SAP Innovations:
FlexFrame for SAP ready for SAP Cloud - SAP HANA for Big Data

Dubai, May 21st 2012 – Fujitsu IT Future Event

Rainer Hettinger - Global Fujitsu SAP Competence Center, Walldorf / Germany

Jason Bath – Sales Director Business Analytics, SAP MENA

Agenda

Fujitsu and SAP

FlexFrame for SAP – ready for the SAP Cloud
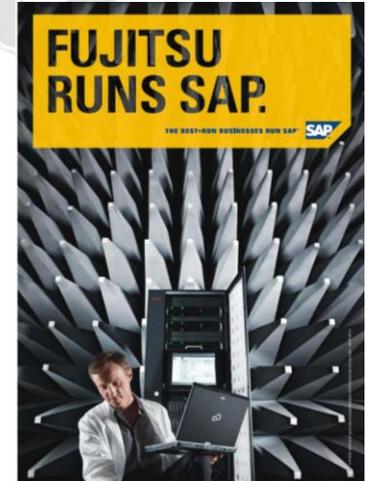
SAP HANA – Real-time analysis for Big Data

Customer examples

SAP Pinnacle Award 2012

Information and contacts

Fujitsu and SAP

- Trustful cooperation and strategic partnership for 40 years (1972 – 2012)

- Fujitsu is one of the rare companies with SAP Global Partner status for Technology, Service und Hosting

- Worldwide 8,000+ joint customer installations

- End-to-end SAP infrastructure, solution & service portfolio

- Fujitsu is driver of SAP innovations, e.g.
  - FlexFrame for SAP for SAP Application Virtualization - first solution for a private SAP Cloud
  - In-Memory technology for SAP BWA infrastructure and SAP HANA (=> Fujitsu is tier one partner)

- "SAP runs Fujitsu"
  - 4.500+ Server (Windows, Linux, Solaris); 5000+ PCs/Notebooks
  - Backup virtualization with ETERNUS CentricStor
  - +5 PB of NetApp storage, provided and implemented at SAP by Fujitsu
  - SAP Value Prototyping Center runs / offers services based on FlexFrame for SAP
  - +100 Fujitsu HANA systems @ SAP, e.g. for BW on HANA, development, projects etc.

- 3,000+ experienced SAP consultants world-wide

Fujitsu – Global IT Player with SAP Focus

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Global Fujitsu SAP Competence Center

Fujitsu SAP CC Sunnyvale

Fujitsu SAP CC Tokio

Global Fujitsu SAP CC Walldorf

FlexFrame for SAP	Application Assessment
BW Accelerator/BOE Infrastructure	SAP Application Management
SAP HANA, SAP HANA for B1	SAP Implementation Services
SAP All-in-One Fast Start	Lifecycle Services
SystemInspection Services	SAP Business Consulting
Integration Services	SAP NetWeaver Consulting
Dynamic Infrastructures	**Business & Application Services**

Remote Support
Remote Operations
SAP Infrastructure Hosting

Managed Infrastructure

- **170.000+ employees worldwide**
- **55 billion $ revenue**
- **2, 8 billion $ R & D**

- **Global SAP Technology Partner**
- **Global SAP Service, Cloud and Hosting Partner**
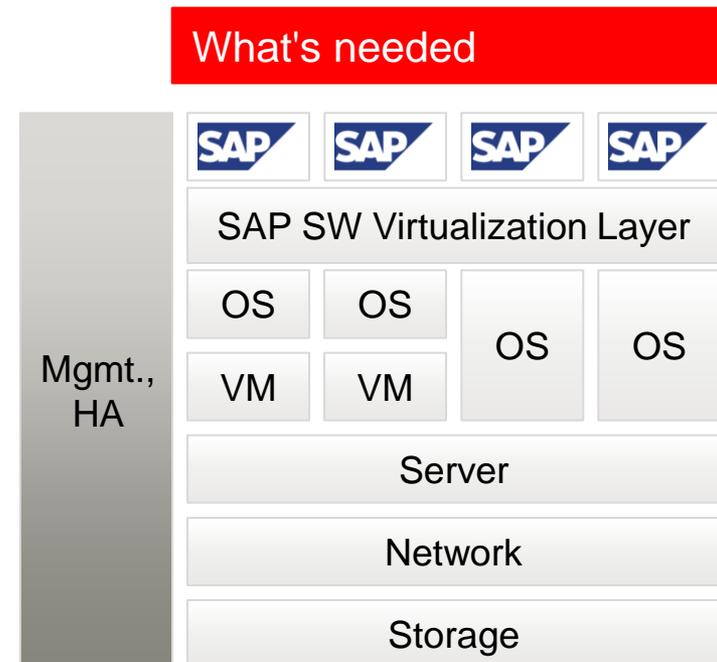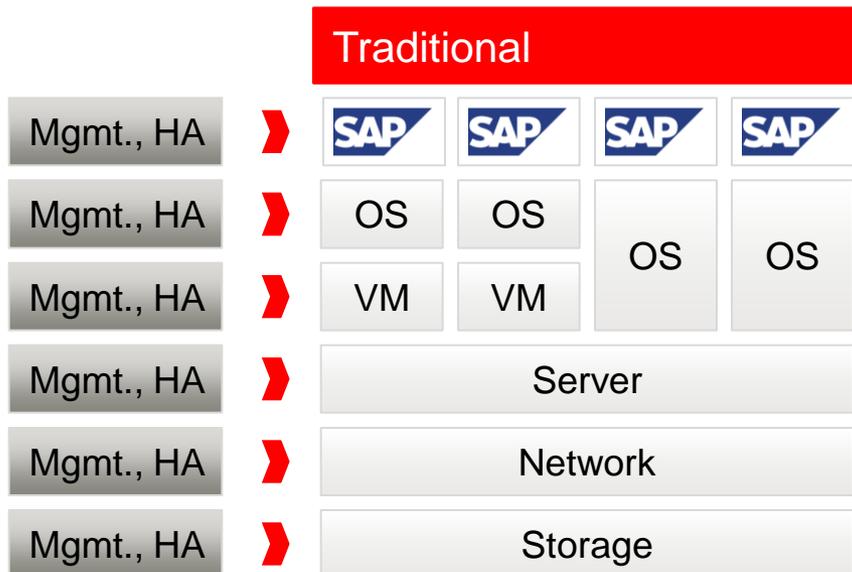
Our Offer in the Middle East

