Appendix B *Glossary*

Some of the terms in this glossary have been drawn from the Soil Conservation Service's Fundamentals of Geographic Information Systems training manual. Other terms have been devloped from various sources as well as from common knowledge.

ASCII - (American Standard Code for Information Interchange) Pronounced "ask-ee." A binary code for data that is used in communications, most minicomputers and all personal computers.

ASCII file - A data or text file that contains characters coded in ASCII. Text files, word processing documents, batch files and source language programs are usually ASCII files. Only the first 128 characters (0-127) within the 256 combinations in a byte conform to the ASCII standard. The rest are used differently depending on the computer.

aspect ratio - The ratio of width to height of a frame, screen or image. When images are transferred from one system to another, the aspect ratio must be maintained in order to provide an accurate representation of the original.

attribute - (1) In relational database management, a field within a record. (2) For printers and display screens, a characteristic that changes a font, for example, from normal to boldface or underlined, or from normal to reverse video.

benchmark - A test of performance of a computer or peripheral device. The best benchmark is the actual set of application programs and data files that the organization will use. Running benchmarks on a single user computer is reasonably effective; however, obtaining meaningful results from a benchmark of a multiuser system is a complicated task. Unless the end user environment can be duplicated closely, the benchmark will be of little value. It may be more effective to find a user organization with a similar processing environment and simply monitor the operation. See Linpack, Dhrystones, Whetstones and Khornerstones.

Bernoulli Box - A removable disk system from Iomega Corporation that connects to personal computers through a SCSI interface. Introduced in 1983, the original Bernoulli Box was an 8" floppy disk cartridge that held 10MB. Storage was later increased to 20MB. In 1987, the Bernoulli

Box II provided 20MB on a 5 1/4” disk, and in 1989, storage was increased to 44MB per cartridge.

beta test - A test of hardware or software that is performed by users under normal operating conditions (prior to formal release).

binary - Meaning two; the fundamental principle behind digital computers. All input to the computer is converted into binary numbers made up of the two digits 0 and 1 (bits). For example, when you press the “A” key on your personal computer, the keyboard generates and transmits the number 01000001 to the computer’s memory as a series of pulses. The 1 bits are transmitted as high voltage; the 0 bits are transmitted as low voltage. The 1s and 0s are stored as a series of charged and uncharged memory cells in the computer.

binary file - A program in machine language form or a file that contains binary numbers. When transmitting files to a remote computer, some protocols handle only ASCII text and cannot be used for binary files.

dumb terminal - A display terminal without processing capability. It is entirely dependent on the main computer for processing. Contrast with smart terminal and intelligent terminal.

environment - A particular computer’s configuration, which sets the standards for the application programs that run in it. It includes the CPU model and system software (operating system, data communications and database systems). It may also include the programming language used. The term often refers only to the operating system; for example, “This program is running in UNIX environment.

Ethernet - A local area network developed by Xerox, Digital and Intel that interconnects personal computers via coaxial cable. It uses the CSMA/CD access method and transmits at 10 megabits per second. Ethernet uses a bus topology that can connect up to 1,024 personal computers and workstations within each main branch. Ethernet has evolved into the IEEE 802.3 standard.

file format - The specification for the structure of a file. There are hundreds of proprietary formats for database, word processing and graphics files that have become standardized and used for data interchange. See record layout.

file maintenance - (1) The periodic updating of master files. For example, adding and deleting employees and customers, making name and address changes and changing the prices in a product file. It does not pertain to an organization’s daily transaction processing and batch processing (order processing, billing, etc.). (2) The periodic reorganization of a computer system's disks. Data that has been continuously updated becomes physically fragmented over the disk space and requires regrouping. An optimizing program is run every cycle (daily, weekly, etc.) that organizes the data contiguously.

file server - A high-speed computer in a local area network that stores the programs and data files shared by the users on the network. Also called a network server, it acts like a remote disk drive. If the file server is dedicated to database operations, it is called a database server.

