Visitor Tracking System using Mobile Ad hoc Network

> BY Sudha B. Patel (11MCEC52)



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING AHMEDABAD 382481 May 2014

# Visitor Tracking System using Mobile Ad hoc Network

**Major Project** 

Submitted in partial fulfillment of the requirements

For the degree of

#### Master of Technology in Computer Science and Engineering

By

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Guide

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING AHMEDABAD 382481 May 2014

## Undertaking for originality of the work

I, Sudha B. Patel, Reg.No. 11MCEC52, give undertaking that the Major Project entitled "Visitor Tracking System using Mobile Ad hoc Network" submitted by me, towards the partial fulfillment of the requirements for the degree of Master of Technology in Computer Science and Engineering of Nirma University, Ahmedabad, is the original work carried out by me and I give assurance that no attempt of plagiarism has been made. I understand that in the event of any similarity found subsequently with any published work or any dissertation work elsewhere; it will result in severe disciplinary action.

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# Certificate

This is to certify that the Major Project entitled "Visitor Tracking System using Mobile Ad hoc Network" submitted by Sudha B. Patel (11MCEC52), towards the partial fulfillment of the requirements for the degree of Master of Technology in Computer Science and Engineering of Nirma University, Ahmedabad is the record of work carried out by her under my supervision and guidance. In my opinion, the submitted work has reached a level required for being accepted for examination. The results embodied in this major project, to the best of my knowledge, haven't been submitted to any other university or institution for award of any degree or diploma.

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## Abstract

A Visitor Tracking system using an Ad hoc network and Infrastructure in which a set of domain nodes shares the responsibility for producing and storing monitoring information about a set of visitors. This information is stored gradually when the set of visitor nodes grows and shrinks. Such a system can be used to store monitoring information of visitors and maintain the traffic through monitoring system by deciding the threshold value for number of visitors. The feature of system include: Counting the number of visitors through monitors located at every entry/exit points, Track the visitors at a particular place, and the approx location of individual visitor at the time of natural disaster and storing this information in a persistent, efficient and searchable manner. The database must be such that the administrator can search all the information and details of the visitor at any given point of time. The records in the database must be persistent such that entries are not affected by the network disruption or lost due to the same. The algorithm for maintaining the database should run with minimal message and computational overhead.

#### Acknowledgements

With immense pleasure, I would like to present this report on the dissertation work related to "Visitor Tracking System Using Mobile Ad hoc Network".

I would first of all like to offer thanks to **Prof. Sharada Valiveti**, Guide & Associate Prof., CS&E Department,Programme Co-ordinator M.Tech. INS, Institute of Technology, Nirma University, Ahmedabad. whose keen interest and excellent knowledge base helped me to finalize the topic of the dissertation work. Her constant support and interest in the subject equipped me with a great understanding of different aspects of the required architecture for the project work. She has been a great motivating factor in outlining the flow of my work.

I like to give my special thanks to **Prof. Vijay Ukani**, Programme Co-ordinator M.Tech. CSE Department, Institute of Technology, Nirma University, Ahmedabad for his continual kind words of encouragement and motivation throughout the Major Project.

My sincere thanks and gratitude to **Dr. Sanjay Garg**, Professor and Head, Computer Engineering Department, Institute of Technology, Nirma University, Ahmedabad for his continual kind words of encouragement and motivation throughout the Dissertation work.

I am also thankful to **Dr.K. Kotecha**, Director, Institute of Technology for his kind support in all respect during my study.

I would like to thank The Almighty, my family, especially my husband, for supporting and encouraging me in all possible ways. I would also like to thank all my friends who have directly or indirectly helped in making this dissertation work successful.

#### - Sudha B. Patel (11MCEC52)

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# Abbreviation Notation

MANET	
IU	Infrastructure Unit
RFID	Radio Frequency Identification
IC	Integrated circuit
EPC	Electronic Product Code

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# Chapter 1

# Motivation

## 1.1 Motivation

Disasters whether natural or man-made can strike at any time. The importance of adequate emergency management is acknowledged by most countries in the world. Disasters have always happened and they will continue to. The cause of such emergencies could be natural disasters like flooding, earthquakes, volcanoes etc. Man-made disasters like terrorist attacks, industrial disasters, radiation contamination, etc. have increased dramatically in recent times. The impact can be reduced through a good understanding of preventive actions. So at tourist places for control the total damage of life and belongings I have decided the threshold value for the tourists. So at the time of disaster at least we have an idea regarding to the number of visitors inside the place. By the pre disaster setup we can identify the location of individual visitor in persistent manner. It is very crucial to find out the human being after the disaster was happened at the tourist places, so through the system at least I can identify the approximate location of visitor in the place.

# 1.2 Thesis Outline

In Chapter 2, literature survey of related work and various location tracking systems are presented. In Chapter 3, problem definition is given.

# Chapter 2

# Literature Survey

# 2.1 Introduction

A mobile ad hoc network is a self-configuring infrastructure less networks of mobile devices. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently[1]. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet.

## 2.1.1 MANET Application Areas

Following are the different application areas where MANET can be used [2].

Application	Possible scenarios/services		
Tactical networks	Military communication and operations Auto-		
	mated battlefields		
Emergency services	Search and rescue operations, Disaster recov-		
	ery,Replacement of fixed infrastructure in case		
	of environmental disasters, Policing and fire fight-		
	ing,Supporting doctors and nurses in hospitals		
Commercial and civilian environ-	E-commerce: electronic payments anytime and		
ments	anywhere		
	Business: dynamic database access, mobile offices		
	Vehicular services: road or accident guidance,		
	transmission of road and weather conditions,taxi		
	cab network, inter-vehicle networks		
	Sports stadiums, trade fairs, shopping malls		
	Networks of visitors at airports		
Home and enterprise networking	Home/office wireless networking		
	Conferences, meeting rooms		
	Personal area networks (PAN), Personal networks		
	(PN)		
	Networks at construction sites		
Education	Universities and campus settings		
	Virtual classrooms		
	Ad hoc communications during meetings or lec-		
	tures		
Entertainment	Multi-user games		
	Wireless P2P networking		
	Outdoor Internet access		
	Robotic pets		
	Theme parks		
Context aware services	Follow-on services: call-forwarding, mobile		
	workspace		
	Information services: location specific services,		
	time dependent services		
	Infotainment:touristic information		

## Table I: MANET Application area

#### CHAPTER 2. LITERATURE SURVEY

#### 2.1.2 Characteristics of MANET

- Autonomous and infrastructure less
- Multi-hop routing
- Dynamic network topology
- Device heterogeneity
- Energy constrained operation
- Bandwidth constrained variable capacity links
- Limited physical security
- Self-creation, self-organization and self administration

#### 2.1.3 Introduction to Hybrid network

A hybrid network is a local area network having a mix of both wired and wireless devices[3][4] [5].Common hybrid network components include routers, repeaters, hubs, bridges, switches, modems and cables.

