

# LESSON 28 : DFD AND ER DIAGRAM

## Topics covered

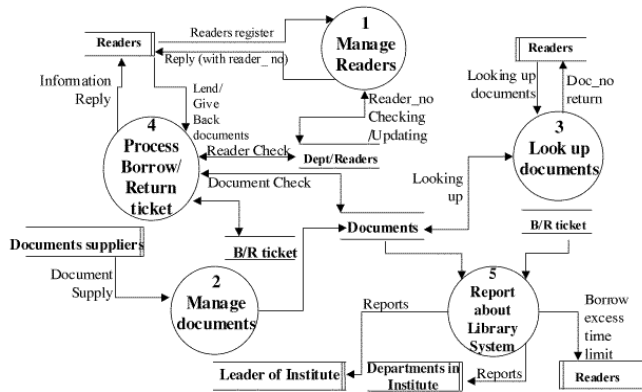
- Data Flow Diagram
- Entity Relationship Diagram

## Objectives

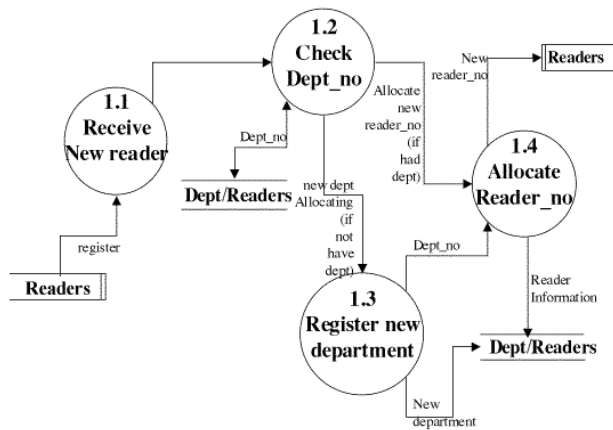
Upon completion of this Lesson, you should be able to:

- Discuss the about ER Diagram

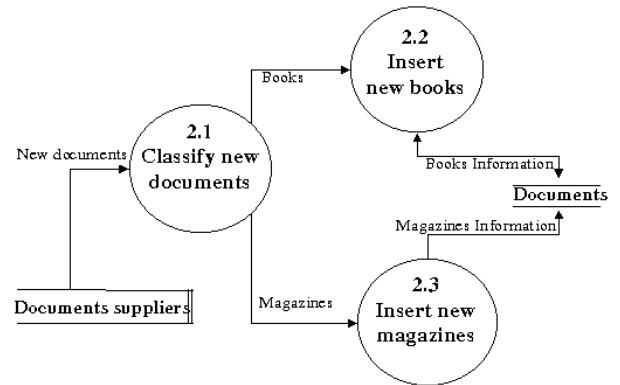
In the example of library management system, corresponding to each level of function hierarchy diagram, we develop the data flow diagrams:



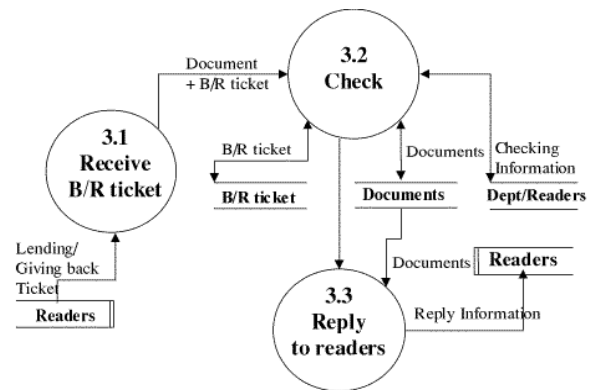
**Data flow diagram high level**



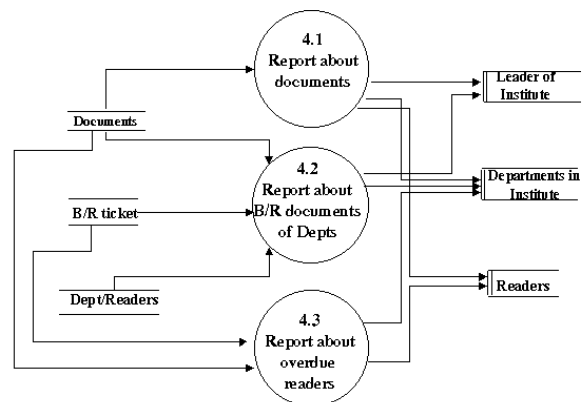
**Data flow diagram (Function 1).**



**Data flow diagram (Function 2).**



**Data flow diagram (Function 3).**



**Data flow diagram (Function 4).**

## Summary

At the end of function analysis phase, we have 2 diagrams: the function hierarchy diagram and the data flow diagram. They will be a basis for finding out entities and relationships between them (which is defined in the Entity-Relationship diagram).

### Entity-Relationship diagram (ERD)

Though the relationship among data warehouse is not emphasized in data flow diagram, it is well reflected in ERD. When developing a new information system, analyst often has discussion with users, especially database manager, on the current system. It's they who have the responsibilities to collect necessary information about the system required by system analyst. ERD is one of the most useful model forming tools to organize this discussion. ERD is network model that describes stored data of a system at a high level of abstraction. For system analyst, ERD has a major benefit: it highlights the relationship between data stores on DFD which would otherwise only be seen in the specification process.

#### The main Components of an ERD Include

- Entity
- Attribute
- Relationship

Entity is a subject, a duty, or an event that has a significant meaning to the future system and is displayed by a rectangle with round corners. Each entity has its own name. In some cases, entities of the same sort can be merged into one entity type.

Entity type of a system is defined base on the outcome of system function analysis.

The simplest approach to decide whether a type of information should be put in the model as a type of entity is to make up the following question: Are these information tables useful for the system? If the answer is yes, system analyst has to identify the basic entities that create flows in the data table.

After a suitable type of entity, entity nature have been identified, the next important step is to define the information that needs to be archived for each entity.

- Attributes are the characteristics of the entity displayed by fields or columns of a table.

Relationship shows connections among the system's entities. Triangle headed arrows display these connections.

#### There are 3 major Types of Relationship used in ERDs

- One - one relationship
- One - many relationship
- Many - many relationship

Let's assume that we have 2 entities in tables A and table B, a one - one relationship will exist between them if:

With each entity in table A, there is a corresponding entity in table B and vice versa, with each entity in table B, there is a corresponding entity in table A. A normal connection line displays this relationship.

Assume that we have 2 entities in table A and table B, a one - many relationships will exist between them if:

With each entity in table A, there are several entities in table B and with each entity in table B, there is one and only one entity in table

A. A triangle-headed connection line displays this relationship. The non-triangle headed end shows to the table with one entity and the other end shows the table with various entities.

Assume that we have 2 entities in table A and table B, a many - many relationship will exist between them if:

With each entity in table A, there are several entities in table B and with each entity in table B, there are several entities in table A. A connection line displays this relationship with triangle at both ends.

In fact, the many - many relationship is often transferred to the one - many relationship via "connection entity" with 2 upper entities.

Thus, of the 3 types of relationships, the one - many relationship is the most important and popular because the one - one relationship can be integrated in a table, the many - many relationship is transferred to one - many relationship by creating a "connection entity", which facilitates the data modeling.

In the example of library management system, we see the following relationships:

We realize that: one book or magazine (documents) must be belong to one language, but one language can have many books or magazines, so this relationship is one - to - many(one language has many documents).

The similar relationships are: documents and nation, documents and collection, documents and speciality.