- **SAP SystemInspection and SAP Consulting Services**

- **SAP Infrastructure-consolidation based on x86 industry standard / PRIMERGY**

- **FlexFrame for SAP – the first SAP private Cloud solution**

- **Leading-edge BW Accelerator and SAP HANA Infrastructure**

Cost-efficient flexible SAP Infrastructure: FlexFrame for SAP for the private SAP Cloud
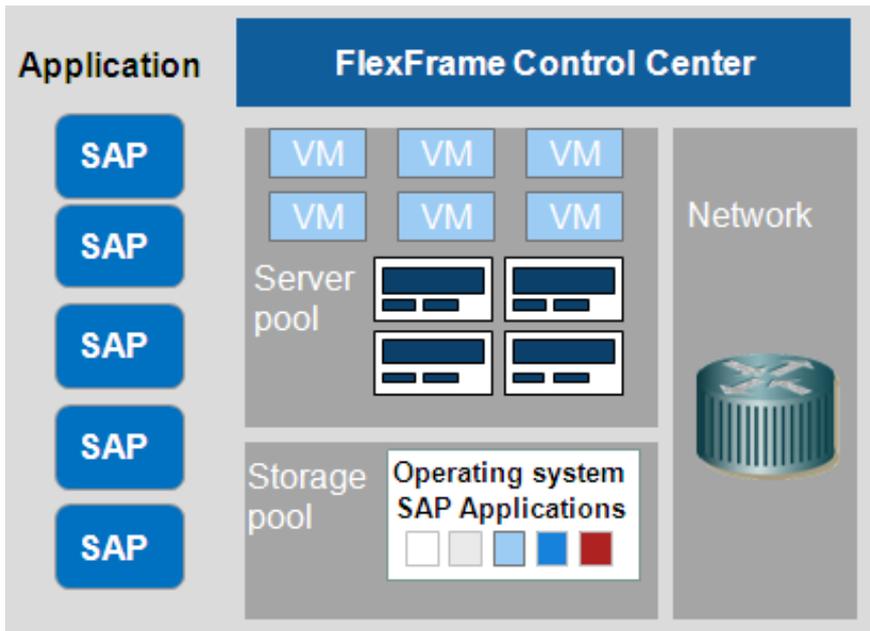
Optimizing the IT Infrastructure

- In traditional data centers the administration is organized horizontally for each layer in the stack
- This makes it difficult to organize a seamless and cost efficient operation with defined service levels for the end user
- What is needed for an efficient and reliable SAP operation is a vertically managed environment from the hardware to the applications layer

What's needed

Mgmt., HA	SAP	SAP	SAP	SAP
	SAP SW Virtualization Layer			
	OS	OS	OS	OS
	VM	VM		
	Server			
	Network			
	Storage			

Traditional

Mgmt., HA	❯	SAP	SAP	SAP	SAP
Mgmt., HA	❯	OS	OS	OS	OS
Mgmt., HA	❯	VM	VM		
Mgmt., HA	❯	Server			
Mgmt., HA	❯	Network			
Mgmt., HA	❯	Storage			

The Solution: FlexFrame for SAP

FUJITSU

FlexFrame Architecture

Application

FlexFrame Control Center

SAP

SAP

SAP

SAP

SAP

VM VM VM
VM VM VM

Server pool

Network

Storage pool

Operating system SAP Applications

Some key features

- End-to-end dynamic infrastructure solution for SAP
- Complete management of servers, virtual machines, storage, network and (!) SAP applications
- Shared storage and shared OS
- Integrated high availability

Key Benefits

- Typically 50% plus savings in investment and operational costs
- High quality of service through comprehensive management of the complete stack
- Scalability: start small – extend as you grow
- Cloud enabling infrastructure offering

▶ **FlexFrame for SAP addresses all customer requierments:
Do it "Cheaper", "Better", "Faster", "Easier"**

FlexFrame for SAP and Cloud Computing

FUJITSU

- FlexFrame for SAP achieved many design principles of
  a „Cloud" even long before" invented"
  => first and leading SAP private SAP Cloud solutions in the market

  - shared resources (server, storage, network, OS)

  - fast SAP provisioning and efficient usage

  - standard building blocks (x86 basis)

  - multi-tenant solution => several customers on one platform

  - usage related accounting

  - easy and seamless scalability

- CAPEX <u>and</u> OPEX optimization
  => very cost-efficient and flexible operation
  of the complete landscape

- SAP out of the Cloud is a delivery model
  => FlexFrame for SAP is the ideal
 technology basis for it

FlexFrame for SAP @ Rehau

Durch FlexFrame for SAP betreiben wir unsere Systeme entsprechend der geforderten SLAs hochperformant, dabei kostengünstig und weiterhin mit schmaler Mannschaft

**Christian Baier,
IT Manager SAP Basis,
REHAU AG & Co/Germany**

▶ World-wide leading in polimer-based innovations and systems for construction, automotive and industry 15,000 employees, 50 countries, 170 locations
www.rehau.com

▶ Operation of SAP services for globally 3,500+ user from the data center in Germany

▶ Consolidation and migration from IBM to FlexFrame for SAP and Linux with DB2 in 2007

▶ Dramatic cost-reduction from 25€ to 4 € per SAPS

Best-in-class operational excellence from 50 to 100+ SAP systems with same resources / operational team

▶ Additional to FlexFrame application virtualization further increase of efficiency of the server resources by integration also hardware virtualization

FlexFrame for SAP @ Lufthansa Systems

- Lufthansa Systems provides consulting and IT services => leading position in the global aviation industry.

