



SAP Knowledge Graph Architecture & Business AI Integration

Deep Dive into the AI-Native North Star Architecture

The Cognitive Core is built on four reimagined architectural layers.

01

User Experience Layer

Shifts interaction to intent-driven UI via Joule and Joule Work.

02

Process Layer

Turns applications into capability providers via the SAP Autonomous Suite.

03

Foundation Layer

Unites data and AI through the SAP Knowledge Graph, SAP Business Data Cloud, and SAP AI Core.

04

Platform Layer

Runs applications and workflows securely on SAP BTP composable services.

Trust governs the flow of context across all enterprise layers.

01

EXPERIENCE LAYER

Experience Context

Generated from each user interaction at the experience layer.

02

PROCESS LAYER

Operational Context

Captured from business execution within the process layer.

03

FOUNDATION LAYER

Institutional Knowledge

Stored and compounded at the foundation layer.

04

PLATFORM LAYER

Enterprise Scale

Run and protected at the platform layer.

Context grounds AI in business data and semantics, making AI reasoning relevant and actionable.

The SAP Knowledge Graph

The Semantic Backbone for AI Agents

01 Semantic Bridge

Links natural language inputs directly to SAP's structured metadata.

02 API Access

Opens access to tens of thousands of APIs, data models, and business entities.

03 Agent Navigation

Acts as a compass and map for AI agents to navigate the ERP universe.

04 Contextual Infusion

Infuses deep ERP business domain know-how into AI operations.

SAP's Autonomous Enterprise at Scale

224

Agent Deployment

Features 224 AI agents deployed across the portfolio.

SAP Autonomous Suite

Includes over 50 domain-specific Joule Assistants coordinating more than 200 specialized agents.

51

Joule Assistants

Utilizes 51 Joule Assistants for intent-driven orchestration.

Unified Interface

Joule Work replaces traditional app navigation with an intent-driven interface.

SAP Knowledge Graph connects the enterprise data fabric to AI.

01

Accurate Responses

Connects data fabrics to AI to ensure contextual and accurate outputs.

02

Structured Mapping

Provides AI agents with a structured map of business entities and processes.

03

Relationship Tracking

Maps relationships across the entire SAP landscape.

04

Core Solution

Functions as the central solution for grounding AI in verified business context.

The Knowledge Graph

Encodes 50 years of SAP ERP engineering into semantic triples.

452,000

ABAP Tables

Semantically mapped across the ecosystem.

80,000+

CDS Views

Indexed with rich business context.

7.3 Million

Data Fields

Semantically connected throughout the graph.

400M+

Semantic Triples

Machine-readable triples forming the core engine.

Native Semantics Derived from SAP Objects & Processes

Meaning is native, not reconstructed — coming directly from decades of SAP domain modeling.

01 | TECHNICAL ENTITIES

Low-Level Data Sources

ABAP Tables & OData APIs

Mapping Scope:

- Maps raw ABAP tables directly (e.g., **EKKO** for purchasing header data).
- Integrates native entity sets directly from SAP OData APIs.
- Preserves complete technical metadata without loss of structure.

02 | BUSINESS OBJECTS

Core Domain Objects

POs & Sales Orders

Mapping Scope:

- Incorporates core business entities like **Purchase Orders** and **Sales Orders**.
- Translates technical relational tables into rich domain-specific objects.
- Embeds inherent business logic, validation rules, and status semantics.

03 | PROCESS MODELS

End-to-End Workflows

Procure-to-Pay & Order-to-Cash

Mapping Scope:

- Includes full end-to-end models like **Procure-to-Pay** and **Order-to-Cash**.
- Connects multi-object lifecycles across enterprise process steps.
- Provides full enterprise context directly derived from SAP standards.

SAP Business Data Cloud

Unifies data integration with the Knowledge Graph core.

Platform & Integration

Unified Platform

Brings together SAP BTP, Business Data Cloud, and AI Foundation.

