

kadaster



De weg van Linked Data @ Kadaster

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Kadaster Data Science Team

Wat doen we als Data Science Team:

AI (op aktes, op beeldmateriaal)

- Voorspellen bouwjaren
- Voorspellen verdiepingshoogtes
- Voorspellen graafschade

- Visualisatie – Dashboards - woningrealisatie
- Data analyse

- Zorgeloos Vastgoed – PODs
- Knowledge Graphs

- Duurzaam AI Bier: 't Perceeltje



Content

Context – Linked Data (@NL) – Kadaster

Why Linked Data @ Kadaster

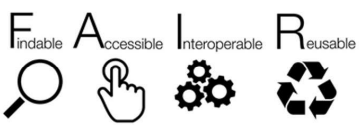
The road we took & lessons

Phase 1 – Kadaster Data Platform

Lessons & Renewed Focus

Phase 2 – The Kadaster Knowledge Graph

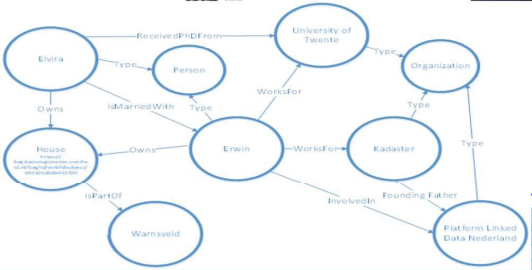
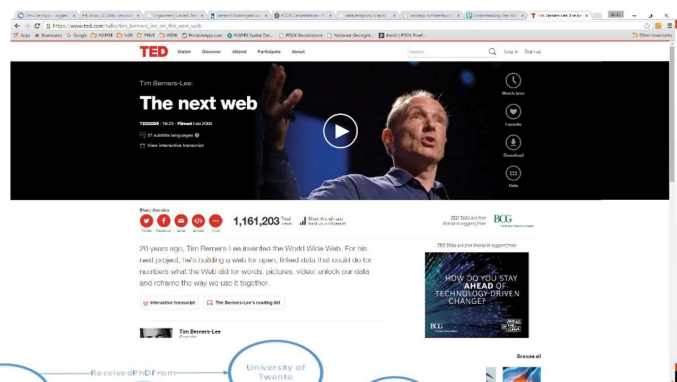
Latest Developments



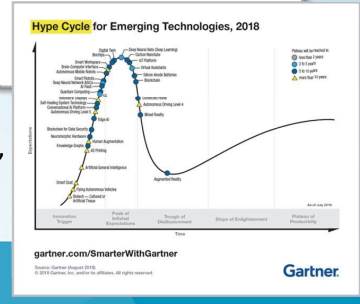
What is Linked Data?



Linked Data: A way of publishing data (reusable, web standards, semantics, related to open and big data). Data is stored as triples (RDF standard) and can be (federated) queried with SPARQL.

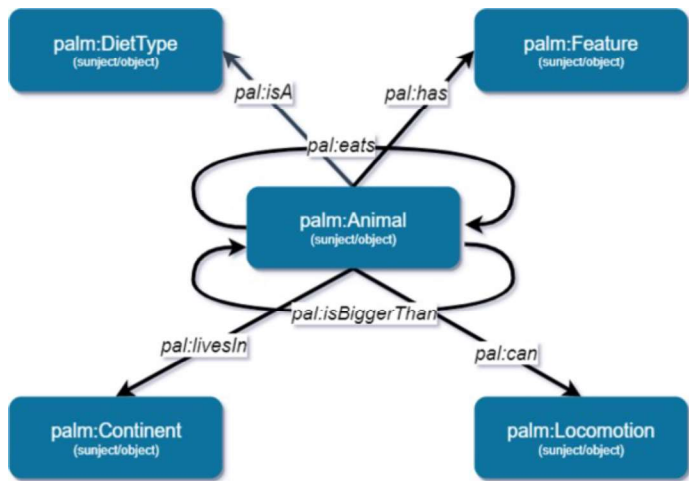


“To Graph or Not to Graph? That Is Not the Question — You Will Graph”
 Mark Beyer, Distinguished VP Analyst, 14 december 2020
<https://www.gartner.com/doc/reprints?id=1-250E2EC1&ct=210112>



Linked Data in the Netherlands

- Platform Linked Data the Netherlands (PLDN)
- Billion Triples Cases



Play-a-LOD

Browser

Table

SPARQL

Graphs 1

Services 1

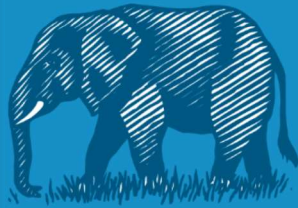
Assets 48

Insights >

https://playalod.nl/dieren/id/Olifant



< Olifant



Dier

https://playalod.nl/dieren/id/Olifant

Type
Dier

Label
Olifant

SameAs
Elephant
Q7378

Depiction


Aantal kaarten
1

Heeft punten
3

Is SPO
S/O



Platform Linked
Data Nederland

Innovatie door betekenisvol verbinden

Home SPARQL Endpoint OSM Dataset PLDN Website

OpenStreetMap (OSM) Dataset



De OpenStreetMap dataset is een publicatie van de Linked Data versie van de welbekende geografische datasets van OpenStreetMap.

De beschikbaarstelling van deze dataset is een samenwerkingsverband tussen de volgende drie partijen:

- Platform Linked Data Nederland (PLDN)
- CGI Infra and asset management lab
- Triply

OpenStreetMap (OSM)

OpenStreetMap (OSM) is een project dat als doel heeft om vrij beschikbare en bewerkbare geografische gegevens te verzamelen, zodat daaruit landkaarten en andere diensten kunnen gemaakt worden. Eenieder die zich inschrijft, kan eraan meewerken. Het invoeren en aanpassen van de geografische data steunt volledig op vrijwilligers. Het is mede opgericht uit onvrede met de hoge kosten die commerciële kaartbedrijven vragen voor hun producten. Reeds meer dan 20 miljoen kilometer wegen, fiets- en voetpaden werden in kaart gebracht door middel van het overnemen van gegevens van luchtfoto's en zelf op pad te gaan met een GPS-apparaat. In juni 2020 waren elke dag

gemiddeld zo'n 6300 vrijwilligers actief aan het bijdragen.

Bron: OSM Wiki

Deze Linked Data versie is

welke_straten_heef....csv


Alles bekijken

Playstod - PLDN | Carnivoor - Play-a-LOD - playstod | Luijsaard - Play-a-LOD - playstod | Platform Linked Data Nederland | Hackal.OO 4-5 november 2022

github.com/plkdn/LDWizard

README.md

LD Wizard: Create Linked Data in One Spell



LD Wizard is a framework for creating end-user focused Graphical User Interfaces (GUIs) that simplify the creation and publication of linked data.

1. LD Wizard Project

So far, the following LDWizard variants have been configured from the LDWizard Core:

Cultural Heritage Wizard
A specific configuration of the LD Wizard by the Dutch Digital Heritage Network.

UM - Humanities and Social Sciences
A specific configuration of the LD Wizard by the University of Maastricht for transforming tabular data in the humanities and the social sciences.

UM - BioLink
A specific configuration of the LD Wizard by the University of Maastricht for transforming BioLink tables.

GeoData Wizard
A specific application of the LD Wizard configured for linking Dutch geo data to the BAG and BRT.

Clariah Wizard
A specific application of the LD Wizard configured for use in the Clariah research infrastructure for the humanities.

2. LD Wizard Documentation

The LD Wizard project uses the following guidance documents for the LD Wizard development community activities:

CODE_OF_CONDUCT
Describes our preferred interaction behavior.

CONFIGURING
Describes how to configure a new LD Wizard variant.

CONTRIBUTING
Describes how to develop local LD Wizard code.

BOUNTY_PROGRAM
Describes how organizations can place bounties and how developers can solve bounties and also gives an overview of the current bounty issues.

GOVERNANCE
Describes our lightweight governance structure incl. the gatekeeper role.

3. Attribution

LD Wizard is an initiative of the following organizations and people:

- Dutch Digital Heritage Network (NDE), Enno Meijers & Ivo Zandhuis.
- The Netherlands' Cadastre, Land Registry and Mapping Agency (Kadaster), Erwin Folmer.

