semantic arts

Data-Centric Transformation Made Possible

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How Converting a Product Catalog to a Graph Reduced Complexity by Two Orders of Magnitude

Lessons Learned, Plus & Minus

Zazuko KG Conference

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Dave McComb

Packing Units

Unit Type of Package 1	PCE
Number of Units in Package 1	1
Package 1 Height	7.5 Cm
Package 1 Width	5.4 Cm
Package 1 Length	12.7 Cm
Package 1 Weight	456 G
Unit Type of Package 2	BB1
Number of Units in Package 2	4
Package 2 Height	8 Cm
Package 2 Width	22 Cm
Package 2 Length	13.2 Cm
Package 2 Weight	1.885 Kg
Unit Type of Package 3	S03

Main

Range	Multi9
Product name	Multi9 C60
Product or component type	Miniature circuit-breaker
Device short name	C60BPR
Device application	Distribution
Poles description	3P
Number of protected poles	3
[In] rated current	20 A at 25 °C conforming to EN/IEC 60947-2
Network type	AC
Trip unit technology	Thermal-magnetic
Curve code	C
Breaking capacity	6 KA Icu at 440 V AC conforming to EN/IEC 6094
	10 KA Icu at 415 V AC conforming to EN/IEC 609
	20 KA Icu at 240 V AC conforming to EN/IEC 609
	6 KA Icu at 440 V AC conforming to GB 14048.2
	10 KA Icu at 415 V AC conforming to GB 14048.
	20 KA Icu at 240 V AC conforming to GB 14048.

	IP40 (modular enclosure) conforming to IEC 60529
Pollution degree	IEC 60947-2
Overvoltage category	
Tropicalisation	68-1
Relative humidity	
Operating altitude	
Ambient air temperature for	
Ambient air temperature for	

Complementary

[Ue] rated operational vo	Hz
	Hz
	Hz
Magnetic tripping limit	AC
[Ics] rated service breaki	orming to EN/IEC 60947-2 - 44
	forming to EN/IEC 60947-2 - 41
	orming to EN/IEC 60947-2 - 24
	forming to GB 14048.2 - 440 V
	forming to GB 14048.2 - 415 V
	forming to GB 14048.2 - 240 V A
[Ui] rated insulation voltage	500 V AC conforming to EN/IEC 60947-2
[Uimp] rated impulse withstand voltage	6 KV conforming to EN/IEC 60947-2
Contact position indicator	Yes

Existing Product Catalog (small portion)
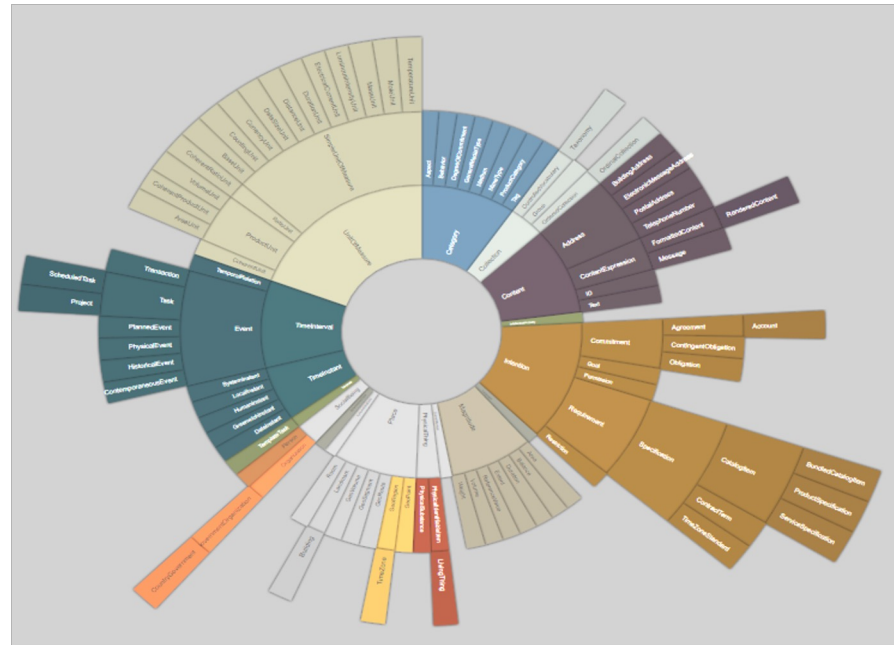
Full catalog database had 700 tables and 7000 columns

