



SUNIL KAKLIJ

# **KNOWLEDGE GRAPH FOR MULTI BRAND ENGINEERING COLLABORATION**

**OSLC FEST 2021  
2021-11-03**

**SCANIA**

# Who AM I ?



Sunil kaklij  
Lead Architect / Solution Architect

Architecture portfolio and Management  
Product Development IT (R&D)  
Scania CV AB, Sweden





# Why Are We Here Today?

- Share our experience & expectations on using RDF and OSLC technology
- Use case: Enable Collaboration by keeping track of Engineering Data exchange between partner OEMs and Suppliers.
- This presentation aims at describing :
  - Business needs
  - Challenges
  - Architecture
  - Learnings
  - Looking forward

*(Focus only on knowledge graph technology & usage)*



# About Scania

- Founded in 1891
- Part of VW group
- Main products are heavy trucks and buses
- Worldwide production and sales
- 50 000 employees
- 5000 engineers
- 2000 engineers in electronics and software
- 100 000 sold vehicles per year
- Vehicles in operation:
  - > 1 000 000
  - > 400 000 connected





# TRATON

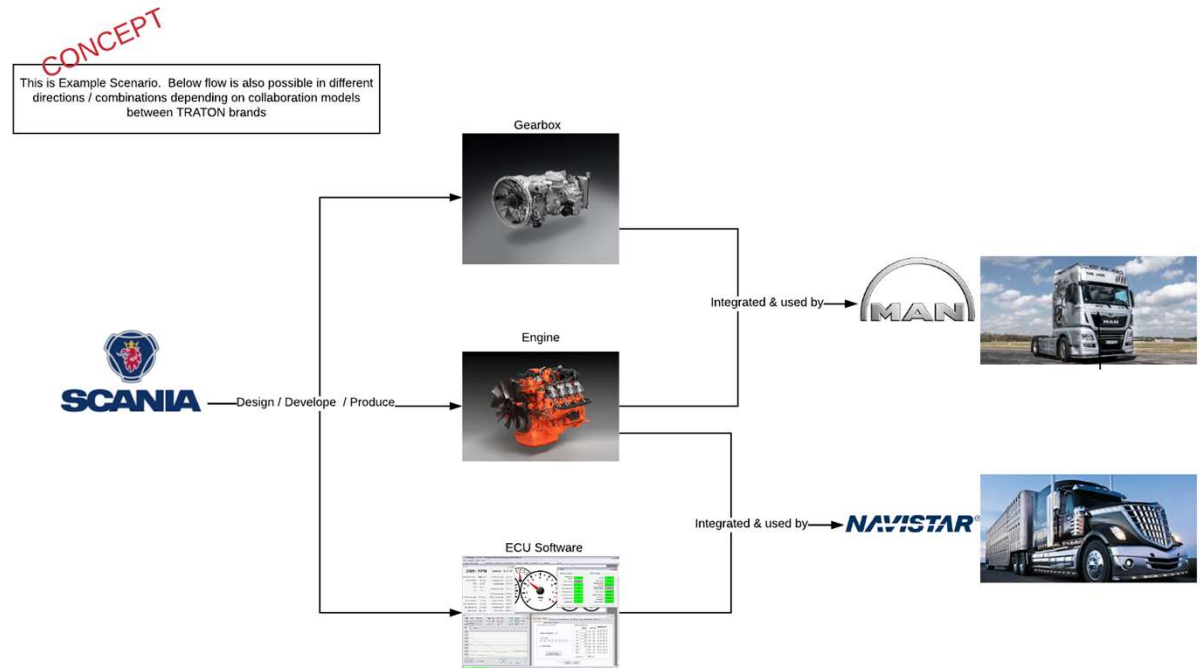






# Our context

Enable TRATON  
Partner brands for  
joint development,  
Integration and use of  
common components  
within group to benefit  
intellectual synergy  
and global scale





