

Abbreviated Outline-Adding in the Internet to your Local Area Network (Lecture 6)

Broadband (DSL/Cable) setup and theory @ <http://santacruzblues.net/giip/broadband>

I. Brief DSL/Cable physical installation and authentication overview

- a. What connects where
- b. Is it working yet? And other discoveries involving a solid green light
- c. Setting up your router to authenticate to the DSL/Cable service provider. Set it and forget it. Right.

II. IP, TCP, UDP: How these networking protocols carry data across the internet.

- a. IP, the INTERNET PROTOCOL. Responsible for the path that data takes to get from endpoint to endpoint. How is this accomplished? IP addressing, routing.
- b. TCP, UDP-responsible for the flow of information along this path created by IP. TCP, UDP run on top of IP addressing.
- c. If your IP address is your physical address, 1156 High St, Santa Cruz, CA, then TCP and UDP are individual doors on your house.
- d. Moving along on this wonderful house analogy, each door, or port, is used for a specific service.
- e. Businesses have a special door for VIP persons, UPS packages, and the general public. Computers have specific ports for specific services.
- d. When running Windows 95/98/ME/2000/XP, you have a lot of open doors, by default.

An example:

Your computer requests a web page from Microsoft.com.

For simplicity's sake, let's assume that your computer knows how to reach Microsoft.com across the internet. Because your computer is requesting a **web page** from Microsoft.com, it fires off a message to Microsoft.com, AND it specifies what PORT, or door, to use once it gets to Microsoft. As you can guess from the size of Microsoft, it has a lot of doors.

The initial request you send to Microsoft is called a SYN packet, which is the first in a three part process in establishing a connection with Microsoft to get that web page.

What happens next? Microsoft sends you back a response. It doesn't send you back the web page you asked for yet, it sends you back a SYN/ACK packet, which is an acknowledgement that it got your request.

Finally, your computer sends Microsoft an ACK packet, which is an acknowledgement that your computer received the SYN/ACK packet from Microsoft.

From this point on, your computer has established a connection with the Microsoft.com web server on port 80, and actual data, in this case a web page, can now be transmitted to your computer.

The preceding example is what happens when using the TCP protocol to communicate information across the internet. TCP is used to transfer web pages, which by far will always be on port 80. TCP provides a high degree of reliability—a connection with the remote host is established before any data is transmitted. If any data is not received at either end, the data is resent. The opening sequence, SYN, SYN/ACK, ACK is called a three-way handshake.

UDP is the other protocol that runs over the Internet to transmit and receive data. It does not use a three way handshake. It passively sends or receives data from the appropriate host on the appropriate port.

Why? Imagine transmitting a web page to a remote computer. If part of the transmission got lost along the way to your computer, you'd want it the information to be resent—otherwise, you'd have a partially loaded web page. This is why web pages are always sent using TCP.

Now imagine streaming audio. If part of the transmission got lost, you'd hear a glurp, or silence. There'd be no use in going back and resending that information, because the audio stream would be coming in to your computer at real time.

And now, a practical demonstration about how this works on a router, and why the Sasser virus spread so quickly.