

Urban Data Centre

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Mission

- To enhance the analysis, design, planning and operations of cities by expanding the opportunities presented by data, and addressing the challenges inherent in data.

Objectives

To achieve this mission, the Centre is/will pursue seven objectives. The development of:

1. Urban Data Repository (UDR),
2. urban data partnerships,
3. trusted urban data governance models,
4. national network of urban data curators,
5. standards for the representation of urban data,
6. tools for the management of urban data, and
7. tools for the analysis and interpretation of urban data.

Urban Data Repository

It will provide researchers and policy makers across Canada with unprecedented access to multi-sourced, integrated urban data leading to potentially revolutionary new insights into how cities function.

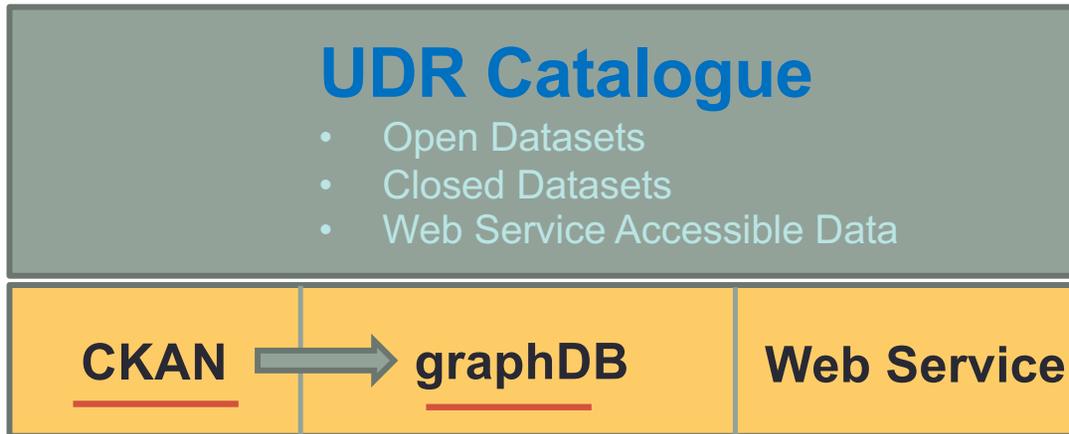
Urban Data Repository

- Repository of urban data from across Canada and around the world
 - Sourced from both authoritative and non-authoritative sources
 - Spanning all urban dimensions
- Supports research into **Urban Issues**
 - Physical infrastructure
 - Social infrastructure
 - Public Health infrastructure
- Supports research into **Urban Data Science**
 - data curation, validity, authenticity/integrity, cleaning, trust, relevance, and fusion,
 - access, ownership and privacy.

