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## Multimapping Design of Complex Sensor Data in Environmental Observatories

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# Multimapping Design of Complex Sensor Data in Environmental Observatories

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## WIMS'16

6<sup>th</sup> international conference on  
Web-Intelligence, Mining and Semantics

Nîmes, France – June 13-15, 2016



National Council for Scientific Research



# Environmental resources

- air quality, water quantity, birds,...
- need for data to understand fundamental questions such as **global change**
- collecting data: sensors + human as a sensor (HaaS)
- need for data sharing, data publishing
- data models and formats have emerged
- need for data crossing



# O-Life

- The **Mediterranean basin** is a priority area and a leading area for the **analysis of environmental data**
- **shared observatory** between France and Lebanon
- with the aim of **collecting, perpetuating, sharing, and valorizing environmental information**
- creation of an ambitious **Circum-Mediterranean observatory network**

## Objectives of O-Life

- Conduct simultaneously: Observation, Research, Training and Valorization
- Federate skills through common tools and objects
- **Organize, share, sustain and enhance environmental data**



# Priorities

- **Build environmental databases** of the critical zone in consideration
- Conduct **monitoring services**: Provide instruments, equipment, assist in the operation and monitoring of sites
- **Enhance environmental data** and research among scientists, public policy makers, and the public in general, to promote a coordinated approach to sustainable development
- **Facilitate the prospective approach and exchange through innovative web services**
- Be a force of exploration and proposal for relevant calls for projects

# Building environmental databases

- crossing heterogeneous data
  - formats
  - context
- collected for a primary goals and not for publication

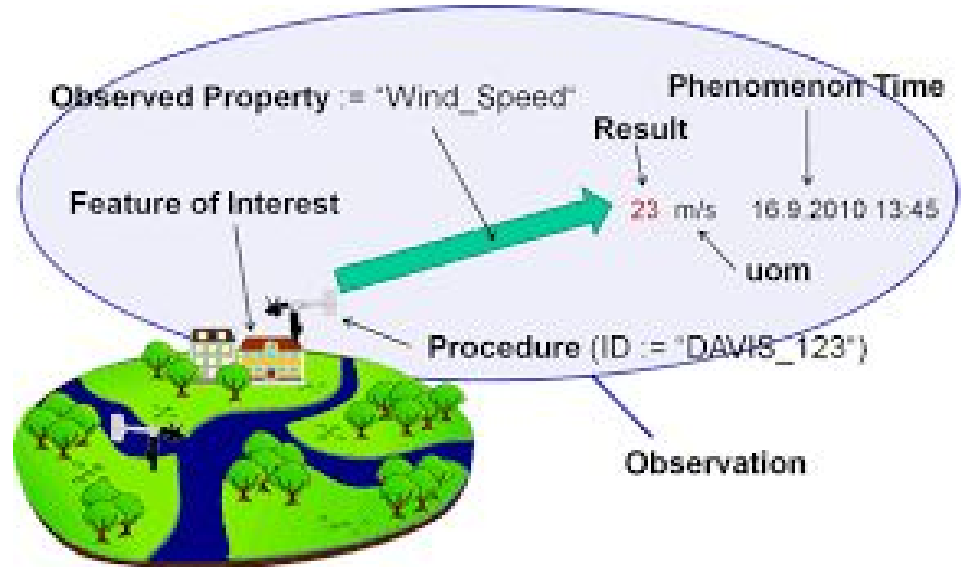
# Sensor Data

- Observations and Measurements (O&M) framework
- SOS: Sensor Observation Service
- proposed by the OGC (Open Geospatial Consortium) within the Sensor Web Enablement (SWE)
- Several frameworks, our choice: 52°North

