CLOUD-BASED ROUTING RESOURCE ALLOCATION IN COGNITIVE RADIO NETWORKS

Authors:

M. N. Morshed
S. Khatun
M. M. Fakir
M. Z. Ibrahim
S. Razali
Y. Ramajayam

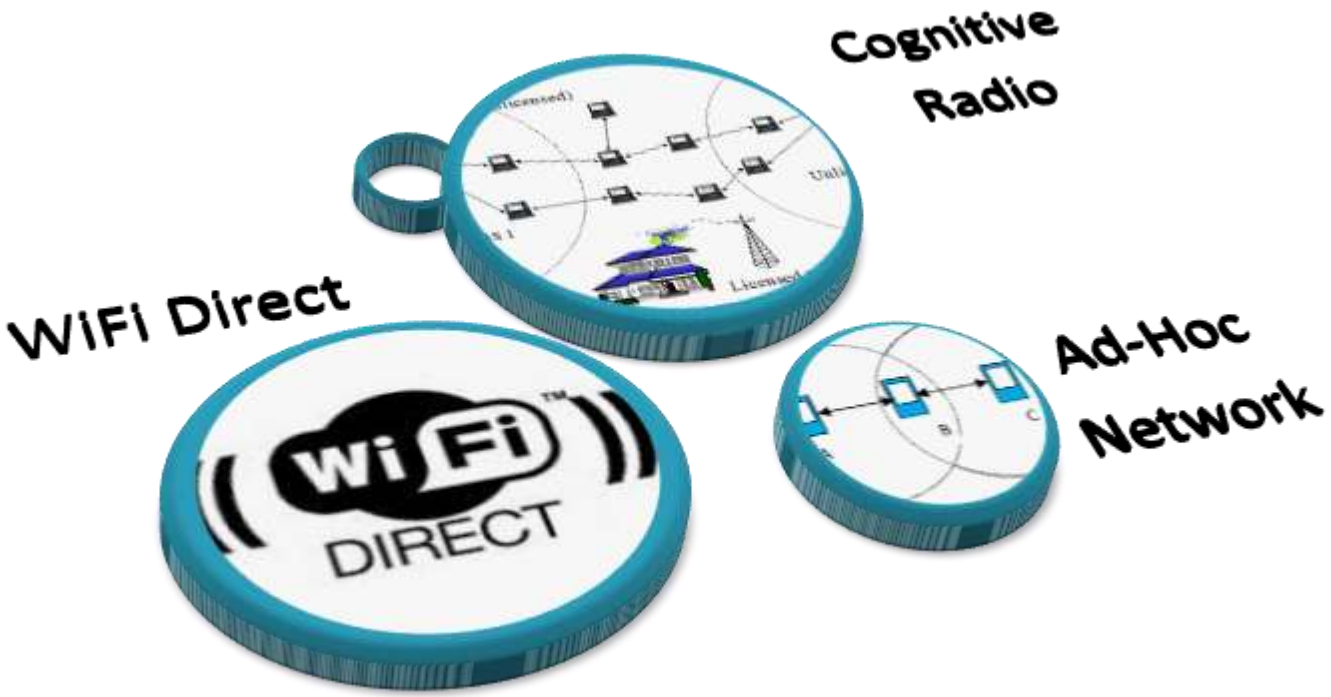
Presentation Outline

- Introduction
- Problem Statement
- Aim of the Research
- Research Tools
- System Model
- Performance Analysis
- Conclusions

Introduction (1/6)

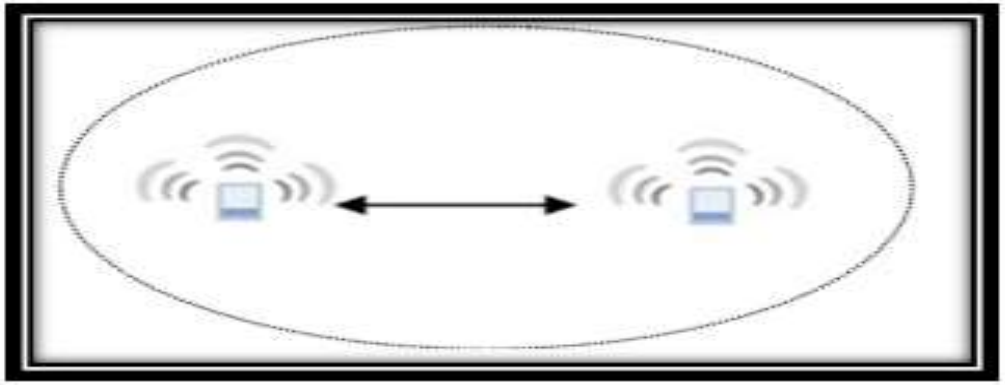
- Developed applications for Android WiFi direct communication and cloud-based file synchronization.
- Distributed file systems for the cloud is a file system that enables customers to have access to the same data or file provides important operational.
- WiFi Direct application is to create an ad - hoc network to transfer files wirelessly by using WiFi in android application and run on multi device.
- To customize the channel to the user demand, cognitive radio (CR) is used.

