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GEO SEMANTICS EXCHANGE (GSX)

CONNECTING CONTENT AND PROVIDING CONTEXT

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About us

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The GFX

GeoFoundation Exchange (GFX) Data

35+ Datasets

- Road segments
- Neighbourhoods
- …

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The Data Dilemma for GIS

- Dataset Silos: There is a disconnect between geospatial datasets.
- Difficult and time consuming to perform complex geospatial queries.
- This results in missed opportunities to combine geospatial data with external data sources.

Our Vision

Using **ontologies** to enable a Smarter Community

Connecting Content and Providing Context

Data → Knowledge

Integrated data as more than the sum of its parts

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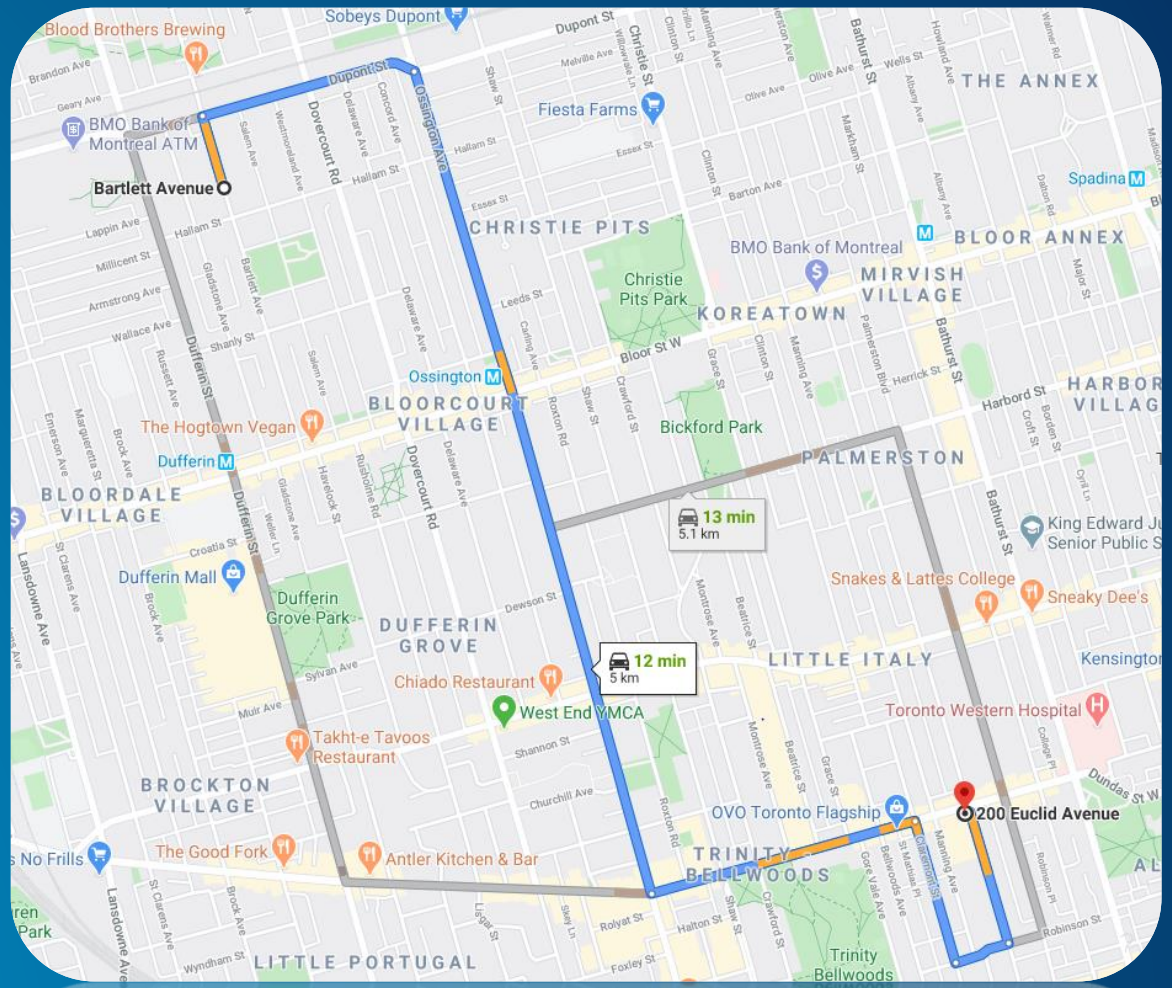
A Case Study:

Identify the points-of-interest, neighbourhoods and land use types along the shortest path between two points, over the road network.



