Modeling Methods

How to simplify, present / document a complex problem?

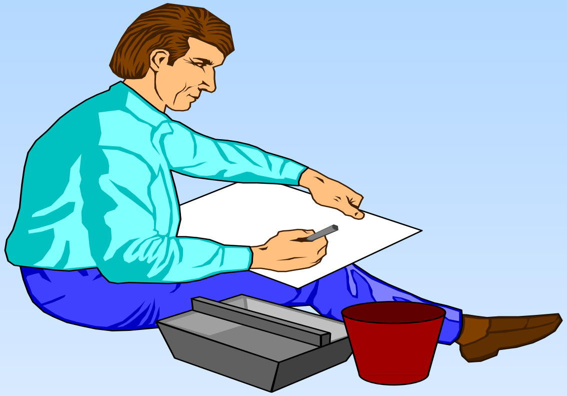
The answer is just Simple, use **MODELS**

Model :

A pictorial representation of reality.

SAMPLE FLOOR PLAN

Process Modeling



Introduction

- Technique for organizing and documenting the structure and flow of data through a system's process and the logic, policies, and procedures to be implemented by a system's process.
- Consists of various types of process models.

Process Modeling

Models

Logical Models

Other names:

~Essential model
~Conceptual model
~Business model

Physical Models

Other names:

~ Implementation Model
~ Technical model

Logical Process Models

- Show what a system is or does.
- Implementation – independent
  - depict the system independent of any technical dependence
- Illustrates the essence of the system
- Used to Depict business and non technical requirements
- Used to document system’s Process focus from the systems owners’ and users’ perspective
- Encourage creativity
- Reduce the risk of missing business requirements
- Allows better communication with end-users in non-technical / less technical languages.

Physical Process Models

- Show not only what a system is or does. But also how the system is physically and technically implemented.
- Implementation –dependent
- Reflect technology choices and the limitations of those technology choices
- Used to Depict technical designs

Process Modeling

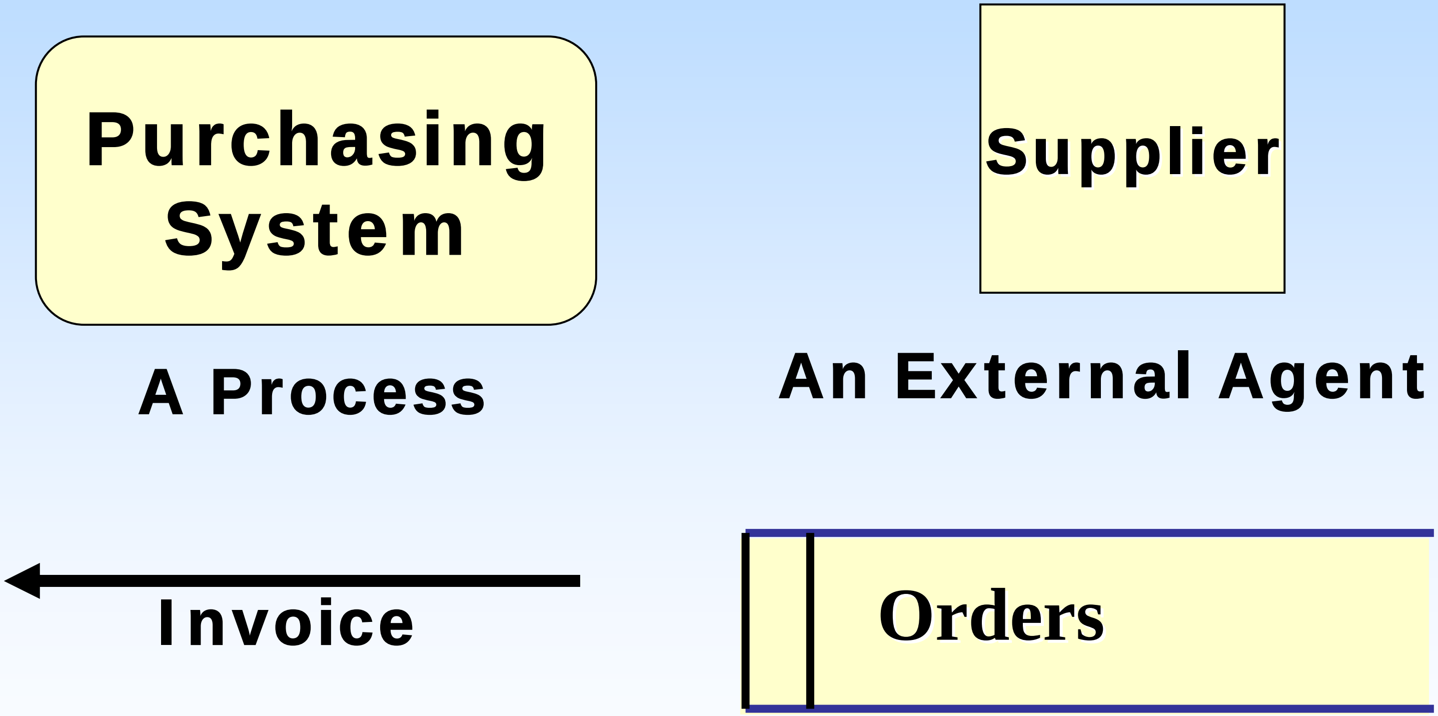
Program Structure Charts
Logic Flow Charts
Decision Tables, are some examples for various types of process models found in early software engineering methods and programming.

Data Flow Diagram : Popular System Analysis Process Model.

