PortfolioXpert

From Fragmented Product Data to Portfolio Intelligence

Using Knowledge Graphs in neo4j

SIEMENS

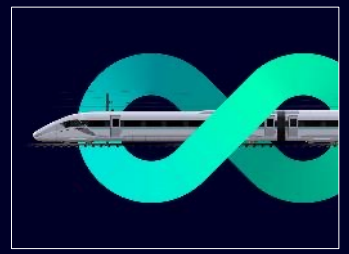
Portfolio of Siemens Digital Industries and Smart Infrastructure

Industrial Business

Digital Industries

Smart Infrastructure

Mobility



Siemens Healthineers[1]

€ 78.9 bn
Revenue 2025

268,800
Employees (of total 318,000)

Selected Core Technologies

- Future of Automation
- Data & Artificial Intelligence
- Integrated Circuits & Electronics
- Simulation & Digital Twin
- Power Electronics
- Cybersecurity & Trust
- Software Systems & Processes
- Advanced Manufacturing & Circularity
- Sustainable Energy & Infrastructure
- Connectivity & Edge

1 Publicly listed subsidiary of Siemens; Siemens' share in Siemens Healthineers is 67%

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Factory Automation: Selected Solutions for machine building - Additive Manufacturing “3D-printing”

Digital Industries

Factory Automation

Further Digital Industry portfolio:

- Motion Control
- Process Automation
- Software
- Customer Services

Totally Integrated Automation (TIA)

TIA ecosystem

Management

- Edge Marketplace
- Open Operating
- Applications
- Digital Twin Cloud Services
- Manufacturing Execution
- Plant Lifecycle Management
- Operations Intelligence
- Simulation

Operation

- Edge Management
- Network Management
- Automation Engineering
- Energy Management
- Maintenance

Control

- Controller
- HMI
- IPC
- Industrial Communication
- Motion Control
- CNC

Field

- Industrial Control
- Distributed I/O
- Drive Systems
- Process Instrumentation
- Identification and Locating
- Power Supply and Distribution

TIA use cases and additional offerings

- Planning and building control panels
- Machine Control Software (AIXPATH)
- Energy Management
- AI in Industry
- OT/ IT Integration
- Open Communication (OPC UA)
- Robot Integration
- Handling Toolbox
- Simulation for Industrial Systems
- Automated Guided Vehicles

Software workflow integration

Fixed-Plane AM processes

- NX Additive Manufacturing
- Direct File Output supporting standard formats
- Connect to Materialise Build Processor Framework
- NX AM External Interface Framework
- Siemens NX Build Processor

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Smart Infrastructure, selected portfolio

