

**DEVELOPMENT OF COMMUNICATION NETWORK
FOR AUTOMATIC METER READING SYSTEM**

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DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgment any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgment is made in the text.

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Abstract

This thesis presents a research work which is carried out to find out correct network resources requirement for an automatic meter reading system. There are various technologies available to automate the meter reading such as PLC, messaging over GSM, telephone line and RF technologies.

As far as utilities providers are concerned, their focus is on a reliable AMR system to read the meter at minimum cost. Development of a reliable AMR system is highly dependant on telecommunication infrastructure which is costly. Therefore, network resource planning needs to be researched in depth to develop a reliable utility wide AMR system.

This particular research is on data concentrator based AMR system focusing on the analysing of cross relationship between channel requirements of the last mile data communication channel, data concentrator memory requirement and backbone channel bandwidth requirements.

This research has established mathematical simulation models for the last mile channel communication, data concentration memory and backbone channel communication infrastructure and integrated into a single model using software tool MATLAB Simulink. This model has established a scientific conclusion of a methodology to estimate the infrastructure requirements to design of such data concentrator based AMR system.

Developed MATLAB Simulink program is used as a computational algorithm that can repeat the program with multi variable inputs to obtain the numerical results. Monte Carlo method is quite useful for solving this kind of simulating phenomena with having many degrees of freedom, significant uncertainty in inputs and wide variety of scenarios.

Various sampling parameters were input to the system and, related results for various scenarios were obtained. These results were then used to find out cross relationships between three main components of a data concentrator based AMR systems and their requirements.

The results of this research are also adopted to develop a utility wide AMR system as pilot projects with LECO staff at various distribution networks.

TABLE OF CONTENTS

Declaration	i
Acknowledgements	ii
Abstract	iii
Table of contents	iv
List of Figures	v
List of Tables	vii
List of abbreviations	xiii
List of Appendices	x
1. Introduction	1
1.1 Introduction to AMR	1
1.2 Introduction to existing technology	2
1.3 Problem identification	3
1.4 Objective	4
1.5 Methodology	4
2. Literature Survey	7
2.1 Existing AMR technologies	7
2.2 Future AMR and Smart meter technologies	12
3. Analysis of metering data structure	14
3.1 Standard metering protocol	14
3.2 Analysis of element data	16
3.3 Simulation of data traffic	22
3.4 Development of model for the traffic analysis	26
3.5 Integrated simulation model	44
4 Simulation results and analysis	46
5. Development of AMR	59
5.1 Zigbee solution for last mile in AMR	59
5.2 Zigbee Implementation	60
5.3 Industrial implementation	69
6. Conclusions	76
6.1 Conclusions and discussion	76
6.2 Future developments	79
Reference List	81
Appendix A : Moratuwa area distribution map	83
Appendix B : Seeduwa area distribution map	84
Appendix C : Program code	85
Appendix D : MATLAB Simulink program (Soft copy)	

LIST OF FIGURES

Figure 3.2.1 – Configuration of the Energy meter reading through GPRS	16
Figure 3.2.2 – Microsoft Network Monitor capturing meter data	17
Figure 3.2.3 – Graphical analysis of Data length vs No. of frames	19
Figure 3.2.4 – Graphical analysis of Data length vs frame No.	19
Figure 3.2.5 – Graphical analysis of Protocol data vs payload data	21
Figure 3.3.1 – Dividing into Clusters	23
Figure 3.3.2 – Basic concept of model	25
Figure 3.4.1 – Simulink System Model	27
Figure 3.4.2 – Flow diagram for billing data profile model	28
Figure 3.4.3 – Simulink Program for billing data profile model	29
Figure 3.4.4 – Flow diagram for Load data profile model	30
Figure 3.4.5 – RF Channel Model	31
Figure 3.4.6 – RF Channel MATLAB program	32
Figure 3.4.7 – RF channel speed model	34
Figure 3.4.8 – Source Block for Gaussian noise generator	35
Figure 3.4.9 – RF channel speed MATLAB program	36
Figure 3.4.10 – GPRS channel model	38
Figure 3.4.11 – GPRS channel Simulink program	39
Figure 3.4.12 – Concentrator memory algorithm	41
Figure 3.4.13 – GPRS channel speed model	42
Figure 3.4.14 – Simulink GPRS channel speed program	43
Figure 3.5.1 – Integrated MATLAB Simulink program	45
Figure 4.1 – Backbone channel speed graph	46
Figure 4.2 – RF channel speed graph	47
Figure 4.3 – Concentrator memory graph	48
Figure 4.4 – Case 1: Concentrator memory (a) vs Dp (b)	50
Figure 4.5 – Case 2: Concentrator memory (a) vs Dp (b)	51
Figure 4.6 – Case 3: Concentrator memory (a) vs Dp (b)	52
Figure 4.7 – Case 4: Concentrator memory (a) vs Dp (b)	54
Figure 4.8 – Case 5: Concentrator memory	55
Figure 4.9 – Case 6: Concentrator memory	56