Data Flow Diagrams

- Shows the flow of data through the system and the processing performed by the system
- Other words : bubble chart, transformation graph, and process model
- Some analysts draw a **decomposition diagram** before DFD
- There exist several competing symbol sets for DFDs.
  - **Gane and Sarson notation is widely popular**

Elements in a DFD
(Gane and Sarson Symbols)



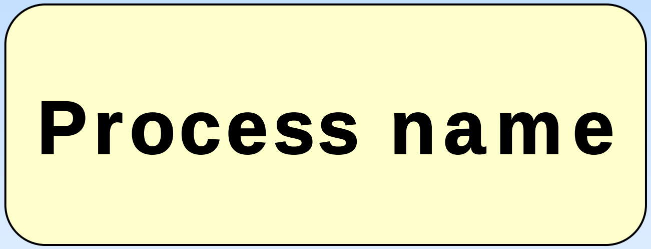
A Process

An External Agent

A Data Flow

A Data Store

Elements in a DFD
(Gane and Sarson Symbols)



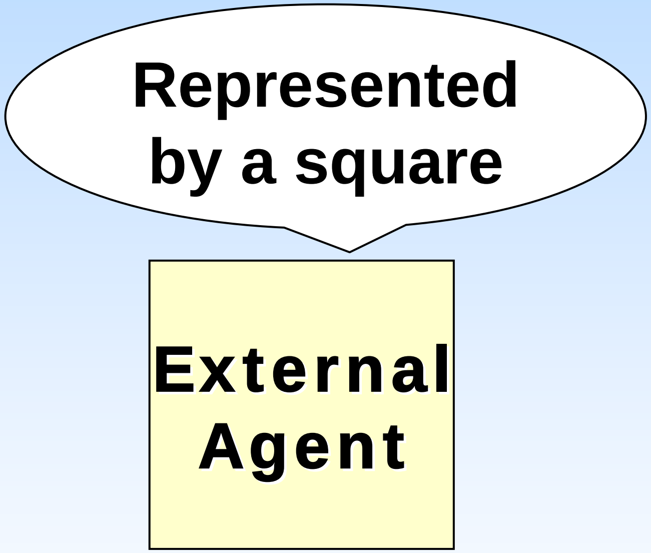
A Processes or Work to be done

Represented by a rounded rectangle

- A Process is work performed by a system In response to incoming data flows or conditions and it transforms incoming data flow into outgoing data flow.

A Synonym is transform

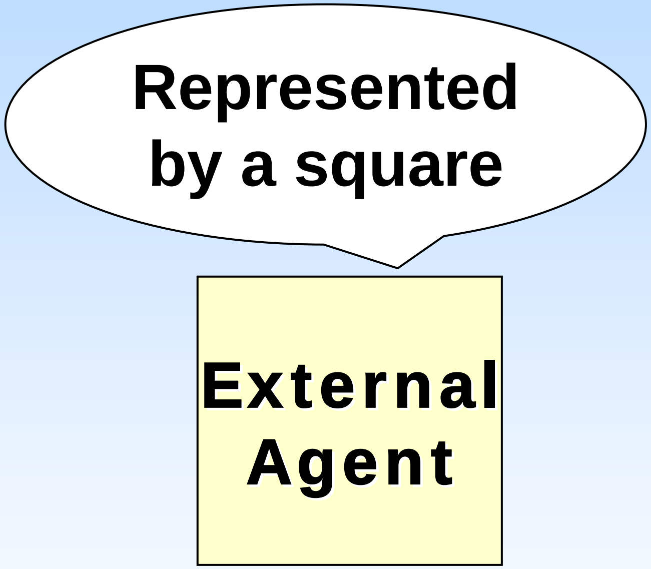
Elements in a DFD
(Gane and Sarson Symbols)



An External Agent

An external agent is an outside person (e.g. supplier, customer), organization unit (e.g. other dept), system (other business systems), or organization (e.g. Bank) that interact with the system. Also called an external entity.

Elements in a DFD
(Gane and Sarson Symbols)



An External Agent

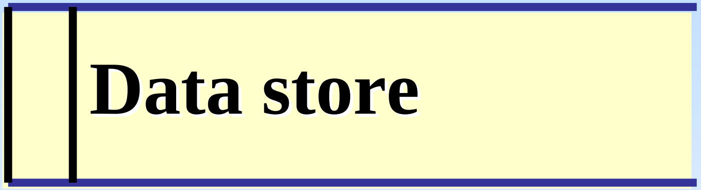
External Agents

Provide the net inputs into the system and receive net outputs from the system being defined.

External

external to the system being analyzed or designed.

Elements in a DFD
(Gane and Sarson Symbols)



A Data Store

Represented by the open-end box

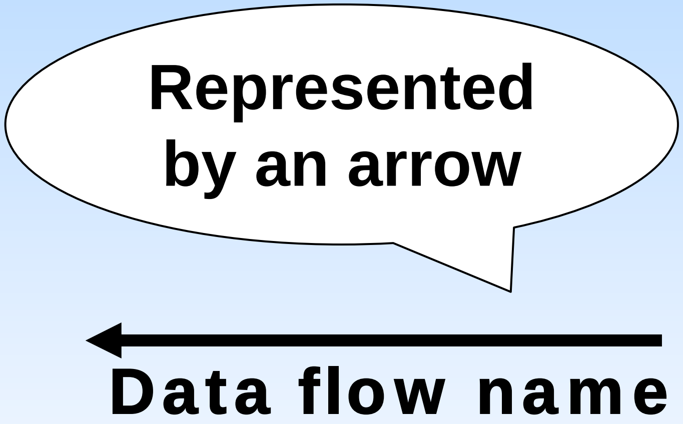
A Data Store is an "inventory" of data. That is, stored data intended for later use (data at rest). Also known as a file or database.

Elements in a DFD
(Gane and Sarson Symbols)

A Data Store

- Data stores should describe “things” about which the business wants to store data.
- These include
  Persons: Customer, Employee
  Places: Building, Room, Campus
  Objects: Book, Machine, Product
  Events: Invoice, Order, Registration, Renewal
  Concepts: Course, Fund, Stock

Elements in a DFD
(Gane and Sarson Symbols)