# 2.2 Broadcasting mechanisms and suggested approaches

Broadcast mechanisms for data dissemination are as follows [6]:

#### Simple Flooding

- Probability based approach
- Counter based scheme

#### Area Based Methods

#### CHAPTER 2. LITERATURE SURVEY

- Distance based approach
- Location based approach

#### Neighbour Knowledge Methods

- Self Pruning
- Scalable Broadcasting Approach
- Ad Hoc Broadcasting Approach

# 2.3 Various location tracking approaches

Comparison between various locations tracking system as given in following table.

Location Tracking Ap- proach	Mechanism	Pros.	Cons.
Patient movement tracking system[7]	Track the loca- tion of patients in an indoor en- vironment and monitor their physical status i.e. walking, running.	<ul> <li>We can track an individual patient in the organized network</li> <li>Also track the motion or the movement of the patient like walking, running etc</li> </ul>	<ul> <li>Localization network which required mul- tiple power consuming sensors</li> <li>The use of a rel- atively large mo- bile node</li> <li>The power and running lifetime of the mobile node</li> </ul>
Visitor tracking in theme park[8]	In this system, the model of the movement of vis- itors in a theme park	It decreases the number of waypoints in a map and al- lowing the simulation of a large number of visitors	It uses trace based model so it uses GPS for tracing. It is dif- ficult to collect real data and the amount of publicly available data is limited.
Visitor face tracking system[9]	This system will record the visi- tor face by cam- era	Track the face of the visitor at various places	Visitor needs to appear in front of the camera for at least 10 seconds so it is time consuming process
RFID Based Equipment Moni- toring System[10]	Tracking of laboratory equipments movement to ensure its avail- ability	It aims at helping the lab administrator in monitoring the equipment from lost or misplaced	<ul> <li>Reader collision when the sig- nals from two or more readers overlap</li> <li>The tag is un- able to respond to simultaneous queries</li> </ul>

	1 /	•	1	1
Table II: Comparison	hetween	various	locations	tracking system
Table II. Comparison	DCUWCCII	various	1000010115	or acting by buch

Location Tracking Ap- proach	Mechanism	Pros.	Cons.
Online Student Monitor- ing System Using Pas- sive RFID (GUI based)[7]	Online student monitoring sys- tem to ensure the availability of the students in the campus	<ul> <li>Improving the current tradition way of monitoring the students</li> <li>Used GUI interface so it is more efficient way to review the attendance</li> <li>Easy to handle and convenient for college/university level</li> <li>This system gives time saving, easy to control and reliability</li> </ul>	<ul> <li>Reader collision when the sig- nals from two or more readers overlap</li> <li>The tag is un- able to respond to simultaneous queries</li> </ul>
Boarding school students monitoring systems using RFID[11]	Monitoring Boarding school student move- ment using by using RFID technology	It can ease the workload of school management and save time	<ul> <li>Cannot control the punctuation of student</li> <li>Reader collision when the sig- nals from two or more readers overlap</li> <li>The tag is un- able to respond to simultaneous queries</li> </ul>

Table III: Comparison between various	locations tracking system
---------------------------------------	---------------------------

#### 2.4 RFID

#### 2.4.1 Introduction of RFID

RFID stands for radio frequency identification. It is an automatic identification technology whereby digital data encoded in an RFID tag or "smart label" is captured by a reader using radio waves. Put simply, RFID is similar to bar code technology but uses radio waves to capture data from tags, rather than optically scanning the bar codes on a label. RFID does not require the tag or label to be seen to read its stored datathat's one of the key characteristics of an RFID system [12][13].

Information is sent to and read from RFID tags by a reader using radio waves[14][15][16]. In passive systems, which are the most common, an RFID reader transmits an energy field that "wakes up" the tag and provides the power for the tag to respond to the reader. In active systems, a battery in the tag is used to boost the effective operating range of the tag and to support additional features over passive tags, such as temperature sensing. Data collected from tags is then passed through communication interfaces (cable or wireless) to host computer systems in the same manner that data scanned from bar code labels is captured and passed to computer systems for interpretation, storage, and action.

Passive smart label[12][16] [13] RFID systems offer unique capabilities as an automatic data capture system in that they: Provide real-time, wireless transmission of data without human intervention; Do not require line-of-site scanners for operation; Allow stored data to be altered during sorting or allow workflow process information to be captured with the data; and Work effectively even in harsh environments with excessive dirt, dust, moisture, and extreme temperatures.

#### 2.4.2 RFID tag

RFID tags consist of an integrated circuit attached to an antennatypically a small coil of wiresplus some protective packaging (like a plastic card) as determined by the application requirements. Tags also sometimes are called "transponders," and sometimes they are called "inlays," although technically an inlay is a tag mounted on a substrate that is ready to be converted into a smart label. RFID tags can come in many forms and sizes[17]. Some can be as small as a grain of rice. Data is stored in the IC and transmitted through the antenna to a reader. RFID tags are either "passive" (no battery) or "active" (self-powered by a battery). Tags also can be read-only (stored data can be read but not changed), read/write (stored data can be altered or rewritten), or a combination, in which some data is permanently stored while other memory is left accessible for later encoding and updates[18].

#### 2.4.3 **RFID-Frequencies**

RFID tags are also available in various frequencies[19]. These include low frequency (LF), high frequency (HF), ultra-high frequency (UHF), and ultra-wide band (UWB). Typically, higher frequencies offer more bandwidth and data exchange, and a higher communication range. The radio frequency table is as given below.