Figure 4.10 – Case 7: Concentrator memory	57
Figure 5.2.1 – Zigbee expansion module	61
Figure 5.2.2 – Xbee module	61
Figure 5.2.3 – X-CTU software	62
Figure 5.2.4 – Xbee USB adaptor	63
Figure 5.2.5 – Arduino Mega 2560	63
Figure 5.2.6 – Arduino program	64
Figure 5.2.7 – Processing program & energy graph	65
Figure 5.2.8 – Simple Xbee data connection project	66
Figure 5.2.9 – Zigbee routing schema	68
Figure 5.3.1 – Energy meter with Zigbee Module	70
Figure 5.3.2 – Concentrator	71
Figure 5.3.3 – Mesh network of the Zigbee radio network	72
Figure 5.3.4 – Radio Range Test of the Zigbee Network	72
Figure 5.3.5 – Radio Island	73
Figure 6.2.1 – GUI	80

LIST OF TABLES

Table 3.2.1 – Load profile data	18
Table 3.2.2 – Summary of the Load profile data	20
Table 3.2.3 – Event data profile	20
Table 3.2.4 – Summary of data profiles	22
Table 3.3.1 – Data profile & frequency	23
Table 3.3.2 – Payload capacity of each clusters	24
Table 4.1 – Summary of the simulation results	58
Table 5.3.1 – Simulation results Vs actual implementation results	74
Table 5.3.2 – Cost analysis	75

LIST OF ABBREVIATIONS

Abbreviation	Description
AMR	Automatic Meter Reading
AODV	Ad hoc On-demand Distance Vector
API	Application Programming Interface
APN	Access Point Names
BPSK	Binary Phase Shift Keying
CDMA	Code Division Multiple Access
CFE	Communication Front End
CLO	Current Loop
CSD	Circuit Switch Data
CT	Current Transformer
D-AMPS	Digital Advance Mobile Phone
DMA	Direct Memory Access
Don	Duration of channel ON
Dp	Duration of channel plan
EP	Enhanced Polling
FIFO	First-In, First-Out
FSK	Frequency Shift Keying
FTP	File Transfer Protocol
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communication
GUI	Graphic User Interface
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IrDA	Infrared Data Association
ISDN	Integrated Services Digital Network
Kbps	kilo bits per seconds
LAN	Local Area Network
LECO	Lanka Electricity Company (Private) Limited
LED	Light Emitting Diode
LQI	Link quality Indicator
OFDM	Orthogonal Frequency Division Multiplexing
PC	Personal Computer
PDA	Personal Digital Assistant

PLC	Power Line Carrier
PSTN	Public Switch Telephone Network
RF	Radio Frequency
RMR	Remote Meter Reading
RRU	Remote Reading Unit
RSSI	Received Signal Strength Indicator
SIM	Subscriber Identity Module
SMTP	Simple Mail Transfer Protocol
SMS	Short Message Service
TCP/IP	Transmission Control Protocol/Internet Protocol
TDMA	Time Division Multiple Access
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
WSN	Wireless Sensor Network