# Business Value



Multibrand Engineering  
collaboration



Partnerships that  
accelerate growth



Scale and efficiency



# Foundation Technologies for Growth



Digital Thread



Digital Twin



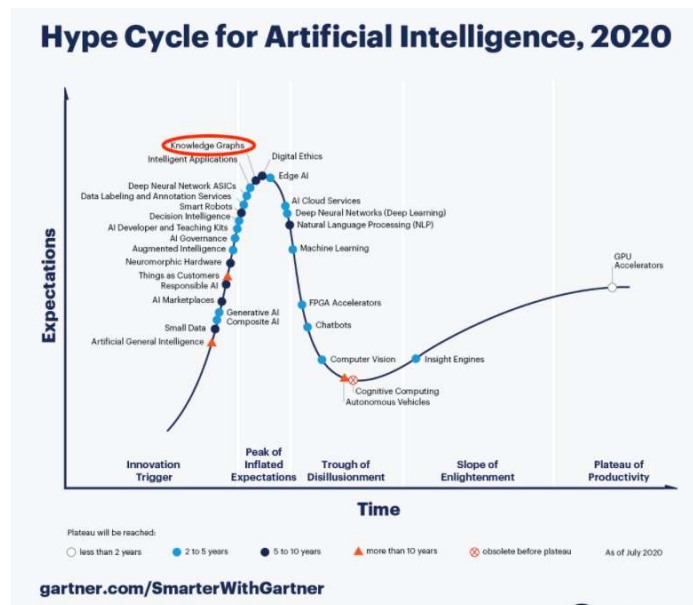
Digital Trust





# What is knowledge graph & Why ?

- knowledge graph is a knowledge base that uses a graph-structured data model or topology to integrate data. Knowledge graphs are often used to store interlinked descriptions of entities – objects, events, situations or abstract concepts – while also encoding the semantics underlying the used terminology

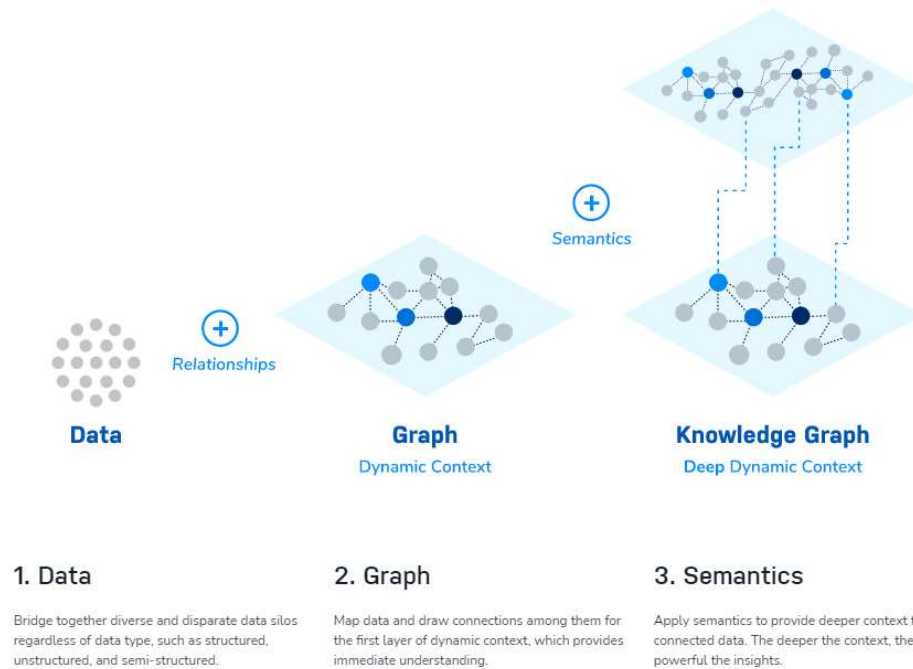


Number of specific uses and applications rely on knowledge graphs.  
Examples include

- Data and information-heavy services such as intelligent content and package reuse,
- Responsive and contextually aware content recommendation,
- knowledge graph powered drug discovery,
- semantic search,
- investment market intelligence,
- information discovery in regulatory documents,
- advanced drug safety analytics,
- Enterprise Data Governance
- Research and Knowledge Discovery
- Many more...



# knowledge graph



## Deeper Context for More Powerful Insights

Only graphs excel at managing connected data and complex queries, because relationships are at the core of the data model. Knowledge graphs add an additional layer of context to deepen the connections.



### Bridge Data Silos

Connect and contextualize the variety of structures and formats of your data so you can operate more efficiently and effectively.



### Complete Visibility

Gain complete visibility into data, processes, products, customers, and ecosystems for increased efficiency and enhanced security.



