ARTIFICIAL INTELLIGENCE AND COGNITIVE COMPUTING

SEMANTIC WEB - OWL ONTOLOGY IN PROTEGE

AIRPORT

Arena Gabriele, Corsaro Miriana, Ventimiglia Andrea Paolo

Cognitive Computing and Artificial Intelligence
University of Catania, Italy

2022-2023

Ontology domain: Airport

Our goal is to develop an ontology that accurately and comprehensively represents the various entities and relationships that occur in an **Airport context**.

The ontology will help us better understand the structure, operations and processes involved in an airport.

Classes and properties [1]

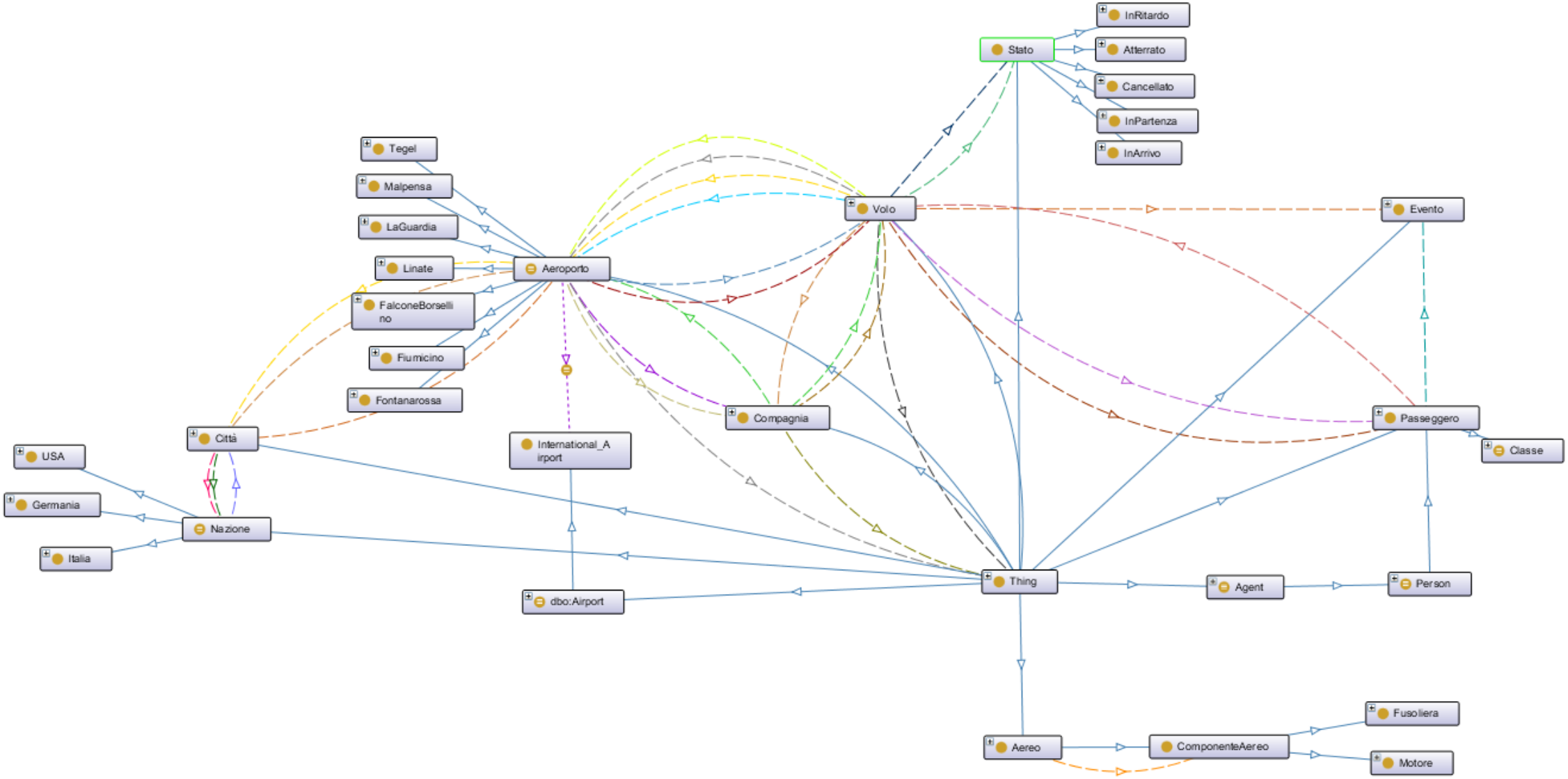
Our ontology will consist of several key concepts modelled by the following classes:

- **Aeroporto**: represents an airport, a place where planes take off and land, equivalent to RDF data "*Internation_airport*".
- **Compagnia**: represents an airline company that operates flights.
- **Passeggero**: represents an individual who travels on an aircraft, related to *FOAF* ontology.
- **Volo**: represents a specific flight between two airports. It can have several properties that describe departure and arrival times, departure and destination airports, and operating airline company.

Classes and properties [2]

- **Aereo**: represents an aircraft used for passenger transportation, composed of “ComponentiAereo” (Part-Whole ODF).
- **Nazione**: represents a sovereign nation.
- **Città**: represents a city or urban settlement.
- **Evento**: represents an event that can be associated with an airport or a flight, such as flight cancellation or delay. It has these attributes: startDate and endDate (Time ODF).
- **Stato**: represents flight status as “isDeparting”, “inArriving”, “cancelled”, “deleyed”, “scheduled” and “landed” (State ODF).

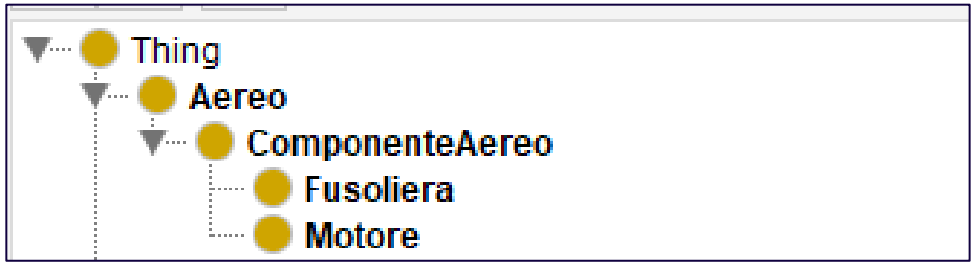
Class and properties [3]



Part-Whole ODP

Definition: *the Part-Whole ODP is a design pattern that helps represent the relationships between an entity and its constituent parts. It is based on concepts such as aggregation, composition and mereology and can be used in different fields, such as biology and computer science.*

Use:



State ODP

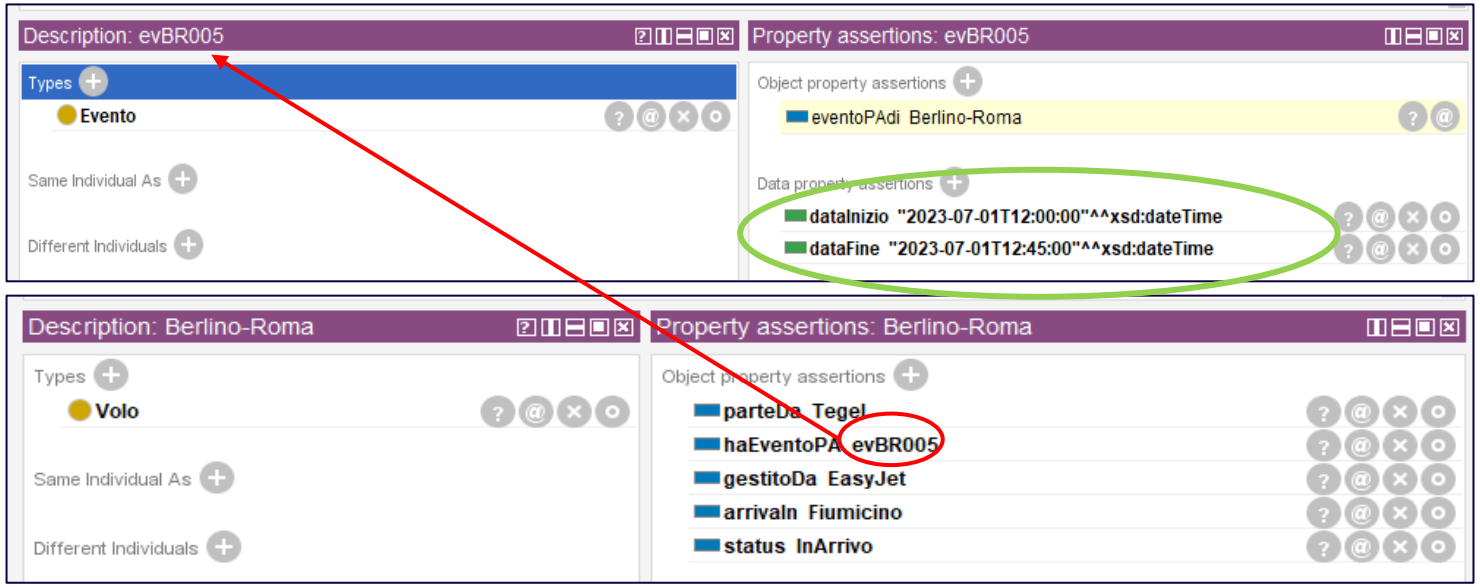
Definition: *the State Patterns ODP is a design pattern that helps represent entities and their states. It is based on concepts such as state, state transition, event and action and can be used in different fields, such as healthcare and finance.*

Use:

Time ODP

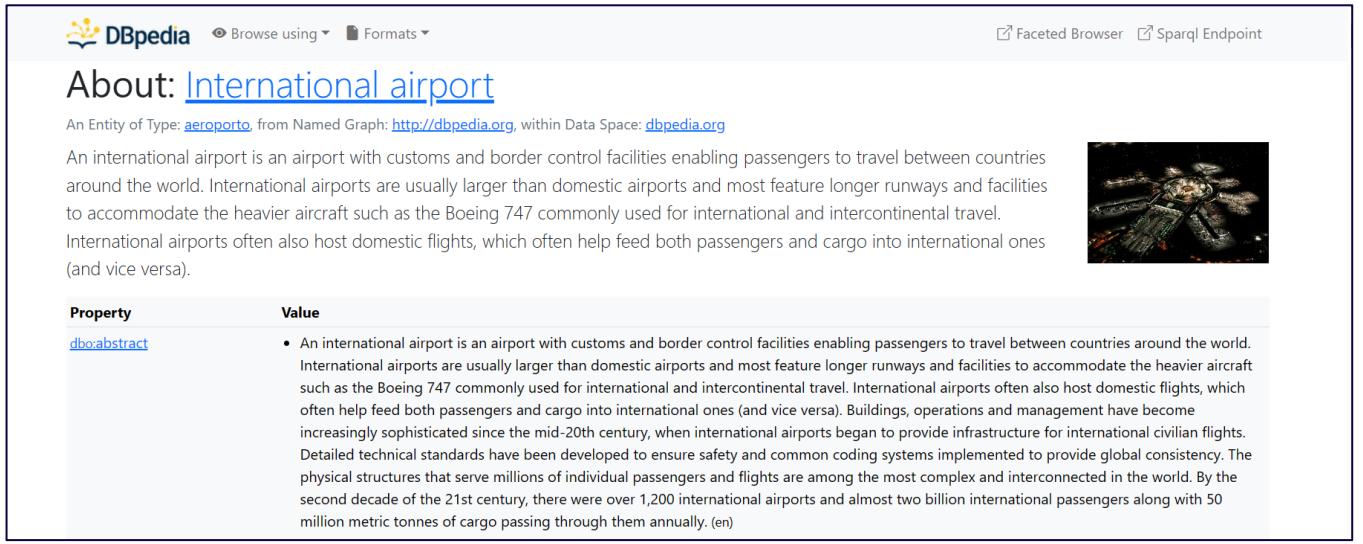
Definition: *the Time ODP is a design pattern that helps represent time and the temporal relationships between events and objects. It is based on concepts such as event, instant, interval, duration and time zone and can be used in different fields, such as science and medicine.*