file sharing protocol -A communications protocol that provides a structure for file requests (open, read, write, close...) between stations in a network. If file sharing is strictly between workstation and server, it is also called a client/server protocol. It refers to layer 7 of the OSI model.

file transfer protocol -A communications protocol that can transmit files without loss of data. It implies that it can handle binary data as well as ASCII data.

firmware - A category of memory chips that hold their content without electrical power and include ROM, PROM, EPROM and EEPROM technologies. Firmware becomes "hard software" when holding program code.

font - A set of type characters of a particular design and size. In daisy wheel printers, fonts are changed by changing the daisy wheel. In dot matrix printers, the fonts are built in and can be selected by software or a control panel switch. In laser printers, some fonts are built in and others can be plugged in with a cartridge or downloaded from a computer.

footprint - The amount of geographic space an object uses. A computer footprint is the amount of desk or floor surface it occupies. A satellite's footprint is the geographic area on earth that is covered by its downlink transmission.

foreground/background -The priority given to programs in a multitasking environment. Programs running in the foreground have highest priority, and programs running in the background have lowest priority. For example, online users at terminals are usually given the foreground, and batch processing activities, such as long sorts and updates, are given the background. If the batch processing activities are given the higher priority, terminal response times may slow down considerably. In a personal computer, the foreground program is the one the user is currently working with, and the background program might be a print spooler or a communications program that is ready to receive a message from another computer.

fourth-generation language - (4GL) A computer language that is more advanced than traditional high-level programming languages. For example, in dBASE, the command LIST displays all the records in a data file.

In second- and third-generation languages, instructions would have to be written to read each record, test for end of file, place each item of data on screen and go back and repeat the operation until there are no more records to process.

First-generation languages are machine languages; second-generation are machine dependent assembly languages; and third-generation languages are high-level programming languages, such as FORTRAN, COBOL, BASIC, Pascal, and C. Although many languages, such as dBASE, are called fourth-generation languages, they are actually a mix of third and fourth. The dBASE LIST command is a fourth-generation command, but applications programmed in dBASE are third-generation.

Query language and report writers are also fourth-generation languages. Any computer language with English-like commands that doesn't require traditional input-process-output logic falls into this category.

fragmentation - The uneven distribution of data on a disk. As files are updated, they become less contiguous on the disk. When data is added, the operating system stores it in the available free space. As a result, parts of the file wind up in disparate areas of the disk, causing additional arm movement when the file is sequentially read. A disk maintenance, or optimizer, program is used to reorder the files in a contiguous manner.

frame buffer - In computer graphics, a separate memory component that holds a graphic image. Frame buffers may have one plane of memory for each bit in the pixel. For example, if eight bits are used to represent one pixel, there are eight separate memory planes.

full-screen - A programming capability that allows data to be displayed in any row or column on the screen. Contrast with teletype mode.

graphics terminal - (1) An input/output device that is capable of displaying pictures. Images are received via communications or entered with a device, such as a mouse or light pen. The keyboard may have specialized function keys, wheels or dials. Graphics terminals employ raster graphics, vector graphics or combination raster and vector technologies. (2) A terminal or personal computer that displays graphics.

hierarchical - A structure made up of different levels like a company organization chart. The higher levels have control or precedence over the lower levels. Hierarchical structures are a one to many relationship; each item having one or more items below it.

In communications, a hierarchical network refers to a single computer that has control over all the nodes connected to it.

hierarchical file system - A file organization method that stores data in a top-to-bottom organization structure. All access to the data starts at the top and proceeds throughout the levels of the hierarchy.

host - The central computer or controlling computer in a timesharing or distributed processing environment.