Table IV: RFID-Frequencies table

Type of	EPC(	Memory	Radio	Word	Power	Reading
$\operatorname{tag}$	Electronic	$\mathbf{type}$	frequencies	Length	source	Dis-
	Product		used	Bits		tance
	code)class					Meters
RFID pas-	0	ROM	138KHz	64	Reader	0.04-3
sive			13.85MHz		EMF	
RFID Ac-	4	ROM	13.85MHz	64	Battery	3-10
tive						
RFID pas-	1	EEPROM	138KHz	more	Reader	0.04-3
sive pro-			13.85MHz	than	EMF	
grammable			96	128		
DEID	2,3,4	EEPROM	138KHz	more	Battery	3-10
RFID			13.85MHz	than		
active pro-				128		
grammable	0.9.4	CMOC	19.051/11		Ditte	2.10
Data tag	2,3,4	CMOS	13.85MHz	more	Battery	3-10
		RAM,	985 MHz(UHF)	than		
		Flash		128		
		RAM				
RF loca-	-	EEPROM	303Mhz	64	Battery	1-100
tion		or CMOS	$2.4/5.8~{ m GHz}$			
		RAM	UWB			

## 2.4.4 Difference between Passive tag and Active tag

The differences between Passive and active tags are as given below:

Passive tag	Active tag		
Operate without a battery	Powered by an internal battery		
Less expensive	More expensive		
Unlimited life (because of no battery)	Finite lifetime(because of battery)		
Less weight(because of no battery)	Greater weight(because of battery)		
Lesser range(up to 3-5m, usually less)	Greater range(up to 100m)		
Lesser range(up to 3-5m, usually less)	Greater range(up to 100m)		
Subject to noise	Better noise immunity		
Derive power from the electromagnetic	Internal power to transmit signal to the		
field generated by the reader	reader		
Require more powerful readers	Can be effective with less powerful		
	readers		
Lower data transmission rates	Higher data transmission rates		
Less tags can be read simultaneously	More tags can be read simultaneously		
Greater orientation sensitivity	Less orientation sensitivity		

Table V: Difference between Passive tag and Active tag:

# Chapter 3

# **Problem Introduction**

# 3.1 Problem Definition

To develop a Visitor Tracking System in Ad hoc infrastructure/infrastructureless network.

## 3.2 Assumptions

- All visitors have RFID tag
- Movement of visitors is independent with respect to each other.
- All infrastructures are directly or indirectly connected to the monitor
- Monitor is having Internet facility.

## 3.3 Objectives

- To form a network for defining the number of visitors inside any tourist places
- To develop a location tracking system to maintain the track of every individuals

## 3.4 Intended outcome

- Designed and evaluation of proposed mechanism
- A system will be developed which provides details of visitors at a specific location. At the time of disaster we are able to know the number of visitors at tourist place and approx location of individual visitor at the time of natural disaster and storing this information in a persistent, efficient and searchable manner

## 3.5 Proposed approach

Figure 3.1 shows the model of Visitor Tracking System. There are three entry/exit points and 6 Infrastructure units. All the visitors have RFID Tags and broadcasts its own information. When the visitor is in the vicinity of an infrastructure, the information broadcasted by visitor will be stored into the infrastructure's own file and sends that information to the Monitor.

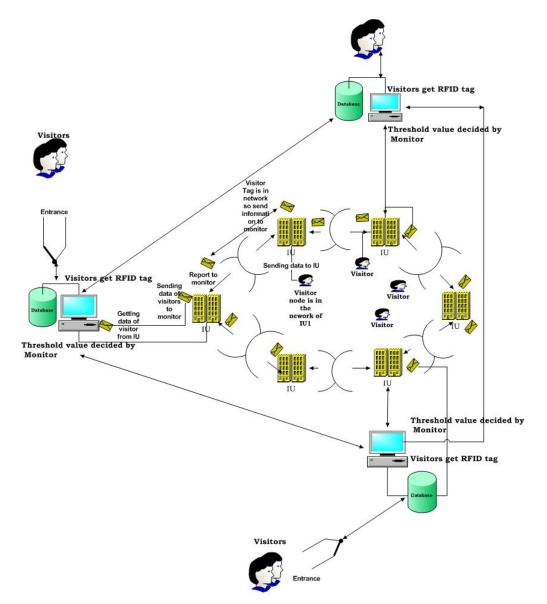


Figure 3.1: Life Saving application model

## 3.6 Modules of the system

#### 3.6.1 Monitoring module by monitor

- Define the threshold value for number of visitors will be allowed at tourist place
- Issue the tag for new user with the consideration of threshold value
- Gets the information from Infrastructure unit regarding visitor
- Monitor send (Broadcast) query or request to the Infrastructure for individual visitor at a particular location, if visitor is in vicinity of infrastructure then infrastructure will reply to the monitor for tracking the visitors
- Once received information from infrastructure units, update user information in the database
- At the time of disaster give approx location of visitors
- Monitor upload all the information on the internet.

#### 3.6.2 Infrastructure unit

- Once received the message from visitors through tag, the location and visitor tag information is sending to the Monitor from infrastructure unit
- Once received search request from monitor, send appropriate information of visitor to the monitor

#### 3.6.3 Visitors

• Periodically broadcast its own information when he or she is in the vicinity of the infrastructure

## 3.7 Algorithm for Visitor tracking system

[Monitor Module]

Step1: [Initialize Process for pre-setup]

```
No_users=0;
Threshold_value=N;
No_Infrastructure=5
No_monitor= 1
L_id[No_Infrastructure index]
L_mid[Monitor index]
```

Step2: [Registration of Visitor]

"Check for threshold":

if No\_users <= Threshold\_value then

Insert the details in to the database:

<Visitor\_id(Serial\_ No),Visitor\_name,Date,Time\_arrival,

Leaving\_time, tag\_id, Address,Phone\_no>

Issue the tag to visitor manually with <TAG (visitor\_id, tag\_id)> else

go to Step2

Step3: [Insert information to the database of Monitor]

"Compare the visitor details detected and provided by all L\_id:" if(Visitor\_id,tag\_id already exist for particular L\_id)

```
Update the information of File1 with <L_id, time>
  }
else
 Make new entry into File2 with all tracking detail for all L_id with
  <tag_id, visitor_id, L_id, time>
Step4: [Search for Request]
-Request()
if (Request for V_id ,L_id, time from L_mid)
   {
   <request to all infrastructure for L_id of V_id for specific time>
   }
-Reply()
if (requested V_id is found from L_id)
   ſ
    print V_id and Tag_id with L_id
store V_id and Tag_id with L_id in search_file
   }
Step5: [Monitor send information to internet]
       Monitor is having internet facility
[Visitor Module]
Step1:[Get tag(tag_id) form monitor]
      <get registered and get tag from monitor>
Step2:[Start Moving]
      Broadcast the information
```

```
<BROADCAST(tag_id, visitor_id )>
```

[Infrastructure Module]

## 3.8 Flowchart of the system

#### 3.8.1 Flowchart for Infrastructure Unit

Figure 3.2 shows the flow chart of an Infrastructure Unit. All the infrastructure unit stores the information of the visitors into their own file and sends the information of all visitors, who are in the vicinity of it's own to the monitor.

