

USRP based Cognitive Radio Test-bed using OpenBTS

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Problem Statement

- ▶ To develop a testbed for cognitive radio demonstrating coexistence of primary (licensed) users and secondary (unlicensed users)
- ▶ A two frequency testbed (channels used 945 MHz and 955 MHz)
- ▶ A four frequency testbed (936 MHz, 943 MHz, 950 MHz, 957 MHz)

Overview of the tasks accomplished in our project

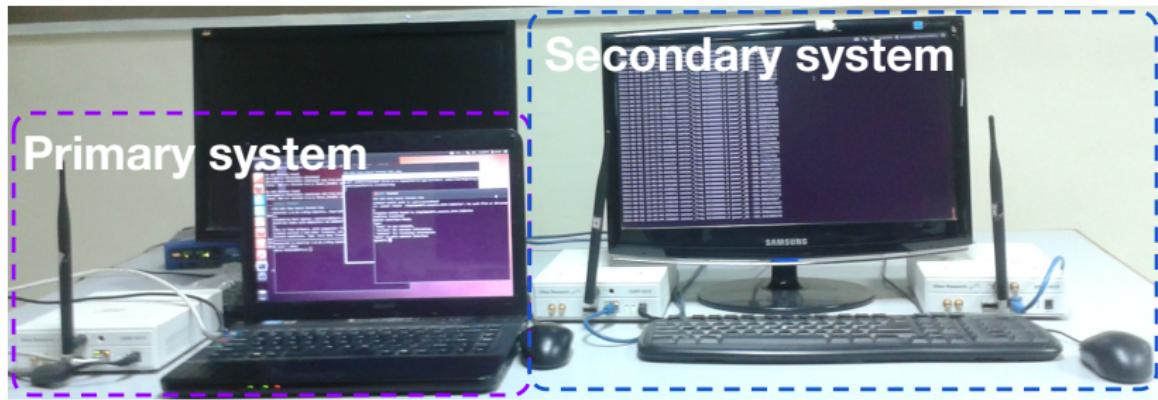
- ▶ Cognitive radio?, spectrum holes?
- ▶ GNURadio
- ▶ Python programming language
- ▶ USRP kit
- ▶ OpenBTS
- ▶ Calls and SMS service on local network
- ▶ Spectrum sensing techniques
- ▶ Defining problem statement

- ▶ Developing a flow chart of the solution to this problem
- ▶ Running GNURadio and OpenBTS on the same computer at the same time
- ▶ Bash scripting (.sh files)
- ▶ Periodogram analysis
- ▶ Building a two frequency cognitive radio test bed
- ▶ Building a four frequency cognitive radio test bed

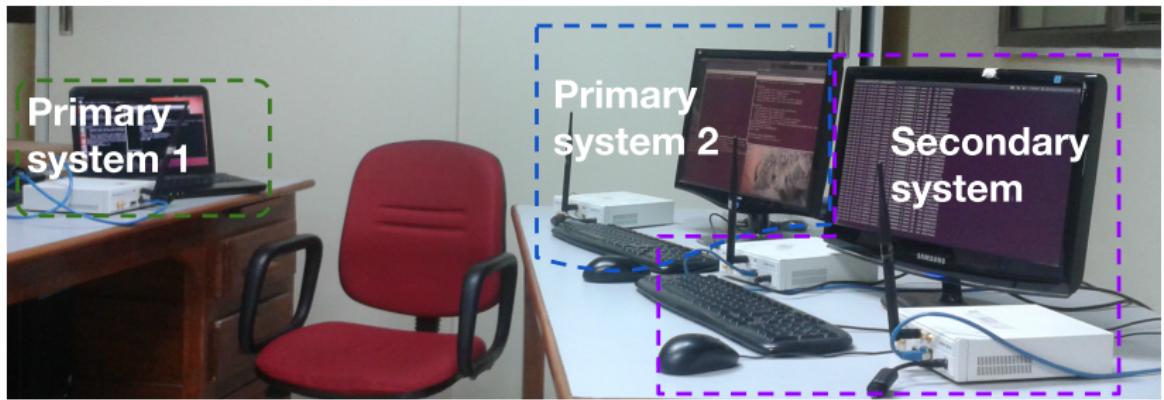
Hardware and software used

- ▶ GNURadio
- ▶ OpenBTS
- ▶ USRP N210 Kits
- ▶ GSM mobile phones with SIM cards
- ▶ Computers

