The Interoperability of Wireless Sensor Networks

Daniela Ballari, Monica Wachowicz, Miguel Ángel Manso-Callejo

Technical University of Madrid

grupo mercator

LatinGEO
Laboratorio de Tecnologías de la Información Geográfica

Motivation

- **Interoperability of sensors** aims at the integration of in-situ and remote sensors to achieve an integrated sensing system at both data and network levels.

- **Metadata** has been traditionally related to routing protocols in WSN and it does not provide the knowledge of the state of the network that can support the interoperability of sensors.

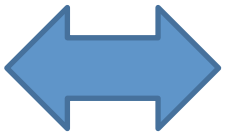
(Liang *et al* 2005; Balazinska *et al* 2007; Moe *et al* 2007, Zhang et al 2006; Dini et al 2004)

Our research challenge

- Develop a model for the interoperability of WSN based on metadata attributes in order to:
  - provide a description of observations, processes and functionalities, as well as their status and configuration,
  - enable a better understanding of the network itself,
  - ensure the interoperability with other networks of sensors.

Our first step…

- **Exploratory study**
  1. Identify the main WSN functionalities.
  2. Identify metadata for each WSN
  3. Classify examples of metadata attributes according to a specific level of interoperability.
  4. Analyze the role of metadata in WSN.

Different WSN functionalities  Different levels of interoperability

WSN Functionalities

- Sensing
- Processing
- Communication
- Configuration
- Maintenance

(Ruiz et al, 2004, Yarvis and Ye 2004).

Interoperability Model

- Previously developed for the interoperability of SDIs using seven different levels of interoperability.

