

Equipping Your Office p3



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Connectivity is the key to an efficient office. It wasn't that long ago when the only way to transfer data from one computer to another was by loading the data from the first computer on a floppy disk, walking to the second computer and copying from the diskette ... we called it SneakerNet. Today SneakerNet has been replaced by a number of much more powerful and efficient alternatives, although the thumb drive has replaced the floppy disk and extended its life.

There are two parts of connectivity – the network (e.g. the sneaker clad human) that provides the bridge between two systems and the software protocols (e.g. loading/copying the diskette) that perform the required translations.

Wired LAN to WAN Connections

As the saying goes, "no man is an island," and lack of connectivity to the Internet would bring most businesses to a halt. From the perspective of your office, the Internet is the Wide Area Network (WAN). The computers and peripherals in your office are connected via a Local Area Network (LAN) which is tied to the Internet WAN by utilizing the services of an Internet Service Provider (ISP). There are a number of methods used by these companies to join your LAN to the Internet WAN. Here are the common wired options:

- Digital Subscriber Line (DSL) - the data signal piggybacks on an analog copper phone line; data throughput ranges from 256 Kbps to 10 Mbps limited by the distance between your office and the central office (CO) or local switch; offered by your local telephone company.
- Cable Modem – data flows through a coaxial cable; the Data Over Cable Service Interface Specification (DOCSIS) throughput is 38 Mbps download and 9 Mbps upload (our local provider, Charter, is pushing 75 Mbps); this bandwidth is shared with other subscribers so their activity will reduce your effective bandwidth; there are also security implications to sharing a network.
- Leased line (T-1 or DS1) - dedicated (not shared) high-performance circuit with 24 channels of 64 Kbps; each channel can be allocated to voice or data; with all data channels the data rate is 1.5

Mbps; data lines are symmetric, meaning that their upload and download data rates are the same; service providers allow purchase of less channels, known as fractional T-1.

- Fiber-To-The-Premises (FTTP) - an optical cable transports the data; AT&T U-verse service can deliver 24 Mbps download and 3 Mbps upload. Integrated Service Digital Network (ISDN) – superseded by DSL, this service uses a phone line to deliver two 64 Kbps channels (compared with the T-1s 24 channels); main application is video conferencing.
- Dial-up – a transient connection using a modem to transport data over an existing phone line; maximum 56 Kbps under ideal conditions.

With the exception of the T-1, the upstream data flow (you to the Internet) is typically significantly slower than the downstream (from the Internet to you) rate. This becomes an issue when you upload a large size file. Since most of the time we are downloading web pages and documents, more bandwidth is allocated to the downstream data flow.

The Wireless Option – how many Gs?

The cell phone network has evolved from its origins of providing voice communications to offer data services. They have marketed these advancements through the "G technology" lingo with a new generation appearing every ten years. Let's trace this history using the time required to download a three-minute MP3 encoded song (5MB; 10% overhead) as a relative speed measure:

- 0G (zero generation, 1946) - analog pre cellular VHF radio system linked to the public switched telephone network
- 1G (first generation, 1981) - analog cellular
- 2G (second generation, 1992) - digital/PCS; 9.6 Kbps (76 minutes song download)
- 3G (third generation, 2001) - spread spectrum transmission; multimedia smartphones and computers; 384 kbps (two minute song download) to 2 Mbps (21 second song download).
- 4G (fourth generation, 2011) - IP packet-switched; 100 Mbps (one second song download).
- 5G (fifth generation, 2020) – under development.

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The data rates stated previously are for mobile users with significantly higher rates available for stationary users. This connectivity option is evolving as more than a mobile (in the field) approach as data rates increase and costs fall.

Living on the Edge

At the interface between your LAN and WAN is an edge device, typically a boundary router. In a small office environment a single unit can perform the switching, routing, and firewall functions that controls the access between your office network (LAN) and the Internet (WAN). This device is often the least expensive (\$100), but most important element of your network as it controls security, quality of service, accessibility, and distribution. The DSL or cable modem functionality is often included.

A router forwards data packets across computer networks using an internal routing table to determine which packets go where and when. This simple design can result in the following benefits:

- Switching – each computer, printer, scanner, etc. on your local network is connected to your router which relays their data between them.
- Firewall – access to specific ports and websites can be restricted, which limits what your people can access; access from outside your office is similarly limited; the rules can be very complex restricting or allowing only certain IP addresses.
- Quality of service (QoS) – When a series of voice packets arrive at the same time, data packets from a large download, is it first come first served or does one have priority over the other? The rules can pick favorites and make sure your conversation is not interrupted.
- Masquerading – You can make devices on your LAN disappear or look like something else by translating packets according to rules in the routing table. The geeks call this NATing (Network Address Translation).

The local network

As with the WAN connection, there are both wired and wireless approaches to connecting your office devices. The most reliable method is to provide wired network connections wherever you anticipate computer equipment. Although category 5 (CAT-5) cable rated for 100 Mbps is plenty fast from most office

environments, category 5e (CAT-5e, 350 Mbps) or category 6 (CAT-6, 550/1000 Mbps) is recommended since the incremental cable cost (versus the labor) is generally small.

Interference and metal walls can wreak havoc with wireless networks, but improved technology and lower costs make this an attractive approach particularly in a transitory environment.

Some of the wireless protocols in use today:

- Wireless Fidelity (Wi-Fi) – connect computers and peripherals at ranges up to 300 feet built on IEEE 802.11 standards: 802.11g (54 Mbps) and 802.11n (300 Mbps).
- Bluetooth – short range audio and data transmission with three power levels providing ranges of 3 feet, 30 feet, and 300 feet at data rates of 700 Kbps (version 1.2) and 2.1 Mbps (version 2.0).
- Wireless USB – replace interconnecting cables with data rates of 480 Mbps (10 feet) and 110 Mbps (30 feet).

Dynamic or Static Address?

One of the considerations in selecting how your office is connected to the Internet is whether your connection is assigned a permanent (static) or a different (dynamic) IP address each time your link is established. Most ISPs will provide a static address as part of the service or for a small monthly charge.

As security requirements are increased, you will most likely be asked by your screening or electronic payments vendor to provide them with a static IP address. They will associate this address with your account and not accept any network traffic unless it originates from this specific address. This presents some challenges with mobile devices which will be discussed in a future article.

In Closing

The arrival of faster and cost-effective wireless network options is very enabling for the mobile nature of the property management business. The traditional barriers (reliability, security, etc.) that gave cabled solutions the edge are being broken down. Meanwhile, hybrid solutions like SneakerNet live on 😊.



When outfitting your office, your computers and peripherals are just the start of the many technologies to consider.