International Journal of Innovative Research in Computer Science & Technology (IJIRCST)
ISSN: 2347-5552, Volume-3, Issue-1, January 2015

Analysis of Routing Tag and Fault Tolerance of Proposed Triangle Network in the Presence of Faults

Amardeep Gupta

Abstract **Routing tag provides the algorithm to pass the data from source to destination in a network. In this paper Fault Tolerance of the proposed MIN Triangle has been analysed . All the path lengths available from source to destination have been found. Routing tag and the algorithms have been proposed to check the Fault Tolerance in porposed MIN.**

Keywords **Fault Tolerance, routing tag redundancy graph, fault tolerance and repair, algorithms of routing.**

I. INTRODUCTION

In distributing routing the decisions are shared among all nodes. Data moves from node to node and routing decisions are made by intermediate nodes. This type of routing can be Fault-Tolerant as there is no central node. The routing can be performed by observing the path setup, path selection and network flow control.

In circuit switching approach , communication path is set before the data transfer begins. But in packet switching data transfer begins before a complete path is setup, this situation leads to packet block if path is busy.

II. ARCHITECTURE PROCEDURE OF TRIANGLE NETWORK

The network is an Irregular MIN of size N*N. It has N sources and N destinations. The Triangle network of size 2^n*2^n consists of (2m-2) stages. This network has (2^n -2) no. of switches of size 3*3 and 2^{n-1} no. of switches of size 2*2.Each source is connected to one SE in each group with the help of N multiplexers and is connected to the output with equal number of demultiplexers.

The network comprises of two identical groups of SEs, named as G^0 and G^1. Each group incorporates N/2 sources and N/2 destinations. Both the groups are connected to the N inputs through N multiplexers of size 4:1 and to the N outputs through N no. of demultiplexers of size 1:2. The switches in all the stages are of size 3 * 3, except the last one.

The switches in the stages m - 2, m - 1 and m have been connected to each other through links called as auxiliary links. These switches are called as complimentary switches. These links are used when the SE in the next stage is busy or faulty. This makes the network more Fault-Tolerant and reliable. The network of size 16*16, with labeled switches is shown in Fig 4.1.The switches are identified as $(S_{i,\,j})^p$ for SE j in the stage i of the group p.

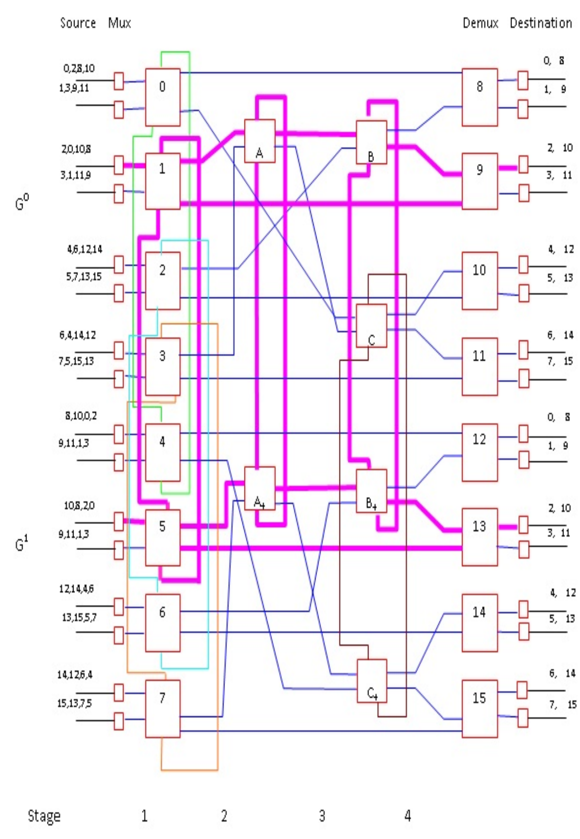

Fig 1: All paths available from source 0000 to 1010 destination in Triangle MIN

Manuscript received January 25, 2015.
Amardeep Gupta, Head PG Dep't of Computer Sc and IT
D A V College, Amritsar, Punjab 1231/12, o/s D A V College
Katra Sher Singh, Amritsar,INDIA,Tel No. 91-09876131015

III. REDUNDANCY GRAPH

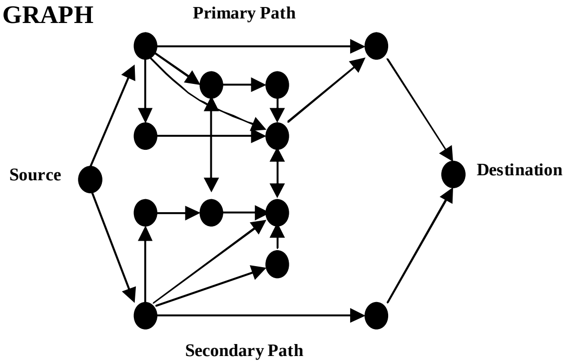

Fig 2: Redundancy graph of Triangle MIN

A. Routing method and analysis of proposed MIN in the presence of faults

Let the source and destination in binary be represented as
$S=S_{n-1}\ldots\ldots\ldots\ldots S_1S_0$
$D=D_{n-1}\ldots\ldots\ldots D_1D_0$
Let the routing tag Koppelman D. M et al. (1990) be denoted as $t_mt_{n-1}\ t_{n-2}\ldots\ldots t_0t_{dm}$, where
t_m is the multiplexer control bit.
t_{n-1} is the bit being sensed by SEs of the first stage.