### Increased Efficiency

Automate critical functions to automatically surface risk and indirect relationships, enforce dependencies and track compliance.



### Improved Governance & Compliance

Track data throughout its entire lifecycle – from source to consumption – to build trust and maximize the value of your data governance.



### Better Predictions for Better Decisions

Unearth highly predictive relationships for analytics and machine learning models to make more informed predictions and decisions.

Reference [neo4j.com](https://neo4j.com)



# Business Scenario for Scania

## TRATON Strategy Statement

*We want to become a Global Champion.*

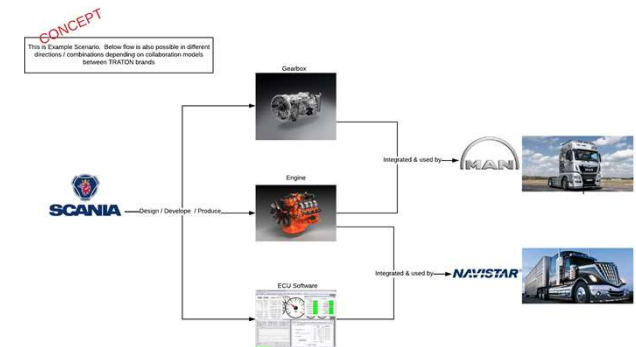
*TRATON is striving to become a Global Champion of the truck and transport services industry. We build upon our strong base by further expanding our brands' presence and utilizing our strong network of strategic partners to access all major profit pools. The Group is aiming to realize significant synergies through cooperation between TRATON's brands and strategic partners.*

## Business Scenario for Scania

*Scania will design & develop common components such as gearboxes, engines, ECU softwares etc which will be used by MAN and Navistar in their Vehicles. Scania Design Engineers needs to collaborate with MAN and Navistar Design engineers during development phase to ensure these components are fit for use in various vehicle configurations and environments.*

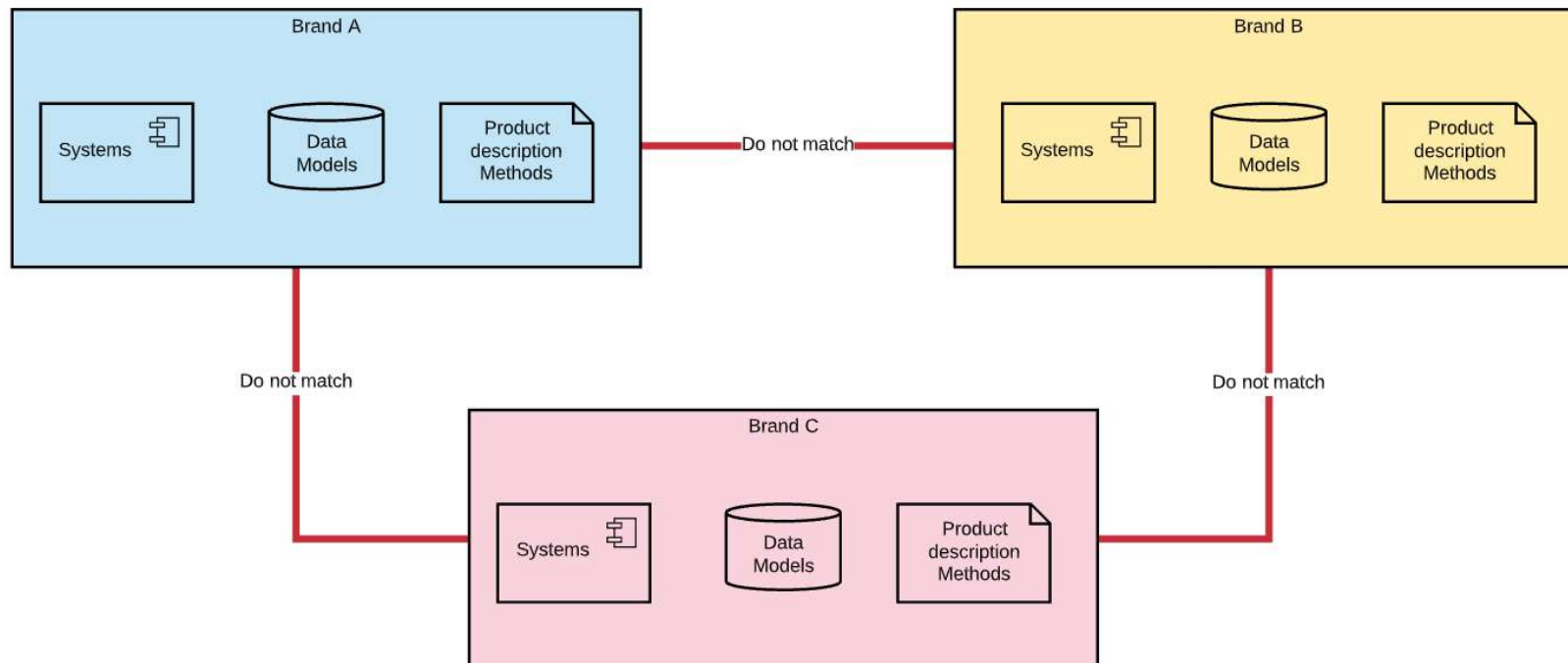
*As design owning brand Scania would like to keep track of its component usage by different brands and map the identity of parts and components used by these brands in their internal systems for better traceability and collaboration.*

