Requirements Modeling: Flow Modeling

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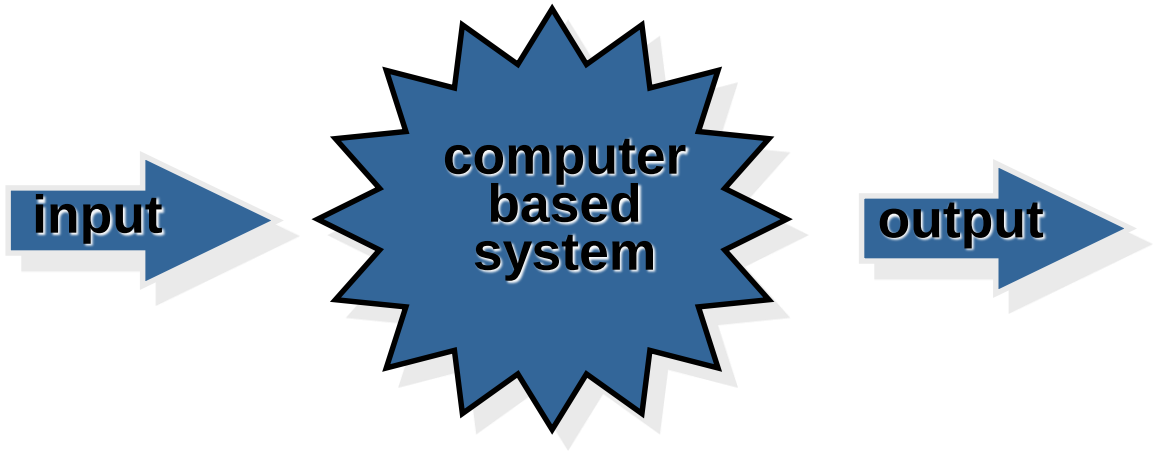
Flow-Oriented Modeling

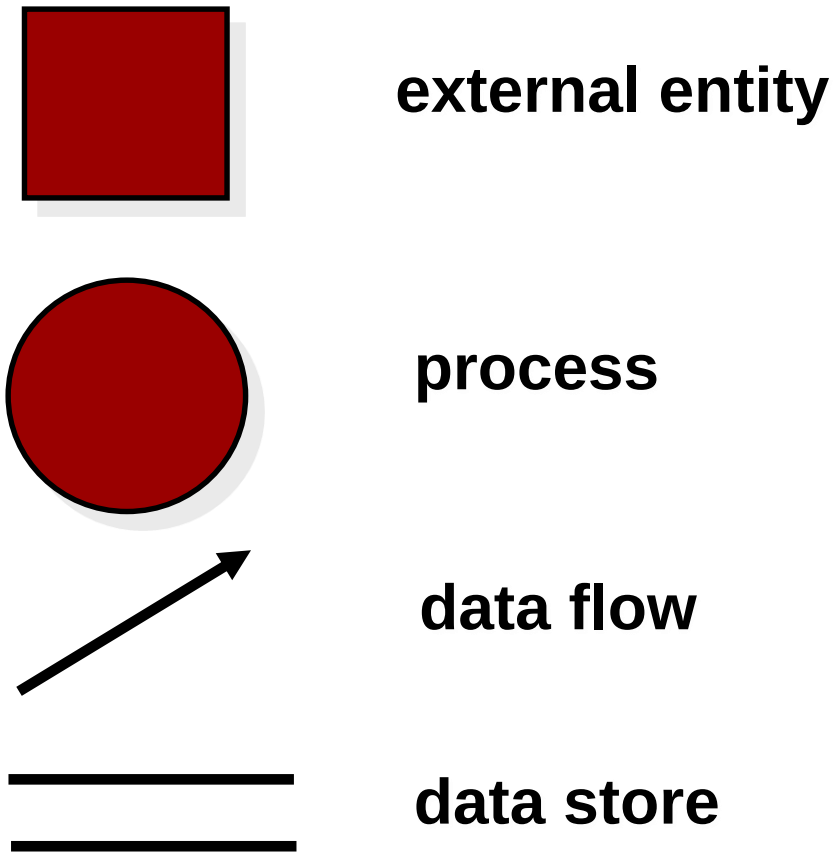
- Represents how data objects are transformed as they move through the system
- **Data Flow Diagram (DFD)** is the diagrammatic form used for representation
- Considered by many to be an “old school” approach, but continues to provide a view of the system that is unique—it should be used to supplement other analysis model elements

The Flow Model

Every computer-based system is an information transform ....



Flow Modeling Notation



External Entity

A producer or consumer of data

Examples: a person, a device, a sensor

Another example: computer-based system

Data must always originate somewhere and must always be sent to something

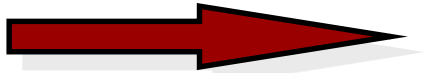
Process

A data transformer (changes input to output)

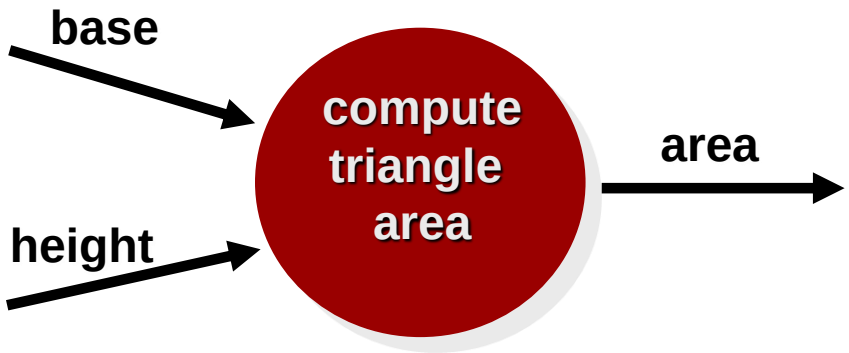
Examples: *compute taxes, determine area, format report, display graph*