A Knowledge Graph to Help with Product Compatibility Evaluation

Design

Product Ontology based on gist. ~ 150 classes and ~ 150 properties

Loaded all catalog data into a triple store conforming to the ontology

Design

Product Ontology based on gist

```sparql
SELECT ?class ?pred (COUNT(?obj) AS ?objects)
WHERE {
    ?class a owl:Class .
    ?i a ?class .
    ?i ?pred ?obj .
    }

GROUP BY ?class ?pred
ORDER BY DESC(?objects
```

| class	pred	objects
spo:ProductReference	gist:specifiedBy	"28413978"
spo:ProductOffer	rdf:type	"4366263"
spo:ProductOffer	gist:hasDirectPart	"4366263"
spo:ProductOffer	gist:hasScope	"4366263"
spo:ProductOffer	gist:categorizedBy	"3988661"
spo:ProductReference	gist:describedIn	"3905976"
gist:Text	gist:expressedIn	"2403043"
gist:Text	rdf:type	"2403043"
gist:Text	gist:containedText	"2345949"
spo:ProductReference	rdfs:label	"2064908"
spo:ProductReference	gist:conformsTo	"1942544"
spo:ProductReference	gist:memberOf	"1841943"

Design

Product Ontology based on gi

```sparql
SELECT  ?pred (COUNT(?obj) AS ?obj
WHERE {
  ?class a owl:Class .
  ?i a ?class .
  ?i ?pred ?obj .
  }
GROUP BY  ?pred
HAVING (?objects > 500)
```

|	
rdfs:label	"2238590"
gist:specifiedBy	"28413978"
gist:hasDirectPart	"4610998"
gist:allocatedBy	"792975"
skos:altLabel	"62001"
gist:categorizedBy	"6033017"
gist:textValue	"222002"
gist:identifiedBy	"1059010"
rdf:type	"10032509"
gist:expressedIn	"2403043"
gist:describedIn	"4022005"
spo:compatibleWith	"920658"
spo:satisfies	"5848"
gist:containedText	"2346028"
gist:basedOn	"676478"
gist:hasUoM	"24967"

Complexity reduction
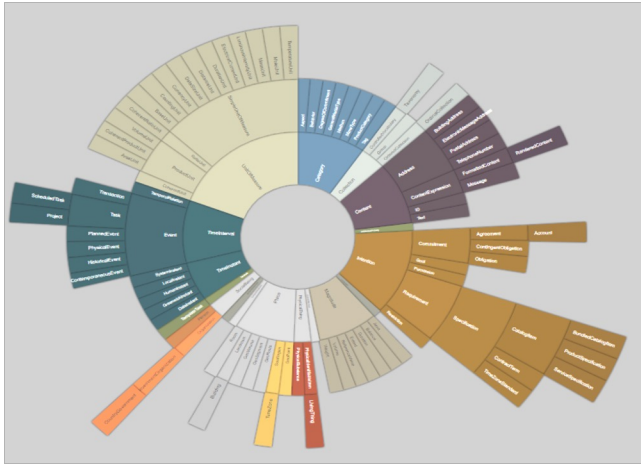
All product data in

46 classes

36 properties

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82 concepts

94-fold reduction in complexity
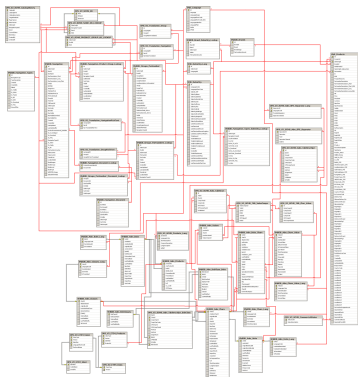
Existing catalog

700 tables

7000 columns

7700 concepts

Dynamically generate ETIM specification
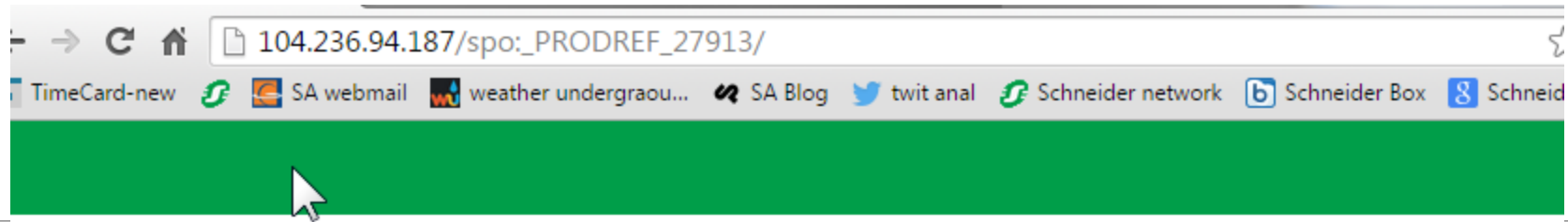
« Back to Products

