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Having data is not enough!
Do you have real-time business insights?

Customer Insights
- Which customers & channels are more profitable?
- Which customer profiles are suitable for loyalty rewards?
- How dynamic is your customer segmentation strategy?

Product/Service Insights
- How are products/services doing vs. their competition?
- Track complaints from call centers & social data in real-time?
- Where else is this part used in my company?

Operations Insight
- How can you predict supply chain disruptions ahead?
- How do suppliers rank by cost, quality and timeliness?
- How is my “on-time/in full” delivery rate by customer?
Need a breakthrough technology
Today's technology requires tradeoff

- **Deep**: Complex & interactive questions on granular data
- **High Speed**: Fast response-time, interactivity
- **Broad**: Big data, many data types
- **Real-time**: Recent data, preferably real-time
- **Simple**: No data preparation, no pre-aggregates, no tuning

OR

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SAP HANA does it all!
Delivering across 5 dimensions of modern decision-processing

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SAP HANA
Architecture & Technology

- Architecture overview
- HANA Scenarios
- Technology implications
- Deployment options
What is In-Memory computing
Orchestrating technology innovations

Dramatically improved hardware economics and technology innovations in software have 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 CPU x 10 Cores per blade)
- Massive parallel scaling with many blades
- 64bit address space – 1TB in current servers
- Dramatic decline in price/performance

**SAP SW Technology Innovations**
- Row and Column Store
- Compression
- Partitioning
- No Aggregate Tables
- Insert Only on Delta
In-Memory computing
Use cache-conscious data-structures and algorithms

Programming against a new scarce resource…

CPU
Core
CPU Cache
Main Memory
Disk

Performance bottleneck today:
CPU waiting for data to be
loaded from memory into cache

Performance bottleneck in the past: Disk I/O

… requires cache-conscious data-structures and algorithms.
In-Memory computing
Challenges of In-memory Computing

• **Challenge 1: Parallelism!**
  Take advantage of tens, hundreds of cores

• **Challenge 2: Data locality!**
  – Yes, DRAM is 100,000 times faster than disk…
  – But DRAM access is still 4-60 times slower than on-chip caches
In-Memory computing
Delegation of data intense operations to the in-memory computing

Today's applications execute many data intense operations in the application layer.

Application Layer

Data Layer

High performance apps delegate data intense operations to the in-memory computing.

In-Memory Computing Imperative: Avoid movement of detailed data. Calculate first, then move results.
In-Memory computing
Delegation of data intense operations to the in-memory computing
SAP HANA
Software component view

- SQL
- SQL Script
- MDX
- Other

Text Analytics
- Application Function Libraries
  - Business Function Library
  - Predictive Analysis Library

Parallel Calculation engine

Relational Stores
- Row based
- Columnar

Object Graph Store

Managed Appliance

- Analytical and Special interfaces
- Application logic extensions
- Parallel data flow computing model
- Multiple in-memory stores
- Appliance Packaging
SAP HANA
Deployment view

Maintains landscape information
Holds data and executes all operations
Collects performance data about HANA
Text analysis pre-processor
Extended Application Services
Repository for HANA Studio updates
Enables remote start/stop
Manages SW updates for HANA

SAP HANA Appliance

- SAP HANA Database
  - Name Server
  - Index Server
  - Statistics Server
  - Preprocessor
  - XS Engine

- SAP HANA Studio Repository

- SAP Host Agent

- Software Update Manager

- Shared persistency for fail-over and recovery

Single host configuration
Multi-node cluster configuration

Node 2
Index Server
Preprocessor
SAP Host Agent

Node n
Index Server
Preprocessor
SAP Host Agent
How do I use SAP HANA?

Following data down the rabbit hole
Storing data in SAP HANA

At its heart, SAP HANA is a SQL DBMS…

> CREATE SCHEMA test
> CREATE TABLE test.myTable (a int)
> INSERT INTO mytable VALUES (1)
Storing data in SAP HANA

Applications writing directly into SAP HANA

Real-time replication using SAP LT Replication Service

Data loaded from files using IMPORT / INSERT

Message queue integration with Sybase CEP

Data loaded at certain events using Business Objects Data Services
SAP HANA uses a hybrid store to combine the benefits of row- and column-wise data handling.
SAP HANA has a safety net which ensures the durability of all data – the persistency layer.
Using data in SAP HANA

SAP HANA speaks SQL and MDX – use Excel as your frontend if you like.