Data must always be processed in some way to achieve system function

Data Flow

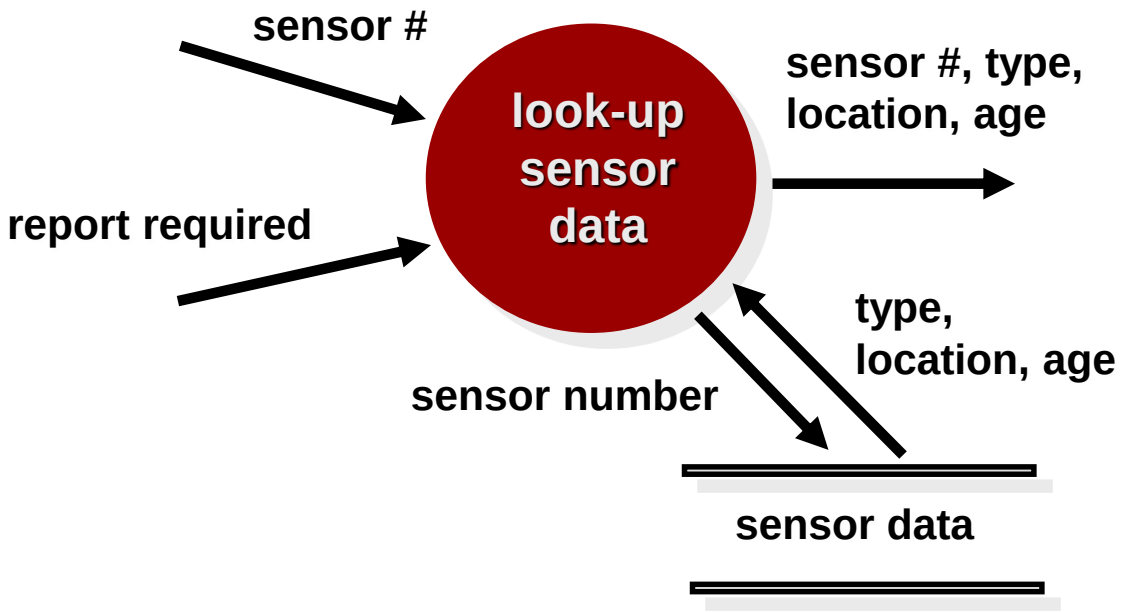


Data flows through a system, beginning as input and transformed into output.



Data Stores

Data is often stored for later use.



Data Flow Diagramming: Guidelines

- All icons must be labeled with meaningful names
- The DFD evolves through a number of levels of detail
- Always begin with a context level diagram (also called level 0)
- Always show external entities at level 0
- Always label data flow arrows
- External Entities cannot directly interact with Data storage
- Do not represent procedural logic

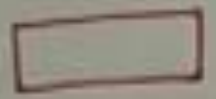
Data Flow Diagrams

- A DFD shows the flow of data through the system and is also used for modelling the requirements
- Also Known as Bubble Chart or Data Flow Graph

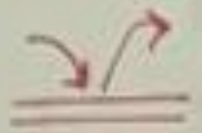
Symbols used in DFD

Process — Depicts a process that transforms data inputs into data outputs.

Data Flow — Shows flow of data into or out of a process or data store



Source or Sink — An external entity that acts as a source of system I/P or sink of system O/Ps.



Data Store — Data repository: a collection of data items.

Some Important Points

- Unique names are important
- DFDs depict flow of data and not order of events like a flowchart.
- Decision Paths (diamond nodes) represent logical expressions

Levelling In A DFD

* DFDs can be drawn to represent the system at different levels of abstraction.
* Higher Level DFDs

Level - 0 DFD

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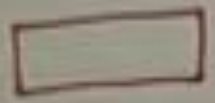

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Levelling In A DFD

* DFDs can be drawn to represent the system at different levels of abstraction.
* Higher Level DFDs are partitioned / refined into lower levels → having more information & functional details.

Level-0 DFD: Context Diagram or Fundamental System Model

Level-0 DFD represents the entire system as a single bubble with input and output data indicated by incoming & outgoing arrows.

