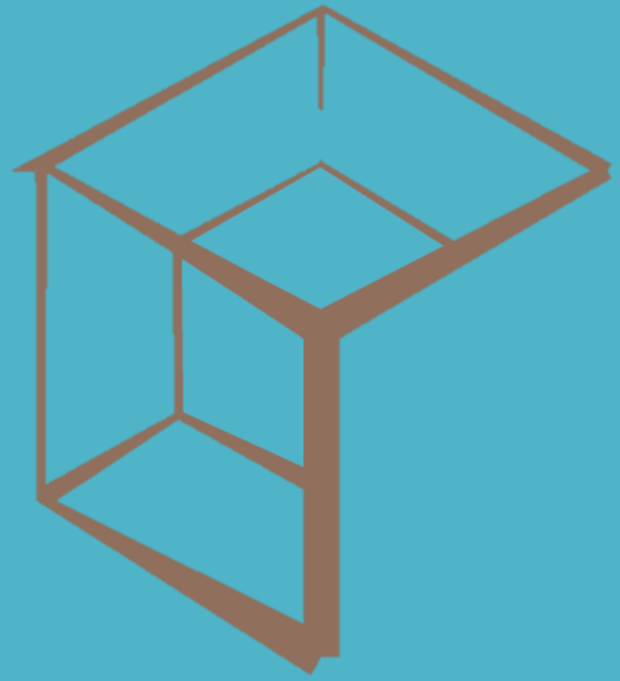

# Ontology-based Access Control for FAIR Data

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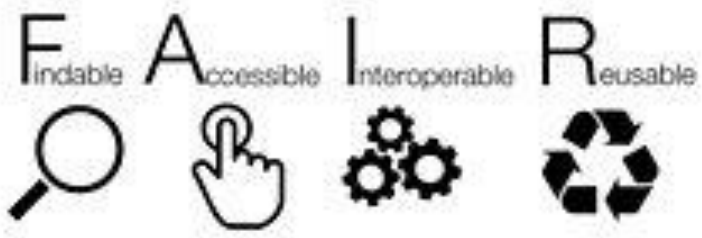
# preliminaries

- dark Web marketplace:

a commercial website that operates via darknets such as Tor or I2P.

Darknet is a network that can only be accessed with specific software, configurations, or authorization, and often uses a unique customized communication protocol.


- **FAIR** data: are data which meet principles of findability, accessibility, interoperability, and reusability.

# Problem?

Defining policy for accessing to FAIR data

**Scenario**:

Court wants to investigate a dark Web marketplace

Two narcotics police officers

one from the United States and

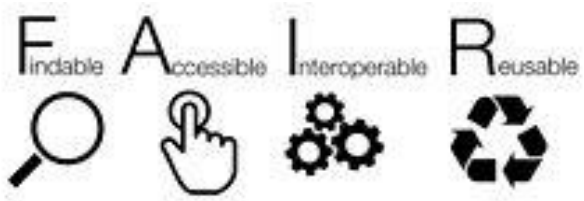
one from Australia, receive a limited mandate

only for narcotics that  both originate from and are shipped to their own country.

# About proposed method:

**Targets the FAIR principles A1.2 and R1.1**

- A1. (Meta)data are retrievable by their identifier using a standardised communications protocol
- A1.2 The protocol allows for an authentication and authorisation procedure, where necessary
- R1. (Meta)data are richly described with a plurality of accurate and relevant attributes
- R1.1. (Meta)data are released with a clear and accessible data usage license
- R1.2. (Meta)data are associated with detailed provenance




**Tripartite approach**:

- data
- associated metadata expressing FAIR information
- additional metadata about users

# Application

security and intelligence domains need data to be shared under tight controls, with widely varying individual access rights.


legal requirements such GDPR

protection of copyright

health and life science research

# Method

**Agora** dark Web marketplace **data set:**
CSV
100,000 rows
12 columns (Vendor, Category, Item, Item Description, Price, Origin, Destination, Rating and Remarks)

**OpenRefine** tool:
convert the CSV Agora data set into RDF data
load this RDF data into an **Apache Jena triple store**