Introduction (2/6)

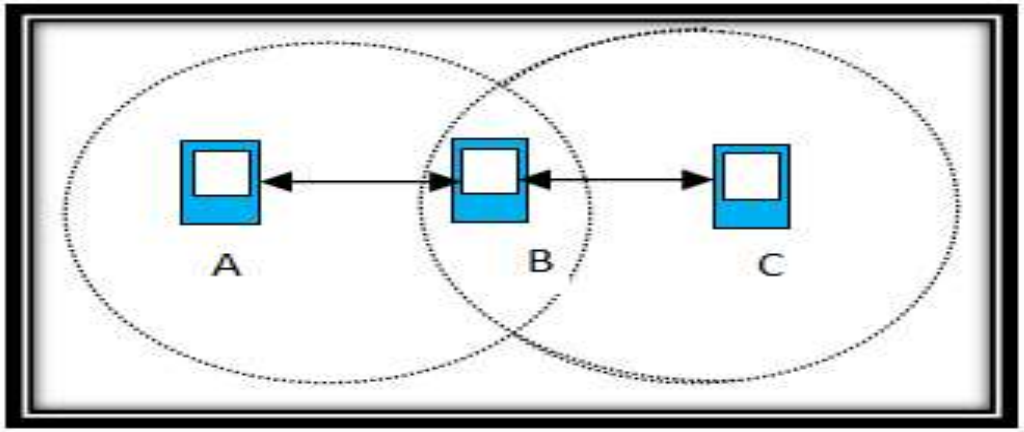


Introduction (3/6)

AD-HOC NETWORK



Point-to-Point Communication



Multi-Hop Communication

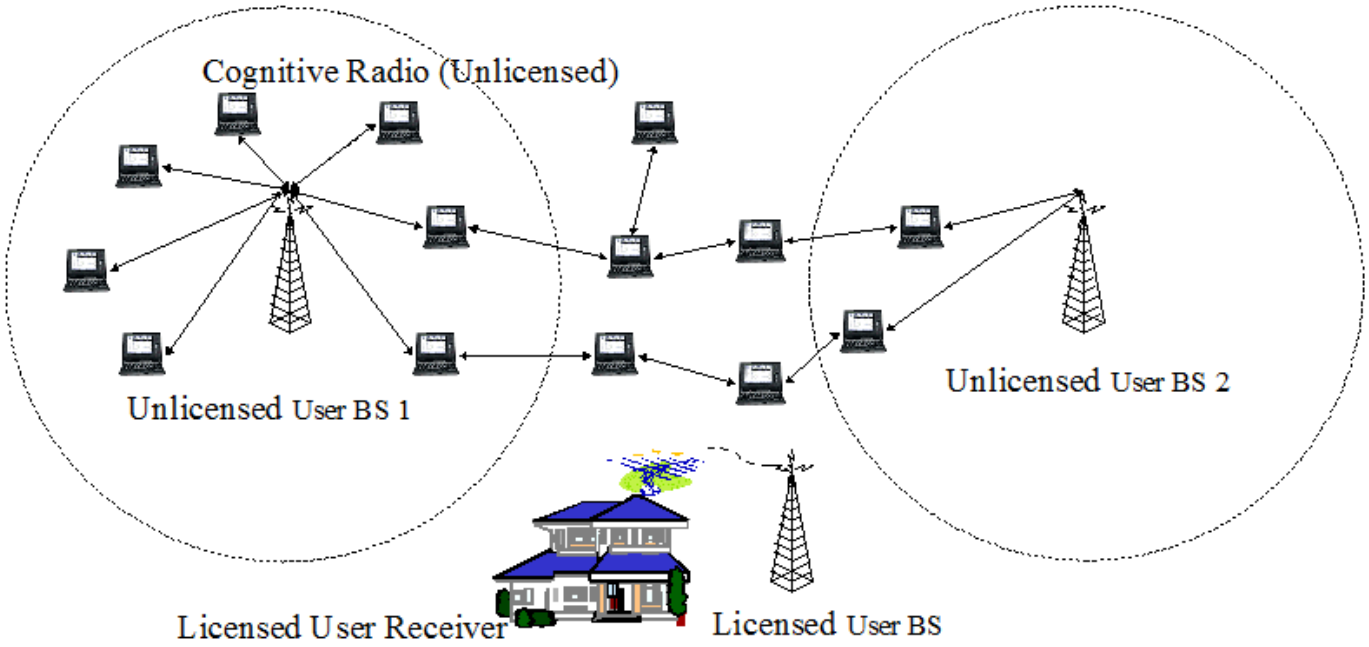
Introduction: Routing in AD-HOC Networks (4/6)

Features/Protocols	REACTIVE PROTOCOLS		PROACTIVE PROTOCOLS	
	AODV	DSR	OLSR	DSDV
Stability		✓	✓	
Delay(high)	✓		✓	✓
High Mobility	✓	✓		x
Routing Load (less)			✓	✓
Efficient Route Maintainance	x		✓	
Performance	✓		✓	✓
Throughput	✓		x	
Loop Free	✓	✓	✓	✓
Scalability	x	x	x	x
Routing Metrics	Fastest & shortest path	Shortest path	Shortest path	Shortest path
Reliability	✓	✓	✓	✓

Introduction (5/6)

COGNITIVE RADIO

Type of technology that allows an unlicensed user to use the spectrum that was given from license user.



