Intersection of Knowledge Graphs and HTML-deployed Digital Twins

Demonstrated using Apple Product Pages

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Situation Analysis

Increasingly, organizations are embedding domain-specific Knowledge Graphs in their web pages as a new technique in search engine optimization (SEO). For instance, Apple uses this approach across the product information and shopping action aspects of its website.

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Why is this important?

Knowledge Graphs embedded within web pages typically provide a close digital rendition (a/k/a Digital Twin) of content that aids search engine computability and discoverability, while also serving the needs of a new generation of **smart agents** and **superapps** equipped with an ability to process **entity relationships** and **relationship type semantics**.

Net effect:
Better return on content management-related investment per embedded Knowledge Graph.

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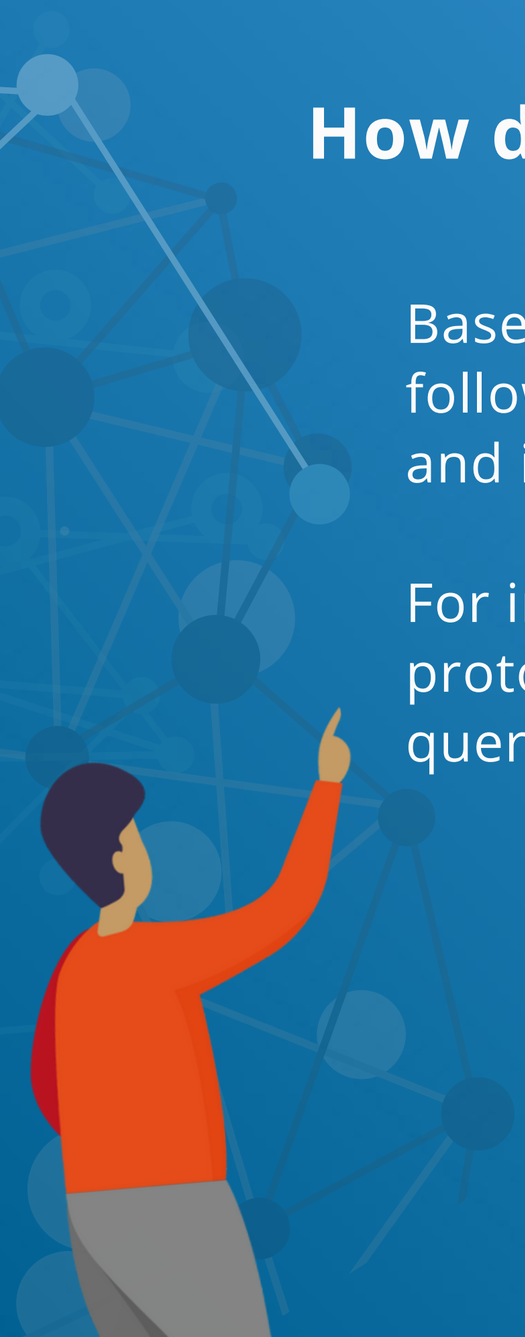

How does this work?

Based on sample pages from Apple's website, the slides that follow will demonstrate some new Knowledge Graph discovery and interaction capabilities that are now possible.

For instance, you can use **HTTP-based** query language & wire-protocol hybrids — such as **GraphQL** and **SPARQL** — for direct query operations.