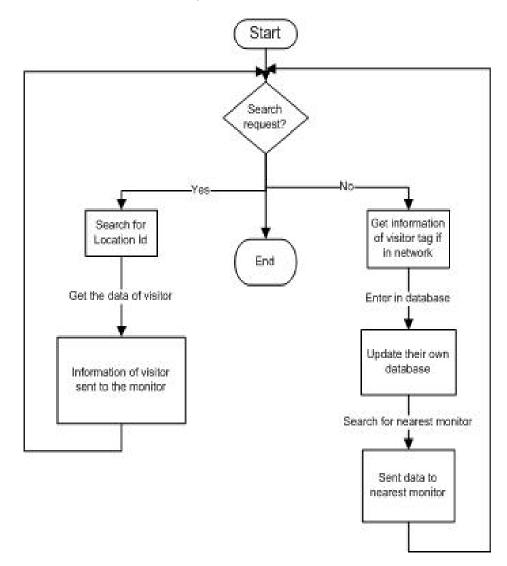


Figure 3.2: Flow chart of Infrastructure Unit

#### 3.8.2 Flowchart for Monitor

Figure 3.3 shows the flow chart of the monitor unit. Monitor stores the information of all the visitors and can search the individual visitors' details.

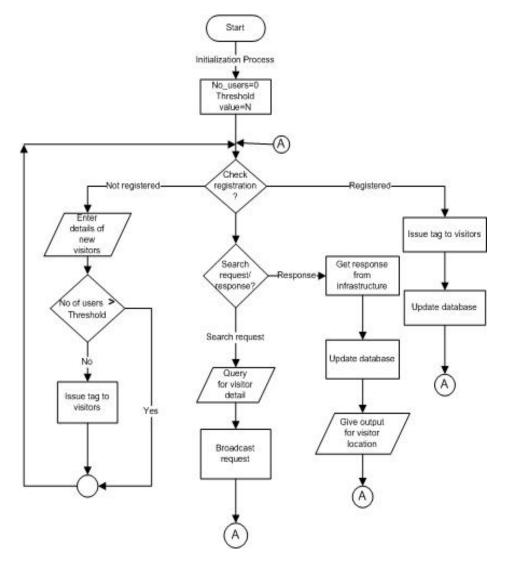


Figure 3.3: Flow chart of Monitoring Unit

#### 3.8.3 Flowchart for Visitor

Figure 3.4 shows the flow chart of the visitor unit. All the visitor have RFID Tag issued by monitor. RFID Tag continuously broadcasts the information of its own.

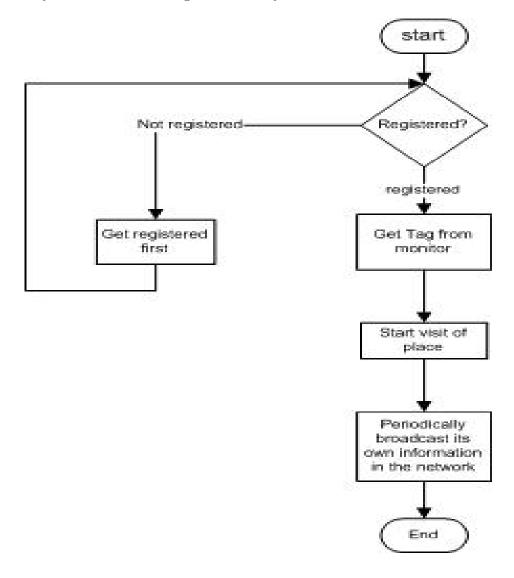


Figure 3.4: Flow chart of Visitor

# Chapter 4

# **Network Simulators**

## 4.1 Network Simulators

#### 4.1.1 NS-2.34

It is a discrete event simulator[20] [21] [22] developed by the VINT project research group at the University of California at Berkeley. The simulator was extended by the Monarch research group at Carnegie Mellon University to include: (a) node mobility, (b) a realistic physical layer with a radio propagation model, (c) radio network interfaces, and (d) the IEEE 802.11 Medium Access Control (MAC) protocol using the distributed coordination function (DCF).

#### Steps to install NS-2.34 in Fedora

- a. Download NS2.34.
- b. Copy the file to /home/yourhome (in my case it is, /home/sudha/).
- c. Open terminal.
- d. Untar it using tar zxvf ns-allione-2.34.tar.gz.
- e. cd ns-allione-2.34/
- f. ./install

#### CHAPTER 4. NETWORK SIMULATORS

g. Once installation over, set the PATH.

#### 4.1.2 Create a new agent in NS2.34

A new agent created in ns2.34.[21] Follow the following steps to create a new agent in ns2: **Steps to create a new agent in ns2.34** 

- a. Create a myagent.cc and myagent.h files.
- b. Put both files in NS2.34 folder.
- c. Add MyPing object filename to the end of OBJECT CC list in Makefile.
- d. Initialize packet size in ns-default.tcl.
- e. Define the new packet type in packet.h.
- f. Go NS2.34 folder.
- g. Perform first make clean then make and make install.
- h. Write MyAgent.tcl file to test newly created agent.

# Chapter 5

# Implementation

### 5.1 Implementation of VIS, INF and MON Agents

#### 5.1.1 VIS Agent

In this topology two base stations are fixed and three visitors nodes are moving node. Three Visitor nodes are moving across 250\*250 meters. The speed of moving nodes is approximately 15m/Sec.

sudha@localhost:/home/sudha/ns-allinone-2.34/ns-2.34/tracking		×
File Edit View Search Terminal Help		
_id=2 ,Send: VIS Visitor broadcast info> Visitor ID: 4 , RFID = RFID5, Message = Hi. id=1 ,Send: VIS	.,Node	own
Visitor broadcast info> Visitor ID: 3 , RFID = RFID4, Message = Hi. id=2 ,Send: VIS	.,Node	own
Visitor broadcast info> Visitor ID: 3 , RFID = RFID4, Message = Hi. id=1 ,Send: VIS	.,Node	own
Visitor broadcast info> Visitor ID: 3 , RFID = RFID4, Message = Hi. id=2 .Send: VIS	.,Node	own
Visitor broadcast info> Visitor ID: 3 , RFID = RFID4, Message = Hi. id=1 .Send: VIS	.,Node	own
Visitor broadcast info> Visitor ID: 4 , RFID = RFID5, Message = Hi. id=2 ,Send: VIS	.,Node	own
Visitor broadcast info> Visitor ID: 4 , RFID = RFID5, Message = Hi. id=1 .Send: VIS	.,Node	own
Visitor broadcast info> Visitor ID: 3 , RFID = RFID4, Message = Hi. id=2 .Send: VIS	.,Node	own
Visitor broadcast info> Visitor ID: 3 , RFID = RFID4, Message = Hi. id=1 ,Send: VIS	.,Node	own
Visitor broadcast info> Visitor ID: 4 , RFID = RFID5, Message = Hi. id=2 .Send: VIS	.,Node	own
NS EXITING Visitor broadcast info> Visitor ID: 4 , RFID = RFID5, Message = Hi. _id=1 ,Send: VIS[root@localhost tracking]#	.,Node	I <sub>own</sub>

