# SAP BW/4HANA – An Introduction
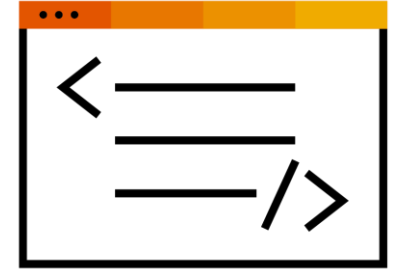
EDW Product Management
November, 2017

**SAP** Run Simple
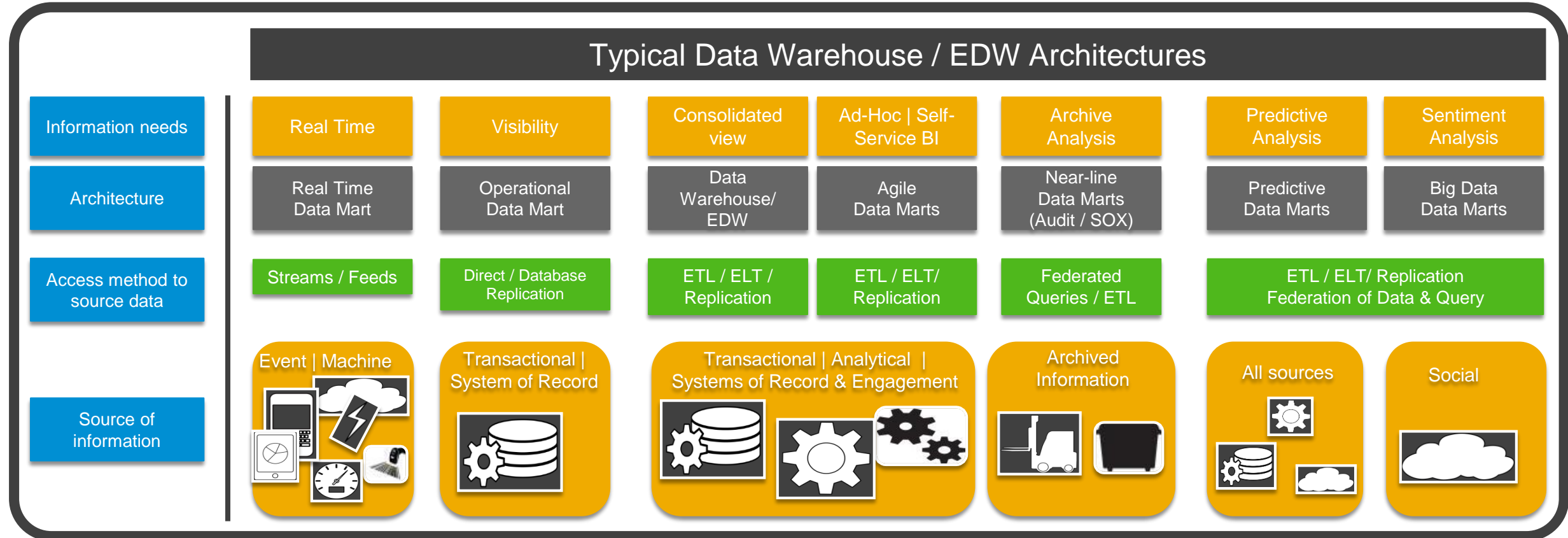
# Agenda

**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 |
|---|---|---|---|---|---|---|---|
| Architecture | 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 | 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
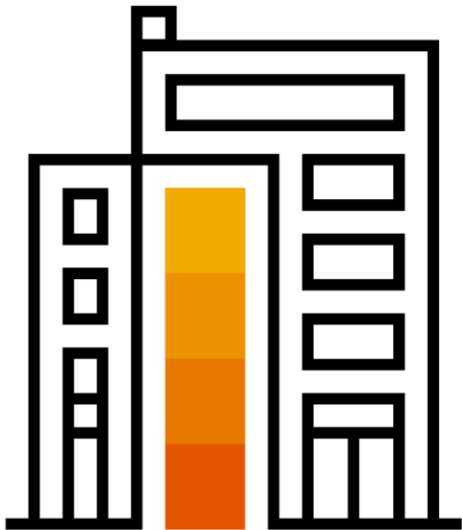- Variety of tools lacking integration

# 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

SAP BW/4HANA

| SCHEDULING & MONITORING | MODELING | PLANNING |
| OLAP | LIFECYCLE MANAGEMENT | ETL |
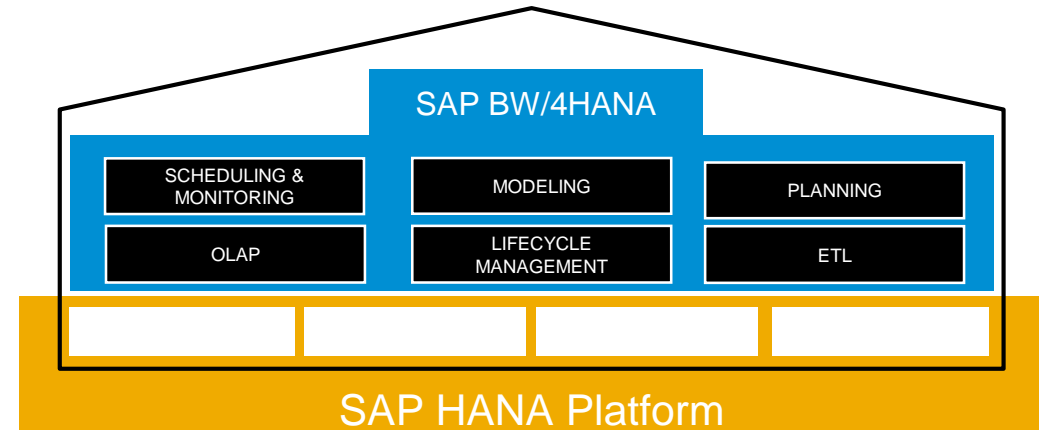
SAP HANA Platform

**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

HANA SQL DW

| SCHEDULING & MONITORING | MODELING | PLANNING |
| OLAP | LIFECYCLE MANAGEMENT | ETL |
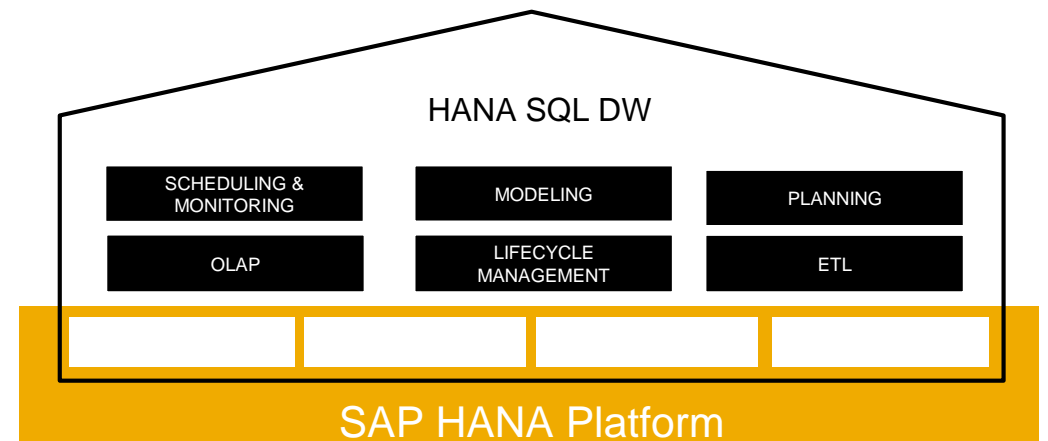
SAP HANA Platform

# SAP HANA Data Warehouse
## Strategy & Vision

# SAP HANA Data Warehouse – Strategy & Vision

| Planning and definition 2016 | Execution and delivery 2016 - 2018 | Vision |
|---|---|---|

**Analytics**
(Business Intelligence, Predictive, Planning)

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(Business Intelligence, Predictive, Planning)