- Link: http://www.lhsystems.com

- SAP Hosting provider approx. 15 airline and aerospace customers based on FlexFrame for SAP as "shared infrastructure" platform

- SAP landscape based on FlexFrame for SAP since 2006:

  - between 150 and 200 SAP systems

  - > 800.000 SAPS

- Main achievements:

  - Lufthansa Technik migrated from AIX to FlexFrame / Linux = one of the most mission critical systems for Lufthansa

  - Cost reduction +30%

  - Saving operational costs +50%
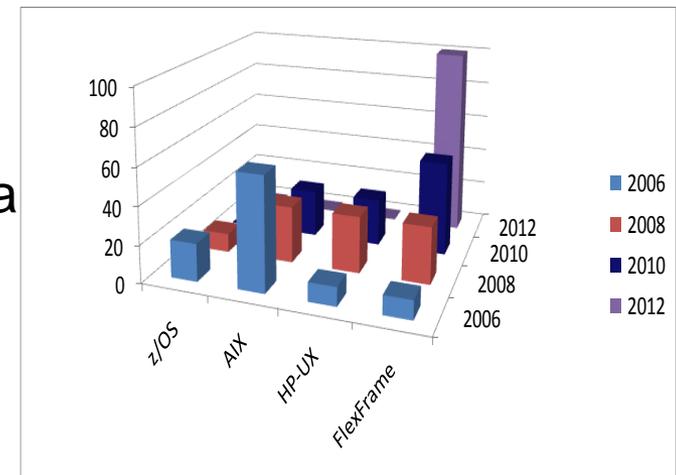
Innovations for Big Data and SAP HANA

Jason Bath
Sales Director
Business Analytics, Technology & Database
SAP MENA

Data Warehousing Solutions from SAP
Comprehensive data foundation enabling price/performance optimization

Complex and diverse challenges

- Real-time analytics
  - Immediate availability of data for analysis
  - Fast and easy creation of ad-hoc views
- Big data
  - Massive data volumes
  - Structured and unstructured data
- Efficiency
  - Reduce complexity and minimize TCO

Sophisticated information landscapes

- High-performance operational analytics
  - In-memory and disk storage
- Enterprise data warehousing
  - SAP and non-SAP source systems
  - Complex transformations

Customer choice via complementary and inter-operable solutions

- SAP HANA
- Sybase IQ
  - Sybase PowerDesigner
- SAP NetWeaver Business Warehouse
  - SAP NetWeaver BW Accelerator

Technology that allows the processing of
massive quantities of real time data
in the main memory of the server
to provide **immediate results** from
analyses and transactions

SAP Strategy for In-Memory Computing

GUIDING PRINCIPLES

TECHNOLOGY INNOVATION → BUSINESS VALUE
Real-Time Analytics, Process Innovation, Lower TCO
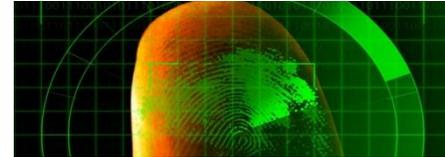
HEART OF FUTURE APPLICATIONS
Packaged Business Solutions for Industry and Line of Business

CUSTOMER CO-INNOVATION
Design with customers

INNOVATION WITHOUT DISRUPTION
New Capabilities For Current Landscape

EXPAND PARTNER ECOSYSTEM
Partner-built applications, Hardware partners

SAP's Currently Available In-Memory Solutions

SAP HANA is founded on a history of building in-memory products at SAP

- These experiences enabled us to orchestrate and combine the different technology innovations with established best practice applications

**Applications already enabled with in-memory computing**

- The SAP NetWeaver Business Warehouse Accelerator : High performance business intelligence, 1000+ active customers
- SAP BusinessObjects Explorer, accelerated version
- SAP Advanced Planning & Optimization
- SAP NetWeaver Enterprise Search
- SAP Customer Relationship Management: Customer segmentation for determining target groups for marketing campaigns, slicing through millions of records in fractions of a second
- SAP Business ByDesign analytics

In-Memory Computing – The Time is NOW
Orchestrating Technology Innovations

The elements of in-memory computing are not new.   However, dramatically improved hardware economics and technology innovations in software have now made it possible for SAP to deliver on its vision of the Real-Time Enterprise with in-memory business applications
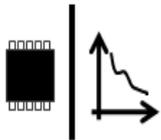
HW Technology Innovations
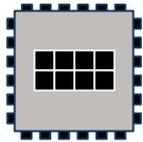
Multi-Core Architecture (8 x 8core CPU per blade)

Massive parallel scaling with many blades

One blade ~$50.000 = 1 Enterprise Class Server

64bit address space – 2TB in current servers
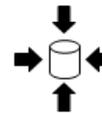
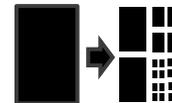100GB/s data throughput