Figure 5.1: VIS Agent Broadcasting information

In this topology total five base stations are fixed and 25 visitors nodes are moving node. The speed of moving nodes are approximately 15m/sec.

sudha@localhost:/home/sudha/ns-allinone-2.34/ns-2.34/tracking
File Edit View Search Terminal Help
n _id=1 ,Send: VIS Visitor broadcast info> Visitor ID: 15 , RFID = RFID15, Message = Hi,Node ow n id=5 ,Send: VIS
Visitor broadcast info> Visitor ID: 15 , RFID = RFID15, Message = Hi,Node ow n id=2 ,Send: VIS
Visitor broadcast info> Visitor ID: 15 , RFID = RFID15, Message = Hi,Node ow n id=4 ,Send: VIS
Visitor broadcast info> Visitor ID: 19 , RFID = RFID19, Message = Hi,Node ow n id=5 ,Send: VIS
Visitor broadcast info> Visitor ID: 19 , RFID = RFID19, Message = Hi,Node ow n id=1 ,Send: VIS
Visitor broadcast info> Visitor ID: 19 , RFID = RFID19, Message = Hi,Node ow n id=4 ,Send: VIS
Visitor broadcast info> Visitor ID: 24 , RFID = RFID24, Message = Hi,Node ow n id=1 ,Send: VIS
Visitor broadcast info> Visitor ID: 24 , RFID = RFID24, Message = Hi,Node ow n id=5 ,Send: VIS
Visitor broadcast info> Visitor ID: 8 , RFID = RFID8, Message = Hi,Node own id=1 ,Send: VIS
Visitor broadcast info> Visitor ID: 8 , RFID = RFID8, Message = Hi,Node own id=5 ,Send: VIS
Visitor broadcast info> Visitor ID: 8 , RFID = RFID8, Message = Hi,Node own id=4 ,Send: VIS

Figure 5.2: VIS Agent Broadcasting information(1)

#### 5.1.2 INF Module

In this topology, total 100 moving nodes as visitor nodes and 5 nodes as fixed nodes are established in 5000\*5000 meter area. The speed of moving node is 15 m/sec to 20 m/sec. All the infrastructure units have their own database in which all the details of visitors is maintained. All Infrastructure have two files to maintain the record. One "Viscur.txt" in which only current location of the visitor is maintained and the second file "Vishis.txt", in which all the tracking details are maintained. The search operation is performed accordingly.

	viscur.txt (/home/sudha/ns-allinone-2.34/ns-2.34/tracking/1) - gedit
File Edit View Search Tools Documents Help	
🕒 🕒 Open 🐱 🏭 Save   🗃   🦐 Undo 🎻   🥁	
isrpy.txt × ivishis.txt × iviscur.txt ×	
18 RFID18 1 Fri May 2 15:00:31 2014	
26 RFID26 1 Thu May 1 08:31:09 2014	
34 RFID34 1 Thu May 1 08:31:10 2014	
16 RFID16 1 Fri May 2 15:05:09 2014	
22 RFID22 1 Fri May 2 15:07:01 2014	
17 RFID17 1 Fri May 2 15:02:22 2014	
23 RFID23 1 Fri May 2 15:12:19 2014	
31 RFID31 1 Thu May 1 08:31:30 2014	
33 RFID33 1 Thu May 1 08:31:31 2014	
37 RFID37 1 Thu May 1 08:31:13 2014	
38 RFID38 1 Thu May 1 08:31:30 2014	
24 RFID24 1 Fri May 2 15:26:29 2014	
28 RFID28 1 Thu May 1 08:32:50 2014	
46 RFID46 1 Thu May 1 08:32:44 2014	
54 RFID54 1 Thu May 1 08:32:48 2014	
56 RFID56 1 Thu May 1 08:32:52 2014	
42 RFID42 1 Thu May 1 08:32:57 2014	
50 RFID50 1 Thu May 1 08:32:58 2014 64 RFID64 1 Thu May 1 08:32:54 2014	
60 RFID60 1 Thu May 1 08:33:00 2014	
78 RFID78 1 Thu May 1 08:32:59 2014	

Figure 5.3: INF Agent store current information

As shown in Figure 5.4, infrastructure unit '1' has viscur.txt file to store the current location of the visitor who are in the vicinity of its own at different time.

viscur.txt (/home/sudha/ns-allinone-2.34/ns-2.34/rscking/1) - gedit
File Edit View Search Tools Documents Help
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$\int \odot$ visrpy.txt $\times / \odot$ vishis.txt $\times / \odot$ viscur.txt $\times$
15 RFID15 1 Fri May 2 15:04:41 2014
105 RFID105 1 Thu May 1 08:34:20 2014
69 RFID69 1 Thu May 1 08:34:17 2014
112 RFID112 1 Thu May 1 08:34:21 2014
27 RFID27 1 Thu May 1 08:34:06 2014
32 RFI032 1 Thu May 1 08:32:55 2014
19 RFID19 1 Fri May 2 15:00:08 2014
21 RFID21 1 Fri May 2 15:00:21 2014
36 RFID36 1 Thu May 1 08:34:10 2014
30 RFID30 1 Thu May 1 08:34:14 2014 49 RFID49 1 Thu May 1 08:34:23 2014
49 AF1049 1 100 149 1 08:34:12 2014
1 RFID41 1 Thu May 1 08:34:17 2014
67 RFID67 1 Thu May 1 08:34:12 2014
70 RFID70 1 Thu May 1 08:34:21 2014
11 RFID11 1 Fri May 2 15:02:20 2014
61 RFID61 1 Thu May 1 08:34:21 2014
91 RFID91 1 Thu May 1 08:34:09 2014
95 RFID95 1 Thu May 1 08:34:05 2014
74 RFID74 1 Thu May 1 08:34:00 2014
103 RFID103 1 Thu May 1 08:33:58 2014
79 RFID79 1 Thu May 1 08:33:54 2014

