Intro Slides

1. Intros
2. LANDRS context and goals
3. Hack goals for next 2 days (+RDA Session)
4. Intro to Linked Data and Semantics
5. Intro to OpenAPI
6. Intro to existing drone data APIs
7. Plan of attack for the hack

Intro Slides: You

?

Name

Home Country

Current Institution

Current Specialisation

Most interesting thing you've learnt about Finland so far

LANDRS Goals

Community developed foundations infrastructure for enabling FAIR Drone data

1. Dereferencable Ontology
2. OpenAPI specification
3. Onboard API
4. Domain specific example implementations

LANDRS Hack2

- Goals
  - New collaborations
  - Advancements on topics
  - Robust design to build to in next 12 months
  - +RDA Session: WG Charter

LANDRS Hack2

Topics

1. Ontology dev
    a. Reconciliation
    b. Demo Part1: A starter resolvable RDF schema
2. Onboard API
    a. A design doc
    b. Demo Part2: Python functions serialising and annotating data
3. OpenAPI Spec
    a. A design doc
    b. Demo Part3: Validate Part2 output and push into a Triplestore

LANDRS Hack2

This doc: **https://tinyurl.com/y4t8qvfk**

- Github: https://github.com/opengeospatial/LANDRS
- Design diagrams: https://tinyurl.com/yxoh9otu
- Topics
  - Ontology:
  - Onboard API:
  - OpenAPI:
    - Backend Server: ssh username@8.12.22.100

~ Pseudo Agenda for the Day

9:00 - 10:00 Intros and these slides

10:00-13:00 Joint and Group Design

13:00 - 14:00 Lunch

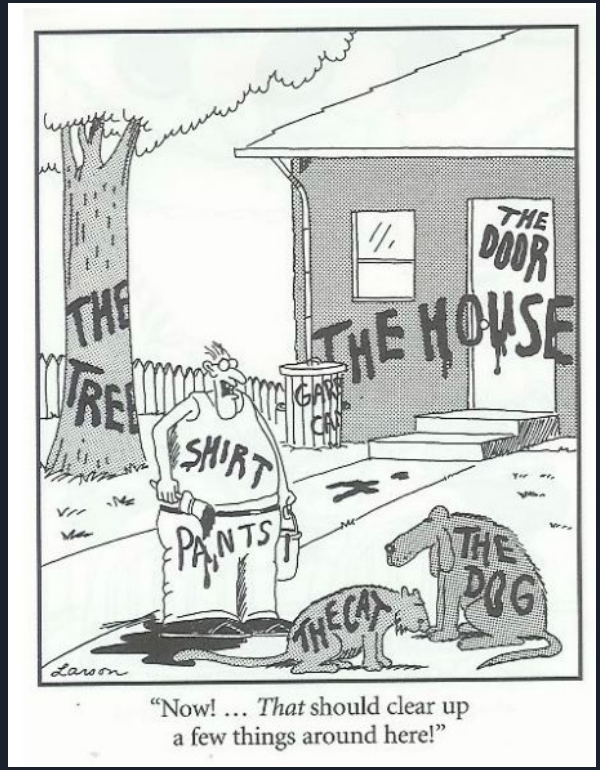
14:00-17:00 Prototyping

17:00-18:00 Sync up and planning

Evening Dinner?

Why use Semantics in Data Management

- Web of Data instead of Web of Documents
  - Publishing data **(A)**
  - Consuming data **(A)**
  - Discovering data **(F)**
  - Decentralised data **(R)**
- Data interoperability: Data fusion **(I)**
- Machine reasoning
- Data Re-use outside of its initial use case **(I,R)**
- Complex queries are possible by using SPARQL**(FA)**