Industrial Business

Smart Infrastructure

Increase grid capacity faster with

Gridscale X

Improve electrical infrastructure reliability faster with

Electrification X

Drive building efficiency faster with

Building X

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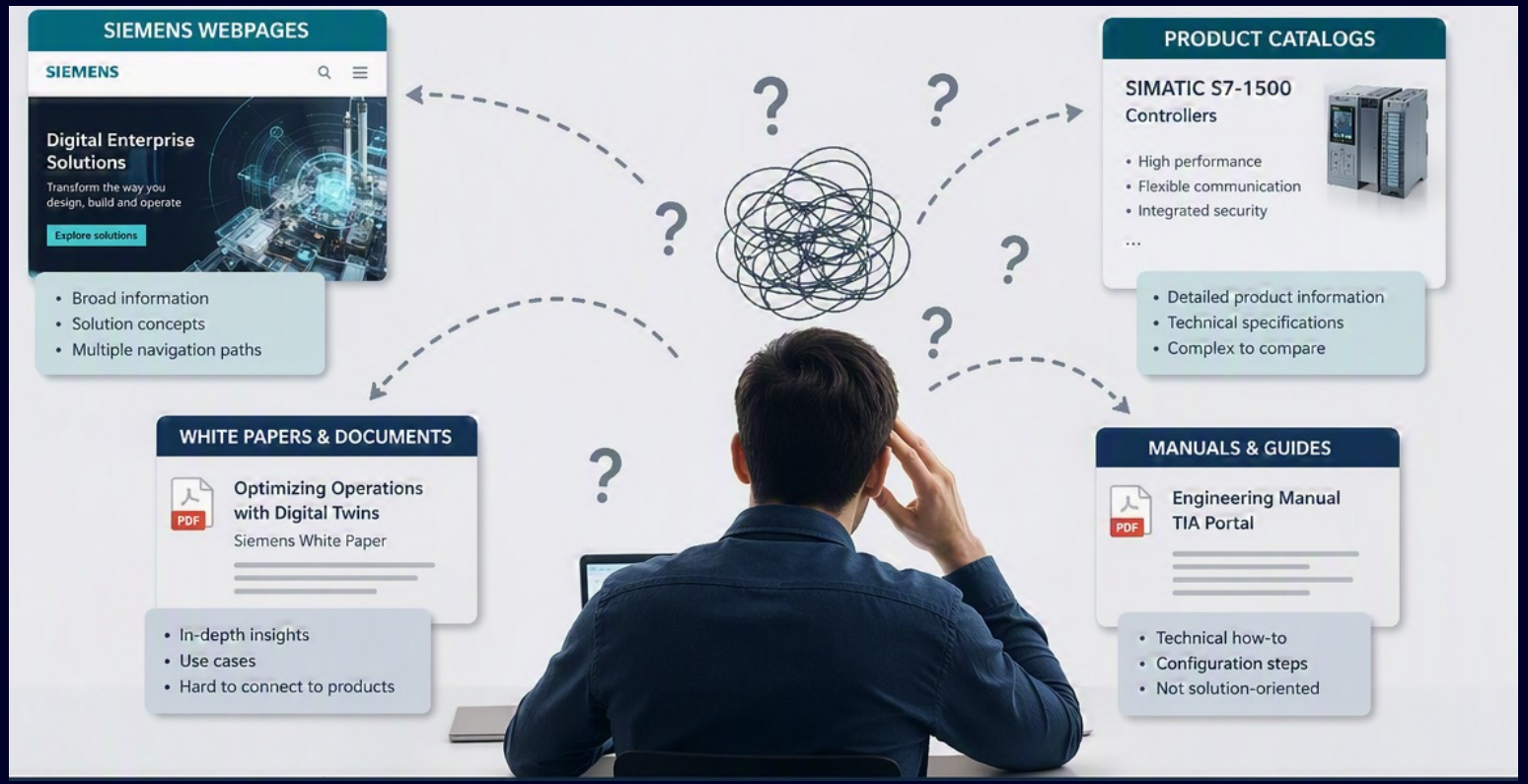
Information scattered across webpages, catalogs and documents



AI generated

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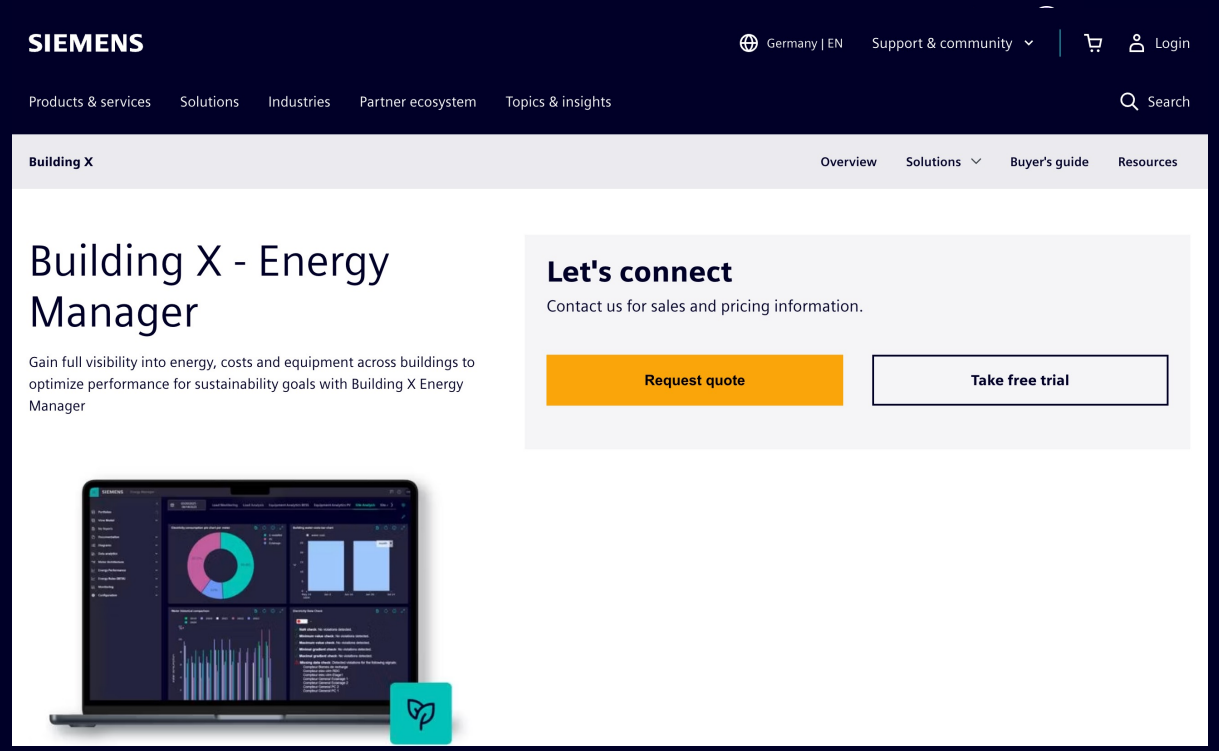
Conversational search to replace the “inside out” view navigation

