CPA BEC - STUDY UNIT 13
Information Technology III:
Core Concepts

A. Operating Systems
1. Every computer requires an **operating system**. The operating system negotiates the conversation between the computer's hardware, the application the user is running, and the data that the application is working with.
2. For **servers**, popular operating systems include UNIX, Windows Server, and Novell Open Enterprise Server.
3. For **desktop and laptop computers**, three operating systems predominate: Microsoft Windows in its many variants (Windows XP, Windows ME, Windows Vista, etc.), Mac OS X, and Linux and other variants of UNIX.

B. Security
1. **Information security** encompasses not only computer hardware and software but all of an organization's information, no matter what medium it resides on. It involves far more than just user IDs and passwords.
2. Organizations have three principal **goals** for their information security programs: data confidentiality, data availability, and data integrity.
    a. **Confidentiality** is protecting data from disclosure to unauthorized persons.
    b. **Availability** is assuring that the organization's information systems are up and running so that employees and customers are able to access the data they need.
    c. **Integrity** is assuring that data accurately reflect the business events underlying them and are not subject to tampering or destruction.
3. The organization accomplishes these goals by performing the following steps:
    a. **Identify the threats** to the organization's information.
    b. **Identify the risks** that these threats entail.
    c. **Design the controls** that will compensate for the risks.
    d. **Incorporate the controls** into a coherent enterprise-wide information security plan.
    e. **Policies** set forth expectations of all persons, both employees and external users, with access to the organization's systems.
4. The classic division of controls in information systems is between general controls and application controls.
    a. **General controls** relate to the organization's information systems environment as a whole. They include IT administration; separation of duties within the IT function; controls over systems development; hardware controls; physical controls, including access controls and environmental controls; logical controls that have a double focus, authentication and authorization; and backup and contingency planning.
    b. **Application controls** relate to the organization's individual systems. Each application has its own vulnerabilities and compensating controls. Application controls include input controls, processing controls, and output controls.

C. Types of Data Files
1. Data files can be classified as one of two main types.
    a. A **master file** comes in two subtypes:
        1) One type contains records that do not change very often. An example is a vendor file, containing each vendor's number, name, and address.

2) The other type of master file is one that is periodically updated to reflect ongoing activity. An example is a general ledger file, which at any given moment holds the balances of all accounts in the ledger.
   b. A **transaction file** contains the data that reflect ongoing business activity, such as individual purchases from vendors or general journal entries.
2. Transaction files and master files are constantly interacting.

D. Nature of Binary Data Storage
1. The digital computers in common use today store all information in **binary** format, that is, as a pattern of ones and zeros. This makes arithmetic operations and true/false decisions on the lowest level extremely straightforward.
   a. A **bit** (sometimes thought of as a contraction of "binary digit") is either 0 or 1 (off or on) in binary code. Bits can be strung together to form a binary (i.e., base 2) number.
   b. A **byte** is a group of bits. Each byte is used to signify a character (a number, letter of the alphabet, or symbol, such as a question mark or asterisk).
      1) Quantities of bytes are measured with units such as the kilobyte (just over one thousand bytes) and the gigabyte (just over one billion bytes).
   c. A **field** is a group of bytes. The field contains a unit of data about some entity.
   d. A **record** is a group of fields. All the fields contain information pertaining to an entity.
   e. A **file** is a group of records. All the records in the file contain the same pieces of information about different occurrences.

E. File Organization and Access Methods
1. The oldest file structure is the **flat file**, meaning that every record in the file has an identical layout; thus, the records can be conceived of as forming a two-dimensional pattern of rows and columns. A telephone directory is a commonly encountered flat file.
2. **Variable-length records** represented a space-saving improvement. For example, a customer orders two different items on one occasion and only one item on another occasion. With variable-length records, valuable space is not taken up for the blank second item on the second order.
3. Another major improvement in efficiency came with the advent of disk drives, which can quickly seek out a given storage address. This technique is known as **direct** or **random access**.
4. The **hierarchical, or tree, database model** was the next development in file organization. Instead of the records being strung out one after the other, they form "branches" and "leaves" extending from a "root." Note that the customer's address is now stored only once.
5. The **network database model** allowed child records to have multiple parents.
6. In the **relational database model**, the elements of data "relate" to one another in a highly flexible way.
   a. Each data element is stored as few times as necessary. This reduction in data redundancy is accomplished through a process called normalization.
   b. The tremendous advantage of a relational data structure is that searching for records is greatly facilitated.
   c. A group of tables built following the principles of relational data structures is referred to as a **relational database**.