Agenda

1. What is a Data Warehouse?

2. Decisions to make: What approach is right for you?

3. SAP HANA Data Warehouse – Strategy & Vision

4. Enterprise Data Warehousing with SAP BW/4HANA

5. Summary
What is a **Data Warehouse**?
Different analytical needs and the consequences in IT architectures

Typical Data Warehouse / EDW Architectures

- **Information needs**
  - Real Time
  - Visibility
  - Consolidated view
  - Ad-Hoc | Self-Service BI
  - Archive Analysis
  - Predictive Analysis
  - Sentiment Analysis

- **Architectures**
  - Real Time Data Mart
  - Operational Data Mart
  - Data Warehouse / EDW
  - Agile Data Marts
  - Near-line Data Marts (Audit / SOX)
  - Predictive Data Marts
  - Big Data Data Marts

- **Access method to source data**
  - Streams / Feeds
  - Direct / Database Replication
  - ETL / ELT / Replication
  - Federated Queries / ETL
  - ETL / ELT / Replication Federation of Data & Query

- **Source of information**
  - Event | Machine
  - Transactional | System of Record
  - Transactional | Analytical | Systems of Record & Engagement
  - Archived Information
  - All sources
  - Social

- **High variety of information sources**
- **Extensive information needs**

Complex architecture landscapes including different kind of Data Marts, Data Warehouses and EDWs
Unlock The Power of Your Data Across The Enterprise

Enterprise Data Warehousing – the single point of truth

Enterprise Data Warehousing – why?
• Consolidate data across the enterprise to get a consistent and agreed view
• Combine SAP and other sources
• Standardized data models on corporate information
• Support decision making on all organizational levels

EDWs require a Database plus an EDW application

EDW with SAP BW/4HANA – a flexible and scalable EDW application
• Highly integrated tools for modeling, monitoring and managing the EDW
• Open for SAP and non-SAP systems
• Agile data modeling using BW/4HANA workspaces
• Runs optimized on top of HANA
• Easy consumption of HANA Data Mart scenarios via virtualized data access

EDW with custom built application
• High development and maintenance efforts
• Variety of tools lacking integration
Decisions to make:
What approach is right for you?
Decisions to make
What approach is right for you?

There are different approaches how to implement an analytical data foundation.

**Pre-Built (Enterprise) Data Warehouse**
- Integrated (E) DW application
- Model-driven pre-packaged (E) Data Warehouse management and orchestration application as a central component
- Out of the box tool set for modeling, managing, operating, and governing an EDW including various data marts

**Custom Built (E) Data Warehouse**
- Loosely coupled orchestration tools
- Higher efforts for development and maintenance
- High flexibility to build custom data models and processes with little enforced governance
- Open environment to easily import industry models

**Custom built data marts without (E) DW integration layer**
- Maximum flexibility for custom data marts specifically built for isolated use cases
- Easy to build and fast realization time
- Low level of integration among different data marts
How does SAP approach Data Warehousing
Two ways to run, or get the best of both

**Application driven approach, SAP BW/4 HANA as premium DW application with integrated services**

- SAP BW/4HANA is an application offering. All data warehousing services via one integrated repository
- Optional integration of additional tools for modelling, monitoring and managing the data warehouse

**SQL driven approach, SAP HANA with loosely coupled tools and platform services, logically combined**

- SQL approaches require several loosely coupled tools, usually having separate repositories
- “Best of breed” approach to build your own model
Enterprise Data Warehousing with SAP BW/4HANA
Enterprise Data Warehousing with SAP BW/4HANA

**BUSINESS CONTENT**
- Pre-defined integrated Data Models and Applications
- Enables fast implementation on proven business applications and industries knowledge
- Rich extractor content for SAP data out-of-the-box

**DATA MODELING**
- Fully integrated modeling environment
- Store once & virtualize wherever possible
- Mix BW and SQL based data models
- Predefined modeling objects for transaction & master data (database abstraction)
- Integrated engines for OLAP & planning functions

**SECURITY & TRACEABILITY**
- Fine-grained security model with mass handling capabilities
- Auditing & Access statistics including identity handling
- Possibility to trace on application logic, database access and effect of authorizations

**RELIABLE DATA ACQUISITION**
- Batch, Real-time & Remote Data Acquisition
- Delta capabilities & Sophisticated Error Handling
- Standard (mapping, formula, lookup, conversion) & custom transformations
- Open adapter framework to connect any system (databases, OpenSource, Social Media, IOT, etc.)