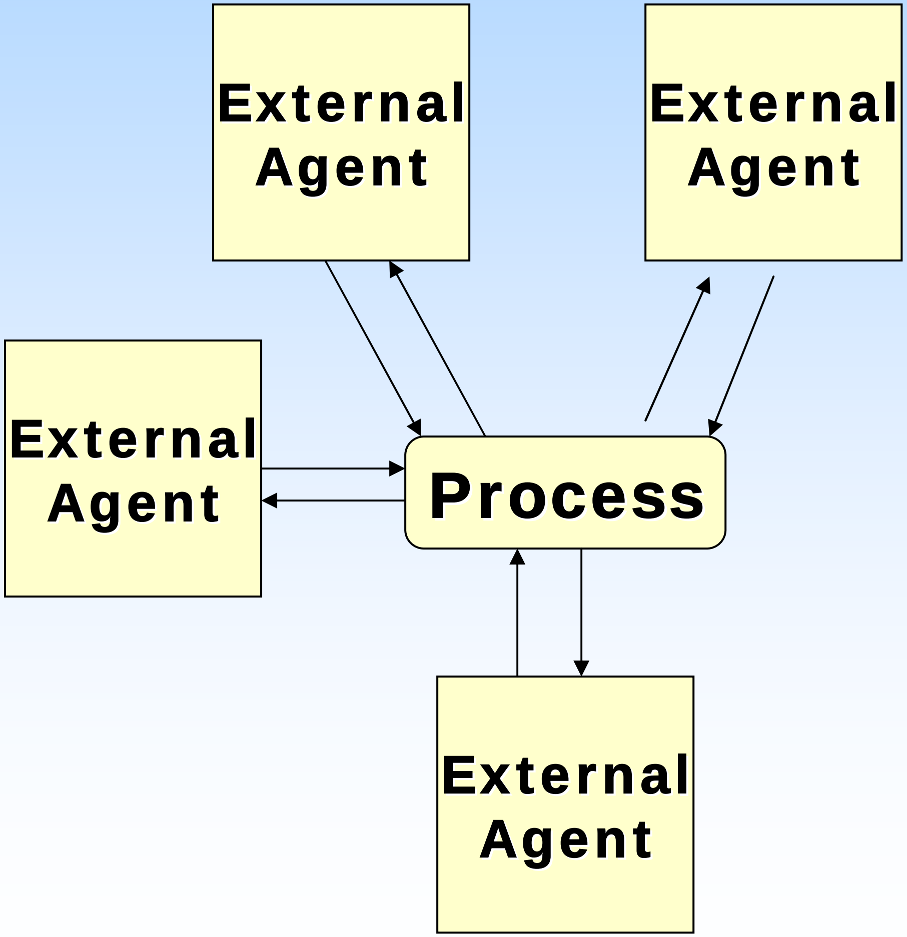


A Data Flow

- Represent inputs or outputs, to or from the processes.
- The arrow head indicates the direction of data flow.
- Label the arrows with the name of the data that moves through it.
- Data in motion

The Context Data Flow Diagrams

- A diagram that shows the system as a “black box” and its main interfaces with its environment.
- Used to document the scope of the system
- Also known as environmental model.



The Context Data Flow Diagrams

- Used to clarify and agree the scope of the investigation
- Shows the interfaces between the system under investigation and the external agents with which it communicates
- Subject to constant change
  - **Because the scope of any project is always subject to change**

The Context Data Flow Diagrams

- Can be drawn without considering the **Document Flow Diagram**

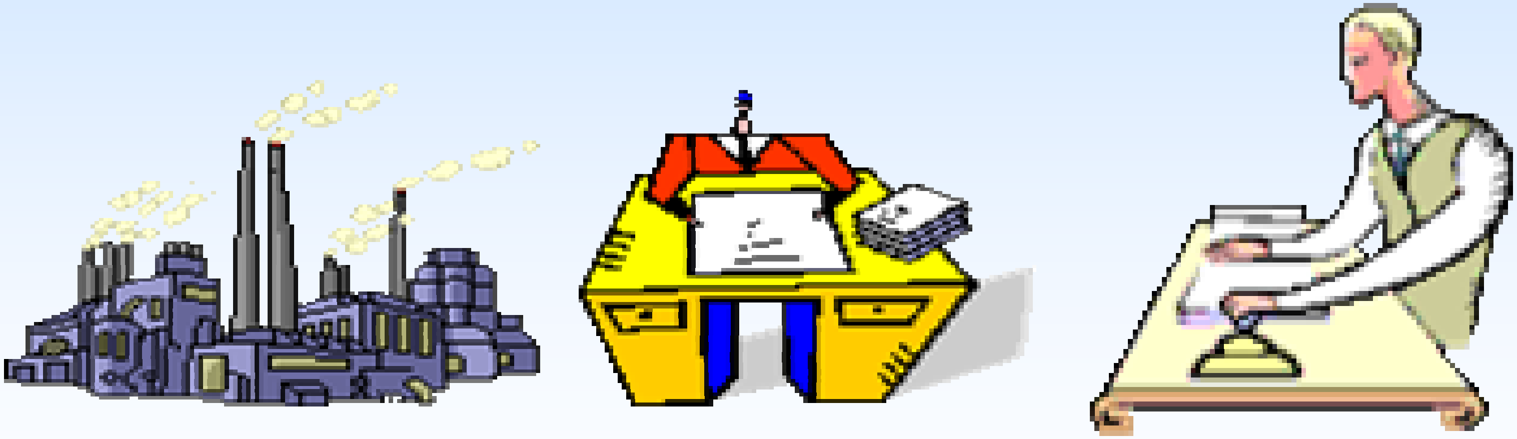
- Need to identify
  - the **data flows** and
  - the **external agents** needed for the context diagram

The Context Data Flow Diagrams

- Think the system as a container
- Distinguish the inside from the outside
- Ignore the inner workings of the container
- Find out the net inputs to the system
  - Business transactions a system must respond to
- For each net input determine its source (External Agents)
- Find out the net outputs from the system
  - Responses produced by the system
- For each net output find the destination (External Agents)
- Identify any external data stores,
  - Files or databases of other systems

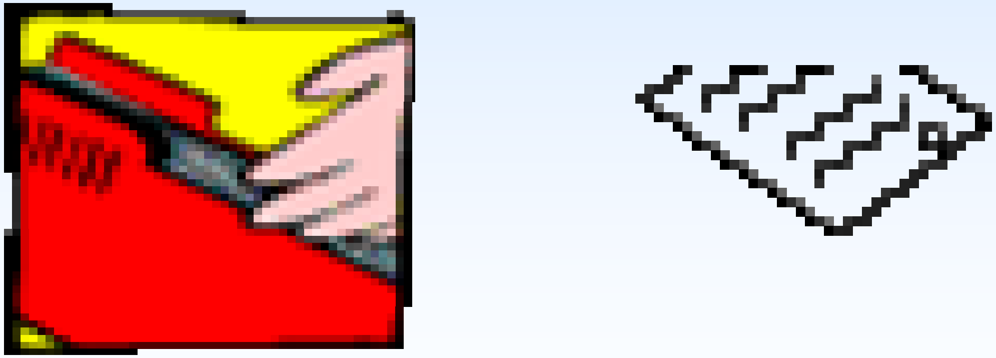
Task 1

Identify all sources and recipients of data to/from the system.