HPGL - (Hewlett-Packard Graphics Language) A vector graphics file format from HP that was developed as a standard plotter language. Most plotters support the HPGL and DMPL standards.

instruction set - The entire group of machine language instructions that a computer can follow. Instruction sets are designed into the CPU and are one of the major components of its architecture. A set may contain from a handful (RISC) to several hundred instructions (CISC). Machine instructions are generally from one to four bytes long.

internet - (1) A large network made up of a number of smaller networks. (2) Internet. A national research-oriented network comprised of over a thousand government and academic networks.

kernel - The fundamental part of a program, such as an operating system, that resides in memory at all times.

network - (1) An arrangement of objects that are interconnected. See local area network and network database. (2) In communications, the transmission channels and supporting hardware and software.

network administrator - An individual who is responsible for the operation of a communications network. The network administrator installs applications on the servers, monitors network activity and is generally responsible for its efficient operation.

open architecture - A system in which the specifications are made public in order to encourage third-party vendors to develop add-on products for it. For example, much of Apple Computer’s early success was due to its open architecture of the Apple II. IBM followed Apple’s lead in making the PC open architecture as well.

Open Look - An X Window-based graphical user interface (GUI) for the UNIX operating system that was developed by Sun Microsystems and is defined and distributed by AT&T's UNIX Software Operation (USO). It conforms to POSIX, ANSI C and X/Open's XPG3 standards.

operating system - A master control program that runs the computer and acts as a scheduler and traffic cop. It is the first program loaded (copied) into the computer's memory after the computer is turned on, and the central core, or kernel, of the operating system must reside in memory at all times. The operating system may be developed by the vendor of the hardware it's running in or by an independent software house.

The operating system is an important component of the computer system, because it sets the standards for the application programs that run in it. All programs must be written to "talk to" the operating system. Also called an executive or supervisor, the operating system performs the following functions.

Job Management

In small computers, the operating system responds to commands from the user and loads the requested application program into memory for execution. In large computers, the operating system carries out its job control instructions (JCL), which can describe the mix of programs that must be run for an entire shift.

Task Management

In single tasking computers, the operating system has virtually no task management to do, but in multitasking computers, it is responsible for the concurrent operation of one or more programs (jobs). Advanced operating systems have the ability to prioritize programs so that one job gets done before the other.

In order to provide users at terminals with the fastest response time, batch programs can be put on lowest priority and interactive programs can be given highest priority. Advanced operating systems have more fine-tuning capabilities so that a specific job can be speeded up or slowed down by commands from the computer operator.

Multitasking is accomplished by designing the computer to allow instructions to be executed during the same time data is coming into or going out of the computer. In the seconds it takes one user to type in data, millions of instructions can be executed for dozens, or even hundreds, of other users. In the milliseconds it takes for data to come in from or go out to the disk, thousands of instructions can be performed for some other task.

Data Management

One of the major functions of an operating system is to keep track of data on the disk; hence the term DOS, or disk operating system. The application program does not know where the data is actually stored or how to get it. That knowledge is contained in the operating system's access method, or device driver, routines. When a program is ready to accept data, it signals the operating system with a coded message. The operating system finds the data and delivers it to the program. Conversely, when the program is ready to output, the operating system transfers the data from the program onto the available space on disk.

Device Management

In theory, the operating system is supposed to manage all devices, not just disk drives. It is supposed to handle the input and output to the display screen as well as the printer. By keeping the details of the peripheral device within the operating system, a device can be replaced with a newer model, and only the routine in the operating system that deals with that device needs to be replaced.

In the PC world, device management is left up to the vendor of the application, because vendors write their programs to directly access the screen and the printer. They bypass the operating system, because DOS either doesn't support the device or adds too much performance overhead. As a result, software vendors have become responsible for providing drivers (routines) for all the popular display and printer standards, adding an enormous burden to their development efforts.

Security

Multiuser operating systems maintain a list of authorized users and provide password protection to unauthorized users who may try to gain access to the system. Large operating systems also maintain activity logs and accounting of the user's time for billing purposes. They also provide backup and recovery routines to start over again in the event of a system failure.

History

The earliest operating systems were developed in the late 1950s to manage tape and disk storage, but programmers often felt more comfortable writing and using their own I/O routines. In the mid 1960s, operating systems became essential to manage the complexity of timesharing and multitasking. Today, all multi-purpose computers from micro to mainframe use an operating system. Special-purpose devices, such as appliances, games and toys, do not. They usually employ a single program that performs all the required input, output and processing tasks.