Example: Siemens.com, Xcelerator Marketplace 2k offerings



Navigate by

- Products & services
- Solutions
- Industries
- Partner ecosystem
- Topics & insights

Use AI conversational search, with RAG

I am looking for a dashboard to monitor the sustainability KPIs of our buildings

That's great! Can you please provide more details about the specific area you'd like to enhance?

I want to track our energy consumption and carbon emission footprint.

Based on your requirements, I recommend exploring our solution Building X – Energy Manager. ….

Current AI search is not using Knowledge Graph go live later this year!

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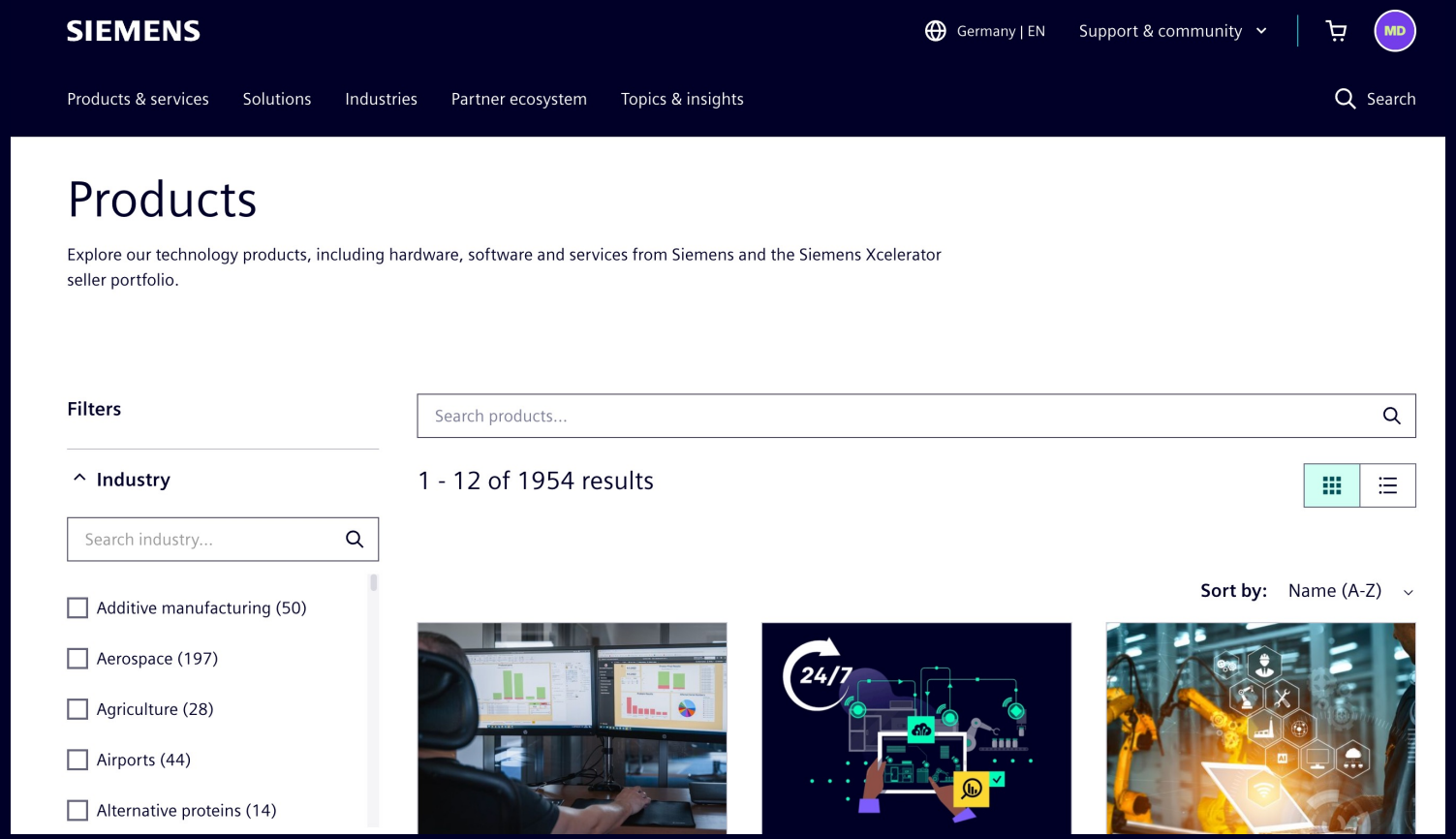
Goal is to solve challenging questions, and more scope