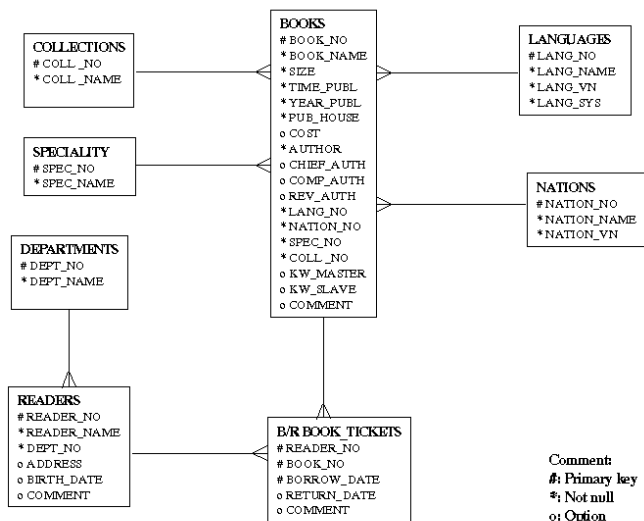
With the magazines: we realize that each magazine category has many volumes (depend on years, months, and numbers...), but one volume must be belong to one magazine category, so this relationship is one - to - many.

The relationship between department and readers is also one -to - many relationships, because one reader must belong to one and only one department, but one department can have many readers (staffs).

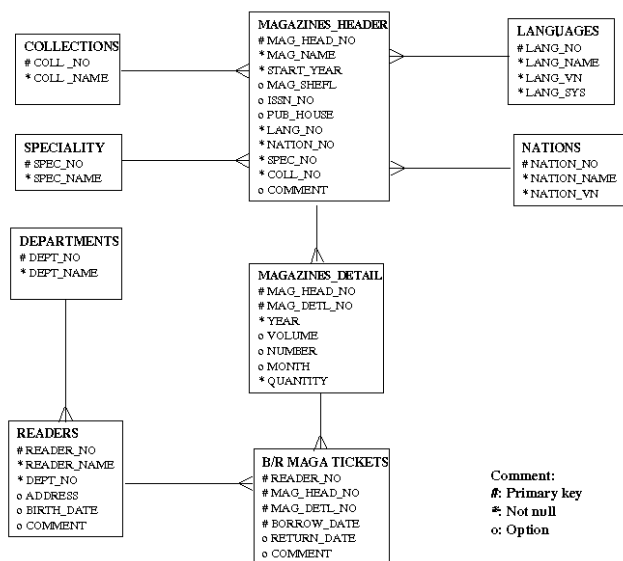
#### And the last relationship

the relationship between readers and documents: This is a special relationship: one reader can borrow many documents, and one document can be borrowed by many readers at different time (because, when a reader gives back a document, it can be borrowed by another reader again). So we can say that this relationship is "many - to -many" relationship, and separate it into 2 "one - to - many" relationships and one entity, the Borrowing/Returning\_Ticket entity, with its primary key is the compose of the primary key of document entity, the primary key of reader entity, and the BORROW\_DATE attribute.

**So we have the Entity-Relationship diagrams as follow**



Entity relationship diagram (Books)



Entity relationship diagram (Magazines)

Mayille is a rural village with a population of 500. Until now Mayville was served by a bookmobile from a larger town. The Mayville village council has authorized funds for a small public library and you have volunteered to set up an information system for the library. Assume that the library will have multiple copies of certain books.

- (i) Draw an ERD for the Mayille library system
- (ii) Indicate cardinality.

Top Text Publishing is a textbook publishing company with a headquarters location, a warehouse and three sales offices that each have a sales offices that each have sales manager and sales reps. Top Text sells to schools, colleges and individual customers. Many authors write more than one book for Top text and some books are written by more than one author. Top text maintains

an active list of over 100 books each identified by a universal code called an ISBN number.

- (i) Draw an ERD for the Top Text information system
- (ii) Indicate cardinality

FastFlight Airlines is a small air carrier operating in three northeastern states. FastFlight is the process of computerizing its passenger reservation system. The following data were identified: reservation number, flight number, flight date, origin, destination, departure time, arrival time, passenger name and seat number.

- (i) Create an ERD, including cardinality for the reservation system.

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