⇓

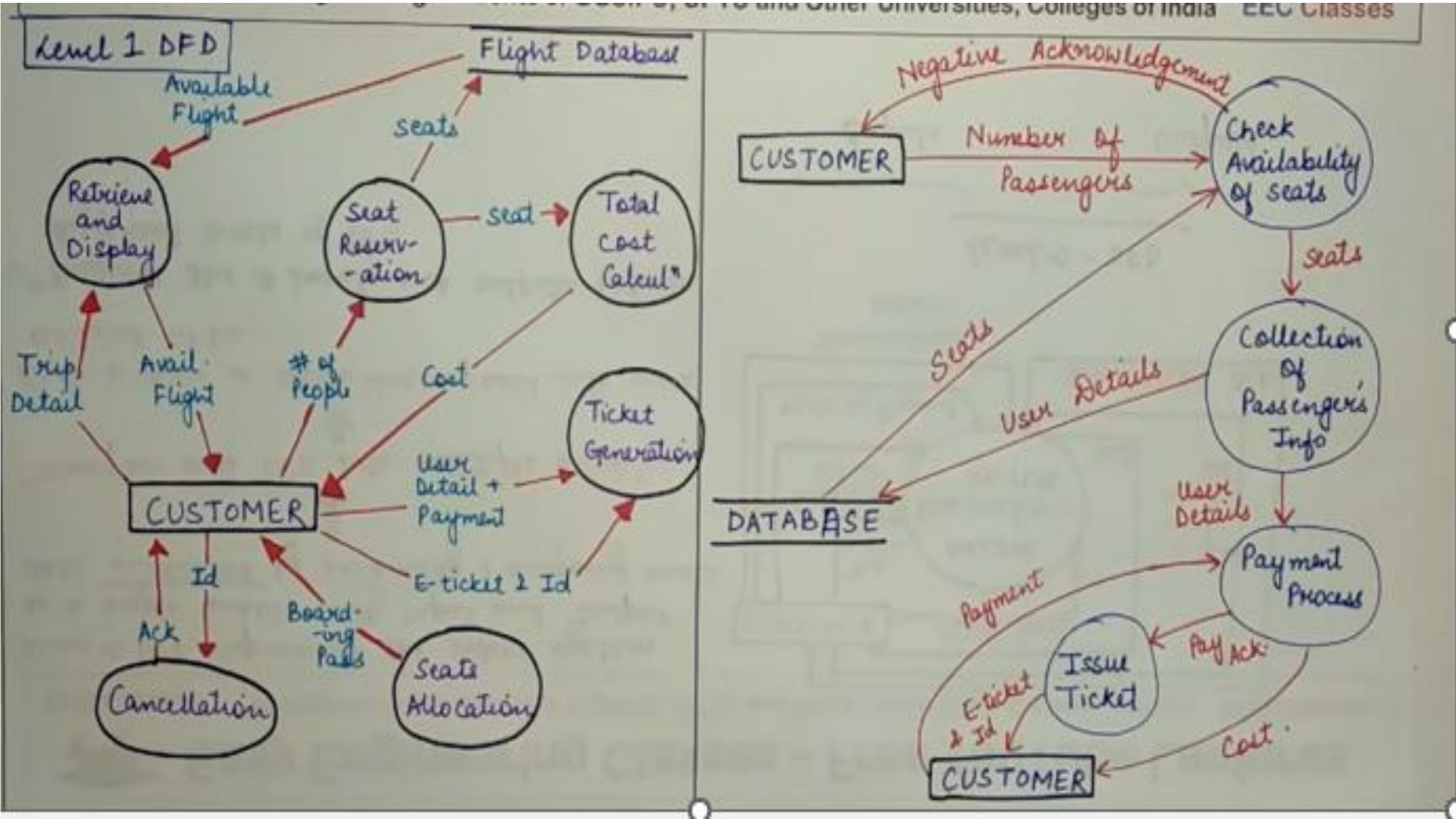
Decompose this DFD into multiple bubbles.

⇓

Each bubble is then decomposed into more detailed DFDs.

