www.ijecs.in
International Journal Of Engineering And Computer Science ISSN: 2319-7242
Volume 5 Issue 11 Nov. 2016, Page No. 19034-19036

Network Switching: Traditional Techniques and Evolution

Devid Sahu[1], Divyanshu Tiwari[2], Pranjali Singh[3], Ruchi Bhatt[4], Rajesh Singh Thakur[5]
BE students[123], Dept. of Computer Science, Government Engineering College Raipur, C.G.
devidsahu1207@gmail.com
divyanshu20.tiwari@gmail.com
pranjal0609@gmail.com
ruchi4bhatt@gmail.com
Asst. Professor[4], Dept. of Computer Science, Government Engineering College Raipur, C.G
rajeshthakurvicky@gmail.com

Abstract: Switching techniques defines when and how packets/messages are forwarded through the network. The aim of the paper is to evaluate and establish a comprehensive view of different switching techniques. The main objective of the paper is to bring out the drawbacks and possible solutions to tackle them. Different switching techniques are used in different networks, each having its own advantage and disadvantage. Networking is a crucial area of research and a lot development has been made. We do not mean to give complete solutions to the disadvantages of different switching techniques, rather we intended to show an overview of all switching techniques along with their disadvantages.

Keywords: Switching Techniques, Packets, Messages

1. INTRODUCTION:

The growing use of smartphone, tablets, wearable, and other mobile device has accelerated the development of mobile network to a great extent. Nowadays networking is common amongst everyone as mobile communication network has reached nearly every corner of the world, internet being the most popular network has also increased the importance of network in day to day life of a person. Hence proper functioning of these networks is crucial activity to the end user and a standard (QoS) must be maintained. Whenever communicating parties or users wants to communicate with each other, both the party uses network as a medium, the network in turn is responsible for transmission of right data to the right party. For the efficient transmission of the right data to the right user, network uses various techniques to carry out this whole operation, one of which is "Switching Technique". Switching defines when and how the packets are forwarded to the network, so that it may reach its actual destination. Circuit switching and Packet switching are the two popular switching techniques.

2. Generic Router Model

A Generic Router Model Switching techniques are understood in the context of routers used in multiprocessor interconnection networks. A simple generic router architecture is illustrated in Figure 1, a generic router has four components [1] –

- Input Ports
- Output Ports
- A switching fabric
- A routing processor

This router microarchitecture presents to messages a four stage pipeline comprised of the following stages.

- Input Buffering (IB): Received message data is stored in input buffers.
- Route Computation (RC) and Switch Allocation (SA): Destination of the message is check and on the basis of that a switch port is computed, requested and allocated.
- Switch Traversal (ST): Message data traverses the switch to the output buffer.
- Link Traversal (LT): The message data reaches the next router by traversing the link.

The end-to-end latency experienced by a message depends on how the switching techniques interact with this pipeline.

DOI: 10.18535/ijecs/v5i11.56

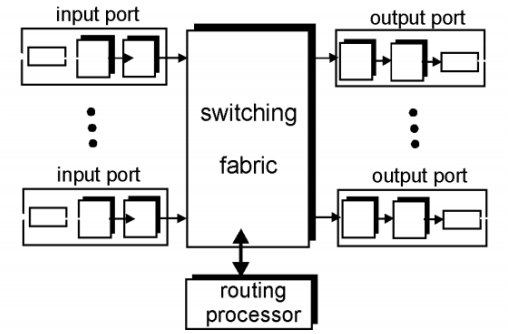
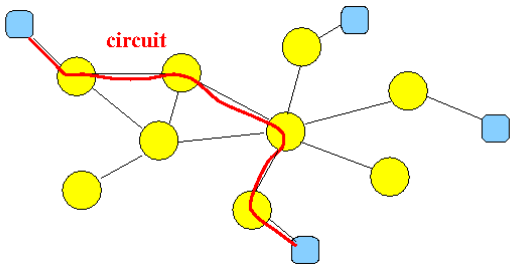


Figure 1: A Generic Router Architecture

3. Basic Switching Techniques

Following are the switching techniques used in today's world-

3.1 Circuit Switching: Circuit switching is a method of implementing a telecommunications network in which two network node establishes a dedicated communications channel (circuit) through the network before the nodes may communicate. The circuit guarantees full bandwidth of the channel and remains connected for the duration of the communication session. The circuit functions as if the nodes were physically connected as with an electrical circuit [2]. Circuit switching evolved from early implementations in telephone switching networks.