Nieuw tabblad | Kadaster Labs | LDWizard | LDWizard

ldwizard.netwerkdigitaalergoed.nl

network digitaal ergoed LDWizard - Erfgoed

1 Upload 2 Configure 3 Publish

No file selected

LOAD YOUR CSV FILE

BACK NEXT RESTART

LDWizard Documentation Dataplatform Github

Nieuw tabblad | Kadaster Labs | LDWizard | LDWizard

labs.kadaster.nl/demonstrators/geodatawizard/#1

GeoData Wizard

1 Upload 2 Configure 3 Publish

No file selected

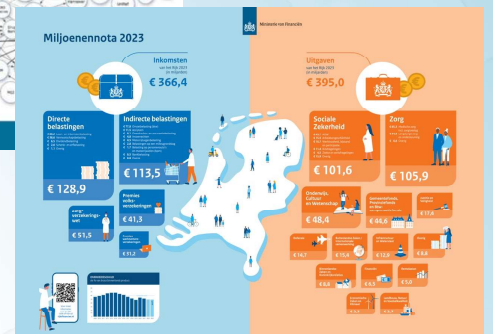
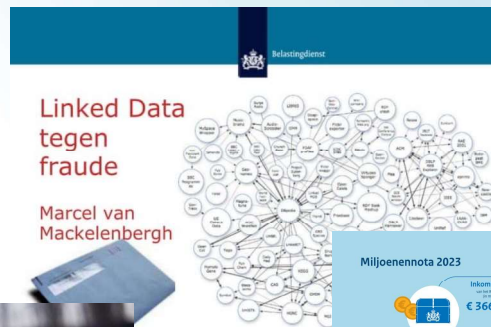
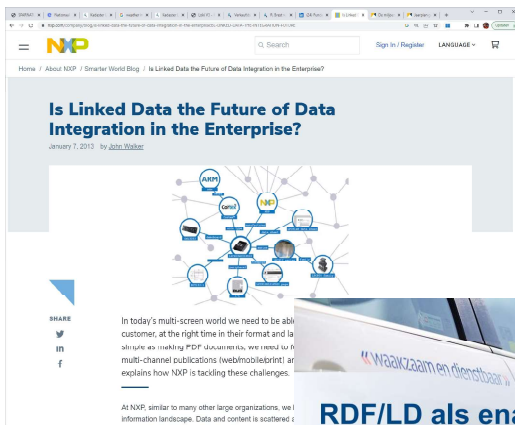
LOAD YOUR CSV FILE

Or try it with an example CSV file

BACK NEXT

LDWizard Documentation Dataplatform Github

The Billion Triples Cases



<https://www.linkedin.com/pulse/fundamentals-digitalisation-towards-holographic-flores-bakker/>

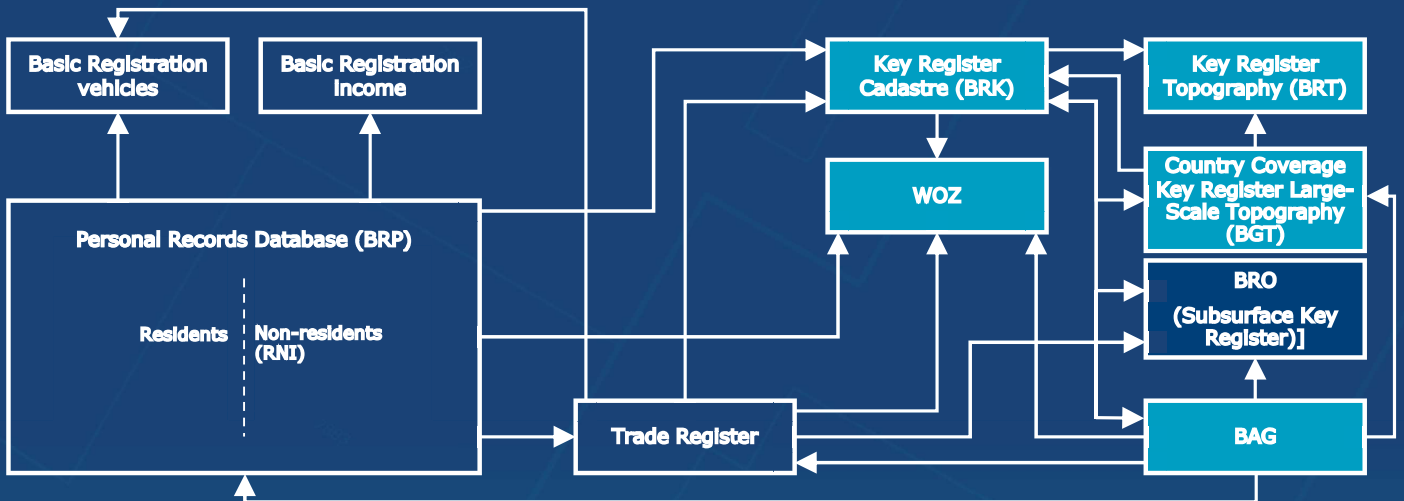
Do you know Kadaster?

Data per Key Register





Key Registers in the Netherlands



Key registers and national facilities

Key Registers	National facilities	Other Tasks
---------------	---------------------	-------------

Key Register Cadastre (BRK) Key Register Registration System Registrations spread across government organizations.	Key Register Addresses & Buildings (BAG)	KLIC (Dutch Cable and Pipeline Information Centre)
---	--	--

Kadaster source holder of: Key Register Key Register Cadastre (BRK) Topography (BRT) Key Register Topography (BRT) 5 registrations from other organisations (national facilities).	Key Register Large-Scale Topography (BGT) Valuation of real estate (WOZ)	<div style="border: 1px solid black; padding: 5px; text-align: center;">Schematic view</div>
---	---	--

	Act on the Recognisability of Public Law Restrictions and Real Estate (WKPB)	Energy Labels
--	--	---------------

		National Triangulation Network
--	--	--------------------------------

	Ruimtelijkeplannen.nl	Defense
--	-----------------------	---------



← → pdok.nl

pdok MENU

Hét platform voor hoogwaardige geodata

[Bekijk alle datasets](#) [Ontdek de PDOK Viewer](#) [Ontdek de VectorTile Viewer](#) [Bekijk de PDOK promofilm](#)

Bij PDOK vind je open datasets van de overheid met actuele geo-informatie. Deze datasets zijn benaderbaar via geo webservices en beschikbaar als downloads. Daarnaast vind je hier inspirerende cases over de mogelijkheden van deze geo datasets. [Meer info over PDOK](#)

87.000.000 datacalls per dag	239 hoogwaardige datasets
---------------------------------	------------------------------

Waarom PDOK?

Kwaliteit PDOK levert hoge kwaliteit (standaard ISO 25010)	Hoogwaardige geodata PDOK biedt hoogwaardige en actuele open geodatasets	Webservices / API's De geodata is benaderbaar via standaard OGC- en W3C
--	--	---

1

ster



cijfers

465.800

Akten

494.500

Hypotheekstukken

91.100

Meetposten

29,1 miljard

PDOK hits

1,2 miljard

BGT views

1.008.000

KLIC meldingen

26,4 miljoen

Inzages in BRK

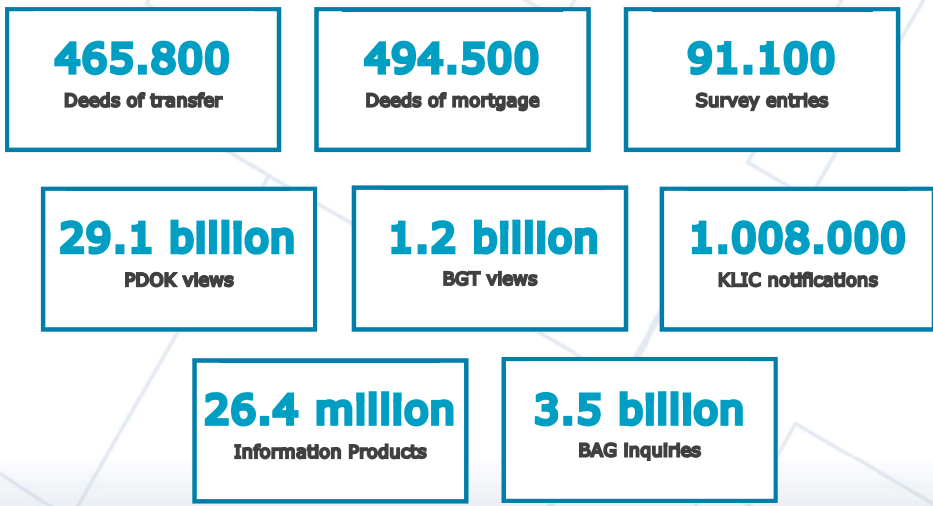
3,5 miljard

BAG bevestigingen





Key figures 2022



Summary

Kadaster = data

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Kadaster Data Platform

The development of the Spatial
Data Platform of the Future

Why?

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vision Kadaster

Making reliable data accessible to everyone. Through a single digital gateway. That is our job, by connecting and providing certainty. When data from different sources is combined, valuable insight is generated offering solutions for challenges in society. Our contribution to a sustainable and livable society. In the Netherlands and abroad.

Kadaster's Ambitions



Providing certainty of ownership and use of anything above and below the surface



Offering a platform for anyone to handle spatial information anywhere and anytime



Supporting society in using spatial information to solve issues that matter



What is the problem with copying?

Not only intrinsic quality

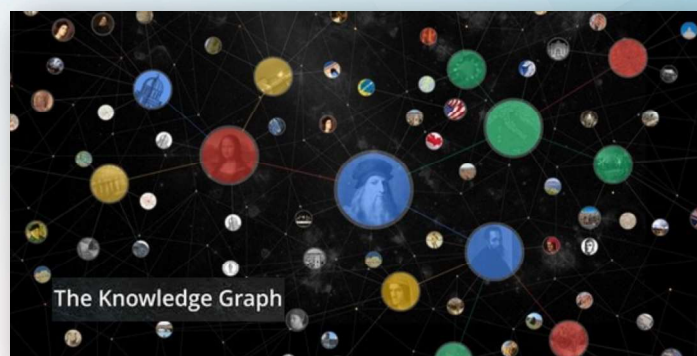
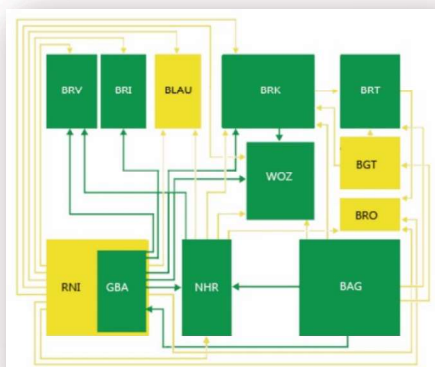
- The leaflet (metadata) is essential
- Semantics
- Provenance
- Transparency is key!