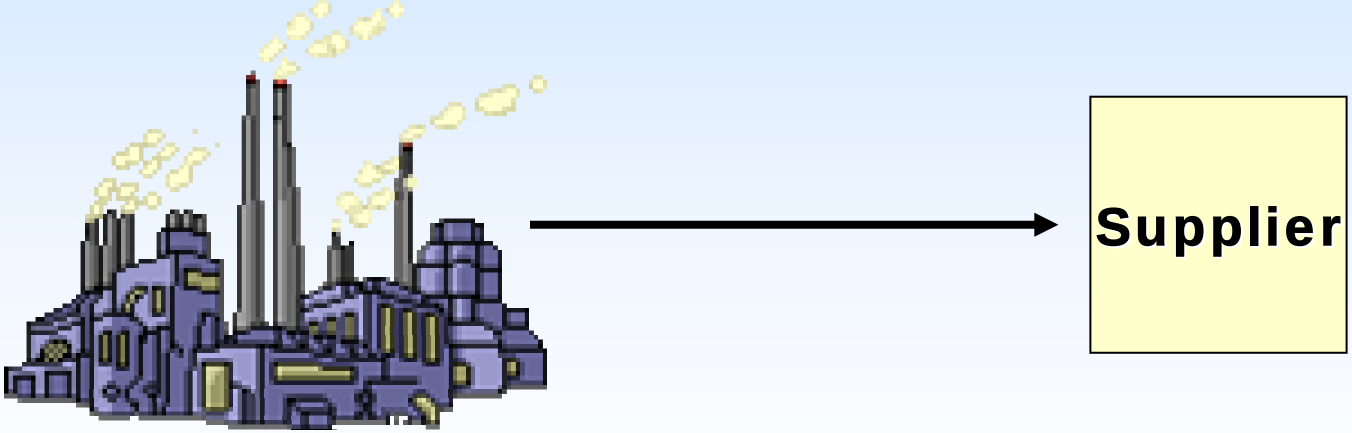
Task 2

- Identify major data flows to and from the System



Task 3

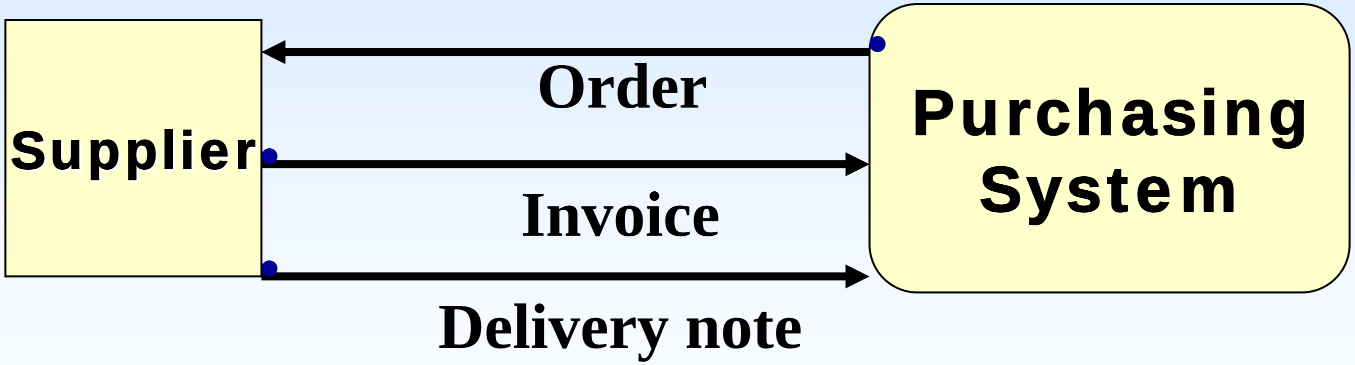
- Convert each source or recipient into external agents



Supplier

Task 4

- Add the data flows between each external agent and the process representing the entire system.



Data Flow Diagrams

- Draw Context Diagram
- Level 0 (Top Level) Data Flow Diagram
- Level 1 Data Flow Diagram
- Continue up to elementary functions

Bank Payment System

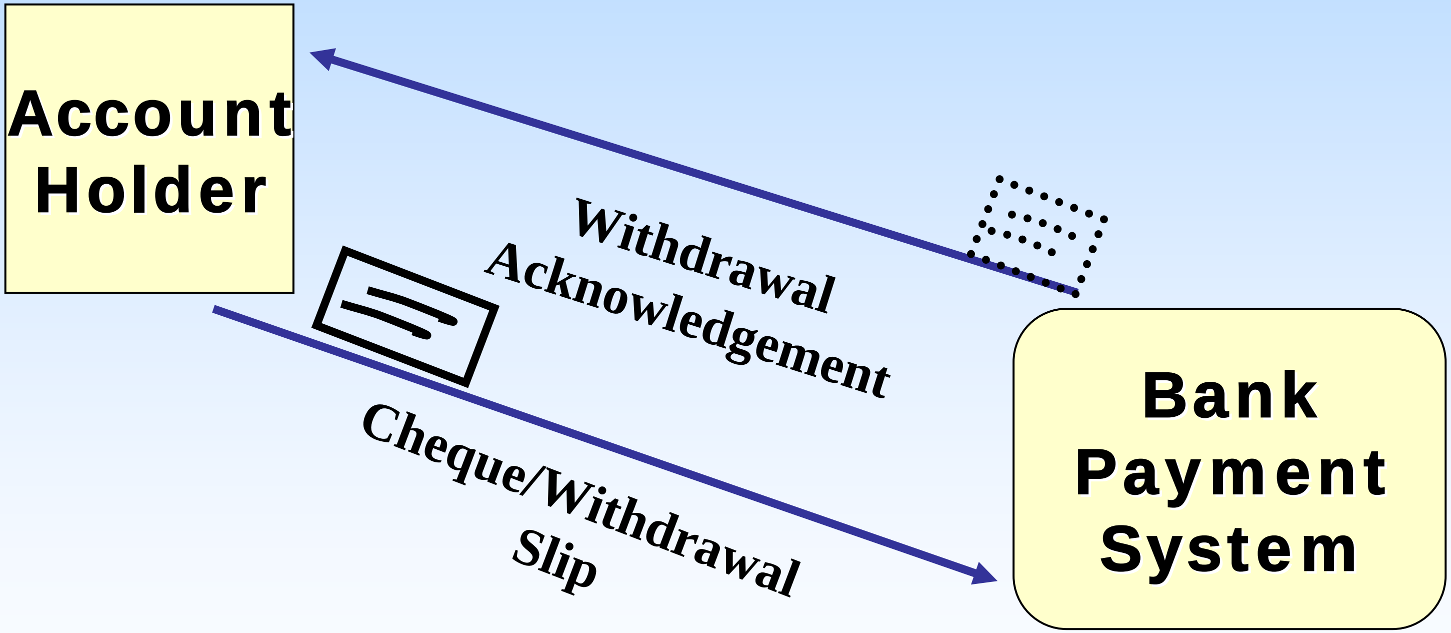
- Consider a system in a bank whereby account holders get their withdrawals effected.

