max 16 or 32 threads (2 threads/core)
- **High CPU Frequency, 64 Socket Scalable Interconnect**
  - SPARC64 X up to 3.0GHz / 14.5Gbps (CPU-CPU)
  - SPARC64 X+ up to 3.7GHz / 25.0Gbps (CPU-CPU)
- **Integrated Memory Controller**
  - 4x embedded memory controllers.
  - Directly connected to 4x DIMM slots
  - 1,600MHz/1,333MHz DDR3 DIMM support
  - 100ns load-to-use latency
- **High Speed Interconnect**
  - 5x 14.5GB/s (X) / 25GB/s (X+) interconnect Interfaces
- **Integrated PCIe Controller**
  - 2x PCIe Gen3 interface
- **Performance (peak)**
  - 382GFlops (X) / 474GFlops (X+)
  - 102GB/s memory throughput

# Processor Innovation: Software on Chip

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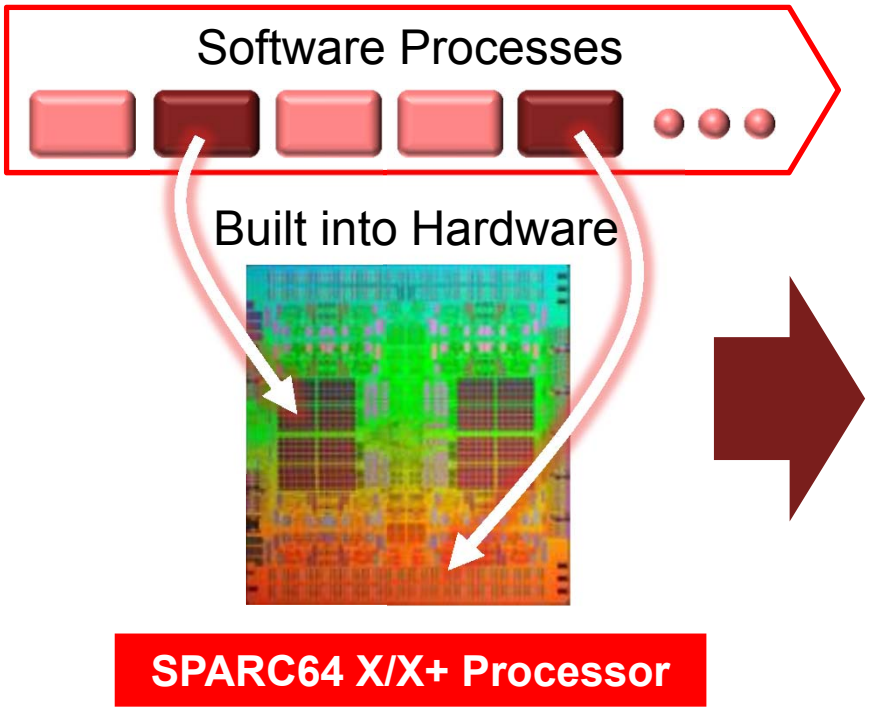
**Supercomputer Technology to Accelerate Oracle DB**




**SSL and Database Accelerators Built-In**

- Dedicated Encryption/Decryption Engine
  - Supporting cryptographic algorithms: AES, DES, 3DES, RSA, and SHA
- Decimal FP ALU (Arithmetic Logical Units)
  - Supporting decimal floating-point based on IEEE Standard (IEEE754) and Oracle Number
- HPC-ACE & SIMD Function (Single Instruction Multiple Data)
  - High speed arithmetic processing by four elements in a single instruction (Supercomputer technology)

# M10 CPU Core Automatic Replacement

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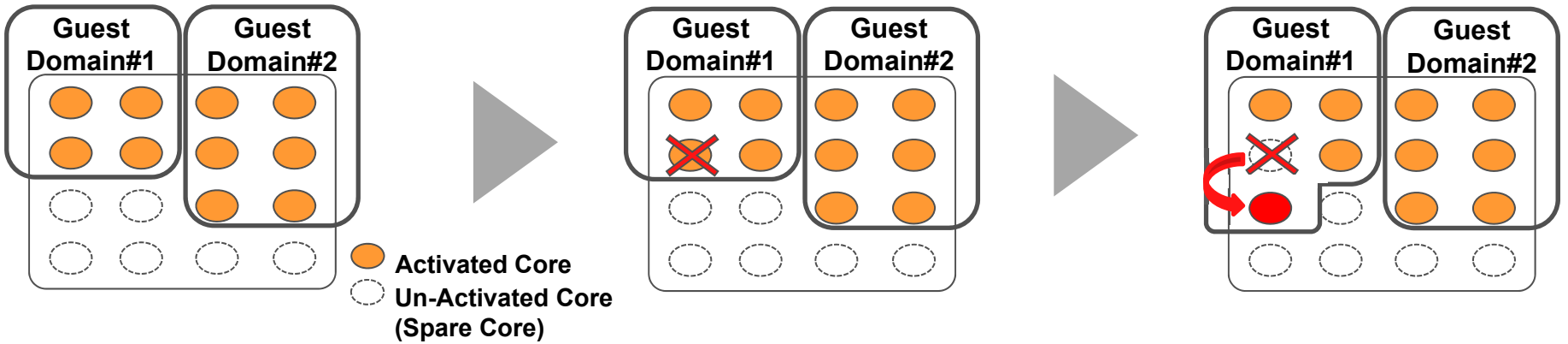
- Active CPU core fails ➔Un-Activated CPU core automatically allocated
- System stays up & no loss of CPU resources




**10x CPU activated cores assigned to OVM Guest Domains**

**One CPU core in Domain#1 fails**

**Bad core goes off-line. Spare core goes on-line and assigned to Domain#1 Automatically**

# Fujitsu M10 SWoC Feature Enablement

## Built-in performance boost as you move to the latest software levels

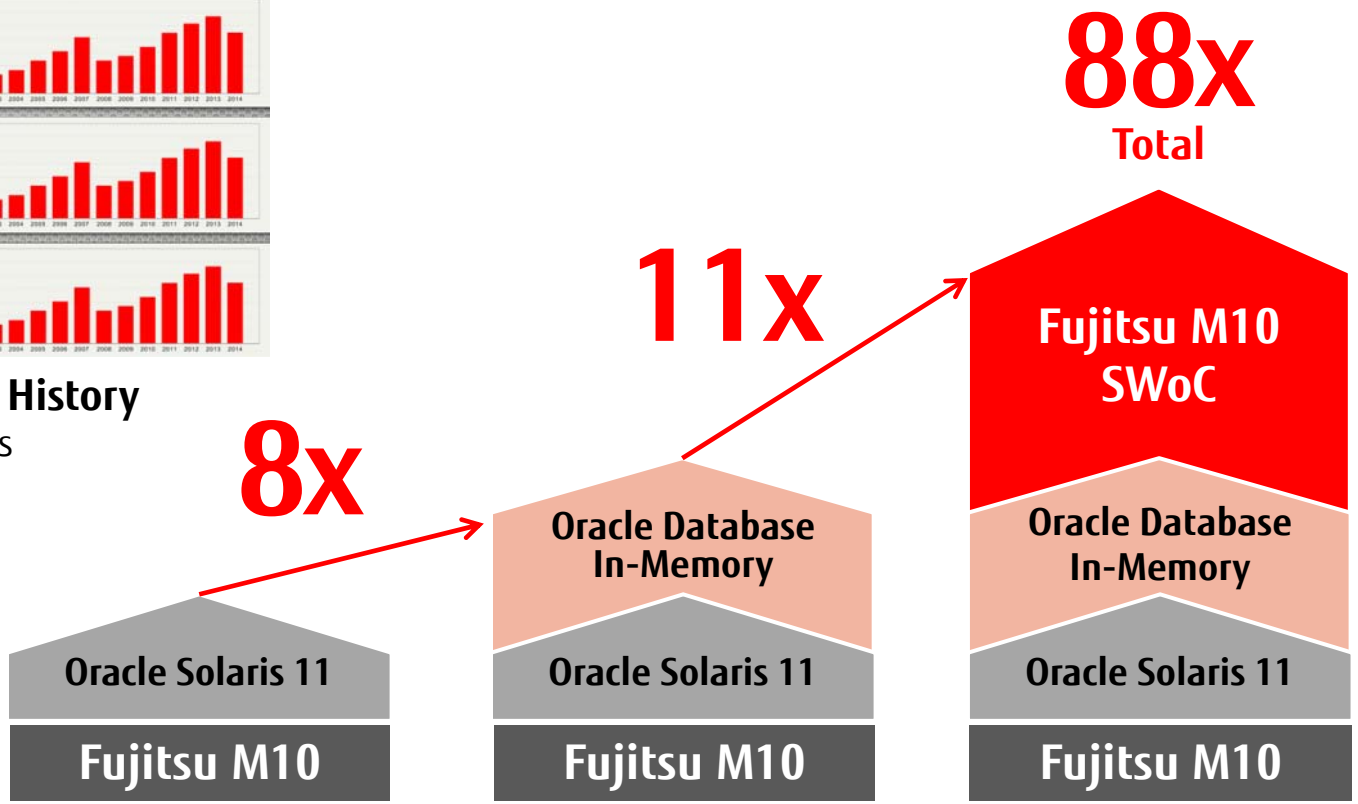
| Feature | Oracle Solaris Level | Compiler | Oracle DBMS |
|---|---|---|---|
| Enhanced in SPARC64 X+ Encryption | Oracle Solaris 11.1 | Implemented in Oracle Solaris 11.1 | 11gR2, 12c |
| Compare, Copy functions | Oracle Solaris 11.1 | | 11gR2, 12c |
| HASH | Oracle Solaris 11.1 | | 12c w/PSE |
| Decimal ALU | Oracle Solaris 11.1 | Studio 12.4 | N/A |
| NUMBER | Oracle Solaris 11.1 | N/A | 12c w/PSE |
| Decompression | Oracle Solaris 11.1 | N/A | 12c + In-Memory |
| Enhanced in SPARC64 X+ SIMD | Oracle Solaris 11.1 | Studio 12.4 | 12c + In-Memory |