What is the problem with not using metadata?

- Size: 100
- Geometries

From data silo's to connected information



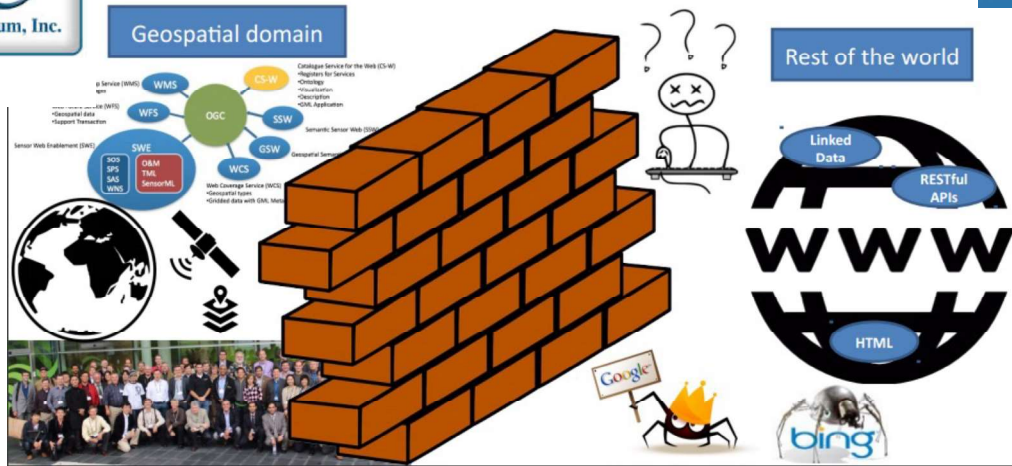
closed



open

Spatial data: to the web

Reaching more people with spatial data



What is the problem?



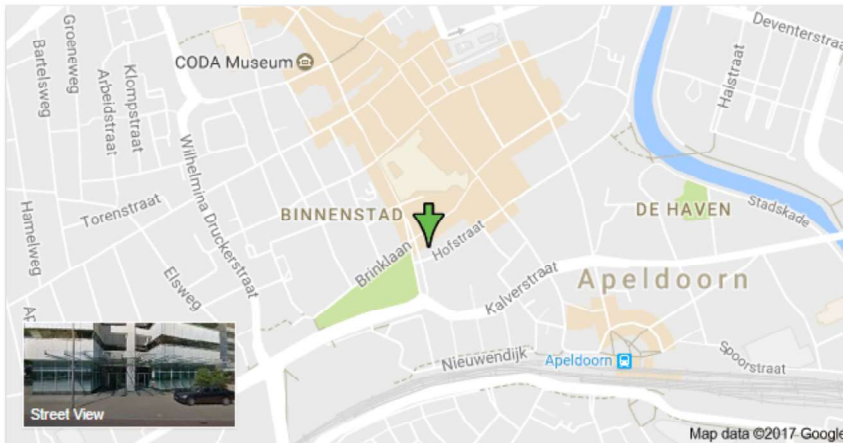
hofstraat 110



Press **F11** to exit full screen

[All](#) [Maps](#) [Images](#) [Shopping](#) [Videos](#) [More](#) [Settings](#) [Tools](#)

About 1.230.000 results (0,71 seconds)



Hofstraat 110, 7311 KZ Apeldoorn

[Get directions](#)

Kadasterkantoren

<https://www.kadaster.nl/kadasterkantoren> [▼ Translate this page](#)

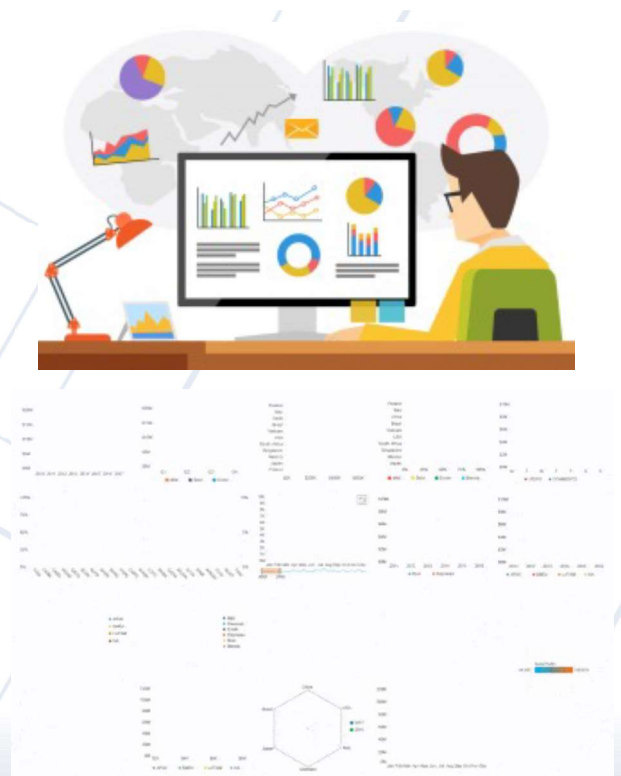
Hofstraat 110 7311 KZ Apeldoorn Telefoon receptie: 088-183 20 00. Routebeschrijving kantoor de Grift. Particulier; Woningwaarde · Eigendom · Grenzen ...

Analytics Friendly

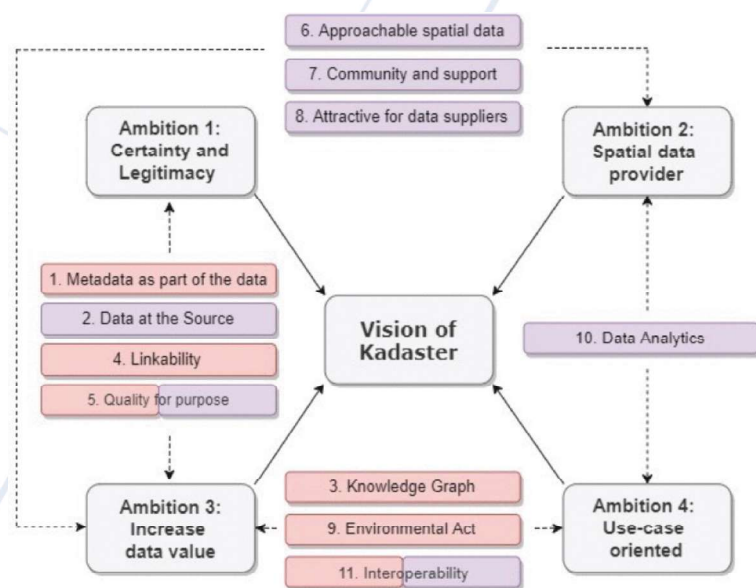
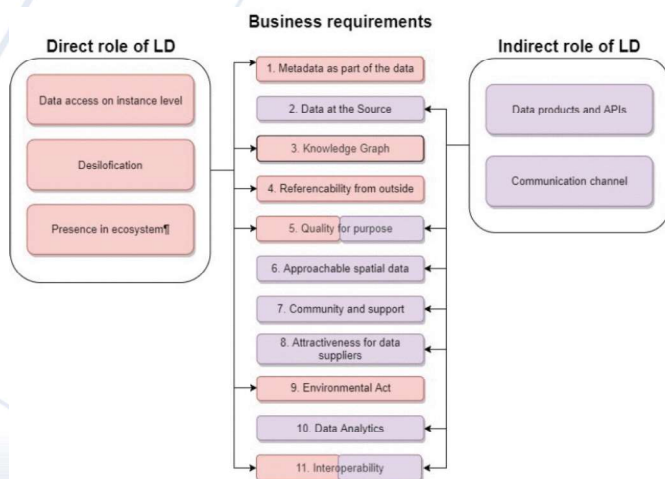
(Self Service GIS)

- **Citizen (non GIS professional)**
- **Data at the Source – Data Ecosystem**
- **Semantics (Transparency, Reproducibility)**
- **The Web (only a browser)**
- **Map integration – GIS functionality**
- **(integration with more advanced tools)**

(GIS = Geographic Information System)



In summary



E. Folmer, S. Ronzhin, J. Van Hillegersberg, W. Beek and R. Lemmens, "Business Rationale for Linked Data at Governments: A Case Study at the Netherlands' Kadaster Data Platform," in IEEE Access, vol. 8, pp. 70822-70835, 2020, <https://doi.org/10.1109/ACCESS.2020.2984691>

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Kadaster Data Platform

The development of the Spatial
Data Platform of the Future

Phase 1 - KDP

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Demo

A dataset as linked data:

<https://data.labs.kadaster.nl>

Live

A Dataset as linked data:

<https://data.labs.kadaster.nl>

(go to top10nl)

A sparql query on BRT (e.g. replace bunker with universities or ziekenhuizen)

Show uri derefencing....Trifid: from Zazuko.