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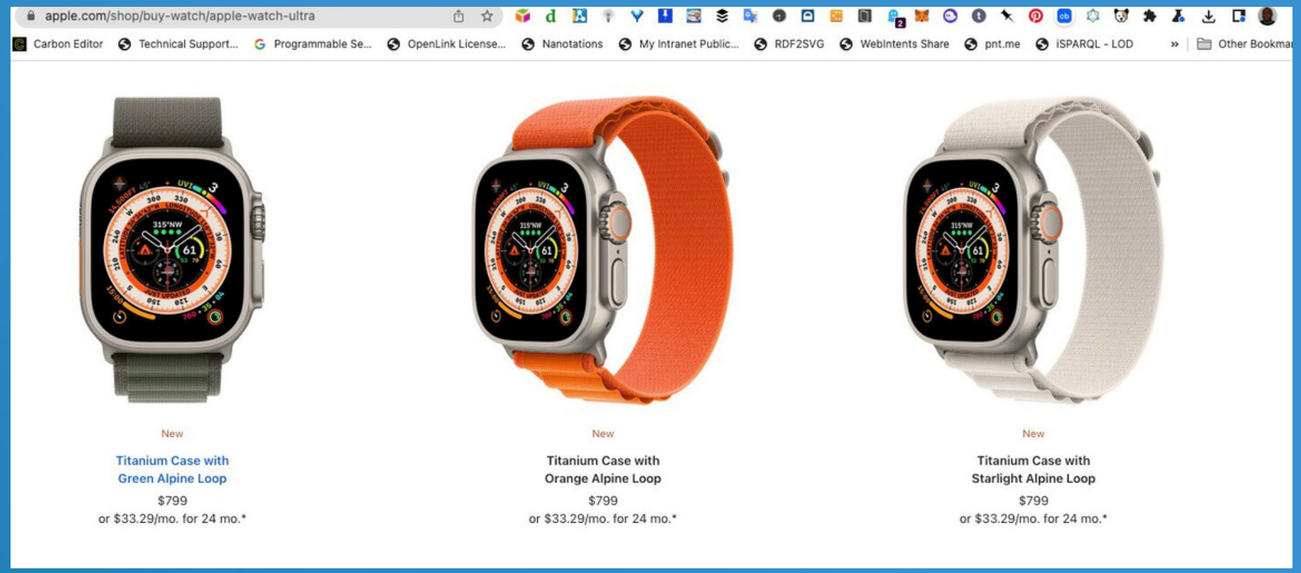
Conventional Page View

Here we see an Apple product page about a selection of watches.

This aspect of the page is oriented towards the needs of a conventional human reader.



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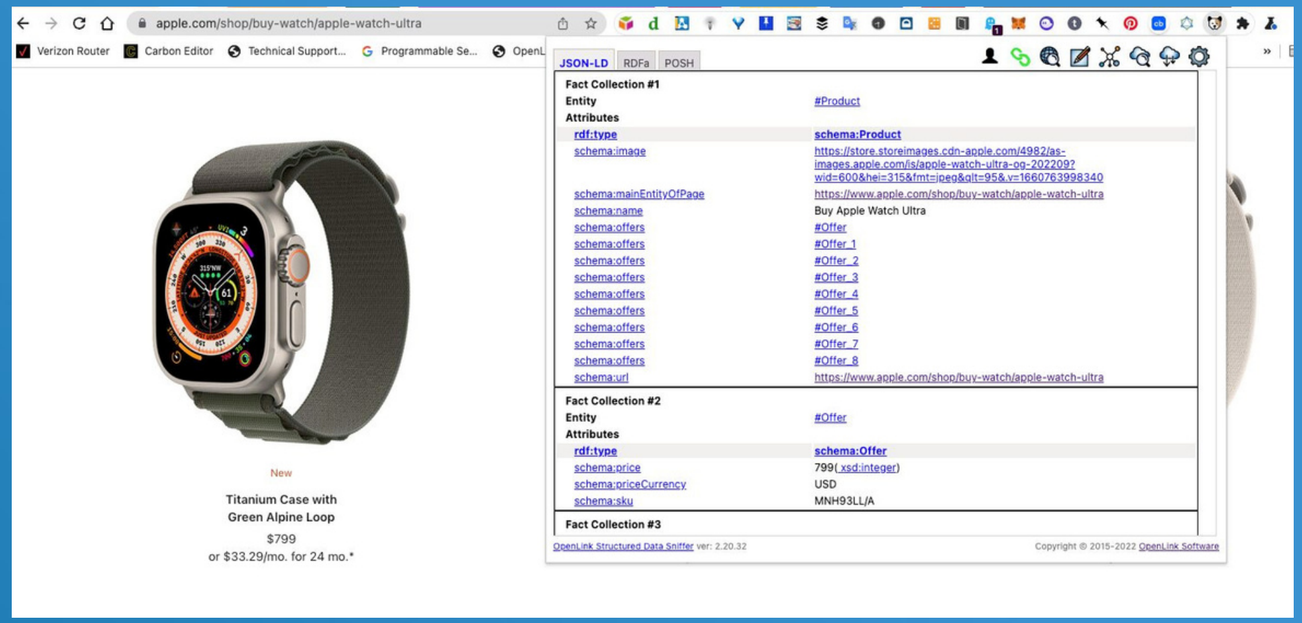
Embedded Product Knowledge Graph View (1)

Recently, Apple announced new Apple Watch models

Impressively, at the same time, they published web pages comprising a Product Knowledge Graph that's both human-readable and machine-computable.



