CREW

Cognitive Radio Experimentation World

CARE
Cognitive Access and Rendezvous Experiments [LIPADE]

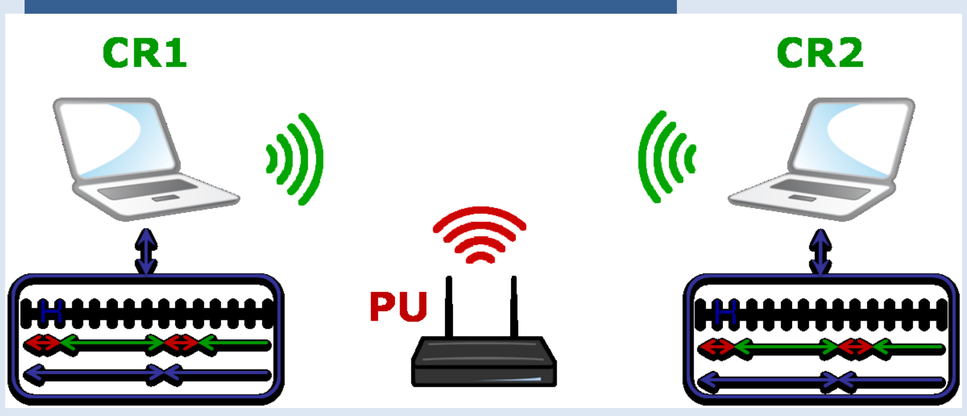
Goals

- To provide a solution for the blind rendezvous problem:
  - by establishing a control link on the same channel among secondary users (SU)
  - without any central coordination
- To test and validate rendezvous algorithms in real settings.
- To verify simulation results in terms of throughput, delay and QoS.

Challenges

- Synchronization among secondary users:
  - Hard to implement in user-space
  - Kernel-space has direct access to driver's Time Synchronization Function
- Channel switching:
  - User-space programs have to go through system calls
  - Kernel-space has direct access to fast driver's calls

Rendezvous setup



The Primary User (PU) floods its channel(s) to simulate the transmission activity in the licensed spectrum.

Cognitive Radio nodes (aka Secondary Users) periodically switch channel to establish a common control channel.

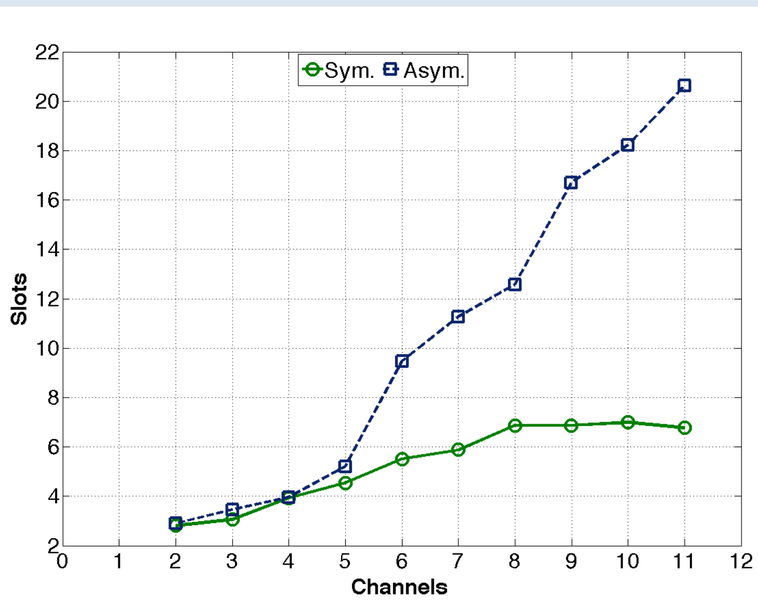
The two rendezvous nodes in this setup have symmetrical channel perceptions and their slots are aligned.

Experiment

- The following scenarios were tested on 6 Wi-Fi nodes in the iMinds w-iLab.t testbed:
  - Scenario 1
    - Symmetrical channel perception (same knowledge on the number of channels)
    - Aligned time slots
  - Scenario 2
    - Asymmetrical channel perception (no knowledge on the number of channels)
    - Unaligned time slots
- A pseudo-random channel hopping algorithm was used to create a control channel among cognitive nodes and avoid the interference with the primary user.

Results

- Required time slot size to switch channels and send/receive probes:
  - When implemented in User-space:
    - Timeslot duration: 10 seconds
    - Dominated by the channel switching time
  - When implemented in Kernel-space
    - Tested with framework developed in FP7 FLAVIA project
    - Timeslot duration: 64 milliseconds
    - Dominated by the probe transmission
- The figure below shows that nodes with asymmetrical channel perception take 3.5 times longer compared to the symmetric case before converging to the same channel.



Testimony

- The open nature of the CREW equipment permits to develop and test innovative protocols that use advanced OS features.
- Excellent support and help from CREW members.
- The documentation for using CREW facilities is wide and very well organized (tutorials, YouTube videos, etc.). Almost no need of support for running experiments.
- The system for scheduling experiments should be improved.
- On-site development experience with embedded devices speeds up the implementation.

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 258301.

PROJECT DATA

Start Date: 01/09/2010; Duration: 60 M

EU Funding: 4.885 M€

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