Packet Switching refers to protocols in which messages are broken up into small packets before they are sent. Each packet is transmitted individually across the net and may even follow different routes to the destination. Thus, each packet has header information about the source, destination, packet numbering etc. At the destination, the packets are reassembled into the original message. Most modern Wide Area Networks (WANs) protocols, such as TCP/IP, X.25 and Frame Relay are based on packet switching technologies.

Packet switching’s main difference from Circuit Switching is that the communication lines are not dedicated to passing messages from the source to the destination. In Packet Switching, different messages (and even different packets) can pass through different routes, and when there is a “dead time” in the communication between the source and the destination, the lines can be used by other routers.

Circuit Switching is ideal when data must be transmitted quickly, must arrive in sequencing order and at a constant arrival rate. Thus, when transmitting real time data, such as audio and video, Circuit Switching networks will be used. Packet Switching is more efficient and robust for data that is bursty in its nature and can withstand delays in transmission, such as e-mail messages, and Web pages.
Two basic approaches are common to Packet Switching:

- Virtual Circuit Packet Switching
- Datagram Switching

**Virtual Circuit Packet Switching Networks**

An initial setup phase is used to set up a route between the intermediate nodes for all the packets passed during the session between the two end nodes. In each intermediate node, an entry is registered in a table to indicate the route for the connection that has been set up. Thus, packets passed through this route can have short headers, containing only a virtual circuit identifier (VCI) and not their destination. Each intermediate node passes the packets according to the information that was stored in it in the setup phase.

In this way, packets arrive at the destination in the correct sequence and it is guaranteed that essentially there will not be errors. This approach is slower than Circuit Switching, since different virtual circuits may complete over the same resources and an initial setup phase is needed to initiate the circuit. As in Circuit Switching, if an intermediate node fails, all virtual circuits that pass through it are lost.

The most common forms of Virtual Circuit networks are X.25 and Frame Relay, which are commonly used for public data networks (PDN).

**Datagram Packet Switching Networks**

This approach uses a different, more dynamic scheme to determine the route through the network links. Each packet is treated as an independent entity and its header contains full information about the destination of the packet. The intermediate nodes examine the header of the packet and decide to which node the packet has to be sent, so that it will reach its destination. In the decision two factors are taken into account:

- The shortest way to pass the packet to its destination - protocols such as RIP/OSPF is used to determine the shortest path to the destination.
- Finding a free node to pass the packet to - in this way, bottle necks are eliminated, since packets can reach the destination in alternate routes.

Thus, in this method, the packets don’t follow a pre-established route, and the intermediate nodes (the routers) don’t have pre-defined knowledge of the routes that the packets should be passed through. Packets can follow different routes to the destination, and delivery is not guaranteed (although packets usually do follow the same route, and are reliably sent). Due to the nature of this method, the packets can reach the destination in a different order than they were sent, thus they must be sorted at the destination to form the original message. This approach is time consuming, since every router has to decide where to send each packet.

Packet switching is similar to message switching using short messages. Any message exceeding a network-defined maximum length is broken up into shorter units, known as packets, for transmission; the packets, each with an associated header are then transmitted individually through the network. The fundamental difference in packet communication is that the data is formed into packets with a pre-defined header format (i.e. PCI), and well-known “idle” patterns which are used to occupy the link when there is no data to be communicated.

Packet network equipment discards the “idle” patterns between packets and processes the entire packet as one piece of data. The equipment examines the packet header information (PCI) and then either removes the header (in an end system) or forwards the packet to another system. If the out-going link is not available, then the packet is placed in a queue until the link becomes
free. A packet network is formed by links which connect packet network equipment.

There are two important benefits from packet switching.

1. The first and most important benefit is that since packets are short, the communication links between the nodes are only allocated to transferring a single message for a short period of time while transmitting each packet. Longer messages require a series of packets to be sent, but do not require the link to be dedicated between the transmission of each packet. The implication is that packets belonging to other messages may be sent between the packets of the message being sent from A to D. This provides a much fairer sharing of the resources of each of the links.

2. Another benefit of packet switching is known as “pipelining”. Pipelining is visible in the figure above. At the time packet 1 is sent from B to C, packet 2 is sent from A to B; packet 1 is sent from C to D while packet 2 is sent from B to C and packet 3 is sent from A to B and so forth. This simultaneous use of communications links represents a gain in efficiency. The total delay for transmission across a packet network may be considerably less than for message switching, despite the inclusion of a header in each packet rather than in each message.

Dax Product Offering:
Some of the Dax products that support “Packet Switching” are as under:

DX-508PS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx508ps.asp

DX-5016PS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5016ps.asp

DX-5024PS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5024ps.asp

DX-5016DS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5016ds.asp

DX-5016eS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5016es.asp

DX-5024eS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5024es.asp

DX-5016VS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5016vs.asp

DX-5024VS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5024vs.asp

DX-508MS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx508ms.asp

DX-5026MF:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5026mf.asp

Dax Megastack:
https://www.daxnetworks.com/Dax/Products/switch_asp/dxmgstck.asp

DX-5044GS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5044gs.asp

DX-5026eG:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5026eg.asp

DX-5016GS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5016gs.asp

DX-5024GS:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5024gs.asp

DX-5726GT:
https://www.daxnetworks.com/Dax/Products/switch_asp/dx5726gt.asp

DX-5744GS:
For complete Dax Product information, please visit: https://www.daxnetworks.com/PFF.htm

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