**SCHEDULING & MONITORING**
- Rich scheduling & monitoring capabilities on all levels
- Process Chains enable workload management for data load processes across systems
- Management of data consistency (insert/update/delete and roll-back/reload)

**LIFECYCLE MANAGEMENT**
- Meta Data Management & Data Governance built in
- Propagation of Meta Data changes (DEV → QA → PRD)
- Data Tiering Optimization with unified concept covering hot, warm and cold data
SAP BW/4HANA – Data Modeling

- Modeling based on predefined semantics and modeling patterns (master data, DataStores) as well as database fields
- Database abstraction using an fully integrated modeling environment
- Store data once & virtualize wherever possible
- Options to use hybrid modeling of BW and SQL based data models
- Pre-defined integrated data models and applications enables fast implementation (Business Content)
- Data Tiering Optimization to handle data lifecycle management for large data volumes
Model-driven approach

InfoObjects (Characteristics, Keyfigures) are the most granular building blocks accompanied by a rich set of business related information for master data:

- Slowly changing dimensions support with integrated time dependency (master data historization)
- Currency and unit conversion built in
- Inventory & non-cumulative measure support
- Complex hierarchies & Multi-language support
- Geospatial support
- Time & date hierarchies including all fiscal year features
- Support for detailed Analysis Authorizations

Alternatively field-based modeling is supported, when these features are not needed.
SAP BW/4HANA – Layered Scalable Architecture (LSA++)

Simplified Data Flows
- High speed Analytics at any layer
- Flexibility through Virtual Data Marts
- Agility through virtually combining data across layers
- Business needs and service level driven
- Combination of bottom-up and top-down modeling approaches – for agile, flexible and sustainable development
- Field or InfoObject based Modelling

An architecture can only become lean if a great deal of transformations and solution modeling are done virtually and dynamically across the DWH and beyond.
SAP BW/4HANA – virtualized and persistent Data Modeling

Model-driven approach
- Fully integrated modeling environment incl. planning functions (with BPC add-on)
- Predefined modeling patterns for transaction & master data optimized for SAP HANA
- Store once & virtualize wherever possible

Persistent Objects
- DataStore object (advanced) – the central object for data storage and data consolidation
- InfoObject – for master data characteristics and key figures with units/currencies

Virtual Objects
- CompositeProvider – to combine data from BW/4HANA and SAP HANA via Join or Union
- Open ODS View – to consume external (and internal) data flexibly without staging

Field based modeling
- Complements InfoObject modeling
- Integrated with existing BW/4HANA Objects/Models and BW/4HANA authorizations
- Direct staging from any source possible, even mass-data loads
SAP BW/4HANA – Mixed Data Model Integration

Use the best of both worlds

- Reuse both BW and SQL skills
- Seamless data model integration
- Use your data at the frequency they are generated: batch, real-time, stream or remote
- Store data once – use multiple times
- Consume via native HANA SQL or BW query by any tool
- Add predictive, spatial and other HANA platform features
SAP BW/4HANA – OLAP & Planning Functions

Analytic Manager
- Analytic Manager is the built-in OLAP engine of BW
- The majority of analytical functions in BW/4HANA are pushed down to HANA and executed directly in the database
- Supports business processes like slow-moving items or elimination of internal business volume
- Rich set of analytical capabilities like
  - Hierarchy handling,
  - Currency and unit conversions
  - Exception aggregation & conditions
  - Restricted and calculated key figures
  - Inventory handling for non-cumulative key figures

Planning Capabilities
- Provide rich set of in-memory optimized planning capabilities using the SAP Business Planning and Consolidation, version for SAP BW/4HANA:
  - Aggregation, Disaggregation, Conversions, Revaluation
  - Copy, Delete, Set value, Repost, FOX-Formulas
- Supports embedded and standard models
SAP BW/4HANA – OLAP & Planning Functions

Example: OLAP Functionalities

SAP BW/4HANA

Build reports with a variety of rich OLAP functions on an object model level

Native SQL Database

Complex aggregations have to be defined in SQL statements or in an additional BI tool

```
SELECT Country, Product, Customer, SUM(Quantity), 1
FROM SalesData
GROUP BY Country, Product, Customer
HAVING SUM(Quantity) > 50000
```
SAP BW/4HANA – Business Content