**Analytics**
(Business Intelligence, Predictive, Planning)

SAP DW Foundation

SAP Power Designer

SAP BW/4HANA

SAP HANA EIM

SAP HANA Platform

SAP Power Designer

SAP DWH Foundation

SAP BW/4HANA

SAP HANA EIM

SAP HANA Platform

DW Modeling

DW ETL & DM
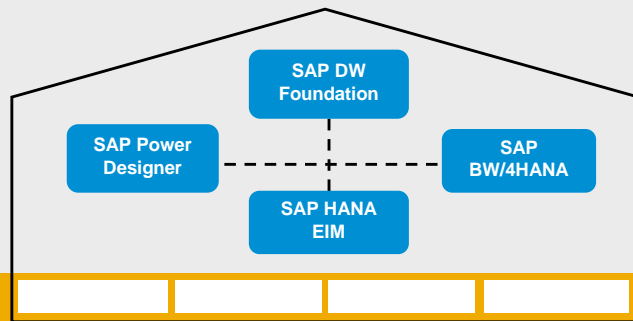
SAP HANA Platform

**Market presence in data warehousing with a clear roadmap**
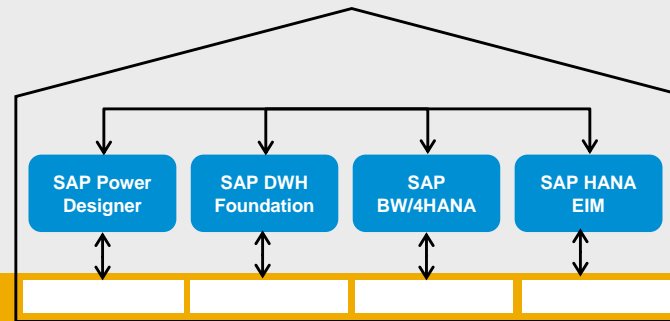
**Strong and simplified offering with tight integration**
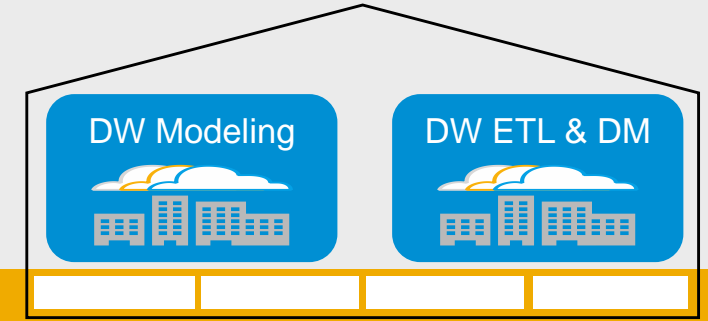
**Convergence into one technology stack addressing BW and SQL-based DW needs**
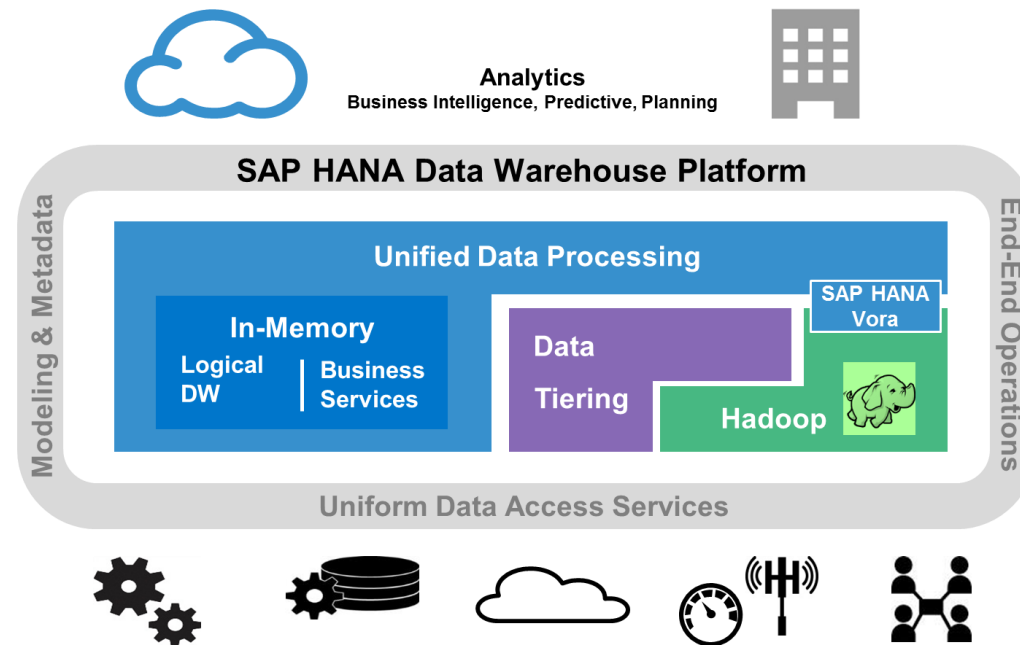
# SAP HANA Data Warehouse
## Future-Proof Data Management Platform

### Serve standard SQL-based and BW-style data warehousing in order to …

**Meet future demands**

- **LDW** for dynamically changing system landscapes
- **Cloud and hybrid deployment**
- Integration of **any data types** and **Big Data technologies**
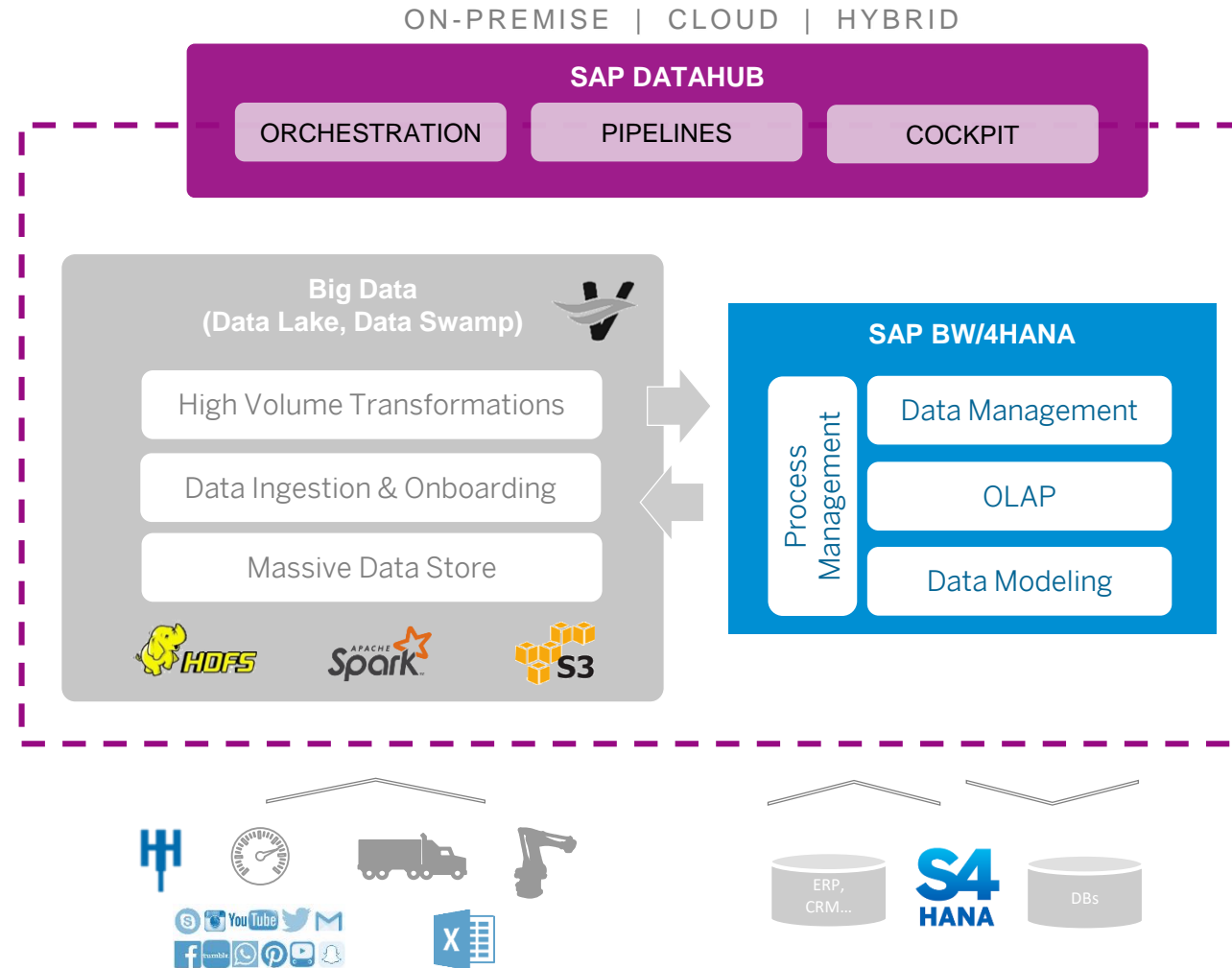- Scale out to **high volumes** and **data lakes**

**Analytics**
Business Intelligence, Predictive, Planning

**SAP HANA Data Warehouse Platform**

Modeling & Metadata

**Unified Data Processing**

**In-Memory**
Logical DW | Business Services

**Data Tiering**

**SAP HANA Vora**

**Hadoop**

End-End Operations

**Uniform Data Access Services**

**Go beyond other DW offerings**

- Top **out-of-the-box integration** to SAP solutions on-premise and in cloud environments
- **Real-time processing power** of HANA
- Hadoop integration with **SAP HANA Vora**
- HANA-optimized re-usable **business content**