ETIM Specification

27913

K60 - circuit breaker - K60N - 1P + N - 16A - C curve

Miniature circuit breaker (MCB)

EC000042

	Feature ID	Value/Lower Range	Unit	Upper Range
Number of protected poles	EF005548	1	each	
Release characteristic	EF000889	C		
Frequency	EF000416	50	Hz	60
Number of phases	EF000351	1P + N		

Map to eCl@ss standard

eCl@ss has over 10,000 classes

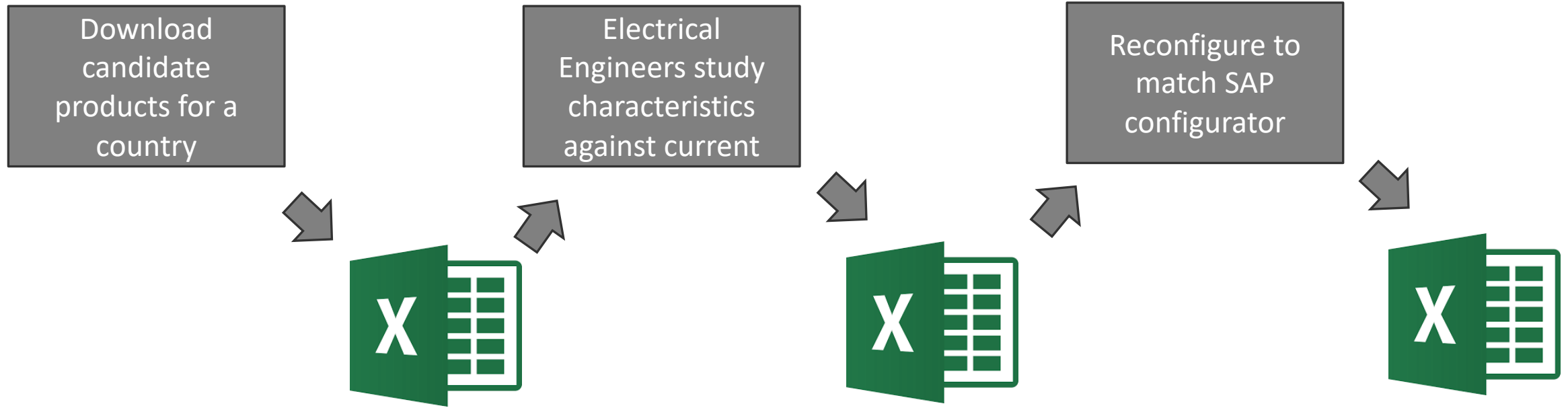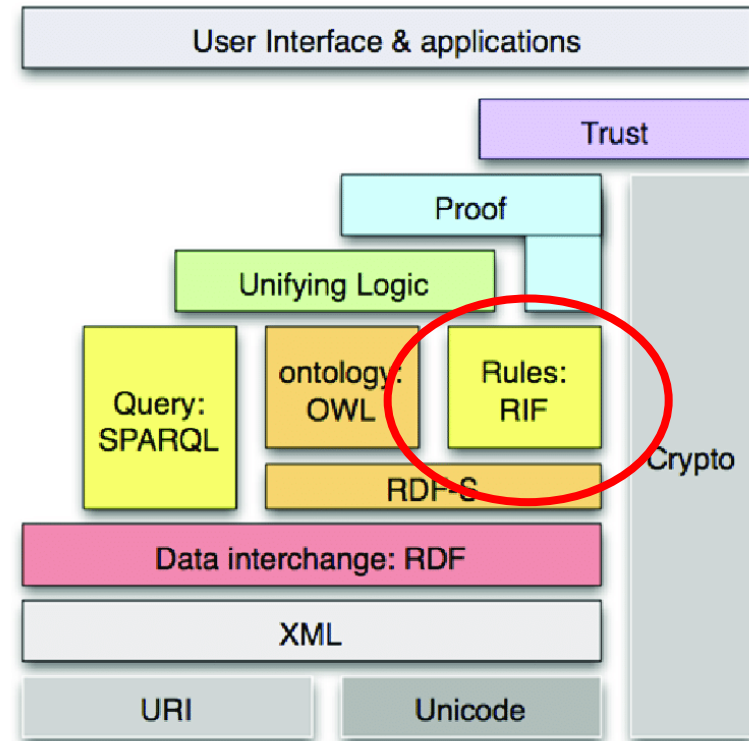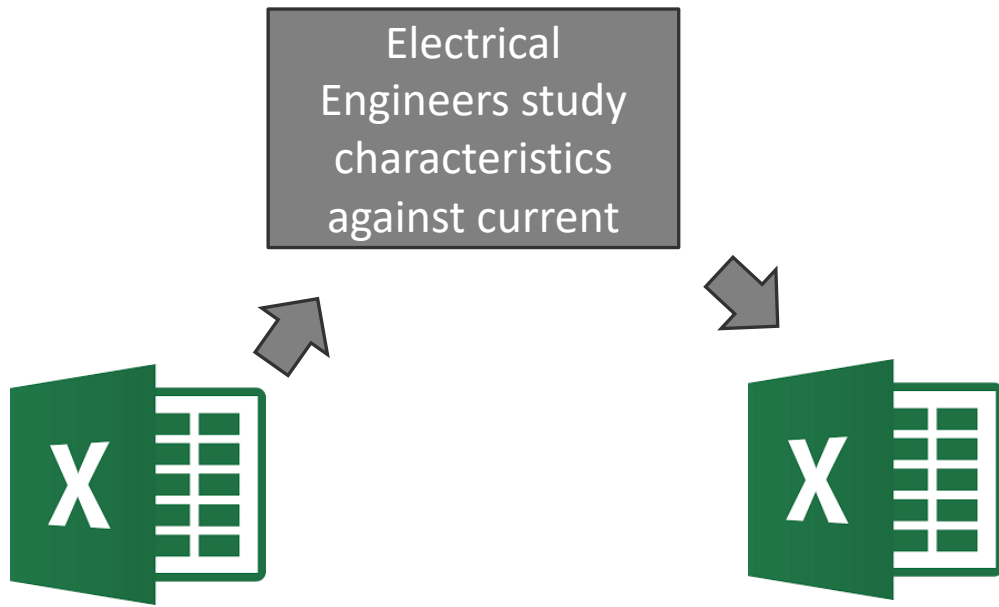|	OPS	Clipsal
		11,992 approx (Clipsal Products Table Parents only)
		18,801 approx (Clipsal Pricing Table Children Only)
Total Number of Products	**592,182 approx** (OPS2_Qualification database)	**18,801 approx** (confirmed by Anthony) This is because the actual reference is created by joining the Parent to the Child. 'Therefore the total products available are based on the number of children'… Anthony
Same products (using the primary keep of Clipsal parent table table)	**2,555 approx**	

