Chapter 7: Design and Development and Evaluation of Systems

Processing Techniques

- The Processing Methods for a system can be divided into:
  - Online Processing
  - Real-time Processing
  - Batch Processing

Online Processing

- Online processing refers to a situation where devices called Terminals are connected directly to the computer so that input may be made at any time and the user is able to immediately and directly access data stored in the computer.
- Online processing is done on a multi-user basis.
- Interactive processing refers to a situation in which the user interacts with the computer.
- The term Interactive Processing is sometimes used to describe online and real-time processing collectively.

Real-time Processing

- Any data that is received must be immediately processed and updated into the database
- Actual status of events or records, transactions are dealt with as events occur
- Database mirrors reality
- Real-time system always online
- Online system not always real-time
- Many system today are both online-real-time systems. E.g. Banking ATM
**Batch Processing**

- Batch processing refers to a situation where transactions are “batched”, i.e. accumulated over a period of time and then processed in a single computer software run when output is needed.
- This is a method of collecting and processing data in which transactions are accumulated and stored until a specified time when it is convenient or necessary.
- Batch processing is an economical method for processing large volumes of data on a routine basis. An example of batch processing is the processing of overtime claims in a payroll system.

**Interface of Online Systems**

- **Commands**
  - One method of interacting with the computer is for the user to key in commands.
  - This does not contribute to ease of use, since commands must be remembered and mistakes are easily made.
- **Menus**
  - Menus may list different applications, such as sales ledger, purchase ledger or stock control routines, from which the user is guided to sub-menus according to the option selected.

**Configuration for Real-time System**

- Support immediate telecommunications and interactive processing
- A powerful computer server, with terminals (e.g. microcomputers) at each user site, connected by telecommunications equipment like modems and leased lines

**Procedure for Batch Data Processing**

- Prepare Batch Control Sheets
- Send batch data to Data Preparation
- Check Batch Control Sheets
- Enter Data
- Validate Data
- Process Data
Procedure for Batch Data Processing – Prepare Batch Control Sheets

- Before sending the batch to data preparation, the number of cards is counted and noted on a batch control sheet.
- The total number of hours worked for all the cards is added and also noted on the sheet.

Procedure for Batch Data Processing – Send Batch Data to Data Preparation

- The batch control sheet is sent with the batched data and a copy is retained in the initiating department.

Procedure for Batch Data Processing – Check Batch Control Sheets

- When the cards arrive at data preparation, the cards are counted and the total hours checked against the control sheet.
- Any discrepancies are checked with the initiating department.
- Based on the batch controls sheet, it will be possible to determine whether any cards have been mislaid or altered in transit.

Procedure for Batch Data Processing – Enter Data

- The data is keyed using a keyboard and stored on disk.
- This step is sometimes called key punching which is an old term from days when punch cards were the main medium for input data.
- When punch cards are used, the data is translated into a machine readable form by punching holes in the cards, which are later read by a reading machine.
**Procedure for Batch Data Processing – Validate Data**

- Validation of data is done to minimize inaccuracies.

**Procedure for Batch Data Processing – Process Data**

- The data is now complete, validated and therefore ready for processing.

**OLTP vs. OLAP**

- **On Line Transaction Processing (OLTP)**
  - Maintains a database that is an accurate model of some real-world enterprise.
  - Supports day-to-day operations.
  - Characteristics:
    - Short simple transactions
    - Relatively frequent updates
    - Transactions access only a small fraction of the database
On Line Analytic Processing

- On Line Analytic Processing (OLAP)
  - Uses information in database to guide strategic decisions.
  - Characteristics:
    - Complex queries
    - Infrequent updates
    - Transactions access a large fraction of the database
    - Data need not be up-to-date

Data Warehouses

- A Data Warehouse is a database geared towards the Business Intelligence requirements of an organization.
- The data warehouse integrates data from the various operational systems and is typically loaded from these systems at regular intervals.
- Data warehouses contain historical information that enables analysis of business performance over time.

Data Warehouses

- OLAP and Data Mining databases are frequently stored on special servers called Data Warehouses:
  - Can accommodate the huge amount of data generated by OLTP systems
  - Allow OLAP queries and data mining to be run off-line so as not to impact the performance of OLTP

Data Mining

- Analysis of large pools of data to find patterns and rules that can be used to guide decision-making and predict future behavior.
OLAP vs. Data Mining

- OLAP tools are front-end tools used by users to analyze data that are stored usually in a data warehouse.
- Data Mining is an example of an OLAP that enables detection of patterns and trends in large databases.

Validation

- Before data can be updated into the database, it must be checked for errors.
- This validation can be done in both online and batch processing.
  - Presence Checks
  - Format Checks
  - Range Checks
  - Reasonableness Checks
  - Check Digits

Validation – Presence Checks

- In this instance, the input data is examined to ensure that all the necessary data items, or fields, are present.
- In the payroll example, a presence check would ensure that fields such as the date of the period-end, the employee number and the hours worked, are present.
- Any set of data failing this test would be rejected.

Validation – Format Checks

- This check ensures that the format of the data in a field is correct, i.e. the correct number of letters and numbers, in the correct order.
- If a field is numeric, then any alphabetic data would be rejected.
Validation – Range Checks

- This is a check that numbers or codes are within an accepted range.
- Employee payroll numbers, for example, could be subjected to this sort of check.
- Any employee number which does not fall into the accepted range could be assumed to be either a mistake or a deliberate falsehood.

Validation – Reasonableness Checks

- These are a form of range check which would reject items which are unreasonable.
- A claim that an employee has worked 25 hours in a day, for example, would fail this test.

Validation – Check Digits

- One of the most common type of mistakes is to transpose the figures in a number.
- The check digits validation check is a method of minimizing the occurrence of transposition.
- It is a mathematical technique in which the digits form the number are used in a mathematical process, the result of which is appended to the original number as the check digit.
- The number can then be tested using the same mathematical process.
- If the result is the same check digit, then the likelihood of transposition is minimal.
- If it is different then the number has been transposed.