

SEVERAL ROUTING ALGORITHM ON NOC

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Abstract— Network-on-chip (NOC) has been introduced as a new paradigm to solve System on chip (SOC) design challenges. The Network-on-Chip (NOC) architecture is a viable solution to the complex on-chip communication problems. Communication performance of NOC's is heavily depends on steering algorithm. The architecture of NOC is based on topology, routing algorithm and switching techniques. The routing algorithm is one of input ingredient in NOC structural design. A routing algorithm determines how the data is routed from source router to destination router. The routing algorithms are confidential base on their input personality The categorization is either where routing choice is taking or a path the packet follows. This paper presents appraisal of deterministic routing algorithm in information, itadvantage and disadvantage.

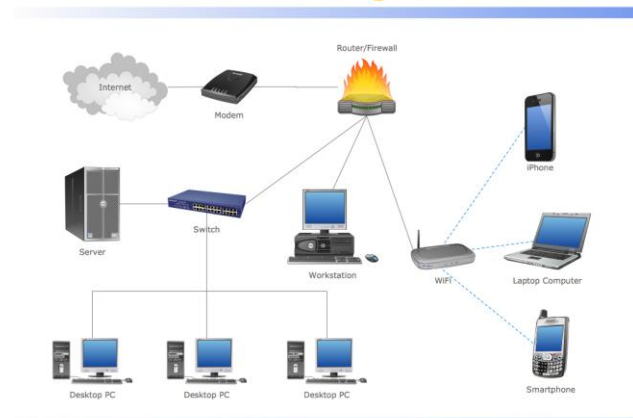
Keywords— Deterministic Routing Algorithm, Deterministic XY Routing, DOR, Network-On-Chip and Pseudo Adaptive Routing

I. INTRODUCTION

As the expertise continues to get better, memories and processors are becoming inexpensive with amplify speed, the trouble of communication in the processors occur, because traditional buses cannot meet the requirement especially in large system scalability and difficulties in single clock synchronization, other limitations like high propagation delay, latency and power consumption make buses unattractive. Network-on-chip (NOC) is the new paradigm where traditional buses are replace with small router that are connected to each other between endpoints in the processors, NOC helps in reducing power consumption, area size and propagation delay in the processors and NOC employs the concept of computer network the only difference is that in NOC traffic is analyses during design period, and the traffic is spread among the node to avoid congestion [1]. Understanding routing algorithm is critical in the design process of any NOC architecture. Previous work was done on different types of XY routing algorithm and its use on different network conditions. Others reflection

of the prior work was application and passage circumstance of the diverse XY steering algorithm. The routing algorithm is key factor which affects NOC network communication. This paper will discuss routing algorithm and review deterministic routing algorithm which is easy to use in any NOC planning.

Network Diagram



II. OVERVIEW OF NOC DESIGN APPROACH

The design of Network-on-chip (NOC) is base on Switching method, Topology and Routing algorithm.

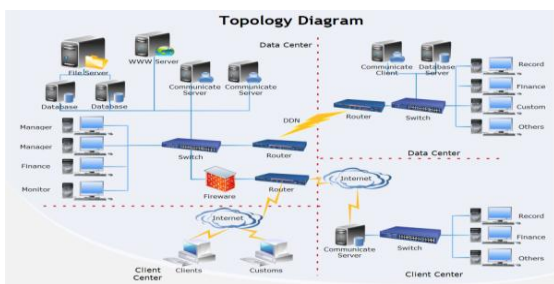
III. SWITCHING TECHNIQUE

There are two most important switch technique: course switching and container switching. Circuit switching establish a association between source and intention node either practically or in the flesh earlier than a significance is being transfer [2]. Major advantages of circuit switching are that there is no disagreement impediment during message diffusion and its performance is more conventional. In packet switching, messages are separated addicted to packet at the starting place node and

then send into a network. Packets move about by the side of a route resolute by the routing algorithm and pass through through a progression of network nodes and finally disembark at the objective node [2]. Packet switching is utilize in most of NOC platform because of its probable for providing instantaneous data announcement between many foundation-destination pairs. Packet switched networks can supplementary be confidential as Wormhole, Store and promote (S&F), and Virtual Cut through Switching (VCT) networks [2]. In Wormhole switching networks, only the description flutter experience latency. Other flits belong complete packet is blocked. It does not necessitate any buffer of the packet. Therefore, the sizes of the chip to the same packet simply follow the path taken by the description flit. If the header flit is blocked then the considerably reduce.

