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Architecture Analysis of NIASN

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Abstract:- The Multi Stage Interconnection Network(MIN) is called as Fault-Tolerant if it is able to work, even in the presence of critical faults. Routing method and algorithm plays a vital role to rote the data from source to destination. In this paper the architecture of a proposed Interconnection Network named as New Irregular Augmented Shuffle Exchange Network (NIASN) has been evaluated.

Keywords *Path setup, Redundancy Graph,routing paths and techniques,path lenghts, conjugate Switches,*

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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 with N/2 sources and N/2 destinations in each group.Futher the groups are connected to the N inputs and same number of outputs. There are N multiplexers of 4:1 size at input and the same number of demultiplexers of 1:2 size are associated at output.The multiplexers and demultiplexers have been numbered as 0, 1, ----, N/2. In this network there are switches of size 2*2 in all the stages but the first stage where the size is 3*3.

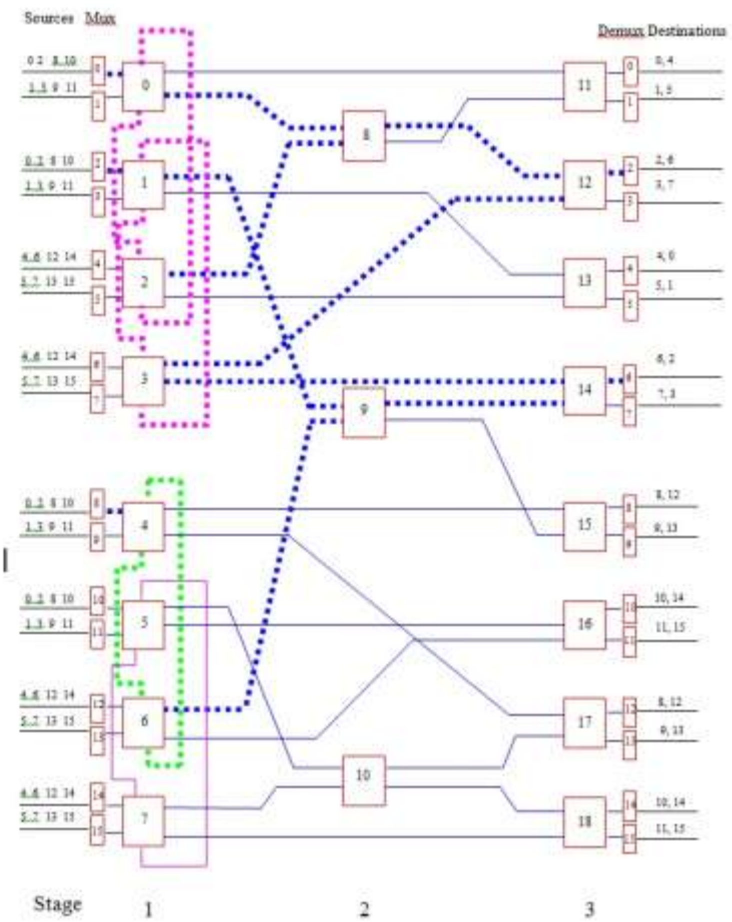

Fig 1: Routes from source 0000 to 0110 in NIASN

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3. REDUNDANCY GRAPH

The graph is the pictorial representation of all the possible paths from sources to destinations in the network. In the figure 2, dark circles represent Switching Elements in the network whereas the arrows show the paths available from source to destination.

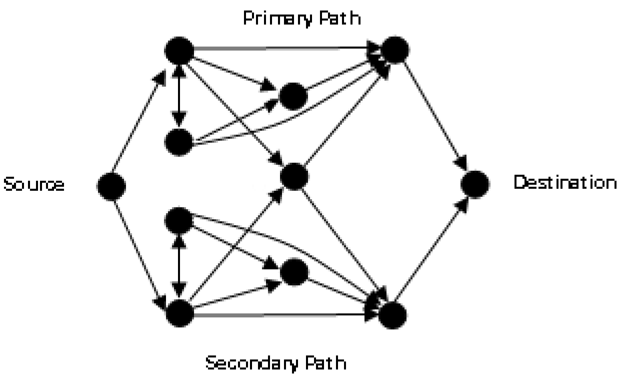

Fig 2: Redundancy Graph of NIASN

The primary path is selected first. In the case of faults in the primary path, the secondary path is chosen to route the data .

ROUTING PATHS AVAILABLE IN NIASN

The network is Fult tolerant in case it is able to work even with degraded efficiency, in the presence of faults in critical components Padmanabhan K et al. (1983) .Single switch Fault-Tolerant network can work with full access in the presence of fault in single Switching Element.

The proposed MIN satisfies the Fault-Tolerant criteria because it is able to function in the presence of some level of faults. This network has upper edge in terms of availability of multiple paths of varying path lengths. The auxiliary links in the first stage help to explore the alternate paths. In critical case, there is fault present in the Switching Element in same loop. Therefore in this case some sources and destinations will be disconnected.

The design of the network has two benefits

1 The network can tolerate the conjugate failure of switches.

Proof: The presence of multiple paths from any source to any designation.

2 On line recovery of faults.

The loop can be removed and replaced with the new. Fig 1 proves this feature of the proposed network in case of more than one path. Take an example of routing the data from 0000 to destination 0110.

Algorithm of routing scheme and routing tag

Let the representation of source and destination in binary is

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

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

- The source selects a sub group G^i, on the basis of the Most Significant Bit of the destination address. The primary path is preferred, in case there is a fault in the this path, the second path is selected to transfer the data.
- If the following stage is the final stage, routing of data is not required as it has reached the destination. If the Switching Element is busy or faulty, request goes to auxiliary Switching Element. If this Switching Element is also busy or faulty then the request is lost.
- The Most Significant Bit of the routing tag is set to 1.The data is forwarded through the alternate path.
- In the intermediate stages, the data is forwarded by the bits d_{n-2}, ...d_{0}.
- LSB d_0 sends the data in the final stage to reach the destination.

Table 1 depicts all the possible path lengths available in NIASN from source 0000 to all targets.

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

Source	Destination	Path Lengths Available for suitable and Non suitable 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

It is clear from above table that in the prposed MIN NIASN there are more number of shortest paths from multiple sources to destinations.This makes this network a multi path MIN with varying path lengths available to move the data from sources to group of destinations.

4. CONCLUSION

It is obvious that prposed MIN NIASN has maximum number of shortest paths available for moving the data which is not the case in similar class of existing networks.

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Moreover there are improved permutations passable , 50% more request parameter, even in the presence of non-repairable faults in the prposed MIN.

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