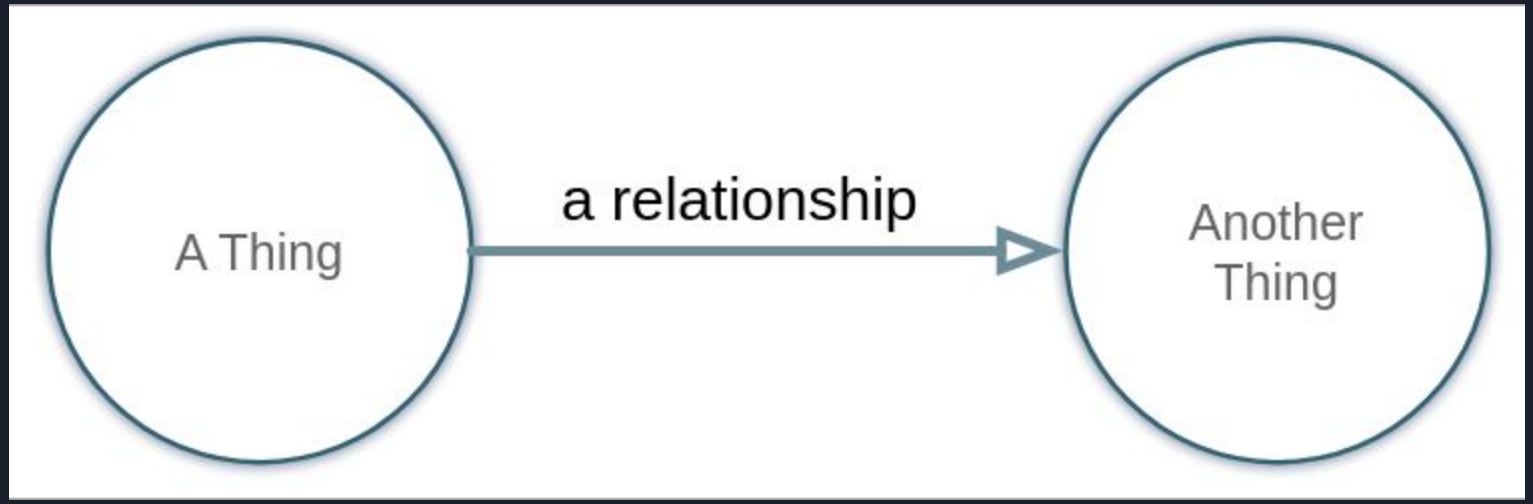


"Now! … *That* should clear up a few things around here!"

Image taken from: http://linked-data-training.zazuko.com/LD-Basics/index.html

Semantic web what/how

A data model



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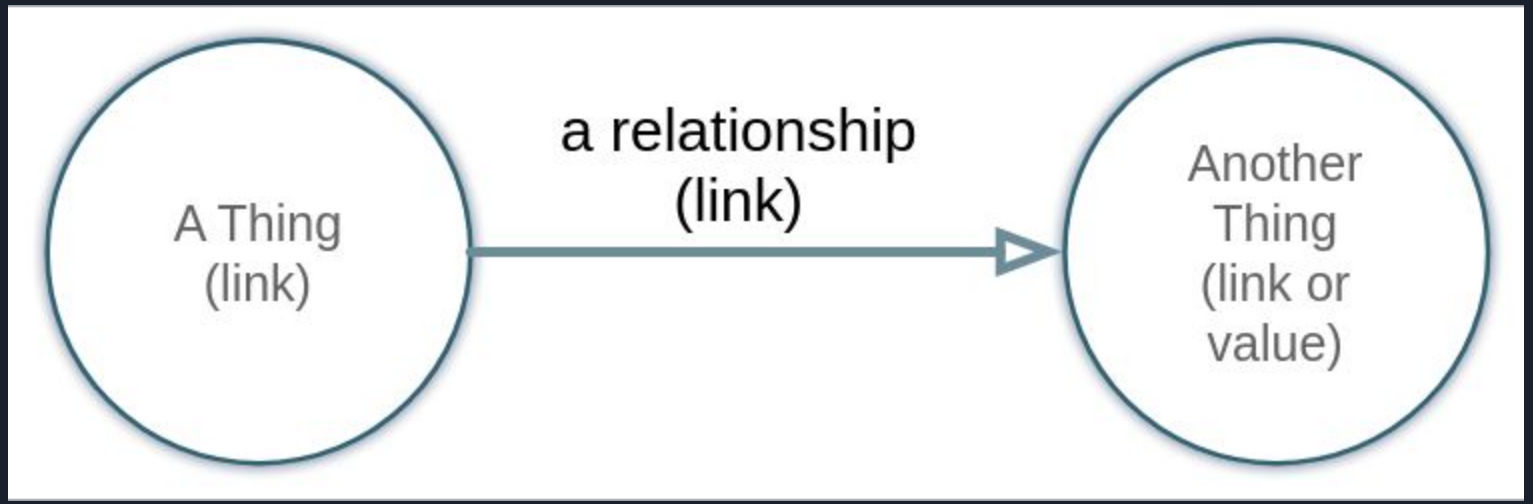
Semantic web what/how

