

Interconnection devices

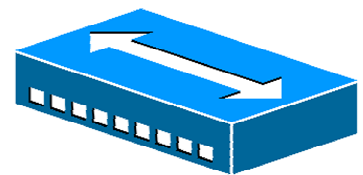
Repeater

A repeater connects buses to form longer buses. It does this by regenerating signals as they pass through. Because this introduces a time delay, the Ethernet specification allows only four repeaters on an elongated bus.

Repeaters were used for 10base-5 and 10base-2 but are rarely required nowadays.

Hub

A hub is a bus inside a box, allowing a number of PCs to be connected to the bus. There are two kinds: *passive* (direct connection to the bus) and *active* (each connection is regenerated to improve signal quality).



Hubs are used with 10base-T, 100base-TX, 1000base-T and 1000base-FX networks.

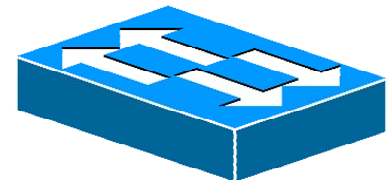
Bridge

Buses slow down as more PCs are added because collisions increase. A bridge breaks the network into two *segments*, allowing each segment to act as an independent bus. This reduces collisions and speeds up the network.

When a signal needs to travel to a PC on the other side of the bridge, the bridge passes the signal through to the other bus. Bridges are rarely required nowadays because they have been made redundant by *switching hubs*.

Switch

A switching hub (commonly called a 'switch') is a combination of hub and bridge technology. It breaks the internal bus into *microsegments*, allowing many connections to exist simultaneously.



This removes the possibility of collisions — thus switches allow bus networks to run at high speed under heavy data traffic, and with a large number of PCs attached.

As their popularity has increased the price of switches has dropped, and they have replaced hubs in most 10base-T, 100base-TX, 1000base-T and 1000base-FX networks.



Switches can also connect PCs that are communicating at different speeds on different media. You can buy 10/100base-T switches, or 100base-T/1000base-FX models.

Router

Routers connect networks together. They direct traffic between networks by examining the destination IP address of data packets.



They communicate with nearby routers by using *routing protocols* to determine the best network to pass packets to. This allows them to redirect traffic away from broken routers, faulty connections or overloaded connections.



Routers are found on larger LAN networks and as the main interconnection device for WAN networks. The Internet relies on a series of routers to pass information around the planet.

Routers may be dedicated boxes of electronics, or a PC with two or more network cards running routing software.

NAT routers

A NAT (Network Address Translation) router sends data packets to the Internet on behalf of other computers. They are commonly used to allow networks to access the Internet through a single connection. Examples include broadband *ADSL routers* (which also function as hubs or switches) or the *proxy servers* used by Southport College.

Gateway

Protocols are the rules used for communication on a network. All PCs on a network must understand the protocols used, otherwise they cannot communicate effectively.

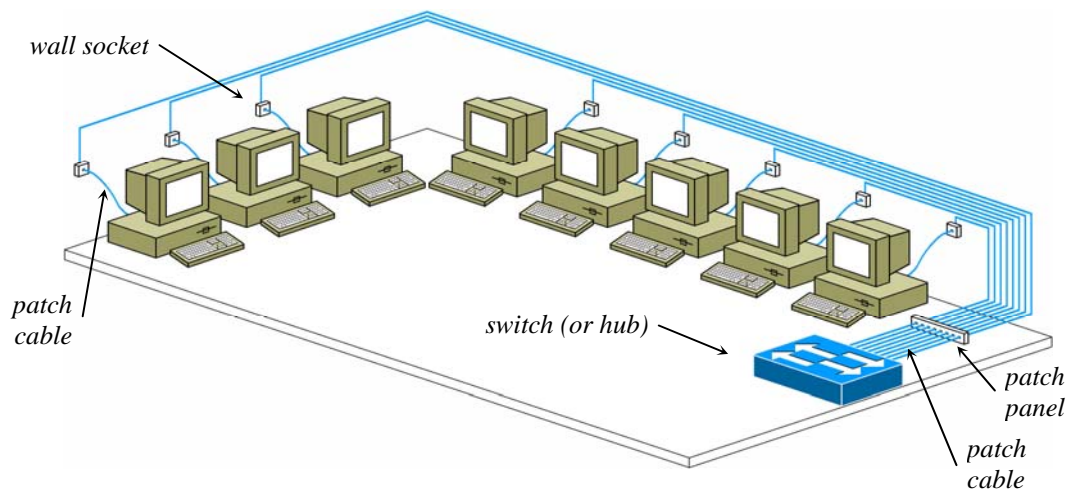
A gateway translates the protocols of one network to another, allowing different types of network to be interconnected. For example, a gateway will allow a token ring network using TCP/IP protocols to connect to an Ethernet network using Novell IPX/SPX protocols.