In the past, when a vendor introduced a new operating system, users had little understanding of the time and effort required by computer professionals to convert to it. This is no longer a behind-the-glass- enclosed-datacenter phenomenon, but squarely in the hands of the users. Switching from DOS to OS/2 or UNIX is not a trivial issue. We will no doubt soon find desktop computers running operating systems, such as IBM's VM, which are capable of running multiple operating systems, each controlling their own applications. History has an uncanny way of repeating itself.

Perhaps the Japanese have the right idea with their TRON operating system, which is ultimately intended to be a common interface across all applications from a microwave oven to the largest supercomputer!

Common Operating Systems

PCs use DOS, OS/2, SCO XENIX and AIX. Apple II's use DOS (from Apple) and ProDOS. Macintoshes use the System along with Finder and Multifinder, as well as A/UX. Digital uses VMS and Ultrix. IBM mainframes use MVS, VM or DOS/VSE.

path - (1) In communications, the route between any two nodes. Same as line, channel, link or circuit. (2) In database management, the route from one set of data to another, for example, from customers to orders. (3) In programming, a set route taken by the program to process a set of data. (4) In DOS and OS/2, the route to a disk directory. For example, if a file named MYLIFE is located in subdirectory STORIES within directory JOE, the path to retrieve the file is: \JOE\STORIES\MYLIFE.

RISC - (Reduced Instruction Set Computer) A computer architecture that performs a limited number of instructions. The concept is that most programs generally use only a few instructions, and if those basic instructions are made to execute faster, performance is increased.

RISC eliminates a layer of overhead called microcode, which is commonly used to make it easier to add new and complex instructions to a computer. RISC computers have a small number of instructions built into the lowest level circuits that work at maximum speed.

root directory - In hierarchical file systems, the starting point in the hierarchy. When the system is first started, the root directory is the current directory. Access to directories in the hierarchy requires naming the directories that are in its path. In DOS and OS/2, going down the hierarchy requires naming the directories in the path from the current directory to the destination directory, but going back up or sideways requires naming the entire path starting from the root directory.

shell - An outer layer of a program that provides the user interface, or way of commanding the computer. Shells are typically add-on programs created for command-driven operating systems, such as UNIX and DOS. The shell provides a menu-driven or graphical icon-oriented interface to the system in order to make it easier to use.

Sun - (Sun Microsystems, Inc.) A manufacturer of network-based, high-performance workstations founded in 1982. The Sun-3, Sun-4 and Sun386i product lines include stand-alone and networked systems, diskless workstations and file servers. The Sun-4 family is based on the SPARC microprocessor, and the Sun 386i is based on the Intel 386 CPU.

Sun supports an open systems model of computing throughout its product line which allows it to interact in networks of computer systems from other vendors. Its Open Network Computing software is supported by over 100 vendors, including Apple, Digital and HP. Sun's Network File System (NFS) software, which allows data sharing across the network, has become an industry standard.

WYSIWYG - (What You See Is What You Get) Pronounced “wizzy-wig.” Refers to displaying text and graphics on screen the same way it will be printed. Although a 24- point font will show up on screen in a proper ratio to a 10-point font, if the screen and printer fonts are not matched, there will be either slight or obvious differences between the screen characters and the printed characters. In addition, a desktop laser printer, at 300 dots per inch, has a much higher resolution than almost any display screen; therefore, the screen and printout cannot be 100% identical.

X/Open - A consortium of international computer vendors, founded in 1984, to resolve standards issues. Incorporated in 1987 and headquartered in London, current members include AT&T, Bull, DEC, Ericsson, HP, International Computers, Nixdorf, Olivetti, Philips, Siemens and Unisys. X/Open's North American offices are in San Francisco.

X/Open's purpose is to integrate evolving de facto and international standards in order to achieve a user-driven and open environment, or Common Application Environment. X/Open's XPG defines the specification, and VSX defines the testing and verification procedure.