

**SOME STUDIES ON LOCAL AREA NETWORK FOR
SAFETY SYSTEMS WITH APPLICATION TO
RAILWAY SIGNALLING SYSTEM**

by
K. VIJAYA KUMAR

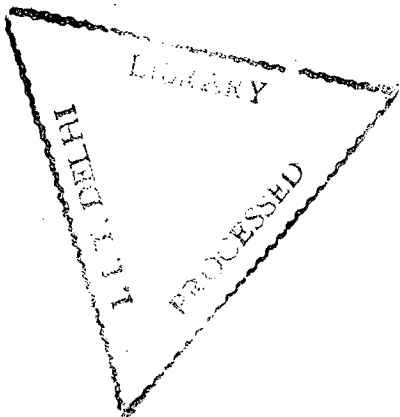
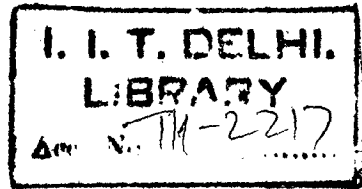
*A thesis submitted to the
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for the award of the degree of
DOCTOR OF PHILOSOPHY*



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CERTIFICATE

This is to certify that the thesis entitled "SOME STUDIES ON LOCAL AREA NETWORK FOR SAFETY SYSTEMS WITH APPLICATION TO RAILWAY SIGNALLING SYSTEM", which is being submitted by **K. Vijaya Kumar** to the Department of Electrical Engineering, Indian Institute of Technology, New Delhi, for the award of the degree of "**Doctor of Philosophy**", is a bonafide research work carried out by him under my supervision and guidance.

In my opinion, this dissertation has reached the standard fulfilling the requirements of all the regulations relating to the degree. The results contained in this thesis have not been submitted in part or in full to any other university or institute for the award of any degree or diploma.

Date : Jan 31, 1994



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K. Vijaya Kumar
(K. Vijaya Kumar)

SYNOPSIS

Summary

This thesis deals with studies on a local area network for safety critical systems with application to railway signalling system. The local area network should meet the real time, safety and reliability requirements of the railway signalling application. For this purpose, the design of a fault-tolerant, fail-safe (FTFS) node using transputers has been developed. The FTFS node uses a new rotation-based leadership technique to meet the safety and reliability requirements. A local area network of FTFS nodes having dual ring topology is proposed. The real time communication issues of the network are addressed by proposing a schedulability model for the periodic messages. The performance measures of the network are evaluated by simulation. Subsequently, The implementation aspects for the specific application to railway signalling system, namely, the solid state interlocking system are described. Finally, the reliability and safety of the system are quantified. The chapterwise details of the thesis are briefly described as follows.

CHAPTER 1 Review of real time communication networks

Real time communication is timely delivery of inter-task messages and is essential to the completion of real time tasks before their deadlines. Chapter 1 introduces real time communication networks and contains a review of real time multiple access networks and real time multihop-networks. A review of network topologies is also given in this chapter.

DEDICATED

TO

my parents

and

my wife

CONTENTS

	<u>Page No.</u>	
Certificate	(i)	
Acknowledgements	(ii)	
Synopsis	(iii)	
List of Figures	(xi)	
List of Tables	(xiv)	
List of Abbreviations	(xv)	
List of Symbols	(xvii)	
CHAPTER 1 REVIEW OF REAL TIME COMMUNICATION NETWORKS		
1.1	Introduction	1
1.2	Review of Scheduling Algorithms	1
1.2.1	Rate monotonic scheduling algorithm	2
1.2.2	Dynamic deadline driven algorithm	3
1.3.1	Real time communication in multi-access networks	5
1.3.2	Real time communication in multi-hop networks	6
CHAPTER 2 REVIEW OF APPLICATIONS AND IDENTIFICATION OF THE PROBLEM		
2.1	Introduction	14
2.2	Review of Microprocessor Based Route Interlocking Systems	14
2.2.1	Dual hardware redundancy	15
2.2.2	Triple modular redundancy	15

2.2.2.1	Communication between interlocking unit and track side equipment	16
2.2.3	Software redundancy	17
2.2.4	Dual hardware redundancy and software diversity	19
2.2.4.1	Safety	19
2.2.4.2	Reliability	20
2.3	Review of Transputer-based Safety Critical Applications	20
2.3.1	Overlapping triad topology	21
2.3.1.1	Input data validation	21
2.3.1.2	Controller task calculation	22
2.3.1.3	Data output validation	22
2.3.1.4	Link adaptor shutdown logic	22
2.3.2	Quadruplex systems	23
2.3.2.1	Hot sparing system based on four transputers and a spare	23
2.3.2.2	Four transputers with multiple sample rate and without standby	24
2.3.3	Star based systems	24
2.4	Identification of the Problem	25

CHAPTER 3 DESIGN OF FAULT-TOLERANT AND FAIL-SAFE NODE

3.1	Introduction	32
3.2	Fault Tolerance Principles	32
3.3	Design of Fault-tolerant and Fail-safe (FTFS) Node	35
3.3.1	Description of fault-tolerant and fail-safe (FTFS) node	35