PSE= Platform Specific Enhancement

# Oracle Database 12c In-Memory on Fujitsu M10


**Company X Sales Order History**

- 12 Years of Transactions
- 180 Million Records
- 100GB+



# Oracle Enterprise Manager Ops Center

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## Complete Management for Oracle Hardware, OS & Virtualization


ORACLE 12c
ENTERPRISE MANAGER
OPS CENTER

- Data Center Discovery
- Virtualization Management
  - Oracle Solaris Zones and Oracle VM for SPARC
- Configuration Management
  - Patch OS, Update Firmware, Configuration Compliance
- Operating System Analytics
- Maintenance
  - Health Checks, Remote Management

# Best Performance for Business Workloads


**Faster memory Throughput**

**#1 Arithmetic Performance**

**#1 Application Performance**

**#1 Scientific Performance**

**#1 Java Performance**

| | |
|---|---|
| STREAM TRIAD | 1 1 1 |
| SPECint_rate 2006 | 1 1 |
| 2-tier SAP SD | 1 1 |
| SPECfp_rate 2006 | 1 1 1 |
| SPECjbb2005 | 1 |

As of Dec 2014

# Core Activation Cuts Costs

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## Software Licensing

*You anticipate business growth, but unsure how much, so you buy a 4 socket M10-4S server.*

*Assume software licensing costs: $20,000 per core annually.*

***Without core activation, software licensing is $1,280,000 per year.***

| Time | Projected Workload | #Cores X $20K | Cost Savings with Core Activation |
|---|---|---|---|
| Year 1 | 16 cores | 16 x $20K | $960,000 |
| Year 2 | 32 cores | 32 x $20K | $640,000 |
| Year 3 | 48 cores | 48 x $20K | $320,000 |
| Year 4 | 64 cores | 64 x $20K | 0 |

# Key M10 Strengths

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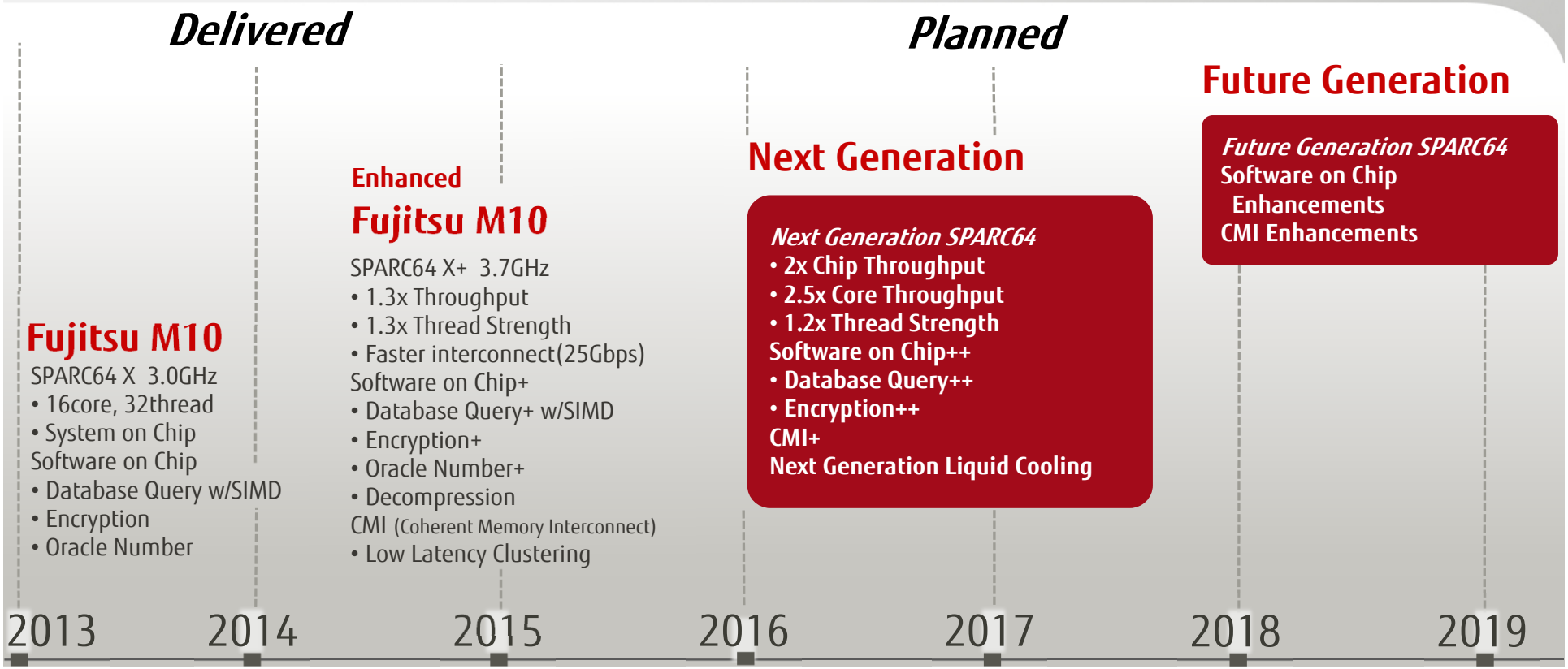
## Fujitsu M10:

- **Single Thread Performance**
  Applications that benefit from very strong single thread performance (e.g. batch, DWH, analytics)
- **Scalability Past 32 Sockets**
  Initial or target environment will be anywhere between 2 and 64 sockets
- **Granularity**
  When gradual growth is planned or step-by-step consolidation is needed at the core and/or socket level
- **Capacity on Demand with Core Activation and Building Block Architecture**
  When not all cores initially need to be activated, due to application requirements or licensing
- **Mainframe-class RAS**
  For customers who know and expect Fujitsu RAS
- **Dynamic Reconfiguration**
  Implementations requiring Hot Swap and/or Hot Add/Delete of hardware resources
- **Partitioning**
  Implementations that require hardware isolation through physical partitioning
- **Physical Partitioning Granularity**
  M10-4S Building Blocks: Start from 2 sockets and grow to 64 sockets with up to 16 physical partitions
- **Huge I/O Scalability**
  Lots of consolidation needs lots of PCIe expansion. Unique M10 PCI Expansion Unit adds slots to all models (928 slots max)

# Fujitsu M10 Roadmap

ORACLE FUJITSU




http://www.fujitsu.com/global/products/computing/servers/unix/sparc/key-reports/roadmap/index.html

# Fujitsu Technology Ecosystem

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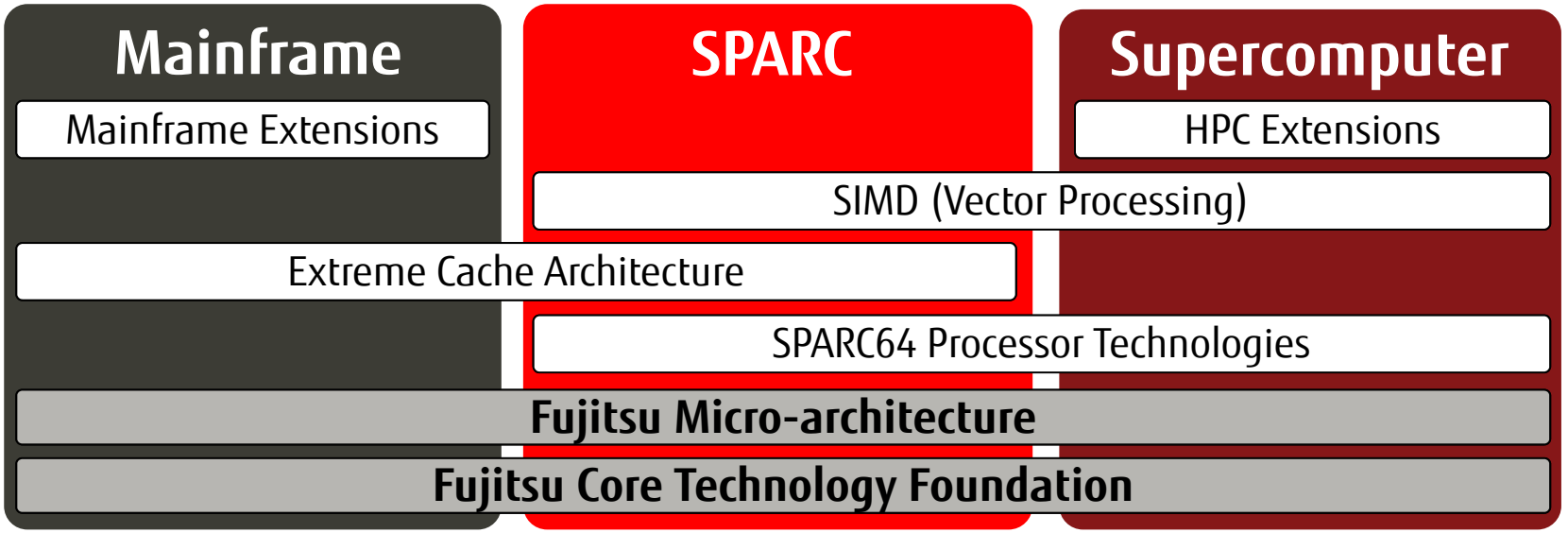
Mission Critical and HPC product families benefit from collaborative technology investment

