**Lab No. 5**

# DFD & ERD

Objectives

Deeper understanding of System modeling: Data model: entity-relationship diagram (ERD) and Functional model: data flow diagram (DFD).

**LAB # 05**

**ERD & DFD**

## **Introduction**

Modeling consists of building an abstraction of reality. These abstractions are simplifications because they ignore irrelevant details and they only represent the relevant details (what is relevant or irrelevant depends on the purpose of the model).

**2.1 Why Model Software?**

Software is getting larger, not smaller; for example, Windows XP has more than 40

million lines of code. A single programmer cannot manage this amount of code in its entirety. Code is often not directly understandable by developers who did not participate in the development; thus, we need simpler representations for complex systems (modeling is a mean for dealing with complexity).

A wide variety of models have been in use within various engineering disciplines for a long time. In software engineering a number of modeling methods are also available.

**2.2 Analysis Model Objectives**

• To describe what the customer requires.

• To establish a basis for the creation of a software design.

• To define a set of requirements that can be validated once the software is built.

**2.3 The Elements of the Analysis Model**

The generic analysis model consists of:

• An entity-relationship diagram (data model).

• A data flow diagram (functional model).

• A state transition diagram (behavioral model).

NOTE: state transition diagram will be covered in lab 11.

**2.3.1 Entity Relationship Diagram**

An entity relationship diagram (ERD) is one means of representing the objects and

their relationships in the data model for a software product.

Entity Relationship diagram notation:

Entity

Relationship

To create an ERD you need to:

• Define “objects” by underlining all nouns in the written statement of scope: producers/consumers of data, places where data are stored, and “composite” data items.

• Define “operations” by double underlining all active verbs: processes relevant to the application and data transformations.

• Consider other “services” that will be required by the objects.

• Then you need to define the relationship which indicates “connectedness”: a "fact" that must be "remembered" by the system and cannot be or is not computed or derived mechanically.

Diagram

Description automatically generated

Figure 1: Internet sales model ERD example

For example, in a University database, we might have entities for Students, Courses, and Lecturers. Students entity can have attributes like Rollno, Name, and DeptID. They might have relationships with Courses and Lecturers.

Diagram

Description automatically generated

Figure 2: University database ERD example

**2.3.2 Data Flow Diagram**

A data flow data diagram is one means of representing the functional model of a

software product. DFDs do not represent program logic like flowcharts do.

Data flow diagram notation:

External entity

Process

Data flow

Control flow

Data store

Diagram

Description automatically generated

Figure 3: bookstore orders and warehouse retrievals DFD example

To create a DFD you need to:

• Review ERD to isolate data objects and grammatical parse to determine operations.

• Determine external entities (producers and consumers of data).

• Create a level 0 DFD “Context Diagram” (one single process).

• Balance the flow to maintain data flow continuity.

• Develop a level 1 DFD; use a 1:5 (approx.) expansion ratio.

Data Flow Diagram Guidelines:

• All icons must be labeled with meaningful names.

• Always show external entities at level 0.

• Always label data flow arrows.

• Do not represent procedural logic.

• Each bubble is refined until it does just one thing.

## **Time Boxing**

|  |  |  |
| --- | --- | --- |
| Activity Name | Activity Time | Total Time |
| Login Systems + Setting up Visual Studio Environment | 3 mints + 5 mints | 8 mints |
| Walk through Theory & Tasks | 60 mints | 60 mints |
| Implement Tasks | 80 mints | 80 mints |
| Evaluation Time | 30 mints | 30 mints |
|  | Total Duration | 178 mints |

## **Objectives**

## **Lab Tasks/Practical Work**

**1.** You should create ERD and DFD for your project