



# SEMANTIC WEB - OWL ONTOLOGY IN PROTEGE

## AIRPORT

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# 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]

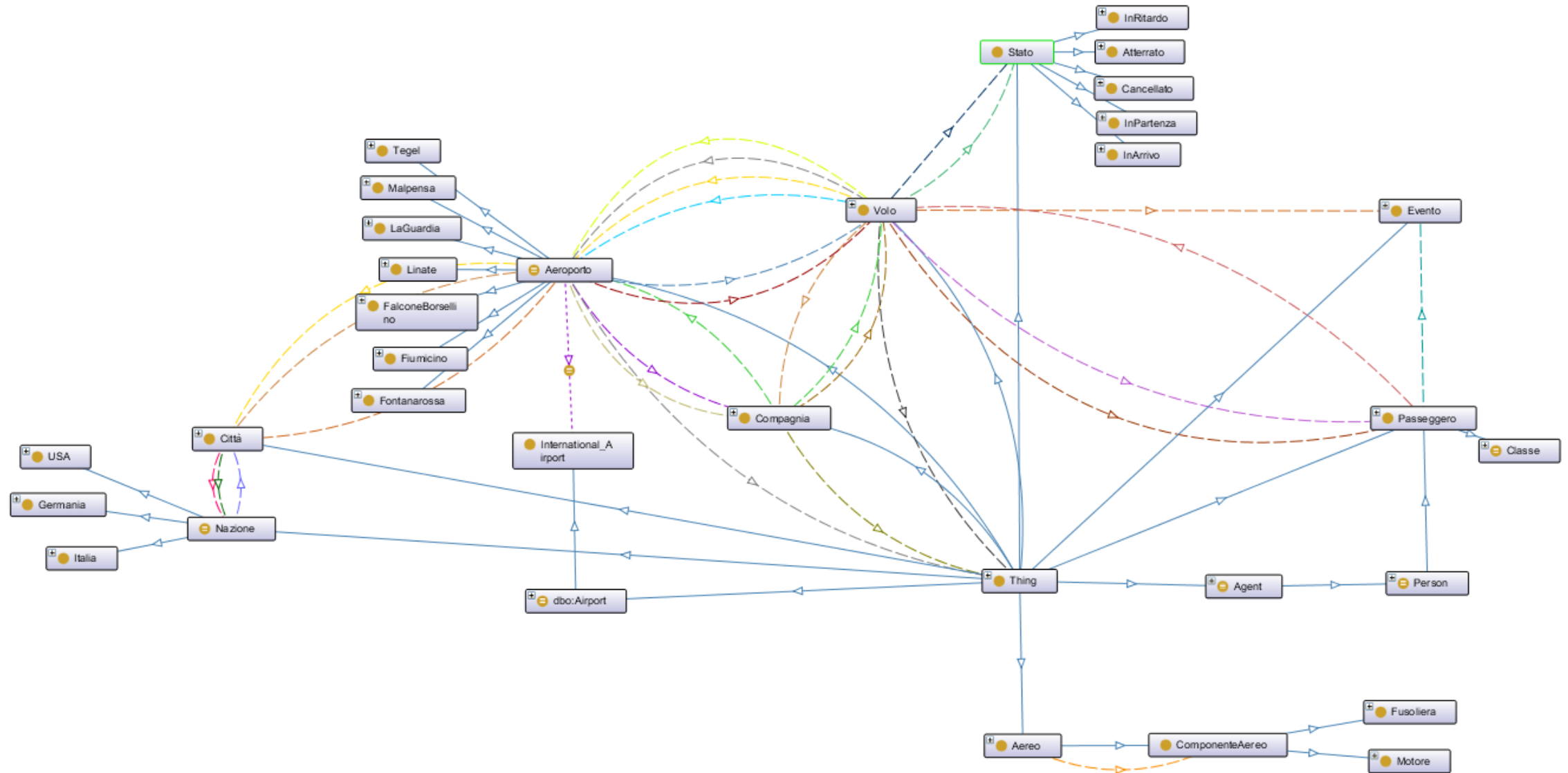
Our ontology will consist of several key concepts modelled by the following classes:

- **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).

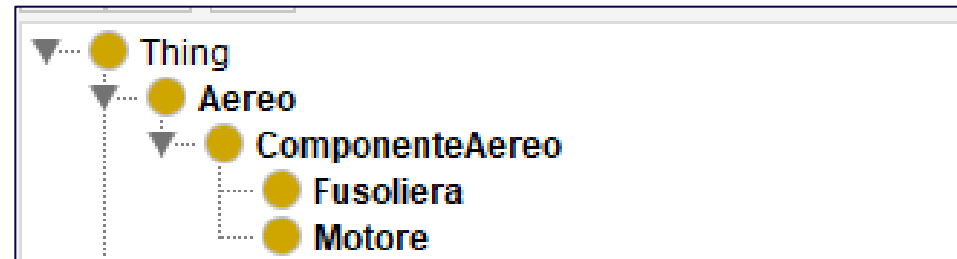
# Class and properties [3]



# 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:



●	arrivalIn	exactly 1	Aeroporto
●	gestitoDa	exactly 1	Compagnia
●	haPasseggero	some	Passeggero
●	parteDa	exactly 1	Aeroporto
●	status	exactly 1	Stato

# 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:

The image displays a software interface with two panels, each showing a description and property assertions for a specific entity.