Setup for the two-frequency testbed

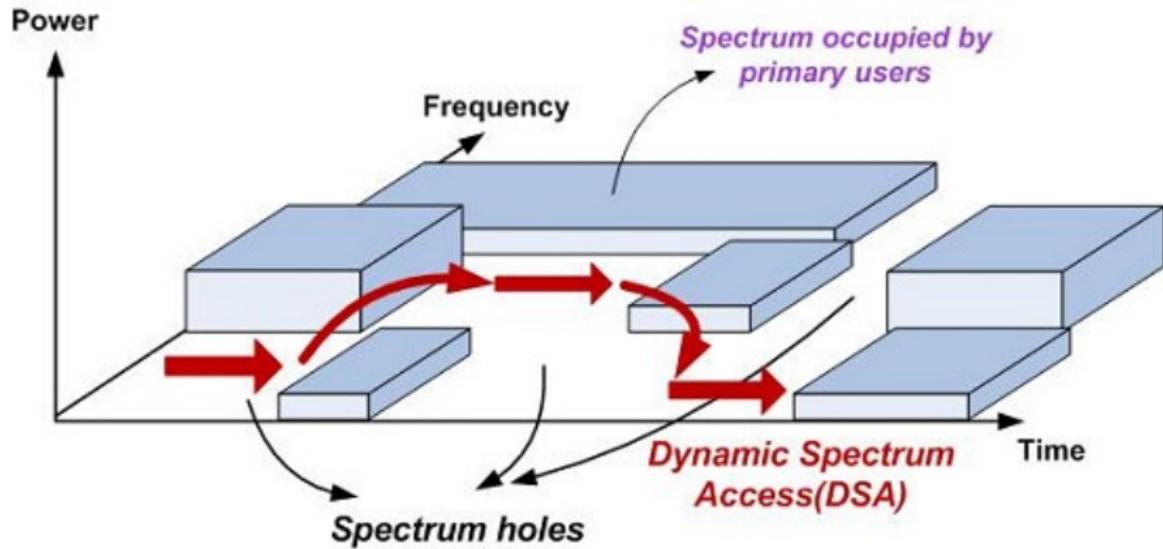


Setup for the four-frequency testbed



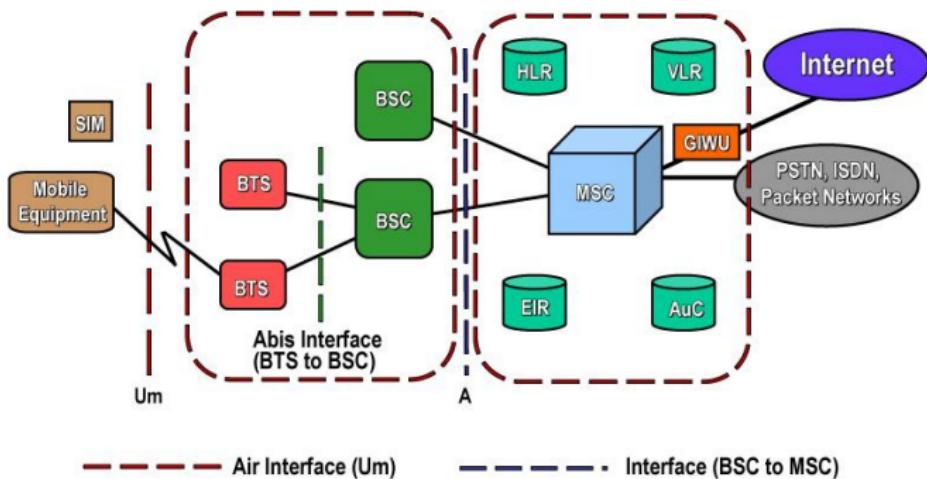
Cognitive Radio

- ▶ What is Cognitive Radio?