Siemens Xcelerator Marketplace



what is the difference of SIMOTION Scout and Sinamics Startdrive? How do they complement each other for my machine building production?

SIMOTION SCOUT is…
Sinamics Startdrive is…

In a typical machine building scenario, you would use SCOUT for the motion controller logic and Startdrive for configuring and commissioning the drives that execute the motion commands.

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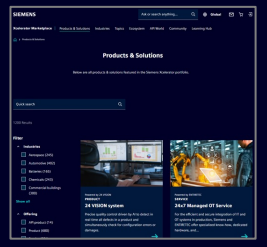
Portfolio information distributed across numerous platforms and document libraries

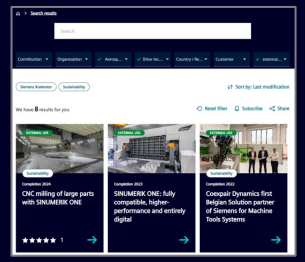
Marketing and Commerce solutions (selection)

Siemens.com
incl Xcelerator Marketplace



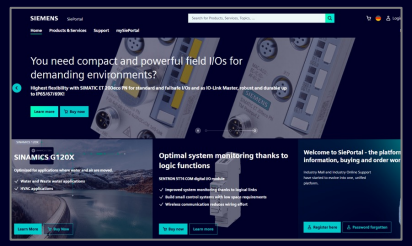
Product description
Topic
Benefits.
…
Industry…

References
Customer Testimonials



Customer
Use case
Industry…
Benefits
…
Products

SiePortal
e-commerce

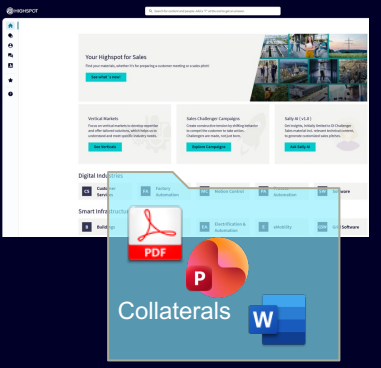


Product
Application
Benefits
Configuration
Files.
…

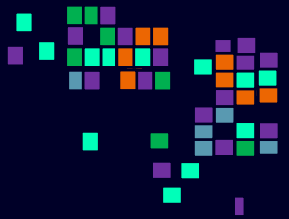
Product Master
PMD

Product name
Details
- Technical
- Commercial

Marketing
HighSpots, SID, HIT,…



Product Brochure
Benefits
Use case…



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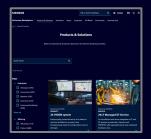
From Fragments to Structured Context with Knowledge Graphs