Business Oriented Modeling

Rich Business Content

- Enables fast and cost-effective implementation
- Based on proven business applications and industries knowledge
- Pre-defined integrated Data Models and Applications
- Rich extractor content for SAP data out-of-the box
- Supporting layered scalable architecture (LSA++)
- Provides higher level of details (line items, …)
- Mixed modeling implemented with SAP HANA and SAP BW/4HANA content where applicable
- [LINK] to latest Business Content
SAP BW/4HANA – Reliable Data Acquisition

- Batch and Real-time Data Acquisition
- Virtual/Remote Data Access support
- Delta capabilities & Sophisticated Error Handling
- Built-in data transformation and data quality functions with standard (mapping, formula, lookup, conversion) & custom transformations
- Open adapter framework to connect any system (databases, OpenSource, Social Media, IOT, etc.)
- Out-of-the-box data integration for a variety of external sources
- Optimal integration with SAP Systems (extractor content)
SAP BW/4HANA – Simplified Data Integration

SAP BW/4HANA simplifies data integration, offering comprehensive access to external systems

- Replicate data in real-time (HANA SDI based replication or via ODP – especially with ODP-SLT)
- Access data virtually
- Load data using optimized processing
## SAP BW/4HANA – Simplified Data Integration

### Automated delta management handling during data flow

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<th>Value</th>
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**Alternative 2**

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<td>-100</td>
</tr>
<tr>
<td>1</td>
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</table>

### Native SQL Database

Each entity with key ‘measures’ will need to define a ‘delta’ table

- Delta handling process needs to be implemented manually in ETL code / tool, for example, based on timestamp or using table compare statements

```
SELECT * FROM ... WHERE timestamp >= '20141224'
```
SAP BW/4HANA – Lifecycle management

Lifecycle management of Metadata
- Object-Versioning and modification tracking
- Append Concept
- Consistent Patching & Upgrades across landscape
- Deployment using proven SAP transport mechanism across multi-tier landscapes (e.g. DEV → QA → PRD)
- Consistent Remodeling

Lifecycle management of Data Persistence
- Data Tiering Optimization with unified concept covering HOT, WARM and COLD data
One concept for hot, warm and cold data based on Advanced DataStore Object Partitions

**SAP HANA In-Memory Store**
- **Hot Store**
  - This tier is used to store mission critical data for real-time processing and real-time analytics.
  - Data is retained “In-Memory”.

**Data Tiering with Scale-Out**
- **Warm Store**
  - This tier is used to store data with reduced performance SLAs, which is less frequently accessed.
  - Data is stored on dedicated SAP HANA Scale Out Nodes (Extension Nodes) with a relaxed sizing ratio.

**Data Tiering with External Storage**
- **Cold Store**
  - This tier is used to store voluminous data for sporadic or very limited access.
  - Data is stored on disk, in columnar structures on SAP IQ or in Hadoop HDFS.
SAP BW/4HANA – Scheduling & Monitoring

- Integrated data processing and error monitoring/handling across systems
- Scheduling framework for all DWH processes
- Management of data consistency (insert/update/delete and roll-back/reload)
- Process Chains enable workload management for data load processes
- Open-hub service for data distribution
- Integration into 3rd party scheduling tools (e.g. Redwood)
- High scalability for large implementations
- Rich monitoring capabilities on all levels
SAP BW/4HANA – Security & Traceability

- Fine-grained security model with mass handling capabilities
  - Object and Hierarchy level security
  - Access-control at row level
  - Analytic Privileges grant different users access to different portions of data in the same view based on their business role.
  - Can be implemented on top of mandatory object privileges to secure access based on certain values or combination of values.

- Synchronization with other applications and IDM systems

- Support for SSO and Active Directory

- Auditing & Access statistics including identity handling

- Possibility to trace on application logic, database access and effect of authorizations
Summary
SAP BW/4HANA is SAP’s strategic EDW solution

SAP BW/4HANA offers fully integrated data warehouse application with

- Agile and flexible data modeling to also combine BW and native SQL data for real-time insights.
- Predefined Content for fast implementation
- Sophisticated data acquisition with rich scheduling & monitoring
- Integrated lifecycle management for metadata
- Built-in Data Tiering Optimization for hot, warm and cold data
- Detailed security & auditing
Thank you.