# SAP Data Hub & SAP BW/4HANA

## Establish a BIG Data Warehouse

- Build a modern, open and hybrid DWH offering for any data

- SAP BW/4HANA as modern and simplified core data warehouse solution

- Implement and execute high volume transformations on Big Data Clusters Data Lake

- Leverage Big Data landscapes for data onboarding and ingestion for various types of data and files

- Data Hub as orchestration and refinery application to address end to end processes

ON-PREMISE | CLOUD | HYBRID

**SAP DATAHUB**

| ORCHESTRATION | PIPELINES | COCKPIT |

**Big Data (Data Lake, Data Swamp)**

High Volume Transformations

Data Ingestion & Onboarding

Massive Data Store

HDFS · Apache Spark · S3

**SAP BW/4HANA**

Process Management

Data Management

OLAP

Data Modeling

ERP, CRM... · S4 HANA · DBs

# Enterprise Data Warehousing with
## SAP BW/4HANA

# Enterprise Data Warehousing with SAP BW/4HANA
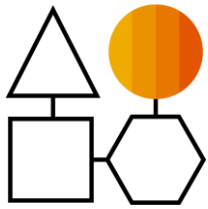
## BUSINESS CONTENT

- 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
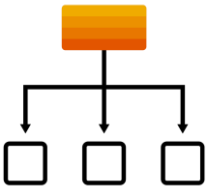
## DATA MODELING

- 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
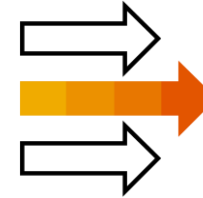
## RELIABLE DATA ACQUISITION

- 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
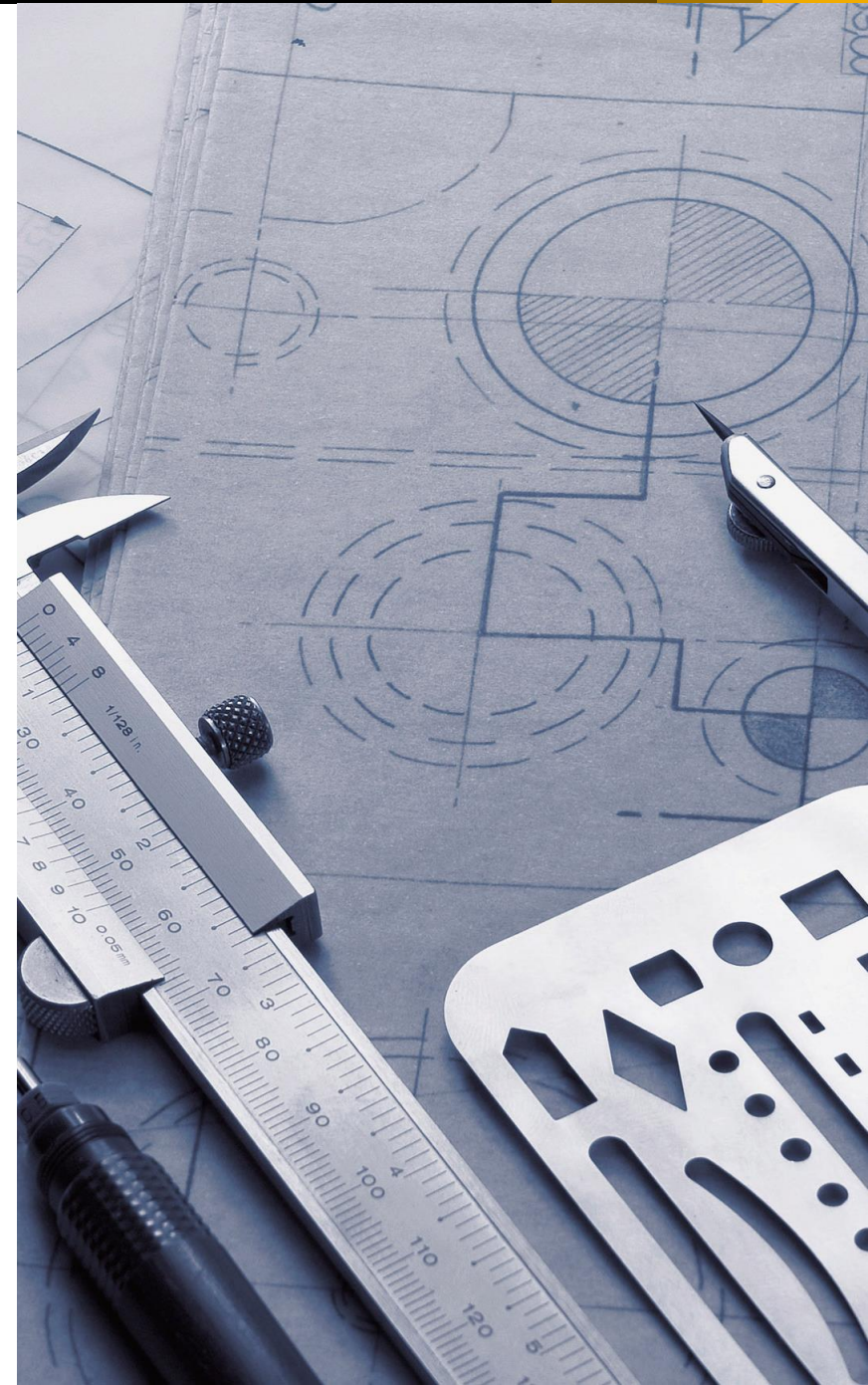- Management of data consistency (insert/update/delete and roll-back/reload)

## 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
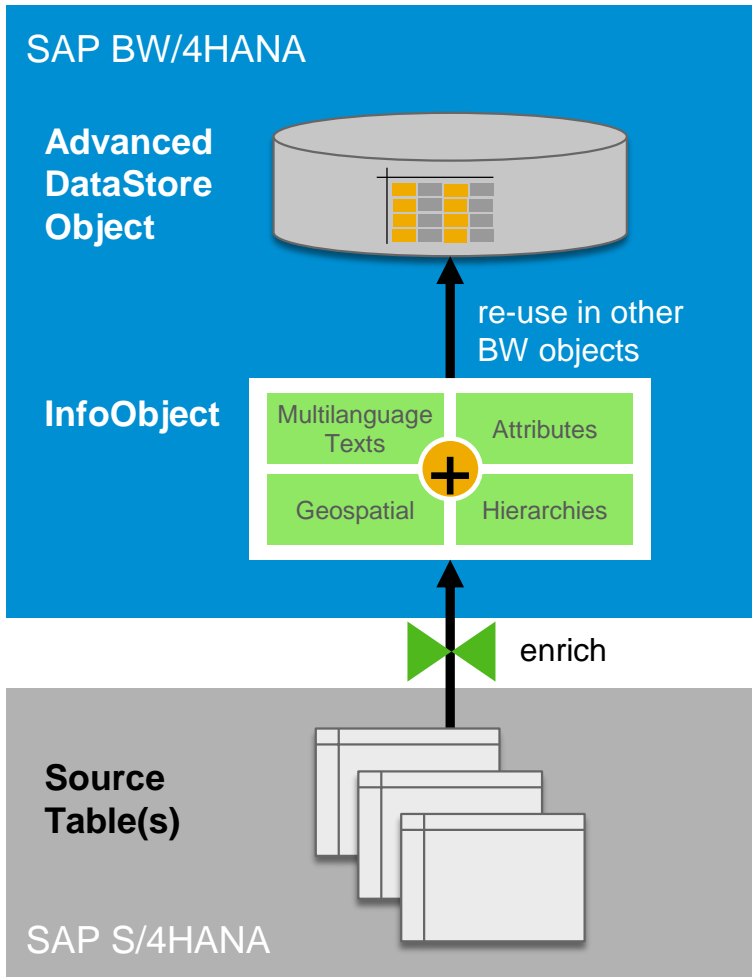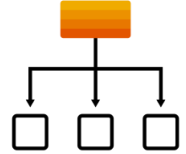
# SAP BW/4HANA – Data Modeling
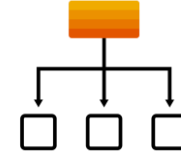
- Modeling based on predefined semantics and modeling patterns (master data, DataStores) as well as database fields