Dramatic decline in price/performance

SAP SW Technology Innovations

Row and Column Store

Compression

Partitioning

No Aggregate Tables

Insert Only on Delta

Making Use of Columnar Data Store

conceptual view

A	10	€
B	35	$
C	2	€
D	40	€
E	12	$

mapping to memory

Columnar data store benefits

- Optimizes load of data to CPU
- High data compression
- Very fast data aggregation
- Makes use of real-life fill of tables (few fields filled, few updates)
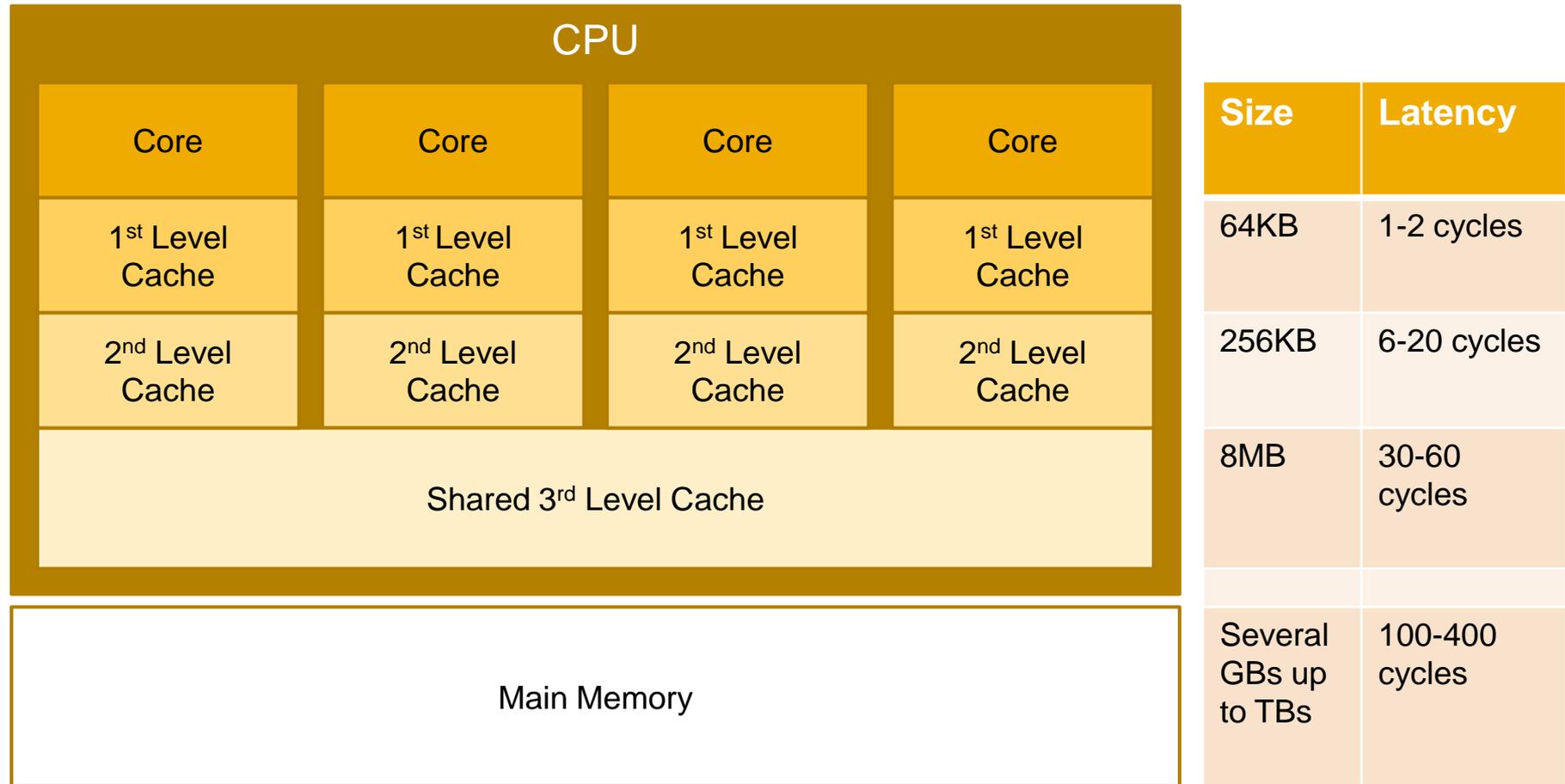
Can be joined with row-based data

organize by row

| A | 10 | € | B | 35 | $ | C | 2 | € | D | 40 | € | E | 12 | $ |

organize by column

| A | B | C | D | E | 10 | 35 | 2 | 40 | 12 | € | $ | € | € | $ |

memory address

Simplified Memory Hierarchy
Main memory vs. Cache (Based on Intel Nehalem)

	CPU				Size	Latency
Core	Core	Core	Core		64KB	1-2 cycles
1st Level Cache	1st Level Cache	1st Level Cache	1st Level Cache			
2nd Level Cache	2nd Level Cache	2nd Level Cache	2nd Level Cache		256KB	6-20 cycles
Shared 3rd Level Cache					8MB	30-60 cycles
Main Memory					Several GBs up to TBs	100-400 cycles

Flash – 5000 cycles; Disk seek – 10,000,000 cycles

SAP In-Memory Strategy
Product Strategy and Plan

"Renovation"
SAP HANA 1.0
GA since June 2011

"Innovation"
Mid-Term (Plan)

"Transformation"
Longer-Term (Plan)

| Capabilities	In-Memory Analytics	Next-gen Applications	One Store for Data and Analytics
	■ **SAP HANA real-time operational analytics**	■ **SAP NetWeaver BW fully running on SAP HANA**	■ SAP HANA only persistence layer for SAP Business Suite
	■ Complete SAP BusinessObjects Business Intelligence (BI) suite 4.0 runs on SAP HANA	■ SAP HANA platform for in-memory apps	■ **SAP Business Suite optimized for in-memory computing**
		■ **SAP Business Suite runs on SAP HANA**	
		■ Further optimization of SAP BusinessObjects BI suite for SAP HANA	
		■ Industry and LoB Analytic Apps	

Benefits			
	■ Flexible real time analysis of operations at non-aggregated level	■ Real-Time operational planning and simulation capabilities: link to execution	■ Reduced landscape complexity
		■ Primary persistence and optimized for SAP NetWeaver BW	■ Value chain transformation

SAP HANA™
Architecture
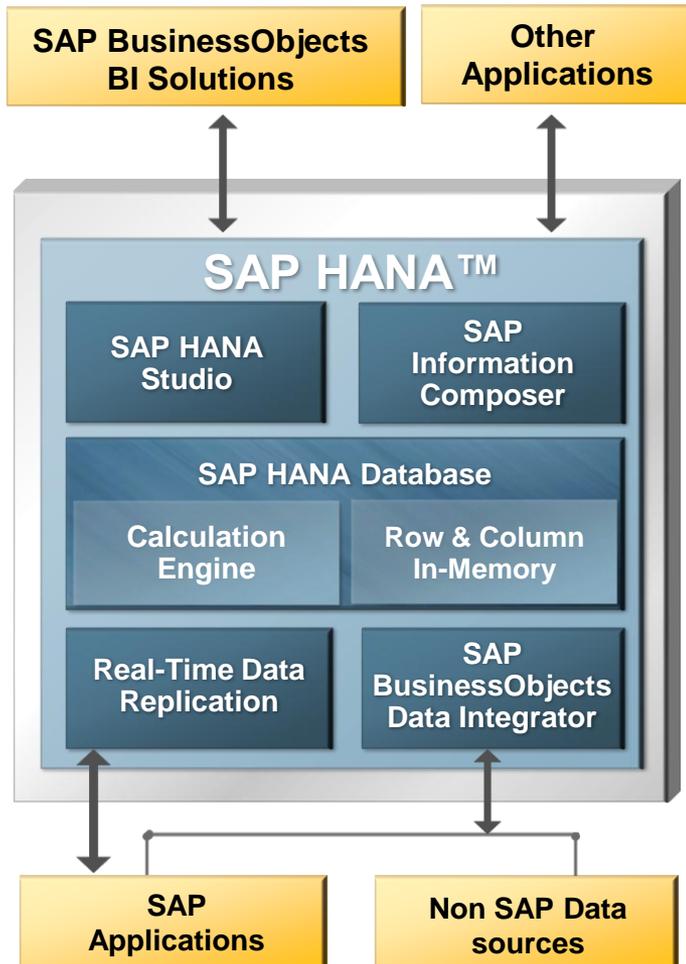
SAP HANA appliance

