# LOCAL AREA NETWORKING: AMES CENTERWIDE NETWORK

Edwin Price

## WHAT IS A COMPUTER NETWORK TO THE USER?

A computer network can benefit the user by making his/her work quicker and easier. A computer network is made up of seven different layers with the lowest being the hardware, the top being the user, and the middle being the software.

The base for computer networks is the hardware, which for Ames Centerwide local area network (LAN) is the Ethernet. The Ethernet in its simple form is a yellow coaxial cable which carries information from one computer to another. The next level up is the software. This is the level that allows the user to perform different functions by using protocols such as DECNET, TCP/IP, XNS, CHAOSNET, and 3SERVER. With these protocols the user is able to send or receive mail, perform remote logon, do file transfer, and do supercomputer job submission.

The first of these tasks, sending and receiving mail, gives the user the ability to talk to any other user on the same net or beyond. The next task, remote logon, gives the user the ability to logon to to any other computer that is tapped into the same Ethernet. This function is useful when a user wants to utilize certain capabilities of another computer. File transfer is another option. File transfer is helpful when two people are working on a project and want to save it under one file, or if they want to see in what direction their partner's writing is going. The final task that the software performs is supercomputer job submission. This is used when a user wants to benefit from the abilities of a bigger and faster computer without leaving his/her own local computer.

The top level of this system is the user himself/herself. With all this help from his/her local terminal the user is able to do many different tasks without leaving his/her desk.

## ETHERNET

Ethernet consists of information passing through a yellow coaxial cable that runs through a building from one host (computer) to another. With the right software the Ethernet can be used to share information, or to gain access to another computer. The Ethernet carries the information between users in the form of packets. A packet is a series of on and off pulses which are divided into six segments: the preamble, the source (where the packet is being sent from), the destination (where the packet is being sent to), the type/length, the data or actual information being sent, and the CRC or amount of error. There is a limit in using Ethernet cable because the maximum distance the electronic signals can travel is 500 meters (1500 ft).

The Ethernet cable is only useful if a user can get information on and off the cable. In order to get the electronic signals off the Ethernet a person needs to tap into the cable with a transceiver. The two simplest ways of tapping into a cable are by using a vampire tap, or by using N connectors. Vampire taps are made by drilling a hole in the cable and placing into the cable a probe which picks up the electronic signal being sent. N-connector taps are made by cutting through the cable and placing N connectors on the ends, which then plug into both sides of the transceiver. Once a transceiver has been placed on the Ethernet, it becomes a translator by changing broadband signals traveling on the Ethernet into digital signals which go out on drop cables.

## REGIONAL ETHERNET

It is helpful to set up a stable regional Ethernet because it extends the range of an Ethernet segment from 500m to 2800m. It is also important to set up a regional Ethernet because the ideal state would be to have all computers communicating with each other. In order to set up a regional Ethernet the engineer must find a way to send information from one building to another. Due to the distance limitation of the Ethernet, one way to connect Ethernets in two separate buildings is by setting up a remote repeater link.

A remote repeater link is created in order to pass packets from one Ethernet segment to another. Here at NASA Ames the connection is made through fiber-optic cable. Fiber-optic cable is made up to tiny glass strands, 50 millionths of an inch thick. Four benefits of using fiber-optic cable are that it transmits low-powered light, it is not disturbed by outdoor factors, it is secure and does not decay due to weathering, and it has the ability to support more bandwidths than other cables.

Now that there are remote repeater links going from one building to other surrounding buildings, the central building has become a hub. A hub and its surrounding buildings take the form of a wheel with all the spokes meeting at a center building. Once a hub has been set up the next step is to connect it to an already existing hub. Connection can be made by another remote repeater link, but the problem with making this link is that remote repeaters have no filters. Information being sent from one building to another on the same hub gets sent over the link to the other hubs, congesting the whole network with unnecessary traffic. Another problem with remote repeater links is that they can only transmit up to 1000 meters between any two machines, and the distances between many buildings at Ames is much greater.

## APPLITEK BACKBONE

The Applitek Backbone can be used to solve both the traffic- and distance-limitation problems. Having a backbone connected to the network would almost be ideal because it puts gates at the entrance/exit of all hubs, but it still does not solve the problem of transmitting unwanted information throughout a single hub.

The gates the backbone uses are like checkpoints which check the packets for their destination. If the packet needs to be sent to another hub, Applitek checks it for destination and error. If the packet is correct the backbone transmits it. If the destination is local, then Applitek ignores it because the packet can be delivered by Ethernet.

The biggest benefit of using a backbone is that once it is connected, distance is not a factor. The backbone can transmit up to 30 miles on cable or by microwave. This concept opens up many possibilities. Not only is it easier to set up an efficient centerwide network, but the ultimate goal of having all computers communicating with each other, like the worldwide telephone system, is now in reach.