Whenever an account holder wants to withdraw some cash, he presents a cheque or withdrawal slip.

The account is checked for the appropriate balance.

If balance exists, the cash is paid and the account is updated.

Context Diagram



Account Holder

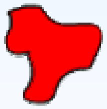
Withdrawal Acknowledgement

Cheque/Withdrawal Slip

Bank Payment System

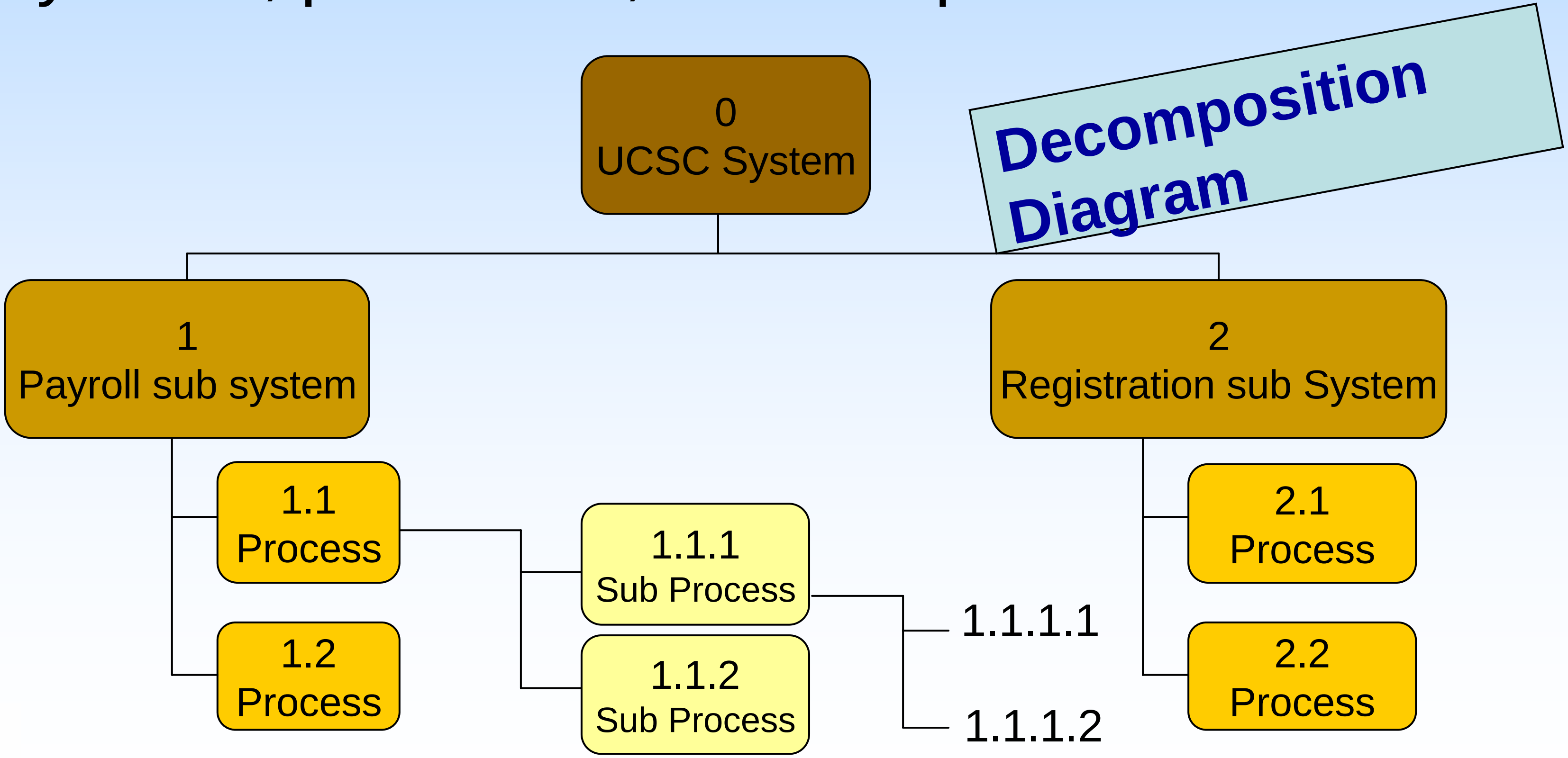
Decomposition

- Is the act of breaking a system into its component subsystems , processes and sub processes.
- Top level function is then decomposed to its component functions



