

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	TITLE PAGE	i
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENTS	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	x
	LIST OF FIGURES	xi
	LIST OF ABBREVIATIONS	xiv
1	INTRODUCTION	1
	1.1 An introduction to UML	1
	1.2 An introduction to Petri Net and Colored Petri Net	3
	1.3 Problem Background	4
	1.4 Problem Statement	5
	1.5 Project Aim	5
	1.6 Objectives	6

1.7	Project Scope	6
1.8	Significance of Project	7
1.9	Organization of Report	7
2	LITERATURE REVIEW	8
2.1	Introduction	8
2.2	Modeling Language	9
2.3	Unified Modeling Language	11
2.3.1	General Description	11
2.3.2	Modeling	13
2.3.3	Diagrams	14
2.3.4	Activity Diagram	16
2.3.5	Concepts	19
2.3.6	Criticisms	20
2.4	Petri Nets in a Holistic View	21
2.4.1	Basic Mathematical Properties	23
2.4.2	Reachability	25
2.4.3	Boundedness	26
2.4.4	Liveness	28
2.4.5	Main Petri Net Types	29
2.4.6	Petri Net Capability	31
2.5	Colored Petri Net	33
2.5.1	Colored Petri Net Capability	36
2.6	Trends	37
2.7	Summary	37
3	METHODOLOGY	38
3.1	Introduction	38
3.2	Phases of Research	39

3.2.1	Investigation of Formalization of Coloured Petri Net	40
3.2.2	Investigation of Nonfunctional Quality Attributes with CPN	40
3.2.3	Developing Transformation Algorithm	41
3.2.4	Developing Validation and Verification for AD	41
3.2.5	Developing the ADET	42
3.3	Case Study	42
3.4	System Requirement for ADET	43
3.5	Summary	43
4	VERIFICATION AND VALIDATION MODEL FOR ACTIVITY DIAGRAM USING COLOURED PETRI NET	44
4.1	Introduction	44
4.2	Investigation in formalism of colored Petri net	45
4.2.1	Definition of the coloured Petri net	45
4.2.2	Characteristics of coloured Petri net	48
4.3	Investigation of Non Functional Quality Attributes with CPN	50
4.3.1	An example for finding the quality value nondeterministically	53
4.3.2	Reliability	54
4.3.3	Security on Network	55
4.3.4	Security on memories and files	56
4.3.5	Time efficiency	57
4.3.6	Resource efficiency	58
4.4	Developing Transformation Algorithm	59
4.5	Verification of Activity Diagram	67
4.6	Validation of Activity Diagram	68
4.7	Summary	69

5 ADET DEVELOPMENT FOR VALIDATION AND VERIFICATION OF AD	70
5.1 Introduction	70
5.2 ADET Architecture	71
5.3 ADET Functionalities	73
5.4 Example of Operations	75
5.5 Summary	81
6 RESULTS AND DISCUSSIONS	82
6.1 Introduction	82
6.2 Selected Case Study	83
6.3 Mapping	86
6.4 Validating and Verifying	87
6.5 Discussion on the Result	89
6.6 Summary	91
7 CONCLUSION AND FUTURE WORK	92
7.1 Conclusions	92
7.2 Future Works	93
REFERENCES	94

LIST OF TABLES

TABLE NO.	TITLE	PAGE
2.1	Components of Petri Nets	22
2.2	Summary of Early Researches over Different Concepts Using Petri Nets	31
2.3	Summary of Early Researches over Modeling UML Using Petri Nets	32
2.4	Summary of Early Researches over Different Concepts Using Colored Petri Nets	36
4.1	Mapping Table from Activity Diagram to CPN	65
6.1	Results of Activity Diagram Verification in its Third Iteration Using the Tool	89

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
1.1	Modeling Schema Using Petri Net	3
2.1	Hierarchically View of UML Diagrams	14
2.2	Sample Activity Diagram	17
2.3	Sample Swimlane	18
2.4	Sample Petri Net	24
2.5	Corresponding Matrixes for Petri Net in Figure2.4	24
2.6	Reachability Graph of a Sample Petri Net	27
2.7	Example of Place-Transformation	28
2.8	Graphically Shown Six Main Petri Nets	30
3.1	The main phases of research	39
4.1	An Example of CPN	47
4.2	Determining Quality Values	52
4.3	An Example of Calculating Quality Values	53
4.4	Calculation of reliability	54
4.5	Security on Network	55
4.6	Security on Memories and Files	56
4.7	Time Efficiency	57
4.8	Resource Efficiency	58
4.9	Additional Shapes	60
4.10	CPN for Activity Diagram Figure 2.2	64
4.11	Flowcharts for Mapping from Activity Diagram to CPN	66

5.1	Architecture of the ADET	71
5.2	Logical architecture of ADET	72
5.3	The ADET interface	74
5.4	Sample coloured Petri net	75
5.5	First part of compiling	76
5.6	Second part of compiling	77
5.7	Third part of compiling	78
5.8	Validation	79
5.9	Verification	80
6.1	Relation of Process Sale with its Two Actors	84
6.2	Process Sale Activity Diagram	85
6.3	The mapped activity diagram	86
6.4	The mapped activity diagram	90

LIST OF ABBREVIATIONS

AD	-	Activity Diagram
ADET	-	Activity Diagram Evaluation Tool
BPMN	-	Business Process Modeling Language
CPN	-	Coloured Petri Net
ESL	-	Energy System Languages
FMC	-	Fundamental Modeling Concept
IDEF	-	ICAM Definition Language
ISO	-	International Organization for Standardization
MDA	-	Model Driven Architecture
MDD	-	Model Driven Development
MDE	-	Model Driven Architecture
MOF	-	Meta Object Facility
OMG	-	Object Management Group
OO	-	Object Oriented
PDA	-	Personal Digital Assistant
PN	-	Petri Net
POS	-	Point Of Sale
RUP	-	Rational Unified Process
SysML	-	System Modeling Languages
UML	-	Unified Modeling Languages
XMI	-	XML Metadata Interchange
XML	-	Extensible Modeling Language