- In-Memory software + hardware (HP, IBM, Fujitsu, Cisco, Dell)

- Data Modeling and Data Management

- Real-time Data Replication via Sybase Replication Server

- SAP BusinessObjects Data Services for ETL capabilities from SAP Business Suite, SAP NetWeaver Business Warehouse (SAP NetWeaver BW), and 3rd Party Systems

Capabilities Enabled

- **Analyze information in real-time** at unprecedented speeds on large volumes of non-aggregated data

- **Create flexible analytic models** based on real-time and historic business data

- **Foundation for new category of applications** (e.g., planning, simulation) to significantly outperform current applications in category

- **Minimizes data duplication**

SAP HANA – Example Pilot Customers

Customer	Scenario	Data	Source	Benefits
Chemicals (DE)	profitability analysis	ERP 8TB	ERP 6.0 EhP4 on Oracle/AIX	query performance, load time/latency
Manufacturing (DE)	material disposition, production line utilization	ERP 1TB BW 2TB	ECC 6.0 on DB2/AIX BW 7.0 on DB2/AIX	reduce extraction impact on ERP, query performance
Apparel (US)	demand planning, order planning	ERP 2TB	R/3 4.6c on Oracle BW 7.0 Teradata	load time/latency (currently 24h with Teradata, target is 15 min)
CPG (US)	multiple ABAP reports (MB51 material document list, FAGLL03 GL line item display, KE27 periodic valuation), CPG warehouse scorecard, trade latest estimate, customer service dashboard	ERP 10-200 mio. records of relevant data	ERP 6.0 EhP4 on Oracle/Linux BW	query performance
Manufacturing (CH)	customer contact listing, open quotes/open orders	ERP 200 m. orders, 9 m. contacts	ERP 6.0 on Oracle/Linux	impact on ERP, query performance
SAP GFO (DE)	sales pipeline analysis	CRM 2,7TB	CRM	load time/latency, performance
CPG (US)	profitability analysis		ERP 6.0 on DB2 on AIX	query performance, load time/latency

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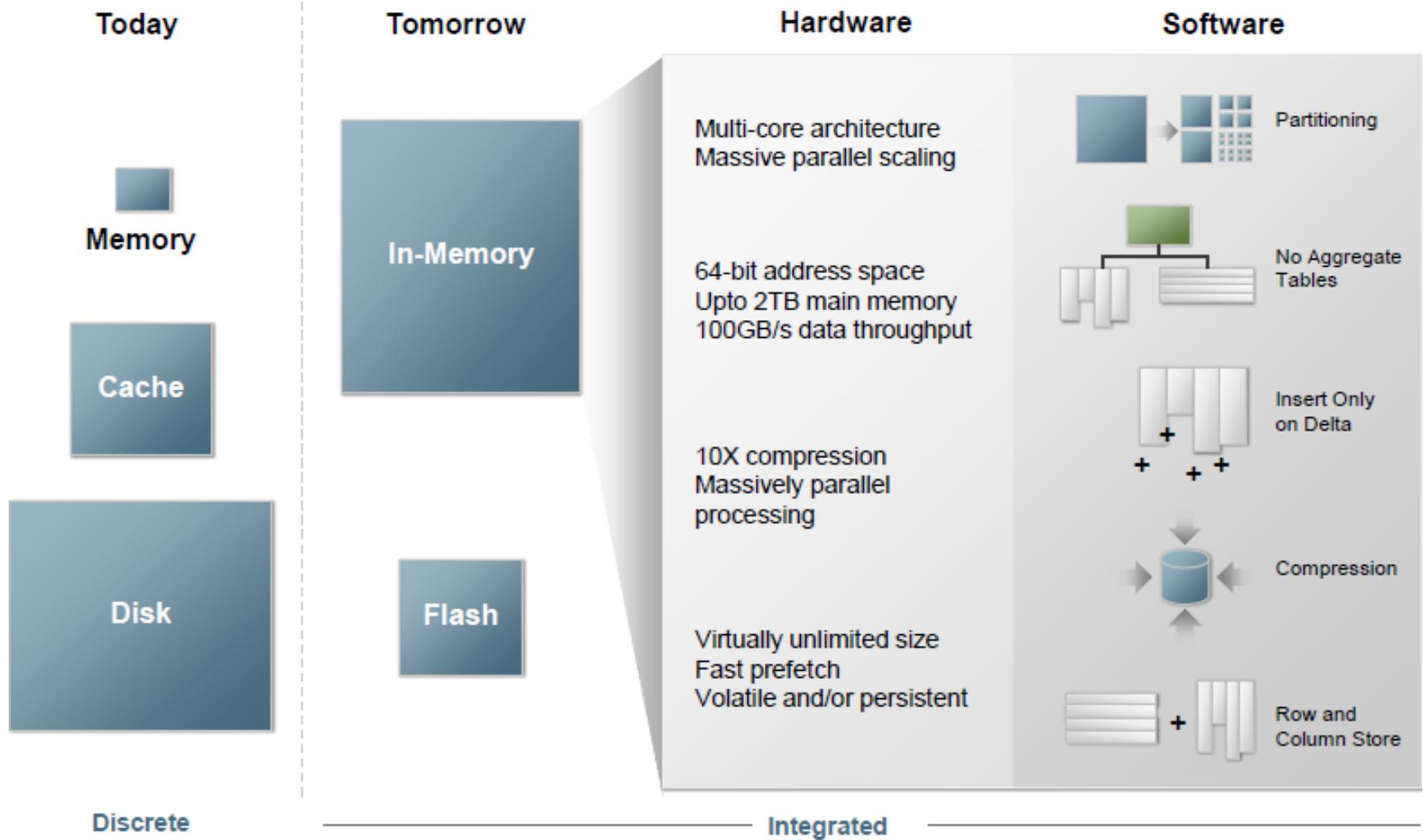# SAP delivers the next generation of applications powered by SAP HANA