✓ Preserve the # inputs and outputs between different levels of DFD

Level-0 - DFD


Level 1 DFD
Flight Database
Available Flight
seats
Retrieve and Display
Seat Reserv-ation
seat
Total Cost Calcul°
Trip Detail
Avail Flight
# of People
Cost
Ticket Generation
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Ack
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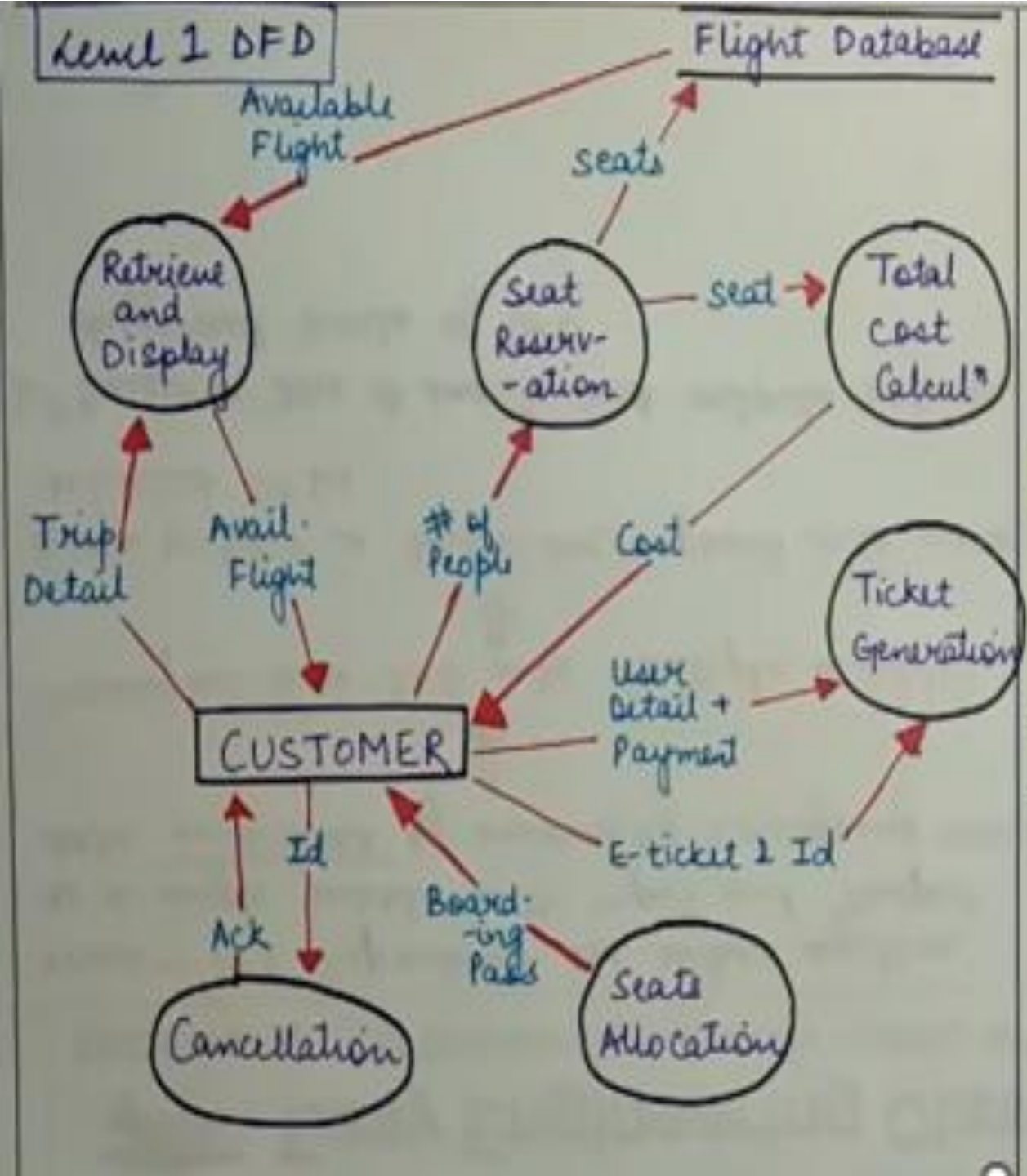
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Id
Ack
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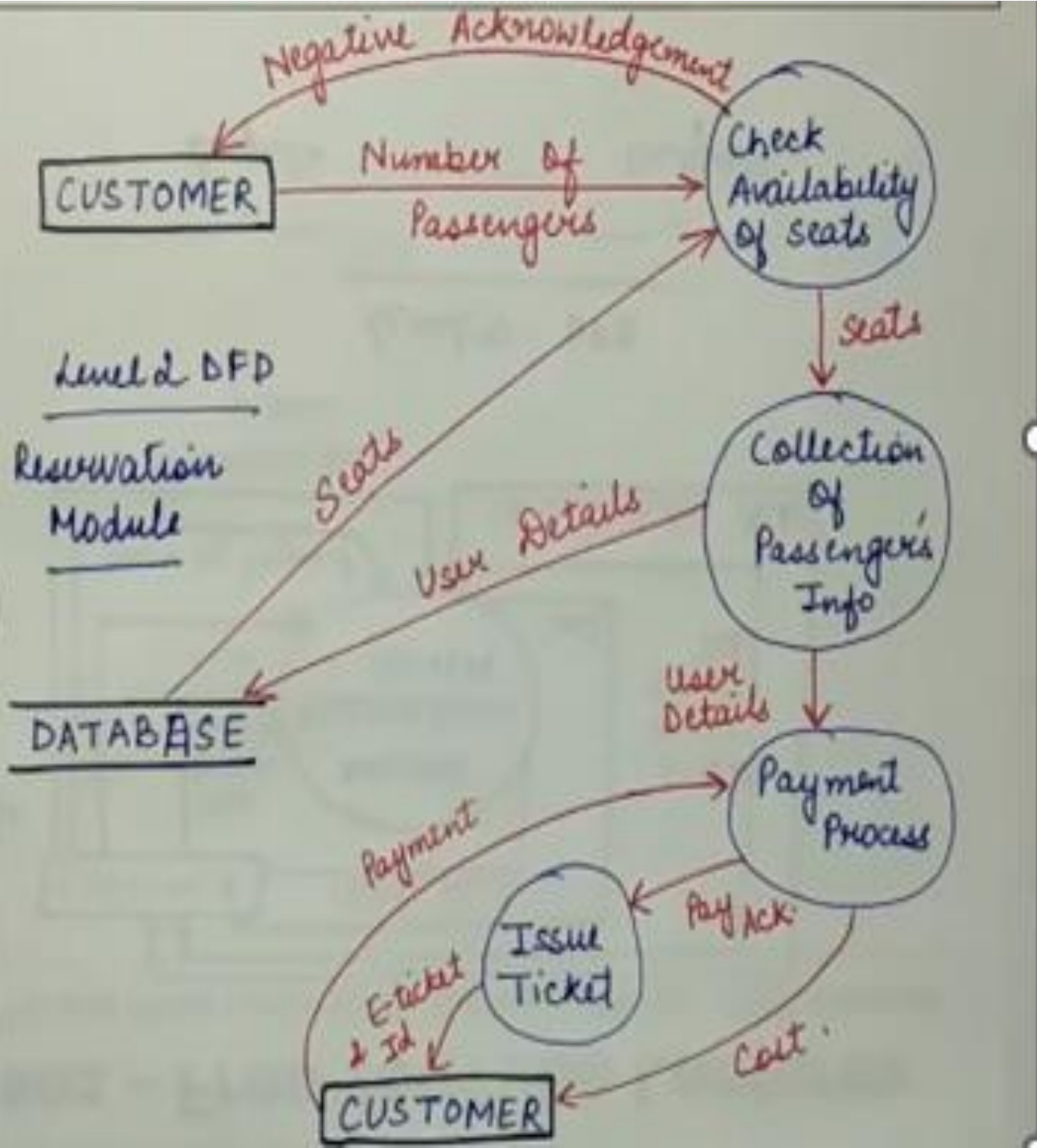
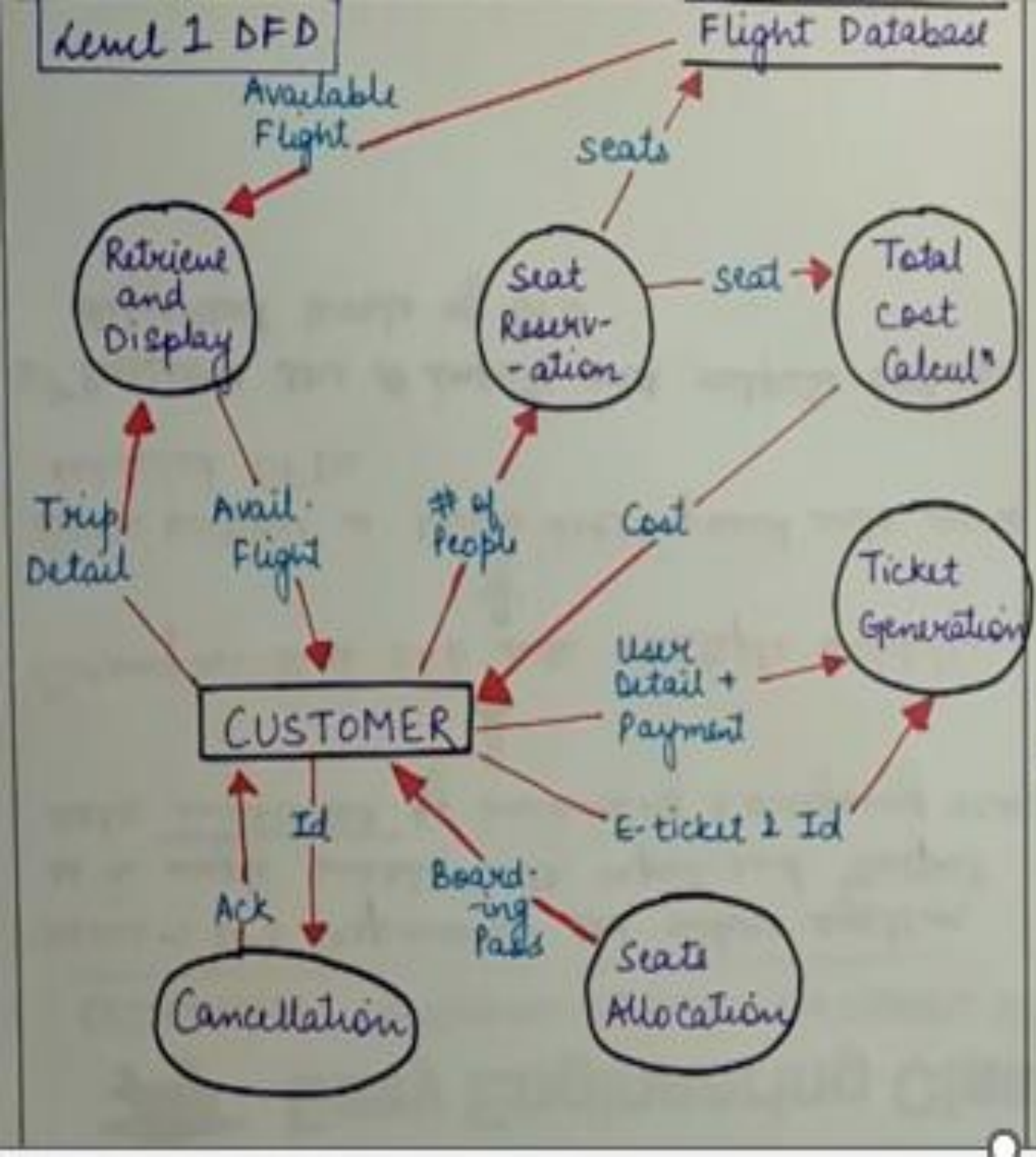
Cancellation
Seats Allocation