Highly unstructured, fragmented and redundant portfolio descriptions

Marketplace



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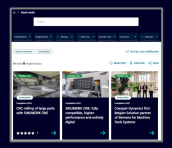
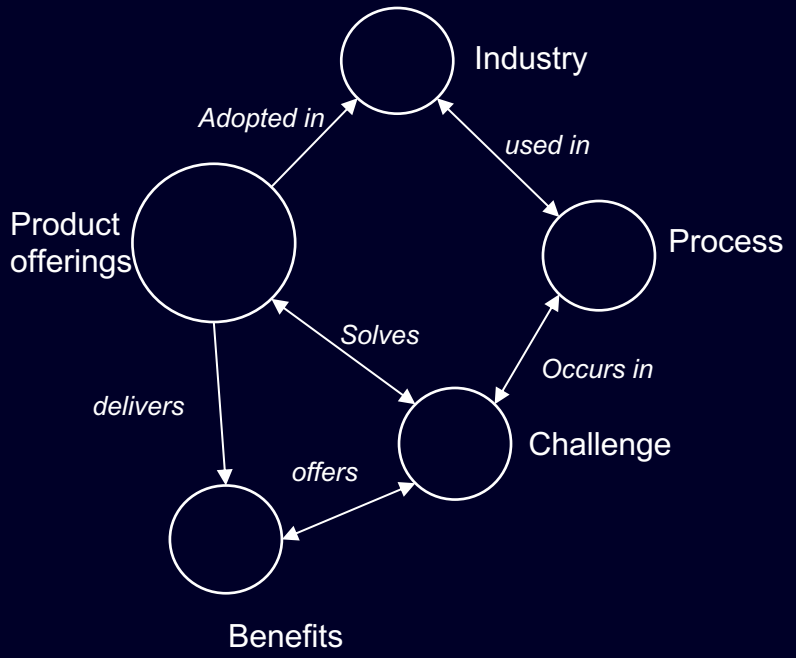


Commerce

Product Master

Continued…

Grounding answers on
- Organized context
- Relationships
- Multi-step and cross-source reasoning



Deterministic not Probabilistic responses

Indicative

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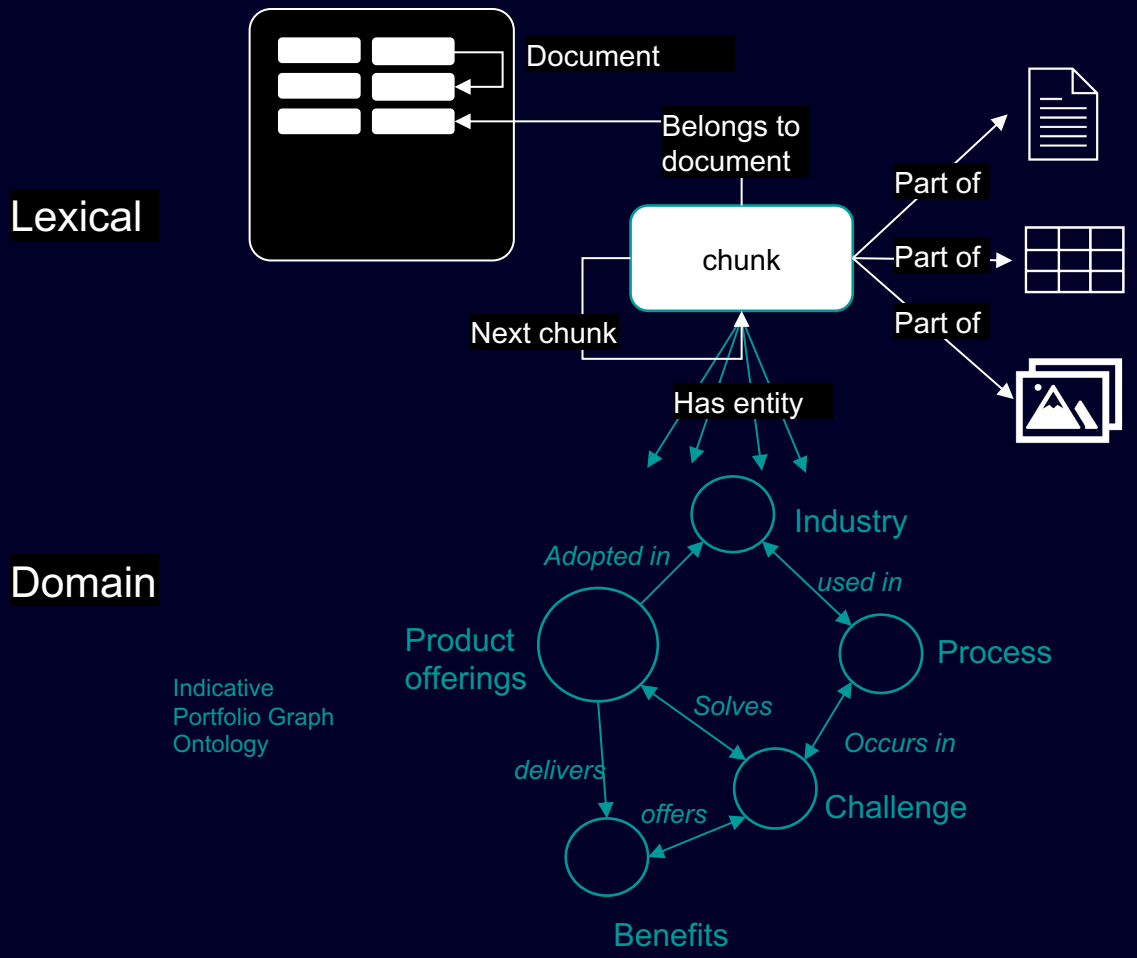
How can we organize unstructured text from many sources?