Figure 5.4: INF Agent store current information(1)

viscur.txt (/ho	me/sudha/ns-allinone-2.34/ns-2.34/tracking/2) - gedit
File Edit View Search Tools Documents Help	
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114 RFID114 2 Thu May 1 08:34:24 2014	
52 RFID52 2 Thu May 1 08:34:38 2014	
29 RFID29 2 Thu May 1 08:34:40 2014	
63 RFID63 2 Thu May 1 08:34:41 2014	
44 RFID44 2 Thu May 1 08:34:42 2014	
71 RFID71 2 Thu May 1 08:34:44 2014	
75 RFID75 2 Thu May 1 08:34:45 2014	
48 RFID48 2 Thu May 1 08:34:47 2014	
76 RFID76 2 Thu May 1 08:34:48 2014	
80 RFID80 2 Thu May 1 08:34:49 2014 88 RFID88 2 Thu May 1 08:34:50 2014	
92 RFID92 2 Thu May 1 08:34:51 2014	
104 RFID104 2 Thu May 1 08:35:02 2014	
101 RFID101 2 Thu May 1 08:34:56 2014	
4 RFID5 2 Fri May 2 14:49:46 2014	
3 RFID4 2 Fri May 2 14:49:46 2014	
6 RFID6 2 Fri May 2 15:12:26 2014	
13 RFID13 2 Fri May 2 15:28:18 2014	
10 RFID10 2 Fri May 2 15:25:32 2014	
11 RFID11 2 Fri May 2 15:27:15 2014	
8 RFID8 2 Fri May 2 15:25:31 2014	
12 RFID12 2 Fri May 2 15:34:40 2014 22 RFID22 2 Fri May 2 15:34:40 2014	
22 NFID22 2 FTI May 2 15.34.40 2014	

Figure 5.5: INF Agent store current information(2)

Activities	Fri 17:40
	vishis.txt (/home/sudha/ns-allinone-2.34/ns-2.34/tracking/1) - gedit
File Edit View Search Tools Documents Help	
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22 RFID22 1 Fri May 2 15:06:46 2014	
12 RFID12 1 Fri May 2 15:06:46 2014	
23 RFID23 1 Fri May 2 15:06:46 2014	
12 RFID12 1 Fri May 2 15:06:46 2014	
22 RFID22 1 Fri May 2 15:06:46 2014	
24 RFID24 1 Fri May 2 15:06:47 2014 24 RFID24 1 Fri May 2 15:06:47 2014	
23 RFID23 1 Fri May 2 15:06:48 2014	
12 RFID12 1 Fri May 2 15:06:48 2014	
24 RFID24 1 Fri May 2 15:06:48 2014	
12 RFID12 1 Fri May 2 15:06:48 2014	
22 RFID22 1 Fri May 2 15:06:48 2014	
24 RFID24 1 Fri May 2 15:06:48 2014	
23 RFID23 1 Fri May 2 15:06:48 2014	
23 RFID23 1 Fri May 2 15:06:49 2014	
22 RFID22 1 Fri May 2 15:06:49 2014	
24 RFID24 1 Fri May 2 15:06:49 2014	
12 RFID12 1 Fri May 2 15:06:49 2014 23 RFID23 1 Fri May 2 15:06:50 2014	
24 RFID24 1 Fri May 2 15:06:50 2014	
2110102111110y 215.00.50 2014	

Figure 5.6: INF Agent store history

	viscur.txt (/home/sudha/ns-allinone-2.34/ns-2.34/tracking/2) - gedit
File Edit View Search Tools Documents Help	
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viscur.txt ×	
113 RFID113 2 Thu May 1 08:33:25 2014 95 RFID95 2 Thu May 1 08:31:35 2014 62 RFID62 2 Thu May 1 08:30:35 2014	Ī
115 RFID115 2 Thu May 1 08:33:28 2014 87 RFID87 2 Thu May 1 08:32:28 2014 79 RFID79 2 Thu May 1 08:32:25 2014 55 RFID55 2 Thu May 1 08:30:34 2014	
91 RFID91 2 Thu May 1 08:31:32 2014 39 RFID39 2 Thu May 1 08:30:22 2014 31 RFID31 2 Thu May 1 08:30:12 2014 74 RFID74 2 Thu May 1 08:31:29 2014	
69 RFID69 2 Thu May 1 08:31:03 2014 35 RFID35 2 Thu May 1 08:30:26 2014 47 RFID47 2 Thu May 1 08:30:40 2014 17 RFID47 2 Thu May 1 08:30:40 2014	
17 RFID17 2 Fri May 2 15:28:06 2014 43 RFID43 2 Thu May 1 08:30:24 2014 59 RFID59 2 Thu May 1 08:30:41 2014 23 RFID23 2 Fri May 2 15:34:40 2014	
51 RFID51 2 Thu May 1 08:30:42 2014 65 RFID65 2 Thu May 1 08:30:37 2014 103 RFID103 2 Thu May 1 08:33:16 2014	

Figure 5.7: INF Agent store current location

	vishis.txt (/home/sudha/ns-allinone-2.34/ns-2.34/tracking/2) - gedit
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viscur.txt ×	
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95 RFID95 2 Wed Apr 30 19:20:34 2014	
62 RFID62 2 Wed Apr 30 19:20:34 2014	
115 RFID115 2 Wed Apr 30 19:20:34 2014	I
87 RFID87 2 Wed Apr 30 19:20:34 2014	
79 RFID79 2 Wed Apr 30 19:20:34 2014	
55 RFID55 2 Wed Apr 30 19:20:34 2014	
91 RFID91 2 Wed Apr 30 19:20:34 2014	
39 RFID39 2 Wed Apr 30 19:20:34 2014 31 RFID31 2 Wed Apr 30 19:20:34 2014	
74 RFID74 2 Wed Apr 30 19:20:34 2014	
69 RFID69 2 Wed Apr 30 19:20:34 2014	
35 RFID35 2 Wed Apr 30 19:20:34 2014	
95 RFID95 2 Wed Apr 30 19:20:34 2014	
47 RFID47 2 Wed Apr 30 19:20:34 2014	
113 RFID113 2 Wed Apr 30 19:20:35 2014	
17 RFID17 2 Wed Apr 30 19:20:35 2014	
79 RFID79 2 Wed Apr 30 19:20:35 2014	
35 RFID35 2 Wed Apr 30 19:20:35 2014	
115 RFID115 2 Wed Apr 30 19:20:35 2014	
69 RFID69 2 Wed Apr 30 19:20:35 2014	

