

CHAPTER VI

CONCLUSION

6.1 INTRODUCTION

This chapter highlights the conclusion of this research. It discusses the implemented system and its results, the contribution and limitations of the study. Lastly it highlights the recommendations and future work.

The research result has answered the research questions in section 1.3. The multilayer security system that the thesis presented provides a solution for these questions by:

1. Keeping the key safe from being sniffed (Confidentiality).
2. So the key cannot be compromised (Integrity).
3. And keeps secure KMS available when KMS service is needed (Availability) by solving the coverage issue using commercial FM stations.
4. Finally saving WSN nodes resources (CPU, storage and power) by sending the key directly to the WSN base station without needing pre-implemented keys, so there is no need for key algorithms and calculations to generate a common key between WSN nodes as the key will be directly sent by WSN base station to the nodes.

6.2 RESEARCH CONTRIBUTION

This is the first research that provides such a solution using the combination of SDR and FM to solve the symmetric key exchange issue in WSN coverage and save WSN resources. This thesis provides a proof of concept solution for WSN issues especially in remote areas where no wire networks are available, and using expensive wireless solutions (e.g. satellite connection) costs a lot of money and it is resilient to bad weather.

The system's cost is another contribution, table 6.1 shows the total cost of the system items.

The system total cost is about 530 USD (~2160 Malaysian Ringgit)

Table 6.1: Total cost of the project, Price in USD.

Item	Quantity	Cost
GNURadio	2	Free
HackRF One	1	200
RTL-SDR RTL2832U Dongle	2	40
Raspberry Pi 2 Model B	1	60
Refurnished HP EliteBook 2540p	1	230
Total		530

6.3 LIMITATIONS

There are two main limitations: the first one is to modulate on the 80 KHz because of clocking recovery issue. The second limitation is USB low speed, as it's better to install directly to a detected hard drive.

6.4 FUTURE WORK

Future work for this thesis would be using Universal Software Radio Peripheral (USRP) instead of HackRF one and RTL-SDR to send the key along with audio and RDS, and to test it with long distance range by connecting it to a bigger antenna to evaluate the system in an open area.