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# A Review Paper on Different Switching Techniques in NOC Router Architecture

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***Abstract— Network-on-Chip (NoC) is nano scale packet switched networks. It is universal structure, which connects all functional units on the chip. It is an on-chip network having cores connected by switches, which were in turn connected among themselves by communication channels.***
***Main methods for transferring messages are circuit switching & packet switching. In circuit switching, a path is established before the packet is sent. When a circuit between source & destination has been established, the packet can be sent & any other communication on the allocated path is denied. In packet switching, a message is broken into packets that are transmitted through the network. It implies the use of switching mode. The most popular switching techniques are store & forward, WH & VCT.***

***Keywords— Network on–Chip, Virtual cut through switching, Wormhole switching***

## I. INTRODUCTION

In the NoC router has five input port and five output port. The port are local, east, west, north, south on these five input port packet transmission is done from source to destination. When all the input port are request for the same output port contention is occur to avoid this contention arbiter are used in NoC Router. In NoC Router different arbitration technique are used.

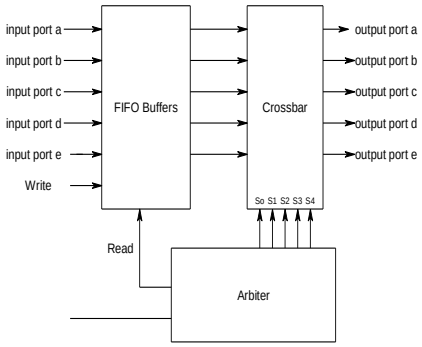


Fig. Block Diagram NoC Router

S. Kumar et al.[1] proposed Chip-Level Integration of Communicating Heterogeneous Elements-CLICHÉ architecture which implements 2-D mesh topology. The architecture consists of resources and routers that are connected using channels as a mesh so that they are able to communicate with each other by sending messages. Each router is connected to four other neighboring routers through input and output channels. The routers are provided with internal queues to handle congestion. Communication between the sources is implemented by passing messages over the mesh network. Resources operate synchronously with respect to each other. Synchronization is provided by synchronization primitives, which are implemented bypassing messages around the network. Even a non-local memory is accessed through message passing. The design is simple but it requires number routers. As point to point links are established between routers, the data transfer latency between any two resources is not constant.

## II. SWITCHING TECHNIQUES

Switching policy is another important parameter of NoC architectures. Switching policy determines the flow of data through routers in the network [2]. Figure 1.2 shows different types of switching techniques implemented in NoC architectures.in the network [2]. Figure 1.2 shows different types of switching techniques implemented in NoC architectures.

### *A. Circuit Switching*

In this technique the physical path is reserved between source and destination before transmission of data. The main advantage of circuit switching technique is once the path is reserved the data transfer latency gets reduced. Since a

 

dedicated link is established from source to destination, there is very low probability of packet loss. Circuit switching technique does not scale well with NoC size. Links are occupied for considerable amount of time.

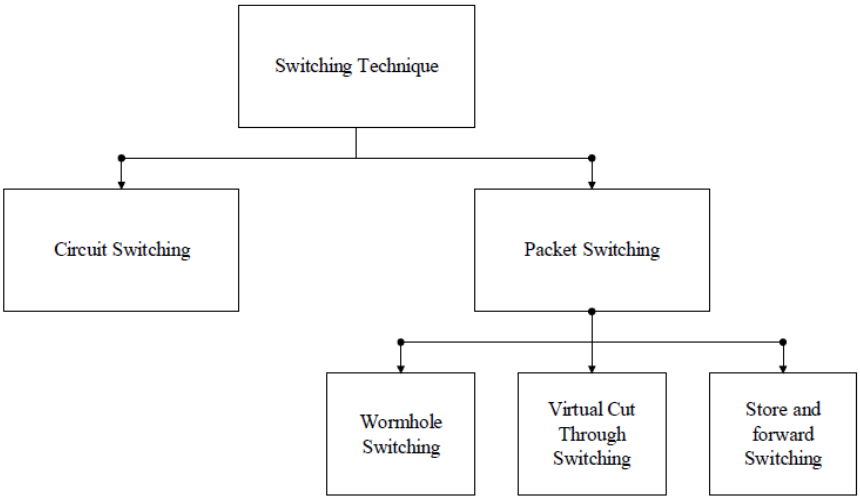


Figure 1.2 Switching Techniques in NoC

### *B. Packet Switching*

Packet switching is the most commonly used technique in NoC. In this technique packets are transmitted from the source and they make their way to the destination independently through different routers. Since packets are transferred to the destination through different routes a variable delay is introduced due to contention in router along packet path. Packet switching is further classified as

i] Wormhole Switching
ii] Store and Forward Switching and
iii] Virtual Cut-through Switching.

### *B.1 Wormhole Switching*

Wormhole switching is the most popular and well suited on chip. It splits the packets into several flits [1]. Due to this the buffer size can be reduced to size of flit instead of size of packet. This can reduce the complete size of the chip. The packet can therefore spread into several consecutive routers like a worm. In this switching technique only header flit takes some delay to decide the path. The remaining flits belonging the same packet simply follow the path taken by header flit. The main disadvantage of wormhole switching is, when header flit is blocked complete packet gets blocked. [2]. When a channel is blocked, the subsequent flits are buffered at their current router . This switching technique is more susceptible to deadlock due to dependencies between link.

### *B.2 Store and Forward Switching*

Store and forward switching forwards a packet only when there is enough space available in the receiving buffer to hold the entire packet. Thus, there is no need for dividing a packet into flits. This reduces the overhead, as it does not require circuits such as a flit builder, a flit decoder, a flit stripper and a flit sequencer. Nevertheless, such a switching technique requires a large amount of buffer space at each node [2].

### *B.3 Virtual Cut-through Switching*

In VCT switching, a packet is forwarded to the next router as soon as there is enough space to hold the packet. The VCT algorithm divides a packet into flits, which may be further divided into flits. Therefore, it has the same buffer requirement as Store & Forward. We have implemented store and forward switching technique in our design where the size of the buffer is equal to the packet size

## III. CONCLUSIONS

In This paper we propose that Different switching techniques are useful for the NoC Router Architecture.

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