Benefits customers:

- Innovation Cross-Pollination
- Extreme Performance
- Lower Cost
- High Reliability



# FUJITSU Server PRIMEQUEST

Ambidextrous, rack-optimized enterprise systems making Mainframe/UNIX available on a x86-platform for more operational efficiency while maintaining critical computing abilities

| PRIMEQUEST 2800 B2 | PRIMEQUEST 2400 E2 | PRIMEQUEST 2800E2 |
|---|---|---|
|  |  |  |
| Grow your business with vast performance and business-critical reliability on x86 | No time for downtime | Critical workload processing revolutionized |

# FUJITSU PRIMEQUEST 2x00E/B2 at a glance


## Big-data and in-memory computing

Faster to business results thanks to Intel® Xeon® E7-8800 v3 processors and DDR4 memory – the right performance for database applications, telecommunication infrastructures and real-time analytics


## Advanced RAS-features

Resilience at its best with highest redundancy and failure detection as well as failure correction taken to a new level in an x86-industry standard system


## Innovations for critical applications

The **Extended Partitioning*** function allows you to allocate resources within one system as required and to utilize resources optimally while maintaining the necessary fault tolerance

**Dynamic Reconfiguration*** allows to reconfigure the system while it is running. Stay flexible and react to changes in workload without downtimes




*not available with initial system release

# Performance ≠ Bottleneck

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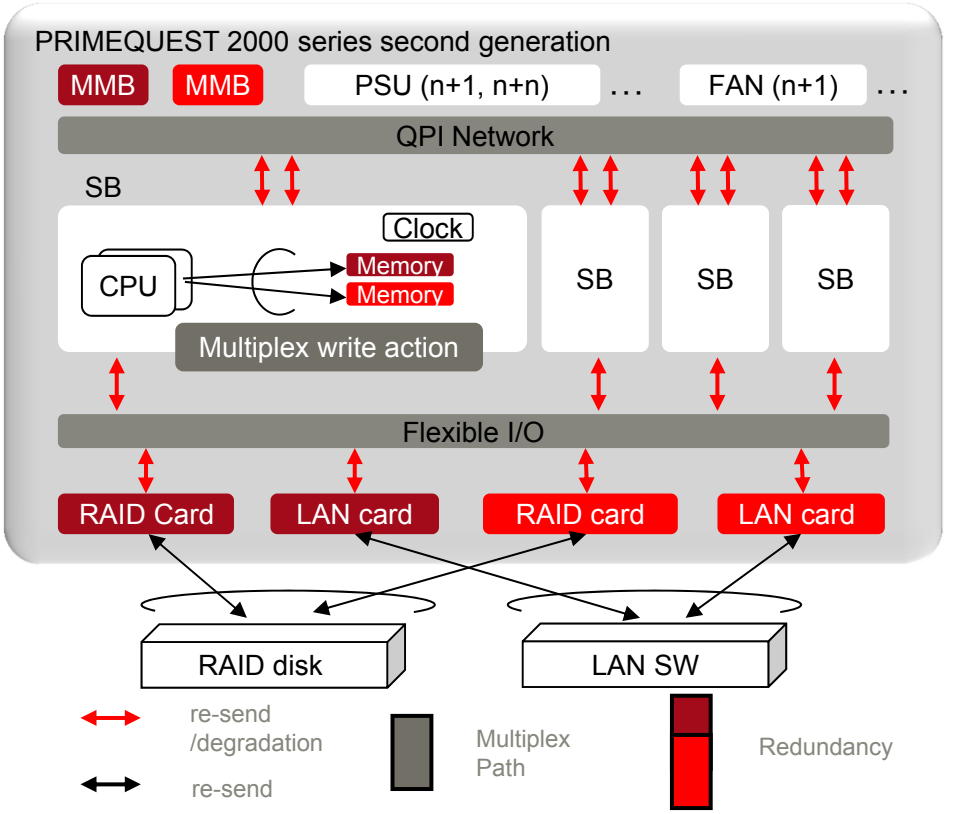
Performance to deliver extraordinary results in shorter time

| In-memory databases have innate risks… | …but PRIMEQUEST can help! |
| --- | --- |
| If in-memory database computing is distributed over several single nodes, the entire system set-up is very complex | PRIMEQUEST is one system which is capable of consolidating up to 8 systems in 1 |
| In the unlikely event of a server outage, all data saved in memory are lost | PRIMEQUEST has extended RAS-features and self-healing capabilities |

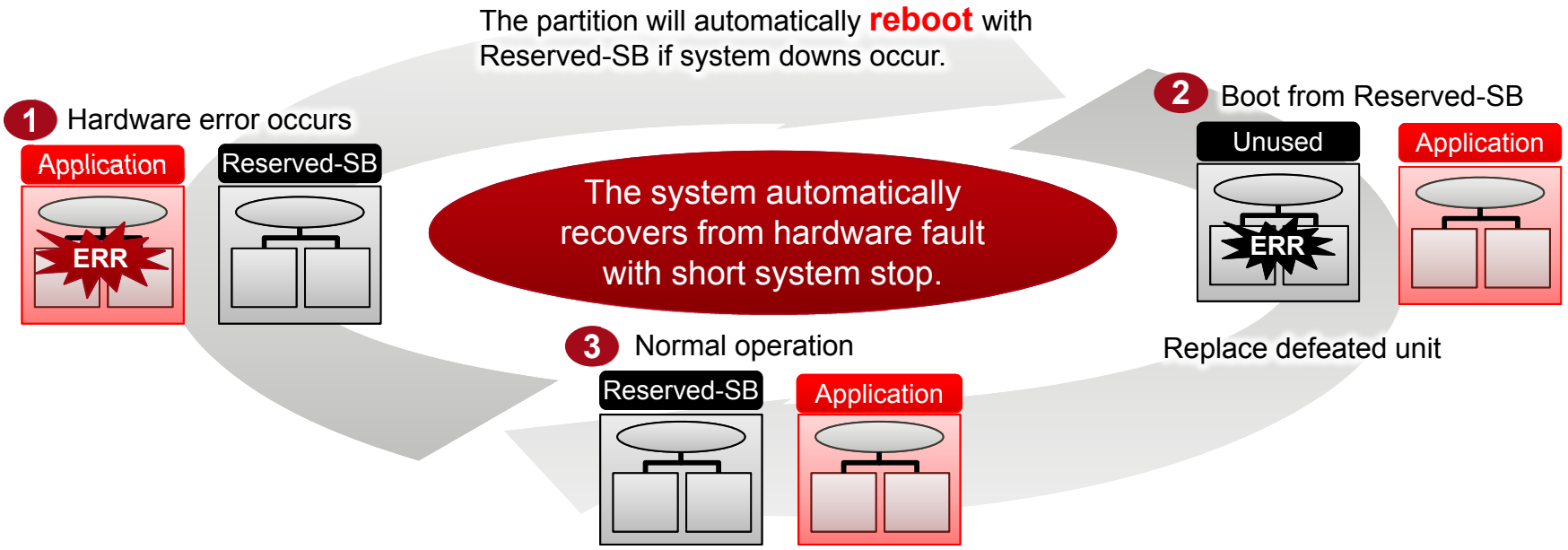
# Full Redundancy within PQ systems

- Fully redundant and fully multiplex for almost all the components
- Even when hardware problems are detected, the system continues operation
  - Memory mirroring, Inter CPU bus, CPU-IO bus
  - Faulty parts can be isolated and the system remains active



# Reserved System Board

Unique Reserved System Board feature decreases system down time in case of hardware failure. The partition will automatically reboot with Reserved-SB in case of failure.