Short-Term

- **SAP BusinessObjects Strategic Workforce Planning**
- **SAP Dynamic Cash Management**
- **SAP Smart Meter Analytics**
- **Profitability Analysis with SAP ERP**

Mid-Term

- **SAP Trade Promotion Management**
- **SAP Merchandise and Assortment Planning**
- **SAP BusinessObjects Planning and Consolidation**
- **Sales and Operations Planning**
- **Predictive Segmentation & Targeting**
- **Customer Revenue Performance Mgmt**
- **Demand Signal Repository**
- **And additional solutions in the pipeline**

In-Memory Computing - Basis for HANA

Today

Memory

Cache

Disk

Discrete

Tomorrow

In-Memory

Flash

Hardware

Multi-core architecture
Massive parallel scaling

64-bit address space
Upto 2TB main memory
100GB/s data throughput

10X compression
Massively parallel
processing

Virtually unlimited size
Fast prefetch
Volatile and/or persistent

Software

Partitioning

No Aggregate
Tables

Insert Only
on Delta

Compression

Row and
Column Store

Integrated

Fujitsu - SAP HANA Engagement

- Close cooperation with SAP and HPI (Hasso Plattner Institut) in HANA development for years

- Fujitsu is "Tier One" SAP HANA Partner

- First Global SAP HANA Demo Center

- First SAP Partner with certified HANA Multi-Node / Scale-Out platform up to 8 TB

- First customer running BW on HANA (Red Bull)

- First provider of B1 on HANA

- R&D, production and staging in Europe
  - Close to customer and his requirements
  - Accelerated implementation and project set-up

First & Fast end-to-end offering

PERFORMANC

Fujitsu SAP HANA Building Blocks

Our HANA Infrastructure is an End-to-End Solution:

- Infrastructure: optimized and SAP certified (PRIMERGY server + network + storage)

- Staging: pre-installed, pre-tested, customized and quality assured delivery

- Services: industrialized, end-to-end services for end-to-end data center implementation

- Infrastructure Solution Support => Fujitsu SolutionContract
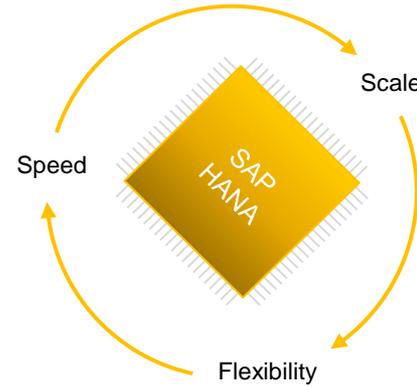
▶ Enables a jumpstart for your HANA project

HANA Infrastructure – Single Node Offering

FUJITSU

- **T-shirt size options based on PRIMERGY Servers RX600 S6**
  - 128, 256 or 512 GB RAM
  - 2 or 4 CPUs
- **Internal disks for persistence**
- **PCI Flash (Fusion-IO) for log writing**

T-Shirt Size	PRIMERGY Model	Memory Size in GB	CPU Intel Xeon E7-4870 10C/20T
M	RX600 S6	512	4
S	RX600 S6	256	2
XS	RX600 S6	128	2

Server

PCI Flash	Local Drives	Local Drives
	RAID	RAID
Log	**Data**	**OS**

Δ   **RAM**
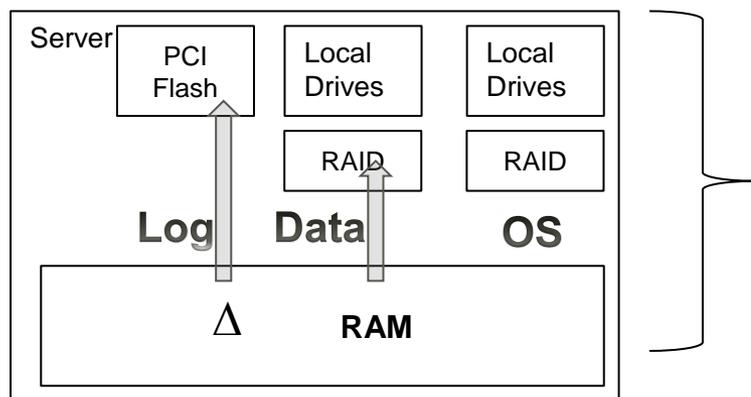
HANA Block

128 – 512 GB RAM
2 – 4 CPUs

IMS-Server PRIMERGY RX100 S7

▶ **Ideal for PoC/PoV, development, tests, quality assurance and training**

HANA Infrastructure – Multi Node Offering

Multi Node Offering for productive environments based on PRIMERGY RX600 and NetApp FAS 3240

- Smart Scale-Out (2-16 nodes) => 8 TB main memory

- No scalability limitations based on building block concept

- Efficient high availability for mission critical environment

- Easy integration of backup/restore functionality into customer landscape

- Open for disaster resilience (2 site concept)

Note:
Fujitsu was the first partner to receive SAP validation for a SAP HANA infra-structure that can scale up to 8 TB main memory

Announced at
Fujitsu Forum Nov. 2011

| NetApp_1 (FAS 3240) | NetApp_2 | NetApp_n |

NetApp

10 gbps Network (redundant Brocade VDX 10Gb Ethernet switches)

HANA Block 1	HANA Block 2	• • •	HANA Block n		HANA QA	HANA DEV
PY RX600 S6 512 GB RAM	**PY RX600 S6 512 GB RAM**				PY RX600 S6 512 GB RAM	PY RX600 S6 128 GB RAM