- 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

# SAP BW/4HANA – Master Data Modeling using InfoObjects



SAP BW/4HANA

**Advanced DataStore Object**

re-use in other BW objects

**InfoObject**

| Multilanguage Texts | Attributes |
| Geospatial | Hierarchies |

enrich

**Source Table(s)**

SAP S/4HANA

## 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.

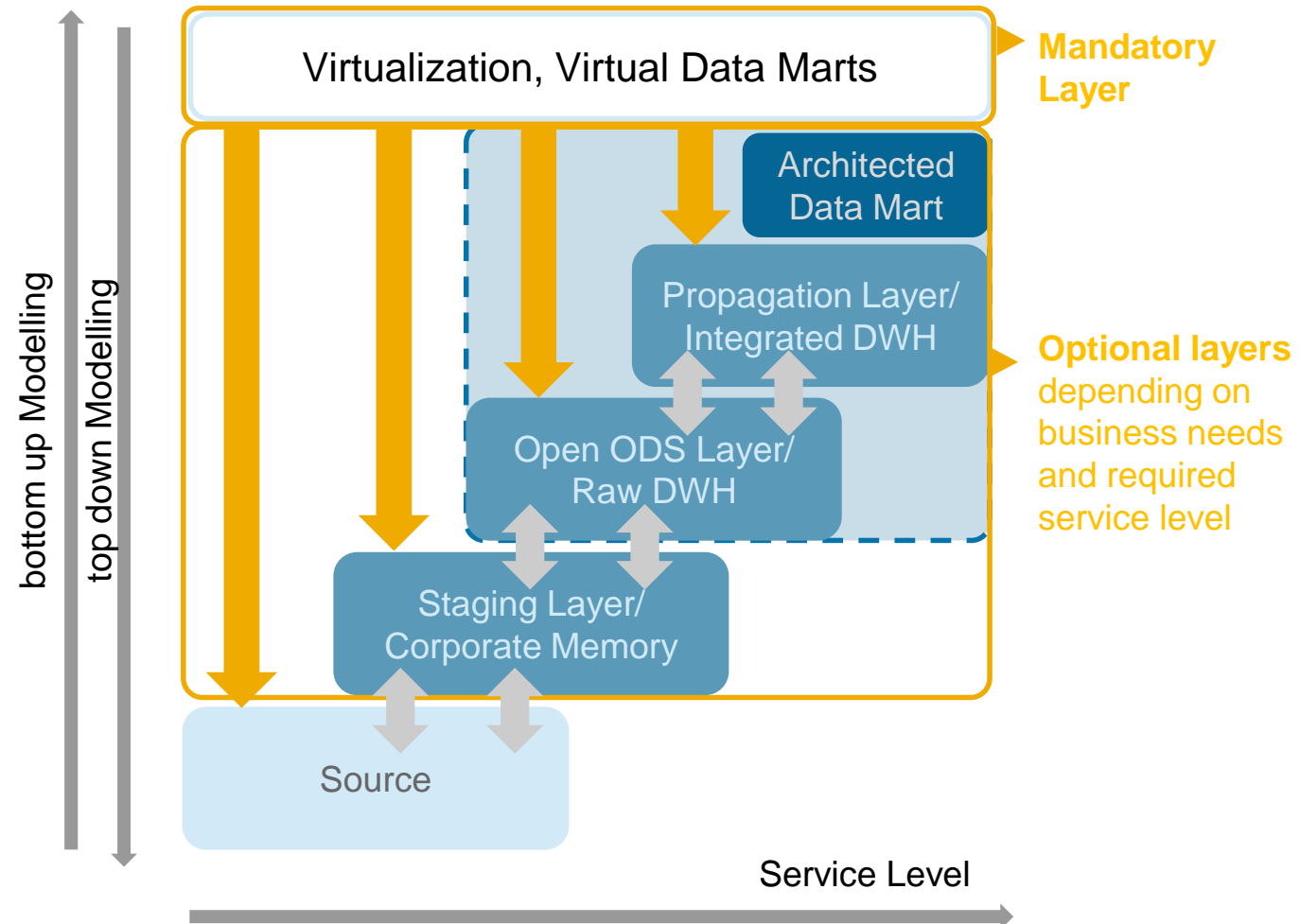# SAP BW/4HANA – Layered Scalable Architecture (LSA++)
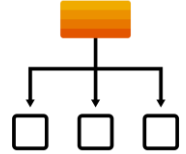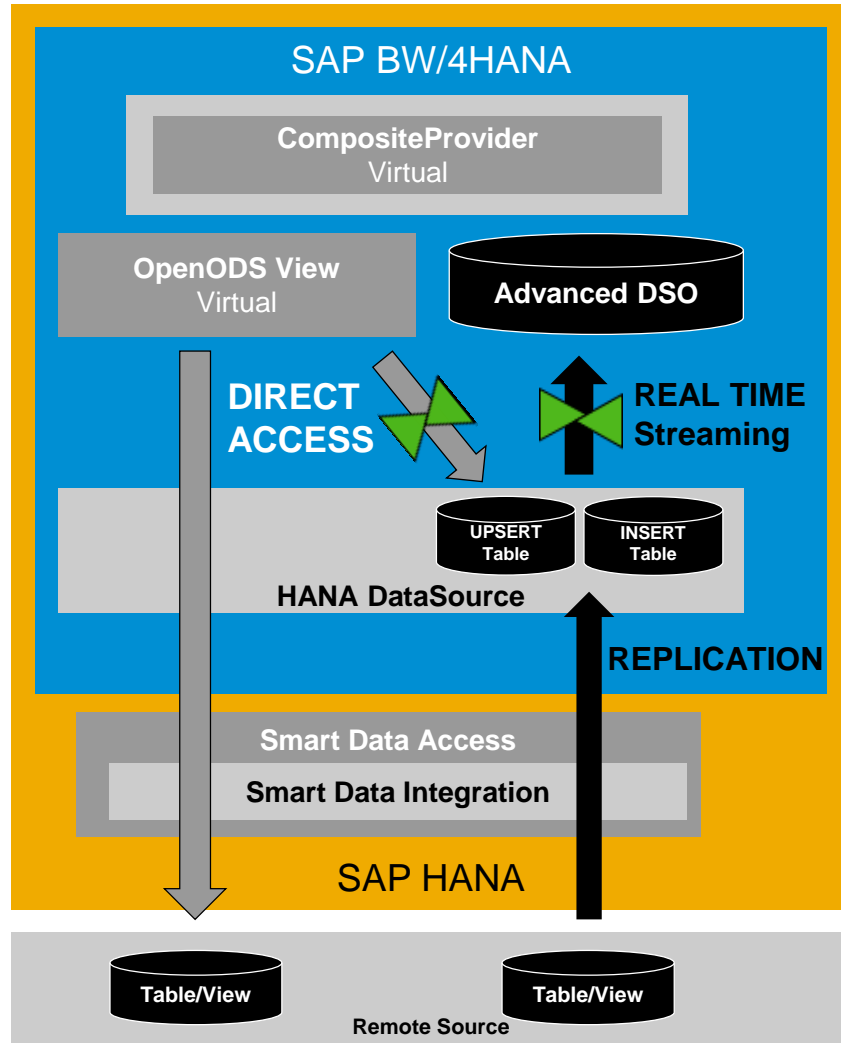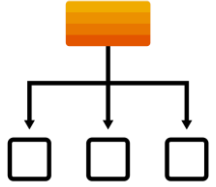
## Simplified Data Flows