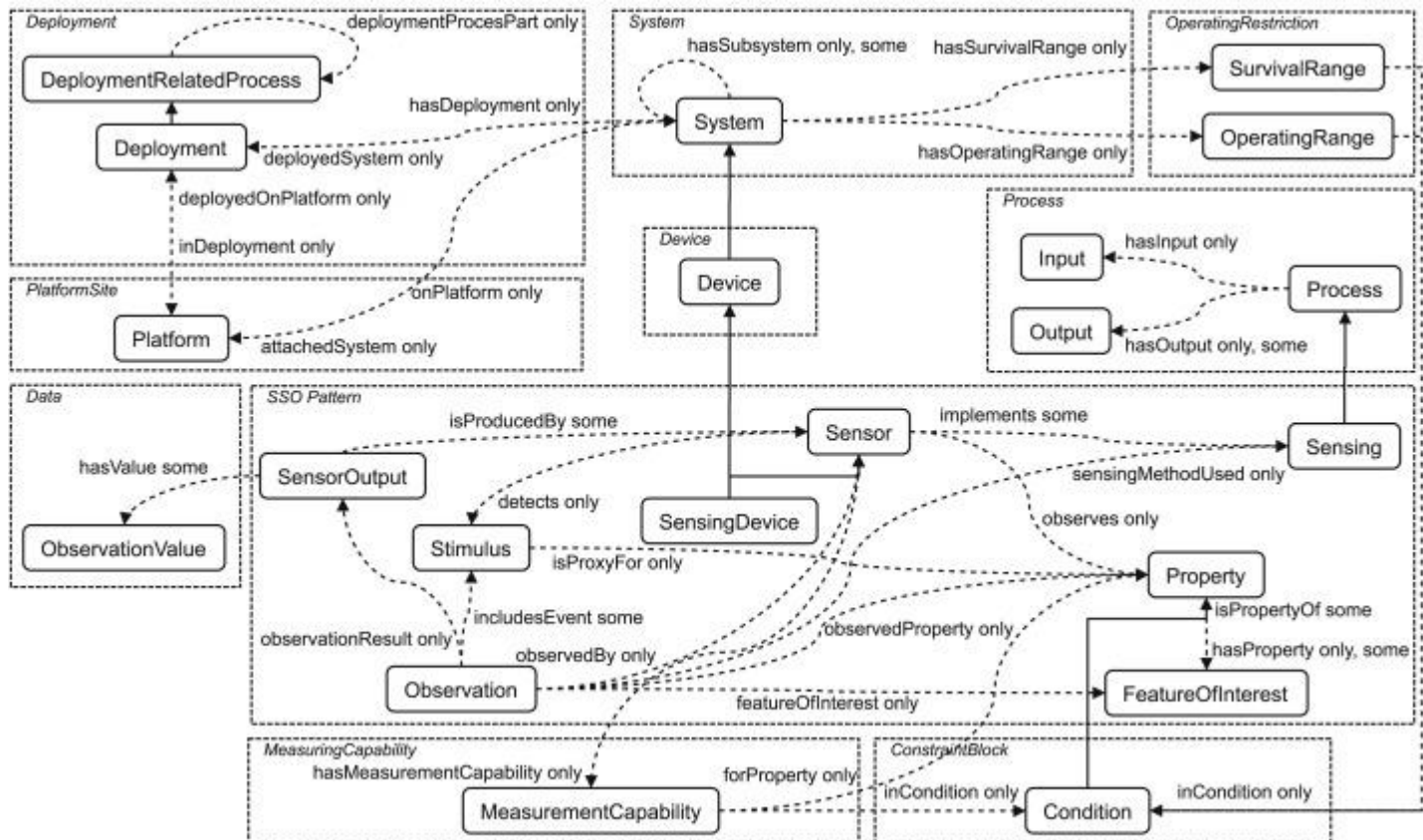


# Concepts

- Feature of interest
- Phenomenon time.
- Result time
- Procedure
- Observed property
- Result
- Unit of Measure







# The need for crossing points of view

- one observation model is meant as to correspond to one feature of interest
- however, it may be the case that several points of view can be considered
- Example
  - following species

Species	Observers	Date of observation (dd/mm/yyyy)	Common name English		Phenology at time of observation	Nb_of_individuals	Sex	Description
				Village				
<i>Dama</i>	A.A.	1/1/2015	Fallow deer	Faraya	Adulte	4	M & F	Gray
<i>Panthera pardus tulliana</i>	C.K.	4/3/2015	Anatolian leopard	Ehden	Young	1	F	Hairy
<i>Dama</i>	S.C.	5/12/2015	Fallow deer	Bsharre	Young	3	M	Long Tail

# Multi-mappings

- with the goal to consider alternative features of interest
- some parts of the SSN ontology are refined in order to be able
  - to represent multiple mappings and
  - to point out the existence of multimapping to the users

# Example: Mapping 1

A	B	C	D	E	F	G	H	I
Species	Observers	Date of observation (dd/mm/yyyy)	Common name English	Village	Phenology at time of observation	Nb_of_individuals	Sex	Description
<i>Dama</i>	A.A.	1/1/2015	Fallow deer	Faraya	Adulte	4	M & F	Gray
<i>Panthera pardus tulliana</i>	C.K.	4/3/2015	Anatolian leopard	Ehden	Young	1	F	Hairy
<i>Dama</i>	S.C.	5/12/2015	Fallow deer	Bsharre	Young	3	M	Long Tail
Mapping_1								
<i>ObservedProperty</i>	Procedure	samplingTime	phenomenon_description	<i>featureOfInterest</i>	propertyValueProvider	propertyValueProvider	propertyValueProvider	propertyValueProvider