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A Simple Algorithm:

- Select: **Point A** and **Point B (Origin => Destination)**
- Find the **Road Segments** in the **Road Network** that define the **shortest path** between A and B.
- Identify the **Neighbourhoods** the path goes through.
- Identify the **Land Use & LandCover** types along the path.
- Locate the **Points-of-interest** "near" the path.

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Problem Context: Dataset Silos

- Select: **Point A** and **Point B (Origin => Destination)**
- Find the **Road Segments** in the **Road Network** that define the **shortest path** between A and B.
- Identify the **Neighbourhoods** the path goes through.
- Identify the **Land Use** types along the path.
- Identify the **Land Cover** types along the path.
- Locate the **Points-of-interest** "near" the path.

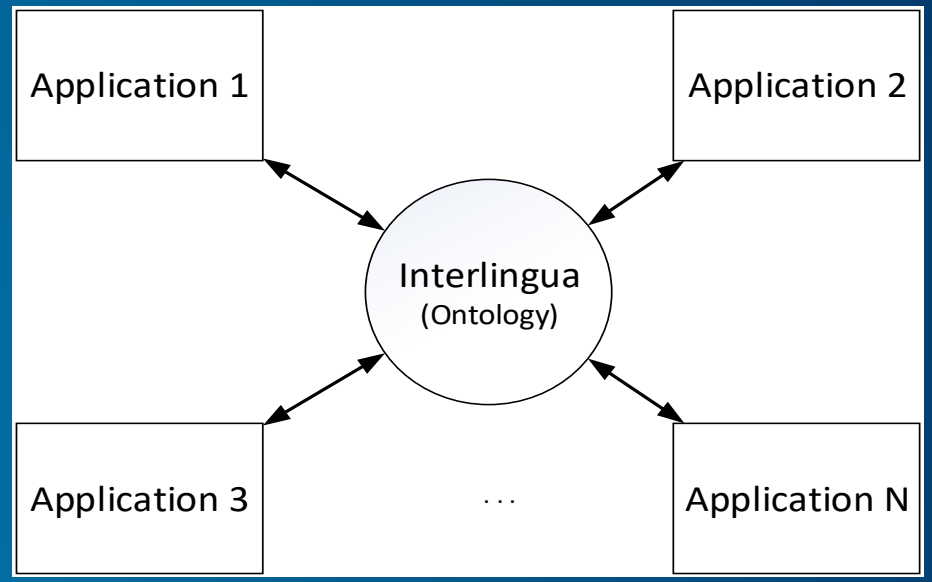
- **Road network** defined by connected R**oad Segments**.
- **Road segments** not connected to N**eighbourhoods**.
- **Road segments** not connected to **Land Use t**ypes.
- **Road segments** not connected to **Land Cover** types.
- **Road segments** not connected to **Points-of-interest**

What is an Ontology?

...and how can we use it to solve this problem?

