



CREW WinnComm tutorial

4: Tecnalia's Experience at CREW

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WinnComm 2012, Brussels

The research leading to these results has received funding from the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 258301 (CREW project).

WinnComm 2012 – CREW tutorial

Experimenters Experience



Outline



- Experiment Description
- Use of CREW testbed environment
- Advantages of Using CREW



Experiment Description



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- **Main objective:** Assessing the benefits of optimized linear collaborative multiband spectrum sensing in cognitive radio networks with respect to its non-optimized counterpart.

- **Specific Goals:**
 - Incorporate the LSC decision scheme for enabling opportunistic multiband spectrum sensing.
 - Benchmark hard decision techniques against genetically-optimized and non-optimized LSC approaches.
 - Quantize the performance gains entailed by the application of Harmony Search (HS) heuristics to the optimization of the LSC coefficients under a maximum-throughput criterion.

■ Different alternatives for spectrum sensing:

- Non Collaborative -> **Many Problems (Hidden Node, etc)**
- Collaborative with hard-decision data fusion -> **(based on AND, OR)**
- Collaborative with soft-decision data fusion -> **e.g Linear Statistics Combining (LSC)**

■ What is LSC?:

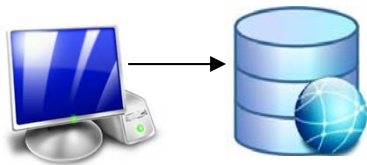
- LSC hinges on linearly combining the unprocessed spectrum measurements captured by cognitive radio nodes by means of a set of configurable coefficients.
- May be applied to a single band or to each band of a broad bandwidth (multiband LSC).
- The values of the coefficients are usually set equal to each other in the conventional implementation. However, results can be improved in terms of throughput by making use of genetics algorithms or **evolutionary heuristics (Harmony Search Algorithm)**.

■ Spectrum Sensing Devices:

- Scan different channels.
- Send their captures through an ethernet link to the central coordinator



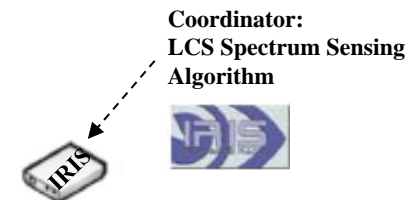
■ Sensing nodes Coordinator (PC + DB):



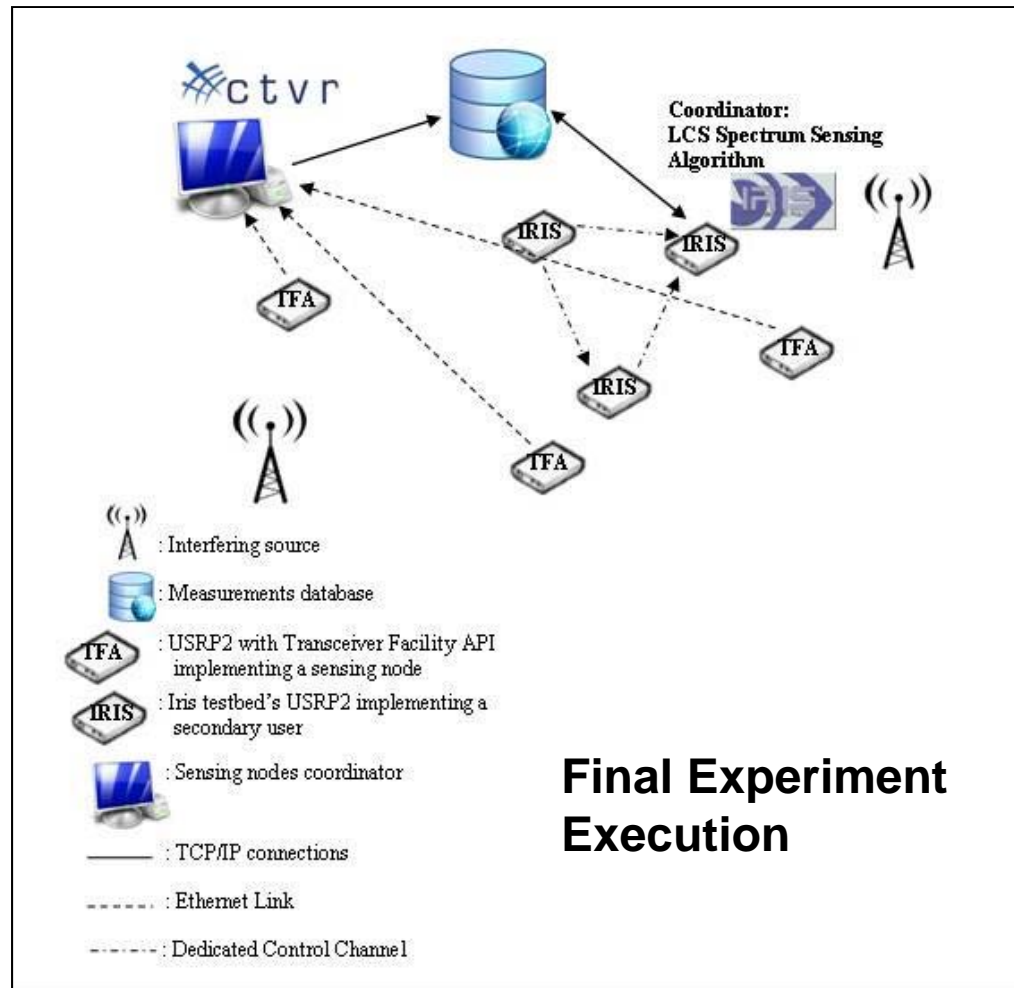
- Configures the different sensing nodes.
- Collects samples from each sensing node and extracts spectrum measurements.
- Stores independent measurements and acts as communication channel between sensing and secondary users network.

■ Secondary users coordinator:

- Read independent measurements from the DB and integrate them with different algorithms.
- Assign free channels to other secondary users.
- Store decisions into the DB.



■ Experiment Set-up





Use of CREW testbed environment



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Use of CREW testbed environment



■ Use of the CREW federation:

- Thales Transceiver Facility API Imp. + USRP2: Spectrum sensing device.
- Iris Software Radio Architecture: Deployment of data fusion algorithms.
- Common Data Collection and Storage Methodology .

■ Contribution to the CREW federation:

- Adds the functionality of collaborative sensing schemes to the cognitive networks.
- Transforming the Iris testbed into a true TV whitespaces secondary users system (including a TV whitespaces data base and the mechanisms to automatically feed it).
- Contribution to the dissemination effort.



Advantages of Using CREW



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Advantages of Using CREW



- **Use of a winnforum standard implementation for the sensing nodes: Thales transceiver API implementation.**
- **A friendly environment for easy deployment of cognitive algorithms: IRIS environment.**
- **Additional hardware for experimentation with multiple sensing nodes.**
- **A common data format to compare results between different experiments.**
- **Nice and friendly project partners ;)**