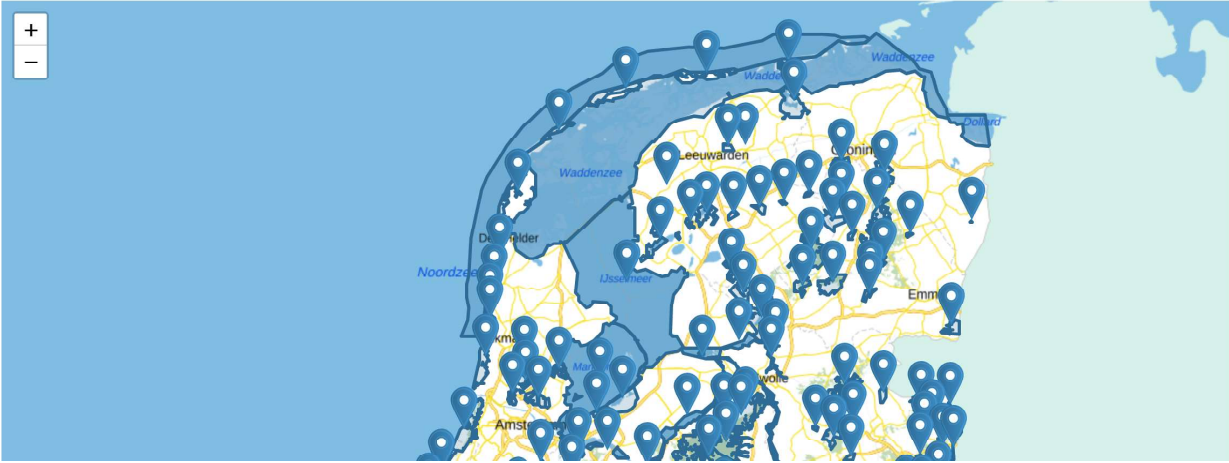
<https://brt.basisregistraties.overheid.nl/brt/id/registratie/NL.TOP10NL.100099668>

**Data story based on sparql queries
(religieuze gebouwen)**

https://data.pdok.nl/sparql

```
1 prefix brt: <http://brt.basisregistraties.overheid.nl/def/top10nl#>
2 prefix geo: <http://www.opengis.net/ont/geosparql#>
3 select ?shape ?shapeLabel {
4   [ a brt:Natuurgebied;
5     brt:naamNL ?shapeLabel;
6     brt:soortnaam "natura2000-gebied"@nl;
7     geo:hasGeometry/geo:asWKT ?shape ].
8 }
9 limit 1000
10
```

Table Response Pivot Table Google Chart **Geo** Download



My Blog **Events & Press**

Rather than publishing online a database of railway station locations in the Netherlands and expecting a user to then query the database for “Amsterdam Centraal Station”, publish the database giving each record a URI so for example Amsterdam Centraal Station becomes;

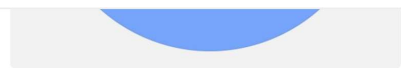
<https://brt.basisregistraties.overheid.nl/top10nl/id/gebouw/102625209>

Now this is something I can paste into an email, tweet or even share on Facebook!

Kudos to the Dutch Kadaster for taking this approach and providing this example, Ordnance Survey you could do the same ?

This approach also results in such data becoming part of the “mainstream” web indexable and searchable, but I argue the key benefit is the “linkability”

The [Spatial Data on the Web best practice document](#), something of course I recommend you taking a longer look at provides many



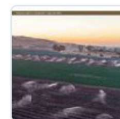
Heart icon, Share icon, Sep 12, 2017

Ed Parsons Retweeted

Sam Zipper
@ZipperSam

Google Earth Engine + @NASA_Landsat = annual 30 m resolution #irrigation maps!

Cool new study by @JillDeines:
onlinelibrary.wiley.com/doi/10.1002/20...



Annual irrigation dynamics in t...
Sustainable management of agricultural water resources
onlinelibrary.wiley.com

Heart icon, Share icon, Sep 11, 2017

Embed

[View on Twitter](#)

Lessons learned

It can be much less work than expected, but in the end it is not.

Projects are interfered with other issues:

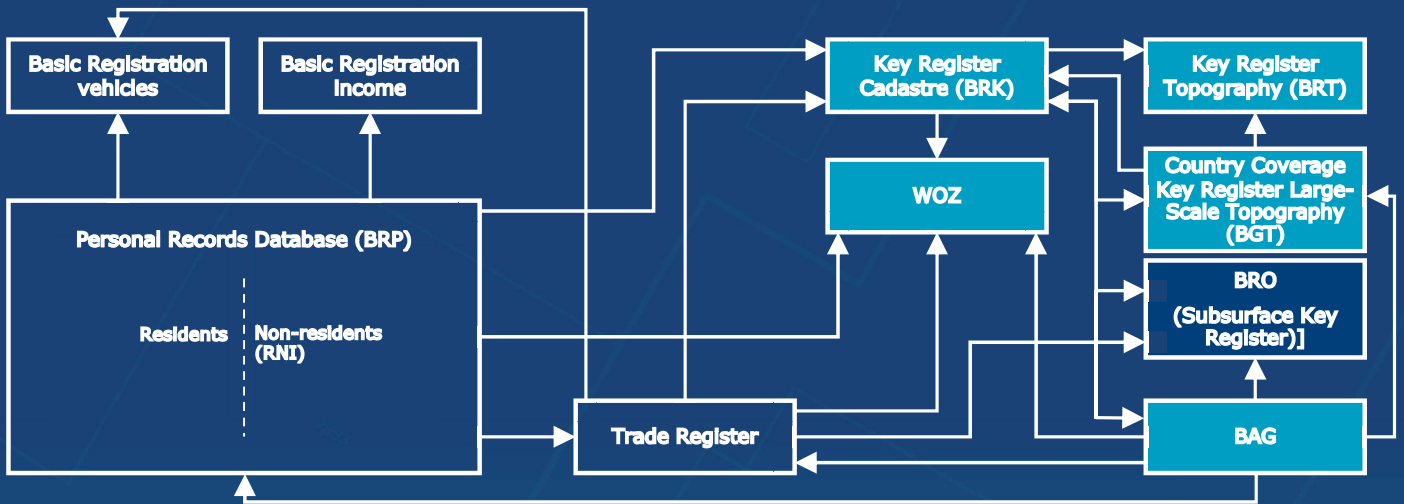
- Improvements in data models (the “ultimate” model)
- Data quality issues (completeness, metadata, etc)

My advise: Keep it simple

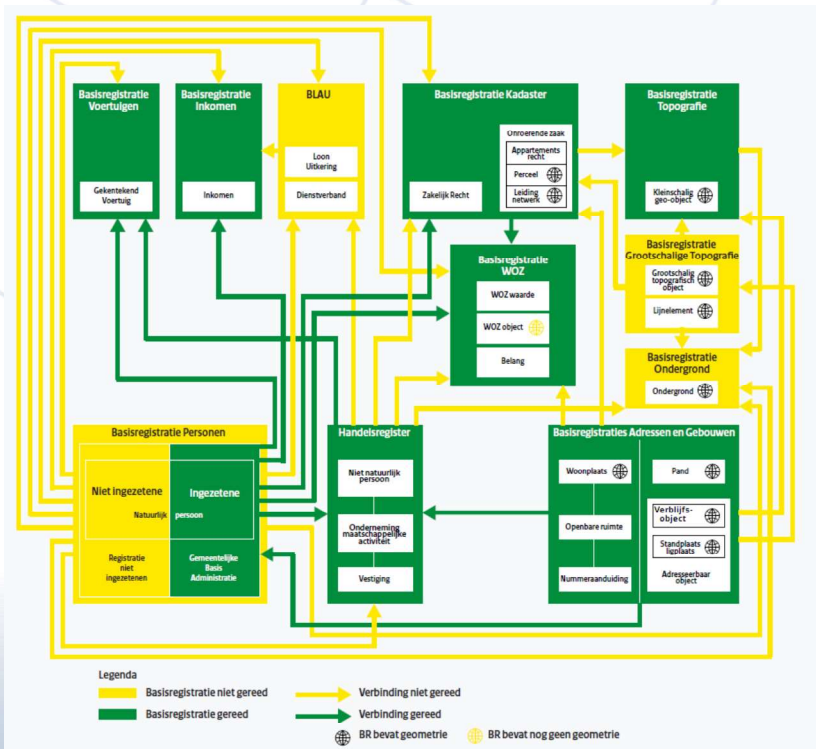
- Sparql queries complex
- Federation....ahum...
- GeoSparql partly supported
- 4 star Linked Data



key registers in the Netherlands



Dutch Humour: System of Silos





Conclusion (~2019):

**We created the ability...
...but have no links...still data silo's.**

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Kadaster Knowledge Graph

Focus on Integrating Data for
Analysis (the Unknown Question)

Phase 2

Experiments 2020-2021

Production & Usability 2022-2023

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Can you imagine?

- That in 2023 we still offer data silo's?
- That citizens can only ask through Wikipedia or Google questions like; what are the churches built before 1900? And based on authentic government data no direct answer is possible?



Geo-informatie voor iedereen

What is our ambition?

