Knowledge On-Demand

Moving from data access to answering questions

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Knowledge On-Demand Environments are about answering questions in real-time

^
near

Smart Phone is our ubiquitous connection to the real world

3.6 Billion unique users[1]

50% uptake = global average

Potential to leapfrog fixed-line technology

1. https://www.statista.com/topics

Next Generation Systems

Answers to questions NOT access to data

Questions and Answers

Questions unpredictable

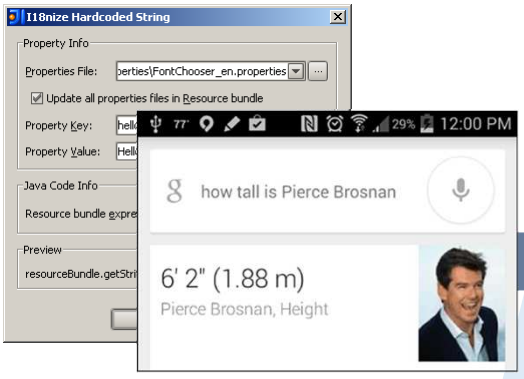
Leave the data where it is and let the analytics do the work

Is this land likely to be flooded

Should we evacuate now

How much land was cleared illegally in last 5 years

Current Situation Hardcoded Analytics



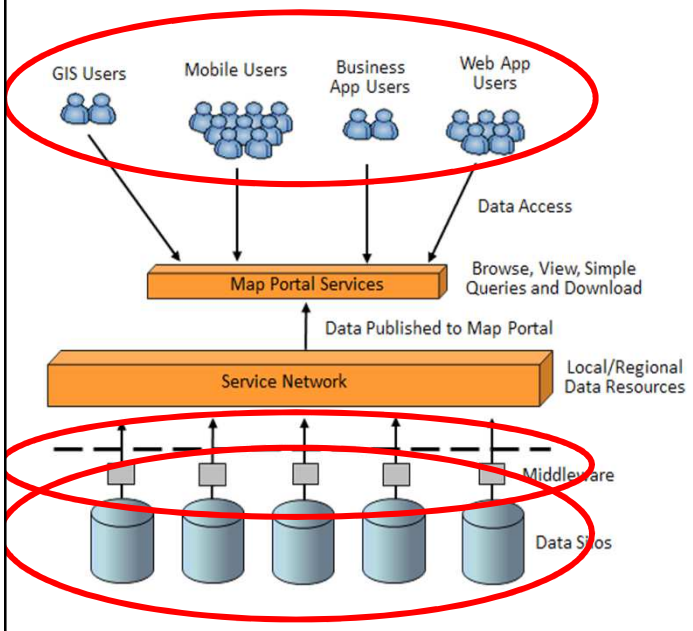
Future Situation Knowledge Inferencing

Knowledge On-demand requires a rethink and redesign in the way data and supporting services are structured

The Traditional Query Process

Query Process Data

Time consuming manual process



SDI Technology Today

Systems designed for DATA-IN

Applications are hard coded and inflexible

The 'Smarts' to integrate data are at the core data-level.

Forecasting Demand

Push → ← *Pull*

Just in case	Just enough	Just in time	Just in real-time	Just for me
Disaster Management	Foundation Spatial Data Themes	High Demand Data Themes and Areas	Data as a Service	Knowledge