- 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 (LSA++)**

bottom up Modelling

top down Modelling

Virtualization, Virtual Data Marts — **Mandatory Layer**

Architected Data Mart

Propagation Layer/ Integrated DWH

Open ODS Layer/ Raw DWH

**Optional layers** depending on business needs and required service level

Staging Layer/ Corporate Memory

Source

Service Level

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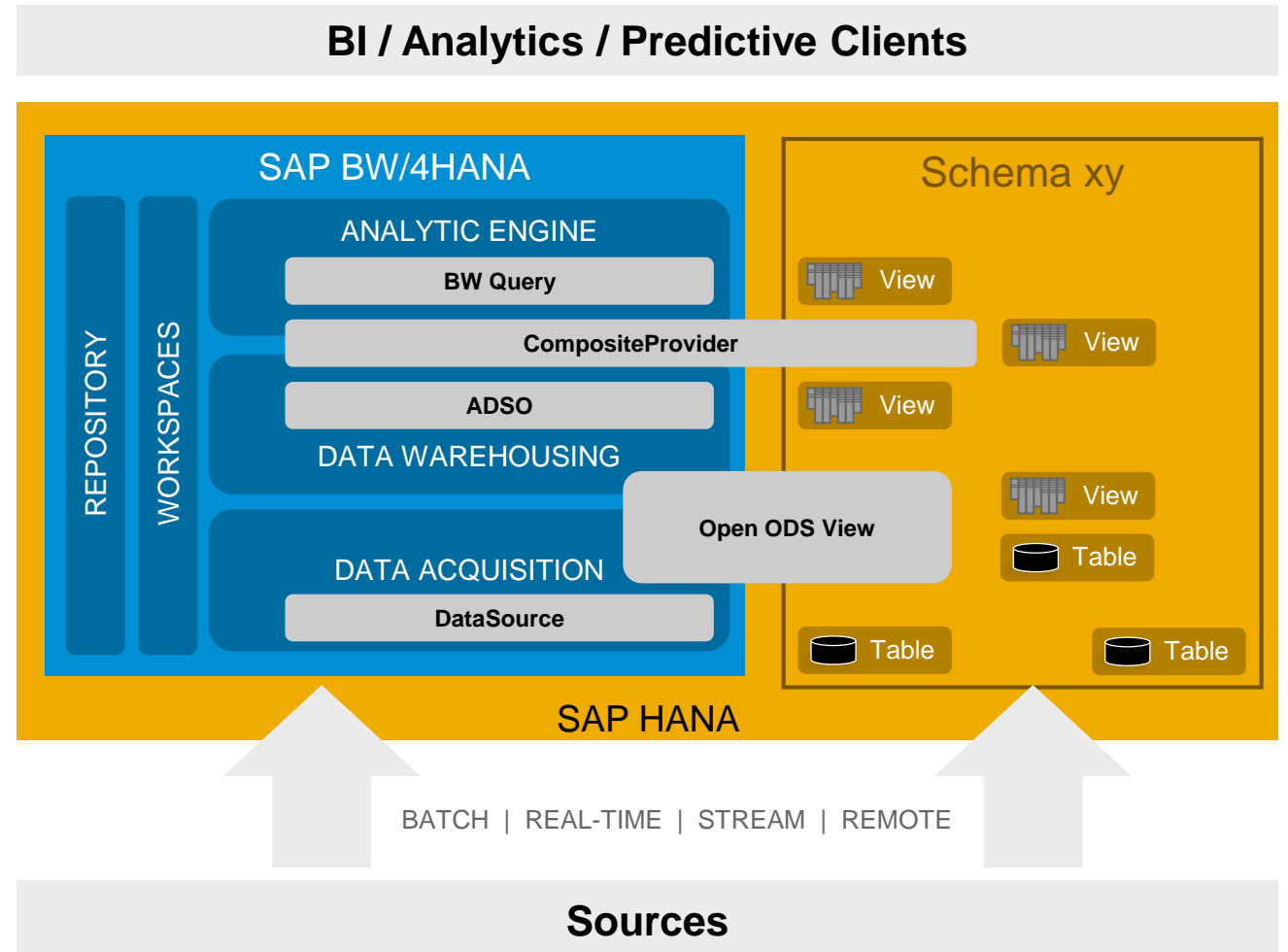
## Field based modeling
- Complements InfoObject modeling
- Integrated with existing BW/4HANA Objects/Models and BW/4HANA authorizations
- Direct staging from any source possible, even mass-data loads

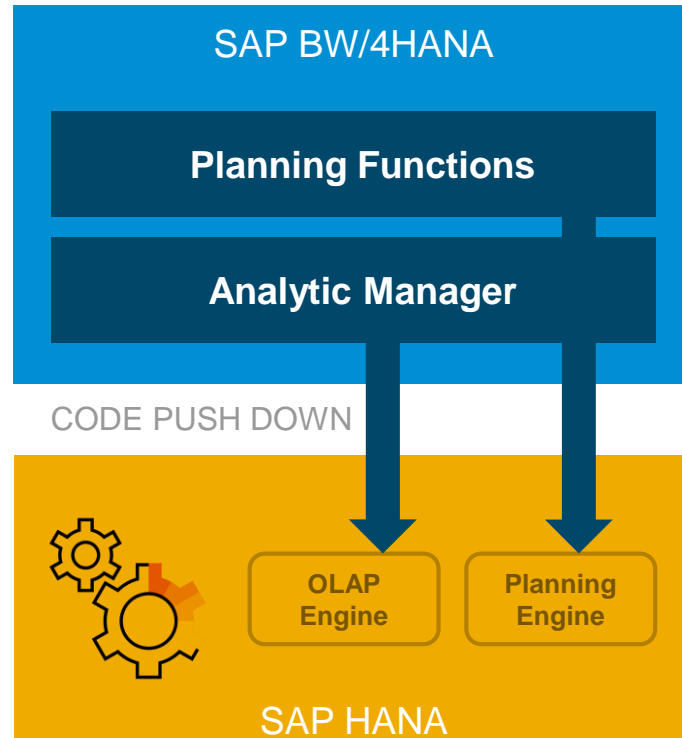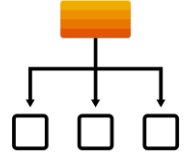# SAP BW/4HANA – Mixed Data Model Integration
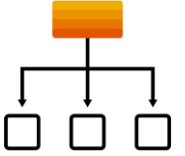
## Use the best of both worlds

- 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

**BI / Analytics / Predictive Clients**

SAP BW/4HANA

REPOSITORY | WORKSPACES

ANALYTIC ENGINE
- BW Query
- CompositeProvider
- ADSO

DATA WAREHOUSING

DATA ACQUISITION
- DataSource

Open ODS View

Schema xy
- View
- View
- View
- View
- Table
- Table
- Table

SAP HANA

BATCH | REAL-TIME | STREAM | REMOTE

**Sources**

# SAP BW/4HANA – OLAP & Planning Functions

## Diagram

SAP BW/4HANA

**Planning Functions**

**Analytic Manager**

CODE PUSH DOWN

OLAP Engine | Planning Engine

SAP HANA

## 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
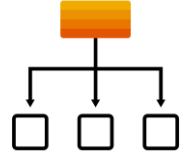
## SAP BW/4HANA

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

SAP BW/4HANA Modeling

Reporting elements

| Country | Product | Quantity | No. of Customers | Share per Product |
|---------|---------|----------|------------------|-------------------|
| | Pencil | 10 | 5 | 67% (10/15) |
| DE | Paper | 5 | 3 | 33% (5/15) |
| | Subtotal | 15 | 6 | 100% |
| | Pencil | 7 | 3 | 39% (7/18) |
| US | Glue | 11 | 5 | 61% (11/18) |
| | Subtotal | 18 | 7 | 100% |
| Grand Total | | 33 | 11 | 100% |

## 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
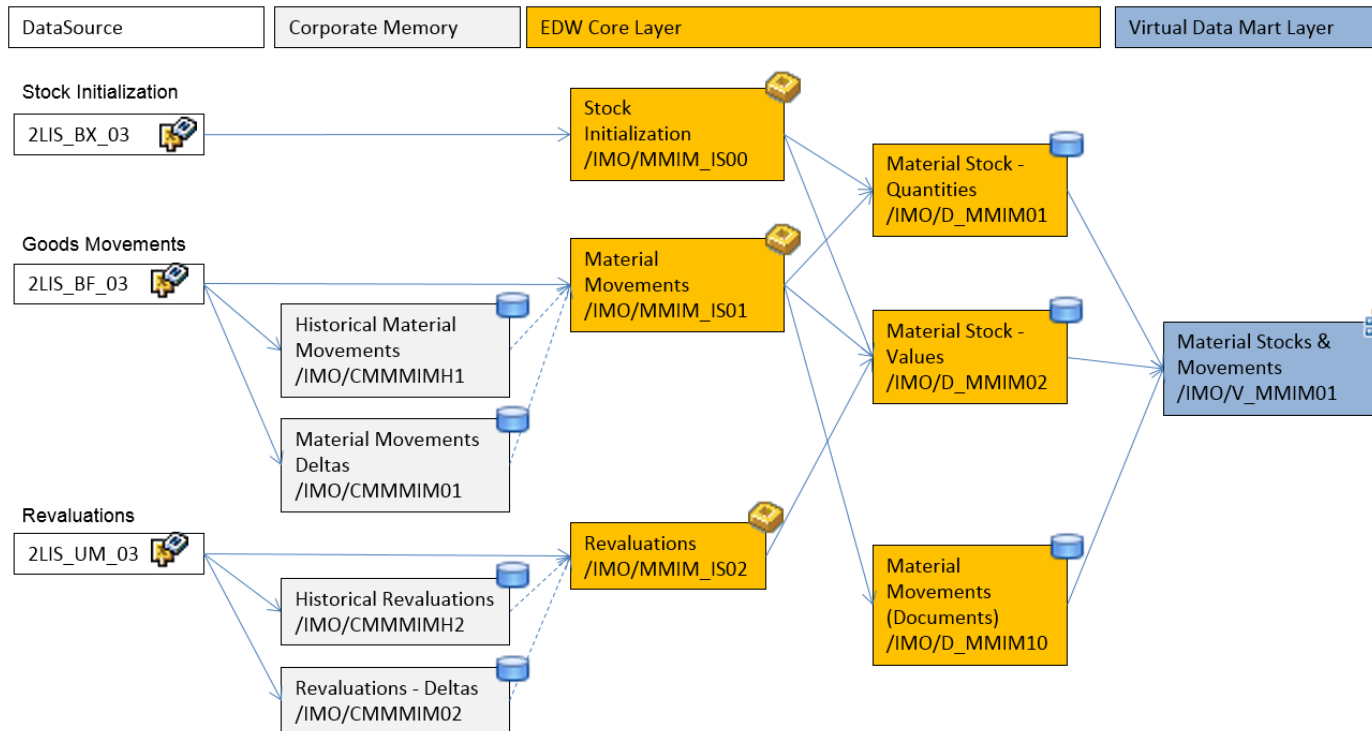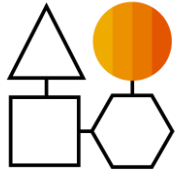