IMS-Server PRIMERGY RX100 S7

1 TB RAM   …Further Scalability
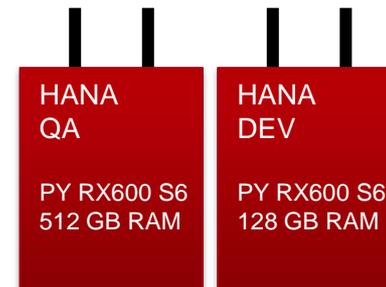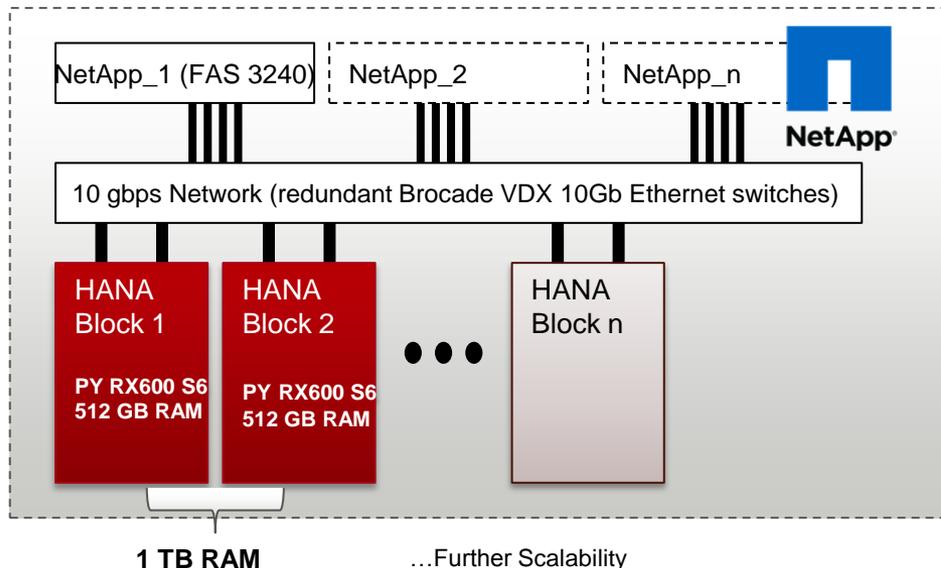
Fujitsu HANA Integration Service offering

FUJITSU

Central staging

1. Step	2. Step	3. Step	4. Step	5. Step	6. Step
Customer Briefing	Solution Concept	Solution Specifi-cation	Solution Implementa-tion	Solution Integration	Solution Support

Duration within one step

1/ 2 day	1 - 2 days	1 - 2 days	2 - 4 days	2 - 3 days	36-60 months

Duration between two steps

n weeks	1-2 weeks	2-3 weeks	1-n weeks
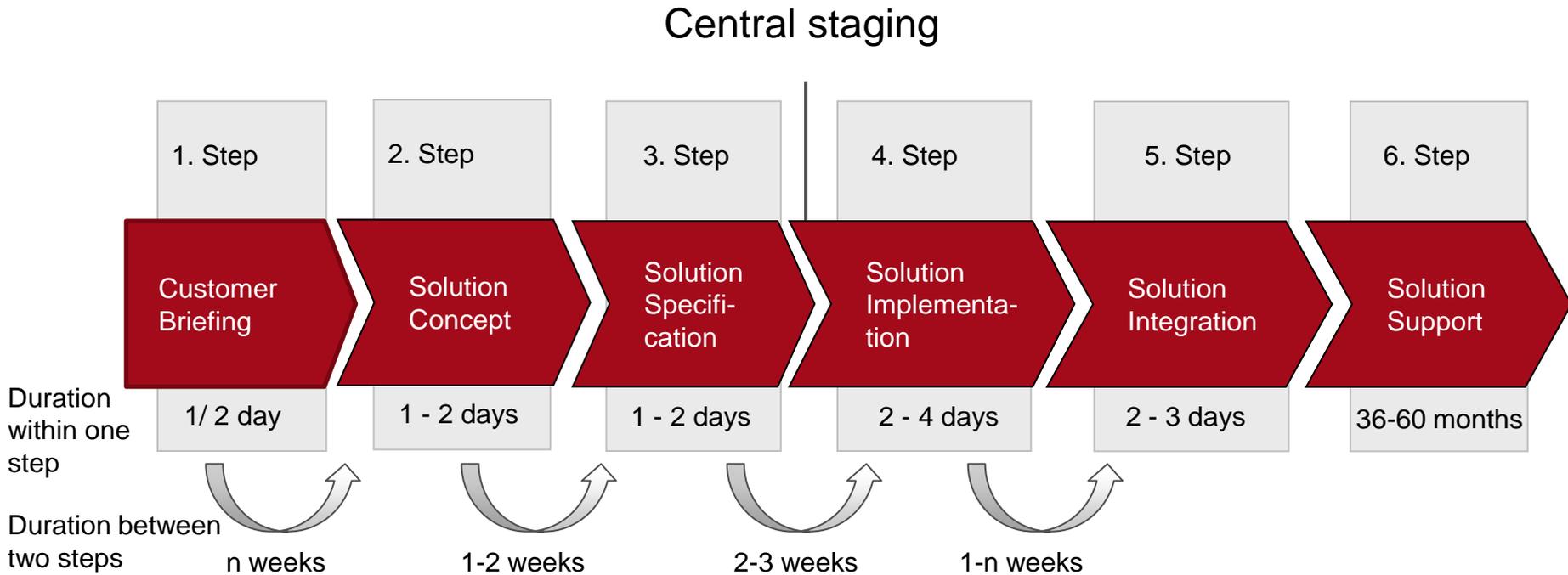
Integration Service Characteristics:

- End-to-End

- Efficient methodologies – best practice

- Fast delivery – ready to run

- High total solution quality

Fujitsu SAP HANA @ Mitsui

"To promote the growth of Mitsui's businesses, it is essential to have an IT platform that flexibly adapts to change and supports rapid decision making. The objectives of SAP HANA align with these needs. **We greatly value Fujitsu's early leadership in support of SAP HANA**, as well as Fujitsu's capabilities in providing global support for our IT platforms, and we intend to continue to work with Fujitsu in this area in the future. With the global cooperation from the team at Fujitsu, we have already begun implementing this technology, and look forward to continuing to work with Fujitsu to achieve our mutual objectives".