# Type of Dynamic Reconfiguration Operations

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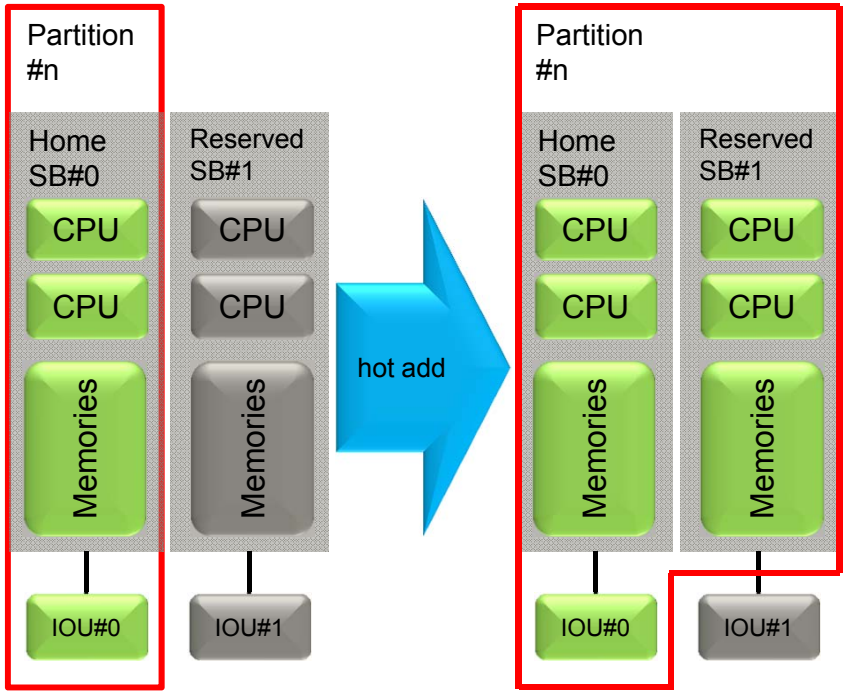
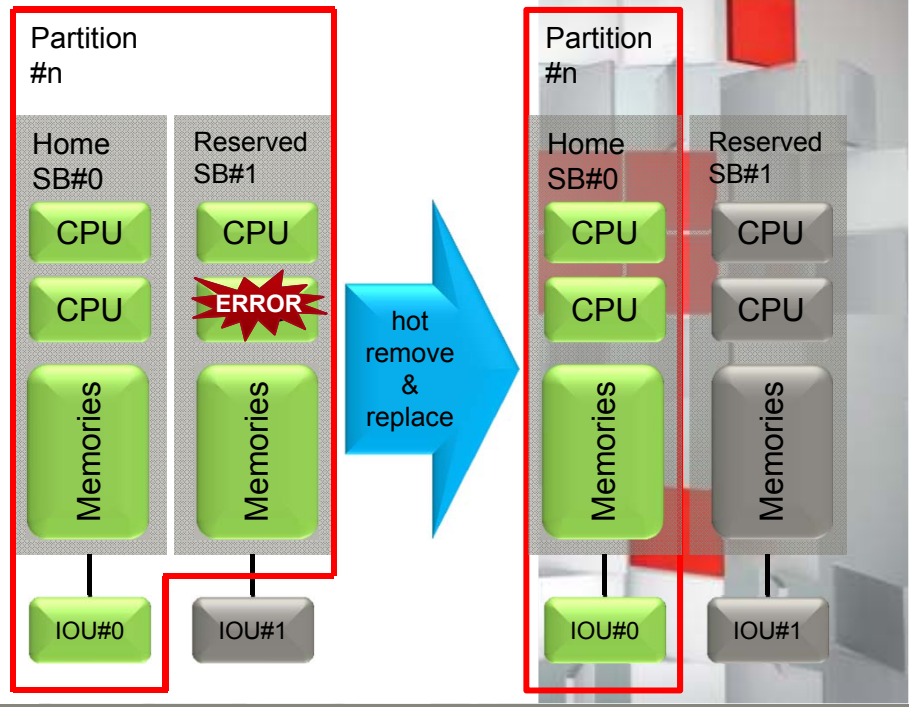
- SB hot-add




- SB hot-remove



# PRIMEQUEST and its facets of efficiency

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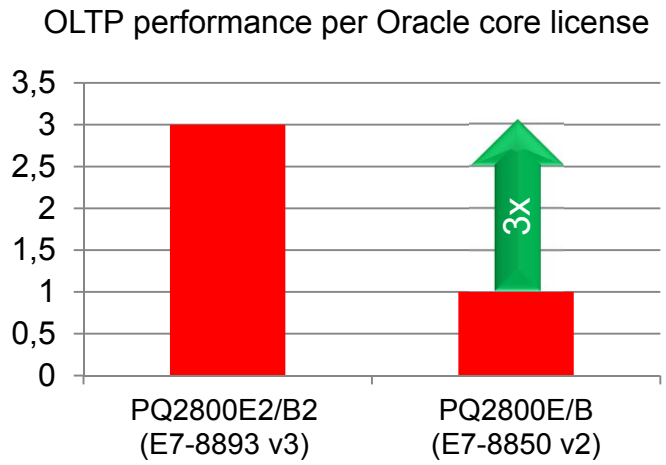
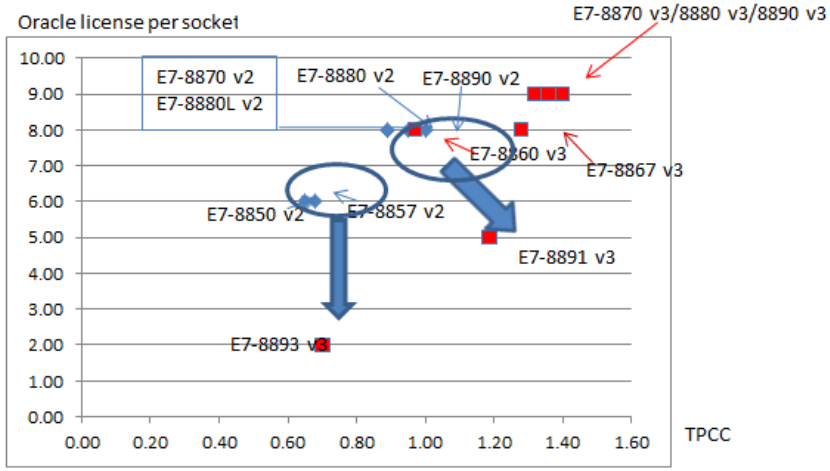
Pressure for cost-efficiency due to increased competition

## Triple OLTP performance per Oracle database license and support charge with PRIMEQUEST 2000 series 2nd Generation

Efficiency



# Reduction for Oracle DB Charge
(Consolidation and speed up)

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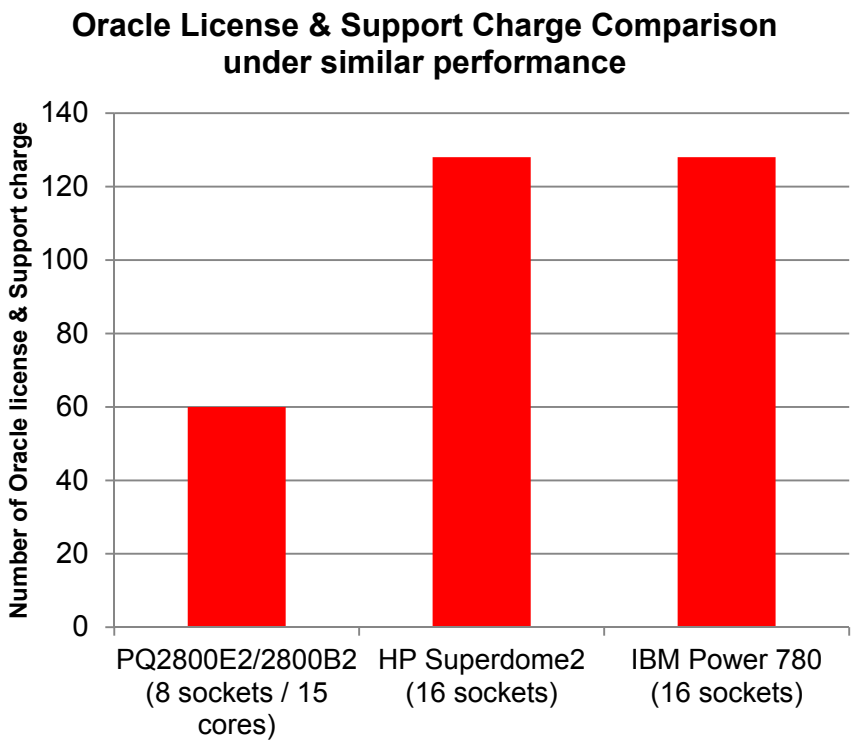
- 8 socket models can halve Oracle license & support charges
- In comparison with HP Superdome2 and IBM Power 780
  - Under similar performance
    - 128 cores for HP Superdome2 16s and Power 780
    - 120 cores for PQ2800E





Preliminary values – confirmation will follow

# PRIMEQUEST and its facets of efficiency

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Scale-out or scale-up? A question many enterprises raise.
But what speaks for Scale-up?


**1** Scale-up is not prohibitively expensive anymore. x86-system design uses the same components for a better trade-off in PRIMEQUEST servers


**2** Scale-out leads to more reliability: Not necessarily. PRIMEQUEST delivers outstanding uptime with a leading feature-set to be failure-resilient – all in one box.


**3** Scalability is limited. Sure, there is a natural barrier within one chassis. Nevertheless, even for future demands, up to four system boards, up to 144 cores and 12 TB of memory are ideal for in-memory computing and leave enough headroom

# Agenda

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- Servers today
  - Fujitsu M10 and PRIMEQUEST (features to solve the demands)
- DC today and upcoming
  - SW defined and  cloud-oriented
  - Trends (Example): Silicon photonics
  - Appliances and (hyper) converged systems (integrated systems)

# Worldwide CIO view for Technology Priorities

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*Fujitsu ETS: Top Technology Priorities for 2015, Japan vs. Global*

| Japan | Global |
|---|---|
| 1. Cloud | 1. BI/Analytics |
| 2. ERP | 2. Infrastructure and Data Center |
| 3. BI/Analytics | 3. Cloud |
| 4. Mobile | 4. ERP |
| 5. Infrastructure and Data Center | 5. Mobile |
| 6. Legacy Modernization | 6. Digitalization/Digital Marketing |
| 7. Security | 7. Security |
| 8. Digitalization/Digital Marketing | 8. Networking, Voice and Data Communications |
| 9. Networking, Voice and Data Communications | 9. CRM |
| 10. CRM | 10. Industry-Specific Applications |
| 11. Risk Management | 11. Legacy Modernization |
| 12. Applications Development | 12. Enterprise Applications |

Excerpts and summary from Gartner 2015 CIO Agenda: A Japan Perspective, 30 January 2015 G00272417.

