Building a Macintosh Ethernet Network

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Let's face it, setting up a network of personal computers can be intimidating. Those given the task rarely jump at the chance unless they are keen on self-punishment. But some computers are, in fact, much easier to network than others.

The Apple Macintosh is a good example of a machine that is easy to network. For example, when Apple designed the first Mac in 1984, its goal was to provide an easy-to-use computer that everyone could understand — "the computer for the rest of us," they called it.

One of the things that made the Macintosh so easy compared to the IBM PC was its built-in networking capabilities. The communications software, called AppleTalk, came already installed as part of the system. The networking hardware, called LocalTalk, was also built into every Macintosh and printer that Apple made.

Connecting a Macintosh to a LocalTalk network is easy. It involves taking the Macintosh from its box and plugging in the network cabling. The appropriate AppleTalk communications software for file sharing and printing is already installed with the system software. The same process on a Windows or MS-DOS-based machine would involve at least five times the number of steps. Networking just comes naturally to the Macintosh.

LocalTalk is still available today on every Macintosh that Apple makes, but it is not the only easy-to-use networking option available to Macintosh users. Companies of all sizes throughout the world are migrating to a faster networking system called Ethernet. Several vendors including Dayna, Farallon, and Asante, provide easy-to-use Ethernet products for the Macintosh designed to be just as easy to set up and use as LocalTalk.

You may be wondering about Ethernet for your network. "What is Ethernet?" "Do I need to switch to Ethernet?" "What do I need to know to make the switch?" To help answer those questions, here are a few important facts to keep in mind when considering your networking options.

Fact 1: LocalTalk's data transmission rate is slow. LocalTalk is much like a two-lane highway — as long as there is not much traffic, things move along quite smoothly. But once traffic increases, things can get bogged down — quickly. LocalTalk is ideal for networking a few Macs and printers but the rate at which it can transmit

data (about 230,000 bits per second) can be limiting once your network begins to grow.

Fact 2: Ethernet can transmit data up to 40 times faster than LocalTalk. Ethernet is more like a motorway. Its increased data rate of 10 million o flow around the network without slowing things down. Consequently, many companies with growing networks and more powerful Macintosh computers are making the switch to Ethernet.

Fact 3: Your network users can help you decide if you should switch to Ethernet. The best way to determine whether to switch is to listen to the people using your network. Are they complaining that the network is slow and seems to be getting worse? Does it take several minutes to print a document? Do people complain about how long it takes to get into their e-mail services? How has the network changed over time? Are there more than 10 users? Have you added more powerful systems such as Quadras? Are people copying large graphics files or opening databases across the network? If you suspect that your company's Macintosh network system is getting bogged down, you may be ready to make the move to Ethernet.

When planning an Ethernet network, you should first determine how many Macintoshes, printers, and other devices you will have on the network and sketch the physical layout. Next, find out how many people require access to the network, what their needs will be (printing, e-mail, file sharing, and so on), and what size files will be transmitted over it. You will also need to consider cabling barriers within your office building. Some buildings are already wired with voice and data grade twisted-pair copper wiring which can be used for both Ethernet cabling and telephone wiring. Others are not. You will need to evaluate your building, the physical barriers within it, and the location of people within the office. Once you have determined the answers to these questions, you are ready to decide which of three different Ethernet cabling types will be most beneficial for your network.

Ethernet Cabling Types

There are three different Ethernet cable types, all with names only an engineer could love. The first numeric portion of the name is equal to the bandwidth in megabits per second (in this case, 10), followed by "broad" or "base" which identifies the type of system, followed by the medium used or the maximum segment length in meters.

10BASE-T: Twisted pair cable that looks much like standard phone wiring — could be a simple, inexpensive Ethernet solution. It uses plug-in plastic RJ-45 connectors, much like telephone connectors. It is used in segments of up to 50m.

Thin Ethernet (or 10BASE-2): This is flexible, usually black coaxial cable that lets you transmit data over longer distances than 10BASE-T (200m). It uses locking metal BNC connectors.

Thick Ethernet (or 10BASE-5): This is usually a heavy, yellow, inflexible coaxial cable that can transmit in segments of up to 500m — typically used as a backbone or main data path for very large networks.

Fact 4: Knowing set up requirements and necessary network devices can help you build a more efficient Ethernet network. If you decide to use 10BASE-T, each of the devices on the network will need its own wired connection to a central unit called a hub. Each device connects to the hub like spokes on a wheel, in what is called a "star topology." This lets you build a highly reliable network. If any device on the network has a problem and goes down, the rest of the network remains unaffected because the data is transmitted through the central hub instead of through each of the devices.