Cloud Storage

- Cloud storage is online data storage in the cloud.
- This will occur saving data to offsite storage system maintained by third parties. Service cloud storage are :

Problem Statement

- A lot of money has been invested to provide such network-infrastructure.

- Randomness towards primary users (licensed), disruption to both intersections authorized and secondary user (unlicensed) is regularly difficult to avoid, which may require low processing for both licensed and unlicensed communications.

- Difficult to transfer files or document to cloud without internet. Without prior platform, there is no evidence that the system is working efficiently. Devices that connect using WiFi Direct technology have no track record or information about the other device that it had connected.

Aim and Objectives of Research (1/2)

Aim

To develop an application for cloud routing to transfer files using android based smartphone for trustable environment.

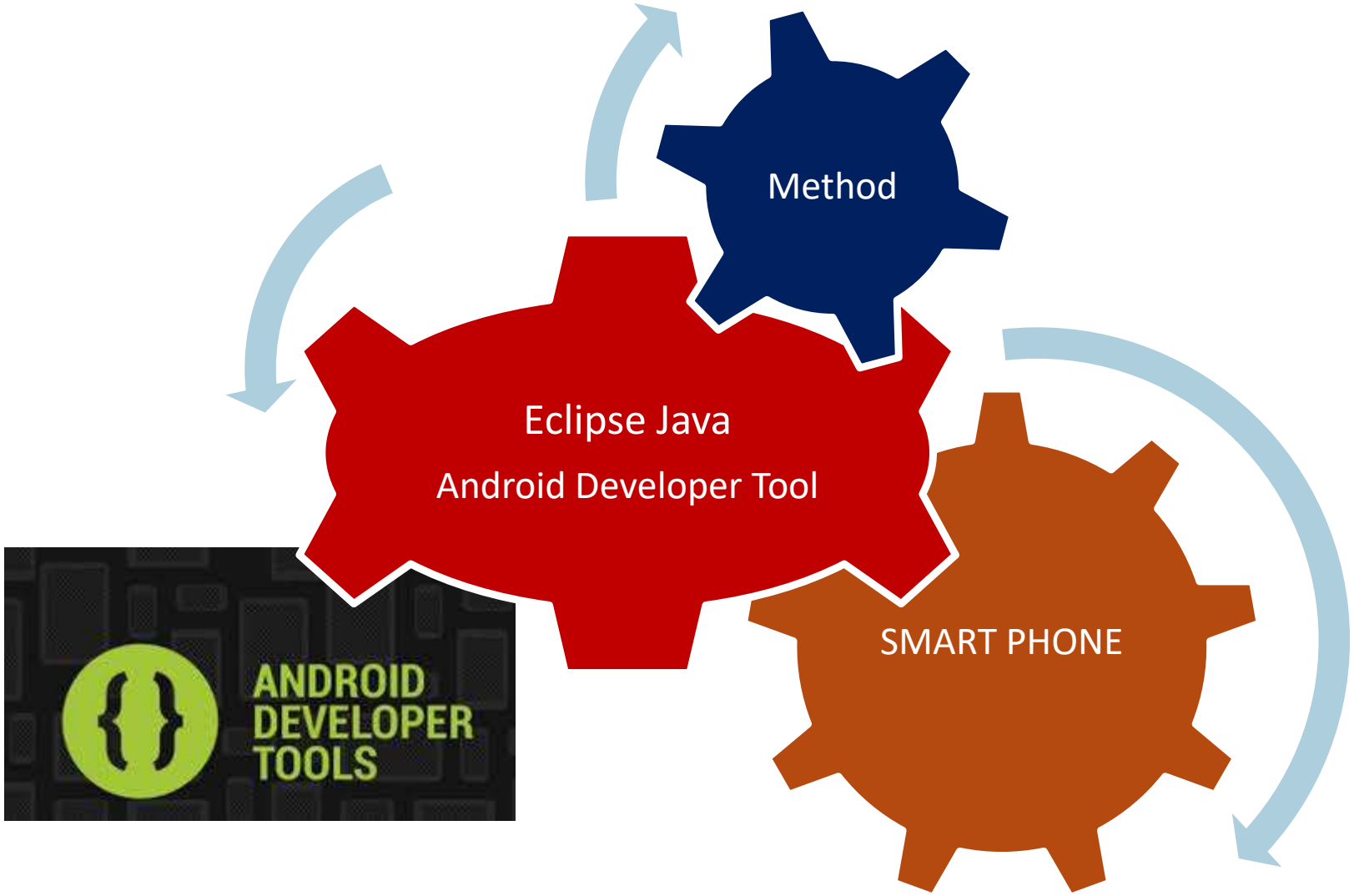
Objectives (2/2)

To investigate about Cognitive Radio (CR) detection and Routing methods to find an efficient detection and routing strategy.

To created CR based ad-hoc network to transfer file wirelessly by using Wi-Fi direct in android application and run on multi device. Finally, save the log file in cloud based storage.

To test and verify the system efficiency using of android based smart phones and cloud storage to validate the proposed method.

