Topics: DFD Level, Software Design Principle, Coding, Software Quality, Software Maintenance.

Levels in Data Flow Diagrams (DFD):

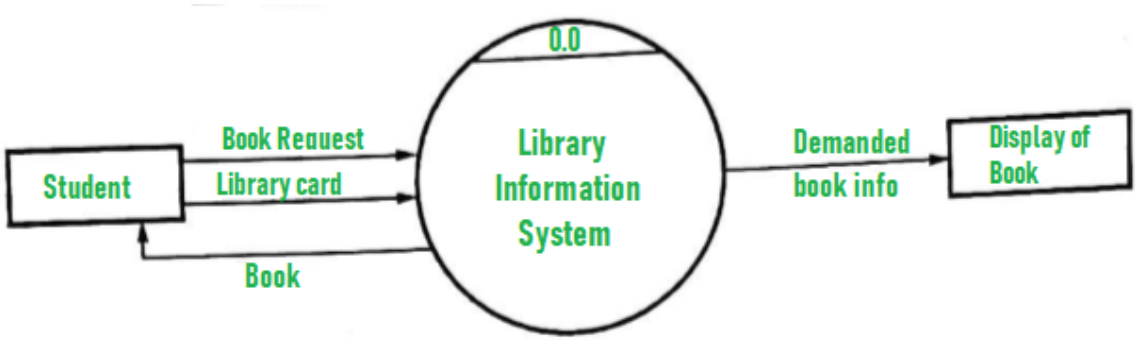
The DFD may be used to perform a system or software at any level of abstraction. In fact, DFDs may be partitioned into levels that represent increasing information flow and functional detail. Levels in DFD are numbered 0, 1, 2 or beyond. Here, we will see mainly 3 levels in the data flow diagram, which are:

- 0-level DFD
- 1-level DFD
- 2-level DFD

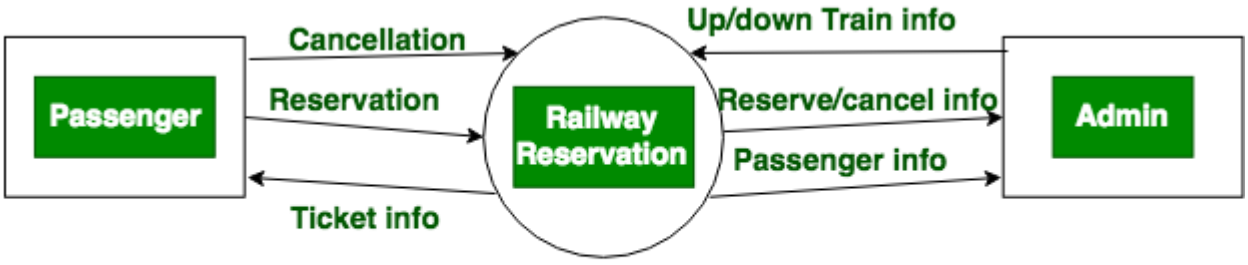
0-level DFD:

It is also known as a context diagram. It's designed to be an abstraction view, showing the system as a single process with its relationship to external entities. It represents the entire system as a single bubble with input and output data indicated by incoming/outgoing arrows.

Library Management System:



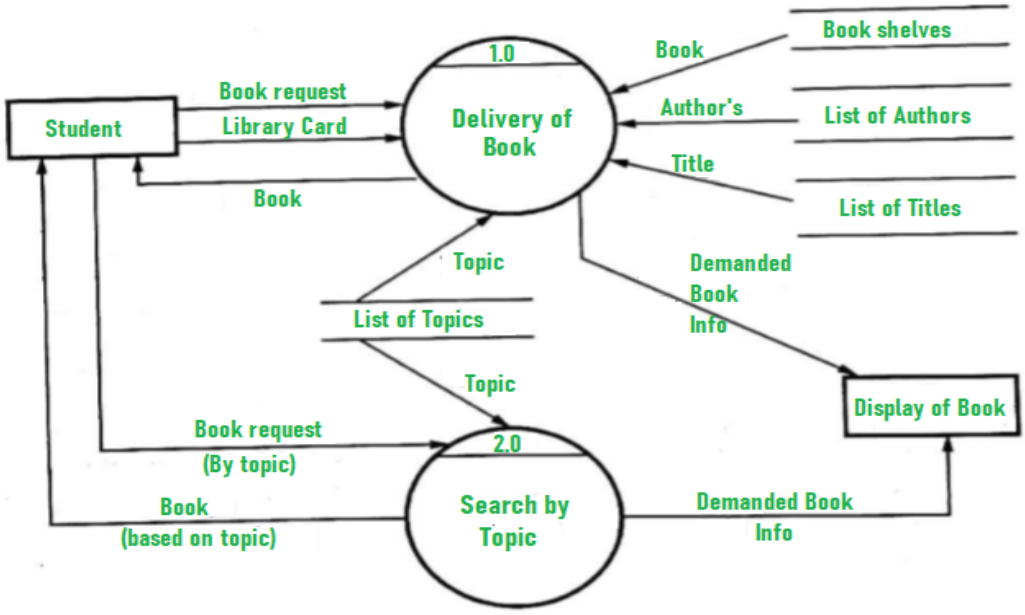
Railway Managements System:



0-LEVEL DFD

1-level DFD:

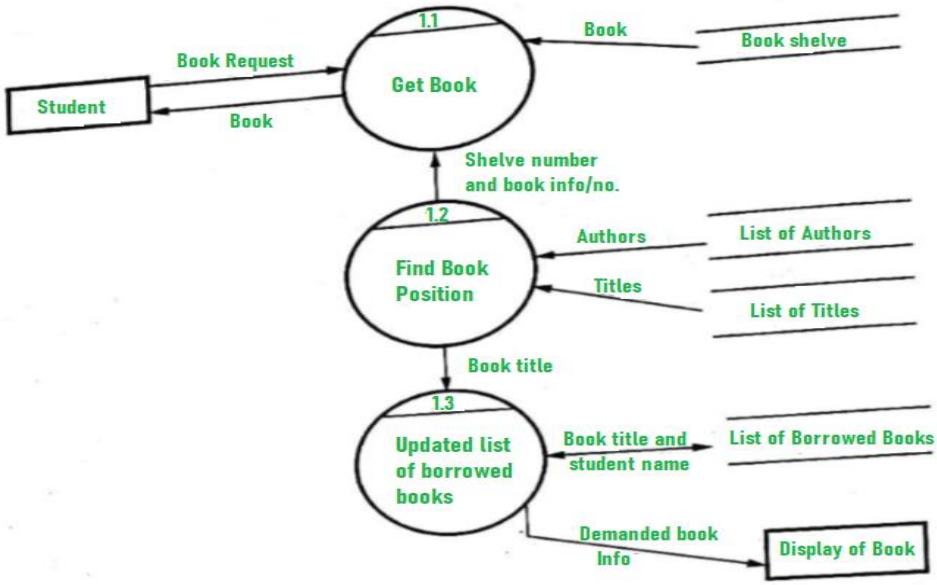
In 1-level DFD, the context diagram is decomposed into multiple bubbles/processes. In this level, we highlight the main functions of the system and breakdown the high-level process of 0-level DFD into sub processes.



Level 1 DFD

2-level DFD:

2-level DFD goes one step deeper into parts of 1-level DFD. It can be used to plan or record the specific/necessary detail about the system's functioning.



Level 2 DFD

Software Design Principles

Software design principles are concerned with providing means to handle the complexity of the design process effectively. Effectively managing the complexity will not only reduce the effort needed for design but can also reduce the scope of introducing errors during design.

Principles:

1. Problem partitioning
2. Abstraction
3. Modularity
4. Strategy Design

1.Problem Partitioning

For small problem, we can handle the entire problem at once but for the significant problem, divide the problems and conquer the problem it means to divide the problem into smaller pieces so that each piece can be captured separately.

