4 Data Flow Diagram

Abstract Data Flow Diagram (DFD) is widely used for structured software analysis and design. It is also widespread in the field of business administration. The syntax and semantics of DFD are introduced in this chapter. A structured approach for DFD model development is also discussed.

4.1 Introduction to DFD

The Data Flow Diagram (DFD) is a structured analysis and design method. It is a visual tool to depict logic models and expresses data transformation in a system. DFD includes a mechanism to model the data flow. It supports decomposition to illustrate details of the data flows and functions. DFD cannot present information on operation sequence. Therefore, it is not a process or procedure modeling method.

DFD includes following characteristics: (1) supporting the analysis and requirement stage of system design; (2) a diagramming technique with annotation; (3) describing a network of activities/processes of the target system; (4) allowing for behaviors of parallel and asynchronous ; (5) stepwise refinement through hierarchical decomposition of processes.

4.2 Syntax and Semantics of DFD

The complete data flow analysis includes: Data Flow Diagram, Data Dictionary and Process Specifications [3].

DFD presents a symbol system to describe data flows and a decomposition mechanism to describe a system at various detail levels.

4.2.1 Notations of DFD

The construction elements of DFD are Activity/Process, Data Flow, Data Store and External Entity (Source/Sink).

(1) Activity/process

The notation of activity/process is shown in Fig. 4.1. These two symbols belong to Gane & Sarson notation system and Ward & Mellor notation system, respectively.

- An activity /process is the transformation of data. It accepts data flows as inputs and produces data flows as outputs.
- An activity can be further decomposed to form more detailed sub-process.
- The label of an activity/process should be a verb.
- Activities are linked to process specifications.

The rules for activity/process are listed as follows.

- An activity/process is always internal to a system. How the external entity or system treats data will not be modeled.
- Data stays at rest unless moved by a process.
- Processes cannot consume or create data. That means the process must have at least 1 input data flow (to avoid miracles), at least 1 output data flow (to avoid black holes) and should have sufficient inputs to create outputs (to avoid gray holes).

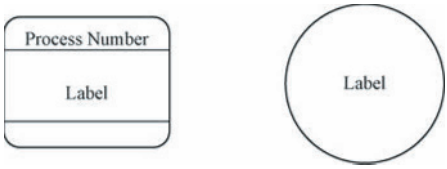

Fig. 4.1. Symbols of activity/process

Logical process models omit any processes that do nothing more than move or route data, thus leaving the data unchanged. Valid processes include those that:

- Perform computations (e.g., calculate grade point average).
- Make decisions (determine availability of ordered products).
- Sort, filter or otherwise summarize data (identify overdue invoices).
- Organize data into useful information (e.g., generate a report or answer a question).
- Trigger other processes (e.g., turn on the furnace or instruct a robot).
- Use stored data (create, read, update or delete a record).

(2) Data flow

A Data flow shows the flow of information. Its symbols are shown in Fig. 4.2.

- A Data flow is a connector element whose two ends link to activities/processes, a Data store, an external entity and so forth.
- It reflects a data transfer but control flows.
- The arrow of data flow shows its direction.
- Data flows can be split / joined.
- The label of a data flow is noun.
- It is specified in the data-dictionary.

The rules for data flow are listed as follows.