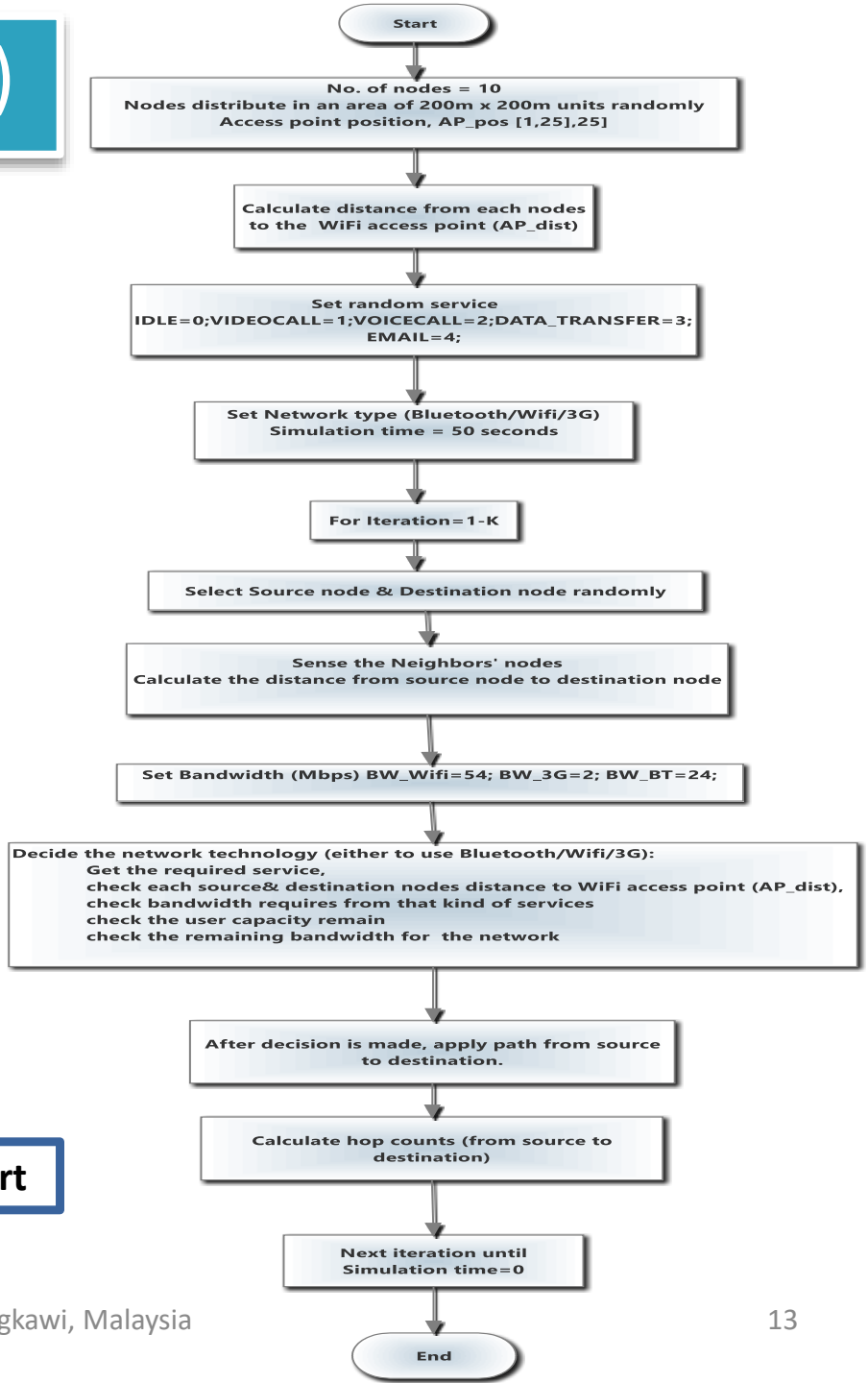
Methodology (1/8)



Methodology (2/8)

For Simulation Purpose, we consider Bluetooth, WiFi & 3G. Decision made based on following factors:

- Service type/requested
- User capacity in the network (current load of each network)
- Bandwidth
- All the neighbors' location (from the transmit node)
- Distance from each neighbor
- Distance from access point (AP)
- Distance between transmit - receive node.



Simulation flowchart

Research Tools for Experiments (3/8)

Methodology

WASPMOTE Bluetooth Sensor

WASPMOTE WiFi Sensor

WASPMOTE Board

Android Device

Wireless AP

Necessary Software:

- Android version 4.0 or above.
- Android Eclipse for android application development.
- MATLAB software for performance evaluation.

