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A Survey on Simulators for Cognitive Radio Network

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***Abstract*—: Cognitive radio is a new emerging and challenging research area in the domain of Adhoc networks. Cognitive radio is an intelligent wireless network that changes its parameters according to its surroundings. Different types of simulators are used to evaluate the performance of cognitive radio in different aspects. CRCN, CRAHN, COGNs are different types of cognitive radio simulators. This paper gives brief introduction about these simulators**

***Keywords*— Cognitive radio, CRCN, COGNS, CRAHN, Simulators**

I. INTRODUCTION

Cognitive radio is a new paradigm in wireless networks. Cognitive radio has its applications in fields like consumer markets, military, agriculture, public safety etc. Cognitive radio has the characteristics Such as (i) it is aware of its environment and capabilities. (ii) it is able to independently alter its physical layer behaviour based on its previous experience and its current environment. (iii) It is capable of performing the complex adaptation strategies according to the cognitive cycle [8].Cognitive radio is gaining its importance in wireless networks as it enables the current fixed spectrum channel assigned by FCC to be utilized by the new users [7].

II. MOTIVATION

Many Researchers are showing their keen interest in cognitive radio to explore facts about various layers of it. But till now there is no single simulator that meets all the needs of cognitive radio. Most of the Researchers are implementing their algorithms by modifying the existing simulators such as NS-2, OPNET, and QUALNET etc. Based on NS-2, CRCN and CRAHN modules are developed

III. SIMULATORS FOR COGNITIVE RADIO

A. CRCN

CRCN means cognitive radio cognitive network. This is based on most popular simulator NS-2[6]. CRCN simulator supports performance evaluations for the proposed dynamic spectrum resource allocation, power control algorithms, and the adaptive Cognitive Radio (CR) networking protocols including the CR MAC and the CR Routing protocols. To generate realistic traffic and topology patterns NS-2 is used in CRCN. For each node in this simulator, a reconfigurable multi-radio multi-channel PHY layer is available by customizing the spectrum parameters such as transmission power, propagation and etc.

1. Installation steps :

NS2 COMPONENTS

1 Make sure your system meets the system requirements.
2 Download crcn.zip
3 Change your working directory to XXX/ns-allinone-2.31/ns-2.31/
4 Unzip the crcn.zip. Copy the files under each subfolder in crcn into the corresponding folders in XXX/ns-allinone-2.31/ns-2.31/. For example, copy the files under crcn/mac/ into XXX/ns-allinone-2.31/ns-2.31/mac/. Please note that it will overwrite some of your ns file in the same directory. Thus, backup the ns directory before executing this command.
5 Add the following three lines in the Makefile, which is under XXX/ns-allinone-2.31/ns-2.31/.

```
wcett/wcett_logs.o wcett/wcett.o \
wcett/wcett_rtable.o wcett/wcett_rqueue.o \
mac/macng.o mac/maccon.o\
mac/macngenhanced.o\
```

6 Run the following commands under XXX/ns-allinone-2.31/ns-2.31/ directory:

```
make clean
make depend
make
```

2. GUI

1. Install the java JDK version 6 or above under linux, here is the link how to install java
2 Install the gnuplot
3 Put throughput.pl and throughputcbr.pl under your ns working directory XXX/ns-allinone-2.31/ns-2.31/.4. Run CRCN.jar. (updated)

B. CRAHN

Cognitive radio Adhoc network is another simulator based on NS-2. It was developed by Marco Di Felice to simulate cognitive radio network. It is add on module to NS-2 that sense primary user activity and pause transmission when primary user claims the spectrum. This simulator provides the facility for nodes to change the transmission and receiving channels because they continuously seek free spectrum to communicate on. The source code can be found at [5].To compile, you'll have to checkout the git repository by typing the following in a terminal window:

git clone git://github.com/abdulla-alali/TFRC-CR.git -b CRAHN

This resulting directory will be a patched ns2.31 directory. You can directly use this directory by replacing the subdirectory in your all-in-one ns2 installation with it and by re "configure && make". More details about this simulator can be found at [3].

C. CogGNS

This simulator is also based on NS-2.This framework can be used to investigate and evaluate the impact of lower layers i.e MAC and Physical layers. CogNs can be used to evaluate the QOS requirements such as packet drop, throughput, end-to-end delay which are important in real time applications.

IV. CONCLUSION

Cognitive radio has lot of scope for research because it solves the problem of spectrum scarcity. But there is no single simulator which can be used to solve the research problems existed in different layers of Cognitive radio. CRCN, CRAHN, CoGNS are based on NS-2 and each of them are used for specific purpose. As a future work there is a need to develop one simulator that suits all the needs of cognitive radio.

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