What didn't work

Product Compatibility

As-is process

Download candidate products for a country

Electrical Engineers study characteristics against current

Reconfigure to match SAP configurator

First Attempt –reverse engineer in RIF

Electrical Engineers study characteristics against current

How semantic web technologies helped develop a **new approach to configuration**

From an internal Schneider deck at the time

Quick-Ref – configurator for modular devices

> **Pre-requisites**

> > **SPO** – Schneider Product Ontology – How can we model our products ?

> > **Data** – retrieved from OPS XML dumps **~7000 references**

> > **Configurator** – how to model the configuration logic ?

> **Failure**

> > We tried to rewrite the current configuration rules with a semantic rule engine

> > High level of complexity

> > Lots of Knowledge to capture, some knowledge is lost!

> > Hard to test properly…

> **We had to rethink our approach**

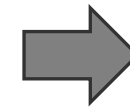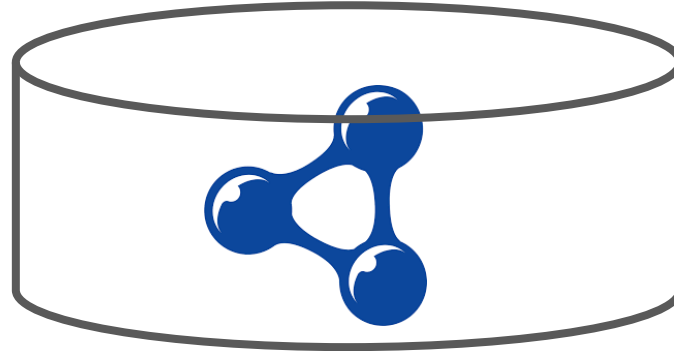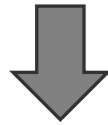> > We moved from **Rule Execution** to **Constraint Satisfaction Problem**
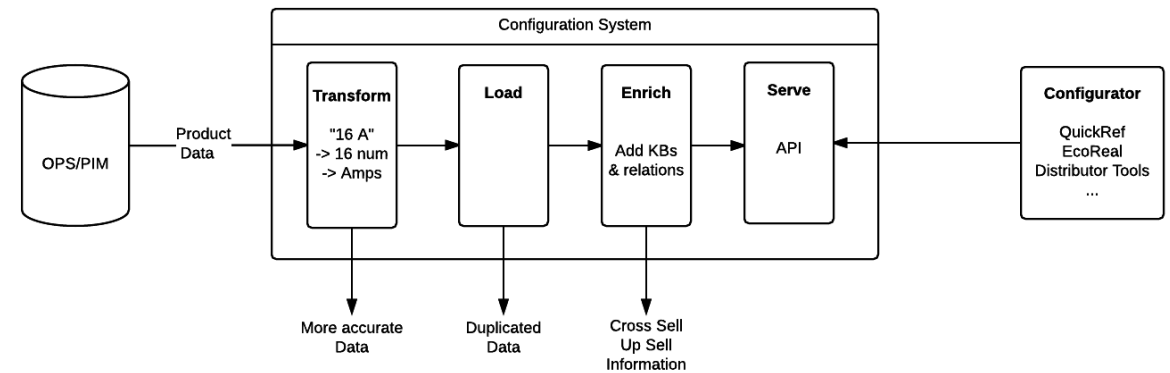
Current Approach to Configuration – Value is created and served in the context of the configurator and not reverted to the referential to be reused elsewhere

