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ROUTING SCHEME ANALYSIS OF NIASN

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ABSTRACT

The network with degraded efficiency even in the presence of faults in critical components , if can work , is called as Fault-Tolerant. Routing method and algorithm plays an important role to transfer the data from source to destination in the network. If the network can work with full access in the presence of fault in single Switching Element, then it is called as a single switch Fault-Tolerant network. The network is considered to be m Fault-Tolerant, if it is able to connect all sources to all destinations in the presence of m faults. In this paper a proposed MIN named as New Irregular Augmented Shuffle Exchange Network (NIASN) has been evaluated in terms of paths available.

Keywords Path Lengths for memory modules, Algorithms of Routing scheme and routing tag , Fault Tolerance, Redundancy Graph, Failure of Switches

1. INTRODUCTION

The proposed MIN satisfies the Fault-Tolerant criteria because it is able to function in the presence of some level of faults. The secondary path is considered in case of fault in the primary path. As there are multiple paths of varying path lengths, from one particular source to one particular destination, this network is a better choice in terms of Fault- Tolerance as compared to other existing networks.

2. STRUCTURAL CHARACTERISTICS OF NIASN

The proposed MIN is an altered IASN Sadawarti et al. (2007) with less number of SEs in the intermediate stages and with changed connection patterns. The Network of size N*N has N sources and N destinations. The proposed MIN consists of k-1 stages ($k=\log_2 N$).The network Comprises of two identical groups of switching elements (SEs), named as G^0 and G^1.There are N/2 sources and N/2 destinations in each group. Both the groups are connected to the N inputs and N outputs. The inputs are connected through N multiplexers of 4:1 size, and the outputs are connected through the same number of demultiplexers of 1:2 size. The multiplexers and demultiplexers have been numbered as 0, 1, ----, N/2. In this network the switches are of size 2*2 in all the stages except the first stage where the switches are of size 3*3. The NIASN network of size N*N has (2*k) no. of switches of size 3*3 and [(2*k) +3] number of switches of size 2*2.Each source is connected to one switching element[3] in each group with the help of multiplexers. The multiplexers and demultiplexers have been given the numbers as 0, 1, ---, N/2-1. The switches in the first stage have been assigned the numbers from 0, 1, ---, N/2-1, connected to each other through links [5]called as auxiliary links. The auxiliary links are used when the SE in the next stage is busy or faulty. This makes the network more Fault-Tolerant and reliable. The switches in the middle stage have been given the number as N/2,--, N/2+2. Like wise the switches in the last stage are identified with the numbers from N/2+3,----, N/2+10.

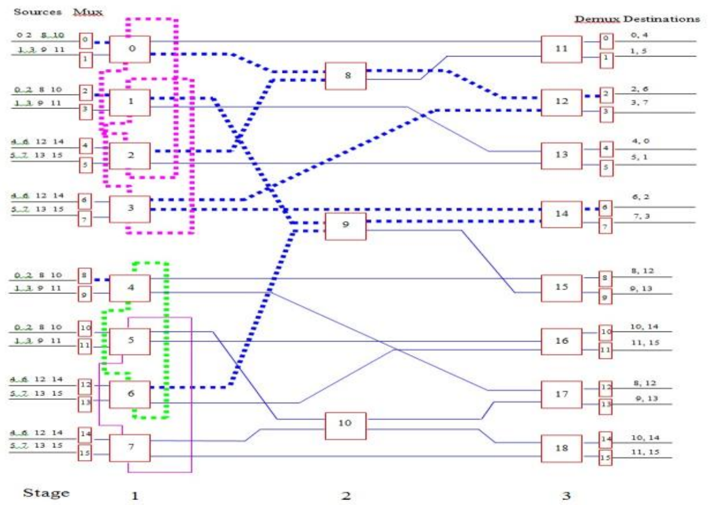

Fig 1: Routes from source 0000 to 0110 in NIASN

3. REDUNDANCY GRAPH

The Fig 2 shows all the possible paths from each source to every destination in the proposed network. In the figure, dark circles are the representation of the SEs[7] in the network. The arrows show the availability of the path to move data from source to destination in the network.