Process Decomposition

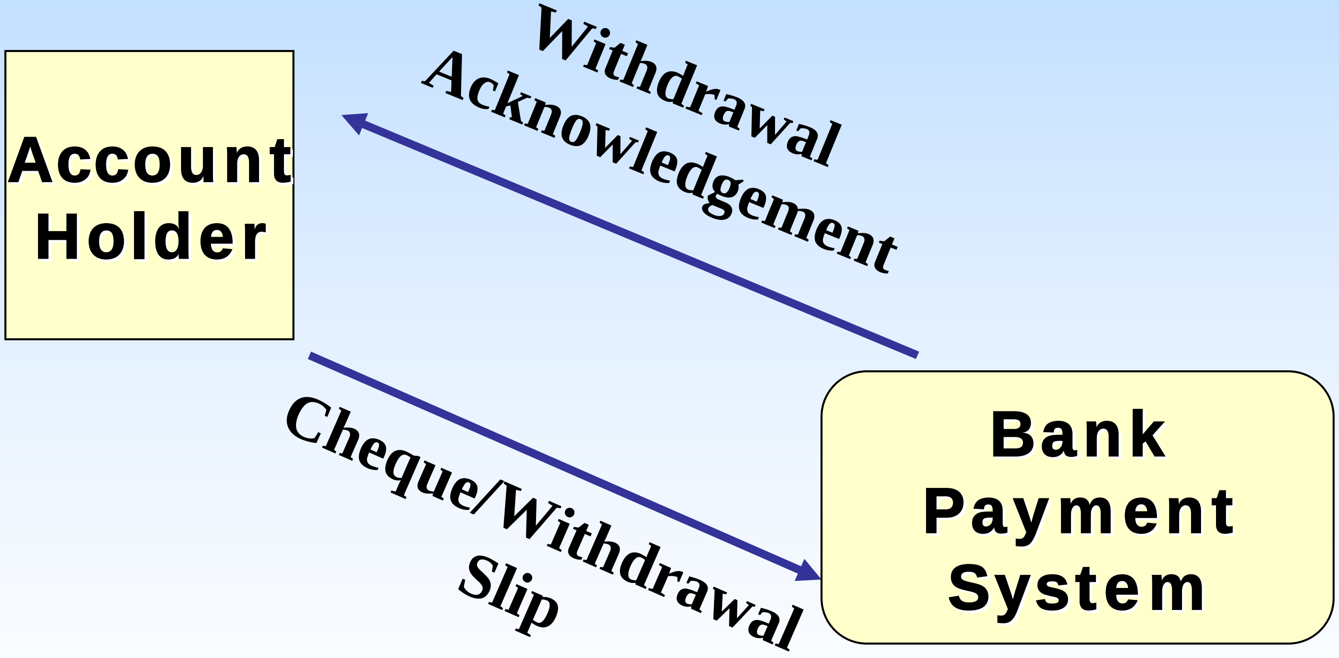
Is an act of breaking a system into its component subsystems, processes, and sub processes.



Decomposition Diagram

- 0 UCSC System
  - 1 Payroll sub system
    - 1.1 Process
      - 1.1.1 Sub Process
        - 1.1.1.1
        - 1.1.1.2
      - 1.1.2 Sub Process
    - 1.2 Process
  - 2 Registration sub System
    - 2.1 Process
    - 2.2 Process