Hardware and Software for the Experimental Implementation

Research Tools (4/8)

Methodology

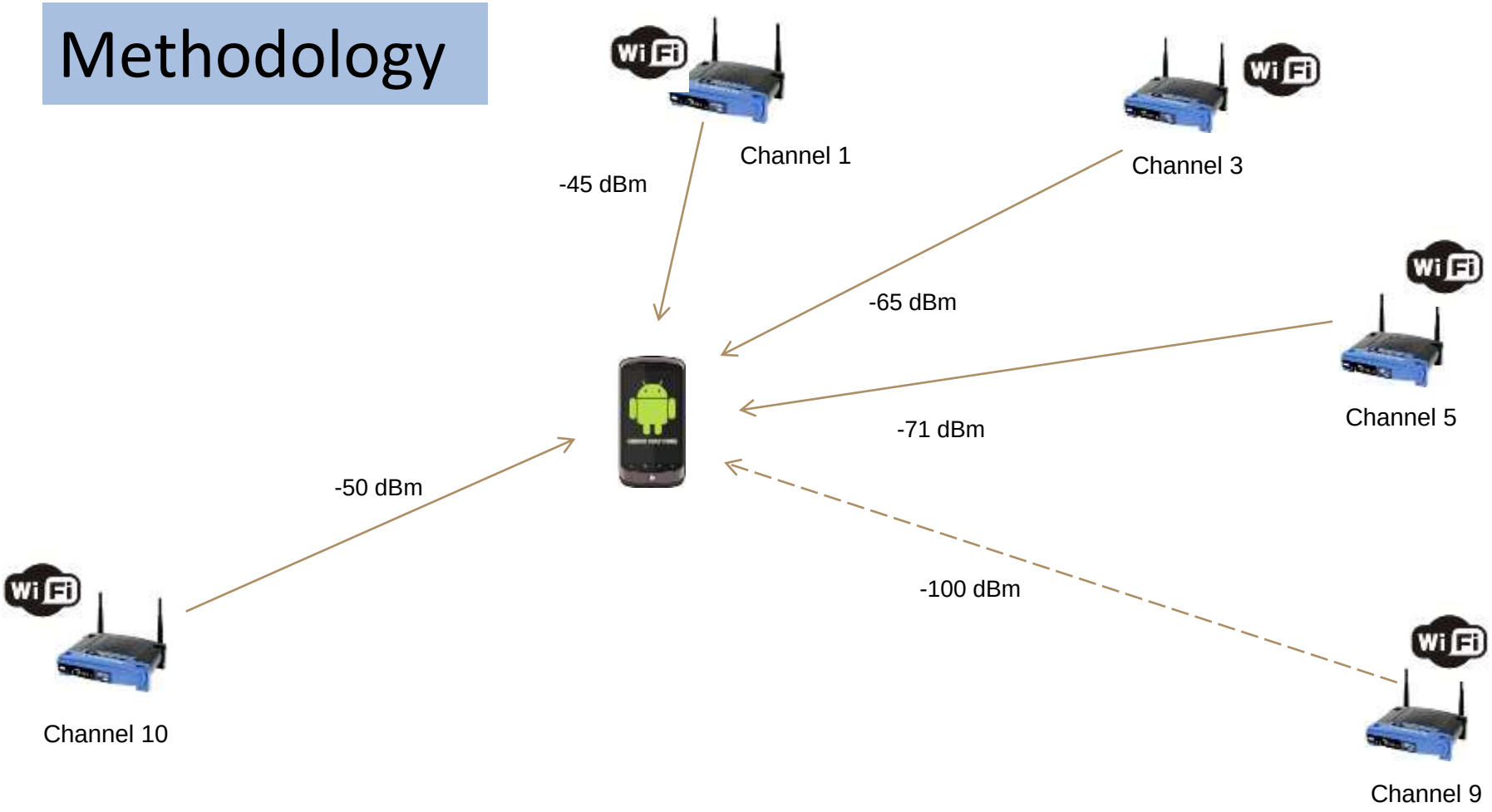
Samsung Galay Tab 2, Samsung Galaxy Note 2, Samsung Galaxy S4, Samsung Galaxy Trend Plus, Sony Xperia SL, Sony Xperia U (custom ROM), Sony Xperia M2 Aqua.

Eclipse ADT 22.2.3 for Application Development

MATLAB R2012a for Performance Measurement

Real Scenario (5/8)

Methodology



Real Scenario (6/8)

Methodology

Channel 1

Channel 3

Channel 5

-100 dBm

Channel 10

Channel 9

Real Scenario (7/8)