Figure 5.8: INF Agent store history

File Edit View Search Tools Documents Help
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73 RFID73 4 Thu May 1 08:31:37 2014
78 RFID78 4 Thu May 1 08:31:26 2014
50 RFID50 4 Thu May 1 08:31:05 2014 I
22 RFID22 4 Fri May 2 15:34:40 2014
16 RFID16 4 Fri May 2 15:33:00 2014
42 RFID42 4 Thu May 1 08:31:03 2014
93 RFID93 4 Thu May 1 08:32:34 2014
82 RFID82 4 Thu May 1 08:31:39 2014
100 RFID100 4 Thu May 1 08:32:39 2014
24 RFID24 4 Fri May 2 15:34:40 2014
90 RFID90 4 Thu May 1 08:32:12 2014
109 RFID109 4 Thu May 1 08:32:36 2014
64 RFID64 4 Thu May 1 08:31:08 2014
105 RFID105 4 Thu May 1 08:32:41 2014
28 RFID28 4 Thu May 1 08:30:26 2014
60 RFID60 4 Thu May 1 08:31:24 2014
86 RFID86 4 Thu May 1 08:31:35 2014
38 RFID38 4 Thu May 1 08:30:22 2014
54 RFID54 4 Thu May 1 08:30:35 2014
98 RFID98 4 Thu May 1 08:32:13 2014

viscur.txt (/home/sudha/ns-allinone-2.34/ns-2.34/tracking/4) - gedit

Figure 5.9: INF Agent store current location

	viscur.txt (/home/sudha/ns-allinone-2.34/ns-2.34/tracking/5) - gedit
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24 RFID24 5 Fri May 2 15:17:49 2014	
33 RFID33 5 Thu May 1 08:31:05 2014	Ī
28 RFID28 5 Thu May 1 08:31:15 2014	
38 RFID38 5 Thu May 1 08:31:06 2014	
46 RFID46 5 Thu May 1 08:31:16 2014	
42 RFID42 5 Thu May 1 08:31:20 2014	
54 RFID54 5 Thu May 1 08:31:17 2014	
50 RFID50 5 Thu May 1 08:31:21 2014	
56 RFID56 5 Thu May 1 08:31:18 2014	
64 RFID64 5 Thu May 1 08:31:22 2014	
60 RFID60 5 Thu May 1 08:31:24 2014	
68 RFID68 5 Thu May 1 08:31:25 2014	
78 RFID78 5 Thu May 1 08:31:25 2014	
73 RFID73 5 Thu May 1 08:31:23 2014	
82 RFID82 5 Thu May 1 08:31:22 2014	
86 RFID86 5 Thu May 1 08:31:25 2014	
90 RFID90 5 Thu May 1 08:31:24 2014 93 RFID93 5 Thu May 1 08:31:28 2014	
98 RFID98 5 Thu May 1 08:31:27 2014	

Figure 5.10: INF Agent store current location

	vishis.txt (/home/sudha/ns-allinone-2.34/ns-2.34/tracking/5) - gedit
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32       RFID32       5       Thu May       1       09:04:26       2014         77       RFID75       Thu May       1       09:04:26       2014         27       RFID27       5       Thu May       1       09:04:26       2014         94       RFID94       5       Thu May       1       09:04:26       2014         94       RFID89       5       Thu May       1       09:04:26       2014         30       RFID30       5       Thu May       1       09:04:26       2014         30       RFID36       5       Thu May       1       09:04:26       2014         36       RFID36       5       Thu May       1       09:04:26       2014         37       RFID75       5       Thu May       1       09:04:26       2014         37       RFID75       5       Thu May       1       09:04:26       2014         38       RFID49       5       Thu May       1       09:04:26       2014         39       RFID49       5       Thu May       1       09:04:26       2014         39       RFID49       5       Thu May       1       09:04:26	

Figure 5.11: INF Agent store history

	vishis.txt (/home/sudha/ns-allinone-2.34/ns-2.34/tracking/5) - gedit
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67 RFID67 5 Thu May 1 08:57:42 2014 36 RFID36 5 Thu May 1 08:57:42 2014	
B1 RFID81 5 Thu May 1 08:57:42 2014	
27 RFID27 5 Thu May 1 08:57:42 2014	
106 RFID106 5 Thu May 1 08:57:42 2014	
114 RFID114 5 Thu May 1 08:57:42 2014	
49 RFID49 5 Thu May 1 08:57:42 2014	
58 RFID58 5 Thu May 1 08:57:42 2014	
94 RFID94 5 Thu May 1 08:57:42 2014	
102 RFID102 5 Thu May 1 08:57:42 2014	
67 RFID67 5 Thu May 1 08:57:42 2014	
32 RFID32 5 Thu May 1 08:57:42 2014	
41 RFID41 5 Thu May 1 08:57:42 2014	
45 RFID45 5 Thu May 1 08:57:42 2014	
58 RFID58 5 Thu May 1 08:57:42 2014	
114 RFID114 5 Thu May 1 08:57:42 2014	
97 RFID97 5 Thu May 1 08:57:42 2014	
70 RFID70 5 Thu May 1 08:57:42 2014 53 RFID53 5 Thu May 1 08:57:42 2014	
114 RFID114 5 Thu May 1 08:57:42 2014	
114 NEIDI14 5 Hu May 1 00.57.42 2014	

Figure 5.12: INF Agent store history

# Chapter 6

## **Result and analysis**

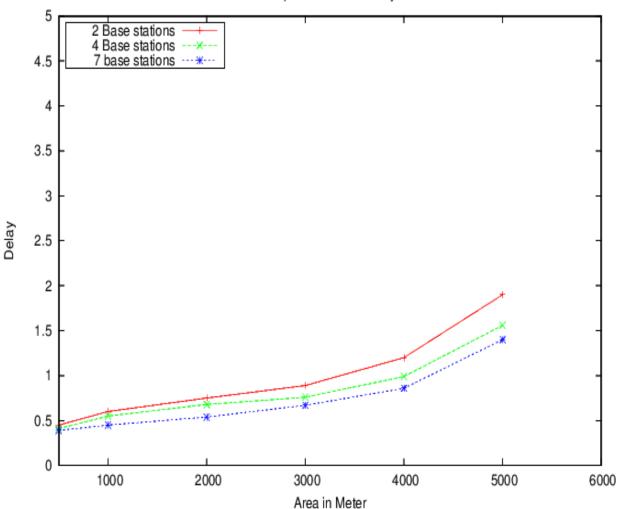
The network parameter of interest is Number of Base station(fixed node) and Number of visitor(moving node). The performance parameters of interest are Success ratio and searching delay. we have compared the results for different area with different configuration.We have compared all the result with different base station. We run the simulation for sufficient time such that each visitor node broadcast the information and all the base station receives the requested file from the monitor.