Source: http://www.brunel.ac.uk/__data/assets/image/0011/237539/Abdullah-Masrubi1.jpg

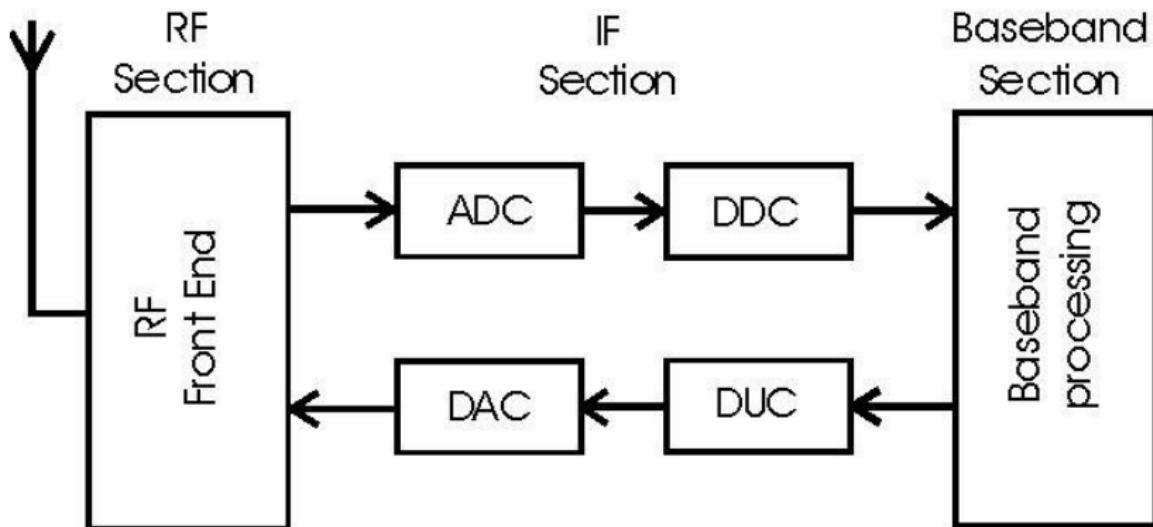
GSM



Source: http://www.hill2dot0.com/wiki/index.php?title=Image:G2407_GSM-Architecture.jpg

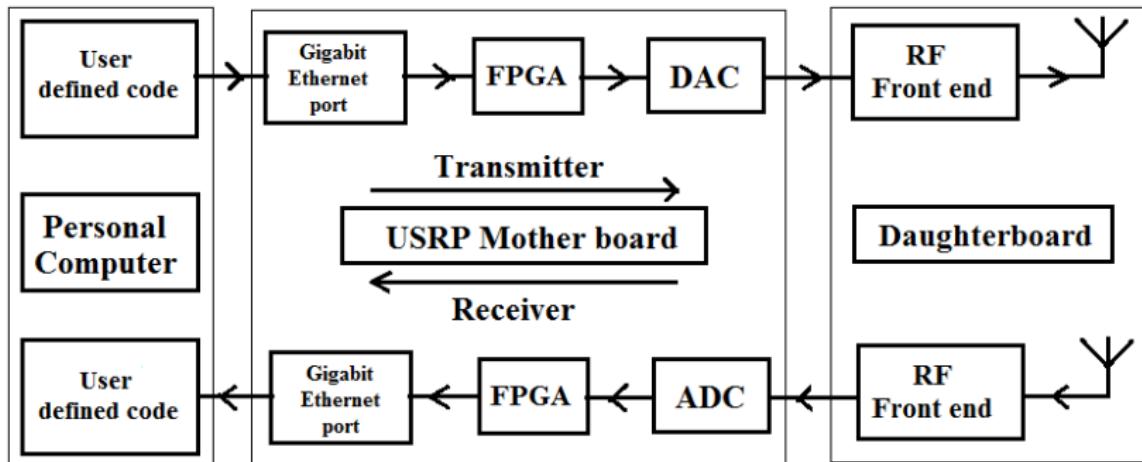
Software Defined Radio

- ▶ What is software defined radio?
- ▶ Block Diagram:



USRP

- ▶ We have used the USRP N210 kit. It performs the task of: transmission, receiving and sensing
- ▶ The kit is equipped with WBX daughter board which spans a spectrum range of: 50-2200MHz



GNURadio

- ▶ What is GNU Radio?
- ▶ Skeleton code `spectrumsense.py`
- ▶ Block Diagram