Ingestion of data, chunking and entity resolution



Source: adapted from example of Alex Gilmore neo4j https://neo4j.com/blog/developer/knowledge-graph-generation/

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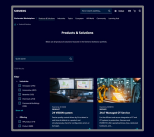
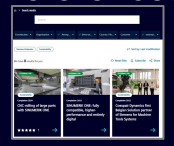
Graph RAG Architecture for PortfolioXpert

Joining tables from portfolio sources

Siemens.com



References



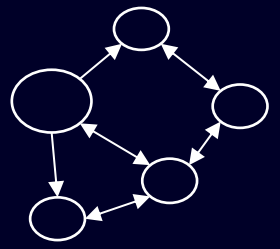
SiePortal

Product Master

Continued…

File repositories

Graph schema



Data loader

Vector Store

Ingestion

Document chunker

Text chunker

Graph schema

Text embedder

Data processing

Azure OpenAI API

neo4j

VectorIndex (:Chunk) [Emb]

FullTextIndex (:Chunk) [Text]

FullTextIndex (:RefProject) [Name, Desc, ...]

FullTextIndex (:PortfolioItem) [Name, Description]

Answer

Question

Streamlit

Frontend

API FastAPI

LangGraph

ReAct Agent

Agent Routing

Backend

Semantic Vector Tool

Semantic Text Tool

Text2Cypher Tool

RefProject Tool

PortfolioItem Tool

VectorCypherRetriever

Cypher Template

Text2CypherRetriever

Cypher Template

Cypher Template

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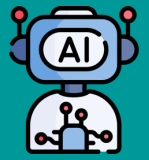
Product Context (Name)	**Product Context** (Vector)	**Product Context** (Text)	**Product Context** (Product Id)	**Ref Project Context** (Name)	**Any other question**
Cypher Query Template using ***Fulltext Index*** on Title & Description	Semantic Vector Search Using Vector Index on Chunks + Traversal	Text Search using ***Fulltext Index*** on Chunks +Traversal	Cypher Query Template	Cypher Query Template Using ***Fulltext Index*** on Title, Benefits, Description	Text2Cypher 1. Schema + Examples 2. Query 3. Execute

Message History

neo4j

Knowledge Graph

LangChain ReAct Agent



What do you know about the product SIMATIC ?

Product Context (Name)

