

# Wireless Sensor Networks

## Gang of Three

Report  
Aarhus University, Science and Technology  
Lectors: Qi Zhang, Michael Alrøe, John Rohde

May 11, 2018

<b>Name</b>	<b>Study number</b>	<b>Signature</b>
David Jensen	11229	
Henrik Bagger Jensen	201304157	
Christian M. Lillelund	201408354	
Troels Thomsen	09641	

# Contents

<b>Contents</b>	<b>ii</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Scenario .....	1
1.1.1 Source: Node A.....	1
1.1.2 Sink and Source: North and South Station .....	1
1.1.3 Sink: Base Station .....	1
1.1.4 Test Scenario .....	1
<b>2 Theory</b>	<b>2</b>
<b>3 Implementaiton</b>	<b>3</b>
3.1 Basestation.....	3
3.2 Relay .....	3
3.3 Runner .....	3
3.4 Energy Lab.....	3
<b>4 Test and Performance</b>	<b>4</b>
4.1 Setup .....	4
<b>5 Results</b>	<b>5</b>
<b>6 Discussion</b>	<b>6</b>
<b>7 Conclusion</b>	<b>7</b>
<b>8 Perspective</b>	<b>8</b>

# Chapter 1: Introduction

it must be able to reach pole station resulting in the highest cost function of the system.

## 1.1 Scenario

### 1.1.1 Source: Node A

Source node A will be transmitting at a periodic transmission rate. Different levels of power consumption will be determined by the chosen protocol, but, in any case, the power consumption will be considered, over a period of one second, constant. The less power consumption of node A will give longer individual lifetime and runtime for the runner, but low signal strength of node A might not give a lowest possible system power consumption. Depending on the needed quality of the received package, e.g. -3db, a cut of distance will be calculated and measured. Distance measuring will be limited by interference providing a need for a scalable transfer function estimate and an average over multiple measurements. Life time of node A will be considered when half of the battery capacity is used.

### 1.1.2 Sink and Source: North and South Station

Idle time, receiving and transmitting power consumption will be calculated and measure. When out of range the “pole” stations will go to an idle state to save power. When in transmitting mode different measurements will be conducted depending on the chosen protocol. E.g. firm or no handshakes between pole station and base station will be measured leading to different possible distances between jumps.

### 1.1.3 Sink: Base Station

The required detail of information needed to give a good user estimate will raise the question of acceptable package loss. Signal strength, package frequency, package loss vs reliability from both pole stations and source will determine the power consumption of the base station and the system. The base station will never be in idle state and

### 1.1.4 Test Scenario

On the datasheet of the TelosB, the current draw when on receive mode is stated to be  $23mA$ . However since the transmit power is not given in the datasheet, testing is needed to gain further knowledge of how much power is used when sending and receiving data between nodes. The test data will be used to conduct different scenarios of the main scenario in which the end result will be the lifetime of the WSN and the minimum power consumption of the WSN. The conclusion will then be used together with the conclusion of the signal strength testing, to conduct the best scenarios for when to hop or not to hop.

## Chapter 2: Theory

# Chapter 3: Implementaition

3.1 Basestation

3.2 Relay

3.3 Runner

3.4 Energy Lab

# Chapter 4: Test and Performance

## 4.1 Setup

## Chapter 5: Results

## Chapter 6: Discussion



## Chapter 7: Conclusion

## Chapter 8: Perspective