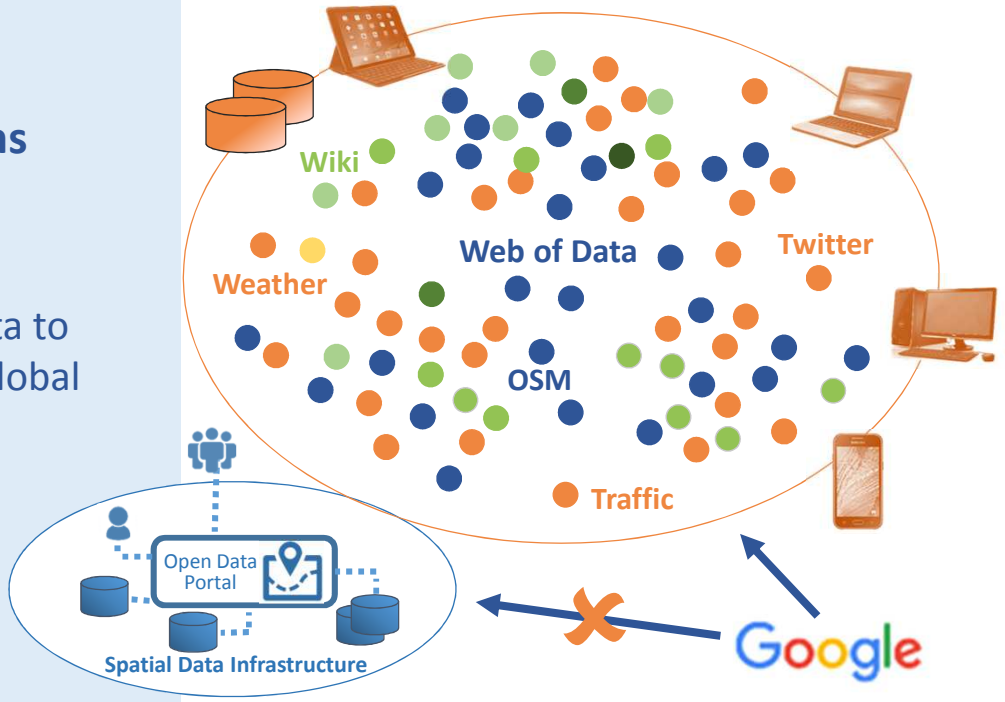
Questions are multifaceted

Unable to be predicted and are context dependent

Query Applications Today

Difficult to integrate data to query on a global scale

Data is not machine-accessible



Information technologies have crossed a threshold

Unprecedented sources of machine-readable data

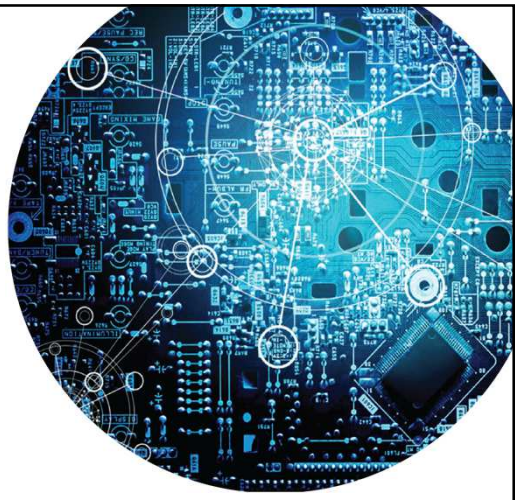
50 billion IoT devices by 2020[1]

Capacity to generate and infer new Knowledge

1. https://www.statista.com/topics

AI Landscape for Knowledge On-demand

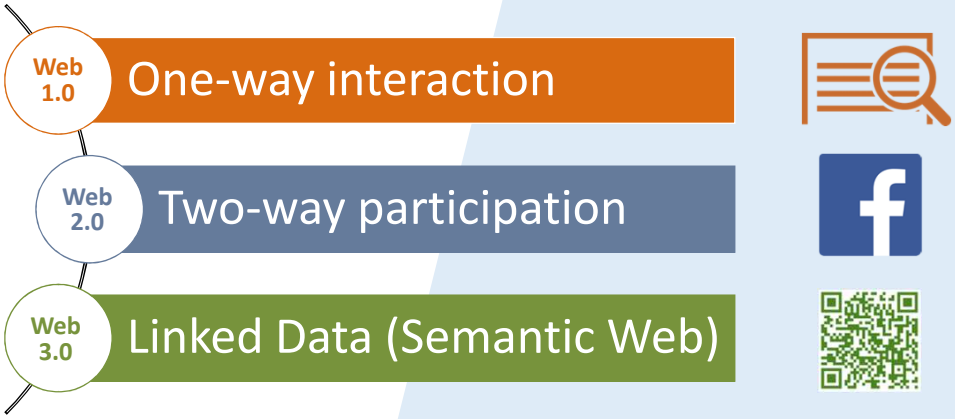
- Speech Recognition
- Natural Language Processing
- Machine-learning
- Deep-learning
- Predictive Apps
- Image Recognition
- Knowledge Representation
  - Ontologies
  - Vocabularies