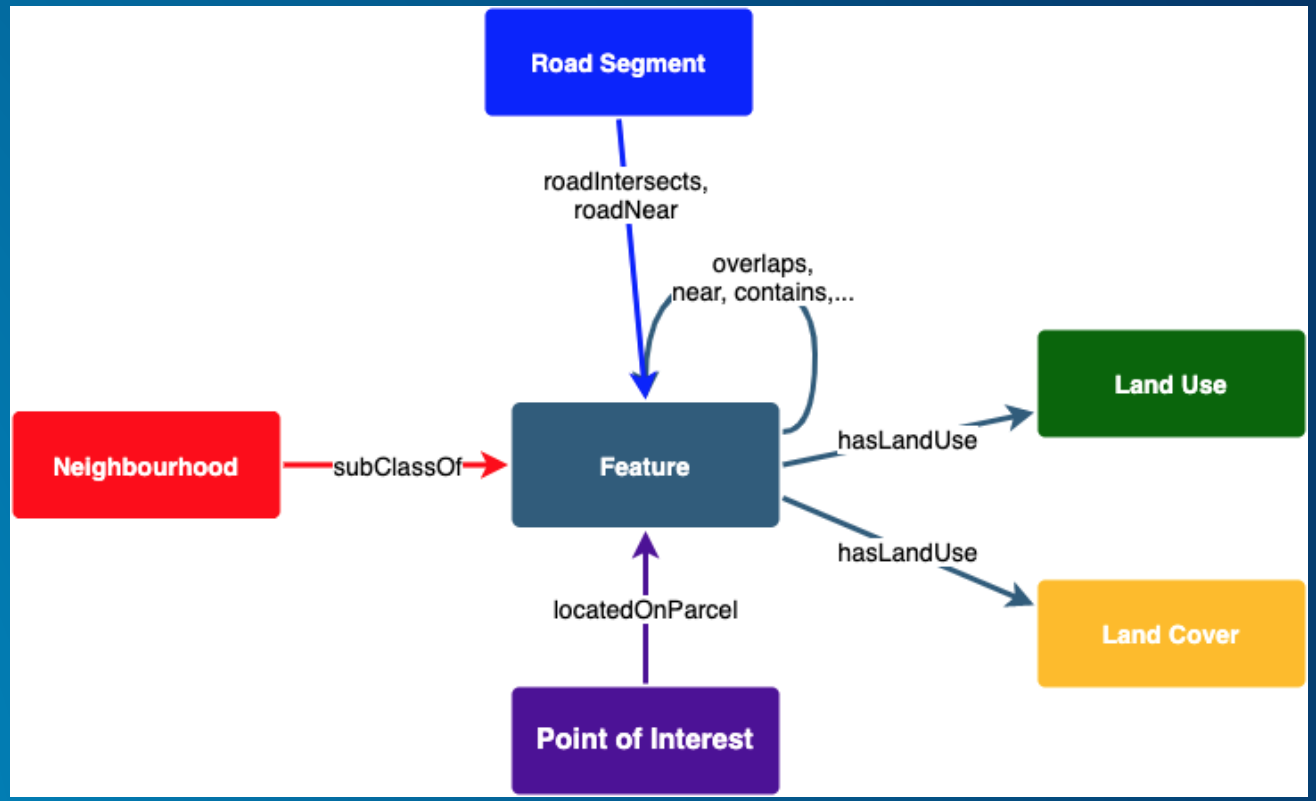
- Ontology (computer science): a machine interpretable artefact that formally defines the semantics of a collection of concepts associated with a domain of interest.

- Applications:
  - Automated reasoning
  - Data validation
  - *Semantic integration: a common language to integrate data sources through a description of its domain*