Negative Acknowledgement
CUSTOMER
Number of Passengers
Check Availability of seats
Seats
Level 2 DFD
Reservation Module
Seats
User Details
Collection of Passengers Info
DATABASE
User Details
Payment Process
Payment
Pay Ack
Issue Ticket
E-ticket & Id
Cost
CUSTOMER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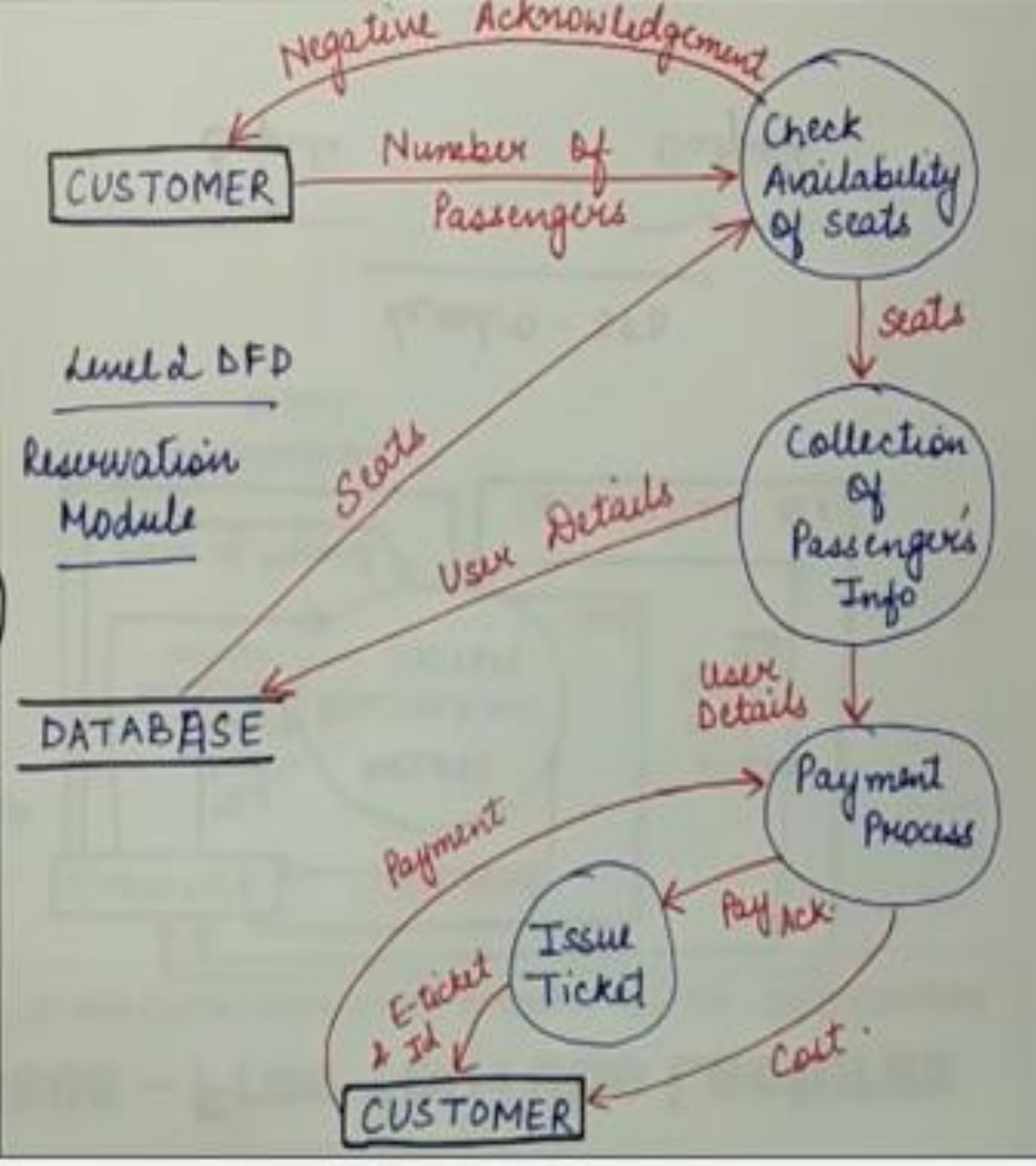
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Payment
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Issue Ticket
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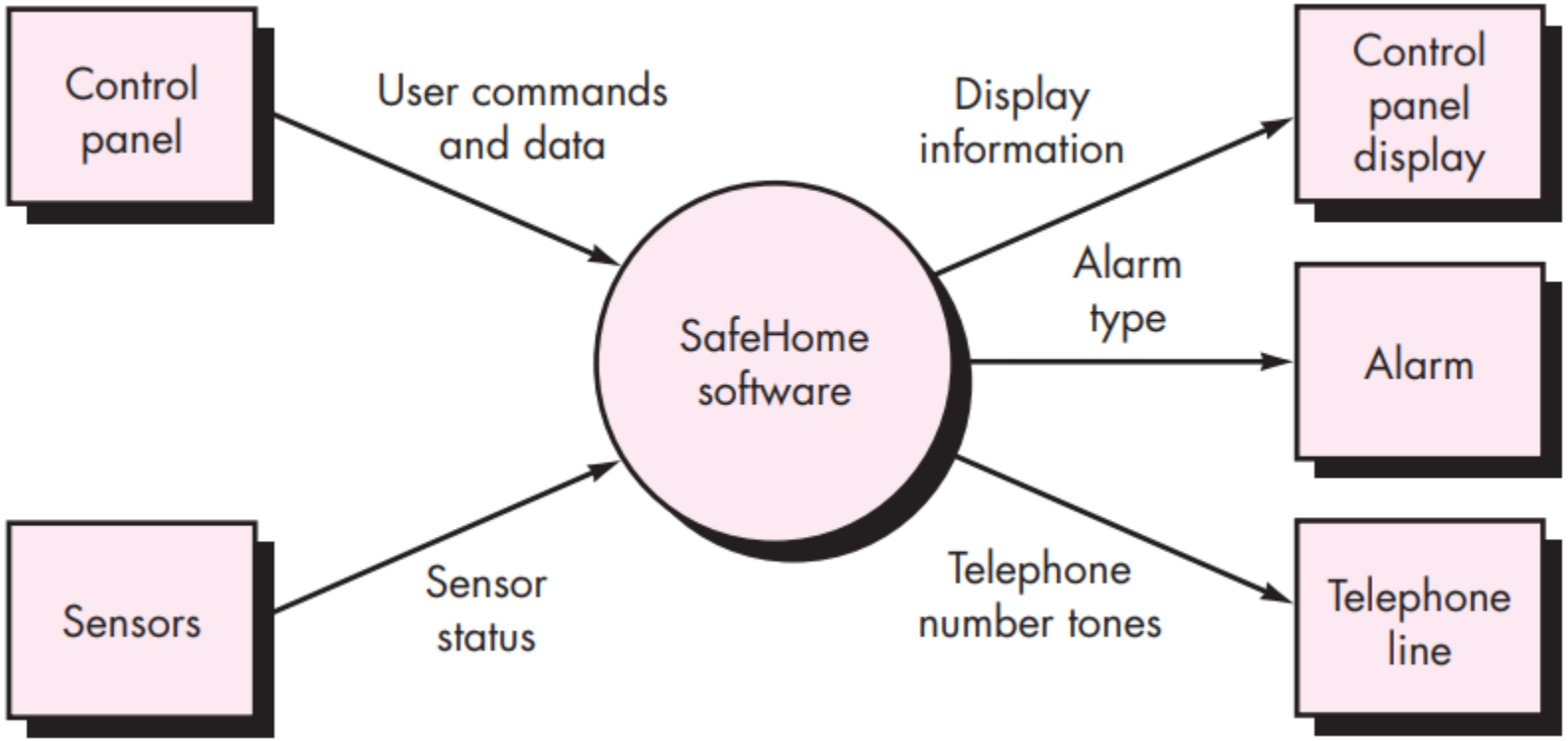
Cost
CUSTOMER