**Rich Business Content**

- 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
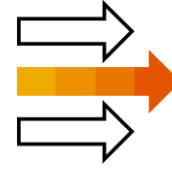
- Batch and Real-time Data Acquisition

- 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

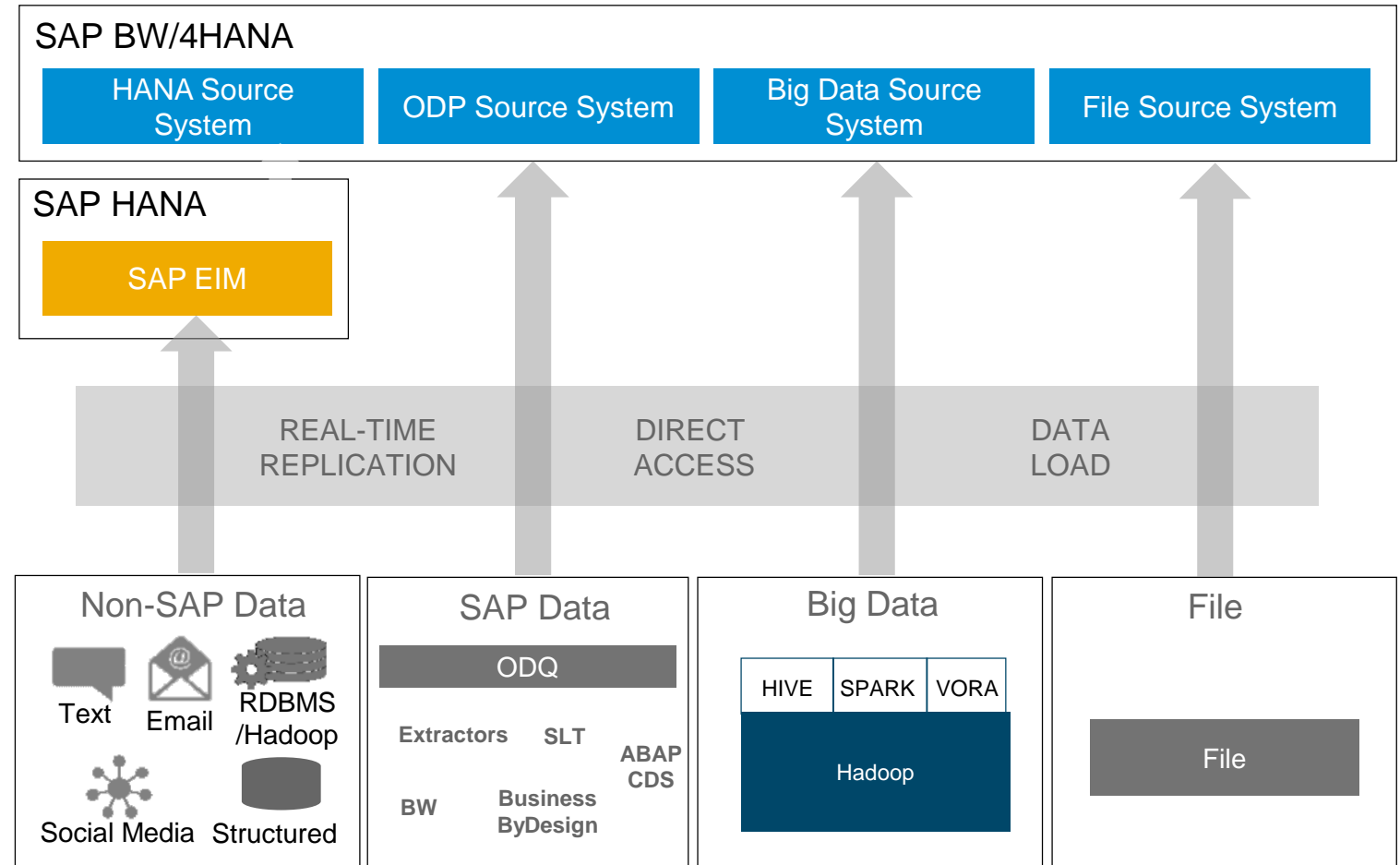- Optimal integration with SAP Systems (extractor content)
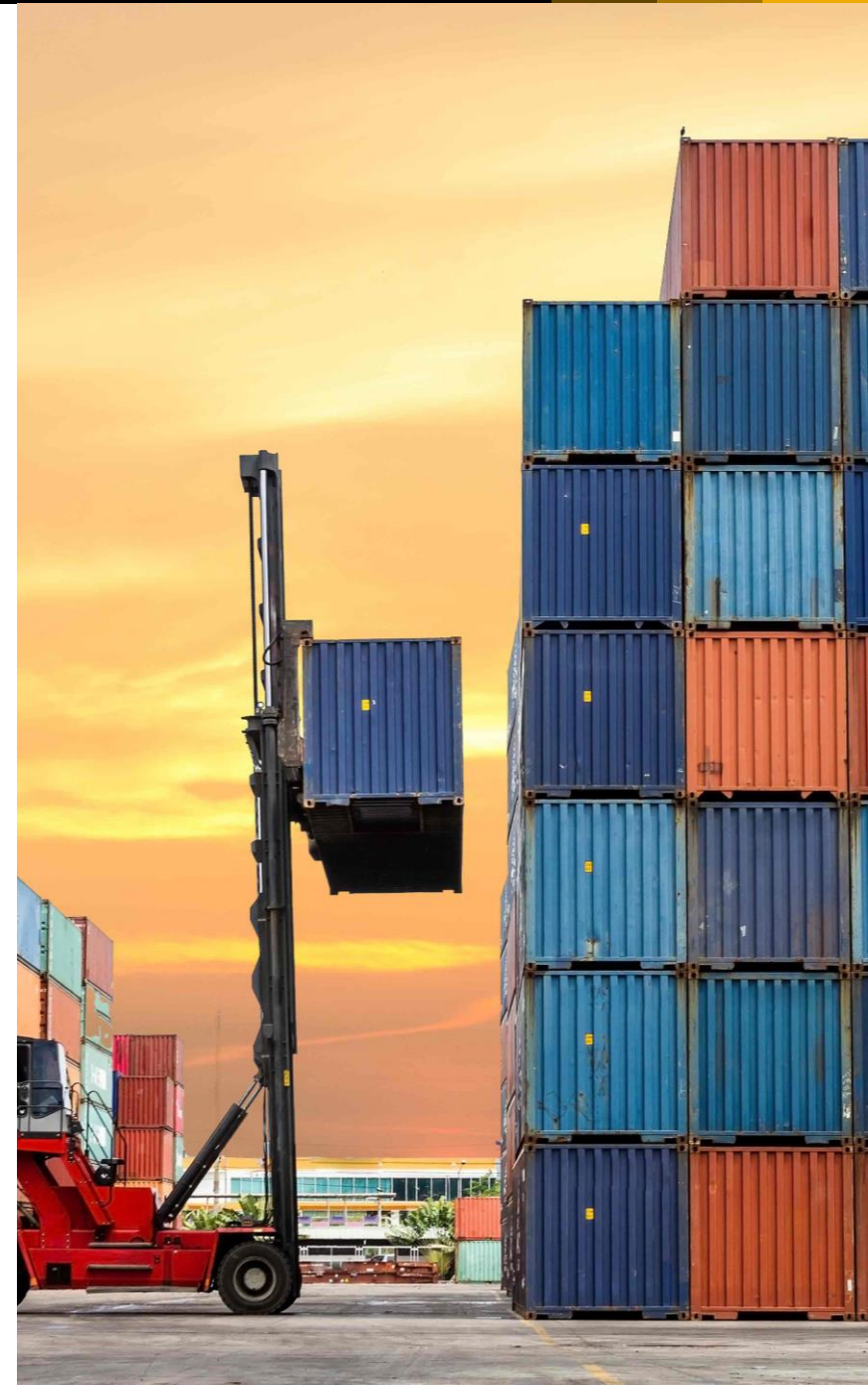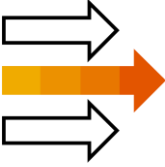
# SAP BW/4HANA – Simplified Data Integration
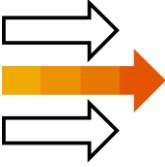
**SAP BW/4HANA simplifies data integration, offering comprehensive access to external systems**