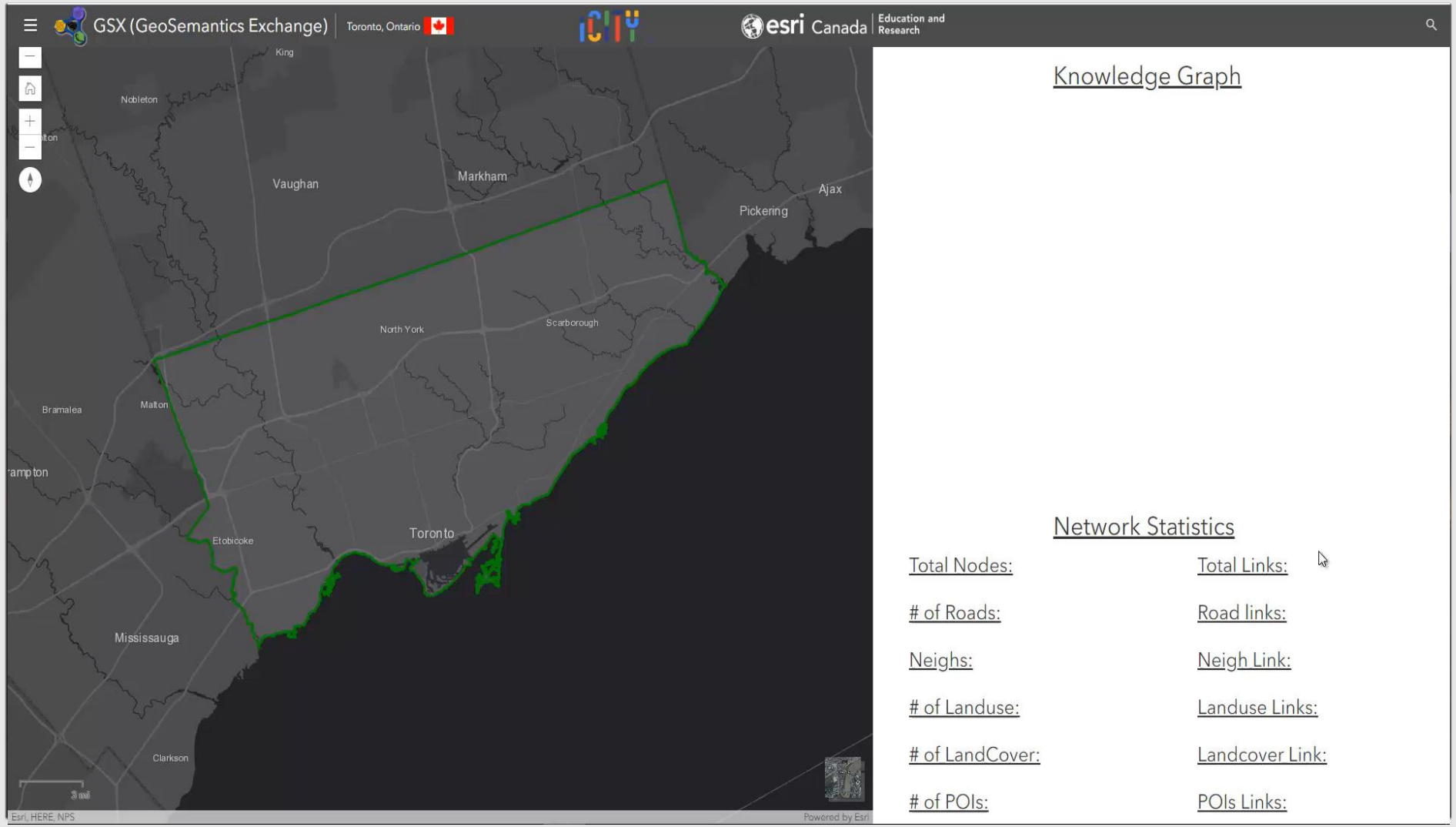


Describing the "Structure of the Knowledge" in the GFX with an Ontology

- Select Point A and Point B.
- Find the road segments in the road network that define the shortest path between A and B.
- Identify the neighbourhoods along the road segments the path goes through.
- Identify the land use types along the road segments the path goes through.
- Locate the points-of-interest "near" the path.