IV. TOPOLOGY

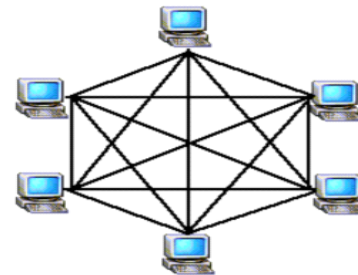
Topology is a very important feature in the design of NOC because design of a router depends upon it. Network topology determines the number of router to be connected, their channels and how connected [3] are. Different topologies are proposed for the design of NOC.



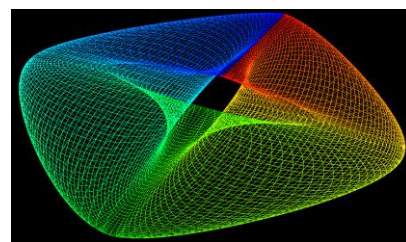
A. *Mesh*- Mesh topology is preferential by many investigate groups because of its layout good organization. It has good electrical possessions and can address the on-chip capital in a simple compartment. A mesh-fashioned network consists

of column c and n rows [4]. The routers are positioned in the intersection of the two wires and the computational possessions are near routers.

Mesh Topology

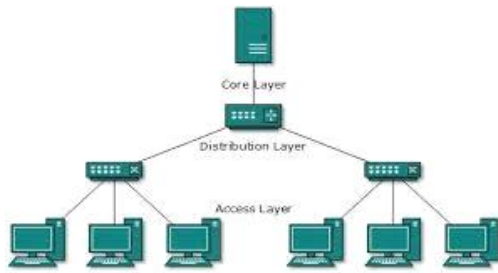


B. *Torus*- A Torus network is an superior description of fundamental mesh network. A simple torus network is a mesh in which the head of the column are associated to the tail of the columns and the left side of the rows are connected to the right sides of the rows [4]. The path assortment of torus is recovered than the mesh network, and it also has supplementary minimum routes.



V. Torus Topology

C. *Tree*- In a tree topology nodes are routers and plants are computational property. The routers higher than a leaf are called as leaf's relatives and in the same way the plants below the forerunner are its children.



Tree Topology

Butterfly- A butterfly network is unit- or bidirectional and butterfly-shaped network typically uses a deterministic routing. Packets arriving to the inputs on the left side of the network are routed to the correct output on the right side of the network.