# Example: Mapping 2

Species	Observers	Date of observation (dd/mm/yyyy)	Common name English		Phenology at time of observation	Nb_of_individuals	Sex	Description
				Village				
<i>Dama</i>	A.A.	1/1/2015	Fallow deer	Faraya	Adulte	4	M & F	Gray
<i>Panthera pardus tulliana</i>	C.K.	4/3/2015	Anatolian leopard	Ehden	Young	1	F	Hairy
<i>Dama</i>	S.C.	5/12/2015	Fallow deer	Bsharre	Young	3	M	Long Tail
<b>Mapping_2</b>								
<i>featureOfInterest</i>	Procedure	samplingTime	phenomenon_description	propertyValueProvider	propertyValueProvider	<i>ObservedProperty</i>	propertyValueProvider	propertyValueProvider

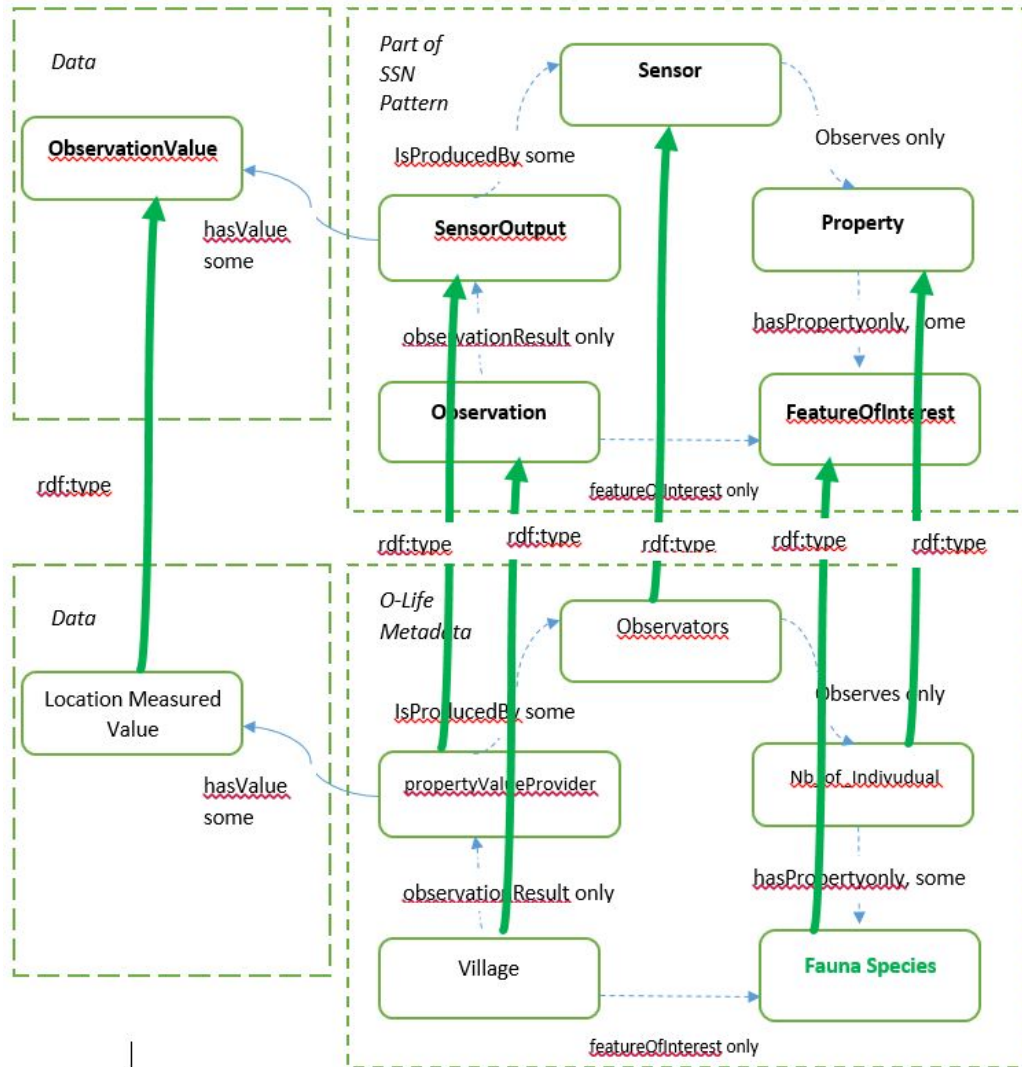
# Representing multiple mappings

- introduction of ssn:alternative
- alternative observation
- alternative feature of interest
- alternative observed property