# Drivers For Introducing A Private Cloud

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**Business Units**

Want to increase agility of IT

Want to improve service levels of IT

Want to be prepared for mergers & acquisitions

Want to be prepared for new business models

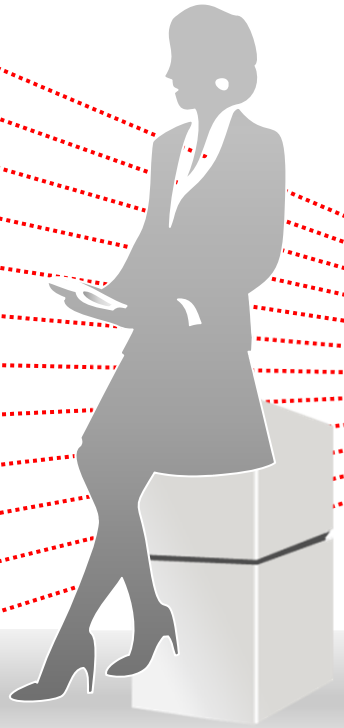
**IT Organizations**

Want to build on significant investment in infrastructure

Want to retain control of assets

Want to increase degree of automation

Want to be prepared for hybrid cloud approach



**Private Cloud Infrastructure**

# Services in the Cloud

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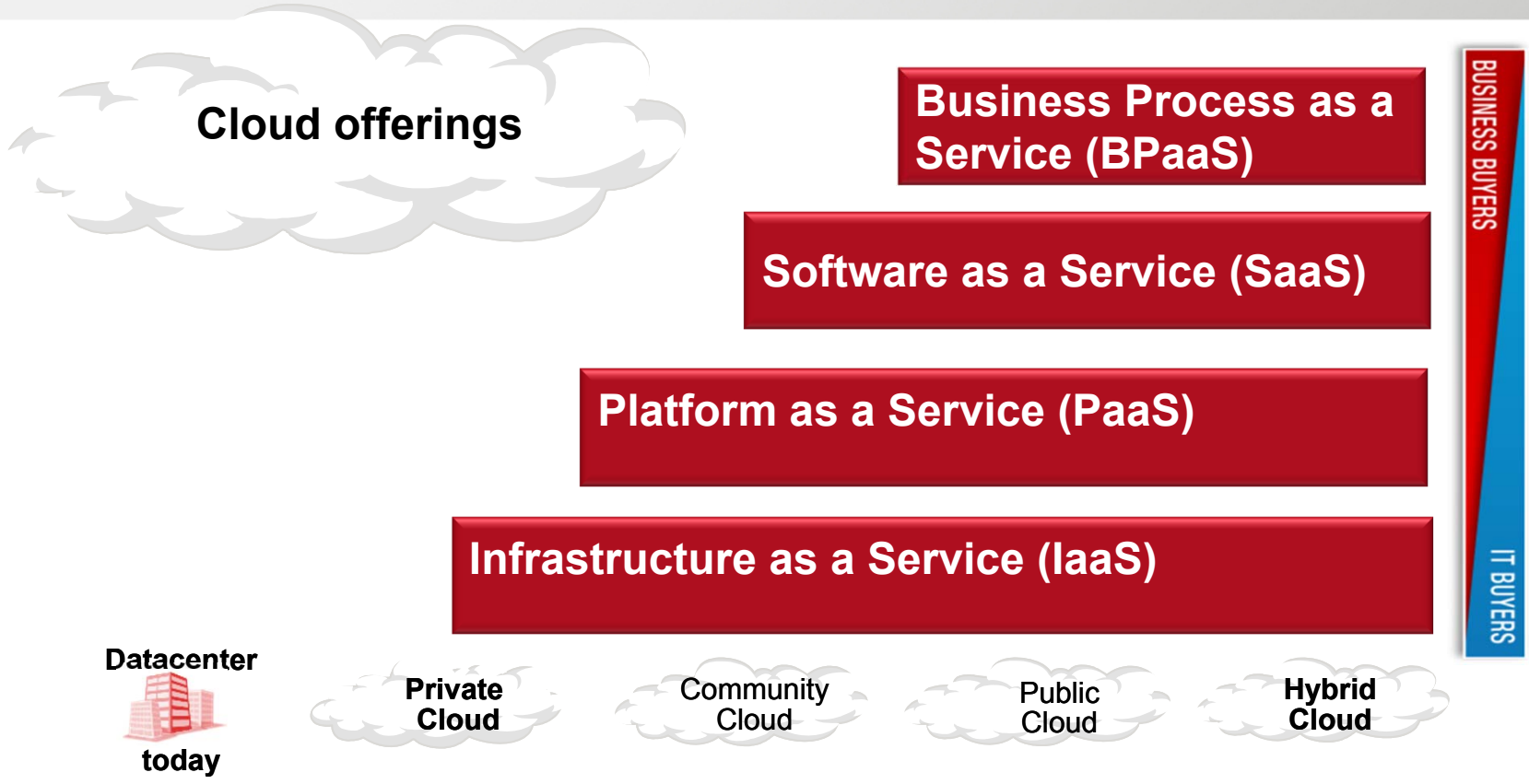

# Drivers For Introducing A Hybrid Cloud

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**Hybrid Cloud* enables companies to**

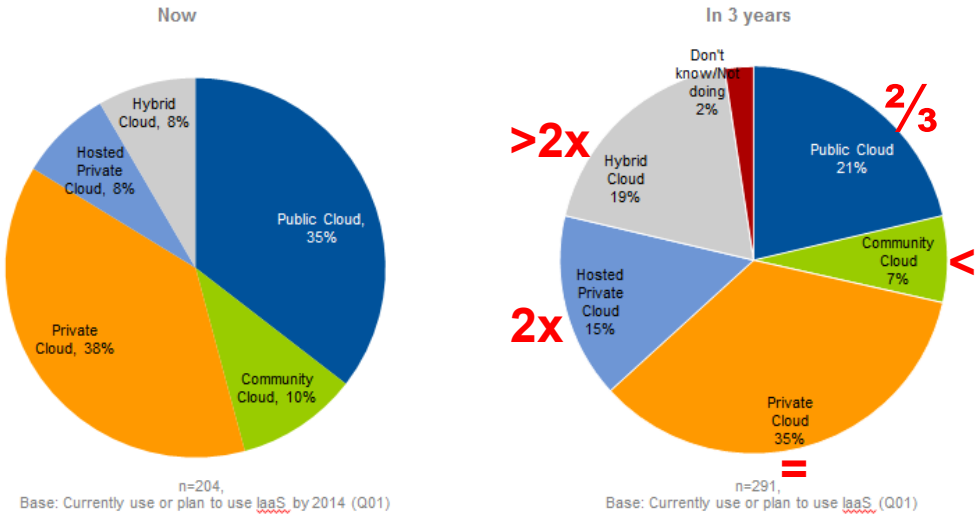
- increase flexibility of choice for sourcing options
- balance isolation, cost and scaling requirements
- easily introduce new functionality quickly and more flexibly
- improve resiliency and disaster recovery by using multiple providers

*Gartner defines a hybrid cloud computing service as a cloud service that spans both private and public cloud implementations, or both on-premises private and off-premises private or public cloud implementations.

# Private & Hybrid Clouds dominate in IaaS

## Hosted Private Cloud and Hybrid Cloud will gain market share for IaaS deployment in the next 3 years

Q03A. When considering your organization's use of IaaS, which is the primary cloud model your organization employs now? And will employ in 3 years?




n=204,
Base: Currently use or plan to use IaaS by 2014 (Q01)

n=291,
Base: Currently use or plan to use IaaS (Q01)

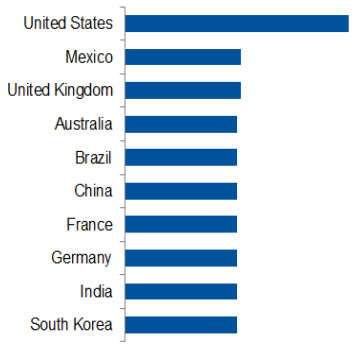


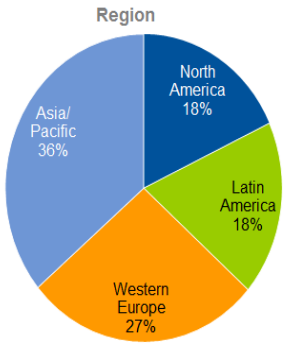
Gartner

## Respondent Profile: Geography

SS01. In which country is your primary work site located?

n=332



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# Example: Oracle Solaris 11

FUJITSU

Reliable. Scalable. Efficient. Secure.