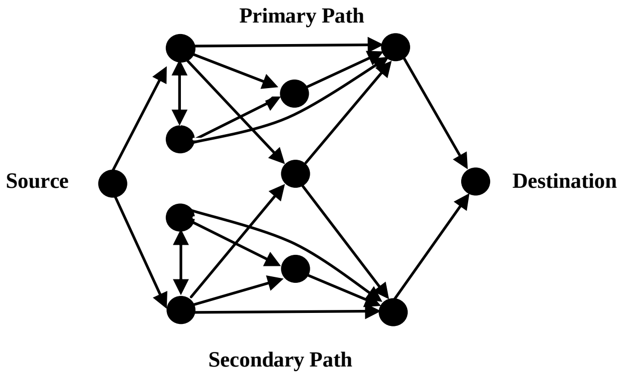

Fig 2: Redundancy Graph of NIASN

To route the data from source to destination, the primary path is selected first. In case the primary path is faulty[1], the secondary path is chosen to route the data as there are multiple paths available for data routing in the proposed network.

4. ROUTING PATHS AVAILABLE IN NIASN

If the network is able to work, of course with degraded efficiency, in the presence of faults in critical components Padmanabhan K et al. (1983) then the network is called as Fault-Tolerant. If the network can work with full access in the presence of fault in single SE, then it is called as a single switch Fault-Tolerant network. The network is considered to be m Fault-Tolerant[2], if it is able to connect all sources to all destinations in the presence of m faults.

The proposed MIN satisfies the Fault-Tolerant criteria because it is able to function in the presence of some level of faults. The secondary path is considered in case of fault[4]in the primary path. As there are multiple paths of varying path lengths, from one particular source to one particular destination, this network is a better choice in terms of Fault- Tolerance as compared to other existing networks The presence of auxiliary links[6] in the first stage help to route the data through the alternate paths. The critical case is when the fault is present in the SE in same loop. Some pair of source and destination will be disconnected.

The design of the network has two benefits

1 The network is able to tolerate the failure of switches in conjugate.

Proof: The multiple paths from one type of source to one type of designation are available.

2 The NIASN network provides on line repair and maintenance.

The loop can be removed from the network, as well as can be replaced with the new. Fig 1 exhibits the Fault-Tolerance capability of the proposed MIN in case of multiple paths. This figure shows the multiple paths available, shown with the help of dashed lines, taking example of routing the data from source 0000 to destination 0110.

Algorithm of routing scheme and routing tag

Let the source and destination in binary be represented as

$$S=S_{n-1}\ldots\ldots\ldots\ldots..S_1S_0$$

$$D=D_{n-1}\ldots\ldots\ldots\ldots D_1D_0$$

- The source selects a sub network G^i, on the basis of the MSB of the destination address. The primary path is preferred, in case there is a fault in the primary path, the secondary path is selected to route the data.
- If the following stage is the final stage, subsequent routing is not required as the data has reached the destination. If the SE is busy or faulty, request passes to auxiliary SE through the links. If the auxiliary SE is also busy or faulty then the request is dropped.
- The MSB of the routing tag is set to 1.The data is sent through the secondary path.
- In the intermediate stages, the data is guided by the bits d_{n-2}, ...$d_{0.}$
- Bit d_0 guides the data in the final stage to reach the destination.

Table 1 lists all the path lengths available in NIASN from source 0000 to all destinations.

Table 1: All path lengths available in NIASN size 16 * 16

Source	**Destination**	**Path Lengths Available for favorite and non favorite memory modules**
0000	0000	2,2,3
	0001	2,2,3
	0010	2,3
	0011	2,3
	0100	2,2,3
	0101	2,2,3
	0110	2,3
	0111	2,3
	1000	2,2,3
	1001	2,2,3
	1010	2,3
	1011	2,3
	1100	2,2,3
	1101	2,2,3
	1110	2,3
	1111	2,3

According to Table 1, it is clear that there are more number of shortest paths available from sources to destinations, in NIASN, which makes this MIN a multi path MIN with varying path lengths available to route the data from sources to destinations

5. CONCLUSION

It has been concluded that NIASN has maximum number of different and shortest paths available for routing the data as compared to similar class of existing MINs. Taking into consideration critical faults in the MIN, the values evaluated of the proposed MIN NIASN shows improvement in permutations passable parameter. In this case, NIASN is able to pass 50% more request as compared to similar class of existing MINs.

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