Second Attempt – Intrinsic Compatiblity

Interviewed design engineers

Compatibility Rules as
~20 SPARQL INSERT
Queries

Compatibility known
before offered in country

Main Device	First	Second	Third	Fourth
MCB/RCBO	Tripping Release	iOF/SD + OF	iOF/SD + OF	
MCB/RCBO	Tripping Release	iOF/SD + OF	iSD	
MCB/RCBO	Tripping Release	iOF/SD + OF	iOF/SD 24	
MCB/RCBO	Tripping Release	iSD	iSD	
MCB/RCBO	Tripping Release	Tripping Release	iSD	iOF
MCB/RCBO	Tripping Release	Tripping Release	iOF	iOF
MCB/RCBO	Tripping Release	Tripping Release	iOF/SD + OF	iOF
MCB/RCBO	Tripping Release	Tripping Release	iOF/SD 24	
MCB/RCBO	MSU	MSU	MSU	
MCB/RCBO	ARA/RCA	Tripping Release	iSD	
MCB/RCBO	ARA/RCA	Tripping Release	iOF	
MCB/RCBO	ARA/RCA	Tripping Release	iOF/SD+OF	
MCB/RCBO	ARA/RCA	Tripping Release	iOF+SD24	

How the project ended
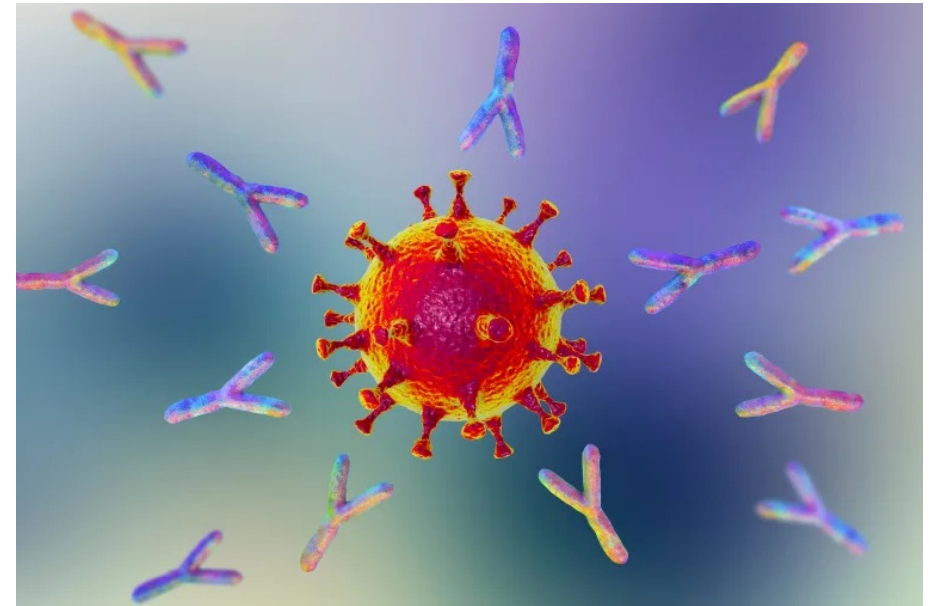
Summary

Semantic Technology can drastically reduce complexity in enterprise databases

Reducing complexity makes many additional efforts easy

Success is not guaranteed

Cultivate multiple sponsors