*This business scenario is also applicable when MAN or Navistar is Lead brand for components which are used by other TRATON partners. hence the solution concept is also applicable for all TRATON brands.*



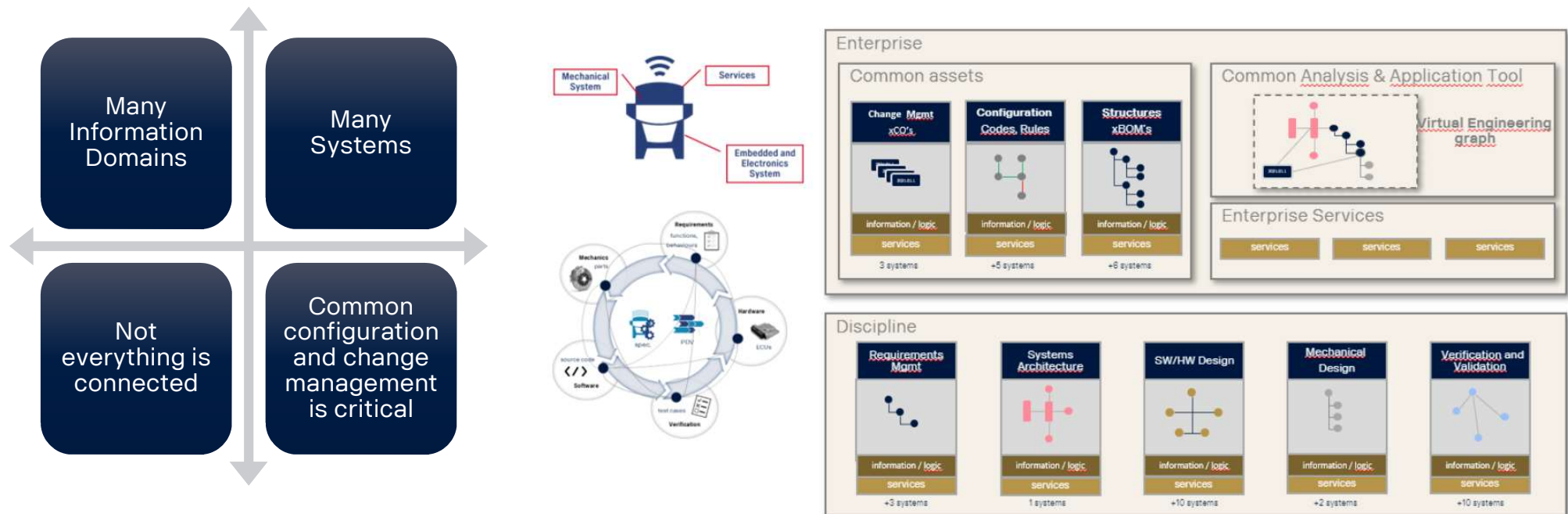


# Challenge





# Further challenge – each brand has





# Solution Need

Modularity

Federated approach where master data and user remains primarily in own systems

Automated data Exchange

Multibrand Solution & access Control

Data Sharing Traciablaity

Data Correlation Tracribality



# Solution Approach

Build Operational  
data Layer with help  
of Knowledge graph  
Technology

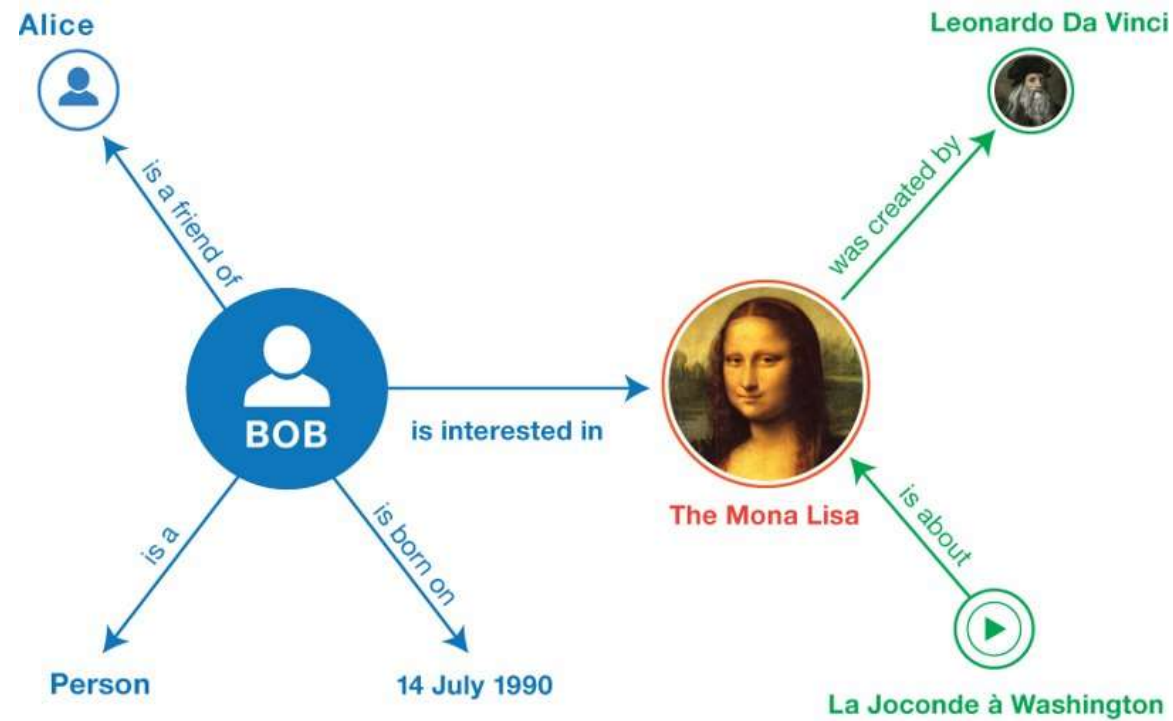
+

Connect with other  
solution Components  
(out of scope for this  
presentation)