<https://www.kadaster.nl/over-ona/beleid/meerjarenbeleidpl>

Wij vinden dat geo-informatie voor iedereen toegankelijk moet zijn. We bouwen ons platform verder uit met mogelijkheden voor analyse van data. Daarnaast gaan we datasets onderling koppelen. Voor de ontwikkeling ervan gebruiken we concrete vraagstukken van gebruikers.



vision Kadaster

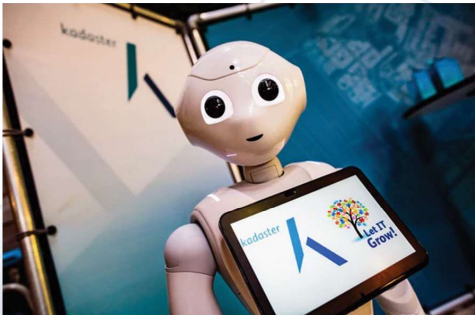
Making reliable data accessible to everyone. Through a single digital gateway. That is our job, by connecting and providing certainty.

When data from different sources is combined, valuable insight is generated offering solutions for challenges in society. Our contribution to a sustainable and livable society. In the Netherlands and abroad.

My dream!



I search for a palace (BRT) with surface of >1500m² (BAG) which is a national monument (RCE), and has a value of >1.000.000 (WOZ) in the neighborhood called Berg en Bos (CBS).



Paleis het Loo

<https://brt.basisregistraties.overheid.nl/top10nl/id/gebouw/101895841>

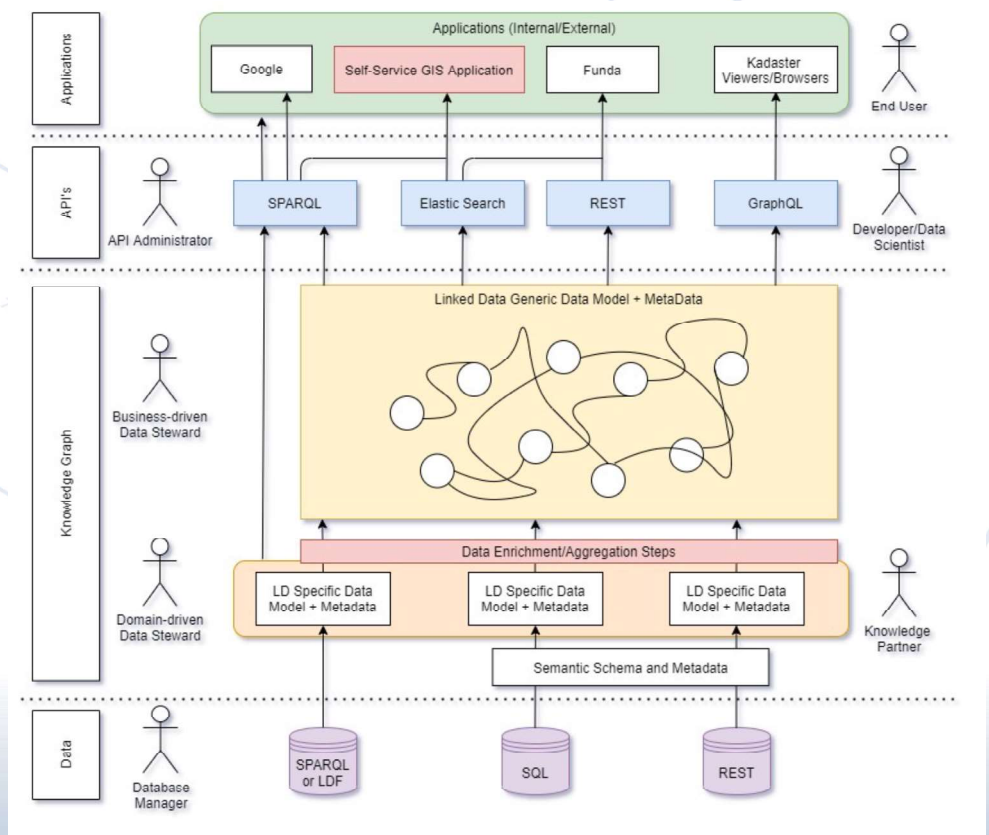
Essence of Kadaster KG project

It is not new, it was already possible.....but expensive, not scaleable, not open, etc...

The main differences are:

- Web standards based (linked data, interoperable)
- No spatial links, but administrative links.
- Data at the Source (in demo: 6 sparql endpoints federation)
- Application independent.

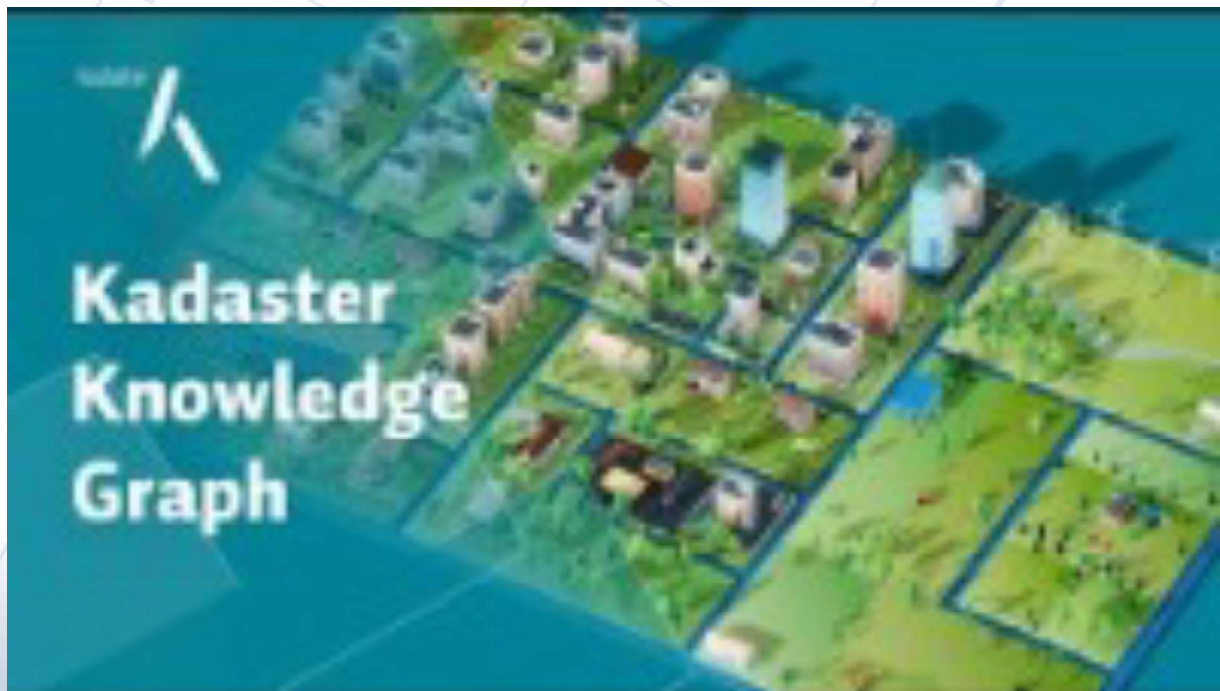
The Architecture for the KKG



7893

Kadaster Knowledge Graph

<https://data.kkg.kadaster.nl>



Kadaster Knowledge Graph

Live demo

Movie? – screenshot op deze

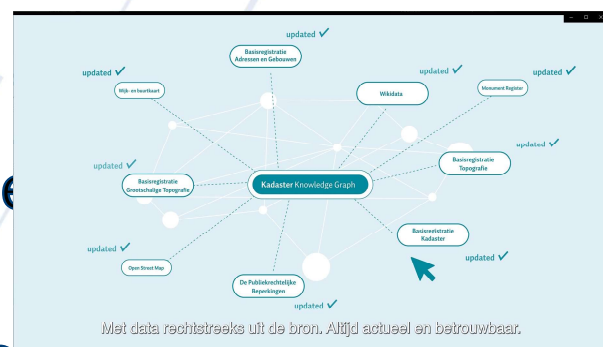
[Data.kkg.kadaster.nl](https://data.kkg.kadaster.nl)

Query: niet; door naar data story

Data Story: algemene queries voor kkg
gebruik

Data model: time for some art.

Production ready!



Lessons Learned

- It works for integrated data analysis and it is being used
- Promoting the KKG (not datasets as LD)
- One KKG for World Peace? Or Many?
 - Complexity for users
 - Complexity for tools
 - Maintenance
- Make it easier!
 - Educate
 - Inspire
 - Tools

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Kadaster Knowledge Graph (KKG)

Latest Developments on Usability

- Inspiration
- Easy/less SPARQL

Warning: Work in Progress!