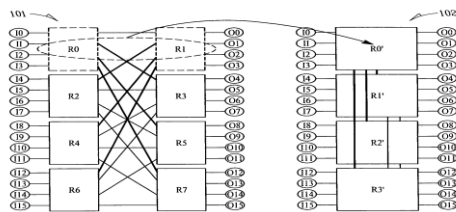


FIG. 1

BUTTERFLY TOPOLOGY

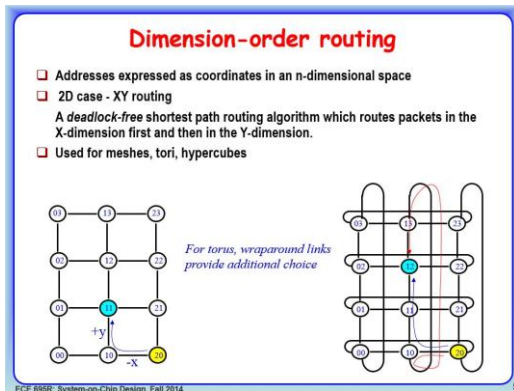
CI. ROUTING ALGORITHM IN NOC-

Routing algorithms are used to establish the progression of channels a message packet traverse from the starting place to the objective. In other words, routing algorithm establish which path a packet will takes from starting place router to destination router [6]. Different types of routing algorithm subsist in NOC, which are differentiate according to their key distinctiveness: If we think about the place where routing pronouncement is made they may be grouped as regional, source and scattered routing algorithm. If an algorithm is regional the path is chosen by a central regulator, if

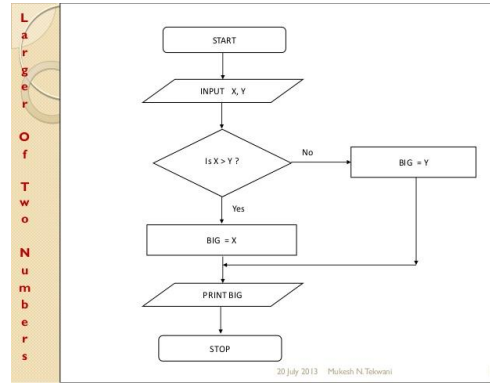
it is starting place the path is select by a source router preceding to a sending the packet, if it is circulated the path is chosen by an go-between routers [7]. If we believe how to choose a path routing algorithm are confidential as deterministic and adaptive algorithm. Deterministic algorithm does not take into relation the network condition before choosing a path from foundation to objective. In adaptive algorithm network load, interchange condition and information about obtainable output guide are always taken into contemplation. In this paper deterministic routing algorithm is see the sights in information and where it is use in NOC. As explained previous, deterministic routing algorithm route packet every time from position A to another position B along a variable path without taking into consideration network provision [8]. In blockage free network deterministic routing algorithm are consistent and have low latency. All actual time system use deterministic algorithm because packet achieve destination in correct order and so reorder is not compulsory. Deterministic routing algorithms are moderate algorithm because they forever choose straight path from resource to intention [6]. The negative aspect of deterministic routing algorithm is that network situation is not mull over, therefore, if the network is overcrowded and another packet is drive the whole network will not succeed.

CII. TYPES OF DETERMINISTIC ROUTING ALGORITHM

A. *Dimension-order-routing- (DOR) algorithm* is measured to be one of the most in style deterministic routing algorithms payable to its plainness for accomplishment and good presentation according to normal packet interruption and throughput metrics. The algorithms determine to what path packet are routed for the duration of every stage of the routing.



B. *XY Routing Algorithm-* XY routing is a measurement order routing which routes packets first in x- or horizontal way to the correct column and then in y- or vertical direction to the recipient. XY routing suit well on a network using mesh or torus topology. Addresses of the routers are their XY-coordinate. There are some problems in the long-established XY routing. The traffic does not pull out often over the whole network because the algorithm causes the biggest load in the central point of the network. There is a need for algorithms which equalize the traffic load more than the whole network.



C. *Pseudo Adaptive XY Routing-* Pseudo adaptive XY routing installation in deterministic or adaptive mode depending on the state of the network. The algorithm works in deterministic mode when the network is not or only slightly congested. When network become uncreative, the algorithm switch to the adaptive mode and starts to search routes that are not congested [6].

CIII. CONCLUSION

In this paper, we initiate the idea of network-on-chip as new model that replace system-on-chip (SOC), the significant design limitation in the direction of consider when designing network on chip: switch technique, topology and routing algorithm. We give details the various arrangement of routing algorithm and their personality. Deterministic routing algorithm as a simplex form of algorithm in network-on-chip due to hardware simplicity, low latency and simple routing logic, mostly all real time system use this routing algorithm because packet reach destination in correct order and reordering is not necessary. Deterministic routing is a greedy algorithm because it always chooses a shortest path to deliver a packet from source to destination.

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