Mr. Toru Nakajima
Associate Officer and General Manager of
Information Technology Promotion Division
Mitsui & Co., Ltd.

SAP HANA Ramp Up Project

Customer Mitsui, Japan

About Mitsui
- Mitsu is a universal trading company
- Total annual sales of approximately 44 billion U.S. dollars
- More than 40,000 employees
- A global network with offices in 66 countries
- Approximately 500 subsidiaries and associated companies

Tasks

- Integration of customer data (japanese character set)
- Preparation of an interactive analyse environment
- Connecting the BusinessObjects BI Tools
  - BO Explorer
  - WebIntelligence
- Reporting (77 Mio. Data sets) <= 1 sec

MITSUI & CO., LTD.

Fujitsu SAP HANA @ Red Bull
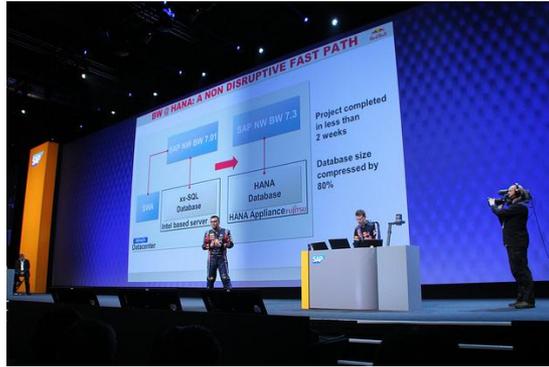
SAP HANA@ **Red Bull** - powered by **Fujitsu**

- **Major Project Achievement**
  - Worldwide first BW on HANA installation

- **Fujitsu SAP HANA Infrastructure**
  - End-to-end Infrastructure Solution (Server, Storage, OS, Network) / Single-Node installation
  - Standardized Fujitsu HANA integration services into the customer data center

- **Customer benefits**
  - SAP HANA system arrived almost "ready to run"
  - Reliable partners for this innovative project
  - Scalability for future growth into Multi-Node / Scale-out platform incl. HA, Backup/Restore and 2 site environment

- **What made SAP and Fujitsu so successful ?**
  - Formula one speed: 10 working days from initial request to implementation
  - Excellent collaboration between Red Bull, SAP, Fujitsu and Imtech Austria
  - Compelling offering and comprehensive HANA Infrastructure concept

Fujitsu SAP HANA @ SAP

FUJITSU

@ SAP Center of Excellence

- +30 Single Node and Multi Node environments RX600 / RX900
- Basis for value prototyping and ramp up projects

SAP BW powered by HANA

- SAP to use HANA as DB for their own BI
- 4 Multi Node landscapes with up to 10TB for the HANA DB
- First system is live since April 30th 2012 – see link

- Link: http://scn.sap.com/community/in-memory-business-data-management/blog/2012/05/04/get-high-availability-with-bw-on-hana-scale-out-solution

SAP Development Department

- Several Multi Node environments with up to 16 nodes
- Usage for development of new OLTP + OLAP scenarios

ERP@HANA CRM@HANA

- Evaluation project started on single node servers with 2TB
- Goal: Use of HANA for own productive OLTP systems

SAP run BW on HANA – Blog, May 4th 2012

FUJITSU

- Link: http://scn.sap.com/community/in-memory-business-data-management/blog/2012/05/04/get-high-availability-with-bw-on-hana-scale-out-solutio

Why SAP HANA with Fujitsu

Consistent and complete offering

- Innovative end-to-end solution
- Scalability
- Data center readiness
- Accelerated, jump-start delivery concept incl. pre-installation from factory and minimized implementation efforts at the customer
- Easy administration and cost-efficient operation

Fujitsu experience

- Fujitsu is global Tier-One Partner for SAP HANA infrastructure and services
- SAP AG and Hasso Plattner Institute (HPI) run and develop on Fujitsu HANA infrastructure
- Fujitsu / TDS HANA application expertise
- More than 10 years experience with integrated SAP solution based Linux- , x86- and NFS (FlexFrame for SAP, SAP BWA)

Fujitsu - Pinnacle Awards 2012 Winner

FUJITSU

„Technology Innovator of the Year"
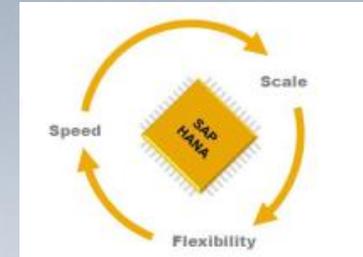
FUJITSU

You are a winner
SAP Pinnacle Awards 2012

The award recognizes Fujitsu's series of industry firsts in delivering value-added solutions for SAP HANA™ powerful in-memory technology, towards using big data in real-time decision-making. The Fujitsu HANA™ engagement includes:

- Early adoption, solid investment and close development collaboration with SAP

- End-to-end approach comprising infrastructure, implementation and operation services

- Advanced delivery via a dedicated, professional staging center in the Fujitsu factory in Augsburg

- Continuous developments of further solutions and services:
  - HANA cloud services
  - Ready-to-Run Appliance for SAP® Business One, analytics powered by SAP HANA™
  - SmartStart for SAP HANA™ (enriches SAP Rapid Deployment Solutions for HANA™)

- Offers for a riskless and quick start into HANA projects: Demo Center workshops, PoV offerings (Proof of Value), Rapid Prototyping (Try & Buy)

SAP Pinnacle Awards 2012 Winner

Further Information and Contacts

- ■ **Fujitsu SAP Infrastructure, Solutions and Services**
  - ▪ www.ts.fujitsu.com/sap
  - ▪ www.ts.fujitsu.com/flexframe
  - ▪ www.ts.fujitsu.com/hana

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- ■ Fujitsu Technology Solutions
  Global Fujitsu SAP Competence Center
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SAP HANA Live Demo
(will be presented on the booth)

In-Memory Date Demo – HANA Your World

- Link: http://hanayourworld.testdrivesap.com/yourworld/yourworldusa.jsp

Global Fujitsu SAP HANA Demo Center

- **Real-time Sales Analysis with SAP HANA**