New tools for next-generation spatial infrastructures

Semantic Web – Making Data Smart

Third stage in the Evolution of the Web



Knowledge On-Demand Query Process

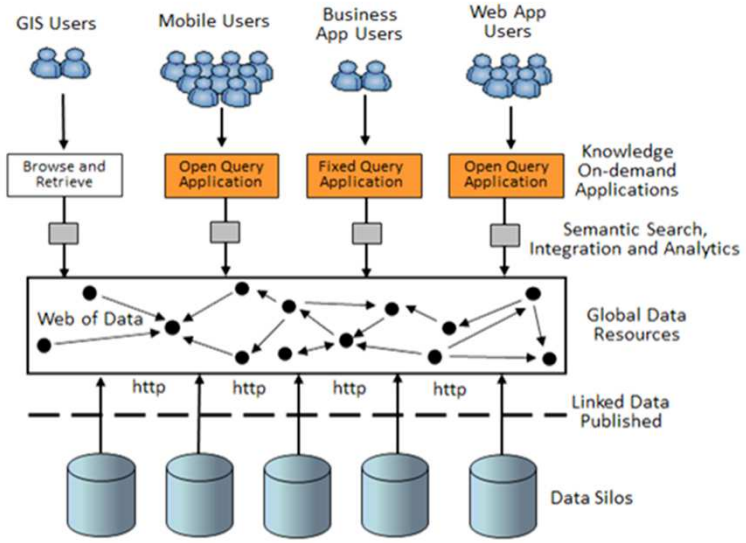
Query Process Linked Data

Ability to infer knowledge Automatically

Next Generation infrastructure

Designed for Knowledge -OUT

Open Query Applications



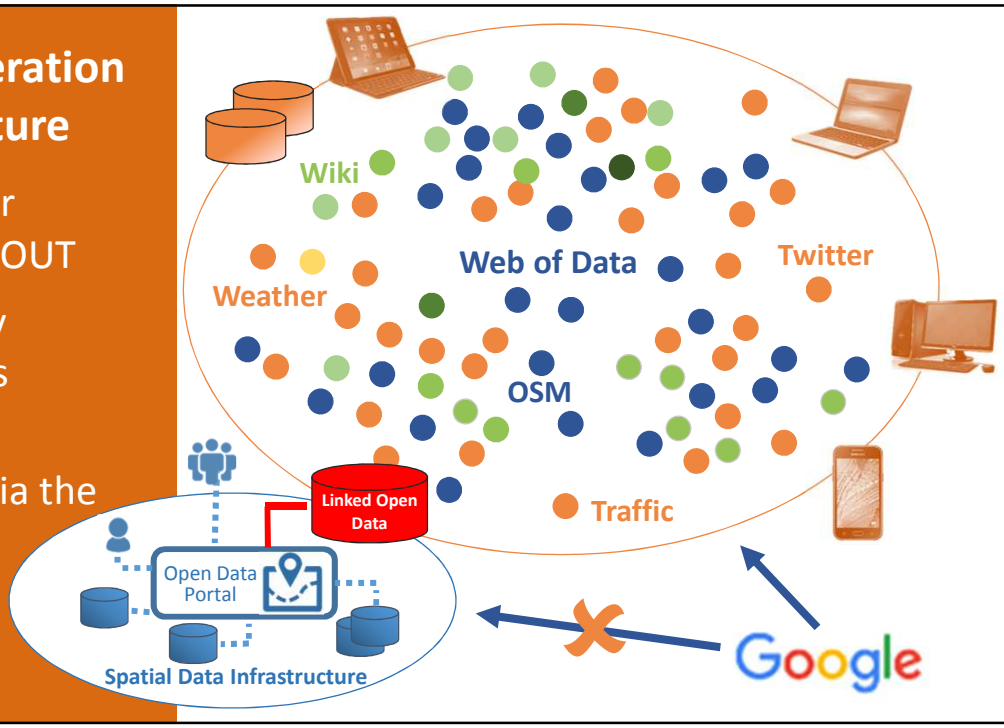
Next Generation Infrastructure

Designed for Knowledge-OUT

Open Query Applications