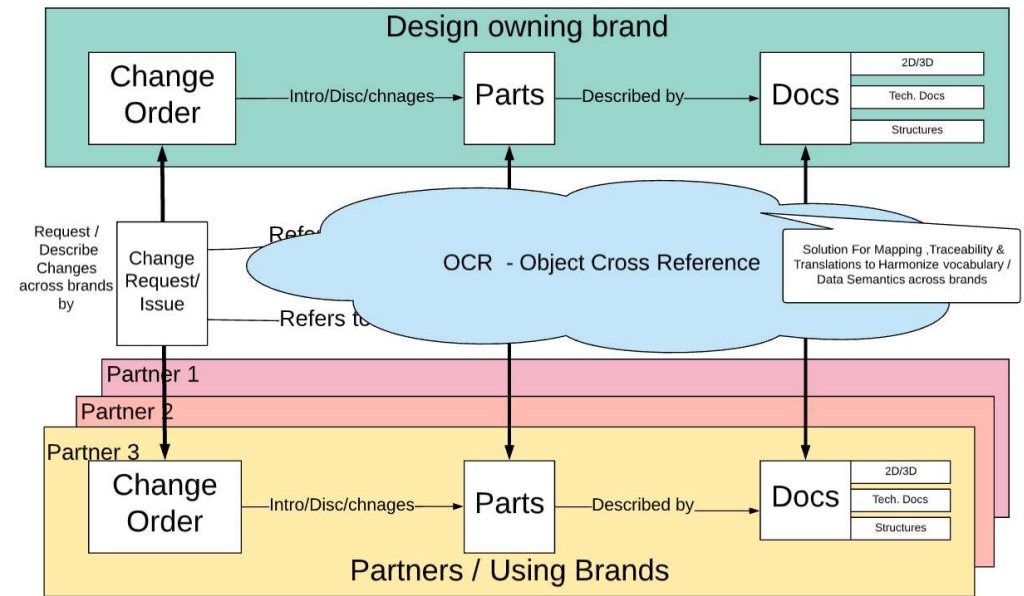
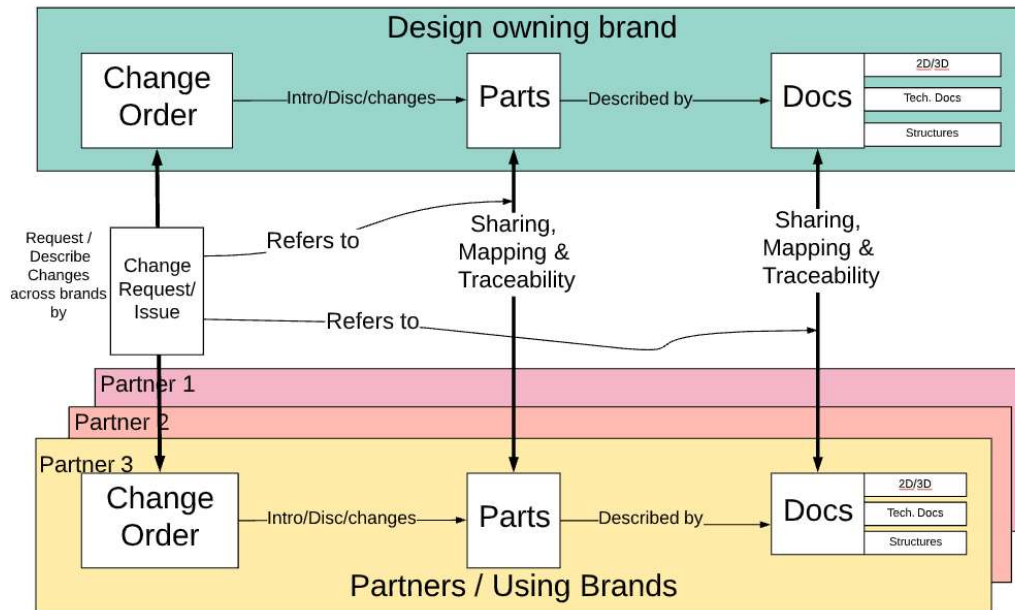


