Spectrum sensing experiment specification ontology

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Outline

• Motivation
• Spectrum sensing ontology
• Demos
• Use case
Spectrum sensing

• core functionality of a true cognitive radio (CR)
• A CR enables operation over a broad range of frequencies and autonomously adapts transmission parameters to the operating environment.
Spectrum sensing hardware

- Nutaq Radio420X FPGA mezzanine card,
- Wireless Open-Access Research Platform (WARP)
- Universal Software Radio Peripheral (USRP)
- WiSpy,
- TelosB,
- VESNA, etc.

- SS hardware is available for use in several testbeds across the world
Cognitive radio testbeds (1/2)

- The cognitive radio experimentation world (CREW) facilities
Cognitive radio testbeds (2/2)

• Other testbeds from Future Internet Research and Experimentation (FIRE) – European effort of setting up testbeds that enable experimentation with future internet technologies

• Testbeds from the Global Experimental Network Infrastructure (GENI) – US effort of setting up testbeds that enable experimentation with new communication technologies

• Each testbed provides a specific mechanism to define, deploy and execute experiments making it difficult to use more than one for a specific researcher.
Tools for federating experimental facilities

• 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.

• The Open-Access Research Testbed for Next-Generation Wireless Networks (ORBIT) at Rutgers University uses the **cOntrol and Management Framework (OMF)**

• For describing spectrum sensing experiments, a joined CREW-GENI (Rutgers) effort lead to the development of the **Spectrum Sensing Ontology** to be used for device capability description and experiment description
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

- Basic device capability description: base band and RF capabilities described
- Description of the processing for base band is under development
The Spectrum Sensing Ontology (2/2)
387-464 MHz frequency band description

<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>
Demo

- Protégé – local

- Tasor ORBIT Inventory
  http://www.orbit-lab.org:8080/tasor/#OrbitInventory:USRP2+SBX
Example Usage Scenario

Resource discovery
- Show me all resources available in the Fed4FIRE federation

Resource requirements
- Limit to nodes that have 2 IEEE 802.11n interfaces

Resource reservation
- Reserve me 30 nodes on testbed X tomorrow from 9-17h

Resource provisioning
- Make sure that they will be deployed with Ubuntu 12.04 LTS
Thank you! Questions?

- https://github.com/cfortuna/CROntology
- http://sensorlab.ijs.si/