CogFrame: Enabling Large Scale Flexible Deployment of Cognitive Radio Routing Protocols

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Motivation

- Increasing demand for mobile devices increased the demand for high bandwidth wireless communications
- Cognitive radio emerged as a solution for enhancing spectrum utilization
  - by allowing unlicensed users to utilize unused spectrum portions
- Building large-scale testbeds for cognitive radio networks has been identified as a CR challenging problem

Conventional Evaluations

- Most of previous evaluations
  - simulations
  - on a small scale in a controlled environment
- Testing routing protocols requires a large scale experiments
- Where using conventional testbeds require using expensive USRPs

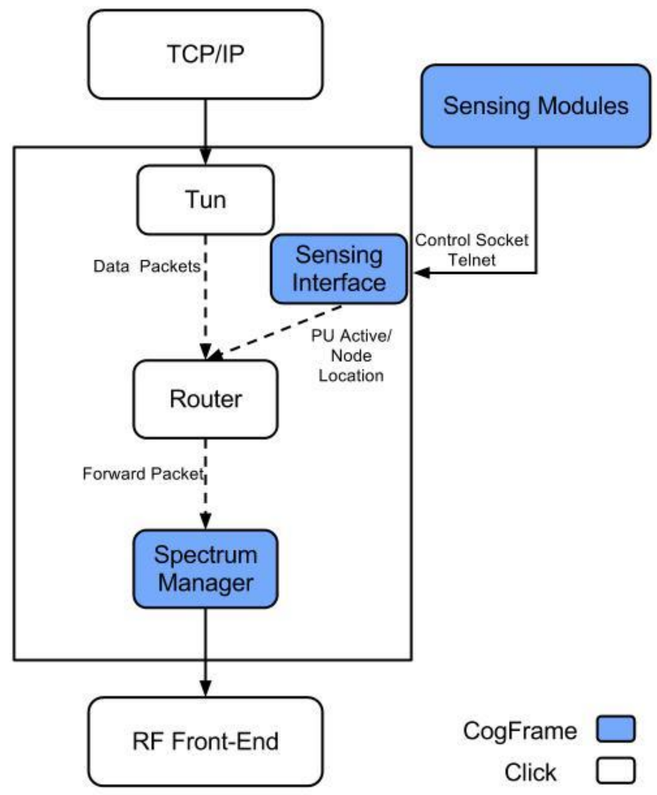
Design Goals

- **Ease of deployment**
  - By building CogFrame as cognitive radio extensions on top of Click Modular Router

- **Cost efficiency**
  - By making it possible to test protocols on conventional general purpose PCs with any kind of RF interfaces (e.g. Wi-Fi card)
- **Utilizing mesh networks testbeds**
  - By designing CogFrame to be compatible to the well established large scale testbeds of mesh networks

CogFrame Components

- ***Spectrum Manager***
  - Receives a packet and decides the transmission frequency
  - CogFrame assumes 802.11 a/b/g/n to be used as RF interface
  - Chooses the channel based on :
    - The routing decision
    - The spectrum state
- ***SensingInterface***
  - Provides handlers to allow sensing modules to tell the router the state of the spectrum
  - Separating the sensing modules from the routing modules
- **Sensing Modules**
  - Sensing primary users
  - Emulating primary user
  - Localizing secondary users



Node Structure

- ***CogFrame 's* requirements are kept to the minimum**
  - Node must be running Click Modular Router
  - Have at least one wireless network interface card

Case Study

- **LAUNCH Protocol**
  - Location aided routing protocol for CRN
  - Requires both spectrum and location sensing
  - Requires two interfaces for sensing and receiving