Linked Data accessible via the Web

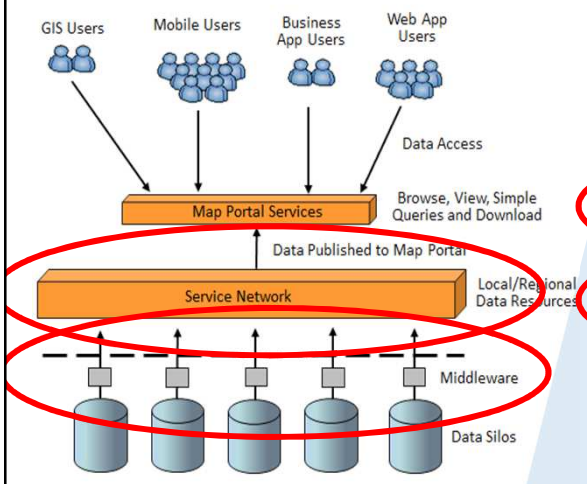
Global data integration

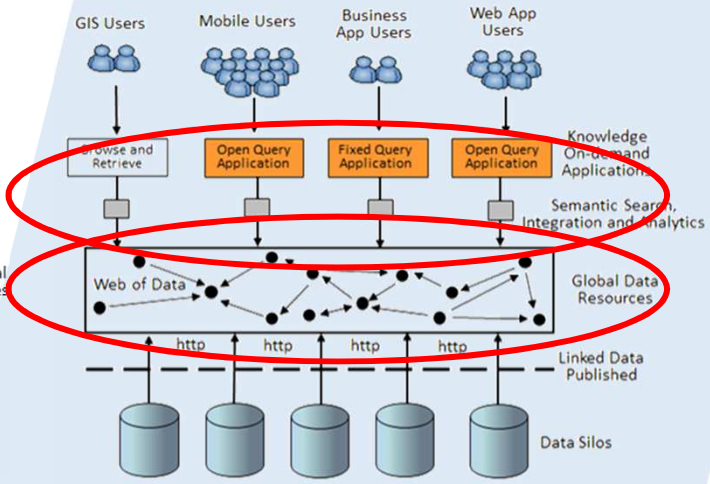


A Global Data Space is some years away

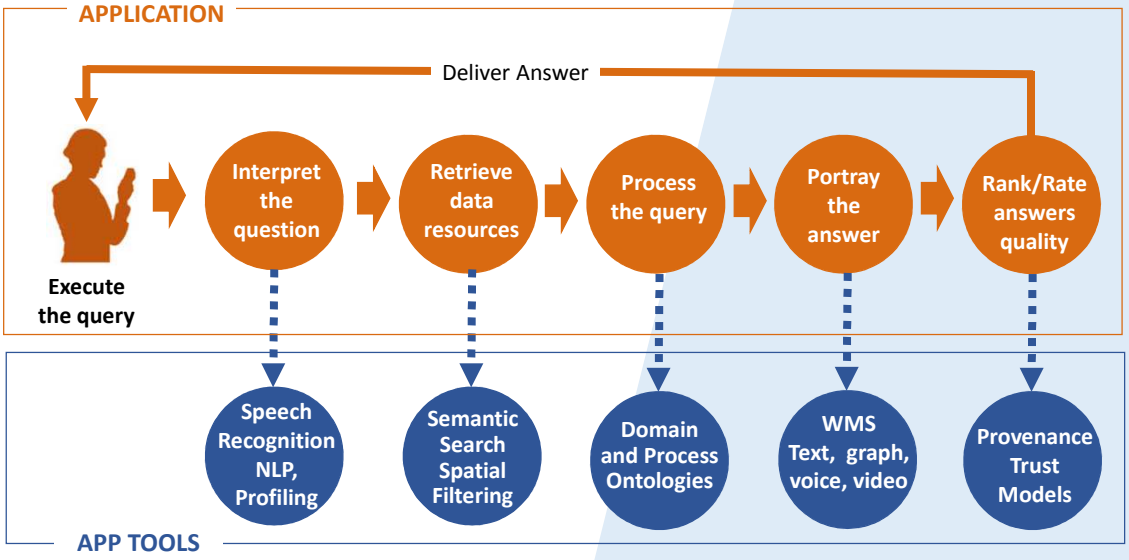
Local, National and Regional Geospatial Linked Data Resources will eventually link up to form a global data space

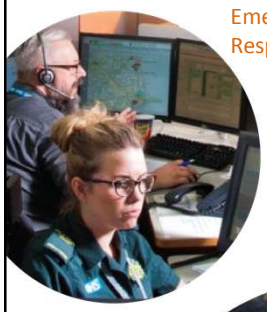
Major Differences





Open Query Process





Emergency Responder

Insurance Broker

Will this home be flooded?