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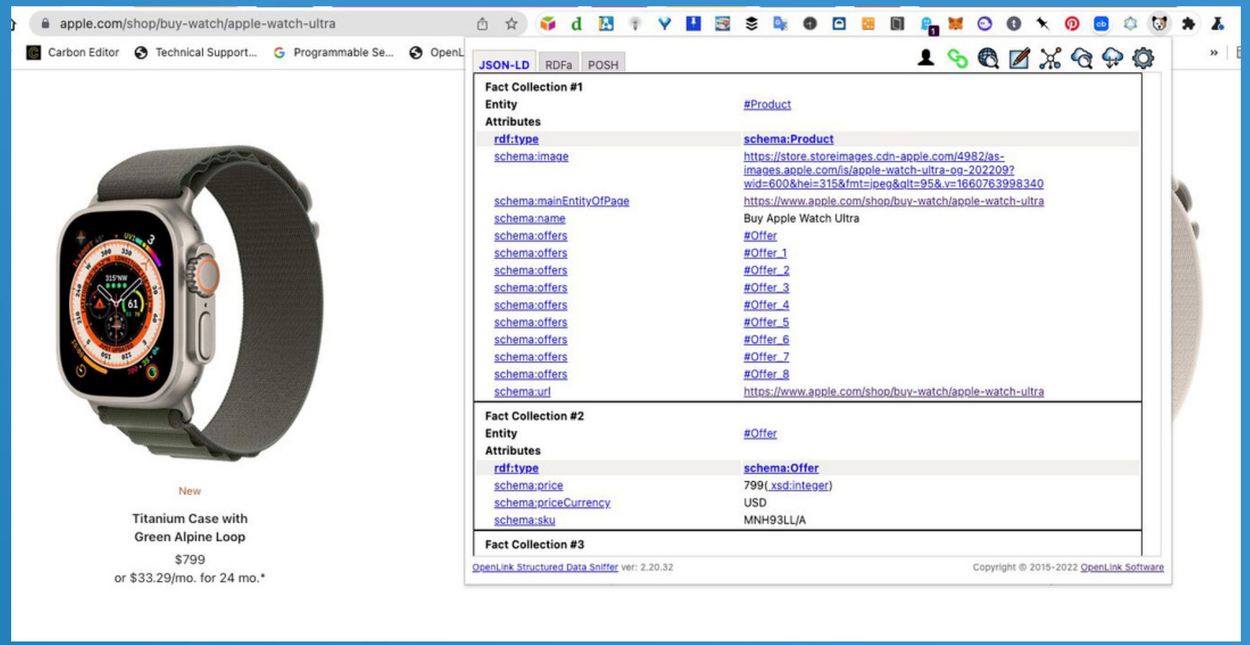
Embedded Product Knowledge Graph View (2)

How is the embedded Knowledge Graph revealed? Simply perform the following steps:

1. Install the OpenLink Structured Data Sniffer (OSDS) browser extension
2. Click the Sniffer icon 🐶 in your browser toolbar to reveal a window with tabs exposing the metadata (JSON, RDFa, etc.)