> SELECT a
FROM test.myTable;
You define views, to make data easily accessible to everyone.
Views enable real-time computing by transforming data on the fly.
Using data in SAP HANA

Query

SELECT …
FROM ...
WHERE …

Views

Execution plan

Statement Processor

Calculation Engine

Data Stores

Persistency Layer

Save Point

Logs
Using data in SAP HANA

Operations can be all sorts of operations on data – not just basic SQL operations but also more complex logic.
In-Memory computing
Delegation of data intensive operations to the in-memory computing

**Traditional**

- Mass data
- Database
- Application

Typical assumption: DB is too slow, app server must optimize (caching)

**In-Memory Computing**

- Mass data

Assumption: do everything with the data where the data is
In-Memory computing
Security implications

**Traditional**

3 tier architecture:
- Users exist in application server only
- Authorization is handled by application server
- DB is accessed with technical user

Security is handled by application server

**In-Memory Computing**

2 tier architecture:
- Users log on directly to HANA
- Users exist in HANA
- Authorization is handled by HANA

Security is handled by database
SAP HANA
Architecture & Technology

- Architecture
- Technology implications
- Deployment
- HANA Development
- HANA Scenarios
SAP HANA: Ancestors

- BWA/TREX (column store)
- pTime (row store)
- MaxDB (persistence)
SAP HANA: Development locations

- Walldorf (column store, XS engine, applications, QA)
- Seoul (row store, catalog)
- Berlin (Backup/Recovery, Security, Admin tools, Make tools)
- Bulgaria, Israel, Palo Alto, …
SAP HANA
Architecture & Technology

- Architecture overview
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- Deployment options
- HANA Scenarios
SAP HANA
In-Memory Strategy

Capabilities
- SAP HANA real-time operational analytics
- Complete Business Intelligence (BI) Suite with BI 4 runs on SAP HANA

Primary persistence
- SAP BW powered by SAP HANA
- SAP HANA platform for in-memory apps
- Further optimization of BI 4 Suite for SAP HANA
- Industry and LOB Analytic Apps
- Development Platform for ISV and Start-ups

One store
- SAP Business Suite optimized for in-memory computing
- SAP HANA only persistence layer for SAP Business Suite
- Enhanced Sybase and SAP HANA integration
- SAP Success Factors on SAP HANA
- Custom Application platform

Benefits
- Flexible real time analysis of operations on detail level
- Primary persistence and optimized for SAP Business Warehouse (BW)
- Reduced landscape complexity
- Value chain transformation

See Appendix for abbreviations

This is the current state of planning and may be changed by SAP at any time.
Side-by-side scenarios
Operational data marts

Operational Data Marts

- Views calculate results for reports in real time on the actual operational data
- No transformation during load step (only selection of relevant data if applicable)
- Real-time replication of time critical data (SLT)

Core Value Proposition SAP HANA

- Real time reporting on operational data

DS: Data Services; DXC: Direct Extractor Connector; SLT: SAP Landscape Transformation
Side-by-side scenarios
SAP HANA based accelerators

HANA Accelerators

• Turnkey solution to accelerate
  • Standard ABAP reports
  • Business processes in ERP

• Flexible reporting using Business Objects BI Clients

• Examples: CO/PA, FIN, Material Ledger

Core Value Proposition SAP HANA

• Turnkey accelerator for ERP customers

DXC: Direct Extractor Connector; SLT: SAP Landscape Transformation; DBSL: Database Shared Library
Integration scenarios
SAP HANA as primary persistence

SAP Netweaver BW, powered by SAP HANA
SAP Business Suite, powered by SAP HANA *

- SAP HANA Database becomes primary persistence of ABAP application server
- All Objects and BW loading procedures are accelerated by in memory technology
- High modeling flexibility

Core Value Proposition SAP HANA
- Speed and simplification for SAP BW / Business Suite

*) planned; BW: Business Warehouse
Transformation scenarios
SAP HANA as platform

Next Generation HANA Apps
- Netweaver AS ABAP leveraging HANA
- iOS apps running against HANA
- Java applications running against HANA

Core Value Proposition SAP HANA
- Simplification: lean code – mean apps
Further Information

SAP Public Web

http://www.sap.com/hana
http://experiencesaphana.com/