Cypher Query Template using ***Fulltext Index*** on Title & Description

Product Context

Semantic Vector Search Using Vector Index on Chunks + Traversal

Product Context

Text Search using ***Fulltext Index*** on Chunks +Traversal

Product Context

Cypher Query Template

Ref Project Context

Cypher Query Template Using ***Fulltext Index*** on Title, Benefits, Description

Any other question

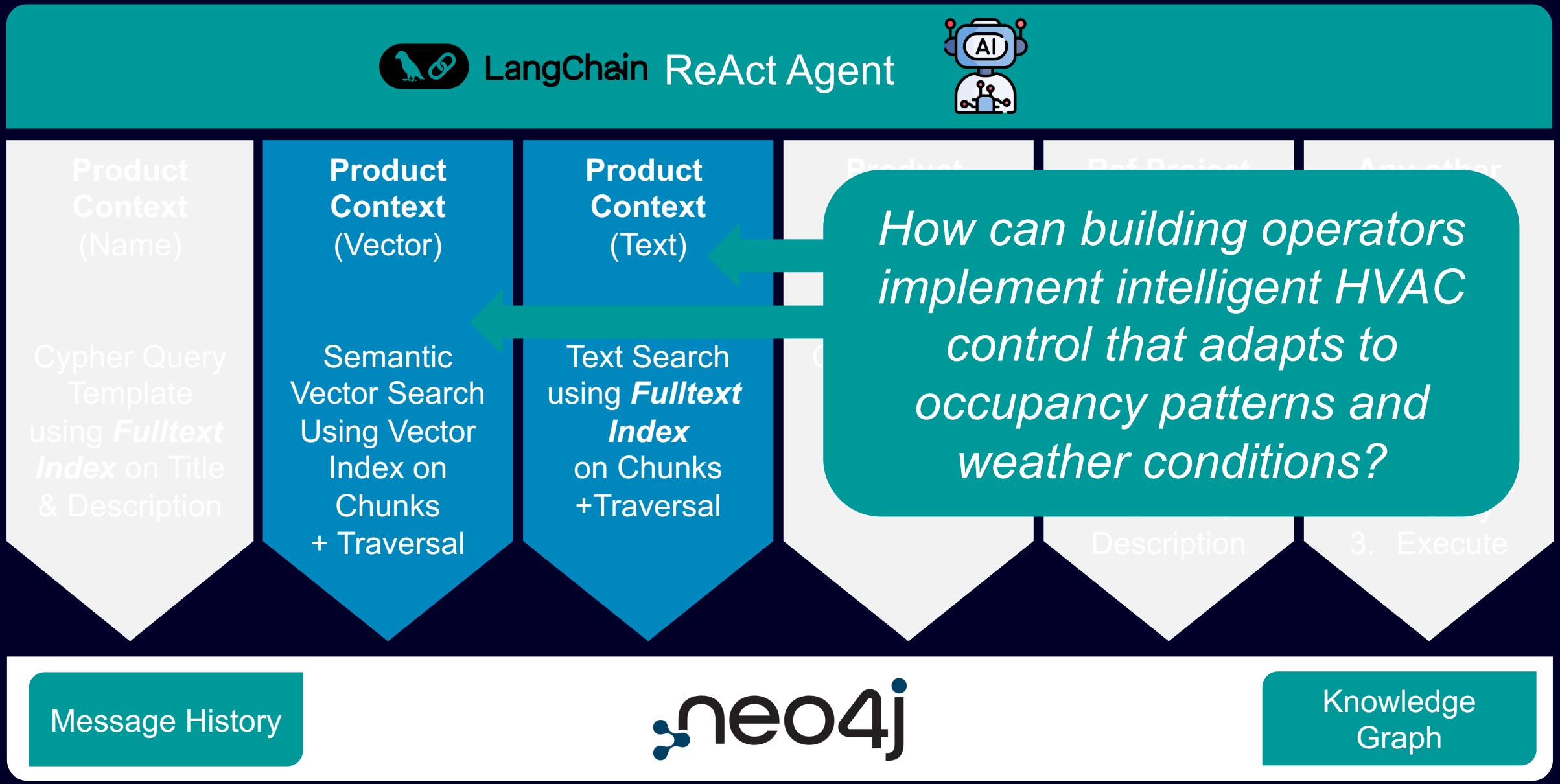
Text2Cypher

1. Schema + Examples
2. Query
3. Execute

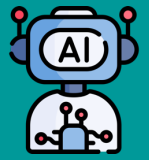
Message History

neo4j

Knowledge Graph


LangChain ReAct Agent
AI
Product Context (Name)
Cypher Query Template using *Fulltext Index* on Title & Description
Product Context (Vector)
Semantic Vector Search Using Vector Index on Chunks + Traversal
Product Context (Text)
Text Search using *Fulltext Index* on Chunks +Traversal
Description
3. Execute
How can building operators implement intelligent HVAC control that adapts to occupancy patterns and weather conditions?
Message History
neo4j
Knowledge Graph

LangChain ReAct Agent



What is the difference between product 2322-23345-89876 and 2322-23345-3344 ?

