



ETHERNET CHANNEL

CSMA/CD

Name/ Ahmed Samir Hassanen

ID / 19

EtherChannel in Computer Network:

EtherChannel is a port link aggregation technology in which multiple physical port links are grouped into one logical link. It is used to provide high-speed links and redundancy. A maximum of 8 links can be aggregated to form a single logical link.

An EtherChannel can be created from between two and eight active Fast, Gigabit or 10-Gigabit Ethernet ports, with an additional one to eight inactive (failover) ports which become active as the other active ports fail. EtherChannel is primarily used in the backbone network, but can also be used to connect end user machines.

EtherChannel technology was invented by Kalpana in the early 1990s. Kalpana was acquired by Cisco Systems in 1994. In 2000, the IEEE passed 802.3ad, which is an open standard version of EtherChannel.

Using an EtherChannel has numerous advantages, and probably the most desirable aspect is the bandwidth. Using the maximum of 8 active ports a total bandwidth of 800 Mbit/s, 8 Gbit/s or 80 Gbit/s is possible depending on port speed. This assumes there is a traffic mixture, as those speeds do not apply to a single application only. It can be used with Ethernet running on twisted pair wiring, single-mode and multimode fiber.

Components:

EtherChannel is made up of the following key elements:

Ethernet links — EtherChannel works over links defined by the IEEE 802.3 standard, including all sub-standards. All links in a single EtherChannel must be the same speed.

Compatible hardware — the entire line of Cisco Catalyst switches as well as Cisco IOS software-based routers support EtherChannel. Configuring an EtherChannel between a switch and a computer requires support built into the operating system; FreeBSD, for example, supports EtherChannel via LACP. Multiple Ether Channels per device are supported; the number depends on the type of equipment. Catalyst 6500 and 6000 switches support a maximum of 64 Ether Channels.

Configuration — an EtherChannel must be configured using the Cisco IOS on switches and router, and using specific drivers when connecting a server. There are two main ways an EtherChannel can be set up. The first is by manually issuing a command on each port of the device that is part of the EtherChannel. This must be done for the corresponding ports on both sides of the EtherChannel. The second way is using Cisco Port Aggregation Protocol (PAgP) for the automated aggregation of Ethernet ports.

CSMA/CD Protocol:

CSMA/CD stands for Carrier Sense Multiple Access / Collision Detection. In CSMA/CD, the range of collision occurrence is 0 to PT (Propagation Time) and the range of collision detection is 0 to $2 \times PT$.

The CSMA/CD protocol functions somewhat like a dinner party in a dark room. Everyone around the table must listen for a period of quiet before speaking (Carrier Sense). Once a space occurs everyone has an equal chance to say something (Multiple Access). If two people start talking at the same instant they detect that fact, and quit speaking (Collision Detection.)

To translate this into Ethernet terms, each interface must wait until there is no signal on the channel, then it can begin transmitting. If some other interface is transmitting there will be a signal on the channel, which is called carrier. All other interfaces must wait until carrier ceases before trying to transmit, and this process is called Carrier Sense.

All Ethernet interfaces are equal in their ability to send frames onto the network. No one gets a higher priority than anyone else, and democracy reigns. This is what is meant by Multiple Access. Since signals take a finite time to travel from one end of an Ethernet system to the other, the first bits of a transmitted frame do not reach all parts of the network simultaneously. Therefore, it's possible for two interfaces to sense that the network is idle and to start transmitting their frames simultaneously. When this happens, the

Ethernet system has a way to sense the "collision" of signals and to stop the transmission and resend the frames. This is called Collision Detect.

The CSMA/CD protocol is designed to provide fair access to the shared channel so that all stations get a chance to use the network. After every packet transmission all stations use the CSMA/CD protocol to determine which station gets to use the Ethernet channel next.