Urban Planner

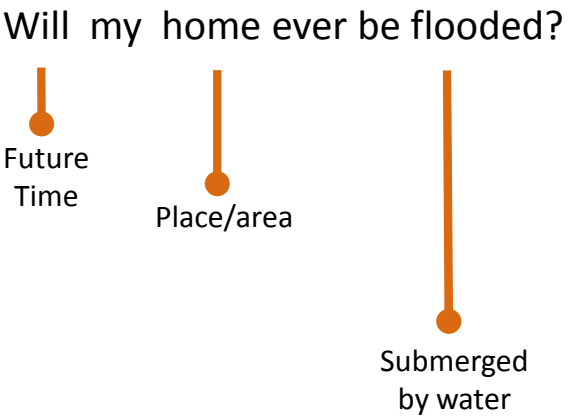
Home Buyer

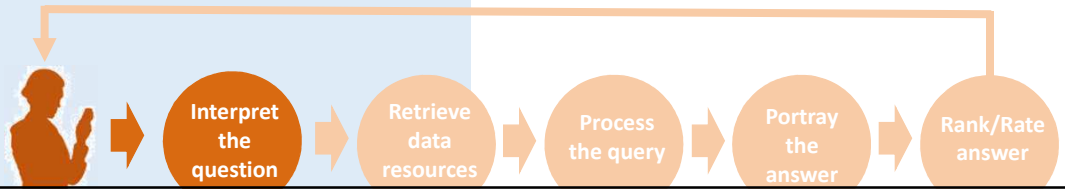
Queries need to be context dependent

Natural Language Processing

Used to decompose a human query.

Machine learning used to infer meaning

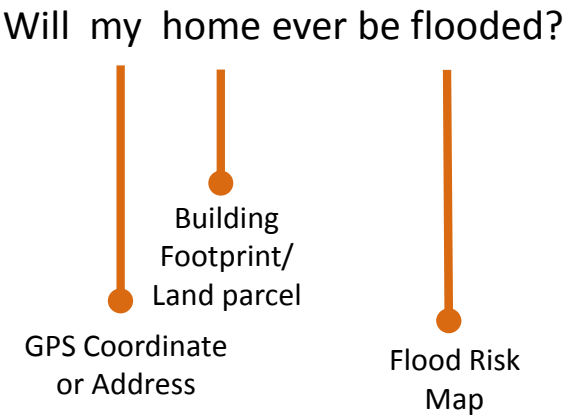


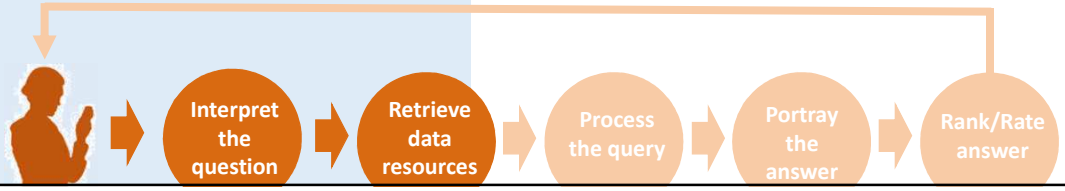


Semantic Search and Spatial Filtering

Identifies and filters data relevant to a users query and context

Improves simple metadata searches

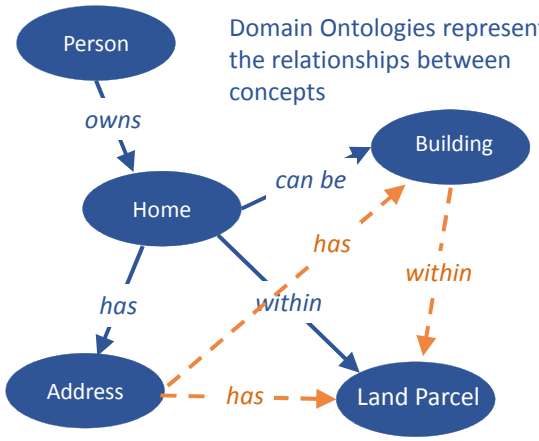




The knowledge to answer a question initially comes from humans.