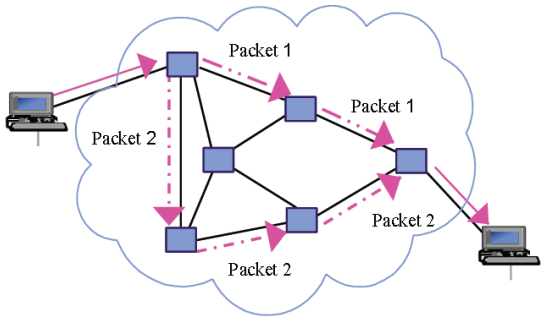


Circuit switching is advantageous when the messages to be sent are infrequent and long compared to the circuit formed. Circuit switching offers minimum delays and the packets which are sent to the receiver need not to be routed and are not blocked in the network. The disadvantages are the same as those associated with reservation-based protocols. When links and switch ports are reserved for a duration this reservation of resources prevents other packet request from making progress. In particular, other packets can be blocked during circuit set up while waiting for another circuit to be released. The links reserved for packet transmission are up to that point that it can similarly prevent other circuits from being established.

3.2 Packet Switching:

Packet switching is a digital networking communications method that groups all transmitted data into packets which are blocks of data obtained by dividing a single message, these packets are transmitted via a medium that may be shared by multiple communication sessions. Packet switching results in increased network efficiency, robustness.

Packets are composed of a header and payload. Header contains information (address) about the destination node or receiver of the packets, this information is utilized by networking hardware to route the packet to its destination, where the payload is extracted and used by application software. [3]



Compare to circuit switching technique, packet switching is more efficient when small packets are to be transmitted. Since resources are not reserved, advantage of this switching technique are high link utilization and network throughput.

3.3 **Virtual Cut Through Switching:** Virtual cut-through (VCT) switching is an optimization of packet switching where in the absence of congestion, packet transfer is pipelined. Like the preceding techniques, VCT has its genesis in packet data networks. [4] Flow control is still at the packet level. However, packet transfer is overlapped with flow control and routing operations as follows. Routing can begin as soon as the header bytes of a packet have arrived at the input buffer and before the rest of the packet has been received. When congestion is absent, switch allocation and switch traversal can proceed and the forwarding of the packet through the switch as well as flow control requests to the next router can begin. Thus packet transfer can be pipelined through multiple routers.

3.4 **Wormhole Switching**: Wormhole switching evolved as a small buffer optimization of virtual cut-through where packets were pipelined through routers. The buffers in each router had enough storage for several flits. When a packet header blocks, the message occupies buffers in several routers. When it was introduced, the pipelined behavior of this switching technique resulted in relatively large reductions in message latency at low loads. Further gains derived from the fact that messages were not ejected from the network for storage. The use of small buffers also has two physical consequences. First, smaller buffers lead to

lower access latency and shorter pipeline stage time. The disadvantage of wormhole switching is that the blocked messages hold physical resources.

3.5 **Virtual Channel:** An important interconnection architecture function is the use of virtual channel flow control [4]. Each unidirectional virtual channel across a physical link is realized by an independently managed pair of message buffers. Multiple virtual channels are multiplexed across the physical link which results in increased link utilization and network throughput. Importantly, routing constraints on the use of virtual channels is commonly used to ensure deadlock freedom. The use of virtual channels decouples message flows from the physical links and their use is orthogonal to operation of switching techniques. Each switching technique is now employed to regulate the flow of packet data within a virtual channel while constraints on virtual channel usage may govern routing decisions at intermediate routers. The micro architecture pipeline of the routers now includes an additional stage for virtual channel allocation. Virtual channels have been found to be particularly useful for optimizing the performance of wormhole-switched routers ameliorating the consequences of blocking and thus broadening the scope of application of wormhole switching.

4. CONCLUSION:

Circuit switching and Packet switching are the traditional techniques used for switching in a network, however new techniques such as Virtual cut through, Wormhole switching and Virtual channels are being introduced to overcome the drawbacks of the traditional techniques.

5. FUTURE SCOPE:

There is always a room for improvement. As the network usage is increasing drastically, research to improve the efficiency of the network is also being promoted, various attempts to combine the traditional switching techniques has been made in order to gain the advantages of both the techniques. Network switching techniques will always be a hot topic for research and will continue to develop.

REFERENCES:

[1] Sanjeev Kayath Prof. Ashfaq Khokhar "Network Router Architecture: A survey"

[2] https://en.wikipedia.org/wiki/Circuit_switching

[3] https://en.wikipedia.org/wiki/Packet_switching

[4] Kermani, P. and L. Kleinrock, "Virtual Cut-Through: A new computer communication switching technique," Computer Networks, vol. 3, no. 4, pp. 267-286, September 1979.

[5] W. J. Dally, "Virtual-channel flow control," IEEE Transactions on Parallel and Distributed Systems, vol. 3, no. 2, pp. 194–205, March 1992.