The RDF data model



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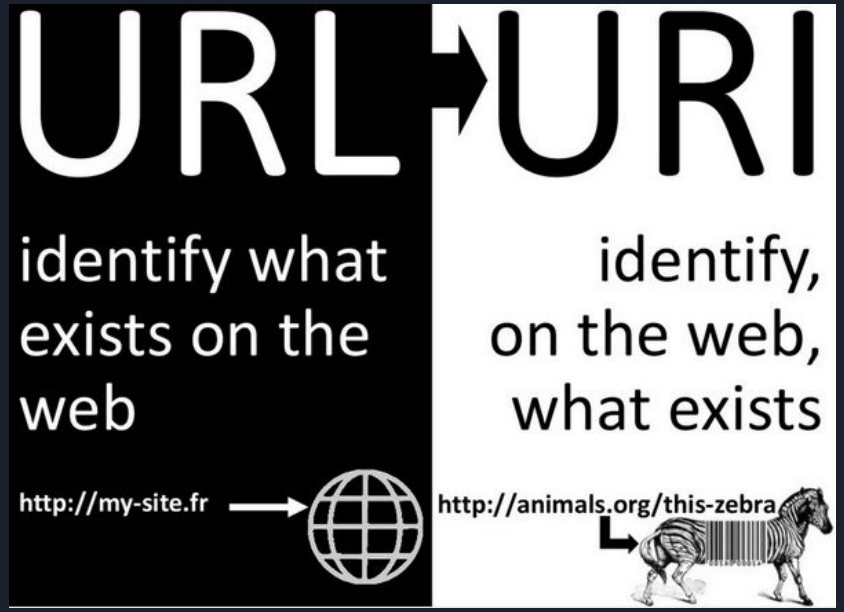
Semantic web what/how



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Semantic web what/how

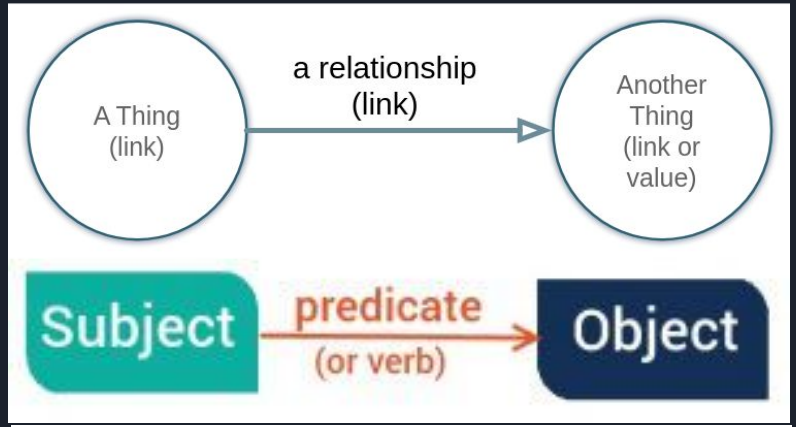
A Network of objects connected by URIs

- **Triples**:

Subject (URI) : Predicate (URI) : Object

ID : Variable name : Variable Value

Eg:
001: Student Title : Mr
001 : Student Name : Joe blogs



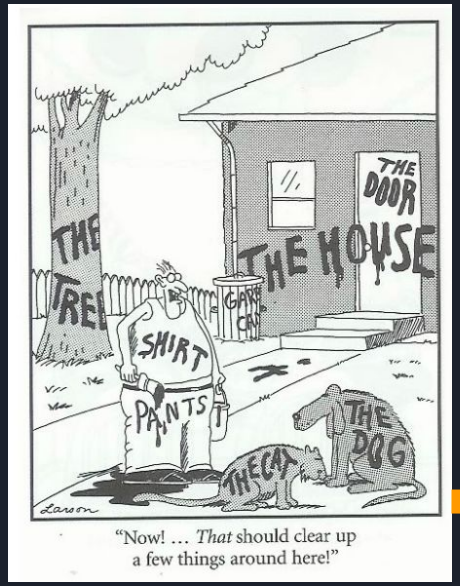
A Resource	A Property	A Literal
Common Name		
Animal	Common Name	Zebra

Linked Data Tech Stack

- RDF as common data model and W3C std for data on the web
  - Multiple formats: Turtle, JsonLD, XML, CSVLD,.....
- Well-known schemas & ontologies as Lingua Franca
- Web (HTTP) as transport
- Links (URIs) as (decentralized) identifiers
- Multilingualism in its core
- SPARQL as standardized query language
- "Agile" data model