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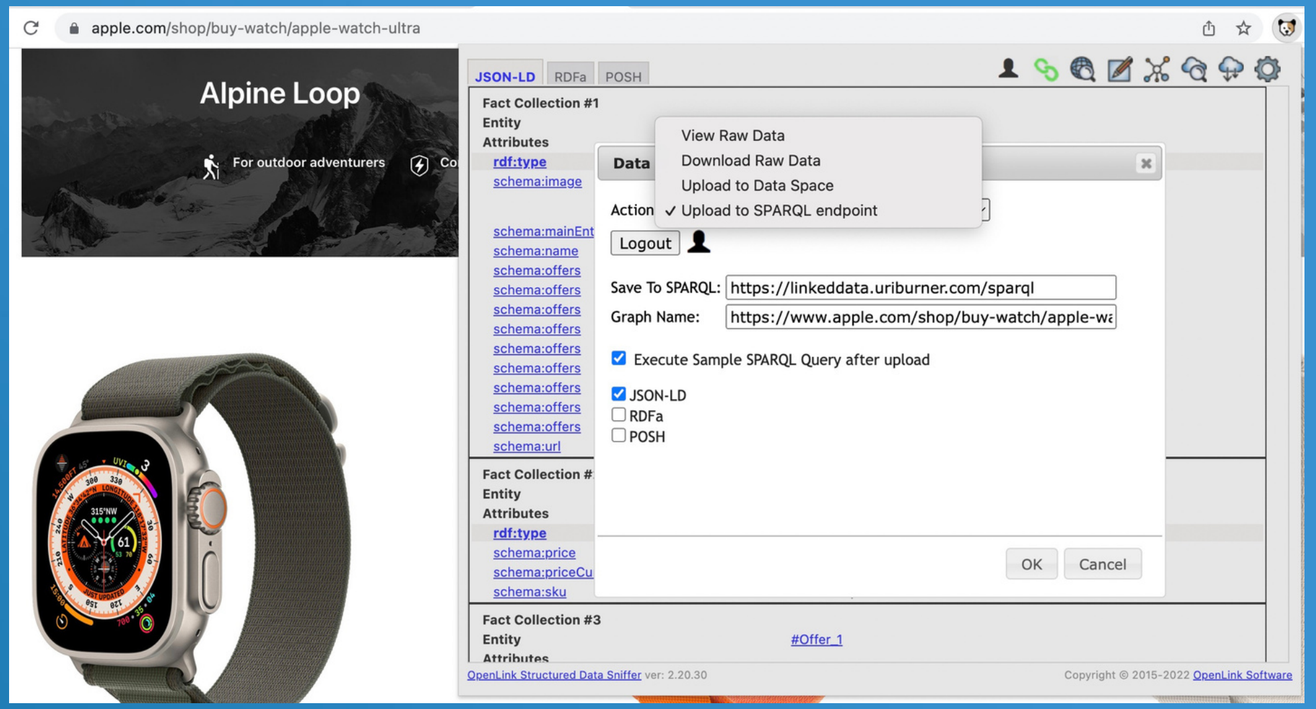
Load Knowledge Graph into a Database Management System (DBMS)

Using OSDS, you can also generate a SPARQL query results page using the host page URL as its Data Source Name (DSN).

How? Simply click  and pick the "Upload to SPARQL" option from the OSDS user inferface!



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Knowledge Graph Introspection & Exploration (1)

Following data upload, you will be presented with a Knowledge Graph introspection & exploration page, constructed from a SPARQL query.

Here's a live example of the SPARQL results page which uses the Apple Watch page URL as its Data Source Name (DSN)

SPARQL | HTML5 table (faceted browsing links)

EntityID	count	EntityTypeID
https://www.apple.com/shop/buy-watch/apple-watch-ultra#Offer	9	http://schema.org/Offer
https://www.apple.com/shop/buy-watch/apple-watch-ultra#ListItem	2	http://schema.org/ListItem
https://www.apple.com/shop/buy-watch/apple-watch-ultra#Product	1	http://schema.org/Product
https://www.apple.com/shop/buy-watch/apple-watch-ultra#BreadcrumbList	1	http://schema.org/BreadcrumbList

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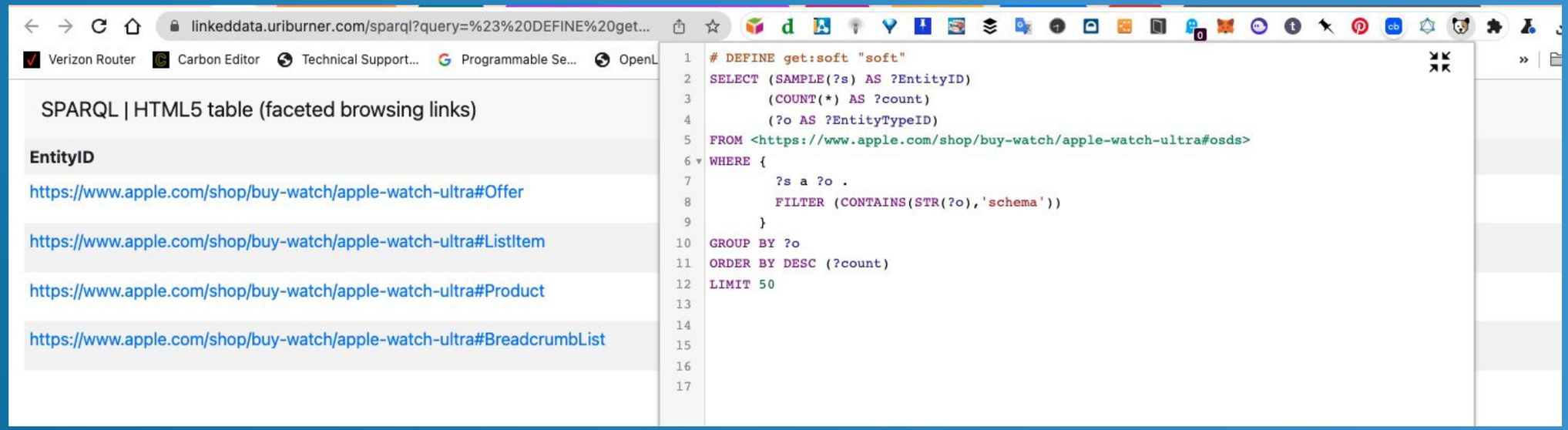
Knowledge Graph Introspection & Exploration (2)