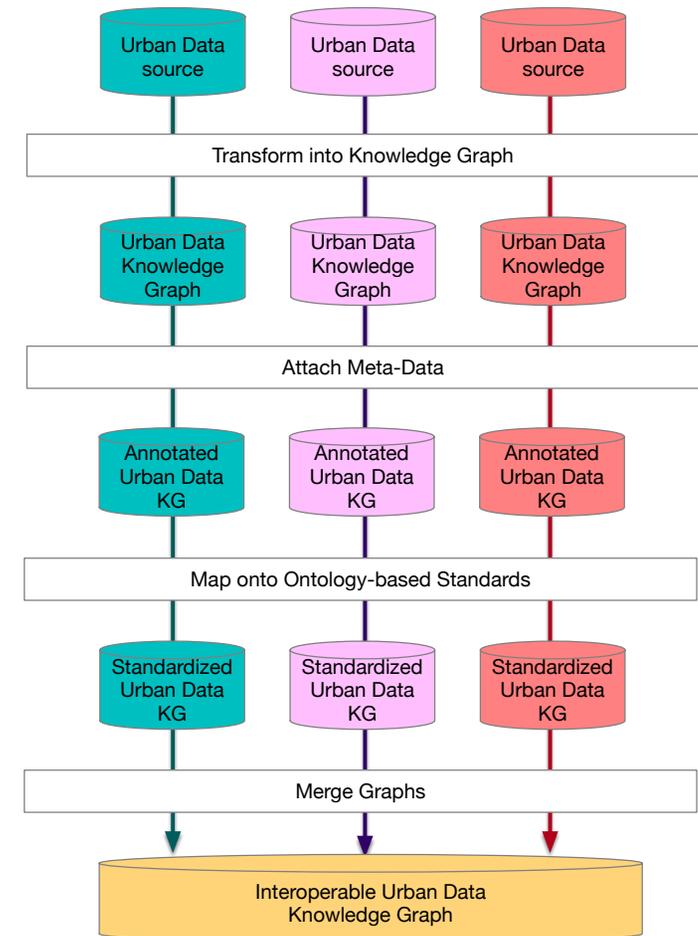
UDR Catalogue

- Open Datasets
- Closed Datasets
- Web Service Accessible Data

- Provides access to three categories of datasets:
 - 1) **Open** datasets stored in UDR in their original format and are openly available for download;
 - 2) **Closed** datasets **not** stored in UDR but are accessible under separate agreement; and
 - 3) **Webservice** access to datasets, including real-time feeds, e.g., sensor data.
- Critical to the provisioning of these three categories of datasets is the creation of a dataset/source catalogue, composed rich descriptions (meta-data) of datasets.
 - Including provider, creation date, usage license, data model,
 - Quality, completeness, validity, authenticity, trust, etc.
 - How used, outcomes, etc.



- All datasets stored in original format
- All datasets integrated into a single knowledge graph
 - Embracing the philosophy of linked data/semantic web
 - Rich semantics
 - Vocabularies and ontologies that specify definitions of concepts, terms, etc.



Urban Data Partnerships

Enable the use of this data for policy-relevant research by developing partnerships across sectors, facilitating data access, and building the capacity of students, faculty, and other researchers to use the data.

Urban Data Partnerships

- Develop a data roadmap that explores the types of data that might be made available and the current barriers to access
- Formalize research partnership with stakeholders
- Streamline access to data, creating a shared ontology and strategies for data linkage

Partnerships

- Health Data:
 - Public Health Agency Canada
- Municipal Data:
 - Federation of Canadian Municipalities and StatsCan
 - City of Toronto Digital Infrastructure Plan
- Governance
 - Innovate Canada
- Standards
 - ISO/IEC JTC1 WG11 Smart Cities
 - World Wide Web Consortium

Trusted Urban Data Governance

Explore governance models that address the legal, political, sociological and practical aspects of governing access to data.

Trusted Urban Data Governance

- Data trust governance is process of ensuring the ethical and responsible collection, processing and use of data and the legal, economic, and social priorities surrounding the sharing and exchange of data.
- Two types of governance to consider with respect to Data and the Tech Sector:
 - **What we can access.** This involves issues of privacy and rights to use .
 - **What we can use it for.** This involves acceptable use of data, regardless of source. This is constrained by laws, regulations and cultural expectations.
- Types of trust: Organization, Ownership, Privacy, Authenticity, Quality, Ethical and Legal Acquisition and Use.

Life Cycle Perspective

- Any single method/process is incomplete with respect to guaranteeing all types of trusted data – what to do?
 1. Accept the fallability of any process put in place.
 2. Take a life cycle perspective – from creation to use
 3. Identify points of:
 - self-certification
 - automation
 4. Accept that self-certification may be incorrect, and automation will be incomplete BUT each complement and reinforce each other

National Urban Data Network

National Network of Urban Data Curators

A network of data curators located in libraries and universities across Canada that will:

- identify sources of urban data,
- secure rights to use the data,
- annotate the data with meta data covering ownership, usage license, quality, etc., and
- deposit the data into the Canadian Urban Data Repository.