**Highly Available, Secure Platform for Enterprise Apps**

- Predictive self healing
- ZFS data integrity
- Low overhead snapshots
- End to end encryption
- Application Clustering
- Compliance reporting
- DTrace observability

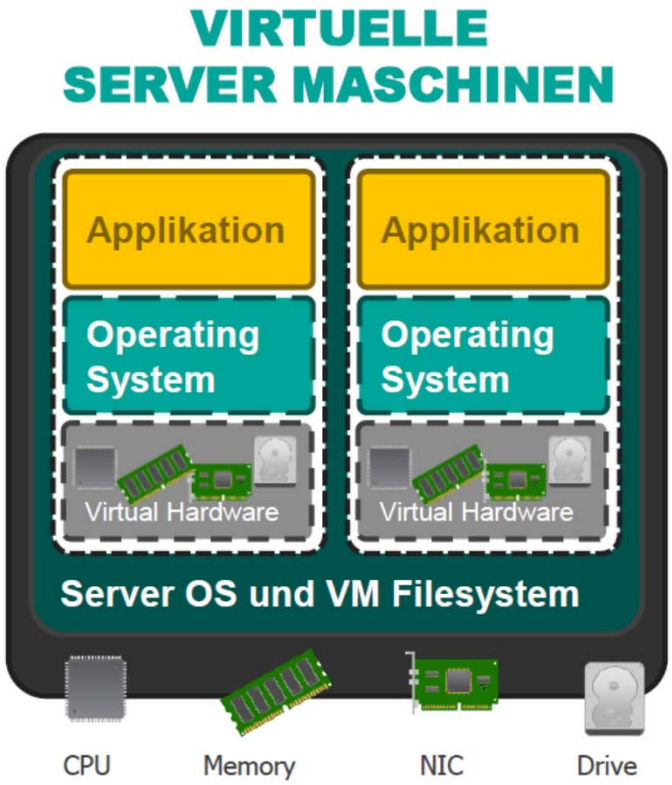

**Solaris 11**

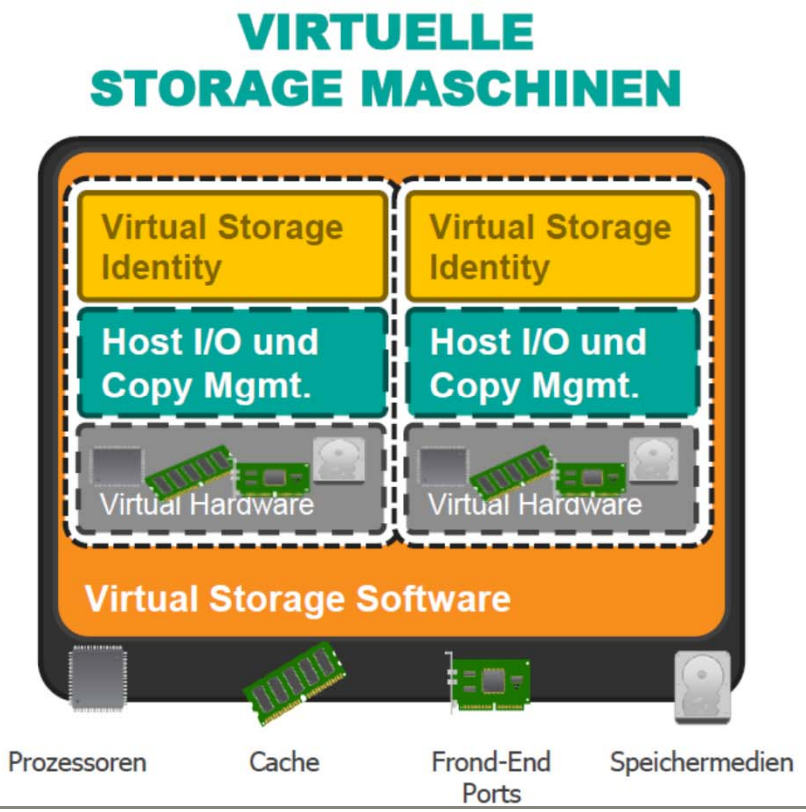
**Large-scale Cloud Management**

- Zero overhead Server, Storage, Network virtualization
- Immutable zones
- Fast, fail safe life cycle management
- Comprehensive cloud management solution

## Mission Critical Meets Cloud

# SW defined DC

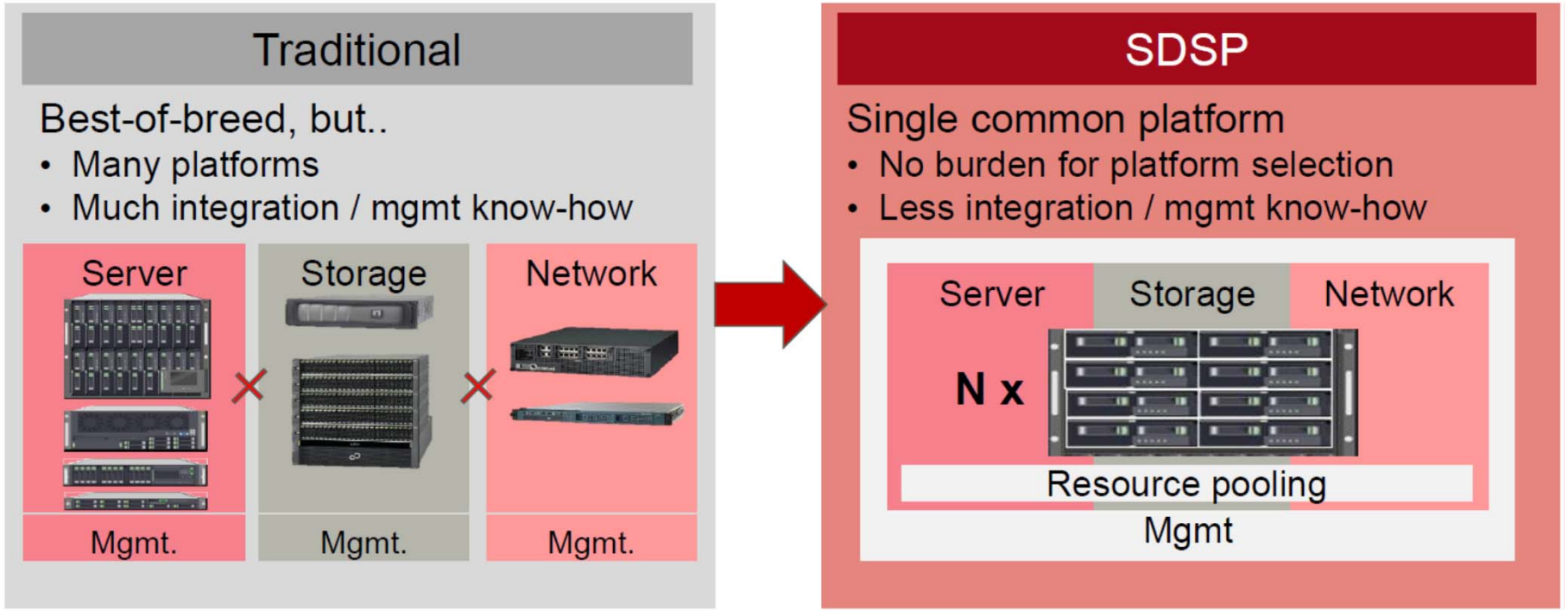


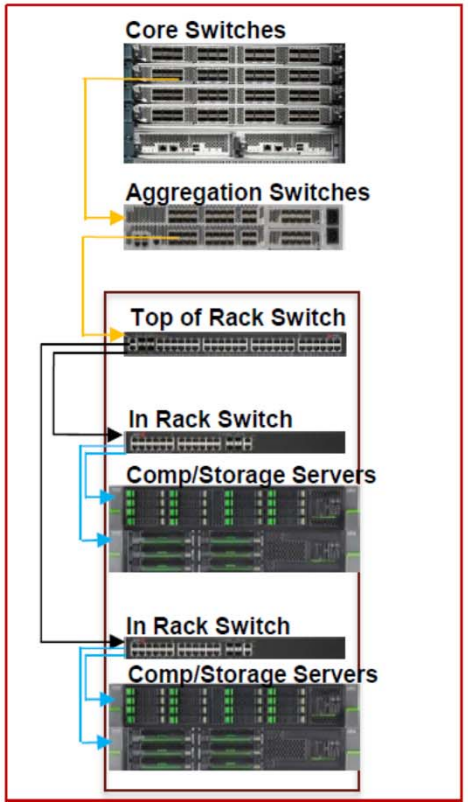
# SW defined DC

FUJITSU

- SDSP provides simple system integration



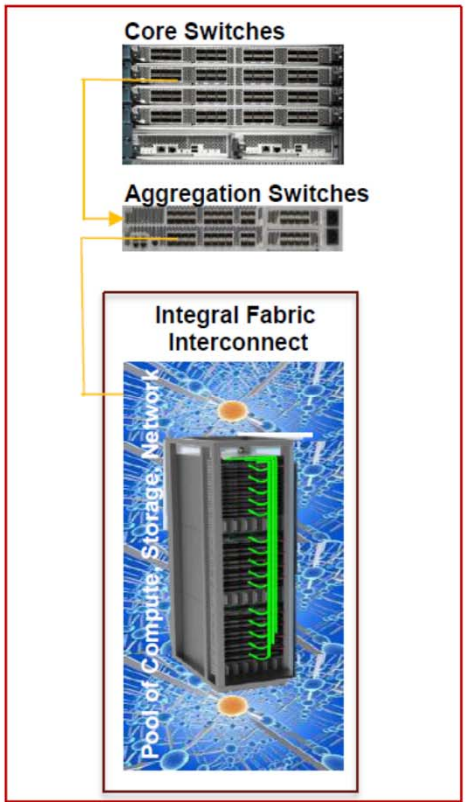
# SW defined DC: New architectures




**Today:**
Compute/Memory/IO in one chassis

**Tomorrow:**
Ressource-Pools of Disaggregated Servers in Racks

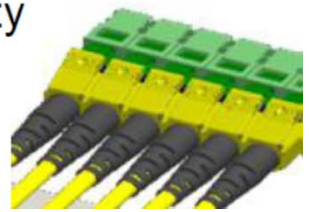
„Rack Scale“
Instead of
„Single Chassis Scale“



