



*Contribution to Special Interest Group 1
SIG1 - Information representation languages*

Spectrum sensing experiment specification ontology

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Spectrum sensing is one of the core functionalities of a true cognitive radio (CR), which supports operation over a broad range of frequencies and autonomously adapts transmission parameters to the operating environment. There are several types of hardware such as the sophisticated Nutaq Radio420X FPGA mezzanine card, Wireless Open-Access Research Platform (WARP) and the Universal Software Radio Peripheral (USRP) and low cost WiSpy, TelosB, VESNA, that can be used to experiment with spectrum sensing. This hardware is available for use in several testbeds across the world (i.e. ORBIT, w-iLab.t, TWIST and LOG-a-TEC). Each testbed provides a specific mechanism to define, deploy and execute experiments making it difficult to use more than one for a specific researcher. In an attempt to decrease the definition and configuration overhead, a common data format for experiment description, specification and results have been developed within the CREW project [1]. As a result, the five federated testbeds in CREW (see Figure 1) support describing, defining and running experiments using the common data format.

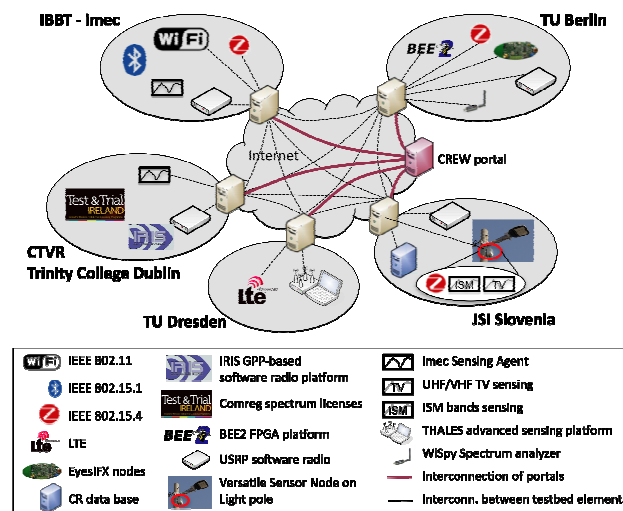


Figure 1: The CREW federated testbed

The Open-Access Research Testbed for Next-Generation Wireless Networks (ORBIT) at Rutgers University has a long history of experimentation with wireless networks. For this testbed, the widely used cControl and Management Framework (OMF) [2] was developed. The OMF is being used now in the GENI and FIRE federated testbeds where the need of a more generic way of specifying experiments is needed to accommodate the capabilities of as many testbeds as possible. For describing spectrum sensing experiments, a joined effort led to the development of the Spectrum Sensing Ontology [3] to be used for device capability description [4] and experiment description.

The current version of the Spectrum Sensing Experiment Specification Ontology focuses on specifying device capabilities in the scope of configuring spectrum sensing experiments. The ontology has three orthogonal parts that allow the description of:

- spectrum related theoretical aspects,

- device spectrum sensing capabilities and
- ranges of values for each

This is depicted in Figure 2 where the light blue concepts represent the theoretical layer, the light green ones represent the device spectrum sensing capability layer and the dark blue individuals represent ranges that can be sets or intervals.

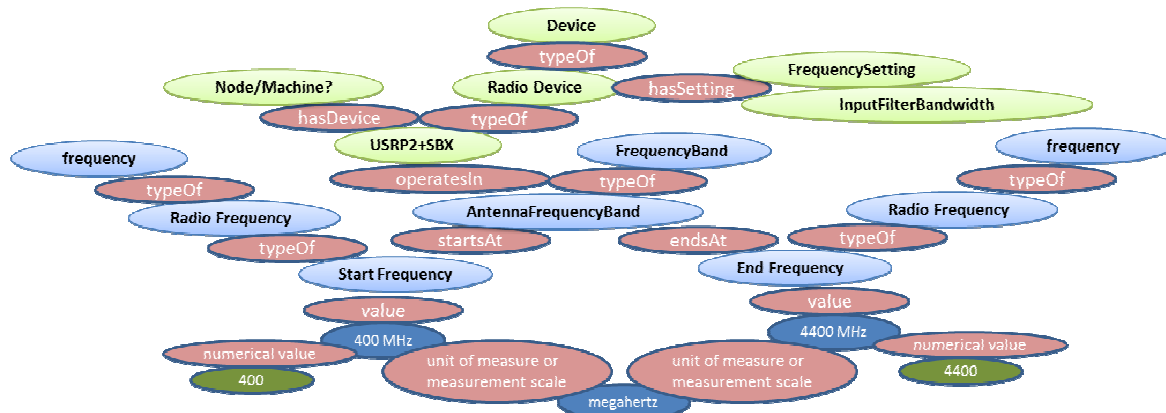


Figure 2 Conceptualization of the 3 layered approach.

With the available ontology, the 387-464 MHz frequency band can be described as follows:

```
<rdf:Description rdf:about="http://www.orbit-lab.org:8080/tsc/resources/OrbitInventory/387-464MHzband">
  <j.8:startsAt rdf:resource="http://www.orbit-lab.org:8080/tsc/resources/OrbitInventory/387MHz"/>
  <j.8:endsAt rdf:resource="http://www.orbit-lab.org:8080/tsc/resources/OrbitInventory/464MHz"/>
  <rdfs:label>387-464 MHz band</rdfs:label>
  <rdf:type rdf:resource="http://sensorlab.ijs.si/2013/v0/SpectrumSensingExperimentSpecification.owl#FrequencyBand"/>
  <rdf:type rdf:resource="http://www.w3.org/2000/01/rdf-schema#Resource"/>
</rdf:Description>
```

For the development of the ontology, best practices provided by the semantic web community have been taken into account. Existing vocabularies are re-used to the largest extent possible and the new ones are built according to Linked Open Data principles.

Work on the ontology is on-going with the aim of extending it for full spectrum sensing experiment descriptions. This means focusing also on transmission capabilities and experiment process description.

References

- [1] <http://www.crew-project.eu/>
- [2] <http://mytestbed.net/>
- [3] <https://github.com/cfortuna/CROntology>
- [4] <http://www.orbit-lab.org:8080/tsc/resources/OrbitInventory>