Demo



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GSX ARCHITECTURE

Microsoft Azure

PostgreSQL

ontop

ArcGIS Enterprise

Flask

Packages & APIs

OWLReady2

rdflib

python

NumPy + Pandas

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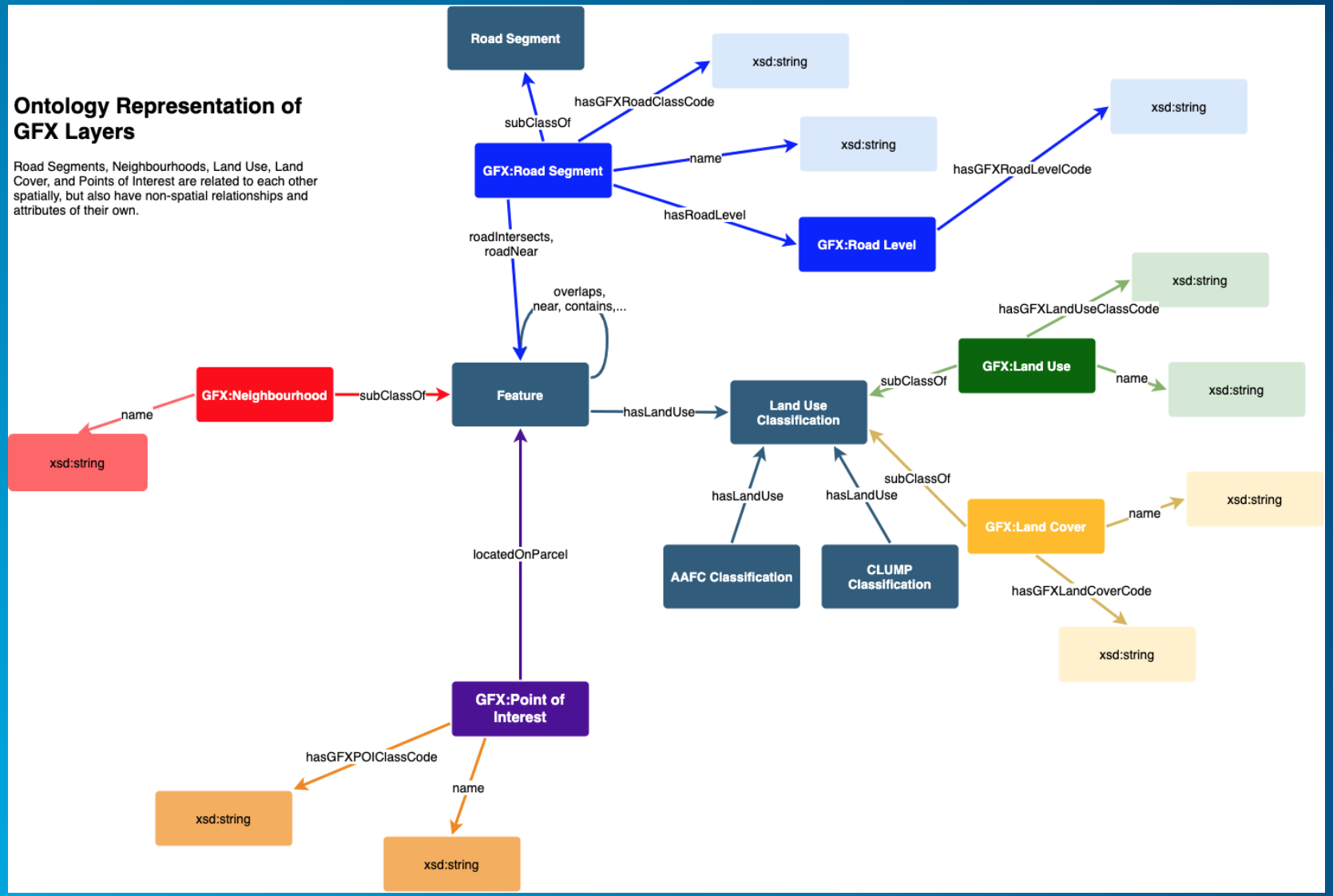
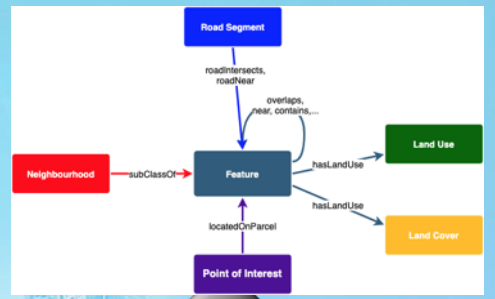
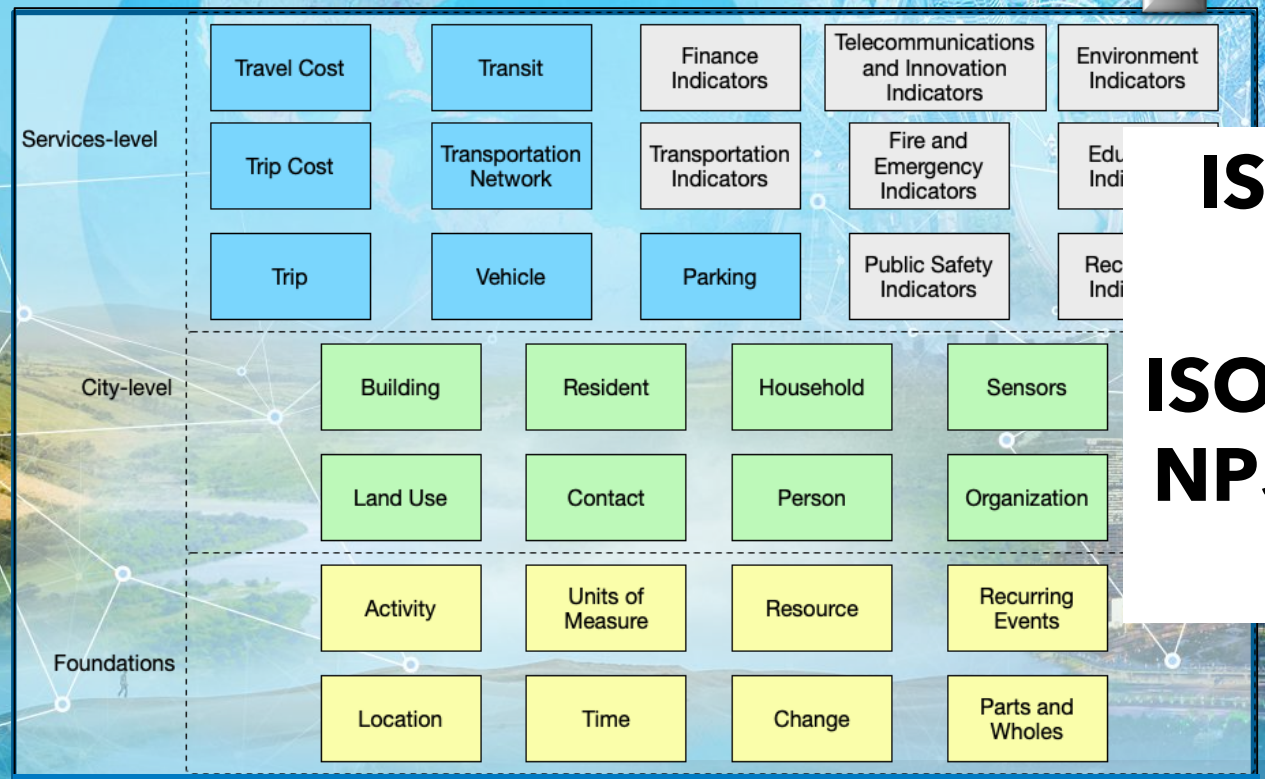
Knowledge Graph – Ontology Structure



GSX Ontology

ESRI GSX Ontology





ISO/IEC JTC1 WG11 Smart Cities

ISO standards projects: NP5087-1, NP5087-2, NP5087-3

iCity-ORF Project 1.1: iCity Transportation Planning Suite of Ontologies

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Next Steps

- Continued design improvements (efficiency, functionality)
- Integrate external data sources
- Apply and adapt Esri prototype for other use cases
- Continued efforts on ISO standardization

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iCity: Urban Informatics for Sustainable Metropolitan Growth

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Nandi
Спасибо
धन्यवाद
Thank you
Tack
Хвала
Köszönöm
Takk
Gracias
Obrigado
Grazie
感謝您
Děkujeme
شكرا
ધન્યવાદ
Merci
Kiitos
תודה
Teşekkürler
Dziękuję
ありがとうございます
Děkuji
Terima kasih
Danke
谢谢您
Dank u
감사합니다
Tak