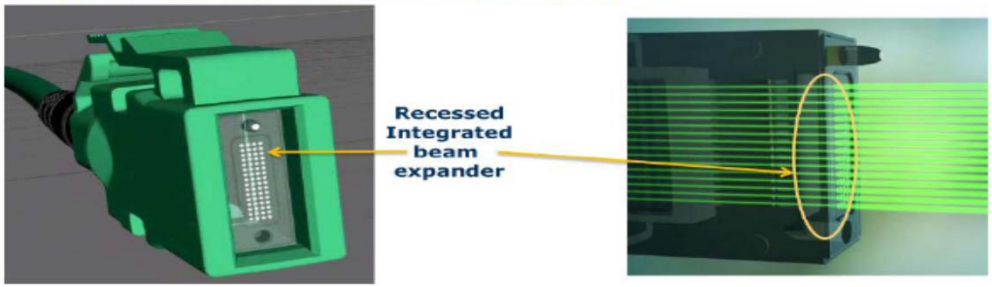
# Future Trends: Silicon Photonics (SiP)

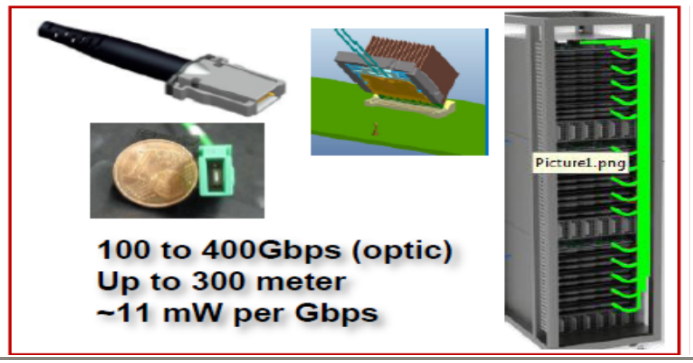
FUJITSU

- Features of optical transmission in / across Servers
  - Universal physical medium for all kinds of networking technologies (PCIe, Eth)
  - 25Gbs/fiber, 64 fiber/ cable, 1.6Tbs/cable (i.e. PCIe 3.0 x16 today: 15,7Gbs)
  - Cable: thin, flexible; Connectors: highly scalable/stackable, high density
  - Low power vs. copper/electrical transmission (energy efficient)
  - Long distance (up to 300m)

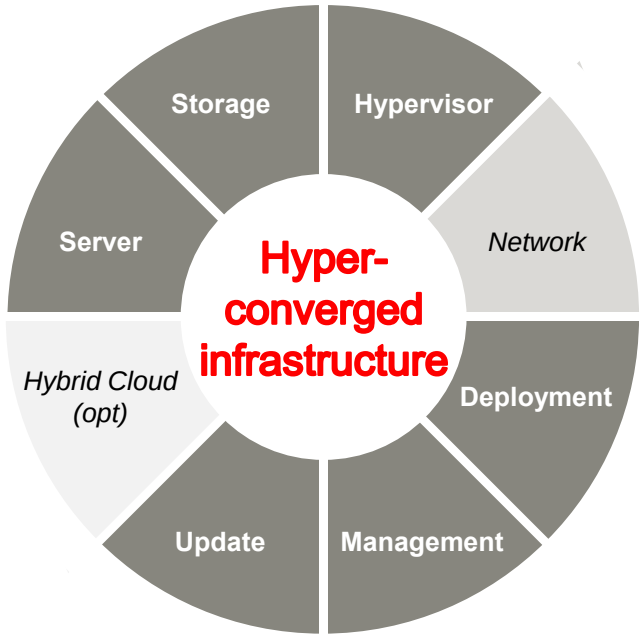


**Expanded Beam Interconnects**



# Welcome to the new edge of hyper-converged infrastructures

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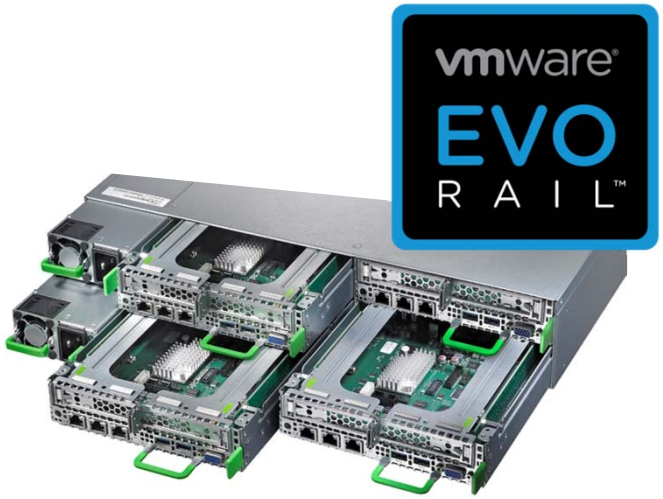
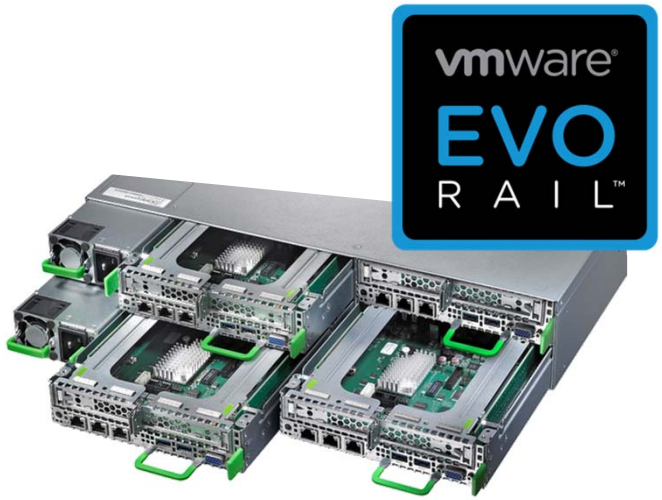
**FUJITSU Integrated System PRIMEFLEX for VMware EVO:RAIL**




Linear scalability and high performance

# Benefits of PRIMEFLEX for VMware EVO:RAIL




- Trusted foundation – hyper-converged IT infrastructure based on proven technology
- Infrastructure at the speed of business
- Easy to obtain & single point of contact
- Ready-to-work in minutes
- Simplified design with predictable sizing & scaling

# Oracle Reference Architectures (RA) - Exadata

FUJITSU

- The best platform for all Oracle Database workloads
  - Warehousing ➔ OLTP ➔ Consolidation ➔ In-Memory Database