t_{n-2} is the bit being sensed by SEs of the second stage.
…………
t_0 is the bit being sensed by SEs of the last stage.
t_{dm} is the demultiplexer control bit.
The function for routing tag and routing procedure is
$t_i = d_i$ for all $(0\leq i \leq\ n-1)$ where $n= \log_2 N$

$t_i = [\ (S_{n-1}\quad d_{n-1}) + (S_{n-2}\quad d_{n-2}) + \ldots\ldots \oplus + S_{n-i} \oplus d_{n-i})]$

for all $n\leq i \leq n$, where is 'exclusive or'

$t_m = s_{n-1}$

$t_{dm} = d_{n-1}$

Routing example from source 0000 to all destinations for the Triangle Network has been listed in Table 1.

Table 1 : All Path Lengths available in Triangle Network

Source	Destination	Path Lengths Available
0000	0000	2,4
	0001	2,4
	0010	2,4
	0011	2,4
	0100	4
	0101	4
	0110	4
	0111	4
	1000	2,4
	1001	2,4
	1010	2,4
	1011	2,4
	1100	4
	1101	4
	1110	4
	1111	4

The function of the path lengths available in Triangle MIN is $\log_2(N)-2$, $\log_2(N)$.
The path length for favorite memory module is $\log_2(N)-2$.

IV. FAULT-TOLERANCE AND REPAIR

The proposed MIN satisfies the Fault-Tolerant criteria because it can work in the presence of certain faults. If there is fault in the primary path then secondary path will be chosen for routing the data. Moreover, there are multiple paths from one type of source to one type of destination which makes this network more Fault-Tolerant and reliable Kamiura N et al. (2000) The auxiliary links in all the stages except the last one provides the alternate route of the data. The critical case is when the fault is present in the SE in same loop. In this case certain pair of source and destination shall be disconnected.

Theorem 1: Different path lengths are available for routing from source to destination in primary and secondary routes.
Proof: The probability of request forwarding within stages of the Triangle Network is different. Moreover, the auxiliary links are available in all the SEs in all the stages except the last one. If fault in any of these SE happens, then the data will be routed to the auxiliary SE in the same stage through auxiliary links.

Theorem 2 : The Triangle Network disconnects some source from some destination in the presence of fault in both the auxiliary switches in the same stage.
Proof : Let us suppose Source S is guided through a faulty switch to destination D. If the auxiliary switch in the same stage is also faulty then source S gets disconnected from destination D.

Lemma 1 : Triangle Network maintains the connectivity in the presence of the fault, only if the auxiliary SE in the same stage is Fault-free.

Repair: To rectify, just replace the loop engaged in the faulty components with the new one.

Fig 1 shows the multiple paths available from source 0000 to destination 1010.

The routing tags used to transfer the data from source 0000 to destination 1010 in the respective faults of stage 3, where the secondary path is established by complimenting the MSB of the routing tag have been listed in Table 2.

Table 2: Routing Tags from source 0000 to destination 1010 with Fault-free and faults in stages of Triangle MIN

Fault	Routing Tag
No Fault	0110
$(S_{3,B})^0$	1110
$(S_{3,B})^0$ $(S_{3,B+})^1$	Shortest path length is use to transfer the data.

V. CONCLUSION

A new class of Fault-Tolerant Irregular Dynamic MIN named as Triangle Network has been proposed in this paper.The algorithm of routing tag and routing scheme of this proposed network have been evaluated. It has been observed that the proposed MIN is fault tolerant in the presence of faults. For 100% requests generation, Triangle MIN passes 50% more requests as compared to comparative MINs. When the critical faults are present in the stage 3 the proposed Triangle MIN, passes 37% of the requests generated.

REFERENCES

1. Bansal P. K., Joshi R. C. and Singh Kuldeep, May 1992, “Quad Tree: a Cost-Effective Fault-Tolerant Multistage Interconnection Network”, International Conference IEEE INFOCOM 92, ITALY.
2. Jeng M. and Siegel H. J., May 1986, “A Fault-Tolerant Multistage Interconnection Network for Multiprocessor Systems using Dynamic Redundancy”, Proceedings 6th International Conference on Distributed Computing Systems, pp. 70-77.
3. K. Arun. Somani, Vaidya Nitin H., April 1997, ”Understanding Fault-Tolerance and Reliability”, IEEE Computer Theme (30).
4. Padmanabhan K. and Lawis D. H., August 1983, “Fault-Tolerant Schemes in Shuffle/Exchange type Interconnection Networks”, Proceedings of International Conference Parallel Processing, pp. 71-75.
5. Reddy S. M. and Kumar V. P., August 1984, “Fault-Tolerant Multistage Interconnection Networks”, Proceedings 5th International Conference on Parallel Processing, pp. 155-164.