Technical

Syntactic

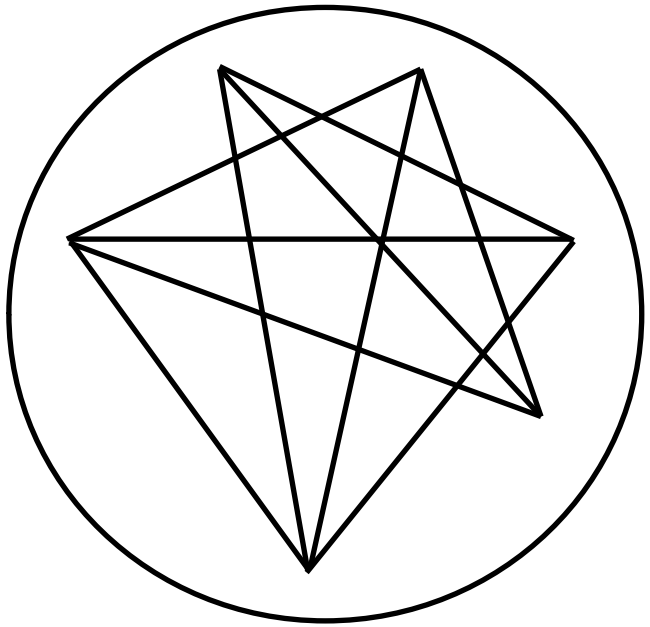
Semantic

Pragmatic

Dynamic

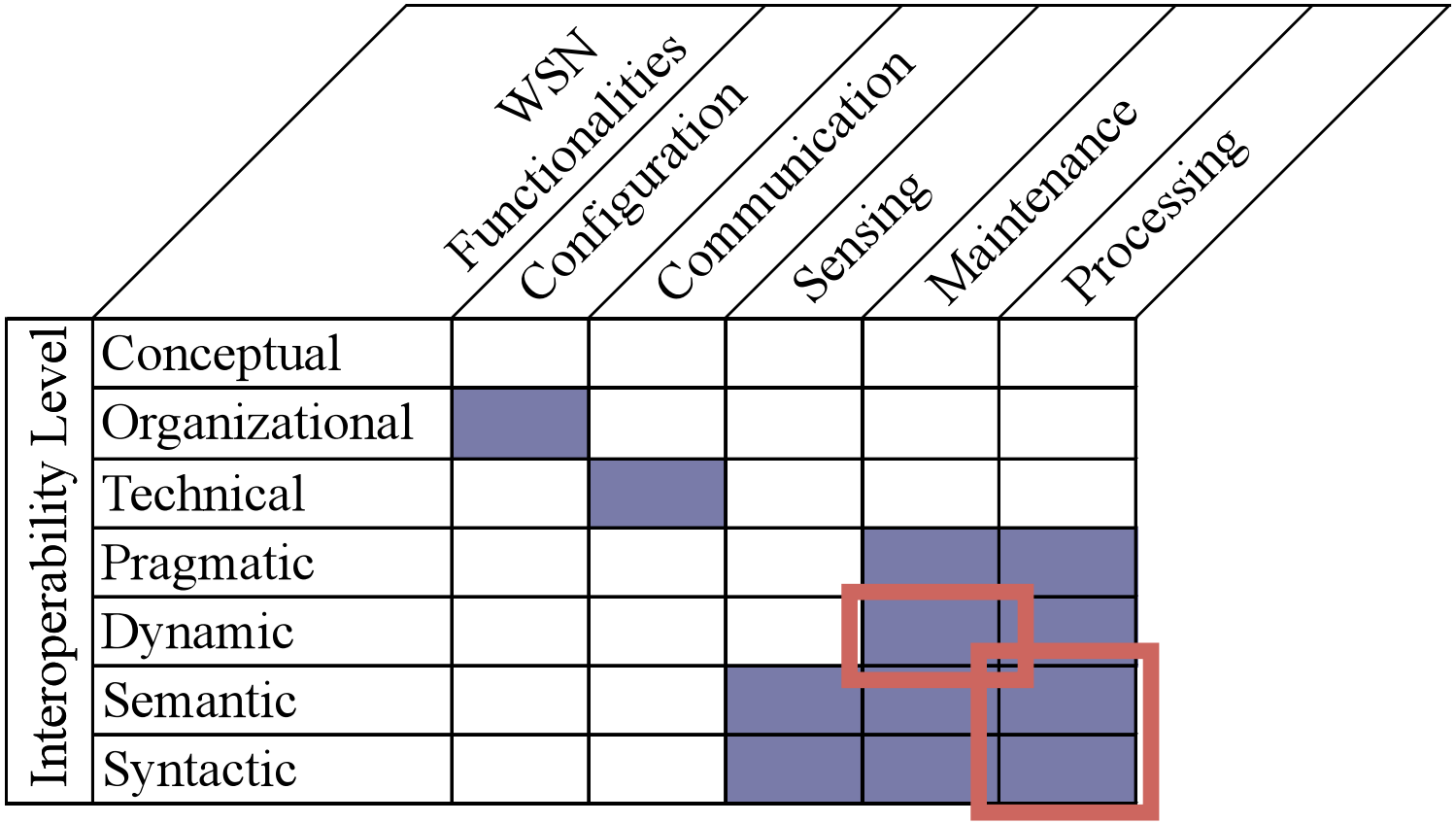
Conceptual

Organisational



(Manso *et al*, 2008)

Preliminary Results



Preliminary Results

- Depending on the interoperability level and the WSN functionalities, the metadata have played a different role such as:

1. Passive vs. active metadata
2. Dynamic vs. static metadata
3. Automated vs. manual creation and maintenance

(Graybeal et al. 2007)

Conclusions

- Our exploratory study demonstrates the existence of relations between WSN functionalities and different interoperability levels.
- “Conceptual shift” from defining metadata for WSN towards defining metadata for the interoperability of WSN.

Future Research

- Implementation of concrete case of study for the evaluation of our interoperability model
  - with an special attention on the dynamic behaviours in the context of mobile sensor.
  - use Sensor Web specifications to inherit its metadata, trying to integrate our interoperability model with Sensor Web.

Metadata is essential to generate the knowledge of a sensing system and the common thread that will connect all the states and functionalities of WSN and preserve the context of the collected data.

Thanks for your attention!

Daniela Ballari
daniela.ballari@upm.es

Monica Wachowicz
m.wachowicz@upm.es

Miguel Angel Manso-Callejo
m.manso@upm.es