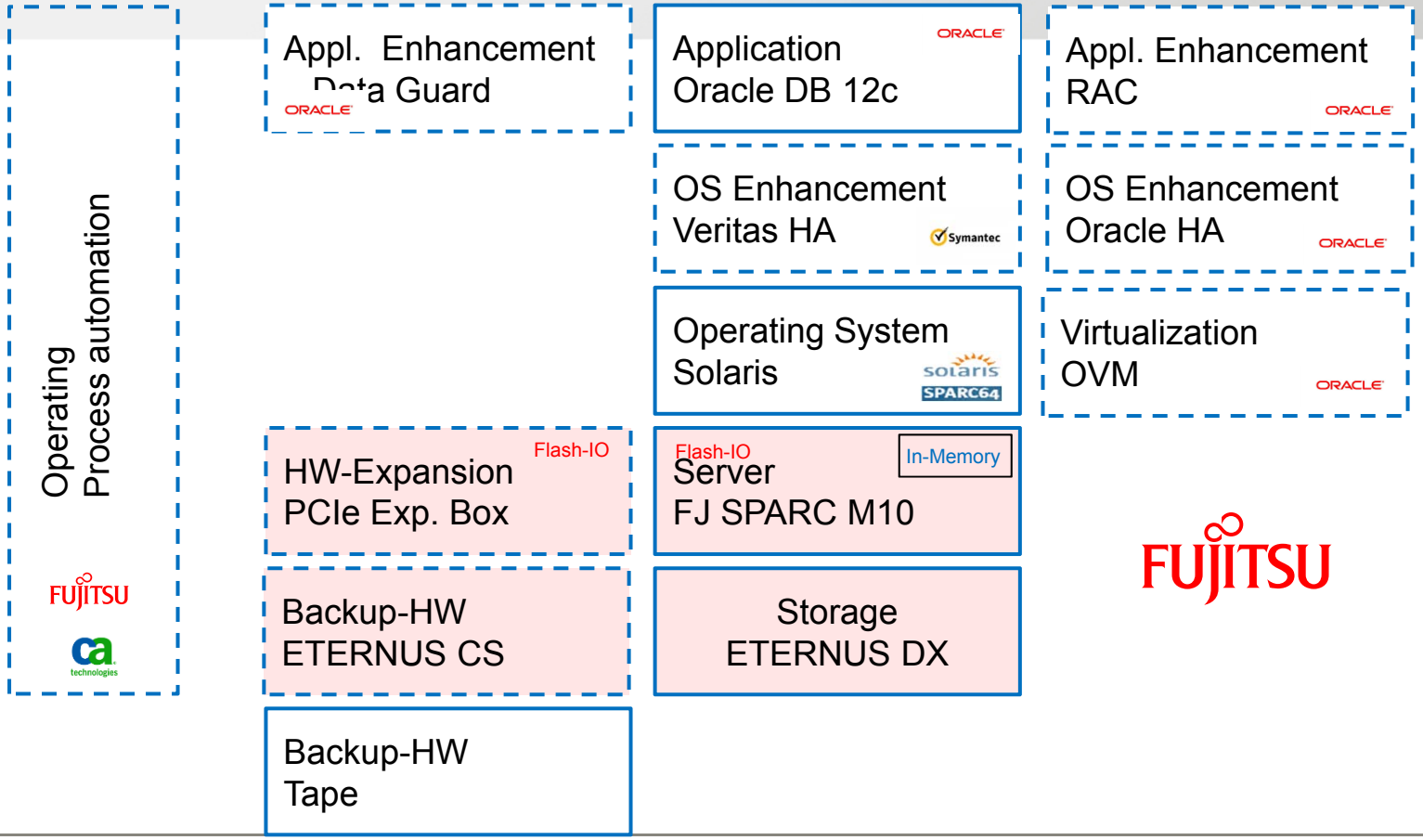
- Latest, most advanced hardware
  - Fully scale-out servers and intelligent storage with unified InfiniBand connectivity and PCI flash

- Unique software that maximizes the Oracle Database
  - Database optimized compute, storage, and networking software dramatically improves performance and cost

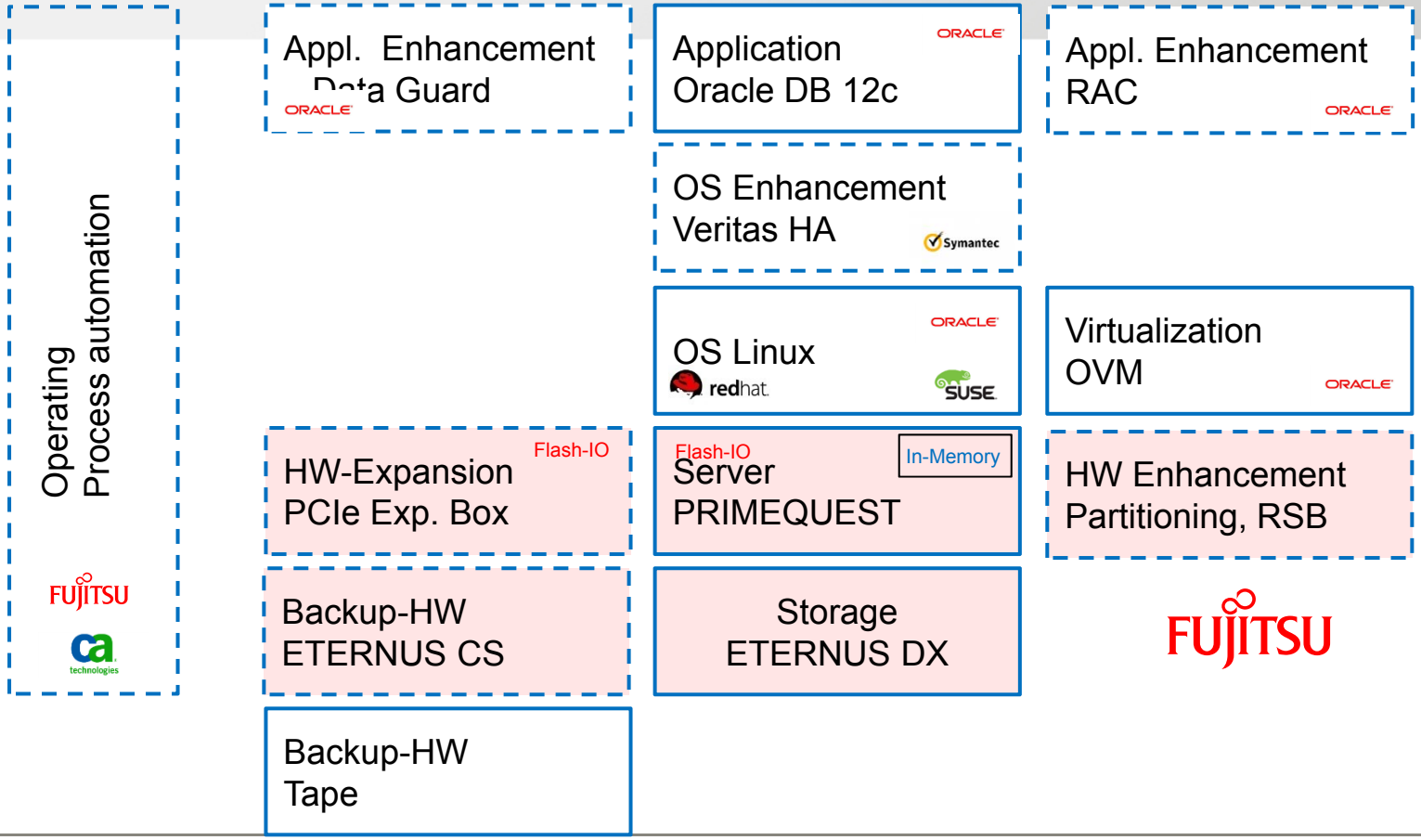
- **Standardized, optimized, hardened end-to-end**
  - By the core Oracle RDBMS development team

*Source: Oracle*

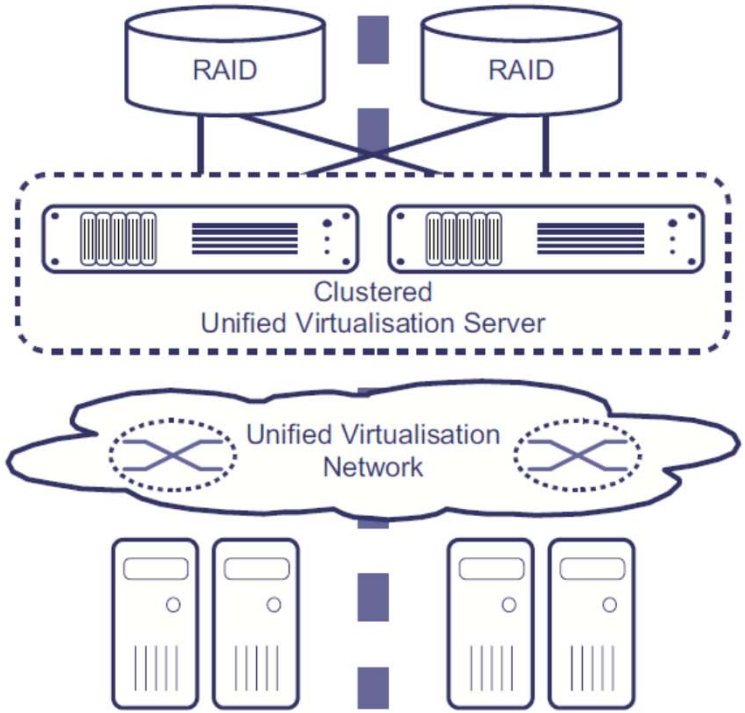
# Fujitsu CE Reference Architectures (RA) - M10



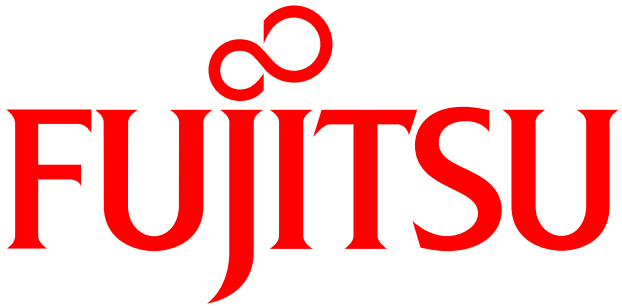
# Fujitsu CE Reference Architectures (RA) – PQ (PY)



# OSL Unified Virtualisation Environment




- Einfaches Spiegeln von VMs z. B. für Backup to Disk/Tape
- Restorefreies Instant Recovery für VMs
- Redundante Netzwerkanbindung für Gastsysteme über eine einzige VNIC, daraus resultierende einfachste Handhabung der gesamten Netzwerkkonfiguration einschl. Routing im Gastsystem.
- Einfache und schnelle Provisionierung neuer VMs über Cloning
- Zentrale Netzwerkkonfiguration
- Mögliche Verwendung administrationsfreier Netzkomponenten
- Netzseitige Trennung der VMs
- Zentrale, hochverfügbare Routeranbindung via UVS

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