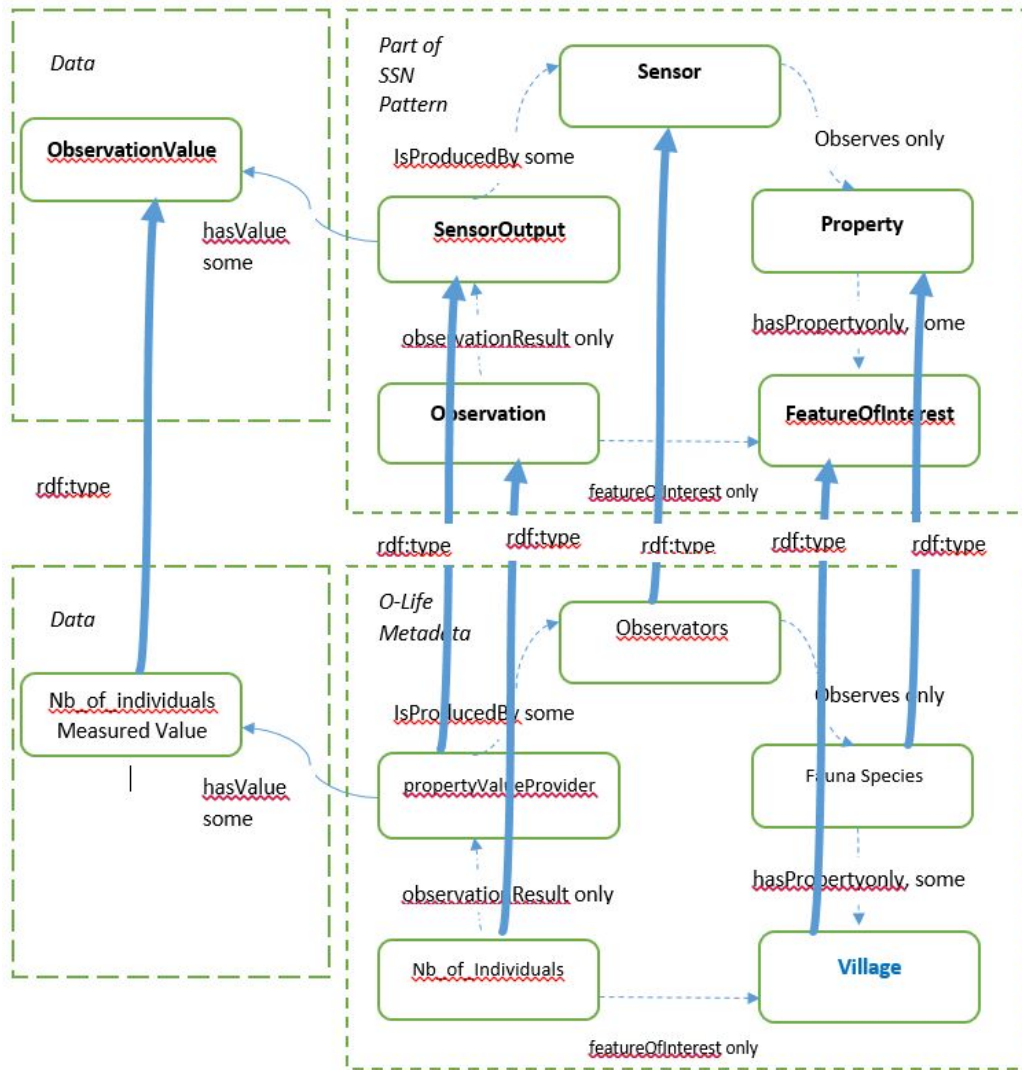
Description	Proposed Property
Alternative Observation	mssn:AltObservationDesign
Alternative Feature of Interest	mssn:altFeatureOfInterest
Alternative Observed Property	mssn:altObservedProperty
Alternative Observed By	mssn:altObservedBy

- introduction of RDF triplets like:

**fauna:species mssn:altFeatureOfInterest ssn:FeatureOfInterest**







# Conclusion and Perspectives

- importance of data crossing in the context of environmental data and climate change
- extension of the SSN ontology in order to make it possible to represent multiple mappings
  
- Need to offer a methodology
- Need to address other examples and frameworks