Standards for the representation of urban data

Role of Standards

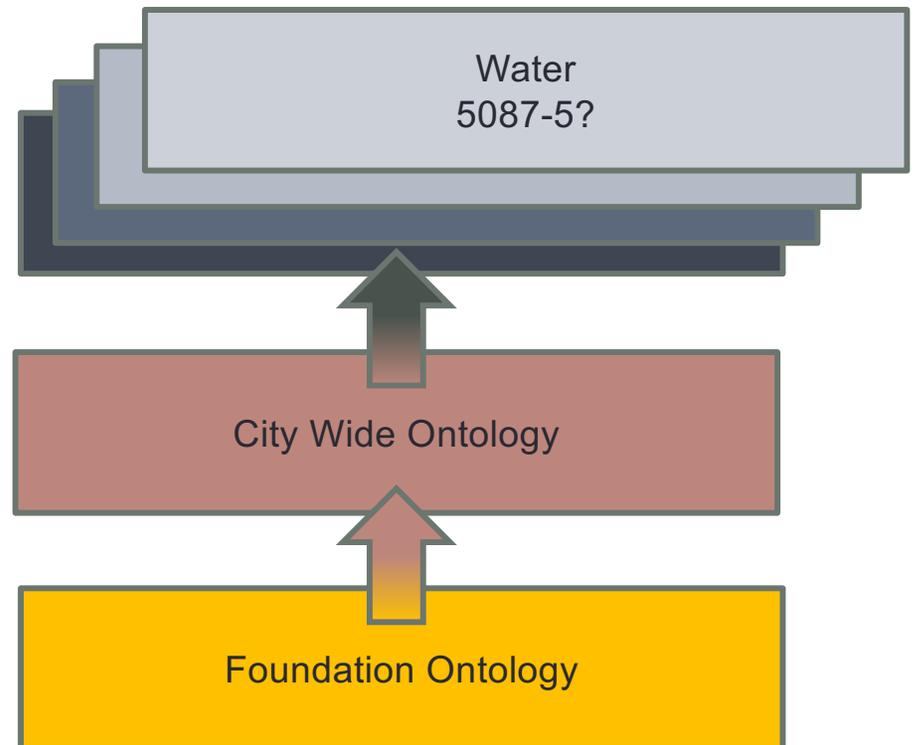
- Provides a precise, unambiguous representation of city data enabling the integration of data across city services, both within the city and its external stakeholders.
- Enables cities to share information, plan, coordinate, and execute city tasks, and support decision making within and across city services.

ISO/IEC AWI 5087 Series

Service Level (5087-n) spans concepts commonly associated with a particular service but still shared with other services, such as Vehicles and Transportation network. *Can be read by multiple services, but updated only by one service.*

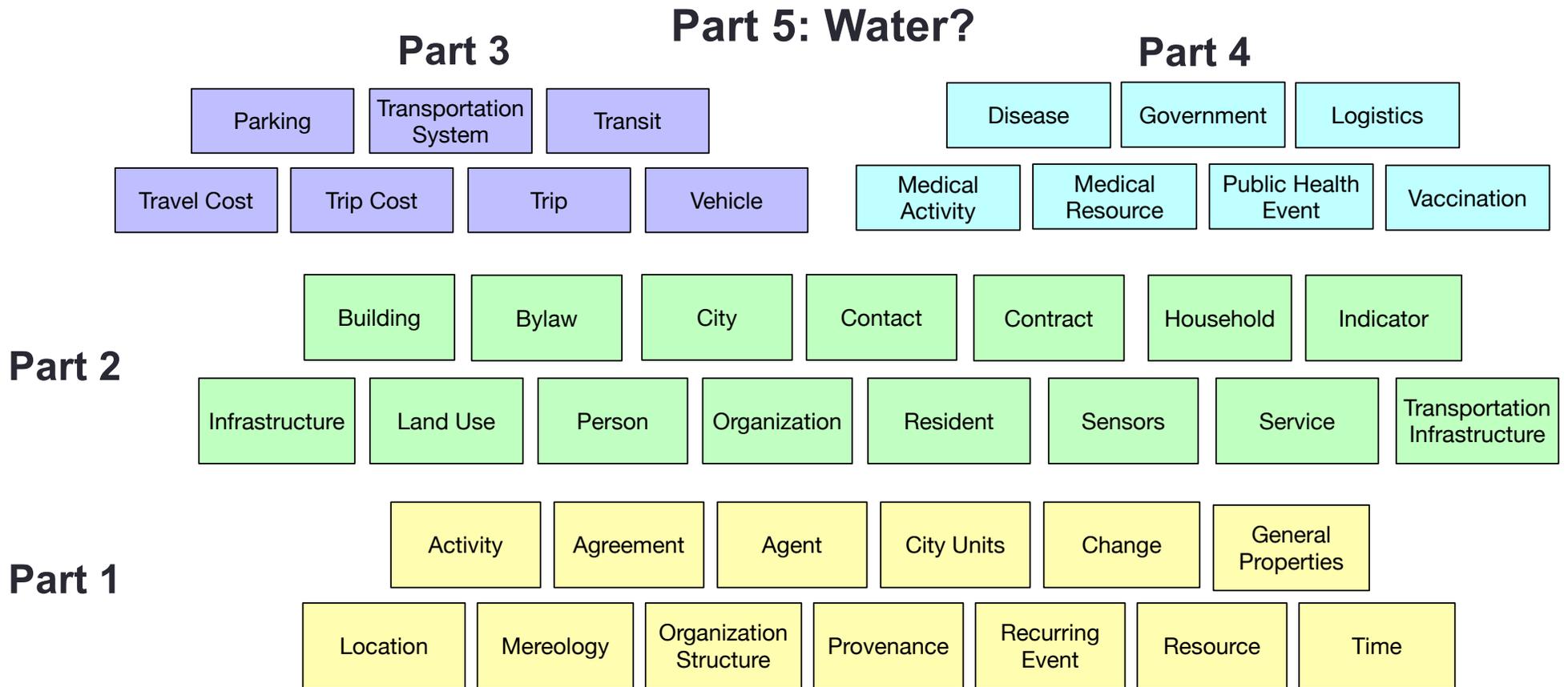
City Level (5087-2) spans concepts that are general to cities and span all services such as Households, Services, Residents. *Can be read and updated by multiple services.*