Context Diagram



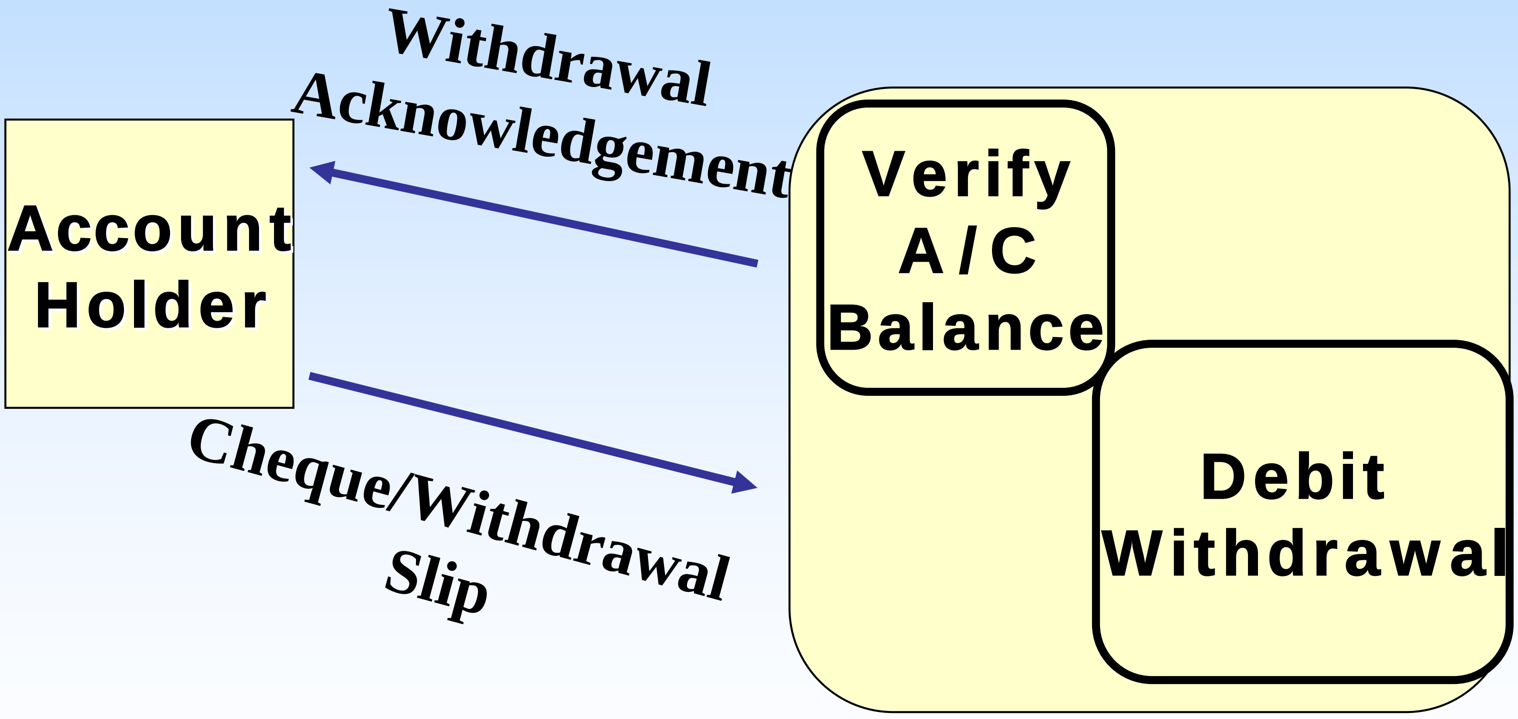
Account Holder

Withdrawal Acknowledgement

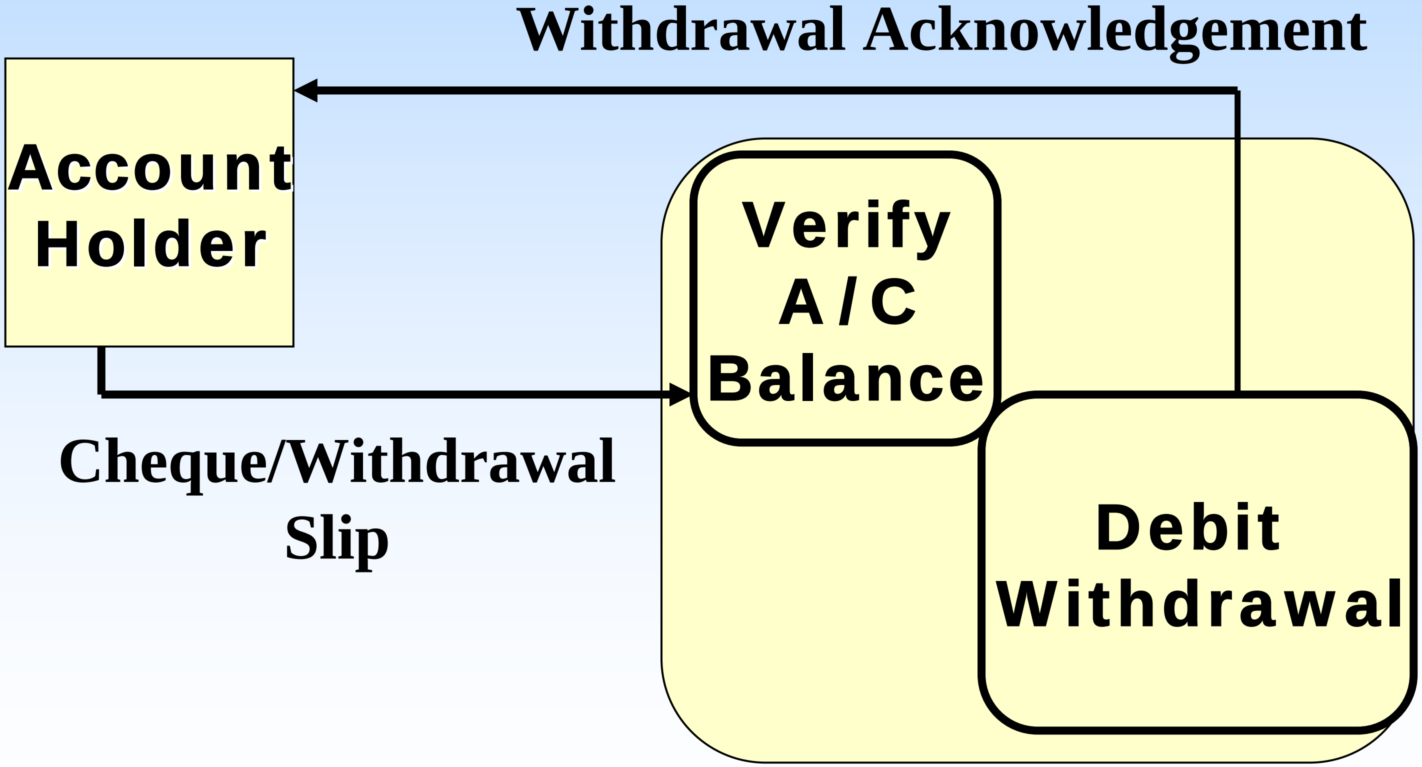
Cheque/Withdrawal Slip

Bank Payment System

Top Level DFD – Step 1

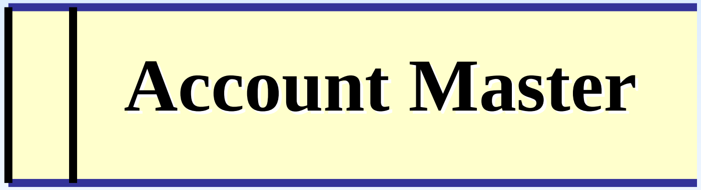


Top Level DFD – Step 2



Top Level DFD – Step 3

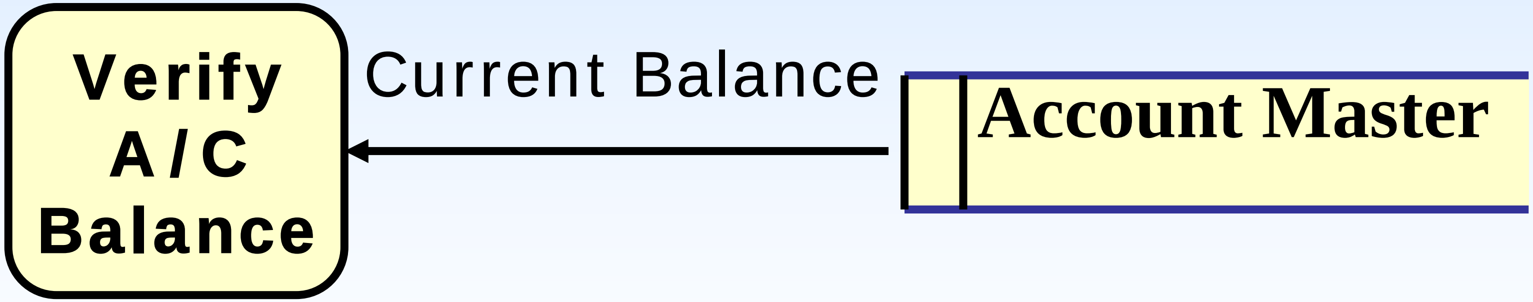
- Identify the Data Stores



Top Level DFD – Step 4

- Identify the other data flows.

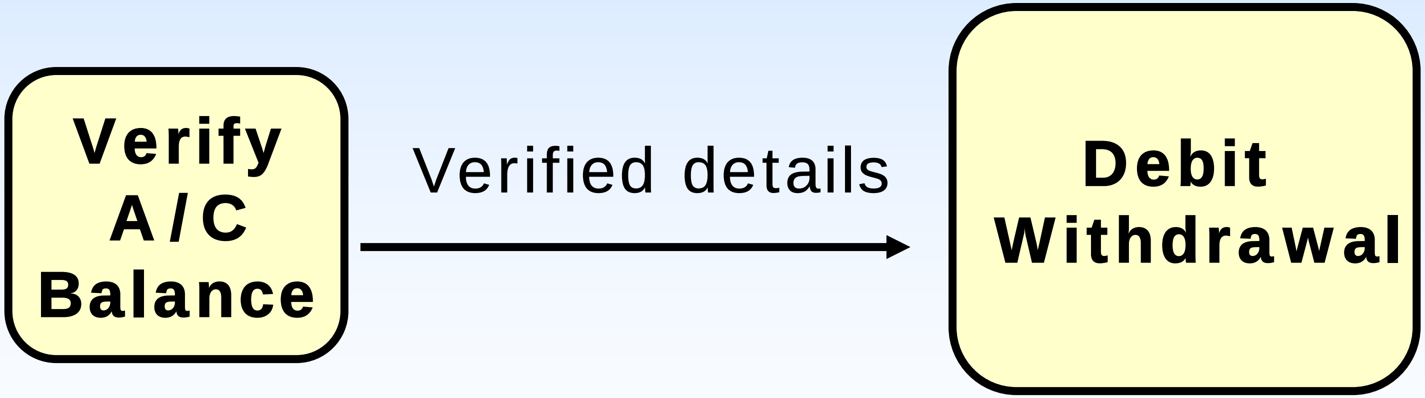
  Get current balance



Top Level DFD – Step 4

- Identify the other data flows.