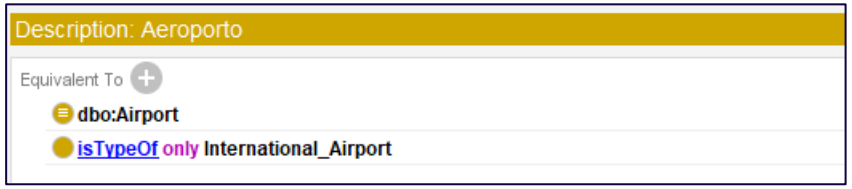
Use:



RDF data from an external source

We imported RDF data *Internation_Airport* from DB-pedia.



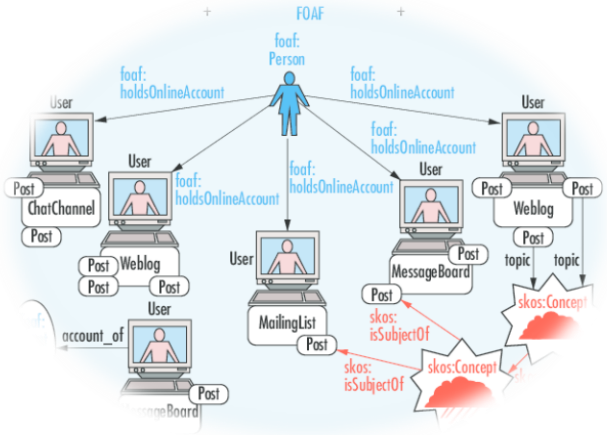


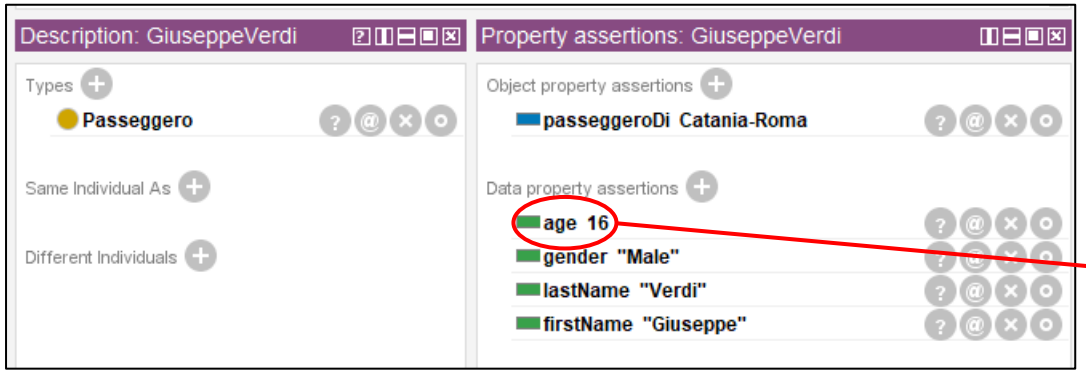
Our "airport" class is equivalent to the "international airport" class