Data Integration

Combines data integration, federation, and data marketplace capabilities.

Lakehouse Core

Lakehouse Architecture

Features an Apache Iceberg-native lakehouse via Dremio.

Semantics & Governance

System of Understanding

Connects business semantics, canonical models, and governed data products.

SAP Datasphere: Automated Ontology Generation

Seamlessly transforming onboarded data into rich business context and unified semantics across hybrid environments.

01

hub

Knowledge Core

Serves as the foundational knowledge core within the SAP Business Data Cloud ecosystem.

02

schema

Automatic Ontology

Automatically creates an ontology representing complex data relationships as data is integrated.

03

domain

Business Context

Preserves inherent business context directly from mission-critical sources like SAP S/4HANA.

04

system

Unified Experience

Unifies semantics, data products, and modeling seamlessly across hybrid cloud environments.

Master Data Governance and Reltio create trusted golden records for AI agents.

SAP Master Data Governance

Enterprise Rules & Governance

01

Golden Records

SAP Master Data Governance creates a golden record for every domain.

02

Preserved Semantics

Ensures one governed model preserves semantics across every business entity.

Reltio

Cloud-Native Performance

03

Cloud-Native MDM

Reltio provides cloud-native Master Data Management unification.

04

Current Views

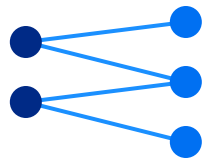
Delivers 'continuously current views' to feed autonomous agents.

SAP AI Foundation: Neuro-Symbolic AI Operating System

Platform Components

Combines SAP AI Core and the Generative AI Hub

Neural Models

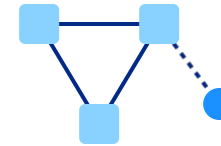


Perceptual & Generative Processing

Manages the complete lifecycle of Large Language Models (LLMs) and foundation models.

- Generative AI Models
- LLM Orchestration
- Deep Learning Frameworks

Symbolic Reasoning



Deterministic & Business Logic

Integrates the Knowledge Graph, business rules, and enterprise ontologies.

- Enterprise Knowledge Graph
- Business Rules Engine
- Domain Ontologies

Unified Lifecycle Management

Manages the full lifecycle of machine learning and generative AI models on SAP Business Technology Platform (BTP).

The Knowledge Graph grounds Joule agents in verified business processes.

01

Process Grounding

The Knowledge Graph provides the semantic backbone for process grounding.

02

Trusted Data Layer

SAP Business Data Cloud acts as the unified, trusted data layer.

03

Contextual Enrichment

Enriches data with business semantics to understand enterprise connections.

04

Reliable Action

Enables Joule Agents and Assistants to act reliably through business applications.

Proprietary foundation models process structured tabular data and ABAP code

SAP-RPT-1.5

Structured Business Data Model

TabPFN Technology Integration

A foundation model for structured business data, integrating TabPFN technology for advanced tabular reasoning and high-accuracy predictions.

Tabular Context

Grounds AI in full business context via the Knowledge Graph, mapping enterprise relationships and schema seamlessly across data models.

SAP-ABAP-1

Code Foundation Model

Dedicated ABAP Architecture

A fully managed code foundation model built specifically for ABAP development, optimizing developer workflow and domain logic.

Training Scale

250M+ Lines

Trained on over 250 million lines of SAP ABAP code and enterprise best practices.

Primary Reasoning with Model Context Protocol

“Anthropic Claude is embedded as the primary reasoning and agentic capability across SAP's portfolio, powered seamlessly through Joule.”

Joule Integration

Claude's advanced AI capabilities are seamlessly powered through Joule.

Model Context Protocol

Uses open MCP standards to coordinate intelligent AI agents across systems.

Business Context Layer

The Knowledge Graph provides the enterprise context layer for Claude's reasoning.

Knowledge Graph grounding prevents enterprise AI hallucinations.