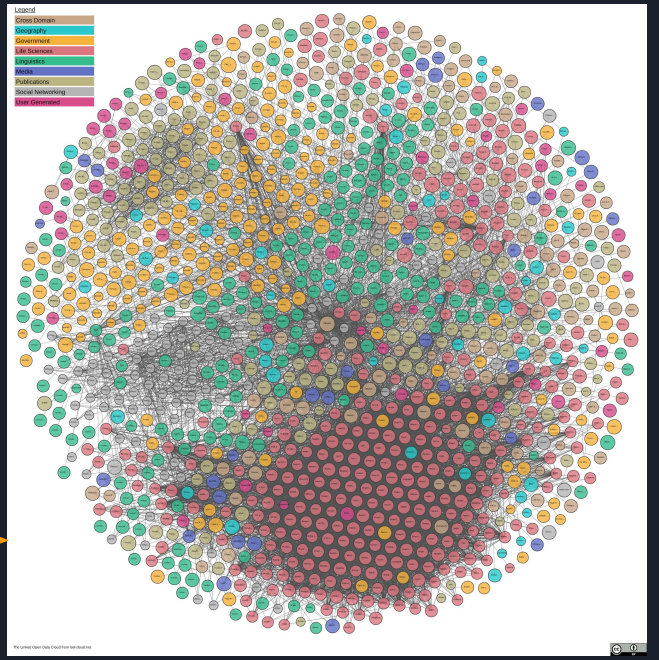
Purpose of RDF/Semantics

The **Linked Open Data** Cloud



"Now! … *That* should clear up a few things around here!"

- RDF data model
- Std ontologies
- HTTP as transport
- URIs as decentralized identifiers

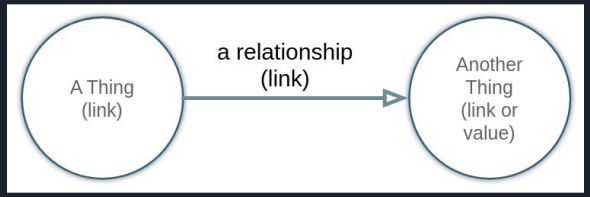


RDF: Resource Description Framework

RDF Triplestore: A Graph database

Structured Data as a **graph** stored in **triples**

- Graph:
  - Vertices
    - Resources: URIs
    - Attributes: Literal values
  - Edges
    - Relationships
- Triples: Subject (URI) : Predicate (URI) : Object



RDF formats

- Turtle
- JsonLD
- csvLD
- XML
- ....

Intro to OpenAPI Spec

“A specification for machine-readable interface files for describing, producing, consuming, and visualizing RESTful web services”

- For LANDRS:
  - Automated API documentation
  - Code generation
  - A means of specifying an API for building applications

Existing Drone APIs

- On Drone
  - Ardupilot and PX4 are 2 open source autopilot firmwares that both support more than just quad and fixed wings
    - PX4: Linux Foundation maintained under “DroneCode”, very popular in commercial drones, better if designing a novel frame.
    - Ardupilot: Fully community driven, broke away from DroneCode due to conflict with direction commercial companies were going. 1st order supported on Pixhawk hardware (Fully open Pro grade autopilot hardware series), best and easies if you just want to fly a std frame format
  - Both speak “Mavlink”: Open comms protocol for D-2-D and D-2-Computer

Existing Drone APIs

- On Ground Stations: All run on Windows, Linux, and Android
  - First order supported by Ardupilot is Mission Planner
  - First order supported by PX4 is QGroundControl
  - Again both speak Mavlink and therefore work with DroneKitPython

Existing Drone APIs

- Proprietary APIs
  - DJI: https://developer.dji.com/
    - Onboard and Mobile: Android only
    - New: Windows
  - Parrot: https://developer.parrot.com/
    - Ground Station SDK: IoS and Android
    - Onboard?
- Simulators: Many
  - SITL (Ardu and PX4), DJI, ROS (any robot), Penn (Custom PX4 drones), Parrot

Some other resources about Semantics

- SPARQL in 11min (Youtube: actually good intro to more than SPARQL)
- http://linked-data-training.zazuko.com/
- RDF 1.1 Primer
- Apache Jena: A Java API which can be used to create and manipulate RDF graphs , tutorials
- *"The Open World assumption"*: if a statement cannot be proven to be true with current knowledge, we cannot draw the conclusion that the statement is false.
    - Or: Everything is permitted until it is prohibited.

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