3.3.2	Leader's role	37
3.3.3	Super Process	37
3.3.4	Data transfer between transputers	39
3.3.5	Start up	39
3.3.6	Clock synchronisation	39
3.3.7	Recovery in FTFS node	40
3.3.8	Reconfiguration	41
3.3.8.1	Transputer link fault	41
3.3.8.2	Transputer fault	42
3.4	Railway Signalling Application	42
3.4.1	Introduction	42
3.4.2	Type of faults covered	43
3.4.3	Safe Shutdown	44
3.4.3.1	Isolation of faulty transputer	45
3.4.3.2	Shutdown logic for vital safety systems	45
3.4.3.3	Driving the output functions to safe state	46
3.4.3.4	Periodic self testing	47
3.4.3.5	Isolation of outputs from faulty transputer	48
3.4.3.6	Grouping and selection of four transputer outputs	48
3.5	Formal Specifications of the FTFS Node	49
3.6	Simulation of the FTFS Node	51
3.7	Conclusion	54

CHAPTER 4 REAL TIME COMMUNICATIONS IN THE NETWORK
OF FTFS NODES HAVING DUAL RING TOPOLOGY

4.1	Introduction	57
4.2	Network Application Requirements	58
4.2.1	Estimate of peak data rate requirement	60
4.2.1.1	Background	60
4.2.1.2	Addressing	61
4.2.2	Real time requirements of the network	62
4.2.3	Reliability and safety requirements of the network	64
4.3	Configuration of the Dual Ring Topology	65
4.3.1	Problem statement	66
4.4	Proposed Local Communication Architecture with Reference to OSI Model	66
4.4.1	Physical layer	67
4.4.2	Data link layer	67
4.4.3	Logical link control (LLC) layer	67
4.4.4	Application layer	69
4.4.4.1	Data protection at application layer	69
4.4.4.2	Network management	70
4.4.4.3	Fault isolation	72
4.4.4.4	Verification of network configuration data	73
4.4.4.5	Reallocation of tasks	74
4.4.4.6	Network partition/master node failure	74
4.4.4.7	Time synchronisation	75

4.4.4.8	Deadlock avoidance	75
4.4.4.9	Token loss/token duplication management	75
4.4.4.10	Special functions of SSI node	76
4.5	Scheduling of Messages	76
4.5.1	Scheduling framework	76
4.5.2	Schedulability condition	77
4.5.3	Schedulability analysis	78
4.5.3.1	Message transmission and overhead	78
4.5.4	Maximum utilisation	82
4.5.5	Change of priority of messages with system conditions	83
4.5.6	Break down of scheduling	88
4.6	Performance Evaluation of the System Network	88
4.6.1	Simulation of IEEE 802.5 MAC protocol in the ring network	89
4.6.1.1	Simulation model	90
4.6.1.2	Poisson data arrival	90
4.6.1.3	Definitions	91
4.6.1.4	Assumptions	92
4.6.1.5	Confidence level and confidence interval	92
4.6.2	Simulation results	94
4.6.2.1	Delay distribution of the messages	95
4.6.2.2	Average delay and maximum delay	96
4.6.3	Conclusions from simulation results	97
4.6.4	Evaluation of system response time	99
4.6.4.1	Assumptions	100
4.7	Conclusions	102

CHAPTER 5 AN APPLICATION TO MICROPROCESSOR BASED
ROUTE INTERLOCKING SYSTEM FOR CONTROL
OF TRAINS IN RAILWAY YARDS

5.1	Introduction	106
5.2	Introduction to the SSI system	107
5.2.1	Yard functions	108
5.2.2	Architecture of the SSI system	109
5.2.3	Redundancy management of the SSI system	109
5.3	Local area network of FTFS nodes for SSI system	111
5.3.1	Introduction	111
5.3.2	Operation of the local area network of interconnected FTFS nodes for the SSI system	112
5.3.3	Redundancy management of the SSI node	112
5.3.4	Simulation of the network of FTFS nodes having dual ring topology on Insun Meiko transputer system	113
5.4	Proposed Interface Between SSI System and the FTFS Node	117
5.4.1	Salient features of the hardware of the interface	117
5.4.1.1	STE bus	118
5.4.1.2	Hybrid micro-circuit modules for the STE bus interface	119
5.4.1.3	IMS C012 link adaptor	120
5.4.2	Software of the proposed interface	121
5.4.3	Software errors	123
5.5	Conclusions	123

CHAPTER 6 RELIABILITY AND SAFETY ANALYSIS

6.1	Introduction	125
6.2	Reliability and Safety of the FTFS Node	127
6.2.1	Markov model of the FTFS node	127
6.2.2	Analysis	131
6.2.3	Results	132
6.2.3.1	Transient analysis of the Markov model	132
6.2.3.2	Recurrent analysis of the Markov model	133
6.3	Analysis of Byzantine Faults in the FTFS Node	134
6.3.1	Extension of byzantine generals on a network of interconnected nodes with authenticated messages	135
6.3.2	Safe Shutdown model	138
6.3.3	The fault coverage of the safe shutdown model	139
6.4	Reliability and Safety Analysis of the SSI System	139
6.4.1	Markov model of the SSI system	139
6.4.2	Results	141
6.5	Reliability and Safety of Local Area Network Having Dual Ring Topology	142
6.5.1	Markov model	142
6.5.2	Results	146
6.5.3	Maintenance requirements of the dual ring network	147
6.6	Conclusions	148

CHAPTER 7 CONCLUSIONS AND FUTURE WORK

7.1	Introduction	151
7.2	Summary of Results	151
7.3	Suggestions for Further Work	153
Appendix-I	Solid State Interlocking System	155
Appendix-II	Advantages of Transputers	156
	Vitae	158
	Abstract	159