Product Context
(Product Id)

Cypher Query Template

Ref Project Context
(Name)

Cypher Query Template Using ***Fulltext Index*** on Title, Benefits, Description

Any other question

Text2Cypher

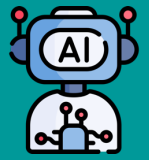
1. Schema + Examples
2. Query
3. Execute

Message History

neo4j

Knowledge Graph

LangChain ReAct Agent



Product

Product

Product

Product

Ref Project Context (Name)

Cypher Query Template Using ***Fulltext Index*** on Title, Benefits, Description

Any other question

Text2Cypher

1. Schema + Examples
2. Query
3. Execute

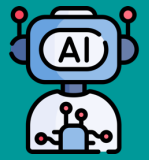
Which products were used at the project "BuildingX" in Croatia?

Message History

neo4j

Knowledge Graph

LangChain ReAct Agent



Product Context (Name)

Product

Product

Product

Ref Project Context (Name)

Any other question

Which Siemens internal products are art of "Commercial Building" industry have at least 5 reference projects?

Cypher Query Template using *Fulltext*

Fulltext on Title, Benefits, Description

Text2Cypher

1. Schema + Examples
2. Query
3. Execute

```
MATCH (p:PortfolioItem)-[:TARGETS_INDUSTRY]->(i:Industry)
MATCH (p)<-[:USED_PORTFOLIO_ITEM]-(rp:RefProject)
WHERE i.name = "Commercial Building"
  AND p.seller = "Siemens"
WITH p, count(DISTINCT rp) AS referenceProjectCount
WHERE referenceProjectCount >= 5
RETURN
  p.name AS productName,
  referenceProjectCount
ORDER BY referenceProjectCount DESC, productName
```

Knowledge Graph

Involving Neo4j Professional Services

1. **Technology advisory**
   Guidance on Neo4j architecture, data modeling, GraphRAG patterns, and best-practice usage

2. **Hands-on development support**
   Direct implementation support for Cypher queries, graph data structures, integrations, and solution components

3. **Product updates and roadmap insights**
   Regular updates on relevant Neo4j capabilities, new features, and potential improvements for the project

4. **Solution review and expert feedback**
   Review of the implemented approach, identification of optimization opportunities, and feedback on scalability, maintainability, and performance

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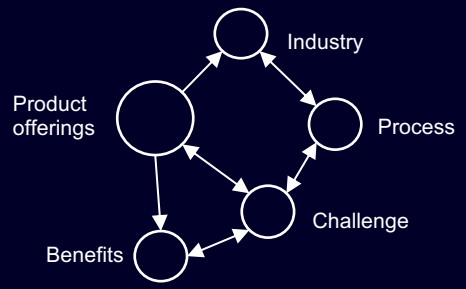
christopher.rost@neo4j.com

neo4j

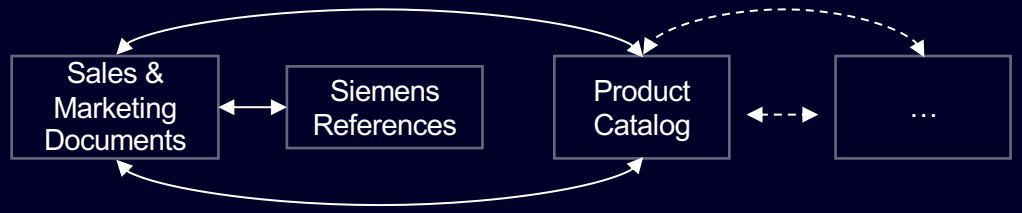
PortfolioXpert
Benefits of a Knowledge GraphRAG[1] approach for AI Agents using neo4j

Context from Dots Across Silos



Deterministic not Probabilistic responses

Deeper Reasoning



Entity resolution of dispersed information with semantical relevancy

Graph RAG performs much better

Accuracy Gain[2]

+ 20 - 30%

Answered ~80%
what standard AI could not

1) Retrieval Augmented Generation

2) compared to standard RAG Arxiv.org, mdpi.com developer.nvidia.com

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