

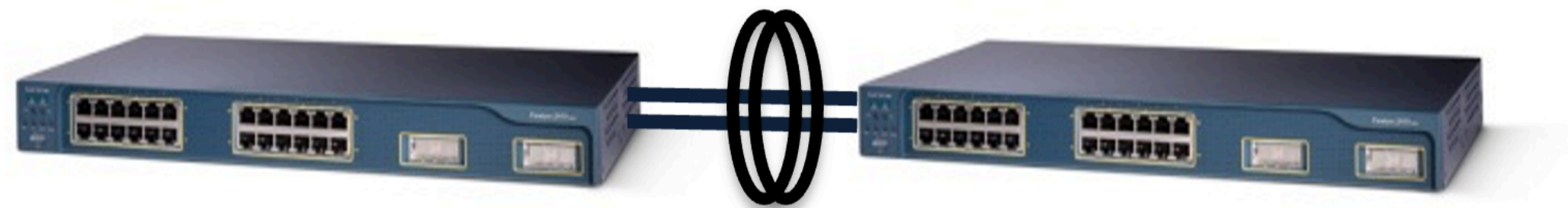


# Etherchannel

Etherchannel will bundle multiple links into one logical link. Up to 8 ports can be in an Etherchannel – they are controlled under a port-channel interface. Any change that is made to the port-channel will also make the change on the participating ports. Some servers have the capability to run Etherchannel as well. All commands in this document are Cisco IOS.

Ports in an Etherchannel must all have the same:

- Access VLAN or trunk configuration
- Native VLAN (if trunk)
- Speed
- Duplex
- STP Settings



## Traffic Distribution

Traffic is distributed across the individual links in an Etherchannel by performing a hash function to arrive at binary number. This binary number will correspond to a link. The hash algorithm can use bits from the following fields to arrive at this number:

- Source/Destination IP
- Source/Destination MAC
- Layer 4 ports
- Combination of the above

If only one field is used to determine the distribution (e.g. dst-ip), the algorithm uses the lower order bits of the hash to determine the individual link to forward the traffic over. If more than one is used, the algorithm will XOR the lower order bits of the hash for each field.

The number of lower order bits to use depends on how many ports are in the Etherchannel

**2 ports = 1 low order bit (e.g. 0 or 1)**

**3-4 ports = 2 lower order bits (e.g. 00, 01, 10 or 11)**

**5-8 ports = 3 lower order bits (e.g. 000, 001, 010 ...)**

Configure the field to use for distribution using the global configuration command `port-channel load-balance <type> mode` and verify using `show etherchannel load-balance`



# PAGP

## Cisco Proprietary - Port Aggregation Protocol

Negotiation packets are sent every 30 seconds. The formation of the Etherchannel will depend on the configuration of the ports on either side....

Port 1 mode	Port 2 mode	Etherchannel Formed?
On	On	Yes
Off	On/Desirable/Auto	No
Desirable	Auto/Desirable	Yes
Auto**	Auto/On	No

\* Negotiation Packets are not sent  
\*\* This is the default

**Silent submode:** allows ports to be added to an Etherchannel *even if* the other end of the link is silent and does not transmit PAGP packets. On by default. This allows the formation of an Etherchannel to something that does not participate in PAGP (e.g. a server). If you expect to see a switch on the other end use the `non-silent` command on the end of the `channel-group` command to turn this mode off.

### Config

```
Switch(config)# interface fa0/1
Switch(config-if)# channel-group pagp
Switch(config-if)# channel-group <number> mode <mode> [non-silent]
Switch(config-if)# exit
Switch(config)# interface port-channel <number>
Switch(config-if)# ... regular interface configuration goes here
```

# LACP

## Industry Standard 802.3ad - Link Aggregation Control Protocol

Like PAGP the formation of the Etherchannel depends on port configurations...

Port 1 mode	Port 2 mode	Etherchannel Formed?
On*	On	Yes
Off	On/Active/Passive	No
Active	Active/Passive	Yes
Passive**	Passive/On	No

\* Negotiation Packets are not sent  
\*\* This is the default

Each switch has a System ID and each port has a Port ID constructed as follows...

**System ID = System Priority (2 bytes) + MAC (6 bytes)**  
**Port ID = Port Priority (2 bytes) + Port Number (2 bytes)**

Unlike PAGP, LACP allows some ports to be in standby mode in case a port that is in the Etherchannel fails. The switch with lowest System ID makes the decisions about what ports are active in the Etherchannel. The ports with the lower port ID will be preferred. Up to 16 ports can be in an Etherchannel – 8 active, 8 standby.

Up to 16 ports can be added to a port channel but only 8 can be active. The switch with the lower System ID determines which ports are active. The ports with the lower Port IDs are the ones that are made active. The others are put into standby.

### Config

```
Switch(config)# lacp system-priority <priority>
Switch(config)# interface fa0/1
Switch(config-if)# channel-group lacp
Switch(config-if)# channel-group <number> mode <mode>
Switch(config-if)# lacp port-priority
Switch(config-if)# exit
Switch(config)# interface port-channel <number>
Switch(config-if)# ... regular interface configuration goes here
```

# Verification

Command	Verification
<code>show etherchannel summary</code>	Shows the current status of each port that is part of the Etherchannel
<code>show etherchannel port</code>	Shows more verbose view of the current status of each port that is part of the Etherchannel
<code>show etherchannel port-channel</code>	Shows similar view of port but includes timestamps of etherchannel changes and the load-balance port index that is used by the hash algorithm.
<code>show etherchannel detail</code>	Gives verbose output about the status of the Etherchannel.
<code>show etherchannel load-balance</code>	Shows what load balancing algorithm is used.
<code>show {lacp pagp} neighbor</code>	Shows the neighbor that is on each port for the relevant protocol.
<code>show lacp system-id</code>	Displays the LACP System ID