# The very basics



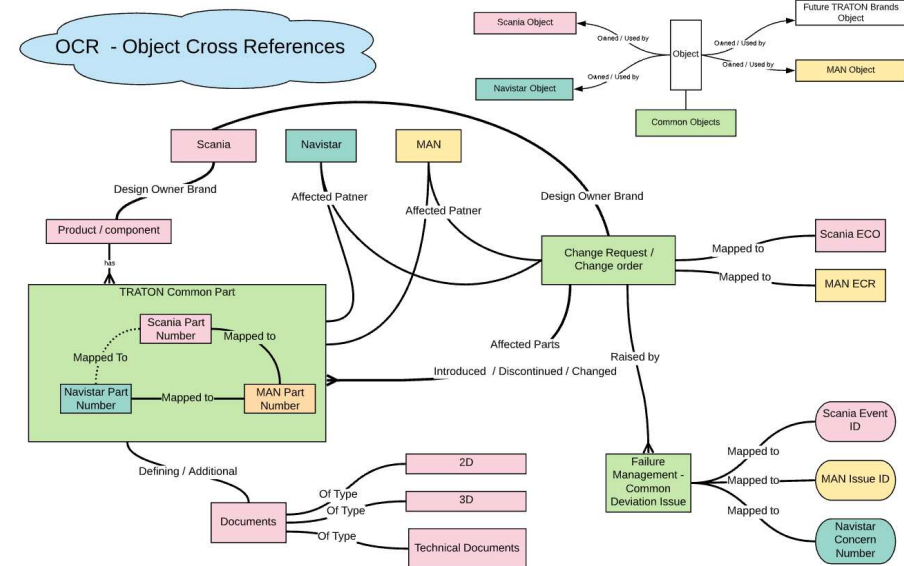
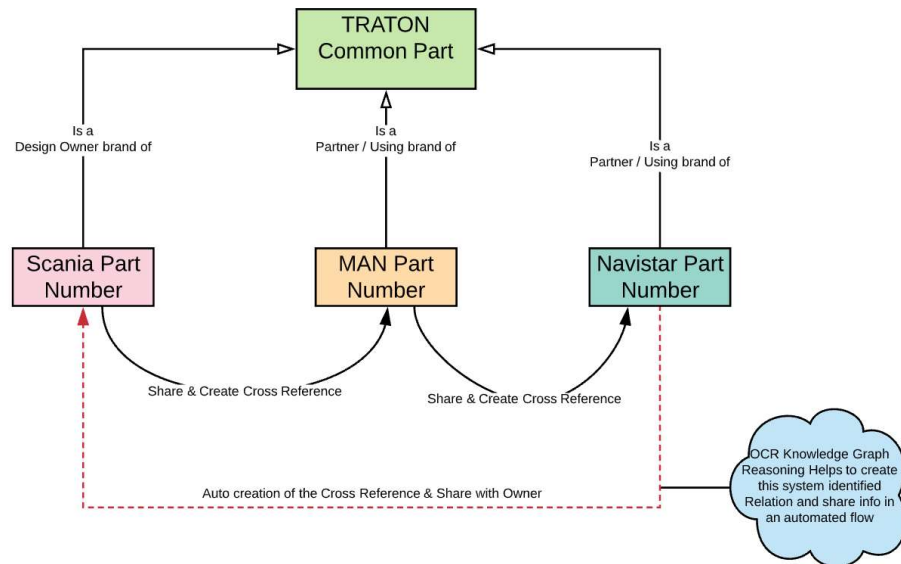