### 6.1 Performance Parameters:

Parameters	Approx. Simulating value
Antenna models	Omni-directional Antenna
Radio Propogation model	Two Ray Ground
MAC Type of MANET	IEEE 802.11
No. of visitors(Threshold value)	100 -150
Infrastructure range	250 m
RFID tag range	100 m (Active RFID tag)
Network area	5000 m X 5000 m
Number of monitors	1-5
Number of infrastructure	1-8

Table I: Performance p	parameters:
------------------------	-------------

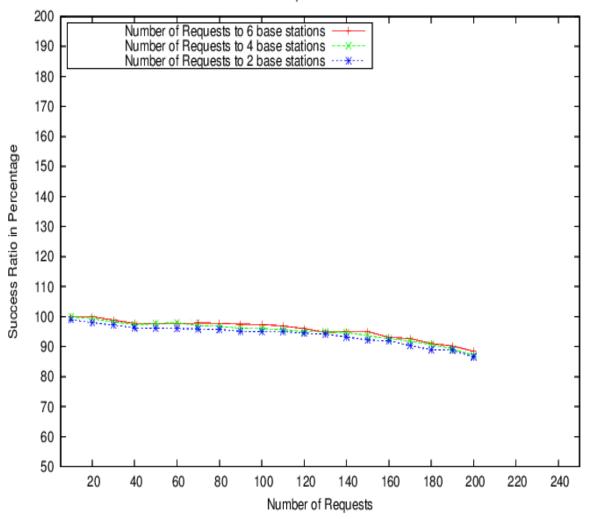
Graph in Figure 6.1 represents effect of changing area on performance parameter i.e. search Delay for searching the visitors. As the area increases search delay also increases. For 500\*500 to 2000\*2000 meter area the delay remains constant for 7 base stations. For 2 base stations the delay remains constant from 500\*500 meter to 1000\*1000 meter. For 500\*500 meter to 1500\*1500 meter area the delay remains constant for 4 base stations. For 4000\*4000 meter area onwards, the search delay increases linearly.



Graph for Area Vs Delay

Figure 6.1: Area Vs Delay

Graph in Figure 6.2 represents the effect of number of requests on the success ratio. Success ratio is the ratio of "number of sending requests" and "number of receiving responses" from the base station. Simulation has been done for different number of base stations. As number of requests increases the success ratio decreases gradually.



Number of Requests Vs Success Ratio

Figure 6.2: Number of request Vs success ratio

Graph in Figure 6.3 represents the effect of number of Visitors on the Performance parameter Search delay. As per analysis, by increasing the number of visitors in increasing area, the delay increases.



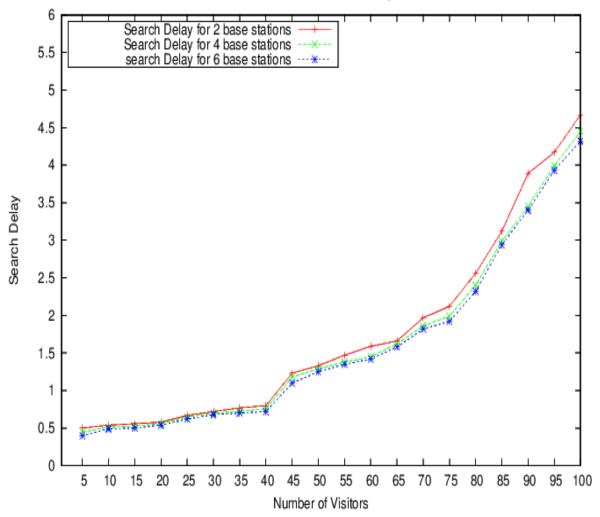
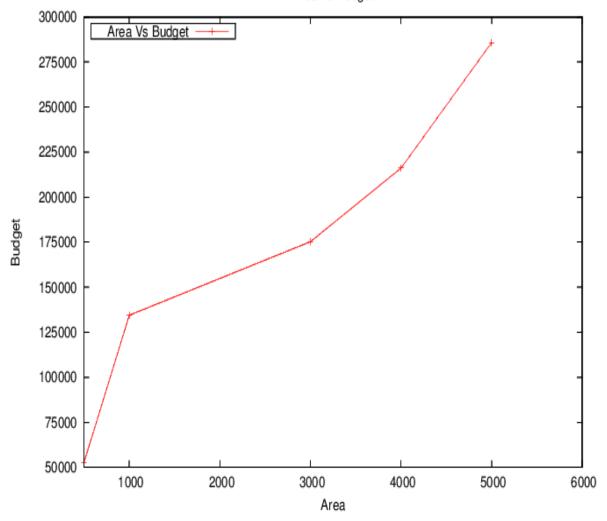


Figure 6.3: Number of visitors Vs search delay

Graph in Figure 6.4 represents the effect of area on the budget. The budget includes the number of visitor RFID tags, number of base stations and number of RFID readers. As area increases, the budget required to establish the network also increases linearly.



Area Vs Budget

Figure 6.4: Area Vs Budget

Graph in Figure 6.5 represents the effect of number of base stations on search delay.As the number of base stations increasing the search delay decreases. When the number of base stations increases, the vicinity area also increases. So search delay comparatively decreases as shown into the graph.



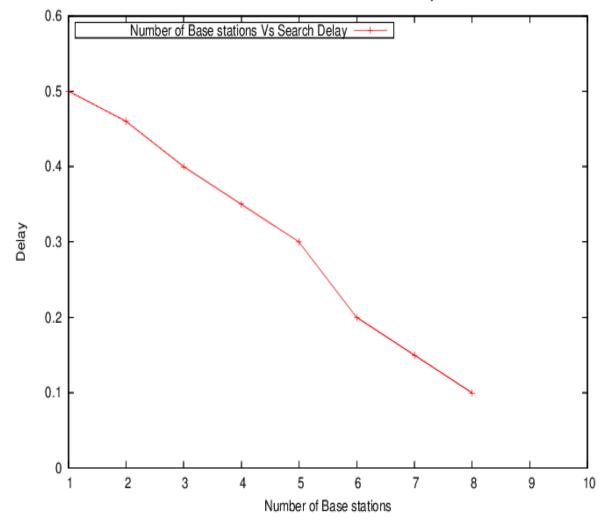


Figure 6.5: Number of Base station Vs Search Delay

## Chapter 7

# **Conclusion:**

In this system the approach for tracking the visitors and transmitting the location information in the small scale fixed scene is developed. The quantity of the fixed nodes participating in tracking the location in network setup process is limited to reduce the network overhead and the bandwidth of the system location by taking the advantage of the location information of the located nodes is optimized. During the process of uploading the location information the moving nodes to the infrastructure unit, the quantity of the request package gets transferred and the node location information is also properly controlled. The effectiveness of the algorithm has been verified by the simulation results.

#### 7.1 Future Work:

In the visitor tracking system there is good future scope. The main focus of the system is to get the response to track the visitors after the occurrence of the disaster. In future, the algorithm can be improved by adding Quality of service parameters and also by adding security parameters to enhance the security features.

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information science and technology, University kebangsaan, Malaysia, Proceeding of 2009 IEEE student conference on research and development (SCOReD 2009), 2009, UPM Serdang, Malasiya.

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