2. Abstraction

An abstraction is a tool that enables a designer to consider a component at an abstract level without bothering about the internal details of the implementation. Abstraction can be used for existing element as well as the component being designed.

3. Modularity

Modularity specifies to the division of software into separate modules which are differently named and addressed and are integrated later on in to obtain the completely functional software.

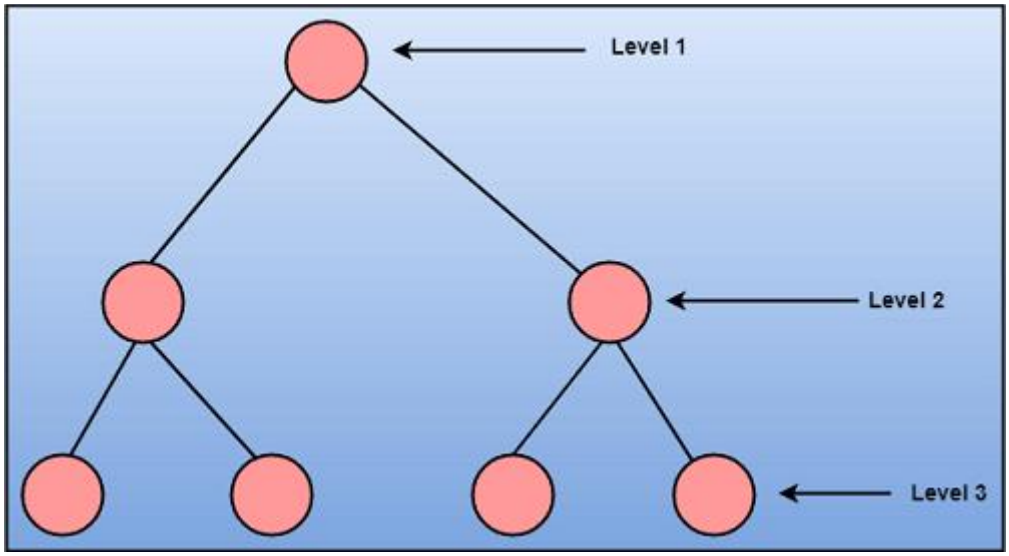
4. Strategy of Design

A good system design strategy is to organize the program modules in such a method that are easy to develop and latter too, change.

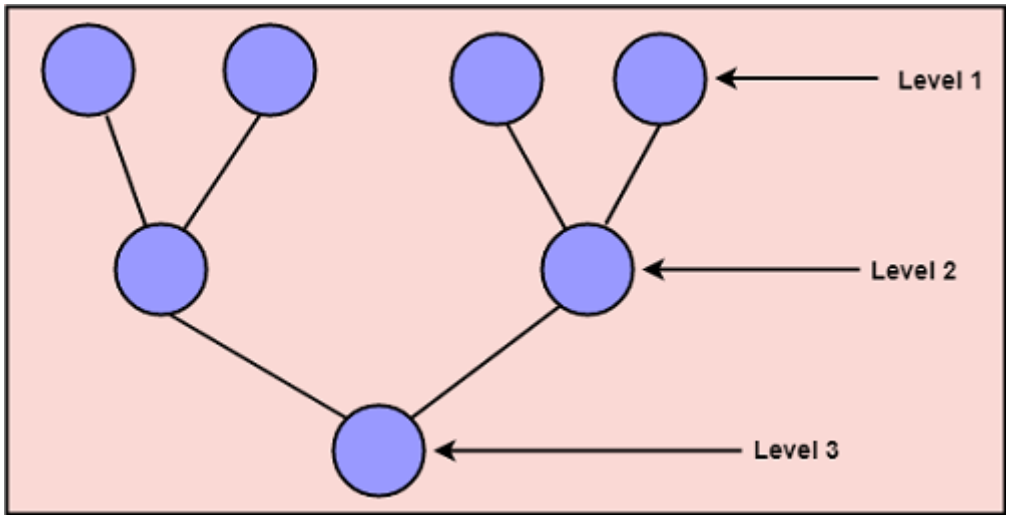
To design a system, there are two possible approaches:

1. Top-down Approach
2. Bottom-up Approach

1. <u>Top-down Approach:</u> This approach starts with the identification of the main components and then decomposing them into their more detailed sub-components.