**AuthzForce**
XACML
description of security policies

# Metadata graph

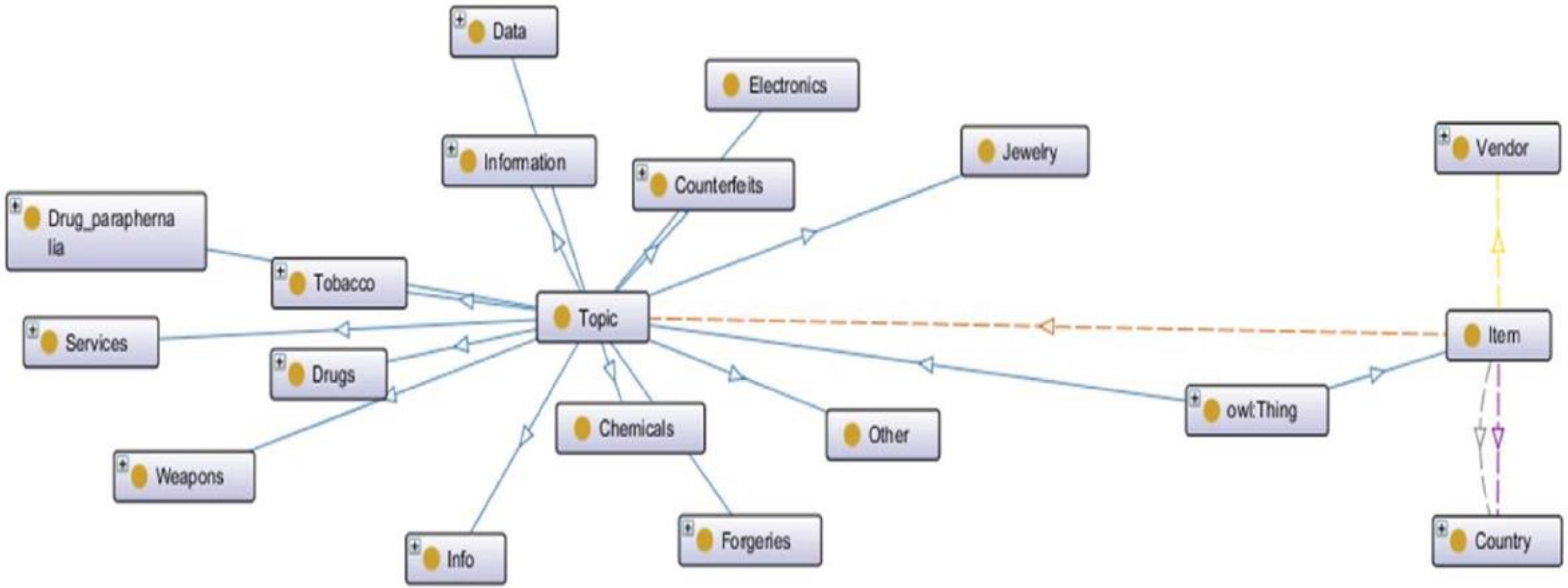



**Figure 1.** Categorization of illicit goods in the Agora marketplace.

# Scenario:

*The **limited mandate** only allows them to look at the title, origin and destination of items.*

*The narcotics officers use their mandate to browse the data and collect facts that might be worth further investigation.*

***If approved**, they will be allowed to work with a **broader mandate** which allows them to hone in on a more specific class of drugs (Steroids) in the data set.*

# Method:

- security policies for this scenario has 4 roles

- USA_drugs_officer_limited: the role for a drugs officer from the United States with a limited mandate.

- AUS_drugs_officer_limited: the role for a drugs officer from Australia with a limited mandate.

- USA_drugs_officer_broad: the role for a drugs officer from the United States with a broad mandate.

- AUS_drugs_officer_broad: the role for a drugs officer from Australia with a broad mandate.

# Method:

## XACML

- XACML is a standard under development since 2001 by OASIS for attribute-based access control usually expressed in XML or JSON providing a means among other things for the description of security policies.

## AuthzForce

- implements the XACML standard and consists of an authorization policy engine

# Method:

Graph patterns for the role *USA_drugs_officer_limited:*

?item **dwo:hasTitle** ?object .

*IF*

?item rdf:type dwo:Item .

?item dwo:hasDestination **dwd:USA** .

?item dwo:hasOrigin **dwd:USA** .

?item dwo:hasTopic ?topic .

?topic rdf:type ?topicType .

?topicType rdfs:subClassOf+ **dwo:Drugs** .

# Method:

Officer query:

```
SELECT ?item ?title ?topic
WHERE {
?item a dwo:Item .
?item dwo:hasTitle ?title .
?item dwo:hasTopic ?topic .
}
```

# Method:

- Result of the query

**Table 1.** Example results of SPARQL queries.

| Item | Title | Topic |
|---|---|---|
| dwd:item/124 | 4-FMA...!! 1 KG | dwo:Drugs/RCs |
| dwd:item/2423 | Ephedrine HCL 8mg (50x Pills 400mg Total) | dwo:Drugs/Weight_loss |
| dwd:item/2561 | ORBIS PHARMA LABS - TEST C 10ML VIAL X 1 - Testosterone Cypionate - $67 | dwo:Drugs/Steroids |

Note: These results only include items that have USA as their origin and destination, even though this is not explicitly mentioned in the SPARQL query.

# Method:

**graph patterns for the role *USA_drugs_officer_broad*:**

?item **?predicate** ?object .
*IF*
?item rdf:type dwo:Item .
?item dwo:hasDestination **dwd:USA** .
?item dwo:hasOrigin **dwd:USA** .
?item dwo:hasTopic ?topic .
?topic rdf:type ?topicType .
?topicType rdfs:subClassOf+ **dwo:Steroids** .

**Officer query:**

```
SELECT ?item ?title ?vendor
WHERE {
?item a dwo:Item .
?item dwo:hasTitle ?title .
?item dwo:hasVendor ?vendor .
}
```

# Method:

- Result of the query

**Table 2.** Example results of SPARQL queries.

| Item | Title | Vendor |
|---|---|---|
| dwd:item/2561 | ORBIS PHARMA LABS - TEST C 10ML VIAL X 1 - Testosterone Cypionate - $67 | dwd:InsideTheWhale |
| dwd:item/2563 | Nordicor Trenbolone Enanthate 200mg/ml 10 vial | dwd:pharmacy_land |
| dwd:item/2578 | Rip 300 10ml multi injection vial | dwd:cerberus |

# RELATED WORK:

- **Ontology-based Access Control :**access to a single specific triple

fine-grained level

- **Traditional method:** high level access policies that use “all-or-nothing”

like user name/password mechanisms.

- **Attribute based access control (ABAC)** : providing differential access to data in databases

# FUTURE WORK

Apply OBAC to other domains :

Health

GDPR

protection of copyright

# Thank you.