Slide 09 : Constructing DFD Model of a System

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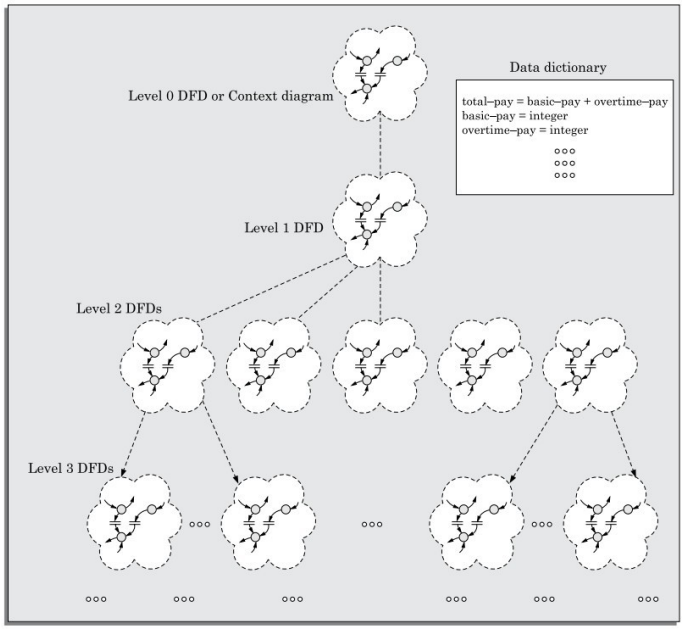
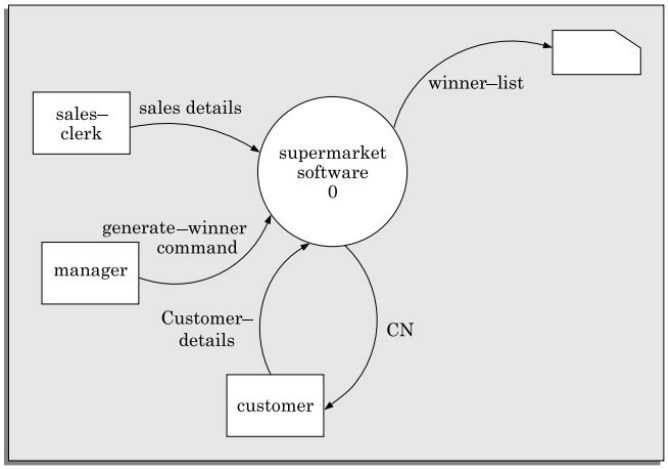
Constructing a DFD Model

- A DFD shows how input data transforms to output through a hierarchy of DFDs.
- ***Level 0 DFD (Context Diagram):*** Most abstract, simplest view of the whole system.
- Lower levels add more detail by breaking processes into sub-processes.
- **Development process:**
    1. Start with highest-level (Level 0) DFD.
    2. Create detailed DFDs at lower levels (Level 1, Level 2, etc.).
- Levels detail:
    1. Level 0 & 1: 1 DFD each
    2. Level 2: up to 7 DFDs
    3. Level 3: up to 49 DFDs
- Only one data dictionary covers all DFDs in the system.



Context Diagram

- Highest-level (most abstract) DFD representing the entire system as one single bubble.
- The bubble is named using a noun (the system name).
- Other levels use verbs for bubble names (functions).
- Purpose: show the system's context, not detailed functions.



Example: A supermarket bookkeeping system is shown as one bubble with external entities interacting with it.

Level 1 DFD

- Shows 3 to 7 bubbles (functions) representing major system functions.
- Created by examining high-level functional requirements in the SRS.

- If more than 7 requirements, combine related ones into single bubbles (split later).
- If fewer than 3 requirements, split some into sub-functions to get about 5–7 bubbles.

Decomposition (Factoring a Bubble)

- Each DFD bubble = a function; broken down into 3 to 7 subfunctions in lower levels.
- Decomposition with fewer than 3 bubbles is redundant; more than 7 bubbles is hard to understand.
- Keep decomposing until each bubble's function can be described with a simple algorithm.

Construction of Context Diagram

To create the context diagram (Level 0 DFD), examine the SRS to find:

- High-level functions of the system
- Input data to each function
- Output data from each function
- Data flow between these functions

Then, represent all these graphically as the Level 0 DFD.

Construction of Level 1 Diagram

- Check high-level functions in the SRS.
- If 3 to 7 functions, represent each as a bubble.
- If more than 7, combine related ones.
- If fewer than 3, split some functions into sub-functions.