2. <u>Bottom-up Approach:</u> A bottom-up approach begins with the lower details and moves towards up the hierarchy, as shown in fig. This approach is suitable in case of an existing system.



Coding:

The coding is the process of transforming the design of a system into a computer language format. This coding phase of software development is concerned with software translating design specification into the source code.

Coding is done by the coder or programmers who are independent people than the designer. The goal is not to reduce the effort and cost of the coding phase, but to cut to the cost of a later stage. The cost of testing and maintenance can be significantly reduced with efficient coding.

Goals of Coding:

1. To translate the design of system into a computer language format.
2. To reduce the cost of later phases.
3. Making the program more readable.

Software Quality:

Software quality product is defined in term of its fitness of purpose. That is, a quality product does precisely what the users want it to do.

ISO (International Standards Organization) is a group or consortium of 63 countries established to plan and fosters standardization. ISO declared its 9000 series of standards in 1987.

Types of ISO 9000 Quality Standards:

1. **ISO 9001:** This standard applies to the organizations engaged in design, development, production, and servicing of goods. This is the standard that applies to most software development organizations.
2. **ISO 9002:** This standard applies to those organizations which do not design products but are only involved in the production. Examples of these category industries contain steel and car manufacturing industries that buy the product and plants designs from external sources and are engaged in only manufacturing those products. Therefore, ISO 9002 does not apply to software development organizations.
3. **ISO 9003:** This standard applies to organizations that are involved only in the installation and testing of the products. For example, Gas companies.

How to get ISO 9000 Certification?

An organization determines to obtain ISO 9000 certification applies to ISO registrar office for registration. The process consists of the following stages:

1. **Application:** Once an organization decided to go for ISO certification, it applies to the registrar for registration.
2. **Pre-Assessment:** During this stage, the registrar makes a rough assessment of the organization.
3. **Document review and Adequacy of Audit:** During this stage, the registrar reviews the document submitted by the organization and suggest an improvement.
4. **Compliance Audit:** During this stage, the registrar checks whether the organization has compiled the suggestion made by it during the review or not.
5. **Registration:** The Registrar awards the ISO certification after the successful completion of all the phases.
6. **Continued Inspection:** The registrar continued to monitor the organization time by time

Software Maintenance:

Software maintenance is a part of the Software Development Life Cycle. Its primary goal is to modify and update software application after delivery to correct errors and to improve performance. Software is a model of the real world. When the real world changes, the software require alteration wherever possible.

Software Maintenance is an inclusive activity that includes error corrections, enhancement of capabilities, deletion of obsolete capabilities, and optimization.

Need for Maintenance:

Software Maintenance is needed for:-

- © Correct errors
- © Change in user requirement with time
- © Changing hardware/software requirements
- © To improve system efficiency
- © To optimize the code to run faster
- © To modify the components
- © To reduce any unwanted side effects.

Thus the maintenance is required to ensure that the system continues to satisfy user requirements.

Types of Software Maintenance

1. Corrective Maintenance
Corrective maintenance aims to correct any remaining errors regardless of where they may cause specifications, design, coding, testing, and documentation, etc.

2. Adaptive Maintenance
It contains modifying the software to match changes in the ever-changing environment.

3. Preventive Maintenance
It is the process by which we prevent our system from being obsolete. It involves the concept of reengineering & reverse engineering in which an old system with old technology is re-engineered using new technology. This maintenance prevents the system from dying out.

4. Perfective Maintenance

It defines improving processing efficiency or performance or restricting the software to enhance changeability. This may contain enhancement of existing system functionality, improvement in computational efficiency, etc.