Constructing a DFD Level-0

- Review user scenarios, requirement of the system to be developed
- Determine external entities (producers and consumers of data)
- Create a level 0 DFD

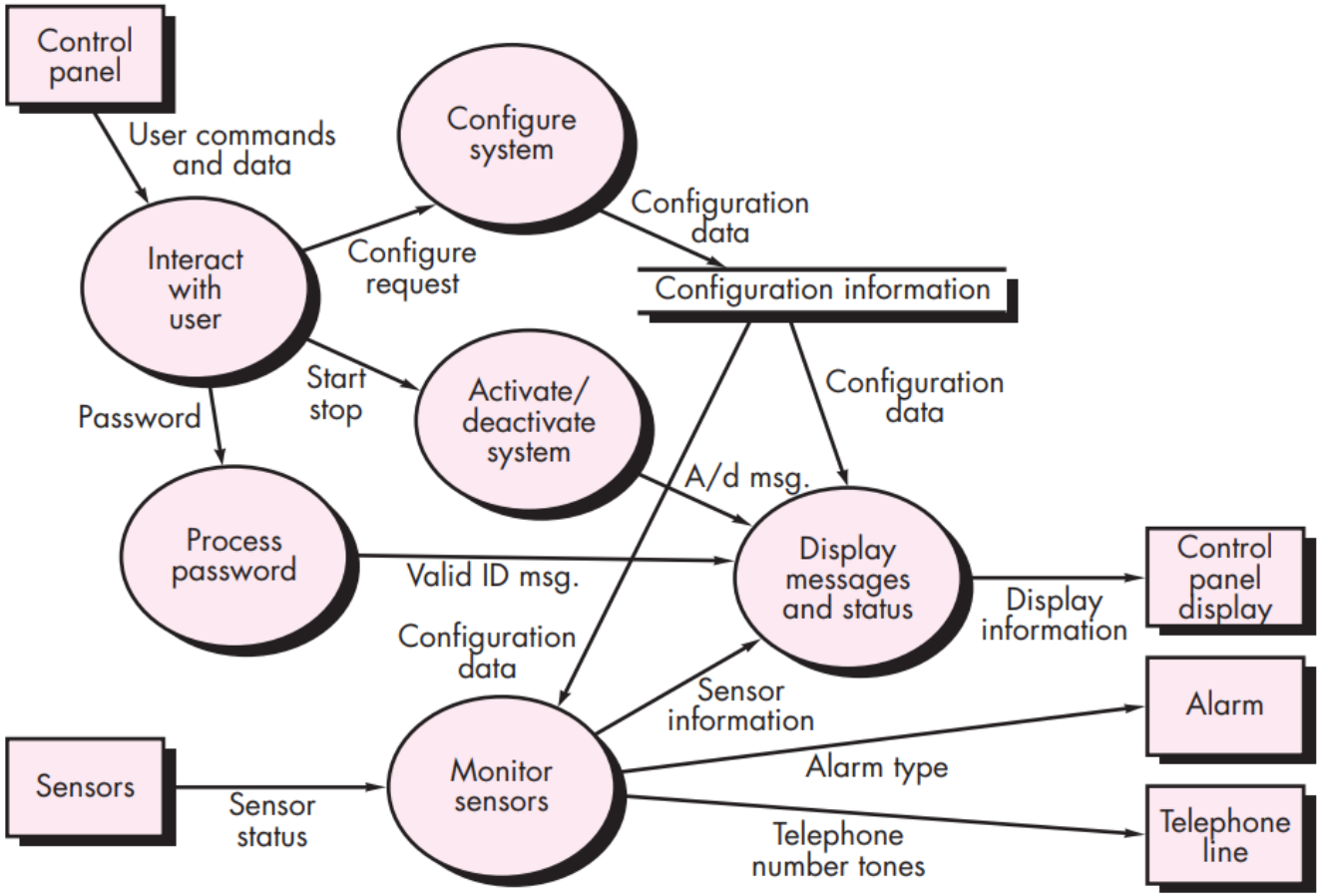
Level 0 DFD Example



Constructing a DFD Level-1

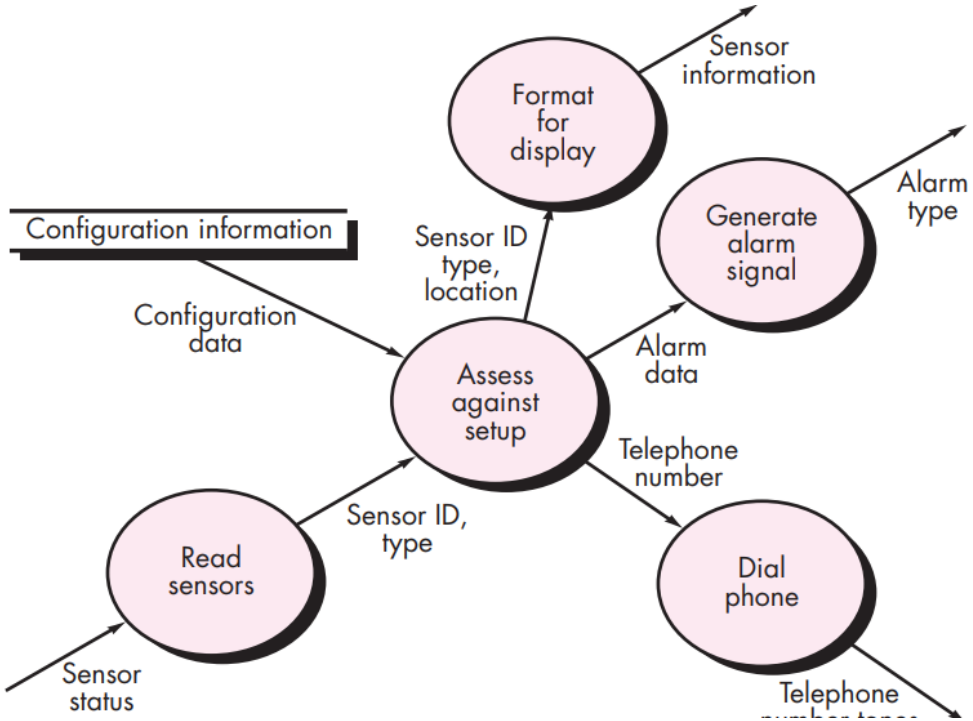
- Write a narrative describing the transform
- Parse to determine next level transforms
- “Balance” the flow to maintain data flow continuity
- Develop a level 1 DFD
- use a 1:5 (approx.) expansion ratio

