Chapter 8 *Networking & Hardware*

Objectives:

In this chapter we will discuss aspects of the physical portion, or hardware, of a GIS. As you already know, a GIS is comprised not only of digital data and software to manipulate it, but also the hardware which stores the data and executes the software. CPU's, hard disks, optical storage devices, tape backups, graphic and textual displays, output devices and so on collectively make up the hardware portion of a GIS.

Decisions regarding what types of hardware will be acquired for developing a GIS are crucial to the installation's success. Knowing your hardware requirements (as well as software requirements) can help to develop a system which best serves your needs.

One specific consideration involves data sharing between computers which is accomplished via a network. Networking provides a means of moving data across a room, a campus, or the nation using coaxial cable, phone lines and perhaps even radio frequency transmissions. Understanding the basic operations of a networking system can help you avoid duplication, speed the transferring of files between computers and open another world of electronic communication.

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At the end of this chapter you should be able to:

1. Describe the layering concept of a network protocol an the movement of data through the various layers.

2. Understand the various output devices available with in GRASS.

3. Define the following terms:

    - Peripheral
    - LAN, CAN, WAN
    -

Hardware:

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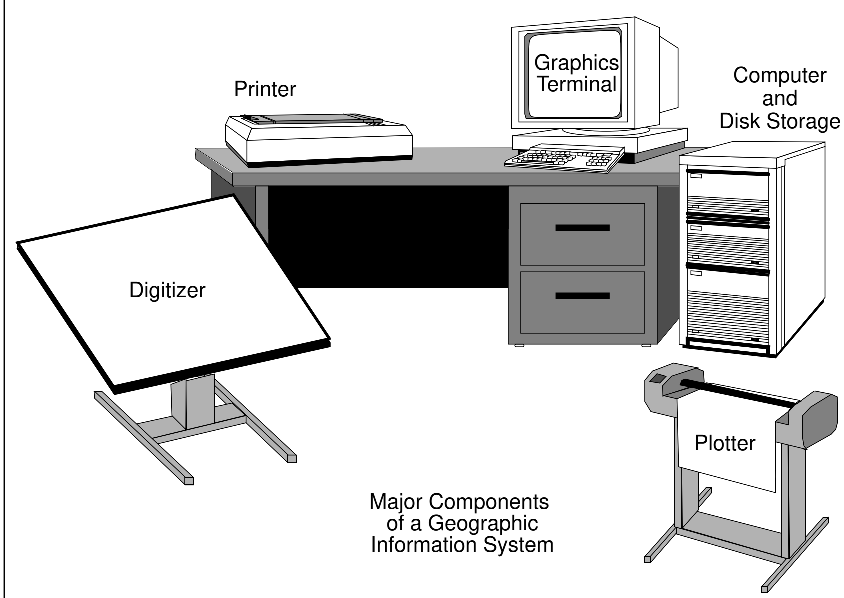
Computers, as you may well know, come in all shapes, sizes and functionalities. They range in size and price from relatively inexpensive notebook sized personal computers to more expensive desktop pc's and workstations and on to mini-mainframes and full-blown mainframe systems possibly costing several million dollars. Each of these types of computers has its advantages.

The hardware of a GIS can be grouped into two general categories, the computer itself and the peripherals attached to or accessible by it. Standard configurations for a computer include a central processing unit (CPU) which usually includes a disk storage device, and a display device which is either a text or graphic display.Peripherals are then digitizers, plotters, and printers.

For a GIS, several components are common. Usually they include:

- Computer / Hard Disk
- Graphics Terminal
- Digitizer / Scanner
- Plotter
- Printer
- Tape Drive (beta, cassette, 9-track)



Major Components of a Geographic Information System

GIS databases are usually vary large requiring big hard disks. It is not uncommon for a GIS to have 300 to 2000 megabytes of disk storage available. Raster based GIS's are especially demanding of disk space while vector systems are often less demanding. No only must there be large amounts of disk space, but the CPU must be sufficiently powerful to work with the large amounts of data in a reasonable amount of time. Today computers are getting faster and more powerful so considerations of processing power are not a great issue.

Since one of the stronger functions of a GIS is the softcopy map, a high quality graphics display is needed to show maps before printing. Graphics monitors range in price and quality from under $1,000 to $5,000 and more.

Another key ingredient in a GIS is some means for getting analog data into digital format. For this, a digitizer of scanner is used. By tracing map features on a digitizer's surface or by sensing contrast changes with a scanner you can develop digital data layers from a paper map.

Statistical reports are a strong feature of any GIS which require some kind of text output device. For this a line printer may be added to the system.

Map production requires some sort of quality plotter whether it be a large pen plotter or an inkjet printer. There are several plotters on the market today ranging in price from about $1,500 to over $250,000.

To use third-party data such as DLG's or DEM's from the USGS some sort of tape device is needed. For example, DLG's and DEM's are provided on 9-track tapes. Tape drives are also used for backing up data on the hard disk.

Together, these components make up a fully functional GIS hardware system. Data and software must be added to complete the GIS.

Networks:

A network is one component which can be added to a GIS to provide the sharing of resources between computers. It is often implemented when more than one GIS is used at a site. By using a network more than one computer can share printers, plotters and other peripherals.

There are several types of networks which can be used at a site involving as little as two computers and as many as hundreds of

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