Methodology

Channel 1

Channel 3

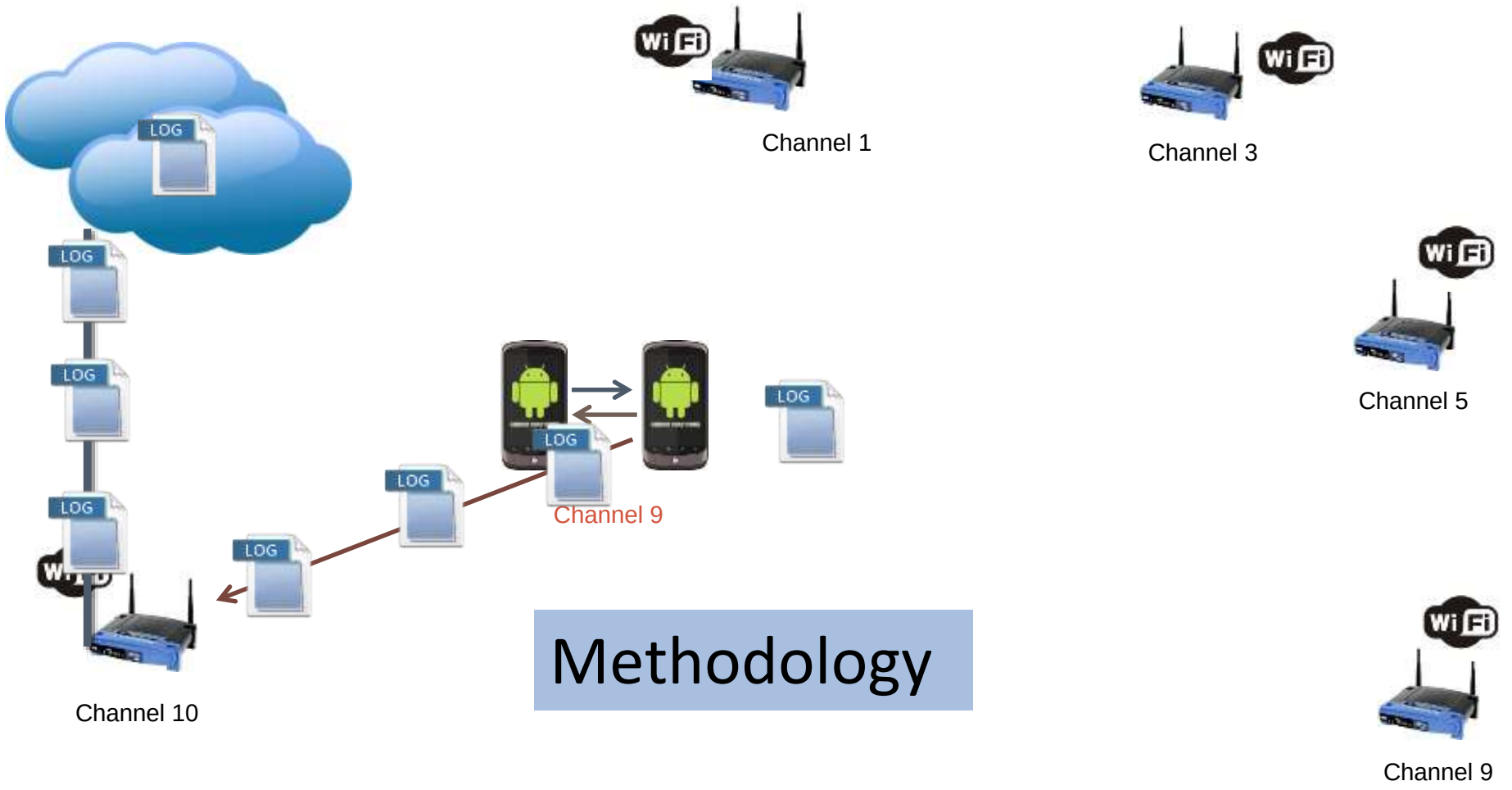
Channel 5

Channel 9

Channel 10

Channel 9

Real Scenario (8/8)



Performance Results (1/6)

The results obtained for Android application created for Cognitive Radio and WiFi direct files transfer to the cloud along with log file (detection and communication) generation process are presented here.

It mainly focuses on three parts:

1. Cognitive Radio
2. WiFi Direct Discovery Service
3. Cloud Backup Service

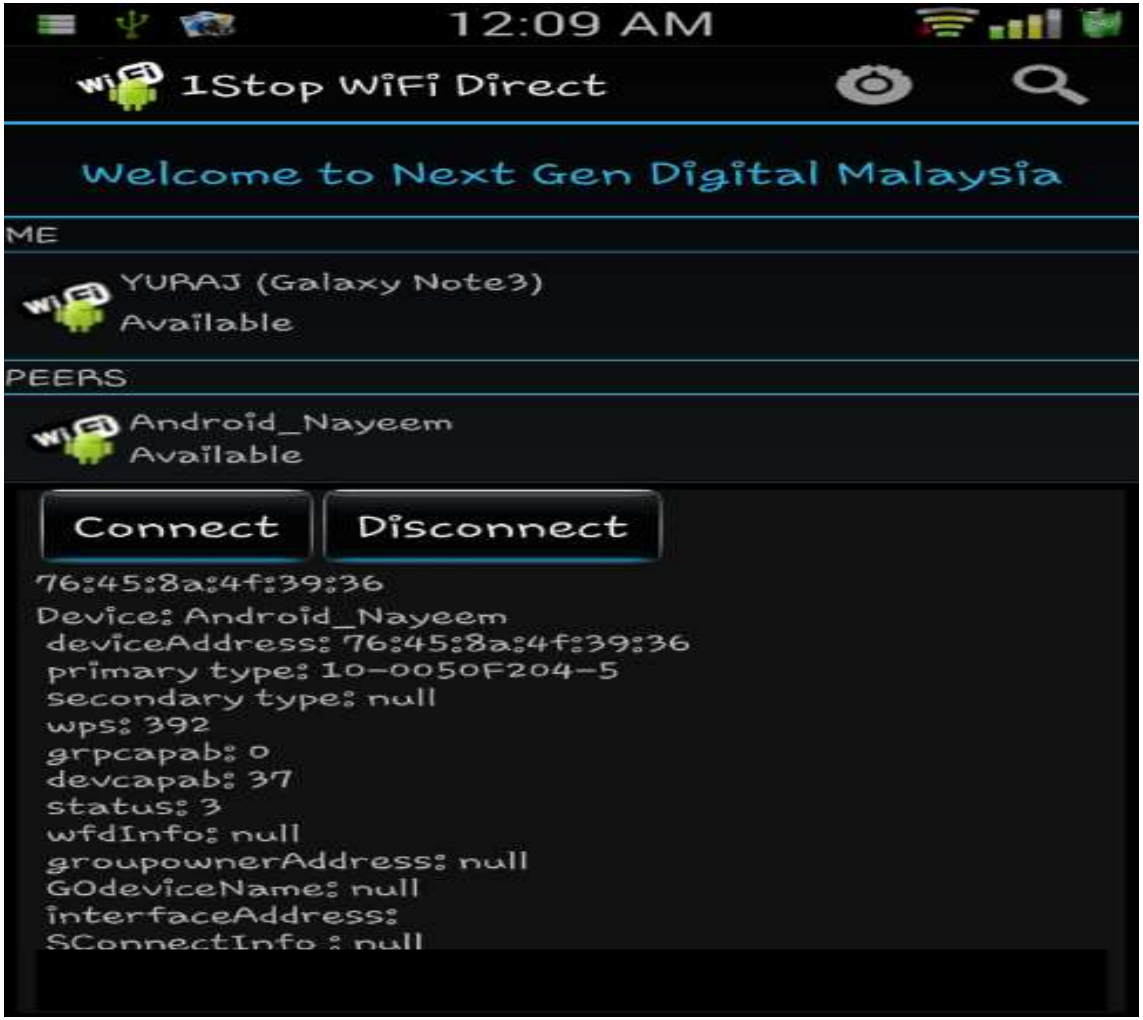
Test-Bed Performances (2/6)