You can also edit this query SPARQL query result page inline using OSDS, as shown in the image below.



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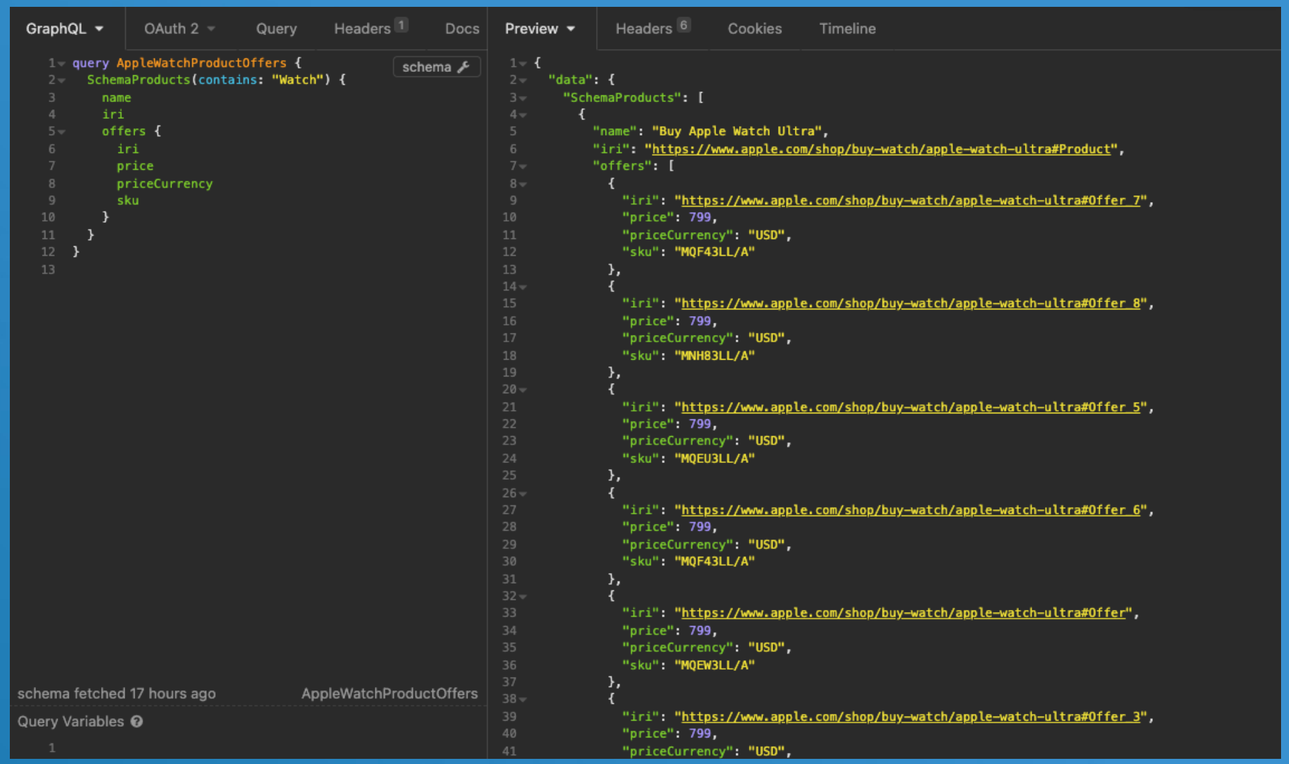
GraphQL Interaction with Knowledge Graph

You can also use GraphQL to query the same Knowledge Graph

Example:

- GraphQL query targeting data from the same Apple Watch page
- GraphQL query results page



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Net Result

Web Pages are a new structured data source, just like relational tables in a SQL-accessible DBMS, for Knowledge Graph discovery and interaction.