- Replicate data in real-time (HANA SDI based replication or via ODP – especially with ODP-SLT)

- Access data virtually
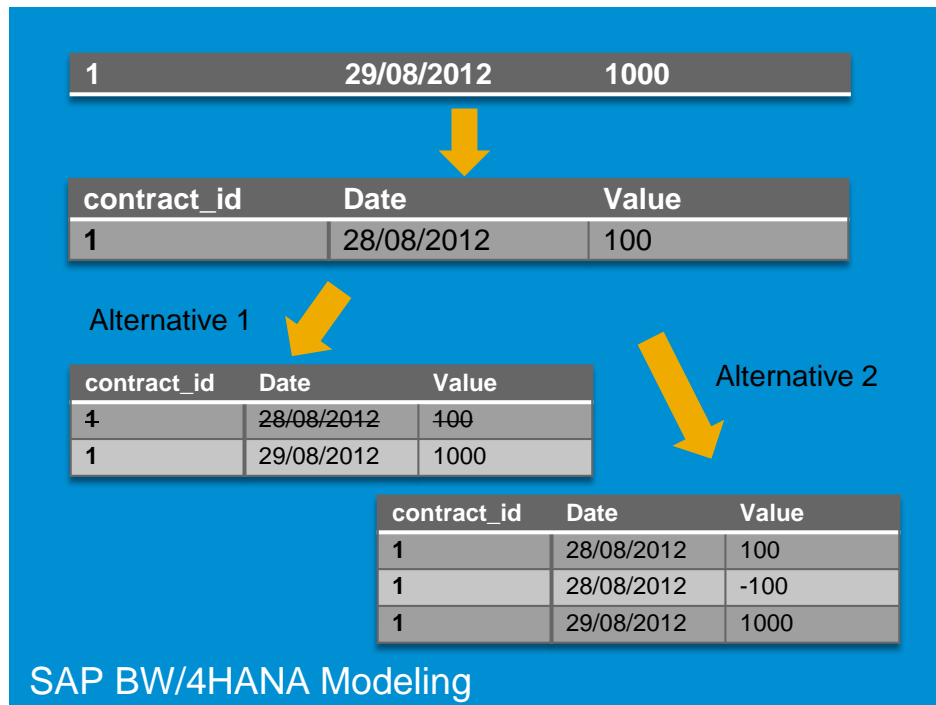
- Load data using optimized processing

**SAP BW/4HANA**

| HANA Source System | ODP Source System | Big Data Source System | File Source System |

**SAP HANA**

SAP EIM

REAL-TIME REPLICATION      DIRECT ACCESS      DATA LOAD

**Non-SAP Data**

Text    Email    RDBMS/Hadoop

Social Media    Structured

**SAP Data**

ODQ

Extractors    SLT    ABAP CDS

BW    Business ByDesign

**Big Data**

HIVE | SPARK | VORA

Hadoop

**File**

File

# SAP BW/4HANA – Delta Management

## SAP BW/4HANA

**Automated delta management handling during data flow**

| 1 | 29/08/2012 | 1000 |
|---|---|---|

| contract_id | Date | Value |
|---|---|---|
| 1 | 28/08/2012 | 100 |

Alternative 1

Alternative 2

| contract_id | Date | Value |
|---|---|---|
| ~~1~~ | ~~28/08/2012~~ | ~~100~~ |
| 1 | 29/08/2012 | 1000 |

| contract_id | Date | Value |
|---|---|---|
| 1 | 28/08/2012 | 100 |
| 1 | 28/08/2012 | -100 |
| 1 | 29/08/2012 | 1000 |

SAP BW/4HANA Modeling

## 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

Contracts

Delta calculation

Contracts_delta

SELECT * FROM …

WHERE timestamp >= '20141224'
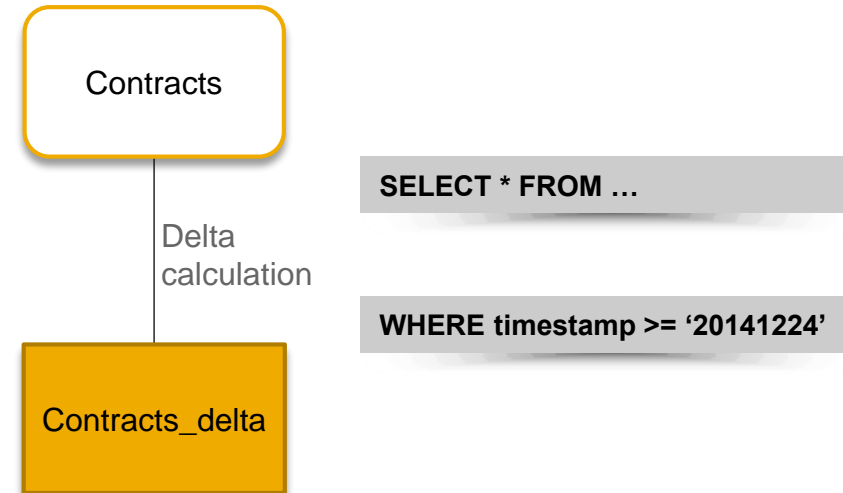
# SAP BW/4HANA – Lifecycle management
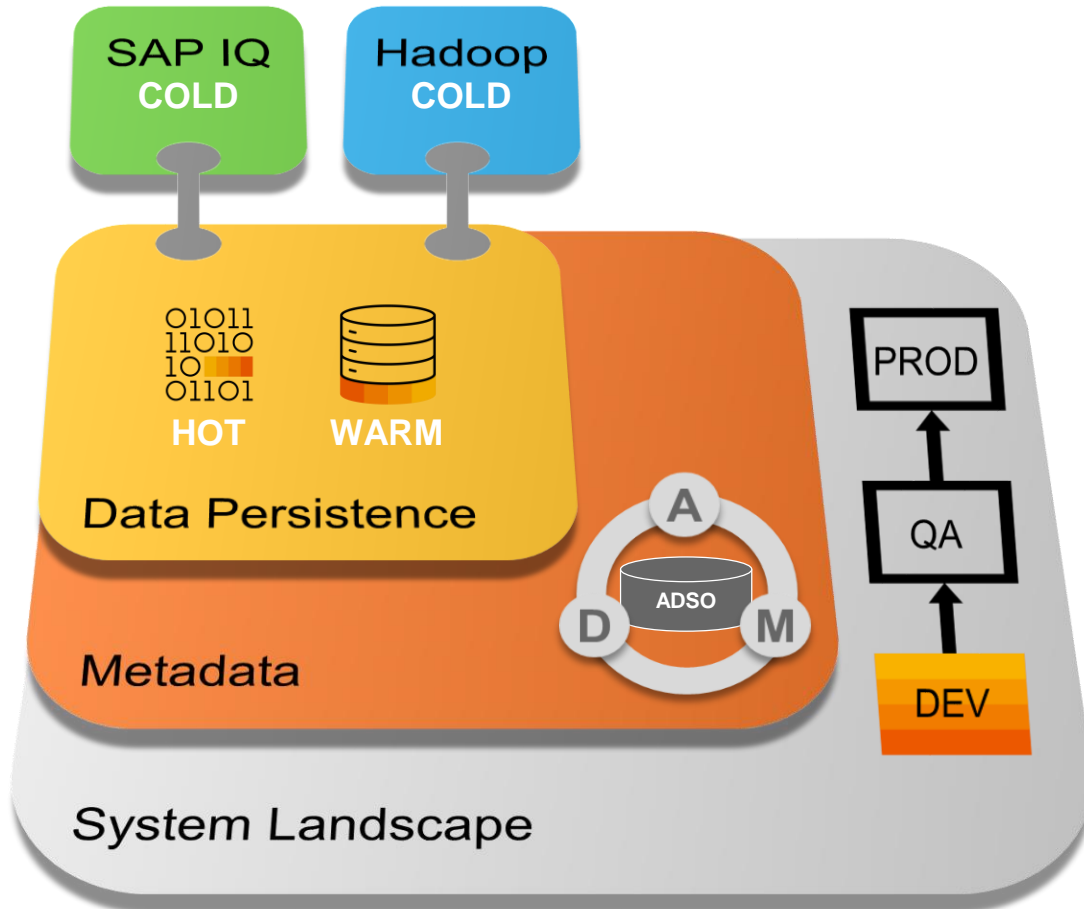