4 networks found. Embedded is the least busy with Frequency: 2437. PU status: Present. Channel available for SU: 10.

Results

Main GUI with Channel Detection Outcomes

Test-Bed Performances (3/6)



Main GUI with Devices Detection Outcomes

Results

Test-Bed Performances (4/6)

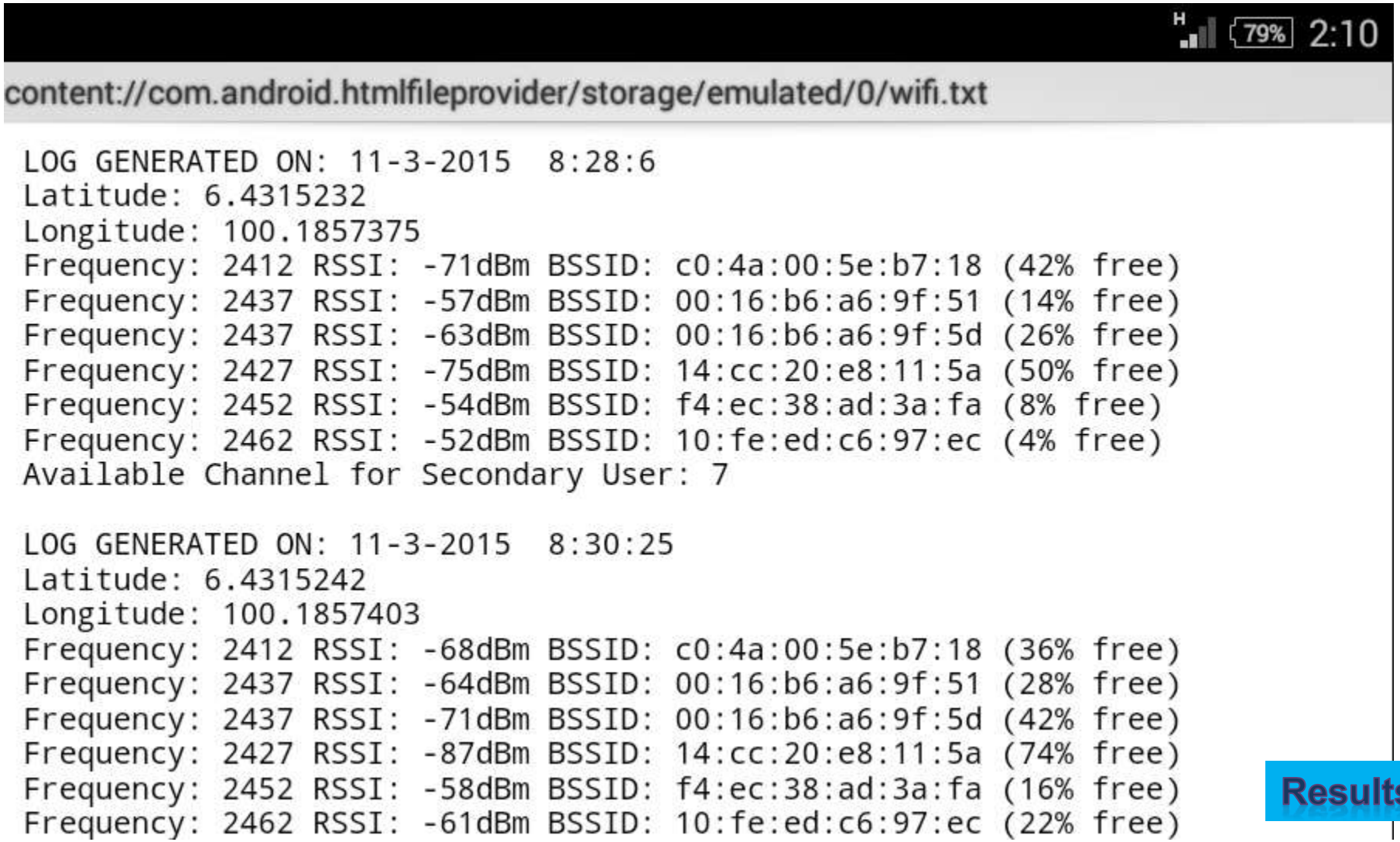


Fig: Channel detection log file

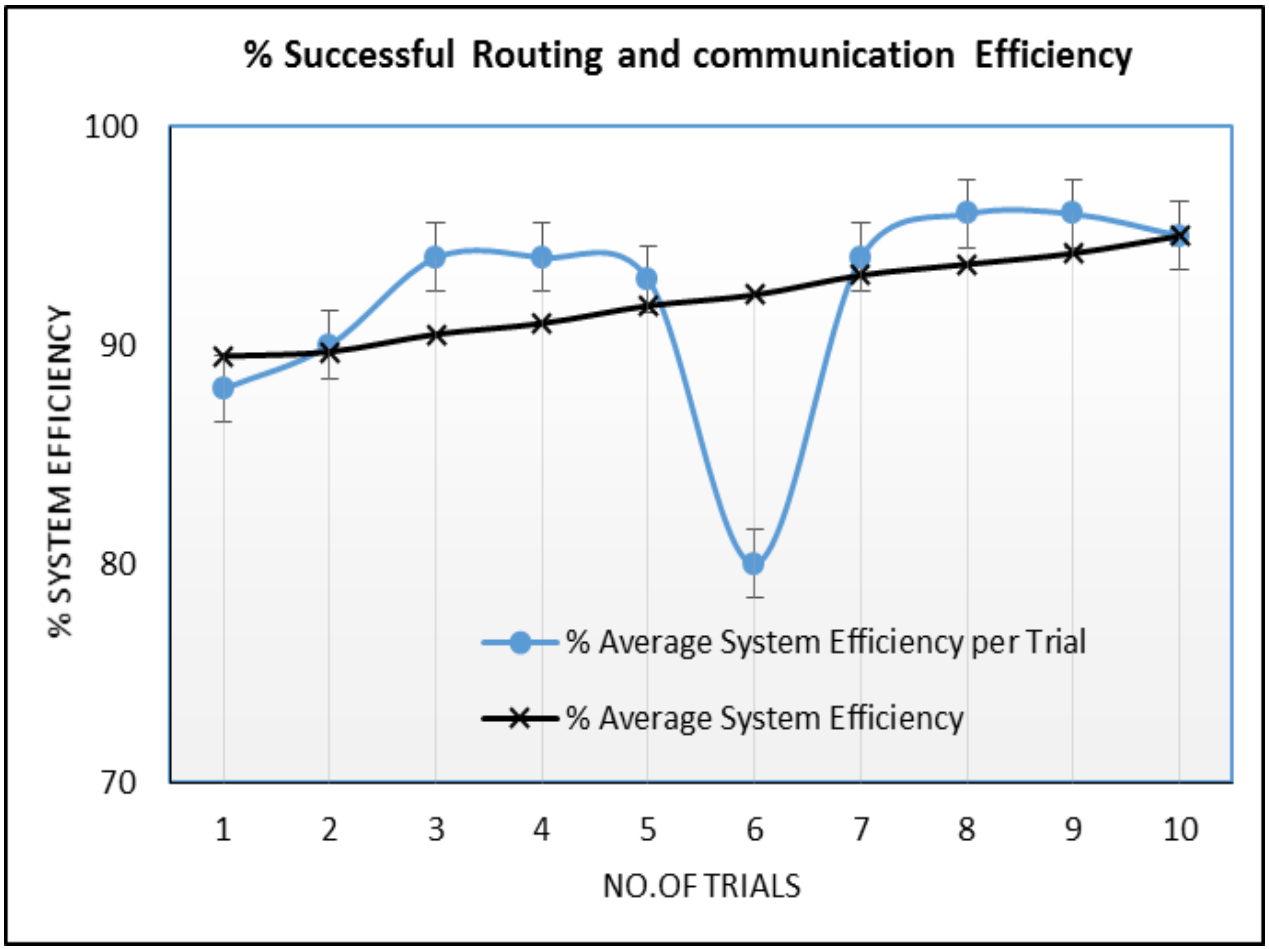
Results

Test-Bed Performances (5/6)

Results

Log file Synchronization to Cloud

Test-Bed Performances (6/6)



Results

Avg System Efficiency 92%

Conclusions

- The system can list down all WiFi devices and Bluetooth devices that available in the range of the android smart Phone.

- WiFi Direct Discovery application created an ad - hoc network to transfer files wirelessly by using WiFi in android application and run on multi device.
- Android SmartPhone based Cognitive Radio detection scheme works smoothly within the individual range of operation for all kinds of WLAN chipset and most of the cases the **Successful Detection Rate is 100%.The average System efficiency is about 92%**

- A Cloud based detection log processing system is introduced for further data processing and security purpose.


THANK YOU