This presentation outlines our general product direction and should not be relied on in making a purchase decision. This presentation is not subject to your license agreement or any other agreement with SAP.

SAP has no obligation to pursue any course of business outlined in this presentation or to develop or release any functionality mentioned in this presentation. This presentation and SAP's strategy and possible future developments are subject to change and may be changed by SAP at any time for any reason without notice.

This document is provided without a warranty of any kind, either express or implied, including but not limited to, the implied warranties of merchantability, fitness for a particular purpose, or non-infringement. SAP assumes no responsibility for errors or omissions in this document, except if such damages were caused by SAP intentionally or grossly negligent.
Agenda

1. Technology
2. Products
Key Technology Trends

1. Multicore CPUs
2. In-Memory Processing
3. Columnar Storage
Multicore CPUs

Single core
- Symmetric multiprocessing (SMP)
- Instruction level parallelism (ILP)
- Increase frequency = increase performance
- Increase frequency = increase power consumption

Multi core
- Thread level parallelism (TLP)
- Increase cores
- Massive parallel processing (MMP)
- Imperative: applications must be coded for TLP
**Memory**

Limited availability of memory

- 32 bit address space (maxing out a 4GB per CPU)
- Expensive memory modules
- Production processes limit denisty of chips (256MB)
- Available memory is defined by physical constraints

Plenty of memory

- 64 bit address space (virtually unlimited memory)
- Sharp drop in memory price due to prod. processes
- High denisty memory chips (4GB)
BW Accelerator Architecture: Horizontal Partitioning

1. Multicore CPUs
2. In-Memory Processing

Scenario: Adding a new node → BW Accelerator Monitor enables easy re-distribution
A BWA Index
- Contains lists of
  - Index names
  - Join conditions
  - Join paths
  - View attributes
  - Key figures
- Stores metadata
- Enables engine to execute queries
- Corresponds to a BW InfoCube
  - But highly compressed to minimize main memory footprint
**BW Accelerator Architecture: Vertical Decomposition**

**Classical DB**
stores tables by row

- Tuple1
- Tuple2

To find all instances of an attribute value:
- Go to the first row
- Check the attribute value
- Go to the next row
- Check the attribute value
- Repeat for each row in the table

**BW Accelerator**
stores tables by column

- Att1
- Att2
- Att3
- Att4
- Att5

To find all instances of an attribute value:
- Go to the attribute column
- Read its row values
Columnar Storage: Advantages

Columnar Storage Supports Parallelization

- On column level (vertical)
- For ranges of columns (horizontal)

Columnar Storage

- Allows Compression such as run-length coding
- High speed of aggregation and scanning: several MB/sec
  - Allows eliminating materialized aggregates in many cases
  - Makes additional indexes unnecessary in many cases
BWA Data Compression

1) Prefix Coding
   - Uncompressed: 4 4 4 4 4 4 3 3 3 1 1 0
   - Prefix Coded: 8 4 3 3 3 1 1 0
     - Value: 8
     - Number of occurrences: 4 4 4 4 3 3 3 3 3 3

2) Run Length Coding
   - Uncompressed: 5 5 4 4 4 4 3 3 3 2 2 2
   - Run length encoded:
     - Value: 4 4 3 2
     - Start position: 0 3 9 12

3) Cluster Coding
   - Uncompressed: 4 4 4 4 4 4 4 4 3 3 3 3 3 3 3 3 3 3 3 3 3 1 1 0 0 0 0 0 0
   - Cluster coded: 4 4 4 3 3 3 3 1 1 0 0
   - Bit vector: 1 1 0 1 0 1
     - Bit i=1 if cluster i was replaced by single value

4) Sparse Coding
   - Uncompressed: 4 4 3 3 1 0 0 0 4 4 4 4 4 0
   - Sparse Coded: 4 3 3 1 0 0 0
   - Bit vector: 1 1 0 0 0 0 0 0 0 0
     - Removes value v which occurs most often. Bit vector indicates positions of v in the original sequence.

5) Indirect Coding
   - Uncompressed: block wise dictionary coding of Value-IDs
     - Block size = 8
     - Compressed:
       - Block 1:
         - Dictionary for Block 1:
           - 0: 2 1 5 2
           - 1: 5 6
           - 2: 12 6
           - 3: 5 6
         - Block 2 is not compressed
       - Block 2:
         - Dictionary for Block 2:
           - 0: 13
           - 1: 28
           - 2: 911
       - Block 3:
         - Dictionary for Block 3:
           - 0: 13
           - 1: 28
           - 2: 911
SAP NetWeaver BW Accelerator Value Proposition

Cost of Operation
- Save time to build and maintain aggregates
- Save disk space
- Take load off BW hardware
- Consolidate BW landscape

Performance / Scalability
- Ready for high data volumes (retail, utilities, banking …)
- Challenging response time SLA
- Ad hoc reporting with stable response times
- Scalable blade server platform

Time for Development
- Less focus on performance aspects
- Faster development of new models and queries

Data Latency
- Much shorter times for roll-ups and change runs
- Opportunity for more frequent data alignments
- Compression not always needed

Extend Reach of BI
- Empower additional user groups with user-friendly BI tools

New Business Scenarios
- Get more detailed insight into your business

IT

Business
Agenda

1. Technology
2. Products
Proven Technology – large installed base

- Outstanding query performance for SAP NetWeaver BW queries
- TCO reduction for SAP NetWeaver BW - no aggregations, less disk space, reduced systems workload
- Data latency reduction – shortened rollup and change runs times, opportunity for more frequent data alignments
- Broader acceptance – broader adoption of BW environments by the business community
SAP NetWeaver BW Accelerator 7.20

New capabilities

Taking the BW Accelerator to the next level of performance

- Enhanced built-in analytical capabilities*
  - F4 Value help
  - Hierarchy support
  - MultiProvider calculation handling
  - Exception aggregation (min, max, avg, count distinct, topk)
  - Analytic indexes

- Advanced features*
  - BWA based InfoCube
  - Use DataStore Objects to create indexes
  - Leverage SAP Business Suite data directly

* Features require update/future release of SAP NetWeaver to be leveraged
Flexible modeling with APD & BWA in SAP NetWeaver BW

- Any output of an APD process can be materialized as a analytic index

- Analytic Indexes are exposed as an Info-Provider for Queries definitions on top of it

- Composite Provider: Simple modeling of compositions of analytic indexes (unions, joins)

- Join/Union operation is processed on the fly

- CompositeProviders are exposed as standard SAP NetWeaver BW InfoProvider for BI client consumption
SAP BusinessObjects Explorer
accelerated version for SAP NetWeaver BW

Search and discover –
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

*This presentation and SAP's strategy and possible future developments are subject to change and may be changed by SAP at any time for any reason without notice. This document is provided without a warranty of any kind, either express or implied, including but not limited to, the implied warranties of merchantability, fitness for a particular purpose, or non-infringement.*

© SAP AG 2009. All rights reserved. / Page 18
Extended support for BW and any data – using the Search and Explore paradigm

- Extended support for SAP NetWeaver BW data models including hierarchies
- Load any kind of data into SAP NetWeaver Accelerator using SAP Business Objects Data Services
- New calculation engine providing support for calculated key figures and restricted key figures
- Updated user interface
In-memory imperative – bring data and operations together at the CPU

- Move data intense operations to the data residing in memory
  - Avoid moving data around (leverage 64bit memory address space)
  - Leverage parallel processing (indexes across cores, CPUs, and blades)
  - Extend calculation capabilities (leverage CPU compute power)
Thank you!