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<https://labs.kadaster.nl/cases/ar-applicatie>

Feature 3: Building Information

- Selected building identifier and building part identifier is used as input, all attribute information for both objects are returned in the UI
- Includes:
 - Building year
 - Floorsize
 - Parcel size
 - Municipality name
 - Neighbourhood name
 - Number of schools within a 3km radius
 - Distance to the nearest trainstation



ITUKALEIDOSCOPE
ACCRA2022

The image shows a screenshot of an API interface on the left and an AR application overlay on the right. The API interface displays a GET request to `https://api.labs.kadaster.nl/queries/dst/ar-demo-data-voor-plaats/run?` and a variable `vboId` with the value `0003010000129471`. Below this is a list of prefixes and an SQL query. The AR application overlay shows building information for 't Spiker 24 7231JT' in Zutphen, including details like 'Bouwjaar: 1976', 'Vloer Oppervlakte: 394 m2', 'Perceel Oppervlakte: 530 m2', 'Gemeente: Zutphen', 'Buurt: Dorp Warnsveld', 'Aantal basisscholen binnen 3km: 12', and 'Afstand trainstation: 2.7 km'. A 'Meer informatie' button and a 'Klopt er iets niet?' message are also visible.

```
1 PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
2 PREFIX dct: <http://purl.org/dc/terms/>
3 PREFIX sdo: <http://schema.org/>
4 PREFIX brt_def: <http://brt.basisregistraties.overheid.nl/def/to
5 PREFIX kad: <https://data.kkg.kadaster.nl/kad/model/def/>
6 PREFIX geo: <http://www.opengis.net/ont/geosparql#>
7 PREFIX sdo0: <http://schema.org/> #error in CBS data
8 PREFIX sor: <https://data.kkg.kadaster.nl/sor/model/def/>
9 PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
10 prefix time: <http://www.w3.org/2006/time#>
11 PREFIX wbk: <https://data.labs.kadaster.nl/cbs/wbk/vocab/>
12 PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
13 PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
14 SELECT DISTINCT ?gebouwNaam ?buurtNaam ?buurtID ?gemeenteNaam ?g
bouwjaar ?gebruiksdoel ?basisschoolAfstand ?trainstationAfstand
15 bind(iri(concat('https://data.kkg.kadaster.nl/id/verblijfsobje
?vbo
16   a sor:Verblijfsobject;
17   sor:gebruiksdoel/skos:prefLabel ?gebruiksdoel;
18   sor:maaktDeelUitvan ?gebouw;
19   sor:hoofdadres ?numeraanduiding;
20   sor:oppervlakte ?vloerOppervlakte .
21 ?gebouw
22   a sor:Gebouw;
```

Different users for data analysis

- GIS developer: GIS tools & GIS formats
- Developer: APIs (only “known” questions)

- (Web) Data Scientists: SPARQL

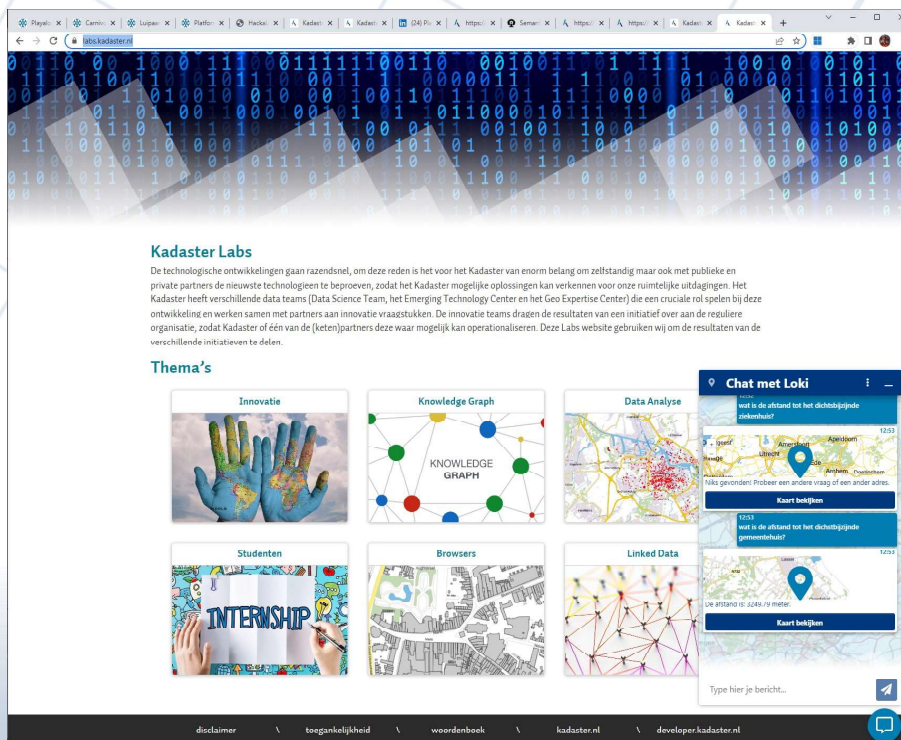
- Business Analysts: ???

- Citizens: ???

Kadaster Query Builder

The screenshot displays the Kadaster Query Builder interface. At the top, the title "QUERYBUILDER KKG-LIGHT" is visible. Below the title, there is a search bar containing "example 1" and a URL: "Querying https://api.labs.kadaster.nl/datasets/kkg-light/results-v2/services/kkg-light-results-v2/sparql". A link "First time here? watch the tutorial!" is present. The query builder consists of three rows of filters, each starting with "Gebouw" and connected by "And" operators. The first row includes "gebruiksdoel", "gebruiksdoel", and "winkelfunctie". The second row includes "bouwjaar" and "from: 1940 to: 1949". The third row includes "Ligt in" and "Herbaggengebied". Below the filters is a blue bar with a play button. Underneath, there are options to "Toggle SPARQL editor", "Share", "Export query in JSON", and "Import query in JSON". The interface also shows "Table", "Chart", "Geo", "Pivot", "Response", "Table", "202 results in 0.23 seconds", "Normal Grouped Heatmap", and "Layers". The bottom part of the screenshot shows a map of a region with various locations labeled, including Hedel, Engelen, Dierik, Oud Empel, Empel, Rosmalen, Spinkulborgh, Heesend, Kluisdijk, Nuland, Lagikant, and Guffen.

But, what if SPARQL is not needed?



The screenshot shows a web browser window displaying the 'Kadaster Labs' website. The page features a header with a binary code background and a main content area with a paragraph about technological developments. Below this, there is a 'Thema's' section with six tiles: 'Innovatie' (hands with map), 'Knowledge Graph' (network diagram), 'Data Analyse' (map with data points), 'Students' (hand holding a sign that says 'INTERNSHIP'), 'Browsers' (map with street view), and 'Linked Data' (network diagram). On the right side, there is a 'Chat met Loki' widget with a map and a chat input field. The footer contains navigation links: disclaimer, toegankelijkheid, woordenboek, kadaster.nl, and developer.kadaster.nl.

Kadaster Labs

De technologische ontwikkelingen gaan razendsnel, om deze reden is het voor het Kadaster van enorm belang om zelfstandig maar ook met publieke en private partners de nieuwste technologieën te beproeven, zodat het Kadaster mogelijke oplossingen kan verkennen voor onze ruimtelijke uitdagingen. Het Kadaster heeft verschillende data teams (Data Science Team, het Emerging Technology Center en het Geo Expertise Center) die een cruciale rol spelen bij deze ontwikkeling en werken samen met partners aan innovatie vraagstukken. De innovatie teams dragen de resultaten van een initiatief over aan de reguliere organisatie, zodat Kadaster of één van de (keten)partners deze waar mogelijk kan operationaliseren. Deze Labs website gebruiken wij om de resultaten van de verschillende initiatieven te delen.

Thema's

- Innovatie
- Knowledge Graph
- Data Analyse
- Students
- Browsers
- Linked Data

Chat met Loki

Wat is de afstand tot het dichtstbijzijnde ziekenhuis?

1203

Kaart bekijken

Wat is de afstand tot het dichtstbijzijnde gemeentehuis?

1229

Kaart bekijken

Type hier je bericht...

disclaimer \ toegankelijkheid \ woordenboek \ kadaster.nl \ developer.kadaster.nl

Latest Developments

Formal product

Lock Unlock project: Authorization

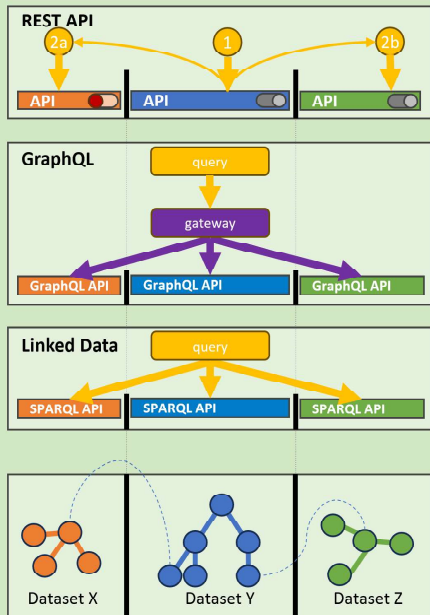
- Combination of open data
- Changing society
- Adding proprietary data

Knowledge Graphs & Large Language Models

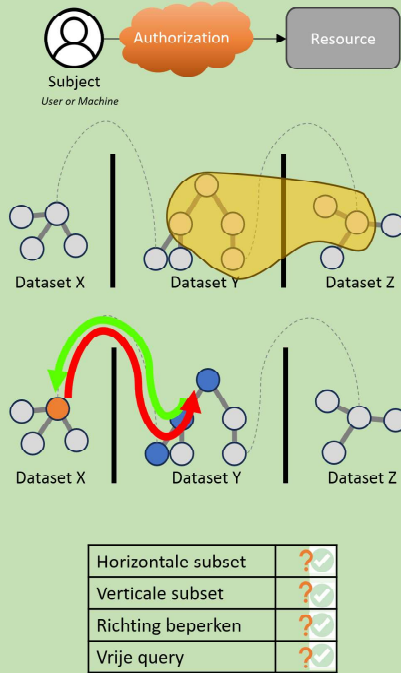
Lock-Unlock: lock de data, unlock het potentieel

