

Networking



Networking Implementation

2.3.2 - Ethernet Port Configurations

What are the different ethernet port configurations and how do they differ?

Overview

Given a scenario, the student will be able to configure and deploy common Ethernet switching features.

Grade Level(s)

10, 11, 12

Cyber Connections

- Threats & Vulnerabilities
- Networks & Internet
- Hardware & Software

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Teacher Notes:

CompTIA N10-008 Network+ Objectives

Objective 2.3

- Given a scenario, configure and deploy common Ethernet switching features
 - Port configurations
 - Port tagging/802.1Q
 - Port aggregation
 - Link Aggregation Control Protocol (LACP)
 - Duplex
 - Speed
 - Flow control
 - Port mirroring
 - Port security
 - Jumbo frames
 - Auto-medium-dependent interface crossover (MDI-X)

Ethernet Port Configurations

Port Tagging

Port tagging, or more commonly known as IEEE 802.1Q is a standard method of frame tagging. This works by inserting a field into the frame to identify the VLAN. 802.1Q is the only option if we want to trunk between a Cisco switched link and another brand of switch. The main purpose of 802.1Q is to provide inter-switch VLAN communication. VLAN 1 is the default native VLAN which allows the trunks to accept information received without any VLAN identification or frame tag.

PAgP/LACP

There are two port channel negotiation protocols to choose, the Cisco version called *Port Aggregation Protocol (PAgP)* and the IEEE version called *Link Aggregation Control Protocol (LACP)*. LACP is the name of the IEEE 802.3ad standard.

PAgP helps with the creation of EtherChannel links. All links in the bundle must have the same parameters. Once PAgP identifies matched links, it groups them into an EtherChannel.

Teacher Notes:

This group is added to STP as a single bridge port. From here, PAgP sends packets every 30 seconds to manage the link for consistency. LACP does the same but is nonproprietary so it can work between multivendor networks.

Duplex and Speed

Two factors of the “parameters” mentioned above are *speed* and *duplex*. Speed refers to the speed of the Ethernet link which can be 10 Mbps, 100 Mbps, 1 Gbps, or 10 Gbps. The duplex will be set to either half or full. Half-duplex means data can only be transmitted in one direction. Full-duplex can be simultaneously transmit and receive information.

Flow Control

We never know how fast or slow Ethernet traffic will be. If a device gets too busy, there needs to be some way to tell other devices to slow down. The pause frame, IEEE 802.3x, is a popular *flow control* method to help manage Ethernet traffic. It gets its name because it will literally pause traffic, allowing for devices to catch up and not overwhelm any buffers.

Port Mirroring and Security

At some point in IT, you need to capture packets. Sometimes it can be difficult to get these packets from a network. One common way is to use a physical tap. You would disconnect the existing link, put the tap in the middle, and now you can see all the traffic moving across that single connection. An active tap allows you to switch between different connections and provide a boost in signal as the traffic passes through. A passive tap “cuts” the signal and sends a piece to your analysis tool.

There is a software-based version of a tap called a *port mirror*, a port redirection, or a switched port analyzer (SPAN). This is built into your network switches so you plug an analysis device into the switch and send a copy of the traffic to your analysis tool. There are limitations based on what your switch can handle and the bandwidth you send to the analysis tool.

Port Security is used to secure a network. This works by preventing unknown devices from forwarding packets. Port security implements two traffic filtering methods, dynamic locking and static locking.

Teacher Notes:

We can use port security to restrict input to an interface by identifying and limiting MAC addresses of workstations. If we assign a secure MAC address to a secure port, the port will not forward packets with source addresses outside of a predefined group of addresses.

Jumbo Frames

Jumbo frames are Ethernet frames that have at least 1500 bytes of payload. If a frame has more than 9000 bytes of payload, overhead and CPU cycles may be reduced. Because of this, it may be advisable to enable jumbo frames to improve performance in high-speed networks.

MDI-X

A medium-dependent interface (MDI) describes the physical and electrical/optical interfaces in a network from a physical layer implementation to the physical medium used to carry a transmission. An MDI crossover (MDI-X) interface can be defined by Ethernet over twisted pair. The way an *Auto MDI-X* works on newer network interfaces is by detecting if the connection requires a crossover and automatically chooses the MDI or MDI-X configuration that appropriately matches the other end of the link. This removes the need for crossover cables to interconnect switches.