EIM 119

High-Performance Analytic Appliance The Road to Analyzing Business as it Happens



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- 1. The Challenge
- 2. SAP In Memory Computing
- 3. HANA

Speed of Change



TED Spread & Components - 2008

The "TED Spread" is a measure of credit risk for inter-bank lending. It is the difference between: 1) the three-month U.S. treasury bill rate; and 2) the three-month LIBOR rate, which represents the rate at which banks typically lend to each other. A higher spread indicates banks perceive each other as riskier counterparties.



Percent

Information Explosion





Mobile Access





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If you happen to have a BIG problem, you tend to divide and conquer.

Scale – Hardware/Cores







SAF







1 Core	4 Cores	8 Cores
120nm process	65nm process	45nm process
1.8 GHz	1.6-3GHz	2.26GHz
32 bit	64 bit	64 bit

Scale – Hardware/CPUs



2007



2010



2 CPUs per Server Memory via Controller CPUs via Controller 4 CPUs per Server Memory Controller on Chip QPI

Scale - Hardware



1. Dimension – Mulicore CPUs

2. Dimension – Multi-CPU Boards

3. Dimension – Multiple Blades

8 Cores per CPU

4 CPUs per Blade

4 Blades

= 128 cores!

Scale – SW side distribute across cores





 Failover - Individual blades may fail without causing problems

Fast - Concept



Stick the data in memory ...



... to keep Cores happy

Fast – Memory Volume



32 bit Systems

64 bit Systems

2^32 = 4,294,967,296 4GB limit per CPU

2^64 = 18,446,744,073,709,551,616 Only constraint by physics (64/128 modules)

Capacity per module grows with new production processes (8GB – 16GB – 32GB) Price per module shrinks with new production processes (-30% with 32nm)

BLADE RAM RAM

1 blade with 64 modules can hold up to **1TB** (16GB)

Fast – Memory Latency



Memory bandwidth increasing at 50% per year but latency remains pretty much constant!

Software needs to be smart about data access, it cannot just assume that data in memory equals fast!



Fast – SW side optimization for memory

SAP

conceptual view

А	10	€
В	35	\$
С	2	€
D	40	€
E	12	\$

mapping to memory

Conventional databases store records in rows

Storing data in columns enables faster in-memory processing of operations such as aggregates

- Columnar layout supports sequential memory access
- A simple aggregate can be processed in one linear scan



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Fast – Further SW side optimization for speed



Row wise stores tables by row



Data records are available as complete tuples in one read.

Compression is limited.

Accessing only few attributes for each tuple is an expensive operation.

Column wise stores tables by column

Att1 Att2 Att3 Att4 Att5

Columns can be accessed in one read.

Columns contain only one data type, enabling very high compression (10x)

Accessing all attributes for one tuple (record) is an expensive operation.

Fast – Further SW side optimization for speed

Delegation of data intense operations to the in-memory computing



In-Memory Computing Imperative - Avoid movement of detailed data – calculate first, then move results

Technology Proof



SAP Business Objects Explorer Accelerated for intuitive enterprise data exploration

- Intuitive user experience for casual business users
- Search and explore large volumes of enterprise data to discover relationships and uncover root cause
- Business users gain immediate 'insight at the speed of thought' without needing assistance from a business analyst or IT

1000+ productive installations



Technology Proof





SAP High Volume Customer Segmentation For Marketing Users

- Immediately select specific customer segment based on unique attributes from entire SAP CRM customer database
- Drag and drop attribute selection for real time segmenting
- Associate segmented customers with campaign in SAP CRM



SAP NetWeaver Enterprise Search For Analysts

- Search for data across different sources simultaneously
 - structured data (e.g. ERP applications & business intelligence data)
 - unstructured data (e.g. PDFs, Microsoft Office formats, HTML)
- Single entry point for your work

Pivotal moment







- 1. The Challenge
- 2. SAP In Memory Computing
- 3. HANA

SAP In-Memory Computing





In-Memory Computing 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

More than an In-Memory DB



Only SAP...

- ...combines transactional and analytical applications enabled by in-memory computing
- ...can conduct analytics, performance management, operations in a single system – real time link between insight, foresight and action
- ...can enhance existing investments with inmemory capabilities: SAP customers implement in-memory computing without disruption – no change to IT roadmaps.
- ...collaborates with industry leading partners to deliver in-memory computing solutions



SAP In-Memory Computing Engine









64bit, up to 2TB (today) 100GB/s data throughput Low price forperformance

HW Technology Innovations

SAP SW Technology Innovations







- 1. The Challenge
- 2. SAP In Memory Computing
- 3. HANA

SAP High Performance Analytic Appliance (SAP HANA) – current ideas

SAP HANA is planned to be ...

- ... the first product which incorporates the SAP In-Memory Computing Engine
- ... shipped as an appliance with our hardware partners



Potential use case with operational reporting



Use case





SAP GFO was looking for a solution to implement sales forecast reports.

The sales forecast report should reflect sales activities in real time, in order to provide immediate insight into business for management.

Management should be able to navigate data withour constraints to get a proper understanding for all opportunities and sales activities.

Challenge

No changes to the CRM system.

No performance impact on the database running underneath the CRM system.

No ABAP programming.

Replicate CRM data into SAP HANA.

Create analytic views for consumption in BI tools.

Consume analytic views with SBOP Explorer on iPads.

Conditions

Solution

Potential use case for agile data marts



Use case



Customer has got cost data for produced goods in SAP BW.

Business departments would like to simulate the imact of changes in BOM before entering these changes in the business system. No changes to BW models in production.

Results needed in 3 business days.

Cost data is not allowed to leave managed systems

Load the cost model from BW into HANA.

Read BOM data into Excel, change it and write it into HANA.

Create an analytic view combining the cost data with the new BOM data.

Consume analytic view wiht SBOP Advanced Analysis

Challenge

Conditions

Solution

Some early numbers





Volume tests ran with 460bn records. Scan speed – 1million records / ms / core Aggregation speed – 10m records / sec / core

200x price performance improvement

SAP In-Memory Computing



To Empower Your Organization...





...perform better

...plan smarter

...run faster

- Next wave of technology innovation
- Combined in-memory analytics & transactional applications
- Our strategy is to provide the continuous real-time link between insight, foresight and action
- SAP HANA is planned to go into ramp-up by end-of-year



Feedback

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