Versie 0.9 – februari 2024

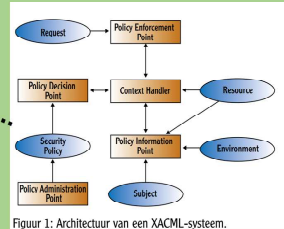
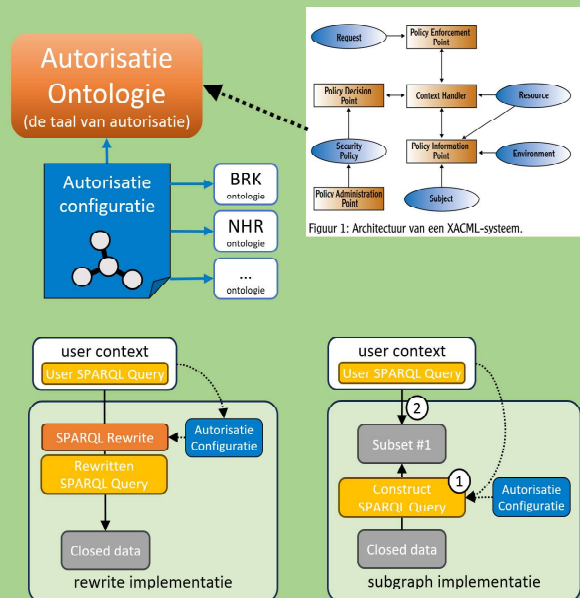
Federatieve bevraging



Afscherming ('lock')

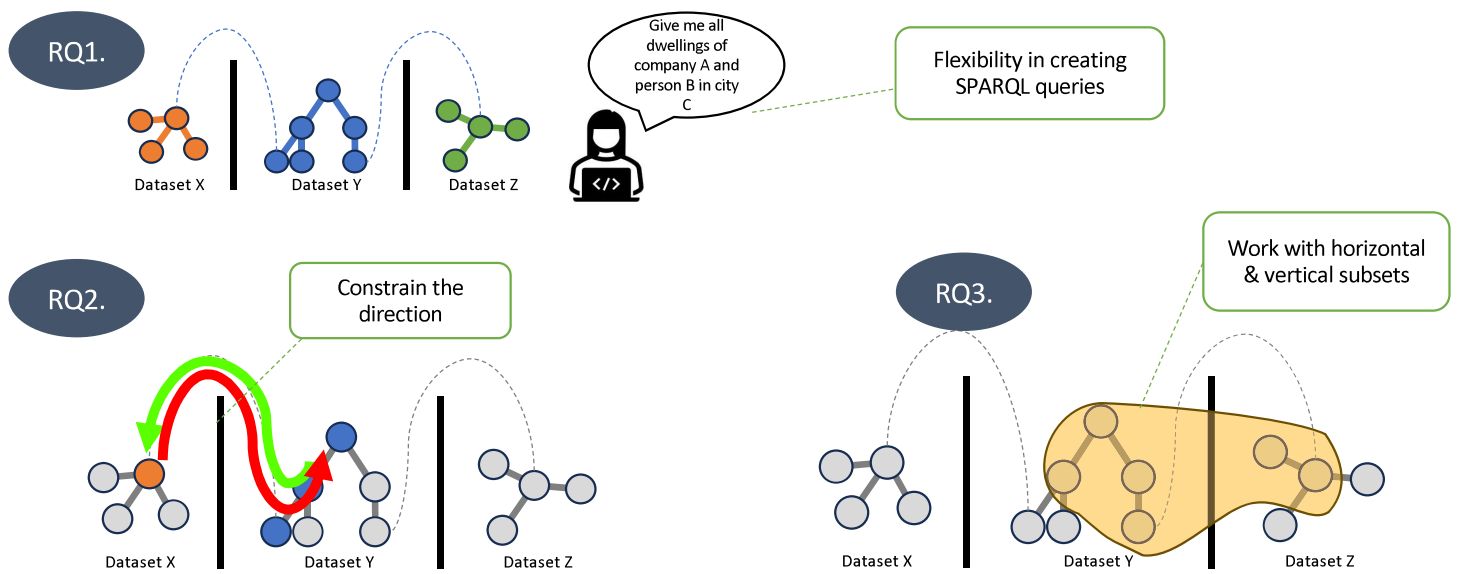


Autorisatie als Linked Data ('unlock')



Figuur 1: Architectuur van een XACML-systeem.

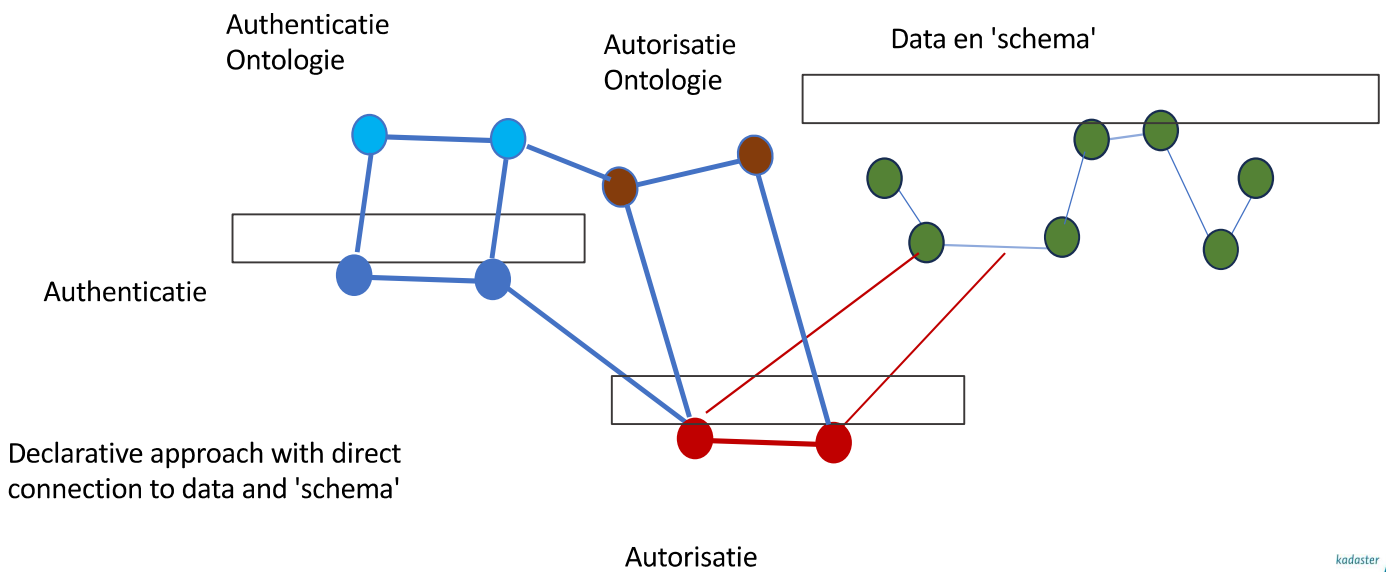
(Advanced) Access Control with Knowledge Graphs