**Top Panel: Description: evBR005**

- Types:** Evento
- Property assertions: evBR005**
  - Object property assertions:** eventoPA di Berlino-Roma
  - Data property assertions:**
    - dataInizio "2023-07-01T12:00:00"^^xsd:dateTime
    - dataFine "2023-07-01T12:45:00"^^xsd:dateTime

**Bottom Panel: Description: Berlino-Roma**

- Types:** Volo
- Property assertions: Berlino-Roma**
  - Object property assertions:**
    - parteDa Tegel
    - haEventoPA evBR005 (circled in red)
    - gestitoDa EasyJet
    - arrivalIn Fiumicino
    - status InArrivo

A red arrow points from the 'haEventoPA evBR005' assertion in the bottom panel to the 'Evento' type in the top panel. A green oval highlights the 'dataInizio' and 'dataFine' assertions in the top panel.



# RDF data from an external source

We imported RDF data *Internation\_Airport* from DB-pedia.

DBpedia

Browse using

Formats

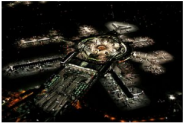
Faceted Browser

Sparql Endpoint

About: [International airport](#)

An Entity of Type: [aeroporto](#), from Named Graph: <http://dbpedia.org>, within Data Space: [dbpedia.org](#)

An international airport is an airport with customs and border control facilities enabling passengers to travel between countries around the world. International airports are usually larger than domestic airports and most feature longer runways and facilities to accommodate the heavier aircraft such as the Boeing 747 commonly used for international and intercontinental travel. International airports often also host domestic flights, which often help feed both passengers and cargo into international ones (and vice versa).



Property	Value
<a href="#">dbo:abstract</a>	<ul style="list-style-type: none"><li>An international airport is an airport with customs and border control facilities enabling passengers to travel between countries around the world. International airports are usually larger than domestic airports and most feature longer runways and facilities to accommodate the heavier aircraft such as the Boeing 747 commonly used for international and intercontinental travel. International airports often also host domestic flights, which often help feed both passengers and cargo into international ones (and vice versa). Buildings, operations and management have become increasingly sophisticated since the mid-20th century, when international airports began to provide infrastructure for international civilian flights. Detailed technical standards have been developed to ensure safety and common coding systems implemented to provide global consistency. The physical structures that serve millions of individual passengers and flights are among the most complex and interconnected in the world. By the second decade of the 21st century, there were over 1,200 international airports and almost two billion international passengers along with 50 million metric tonnes of cargo passing through them annually. (en)</li></ul>

Description: Aeroporto

Equivalent To +

dbo:Airport

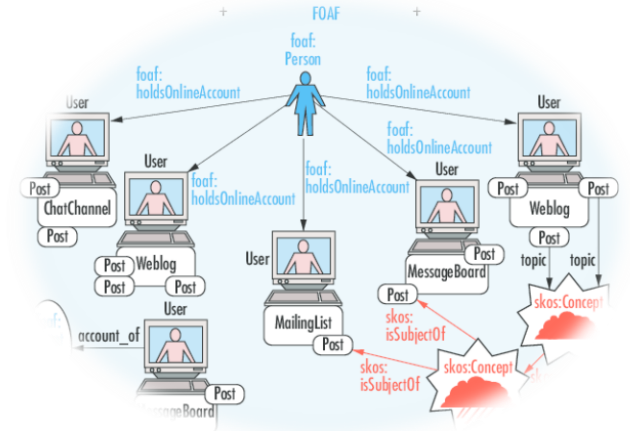
isTypeOf only International\_Airport

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

Source: [https://dbpedia.org/page/International\\_airport](https://dbpedia.org/page/International_airport)

# Use of existing ontology

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



Description: GiuseppeVerdi

Property assertions: GiuseppeVerdi

Types

- Passeggero

Same Individual As

Different Individuals

Object property assertions

- passeggeroDi Catania-Roma

Data property assertions

- age 16
- gender "Male"
- lastName "Verdi"
- firstName "Giuseppe"

Data property hierarchy: age

Annotations: age

Annotations

- rdfs:label
- age
- rdfs:comment
- The age in years of some agent.
- rdfs:isDefinedBy
- <http://xmlns.com/foaf/0.1/>
- term\_status
- unstable

Characteristics: age

- Functional

Description: age

Equivalent To

SubProperty Of

Domains (intersection)

- Agent

Ranges

- rdfs:Literal

# Use case 1

Airtraffic of an Aeroporto: 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:passengeroDi ?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!