As demonstrated in this presentation, our tools aid organizations and individuals alike in their pursuit of agility, driven by productive interaction with data — leveraging new frontiers enabled by a new generation of data access protocols and query languages.

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Conclusion

The growing practice of deploying Knowledge Graphs via web pages offers a cost-effective and practical solution to several challenges:

- Conventional Search Engine Optimization (SEO)
- Emerging Semantic SEO (SSEO) — where machine-computable Expertise, Authority, and Trust (E-A-T) becomes a vital factor in Search Engine algorithms
- Data Access, Integration, Virtualization, and Management — where declarative query language interactions are extended beyond conventional RDBMS tables

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How do I get started — Client Side?

Simply install the OpenLink Structured Data Sniffer (OSDS) extension in your browser and then visit a page of interest. Upon page display, the OSDS icon will be visually activated, indicating metadata discovery. When you click the OSDS icon, you will be presented with a visualization of transformed metadata.

OSDS Download options:

- Chrome Store
- Mozilla FireFox Store
- Apple App Store
- GitHub project page

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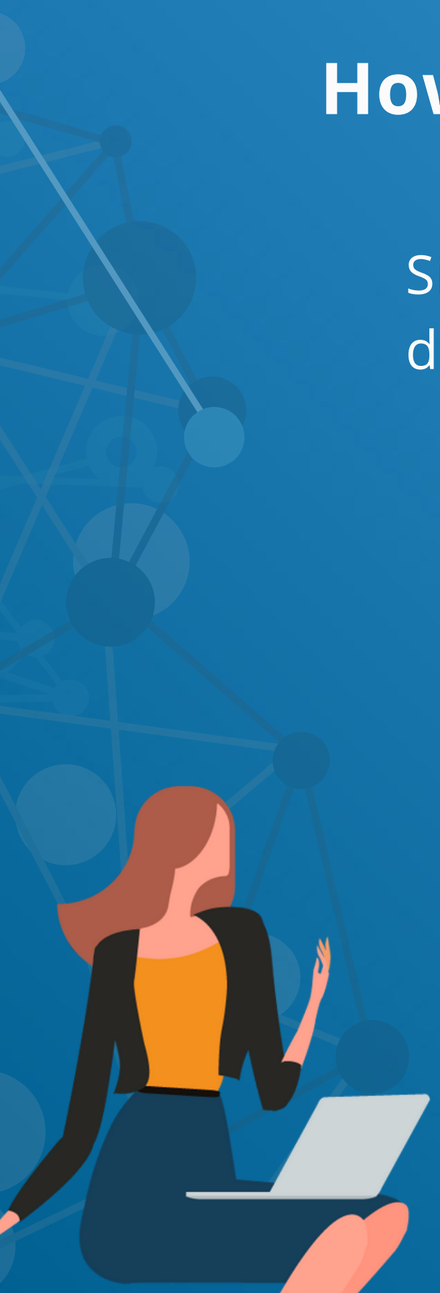
How do I get started — Server Side?



Simply install our Virtuoso multi-model DBMS and Knowledge Graph deployment platform using any of the following options:

- Our Live URIBurner Service — comprising a progressively enhanced Knowledge Graph
- Your own Virtuoso Enterprise Edition instance running on macOS, Linux, or Windows
- Your own Docker Container
- Your own Amazon AWS Cloud instance — BYOL or PAGO
- Your own Microsoft Azure Cloud instance — BYOL or PAGO
- Your own Virtuoso Open Source Edition instance, built or downloaded from our GitHub project repository.

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ADDITIONAL INFORMATION

- What is the OpenLink Structured Data Sniffer, and Why is it Important?
- OpenLink Software Home Page
- OpenLink Community Forum
- Linked Data Ontology and Knowledge Graph Explainer

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