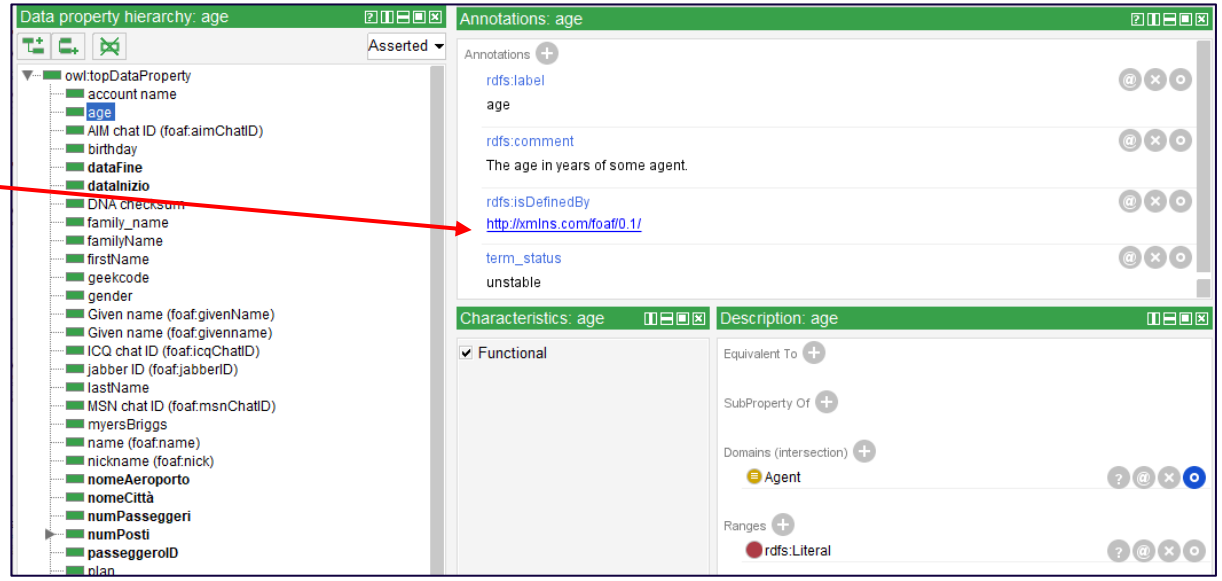
Source: https://dbpedia.org/page/International_airport

Use of existing ontology

We use as existing ontology FOAF, related to «Passeggero» class.







Use case 1

Airtraffic of an Aeroport: list of flights that are scheduled to take off from a given Aeroporto.

```
SELECT ?volo ?status ?aeroportoPartenza
WHERE {
        ?volo rdf:type airport:Volo .
        ?volo airport:status ?status .
        ?volo airport:parteDa ?aeroportoPartenza
        FILTER (?status = airport:InPartenza)
        FILTER (?aeroportoPartenza = airport:Tegel)
}
```

volo	status	aeroportoPartenza
Berlino-Catania	InPartenza	Tegel

Use case 2

Find scheduled flights that have airports of departure or arrival associated with an event causing its closure on those days.

```
SELECT ?Evento ?aeroportoPartenza ?aeroportoArrivo ?inizio ?fine
WHERE { ?Volo airport:haEventoPA ?Evento .
        ?Evento airport:dataInizio ?inizio .
        ?Evento airport:dataFine ?fine .
        FILTER(?inizio > "2023-07-05T00:00:00"^^xsd:dateTime && ?fine < "2023-07
        05T23:59:59"^^xsd:dateTime)
        ?Volo airport:parteDa ?aeroportoPartenza .
        ?Volo airport:arrivaIn ?aeroportoArrivo .
        FILTER(?aeroportoArrivo=airport:Fontanarossa || ?aeroportoPartenza=airport:Fontanarossa)
}
```

Evento	aeroportoPartenza	aeroportoArrivo	inizio	fine
evCR007	Fontanarossa	Fiumicino	"2023-07-05T18:00:00"	"2023-07-05T18:30:00"

Use case 3

Select the names of all passengers who are children bound for Fontanarossa:

```
SELECT ?Passeggero ?Volo ?age
WHERE {
        ?Volo airport:parteDa ?AeroportoPartenza .
        FILTER (?AeroportoPartenza = airport:Fontanarossa) .
        ?Passeggero airport:passeggeroDi ?Volo .
        ?Passeggero foaf:age ?age
        FILTER(?age<18)
}
```

Passeggero	Volo	age
GiadaGialla	Catania-Roma	"17"^^<http://www.w3.org/2001/XMLSchema#integer>
GiuseppeVerdi	Catania-Roma	"16"^^<http://www.w3.org/2001/XMLSchema#integer>

THANK YOU!