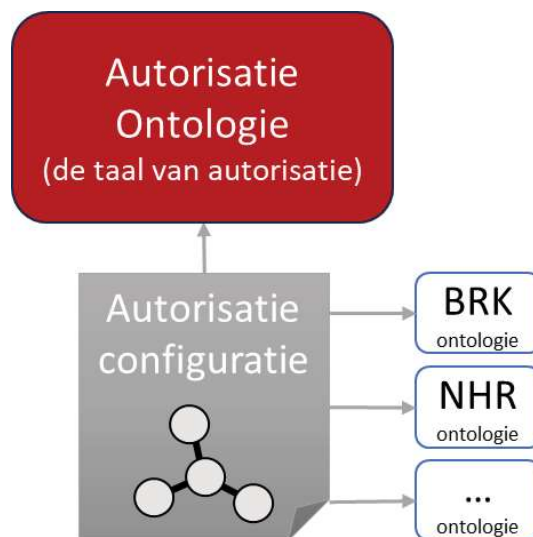
(Advanced) Authorisation in LD

Authorisation ontology

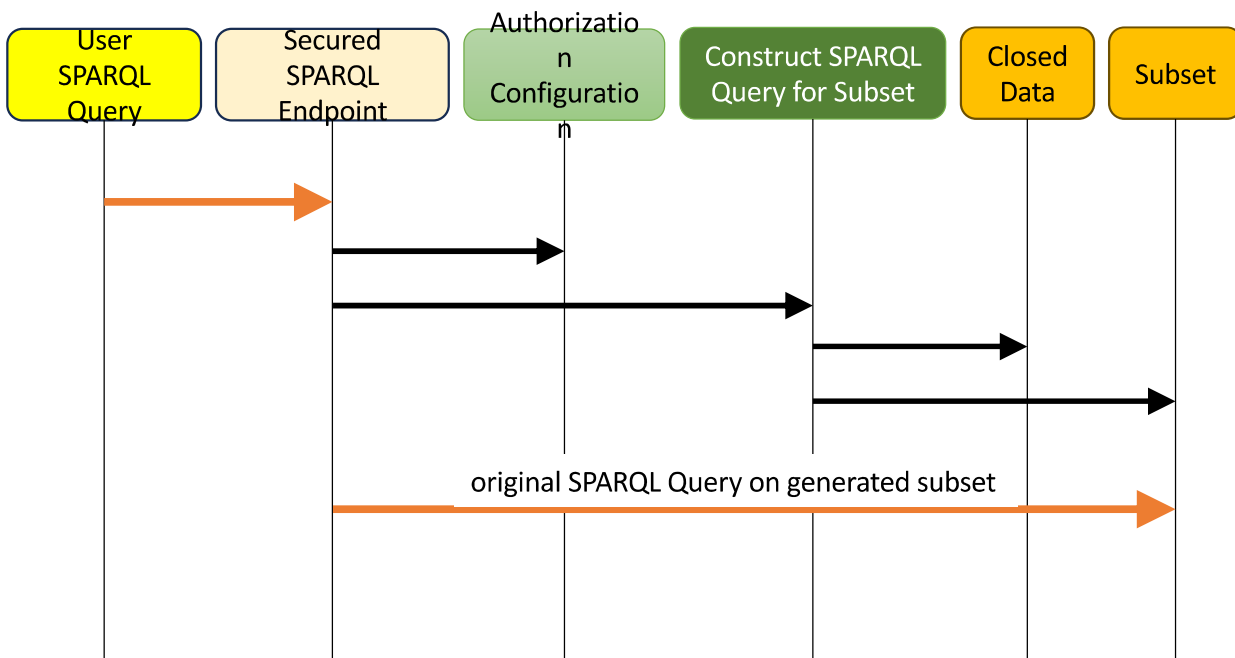
Goal: full Sparql functionality, but no access to closed data



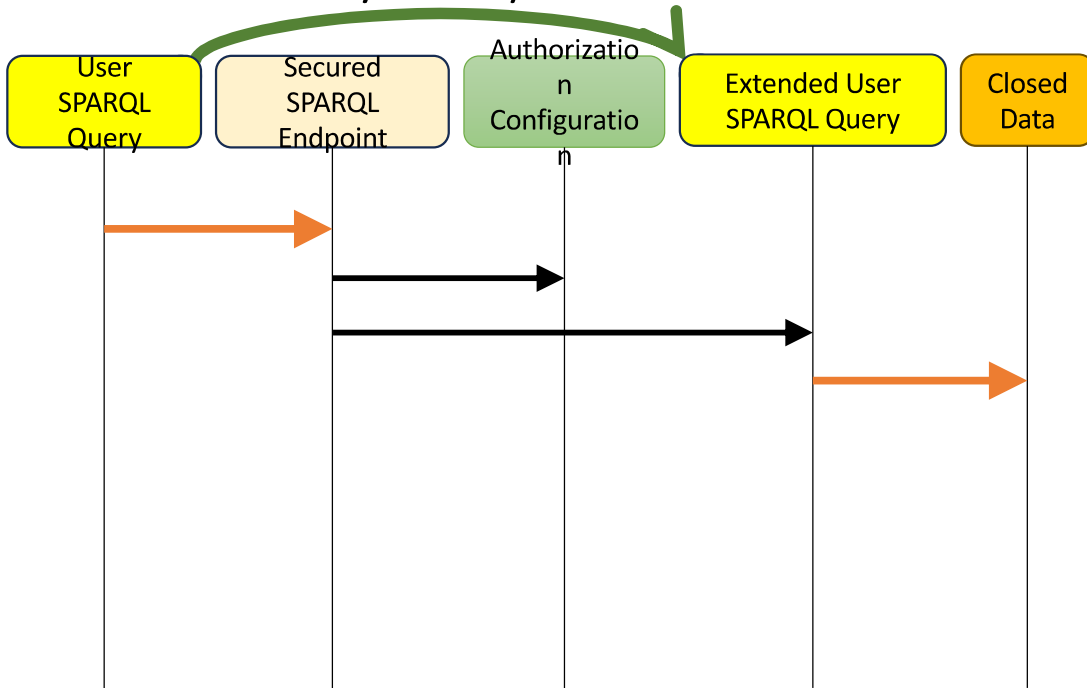
Autorisatie als Linked Data



SPARQL Query story - Subset



SPARQL Query story - Rewrite



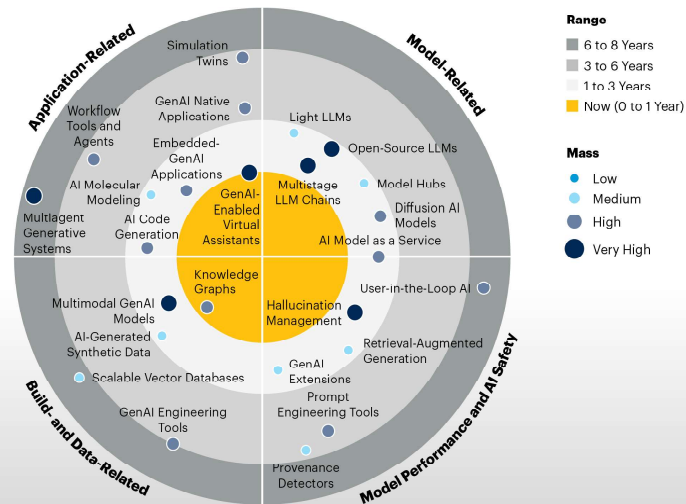
Latest Developments

Lock Unlock project: Authorization

- Combination of open data
- Changing society
- Adding proprietary data

Knowledge Graphs & Large Language Models

Impact Radar for Generative AI



Source: Gartner
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Gartner

<https://www.gartner.com/en/articles/understand-and-exploit-gen-ai-with-gartner-s-new-impact-radar>

Knowledge Graphs (KGs)

Cons:

- Implicit Knowledge
- Hallucination
- Indecisiveness
- Black-box
- Lacking Domain-specific/New Knowledge

Pros:

- Structural Knowledge
- Accuracy
- Decisiveness
- Interpretability
- Domain-specific Knowledge
- Evolving Knowledge

Pros:

- General Knowledge
- Language Processing
- Generalizability

Cons:

- Incompleteness
- Lacking Language Understanding
- Unseen Facts

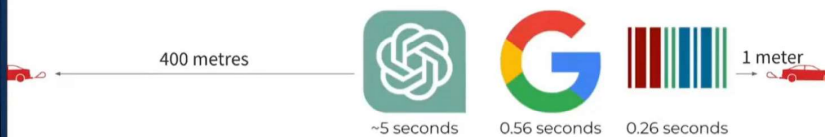
Large Language Models (LLMs)

	LLM	KG	KG + LLM
Hallucinations	👎	👍	🤔
Opaqueness:	👎	👍	🤔
Intransigence:	👎	👍	🤔
Staleness:	👎	👏	🤔
Bias:	👎	👏	🤔
Costs:	👎	👏	🤔
Short tail:	👎	👍	🤔
Sanitised:	👎	👍	🤔
Non-determinism:	👎	👍	🤔
Usability:	👍	👎	🤔

<https://aidanhogan.com/talks/2023-09-22-semantics-2023.pdf>

Why is this important? — Energy consumption

Who created the school of Athens?



Andreas Blumauer
CEO and Co-Founder

Denny Vrandečić: The Future of Knowledge Graphs
in a World of Large Language Models

<https://www.youtube.com/watch?v=WqYBx2gB6vA>

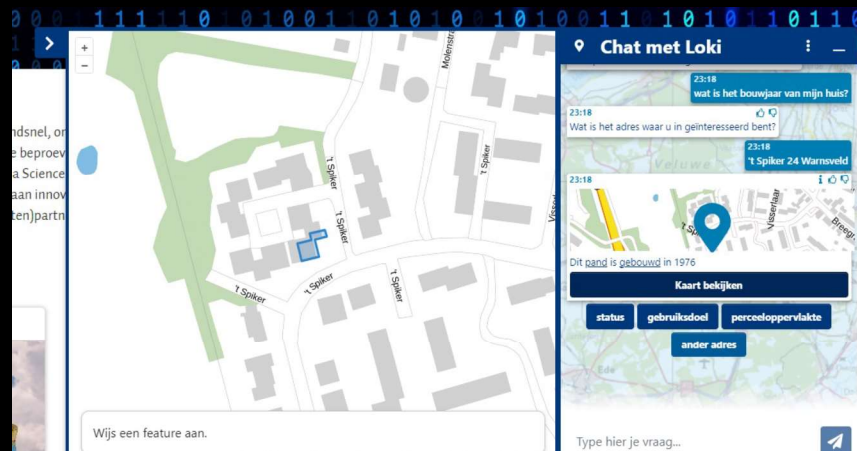
EN BETROUWBAARHEID VAN HET ANTWOORD?

Wat is het bouwjaar van het huis?

CoPilot

Google: de links...

KG+ Loki: antwoord + links naar bron




SWJ Paper - Google Docs | To Do List - Google Docs | Installatie Erwin Folmer

han.nl/agenda/2024/06/installatie-erwin-folmer/

HAN_ Opleidingen v Studiekeuze v Samenwerken v Onderzoek v NL v v v

Lectoraat Applied Data Science & AI Lectoraten

[→ Meld u nu aan!](#)



Op donderdag 21 november wordt Erwin Folmer geïnstalleerd als lector Applied Data Science en AI tijdens het Data & AI event van het Oosten.