If your building is not wired for 10BASE-T, you can set up an Ethernet network using thin Ethernet coaxial cable. Thin Ethernet is also well suited to larger networks because data can be transmitted over distances longer than 10BASE-T. Each of the devices on a thin Ethernet network is connected to a backbone of 10BASE-2 coaxial cabling. This backbone acts much like a pipeline

with T-connectors connecting each of the devices along the line. Thin Ethernet does not require a hub in order to transmit data; data is sent down the pipeline to each f the devices until it reaches its destination. If any of the devices along the line goes down, however, the rest of the network may be affected.

Thick Ethernet, because of its inflexibility and the fact that it can be run in segment lengths of 500m, is almost exclusively used as a backbone in large networks. Very often, thin Ethernet or 10BASE-T cables are run from the backbone to the individual workgroups or departments within a company.

Fact 5: You will need to understand the difference between Macintosh bus architectures and what type of Ethernet adapter each Macintosh will require. Each Macintosh on the network will require an Ethernet adapter, so a basic knowledge of the internal bus architectures of the various Macintosh models can be helpful in setting up the network:

There are four basic Macintosh bus architectures:

• **NuBus:** For the Macintosh II family such as the Mac ii, IIci, IIcx, IIfx Performa, and Centris.
• **The SE PDS (Processor Direct Slot):** For the Macintosh SE.
• **The si PDS:** For the Macintosh IIsi and SE/30 family of computers.

Other Macintosh models such as the Plus and PowerBook line of computers require external Ethernet adapters, since they do not have internal bus slots. These external adapters are designed to connect through either the SCSI port, or the serial (printer) port of the Macintosh.

Many Macintoshes today such as the Quadra family, the new Power Macintosh line, and the Powerbook 500 series have built-in Ethernet, so they do not require and Ethernet adapter. They do, however, require a special transceiver that plugs into the Apple Ethernet port so they can be connected to Ethernet cabling. Several companies today manufacture these types of transceivers.

Most manufacturers of Ethernet adapters

such as Dayna, Farallon and Asante design their products with multiple media ports, which means they support all three types of Ethernet cabling: 10BASE-T, thin, and thick Ethernet. This provides extra flexibility for users who are not sure what type of network they will be setting up, or if they want to change wiring types as their network grows.

Making the move to Ethernet is not as painful as it might first seem. Here is a checklist of steps that can help you design and implement a high-speed Macintosh Ethernet network guaranteed to keep your data flowing and your users happy:

1. Evaluate the needs of your network. Remember that LocalTalk is much slower than Ethernet. If your LocalTalk network is bogged down, consider the needs of the people your network serves, then plan to switch to Ethernet.

2. Plan your Ethernet network before making any purchasing decisions. Determine how many Macintoshes, printers, and other devices will be on the network. Consider its physical setup, the people that use it, and the amount of traffic it will have. Also consider cabling barriers within your building.

3 Decide which of three Ethernet cabling types to use. Depending on the physical limitations of your building or the size of your network, decide between 10BASE-T, thin (10BASE-2), or thick (10BASE-5) Ethernet cabling.

4. Become familiar with the setup requirements and necessary network devices of the type of Ethernet network you are building. If you decide to use 10BASE-T remember that each device on the network will need a connection to a hub. Be sure to purchase enough hubs to provide a port for each device. Each device on a 10BASE-T network will be configured in a star topology.

5. Become familiar with Macintosh bus architectures. Learn what type of bus architecture each of the Macintosh computers is equipped with. Be sure each Macintosh on the network has an Ethernet adapter, either internal or external

depending on the type of Mac it is. If the Macintosh has built-in Ethernet, be sure it has an external transceiver for connection to the network cable.

6. Be sure that other devices on the network, such as printers, have an Ethernet connection. Most LocalTalk printers do not come equipped with built-in Ethernet. You can connect these printers and other LocalTalk devices to the network using bridges.

Conclusion

As a network grows, other devices are used to help keep it functioning properly such as routers, and stackable hubs. You can add these devices to the network as your Ethernet network becomes more sophisticated, for increased performance and functionality. Once you learn a few basic facts about the advantages of both LocalTalk and Ethernet you will be well on your way to building an effective Ethernet network.

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