What, Where, Why, When, and How.

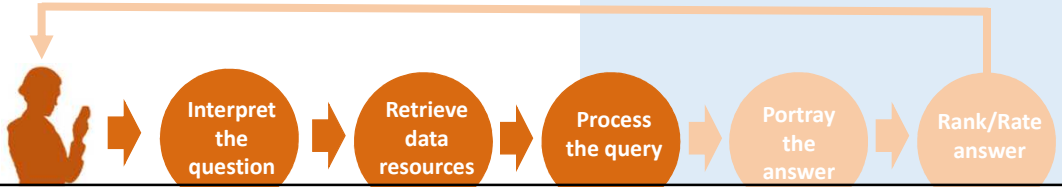
Machines learn from this knowledge.



Domain Ontologies represent the relationships between concepts

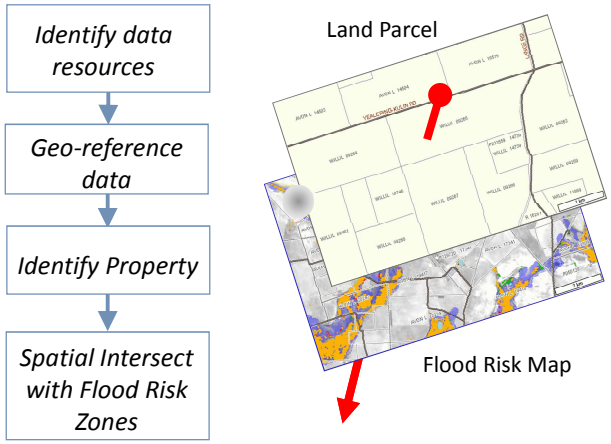
Domain Ontologies are used to represent knowledge in a particular domain.

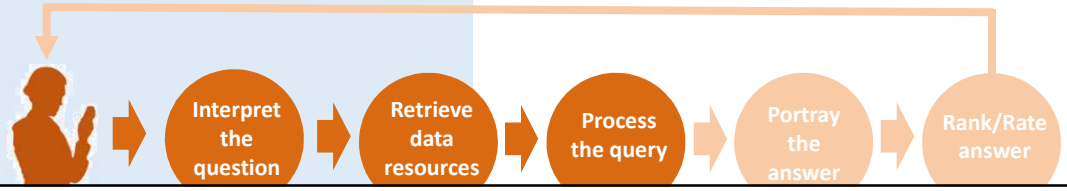
They are shareable and reusable.



Process Ontologies are used to compile, coordinate and run a series of processes to answer a query.

They are shareable and reusable.

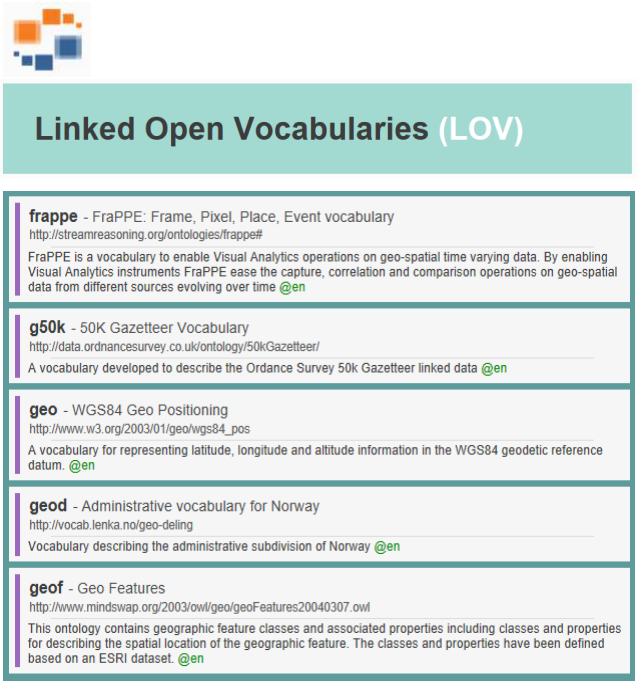




Ontology Libraries Exist

Developers need not start from scratch

There is a need to coordinate these knowledge repositories



Government can support innovative query applications by publishing machine-readable data

The market will establish new business models

In summary -
for Knowledge On-Demand to flourish

- Modernised infrastructure
- Published Linked Data
- Demonstrated Examples

Ontology Libraries Exist

Developers need not start from scratch

creative commons

W3C®

OGC®
Making location count.