01

Metadata Mapping

Maps entity types including ABAP tables, business objects, and OData APIs.

02

Verified Context

Grounds AI in verified business context to deliver explainable responses.

03

Traceable Decisions

Provides deep, traceable explainability for every AI recommendation.

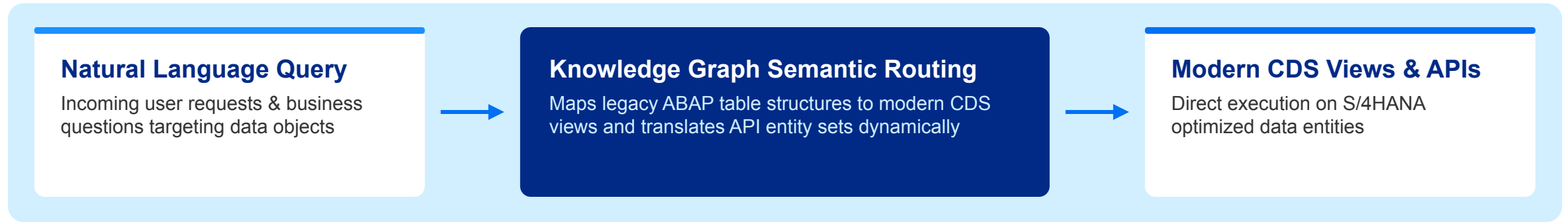
04

Risk Mitigation

Prevents LLMs from misinterpreting relationships or referencing deprecated structures.

Semantic Mapping to Modern CDS Views

Semantic mapping routes queries to modern CDS views instead of legacy tables.



01

Proper Routing

Understands relationships between legacy ABAP tables and modern CDS view replacements.

02

API Translation

Connects business objects to their correct OData API entity sets.

03

Query Translation

Translates natural language queries directly to the correct endpoint.

04

S/4HANA Relevance

Critical for environments where ECC tables have been replaced with new structures.

Strategic acquisitions strengthen the SAP Knowledge Graph ecosystem.

€1B+ Investment

Prior Labs

A €1B+ investment bringing TabPFN, the top-performing tabular foundation model.

Apache Iceberg

Dremio

Provides an open data lakehouse platform, making SAP Business Data Cloud Apache Iceberg-native.

\$185M ARR

Reltio

Delivers cloud-native Master Data Management with \$185M ARR.

Combined Stack: Enterprise Data & AI Integration

Forms a comprehensive enterprise data and AI stack focused on operational data.

SAP HANA Cloud Knowledge Graph Engine

Native In-Memory Semantic Processing Architecture



Multi-Model Engine

Operates seamlessly alongside existing specialized engines within SAP HANA Cloud:

- Spatial Engine
- Property Graph Engine
- Vector Engine



W3C Standards Compliance

Built upon open industry standards for semantic data interoperability:

- **RDF:** Resource Description Framework for standardized data representation
- **SPARQL:** Expressive graph query language for data retrieval



Schema & Validation

Rigorous semantic definition and structural governance frameworks:

- **OWL Ontologies:** Formal class hierarchies and complex relationship mapping
- **SHACL:** Shapes Constraint Language for declarative data validation



Visual Modeling

User-friendly visual knowledge graph management and integration:

- **metaphactory Integration:** Seamless toolset for end-to-end visual semantic modeling
- Accelerates deployment for domain experts and data engineers

SAP HANA Cloud

Enables hybrid GraphRAG without external databases

01 Unified Architecture

Houses both a high-performance Vector Store and a native Knowledge Graph Engine in a single database context.

02 Python Integration

Uses the [langchain-hana](#) package to execute SPARQL queries seamlessly via LangChain workflows.

03 Hybrid Retrieval

The [hana-kgvector](#) library combines deep graph reasoning with fast vector search capabilities.

04 Simplified Stack

Builds Graph RAG applications efficiently without stitching together multiple external databases.