Construction of Lower-Level DFDs

- Break each high-level function into smaller subfunctions by:
    1. Identifying subfunctions
    2. Identifying their input data
    3. Identifying their output data
    4. Identifying data flow between subfunctions
- Draw a DFD for these details.
- Repeat this decomposition until each subfunction is simple enough to be described by a basic algorithm.

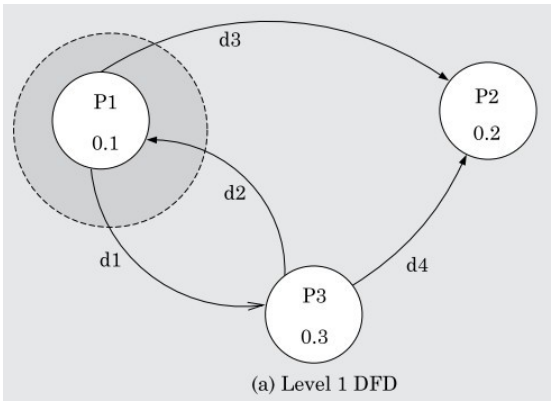
Numbering of Bubbles in DFD

- Each bubble is given a unique number for identification.
- Context-level bubble = 0 (Level 0 DFD).
- Level 1 bubbles = 0.1, 0.2, 0.3, ...

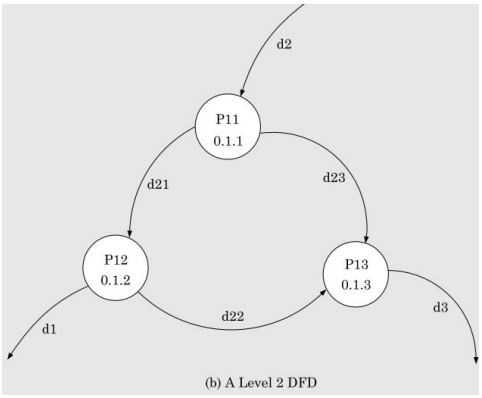
- If bubble x is decomposed, its sub-bubbles are numbered x.1, x.2, x.3, ...
- This numbering shows the bubble's level and its parent-child relationships clearly.

Balancing DFDs

- DFDs in a hierarchy must be balanced with their parent bubble.
- Data flowing into and out of a parent bubble should match the data flows in its decomposed (child) DFD.
- Example: If bubble 0.1 has inputs and outputs at Level 1, its Level 2 decomposition (like bubbles 0.1.1, 0.1.2, 0.1.3) must have the same input/output data flows.



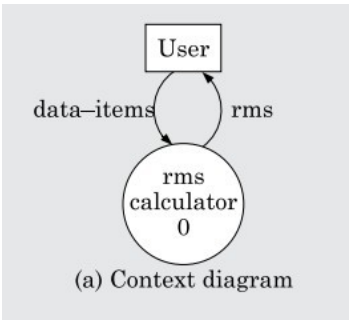
(a) Level 1 DFD



(b) A Level 2 DFD

RMS Calculating Software DFD

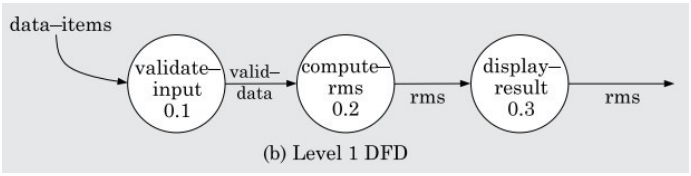
- ***Context Diagram:***
  - System as one bubble
  - Inputs: three integers from user
  - Output: RMS result to user



(a) Context diagram

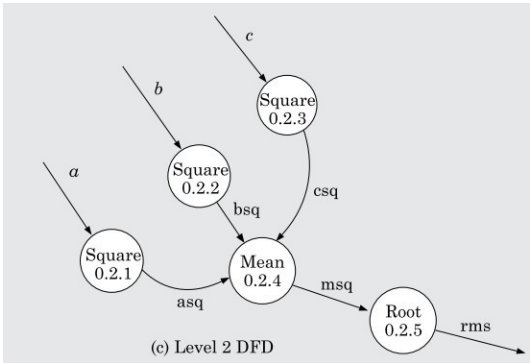
- ***Level 1 DFD:***

  Four main functions as bubbles:
  - Accept input numbers
  - Validate numbers
  - Calculate RMS
  - Display result



(b) Level 1 DFD

- ***Level 2 DFD (Decomposition of RMS calculation):***
  - Calculate squares of inputs
  - Calculate mean of squares
  - Calculate root of mean



(c) Level 2 DFD