MODULE 5

DATA FLOW DIAGRAMS

Learning Units

5.1 Developing Data Flow Diagrams(DFD)
   a) What are DFDs?
   b) Symbols used in DFD
   c) Rules of data flow
   d) Good style in drawing DFD
5.2 Describing systems with DFD & Levelling DFDs
5.3 Logical & Physical DFDs
LEARNING GOALS

In this module we will learn
1. What are Data Flow Diagrams (DFDs)?
2. Why they are useful?
3. How are they developed?
4. How to level DFDs?
5. Good style conventions in developing DFDs
6. Difference between Logical and Physical DFDs
7. Tools available to draw DFDs
MOTIVATION

WHY DFD?

Provides an overview of
- What data a system processes
- What transformations are performed
- What data are stored
- What results are produced and where they flow
MOTIVATION

WHY DFD?

Graphical nature makes it a good communication tool between
- User and analyst
- Analyst and System designer

Structure of DFD allows starting from a broad overview and expand it to a hierarchy of detailed diagrams
DATA FLOW DIAGRAMS

WHAT ARE DATA FLOW DIAGRAMS?

DFDs models the system by depicting

- External entities from which the data flows and where results terminate
- Processes which transform data flows
- Data stores from which the data are read or into which data are written by the processes.
SYMBOLS USED IN DFD

A circle represents a process
- Straight lines with incoming arrows are input data flows
- Straight lines with outgoing arrows are output data flows
- Processes are given serial numbers for easy reference
- Labels are assigned to Data flow. These aid documentation
SYMBOLS USED IN DFD

EXTERNAL ENTITIES

- A Rectangle represents an external entity
- They either supply data or receive data
- They do not process data
A Data Store is a repository of data

Data can be written into the data store
This is depicted by an incoming arrow

Data can be read from a data store
This is depicted by an outgoing arrow

External entity cannot read or write to the data store

Two data stores cannot be connected by a data flow
RULES OF DATA FLOW

• Data can flow from
  - external entity to process
  - process to external entity
  - process to store and back
  - process to process

• Data cannot flow from
  - external entity to external entity
  - external entity to store
  - store to external entity
  - store to store
DATA FLOW DIAGRAMS

An alternate notation is often used

A Process

Store

Issue

Name

Label

A Data store

DS1

Inventory

Name

Label
GOOD STYLE IN DRAWING DFD

- Use meaningful names for data flows, processes and data stores.
- Use top down development starting from context diagram and successively levelling DFD.
- Only previously stored data can be read.
- A process can only transfer input to output. It cannot create new data.
- Data stores cannot create new data.
An entire system is represented by one DFD which gives the system’s overview.

It is called a context diagram.

It gives little detail & is also known as the top level DFD.

Context diagram of mess management is shown in the next transparency.
CONTEXT DIAGRAM OF MESS MANAGEMENT SYSTEM

- Observe this diagram gives very little detail

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LEVELLING DFD

- A context diagram gives an overview.
- It should be split into major processes which give greater detail.
- Each major process is further split to give more detail.
- Each major process is further split to give more detail.
**WHY LEVEL DFD?**

- If a DFD is too detailed it will have too many data flows and will be large and difficult to understand.

- Start from a broad overview. Expand to details - Idea similar to using procedures and linking these with a main program.

- Each DFD must deal with one aspect of a big system.
EXPANDED DFD FOR HOSTEL MESS MANAGEMENT

- Students
  - Payments
  - Itemized bills at end of month
  - Extras/Rebates
  - Expenses
    - No of meals (today +3)

1. Billing system
   - Update daily rate
   - Items used each day
   - Student billing information + bills

Chief Warden
- Unpaid bills

Mess manager

• Going to next process (Continued in next slide)
EXPANDED DFD FOR HOSTEL MESS MANAGEMENT

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- **Continued**

- Vendors
  - Vendor supplies
  - Order non-perishable
  - Vendor data
- Stores issue and Control system
  - Menu (today +2)
  - Low stock (today +2)
  - Items to be issued (today +2)
  - Items used today
- Mess Manager
- Mess Secretary
  - Order data
- Perishable order
  - Vegetables and perishable requisition
  - Orders (perishable)
  - Vendor data (perishable)
EXPANDED DFD-BILLING SYSTEM

1.1 Calculate Daily rate

1.2 Calculate Student’s bills

1.3 Reconcile payments

1.4 Find no Of meals to cook

Itemized bills

Bills

Payments

Unpaid bills

Chief warden

Mess Secretary

Extras/Rebates

No of meals (today + 2)

Students data

Mess Manager

Payments

Unpaid bills

Chief warden

Daily rate average (upto date)

Expenses data

Items rate data

Students data

Students data

• Observe numbering of processes
LEVELLING RULES

- If process $p$ is expanded, the process at the next level are labeled as $p.1, p.2$ etc.
- All data flow entering or leaving $p$ must also enter or leave its expanded version.
- Expanded DFD may have data stores
- No external entity can appear in expanded DFD
- Keep the number of processes at each level less than 7.
ILLEGAL CONSTRUCTS IN DFD

- No loops are allowed in DFD
- A process cannot be a pure decision
- A single data flow should not be split into many flows with different labels
- No data flow allowed between data stores

Actual daily rate \rightarrow \text{Compare} \rightarrow \text{Actual rate} \gt \text{Standard rate}

\text{Compare} \rightarrow \text{Standard daily rate} \rightarrow \text{Actual rate} \leq \text{Standard rate}
ILLEGAL CONSTRUCTS IN DFD

Get students extra/rebates record

Record

Calculate Bill

Ask for next record

Extra/rebate store

• Not correct as loop is formed
LEVELLING EXAMPLES

Stores issue control system process
LEVELLING EXAMPLES

2.1 Inventory update and low stock warning

2.2 Create order for vendor

2.3 Calculate items needed

2.4 Check item availability

Vendor supplies

Items needed from 2.3

Mess manager

Items used today

Vendor

Stores inventory

Order

Vendor data

Order to vendor

Menu (today +2)

Mess secretary

No of meals to (today +2)

Items needed

Low stock item

Stores inventory

Items needed from 2.3

Order

Vendor data

Menu (today +2)

No of meals to (today +2)
LEVELLING EXAMPLES

Ext A → Top Level process → Ext B

Ext A → 1 → 2 → 4 → Ext B

Ext A → 3 → Process 1 → Process 2

Process 1: 1.1 → 1.2 → 1.3 → 1.4

Process 2: 2.1 → 2.2 → 2.3

Ext A → 3.1 → 3.2 → 3.3 → 3.4 → Ext B

4.1 → 4.2 → 4.3
LOGICAL AND PHYSICAL DFD

- DFD’S considered so far are called logical DFDs
- A physical DFD is similar to a document flow diagram.
- It specifies who does the operations specified by the logical DFD
- Physical DFD may depict physical movements of the goods
- Physical DFDs can be drawn during fact gathering phase of a life cycle
LOGICAL DFD FOR CHEQUE ENCASHMENT

Retrieve Customer Record

Check Balance, Issue token

Cheque with Token

Store Token no & cheques

Cheque store With token no.

Customer accounts

Cheque

Token Slip Or cheque

Search & match token

Cheque with token

Update Daily cash book

Cheque store

Day book

Customer

Token Slip

Cash