# OCR-Solution view



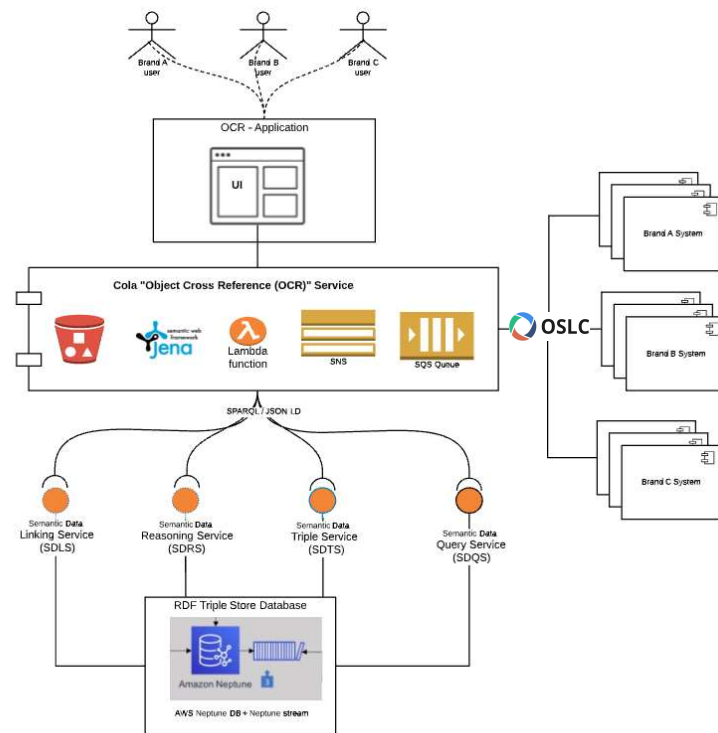


# High level Info view





# Technical Architecture



PROTOTON Collaboration Layer

Role

Cross References

DOCK DOB

Create Cross Reference

Search

ID, CRR or Description

Find

Filter by Scania Partner Brand

By Change Log Event

By Time Period

☐ Pending Changes

☐ Out of Sync

☐ Assigned to me

Apply Filters

Reset Filters

My Brand

Partner Brand

Partner Object

CRR ID

Change Log Event

Pending Changes

Sync Status

Log

Scania CV AB

321444

Quarrel of an axle and a continuous long description

Type: Part

DOB - MAN T&B

MAN T&B

61.44101-0234

Front axle power line to Munich that's a long and not so clear description

HO-78654321

Quarrel of an axle to Hino, Tokyo

Navistar

+ Add Partner Brand

Change DOB

CRR 548

VALIDATED

OUT OF SYNC

Update

CRR 454

NEW

PROPOSED FOR VALIDATION

Update

Scania CV AB

92144445

Front Axle

Type: Part

DOB - Scania CV AB

MAN T&B

61.44101-02344

Front Axle to Munich

+ Add Partner Brand

Change DOB

CRR 488

VALIDATED

Update

TRATON

Marking ID

895 549 578

VALIDATED

Update

MAN T&B

61.44101-0234

Full of an axle an axle to Munich

n32453487

Full of an axle to Illinois

Navistar Inc.

HO-78654321

Full of an axle axle to Hino, Tokyo

VWCO

+ Add Partner Brand

DOB Update Requested

CRR 448

VALIDATED

PROPOSED FOR DOB CHANGE

Update

CRR 423

NEW

PROPOSED FOR DOB CHANGE

Update

CRR 548

EXPIRED

2019-12-24

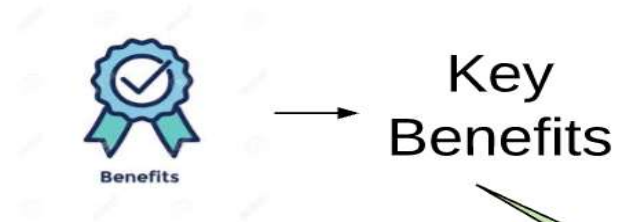
PROPOSED FOR DOB CHANGE

Update

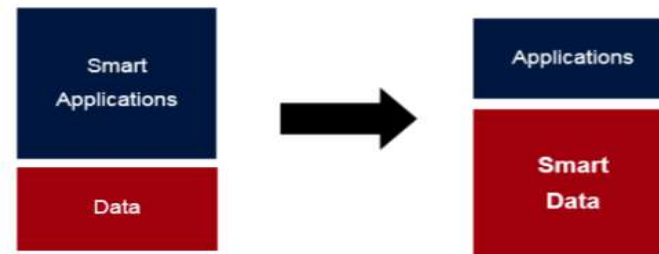


## OCR - Solution Summary

### Generic Solution for Cross Reference needs



1. Modern Data driven solution & architecture based on Linked data (RDF) Semantic Web Technology
2. Easy to scale for multi brand scenarios and add new brands without any major code changes
3. Can be used for mapping & cross referencing for any kind of collaboration objects (part, drawing, versions etc)