Network design

Most modern LANs use Ethernet designs, utilising a combination of 100base-TX and 100base-FX. This is cost-effective and flexible, mostly because it requires similar tools and fixtures to telephone cabling.

Horizontal cabling

PCs within a room or across a floor are connected to a central hub or switch.

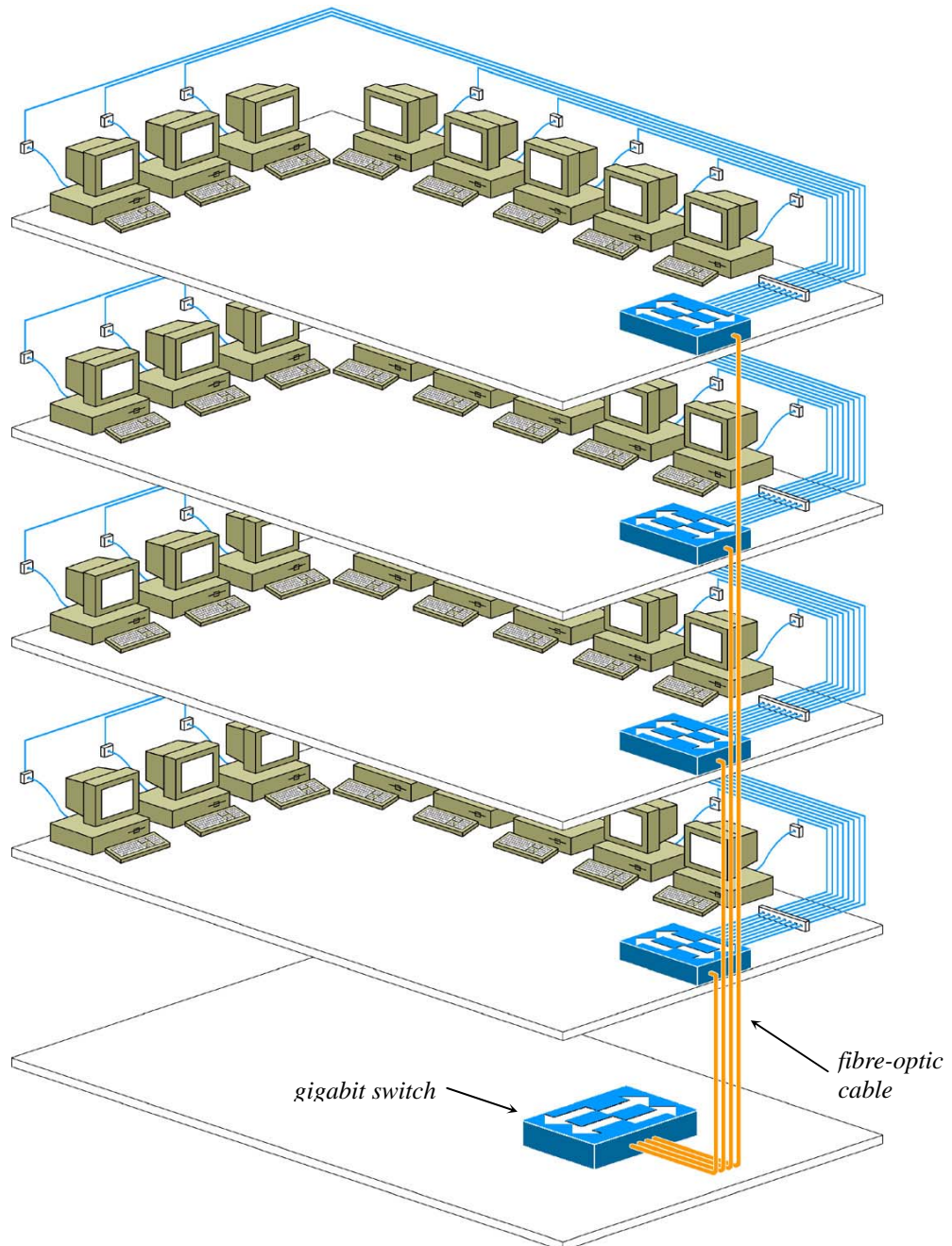


The PCs connect to the wall with a short Cat5 *patch cable*. From the socket, the connection continues through Cat5 cable to a wiring closet, sometimes placed in another room.

Inside the wiring closet, the cables are terminated at a *patch panel*, which allows each cable to be connected to the switch or hub.

Vertical cabling

Floors are each connected to a master switch by fibre-optic cables. This switch is referred-to as a gigabit switch because it runs at 1000 Mbps (1 Gbps).



The switch and its cables form the *backbone* of the expanded star network. Because the backbone commonly runs vertically it is known as 'vertical cabling', but the cables are still called 'vertical cabling' even if the backbone cables run horizontally from place to place.