Australian Government Linked Data Working Group

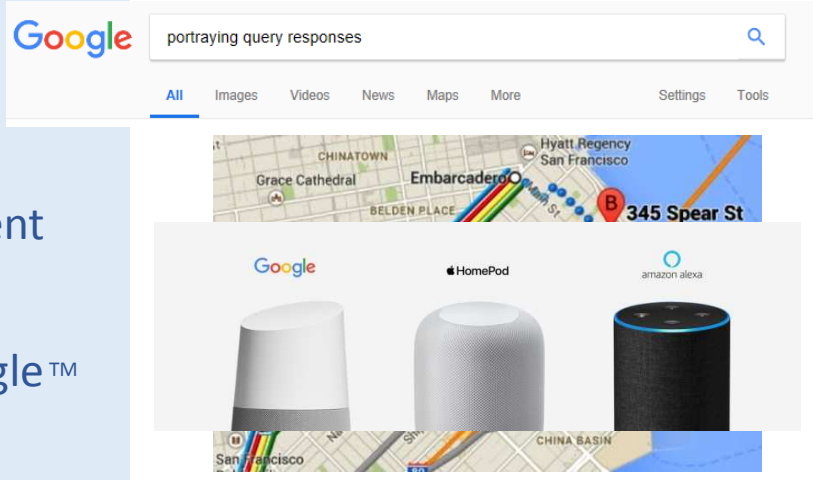
Linked Open Vocabularies (LOV)

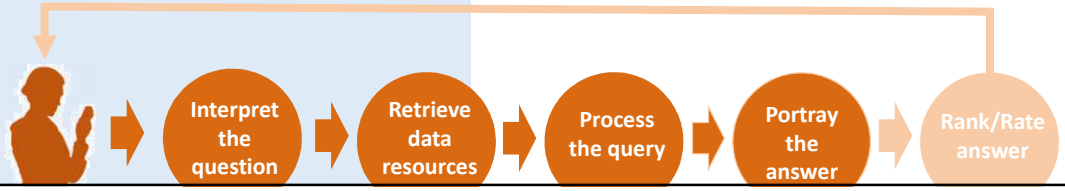
Portray Answers

Query dependent

Application dependent

User preference dependent e.g. Google™





Portray Answers

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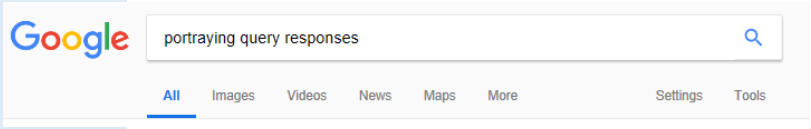
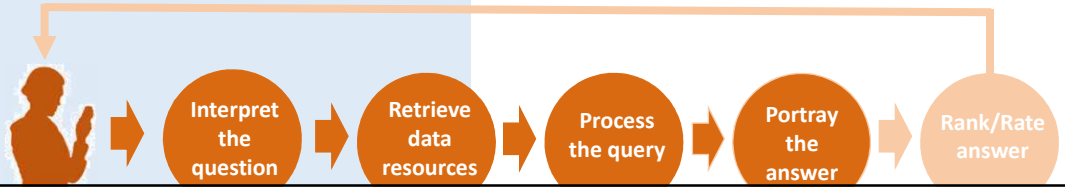
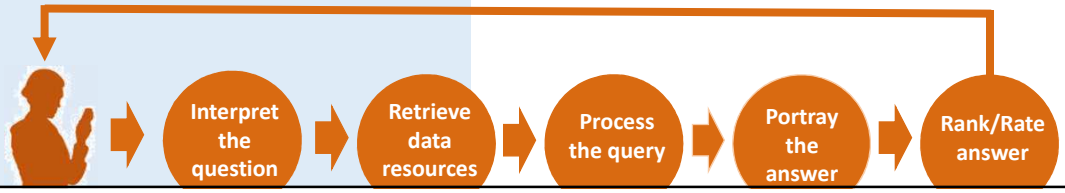




Ranking according to accuracy
Rating according to relevance

No models currently exist for geospatial analytics/queries