**Unicast**

Unicast is the term used to describe communication where a piece of information is sent from one point to another point. In this case there is just one sender, and one receiver.

Unicast transmission, in which a packet is sent from a single source to a specified destination, is still the predominant form of transmission on LANs and within the Internet. All LANs (e.g. [Ethernet](http://www.erg.abdn.ac.uk/users/gorry/course/lan-pages/enet.html)) and [IP networks](http://www.erg.abdn.ac.uk/users/gorry/course/inet-pages/ip.html) support the unicast transfer mode, and most users are familiar with the standard unicast applications (e.g. http, smtp, ftp and telnet) which employ the [TCP](http://www.erg.abdn.ac.uk/users/gorry/course/inet-pages/tcp.html) transport protocol.

**Broadcast**

Broadcast is the term used to describe communication where a piece of information is sent from one point to all other points. In this case there is just one sender, but the information is sent to all connected receivers.

Broadcast transmission is supported on most LANs (e.g. [Ethernet](http://www.erg.abdn.ac.uk/users/gorry/course/lan-pages/enet.html)), and may be used to send the same message to all computers on the LAN (e.g. the [address resolution protocol (arp)](http://www.erg.abdn.ac.uk/users/gorry/course/inet-pages/icmp.html) uses this to send an address resolution query to all computers on a LAN). Network layer protocols (such as [IPv4](http://www.erg.abdn.ac.uk/users/gorry/course/inet-pages/ip.html)) also support a form of broadcast that allows the same packet to be sent to every system in a logical network (in IPv4 this consists of the IP network ID and an all 1's host number).

**Multicast**

Multicast is the term used to describe communication where a piece of information is sent from one or more points to a set of other points. In this case there is may be one or more senders, and the information is distributed to a set of receivers (theer may be no receivers, or any other number of receivers).

One example of an application which may use multicast is a video server sending out networked TV channels. Simultaneous delivery of high quality video to each of a large number of delivery platforms will exhaust the capability of even a high bandwidth network with a powerful video clip server. This poses a major salability issue for applications which required sustained high bandwidth. One way to significantly ease scaling to larger groups of clients is to employ multicast networking.

Multicasting is the networking technique of delivering the same packet simultaneously to a group of clients. [IP](http://www.erg.abdn.ac.uk/users/gorry/course/inet-pages/ip.html) multicast provides dynamic many-to-many connectivity between a set of senders (at least 1) and a group of receivers. The format of IP multicast packets is identical to that of unicast packets and is distinguished only by the use of a special class of destination address ([class D IPv4 address](http://www.erg.abdn.ac.uk/users/gorry/course/inet-pages/ip-address.html)) which denotes a specific multicast group. Since [TCP](http://www.erg.abdn.ac.uk/users/gorry/course/inet-pages/tcp.html) supports only the unicast mode, multicast applications must use the [UDP](http://www.erg.abdn.ac.uk/users/gorry/course/inet-pages/udp.html) transport protocol.

Unlike broadcast transmission (which is used on some local area networks), multicast clients receive a stream of packets only if they have previously elect to do so (by joining the specific multicast group address). Membership of a group is dynamic and controlled by the receivers (in turn informed by the local client applications). The routers in a multicast network learn which sub-networks have active clients for each multicast group and attempt to minimise the transmission of packets across parts of the network for which there are no active clients.

The multicast mode is useful if a group of clients require a common set of data at the same time, or when the clients are able to receive and store (cache) common data until needed. Where there is a common need for the same data required by a group of clients, multicast transmission may provide significant bandwidth savings (up to 1/N of the bandwidth compared to N separate unicast clients).

The majority of installed LANs (e.g. [Ethernet](http://www.erg.abdn.ac.uk/users/gorry/course/lan-pages/enet.html)) are able to support the multicast transmission mode. Shared LANs (using hubs/repeaters) inherently support multicast, since all packets reach all [network interface cards](http://www.erg.abdn.ac.uk/users/gorry/course/lan-pages/nic.html) connected to the LAN. The earliest LAN network interface cards had no specific support for multicast and introduced a big performance penalty by forcing the adaptor to receive all packets (promiscuous mode) and perform software filtering to remove all unwanted packets. Most modern network interface cards implement a set of multicast filters, relieving the host of the burden of performing excessive software filtering.

**Ethernet MAC Address**

The [Ethernet](http://www.erg.abdn.ac.uk/users/gorry/course/lan-pages/enet.html) network uses two hardware addresses which identify the source and destination of each frame sent by the Ethernet. The MAC destination address (all 1 s) is used to identify a broadcast packet (sent to all connected computers in a broadcast domain) or a multicast packet (lsb of 1st byte=1) (received by a selected group of computers).

The hardware address is also known as the [Medium Access Control (MAC)](http://www.erg.abdn.ac.uk/users/gorry/course/lan-pages/mac.html) address, in reference to the IEEE 802.x series of standards that define Ethernet. Each computer [network interface card](http://www.erg.abdn.ac.uk/users/gorry/course/lan-pages/nic.html) is allocated a globally unique 6 byte address when the factory manufactures the card (stored in a PROM). This is the normal source address used by an interface. A computer sends all packets which it creates with its own hardware source address, and receives all packets which match its hardware address or the broadcast address. When configured to use multicast, a selection of multicast hardware addresses may also be received.