4. Data is managed consistently via standard REST APIs and multi brand approval routine integrated.
5. Each brand don't need to develop & maintain similar cross reference solution
6. Only one standardized interface integration towards central OCR service by each brand for data usage
7. Data is managed , access controlled and owned by each brand inline with involved brands in their collaboration
8. Benefits of the scalability , availability , Security of AWS Cloud Infrastructure





# Learnings

Graph data modeling is much flexible compared to traditional relational databases and No SQL database and suitable for managing complex object references and relations

Solution is Better prepared for cross-domain information analysis and advance use cases using AI/ML

RDF is powerful but has steep learning curve. difficult to find resources and competence

Keep end user view usage in mind during ontology design to ensure better query performance

For consumer application with Interface applications, We identified GraphQL endpoint on top of Triple store is far more efficient mechanism to build services compare to SPARQL or OSLC

OSLC is good and helpful to work with object referencing and delegated UI when it comes to ALM tools but hard to apply on legacy/ Custom Home built systems – Need better tooling and development framework / plugins for scaled usage



# Possible Next steps..



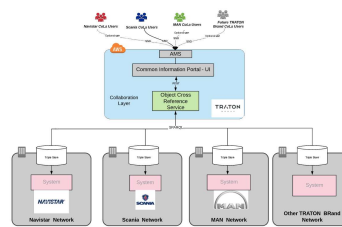
Include More information Objects ☺



Create Federated solution with other partners  
with similar mechanism- Data modeling  
harmonization and data integration using RDF  
and OSLC links




Establish better analysis and visualization tool







 Connect with LinkedIn

[sunil.kaklij@scania.com](mailto:sunil.kaklij@scania.com)



**Sunil Kaklij**  
Lead Architect, Product Development IT at Scania Group  
Södertälje, Stockholm County, Sweden · [Contact info](#)



**SCANIA**