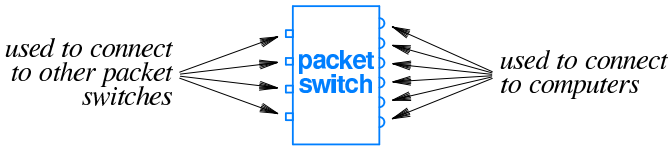
WAN
Ch. 18

Packet Switches

LANs broadcast on a shared medium.

WANs use point-to-point connections between switches.

Switches have multiple connections.
Packets arrive on one, and are sent out on an interface chosen by the switch.

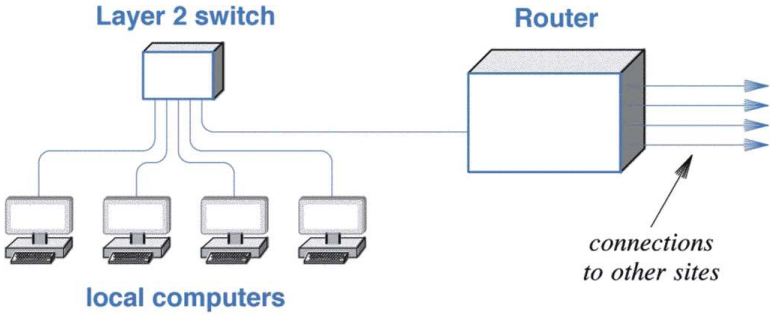


Store-and-forward.

Nowadays More Like This

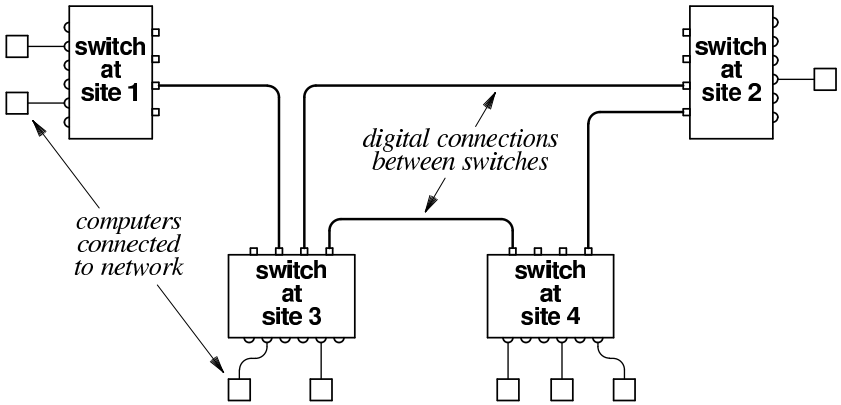
Packet switches predate LANS.
Early ones contained host connections.

Presently, use a LAN connection.



Building A WAN

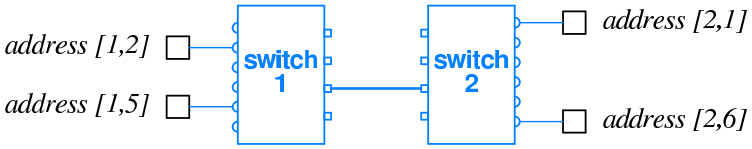
Computers are connected through switches.



Routing

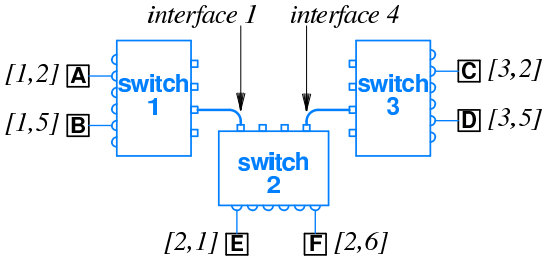
Links are point-to-point.
Each one can carry a separate communication.

Addresses have two parts.
Computers on one switch share the first part.



Unless sending to a directly-attached computer, a router can choose the output interface by only the prefix.

Next-Hop Forwarding



(a)

destination	next hop
[1,2]	interface 1
[1,5]	interface 1
[3,2]	interface 4
[3,5]	interface 4
[2,1]	computer E
[2,6]	computer F

(b)

Routing Tables

Each router retains a routing table.

Sends packets based on destination.

Source does not effect routing.

Hierarchical routing allows all but the final router to ignore the specific destination.

Default routes simplify tables of simple routers.

Next Hop

Each switch must contain a next-hop for each destination.

There may be more than one way to send each packet.

Router should use the best choice.

Best route determined by a form of Dijkstra's Algorithm.

Distance Vector Routing

Each link is assigned a weight representing its speed or capacity.

The cost of a path is the sum of its links.

Each router knows the cost of each adjacent link.

Each router keeps a table of destinations and best known distances.

Each router periodically sends the contents of this table to its neighbors.

Distance Vector Routing Update

When router r hears that the best cost to destination v from its neighbor n is c, it:

- Computes the cost from r to v through n: $c' = c_{r,n} + c$, where $c_{r,n}$ the cost to reach n.
- If v was not previously in the table, enter a route to it through n with cost c'.
- If the existing route to v goes through n, update its cost to c'.
- If the existing route to v does not go through n and has a cost higher than c', replace it with the route through n and cost c'.

Link-State Routing

Each router knows the whole graph.

Messages give only the status of links: up or down.

Any cost information must be known locally.

Routers recompute their tables with the appropriate links added or removed.

Sources

Comer, *Computer Networks and Internets*
(Our beloved textbook.)