Level 1 DFD Example

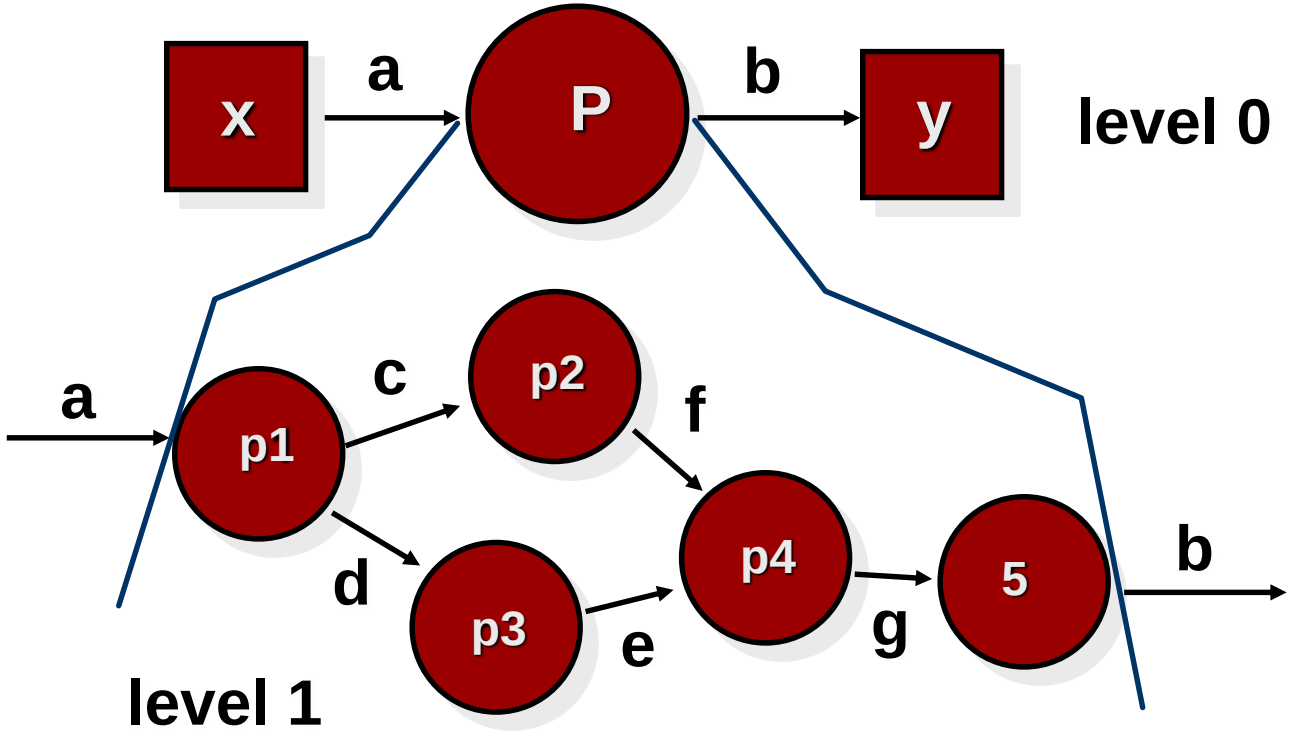


Level 2 DFD Example

Level 2 DFD that refines the *monitor sensors* process



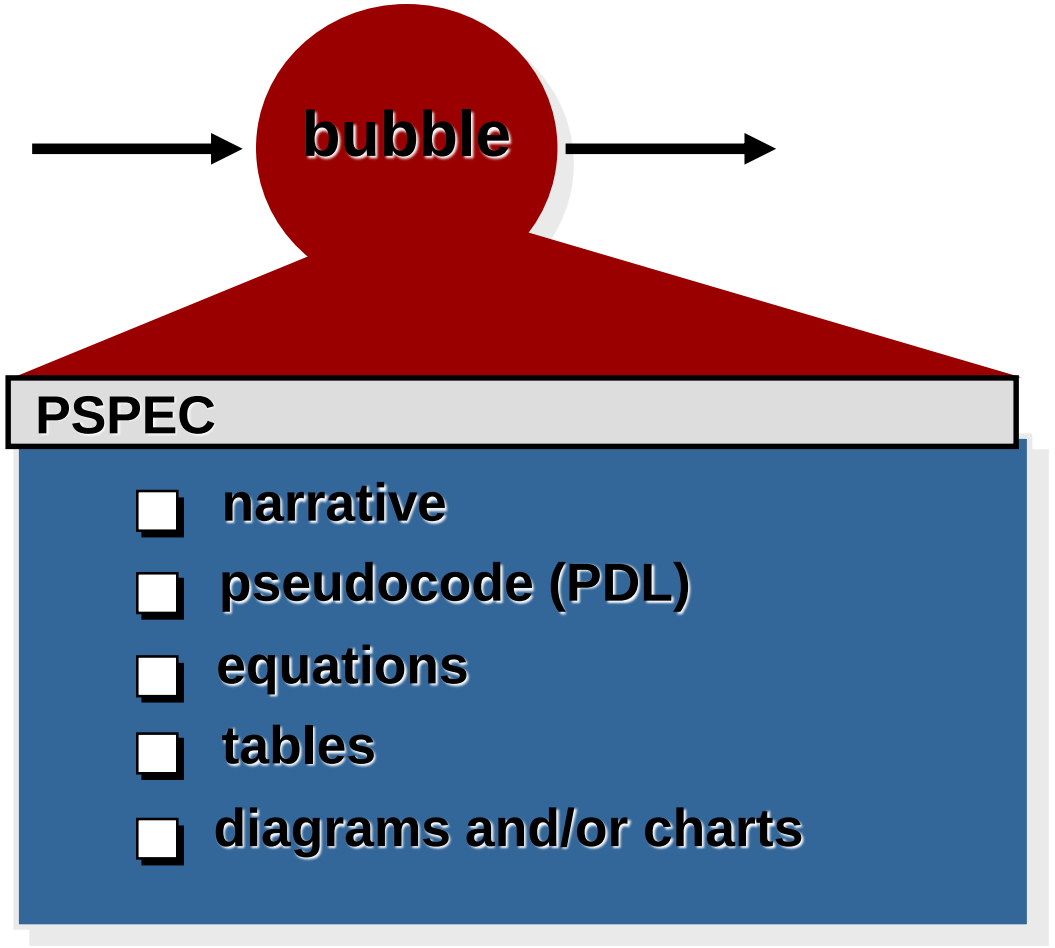
The Data Flow Hierarchy



Flow Modeling Notes

- Each bubble is refined until it does just one thing
- The expansion ratio decreases as the number of levels increase
- Most systems require between 3 and 7 levels for an adequate flow model
- A single data flow item (arrow) may be expanded as levels increase (data dictionary provides information)

Process Specification (PSPEC)



DFDs: A Look Ahead