Networking

Networking Implementation

2.2.2 - Bandwidth Management

What is bandwidth management and how does it help a network?

Overview
The student will compare and contrast routing technologies and bandwidth management concepts

Grade Level(s)
10, 11, 12

Cyber Connections
- **Threats & Vulnerabilities**
- **Networks & Internet**
- **Hardware & Software**

CYBER.ORG

Bandwidth Management

Network Optimization

There will never be a network that cannot be optimized further, whether that is in regard to hardware improving speeds, software improving algorithms, etc. Optimization includes splitting up network segments, offloading work from one server to another, shutting down unnecessary services, and upgrading outdated hardware. In a perfect world, there would be unlimited bandwidth, but that will never happen, so we need a way to manage the resources we have.

Quality of service (QoS) refers to a set of technologies responsible for maintaining high-priority applications and traffic under limited network capacity. There are five problems that can affect data as it traverses a network: Delay, Dropped Packets, Error, Jitter, and Out-of-Order Delivery. Because data can run into congested lines or take a less optimal route to its destination, QoS should be implemented to prioritize delay-sensitive traffic. If the buffers of a router are full, packets will be dropped. In reaction, some applications will request packets be retransmitted if they were expecting a packet and didn't receive one. Packets could be corrupted during transit, arriving in an unacceptable format, requiring retransmission, and resulting in delays. For programs that communicate in real time, there may be variation in packet delay causing issues. The final issue, as the name implies, occurs when packets are received out of order. Users will probably notice degradation of an application's quality.

Teacher Notes:

Traffic shaping (or packet shaping) is another form of bandwidth optimization required for the Network+ exam. This works by delaying specific packets if they meet a certain criteria to guarantee usable bandwidth for other applications. Traffic shaping uses two features, bandwidth throttling and rate limiting which ensure data streams do not send too much data at once and control the rate that traffic is sent respectively. Delayed packets are stored in a FIFO (first in, first out) buffer until they are allowed to proceed, much like cars at a traffic light/stop sign.

CYB≡R.ORG
THE ACADEMIC INITIATIVE OF THE CYBER INNOVATION CENTER