Foundation Level (5087-1) spans very general concepts such as Time, Location, and Activity, upon which other levels are based.



The process of development of this standard is to iteratively select a city service and apply the ontology engineering development process to create, extend and/or modify each level of the standard.

ISO JTC1/WG 11 Smart Cities: 5087



City Data Collaboratory

Convene a global conversation on city data standards

CITY DATA MODEL PROJECT
 A GLOBAL COLLABORATORY

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Introduction

This website is intended to foster international collaboration between stakeholders and related standards groups on a common **City Data Model**. The results of this effort will feed into the various city data standards development projects being undertaken by various Standards Development Organizations.

A common data model enables city software applications to share information, plan, coordinate, and execute city tasks, and support decision making within and across city services, by providing a precise, unambiguous representation of information and knowledge commonly shared across city services. This requires a clear understanding of the terms used in defining the data, as well as how they relate to one another. Beyond syntactic integration (e.g. common data types and protocols), this requires semantic integration: a consistent, shared understanding of the meaning of information.

The City Data Model is stratified into three levels of abstraction (pictured below). The Foundation Level covers very general concepts such as Time, Location, and Activity. The City Level covers concepts that are general to cities and span all services such as Households, Services, Residents. The Service Level spans concepts commonly associated with a particular service but still shared with other services, such as Vehicles and Transportation network.

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Toronto Resident

Subclass Of	City Resident
Namespace (context for definition)	toronto
Description (what distinguishes this sense of the term?)	You are identified as a resident if you reside in, own property, or own or operate a business in Toronto.
Required by Use Case(s) (why is this specialized definition needed?)	
Formal Definition (UML or DL)	TorontoResident subclassOf Resident and (residesIn.Toronto or ownsPropertyIn.Toronto or operates.(Business and hasAddress.(Address and inCity.Toronto))) UML: see figure below
Definition Licensing	
Other Licensing Notes	
Status	Pending Approval
Has Subclass	<input type="text"/> submit

W3C ISO/IEC OGC

Tools for the management of urban data

Focus on data quality and governance.

Urban Data Management Tools

- Research into **data validity**:
 - **Empirically** – the degree to which it is confirmed by other sources,
 - **Methodologically** – the method used to derive it
 - **Reputationally** – the degree of trust in the source
- Research into **semantic integration**.
 - How to integrate data from multiple sources where the attributes and/or values have imprecise and ambiguous semantics.

Urban Data Management Tools

- Research into **privacy and ownership**.
 - Methods of role, use and organization-based access
 - Source-based governance, e.g., OCAP
 - First Nation's Information Governance Centre Ownership, Control, Access and Possession principles
- Research into **data quality**
 - Measurement quality, e.g., sensors.
 - Sampling quality, e.g., how much and how often.
 - Classification quality, e.g., categories.

Urban Data Management Tools

- Research into **temporal management**
 - Methods of managing data that changes over time

Tools to support the analysis and interpretation of urban data

A library of tools to support urban analysis, design, planning and operations

Urban Data Analysis Tools

- Experiment management
 - Goals, objectives, metrics, datasets, analysis process.
- Analysis process/pipeline definition.
 - Workflow of operations performed on datasets.
- Data operations.
 - Selection, aggregation, integration, ...
- Data analysis.
 - statistics, machine learning, ...
- Visualization.

Questions?