## Lifecycle management of Metadata

- 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

# SAP BW/4HANA – Data Tiering Optimization (DTO)

## One concept for hot, warm and cold data based on Advanced DataStore Object Partitions

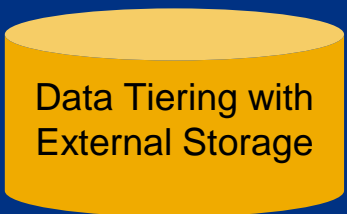| | | |
|---|---|---|
| **SAP HANA In-Memory Store** | **Hot Store** | This tier is used to store mission critical data for real-time processing and real-time analytics. Data is retained "In-Memory". |
| **Data Tiering with Scale-Out** | **Warm Store** | This tier is used to store data with reduced performance 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. |
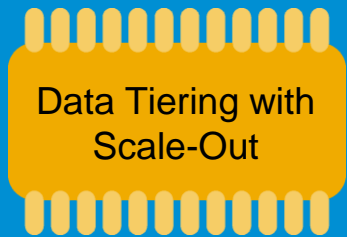
# SAP BW/4HANA – Scheduling & Monitoring

- 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
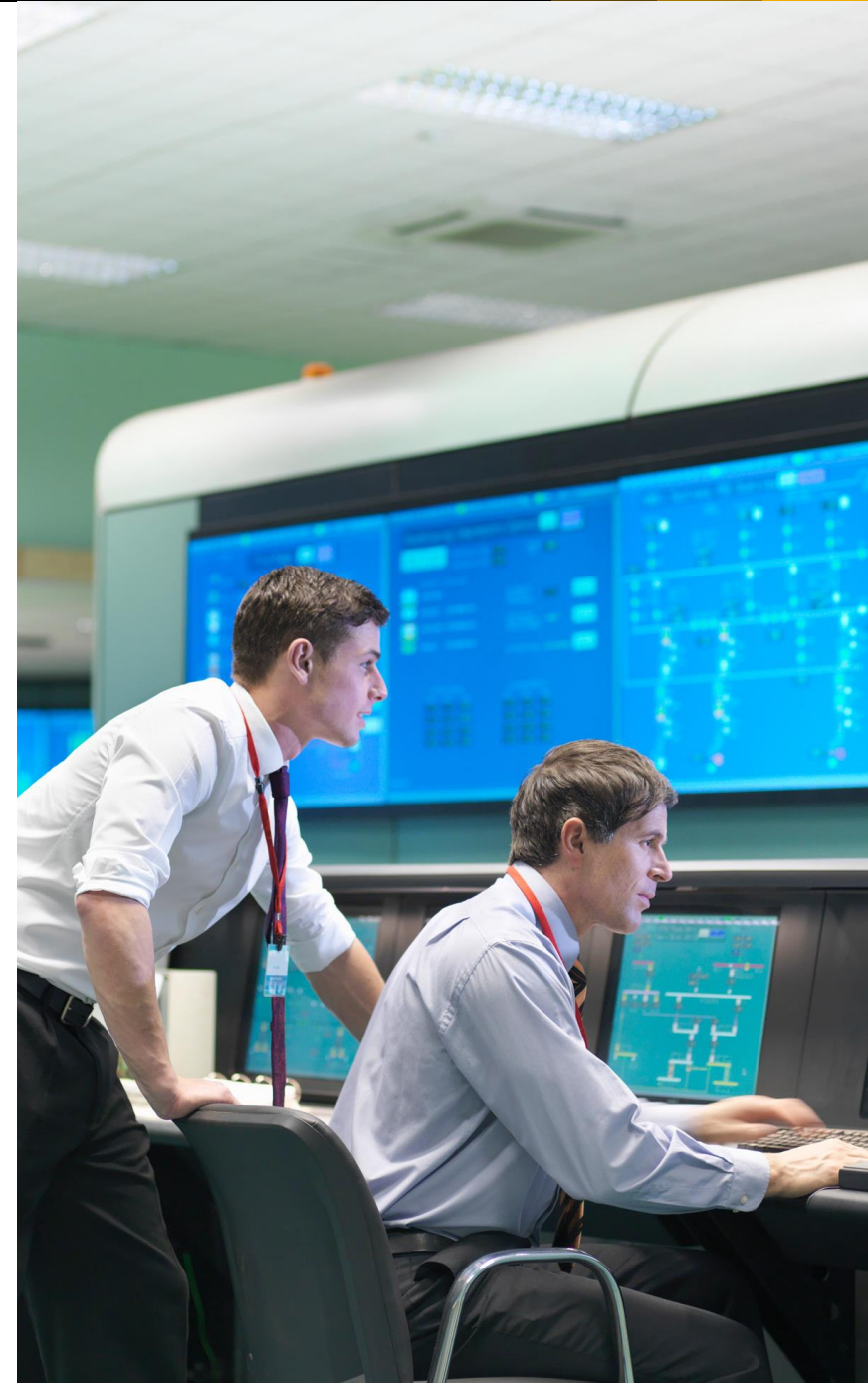
# SAP BW/4HANA – Security & Traceability

- 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

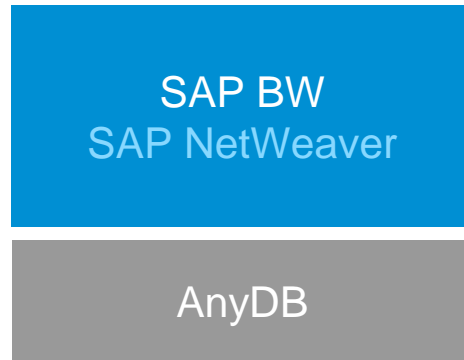- Built-in Data Tiering Optimization for hot, warm and cold data
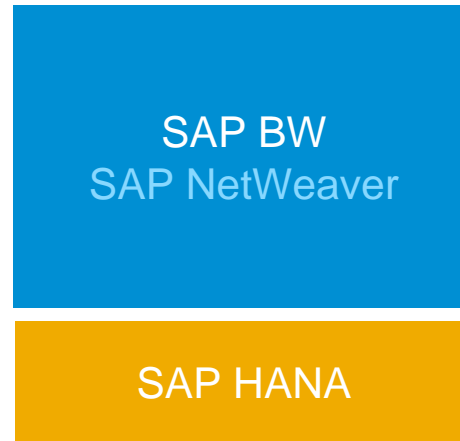
- Detailed security & auditing

# Thank you.

SAP Run Simple

# Appendix

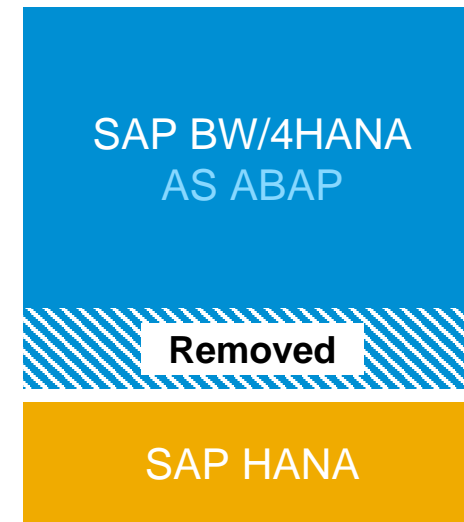# SAP BW/4HANA vs. SAP BW – Differences

### SAP BW

SAP BW
SAP NetWeaver

AnyDB

1. Built on SAP NetWeaver
2. Supports only classic objects
3. Supports AnyDB

### SAP BW powered by SAP HANA

SAP BW
SAP NetWeaver

SAP HANA

1. Built on SAP NetWeaver
2. Supports classic objects and HANA-optimized objects
3. Supports SAP HANA only

### SAP BW/4HANA

SAP BW/4HANA
AS ABAP

Removed

SAP HANA

1. Based on lean ABAP appl. Server (codelines of other NetWeaver components and classic BW objects were removed)
2. Supports only HANA-opt.objects
3. Supports SAP HANA only

# Training for SAP BW4/HANA

## training@SAP

### BW462 – SAP BW/4HANA

**Classroom or Virtual Live Classroom**

German (English coming soon!)

- 5 days
- Prerequisites:
  - Hands-on experience in data modeling with SAP BW 7.x
  - BW310 (SAP BW Enterprise Data Warehousing non-HANA)

■ For details, go to SAP Training

## training@SAP

### DBW4H – Data Warehousing with SAP BW/4HANA - Delta from SAP BW powered by SAP HANA to SAP BW/4HANA
**Classroom or Virtual Live Classroom**

German (English coming soon!)

- 2 days
- Prerequisites:
  - SAP BW 7.4 / 7.5 and SAP HANA 1.0 knowledge is necessary
  - DBW74, BW362, HA100 or HA100e, BW310H

■ For details, go to SAP Training

## openSAP

### SAP BW/4HANA in a Nutshell

**Open Online Course**

English

- 4 Units – 2-3 hours in total
- No prerequisites
- Free participation & certification
- ■

For details, go to openSAP