Transfer the verified details



Verify A/C Balance

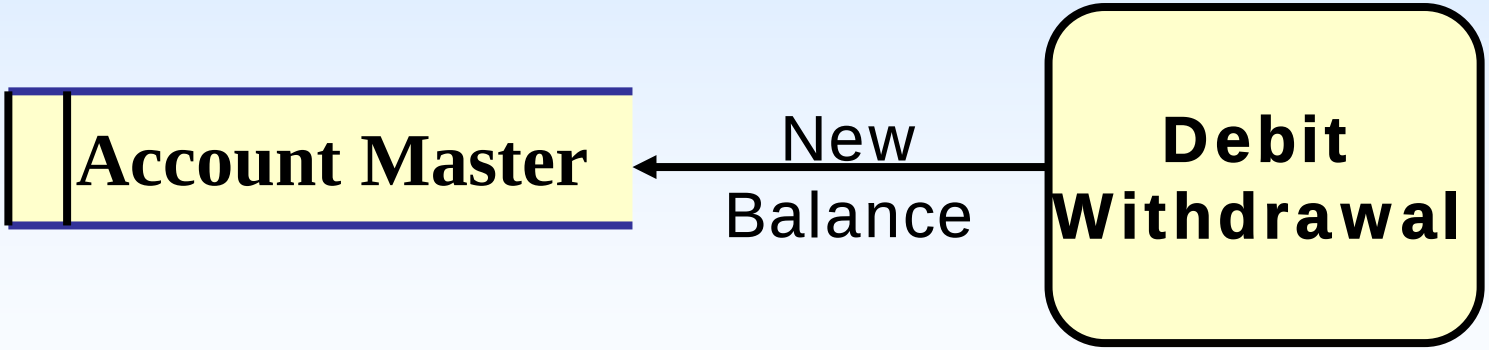
Verified details

Debit Withdrawal

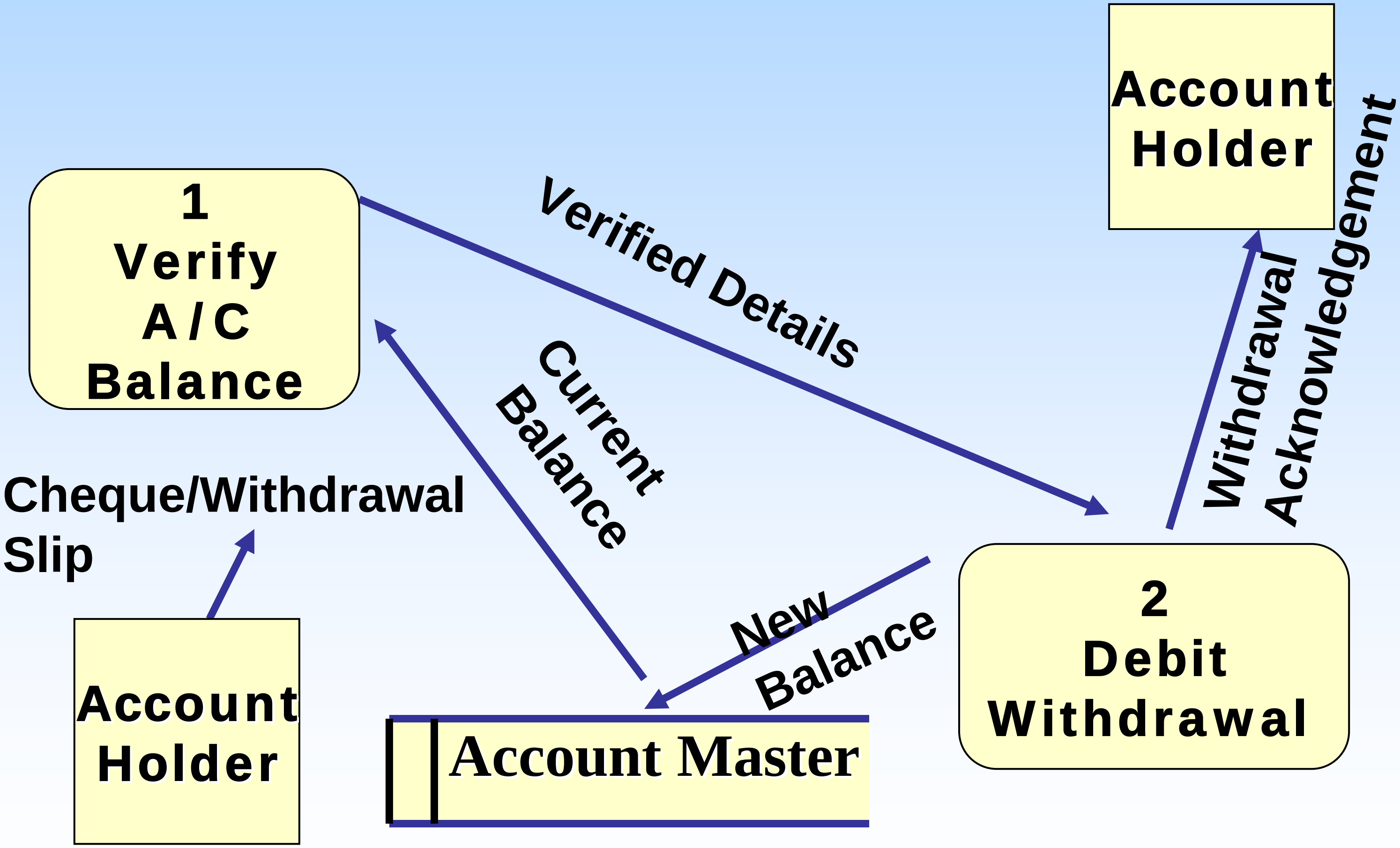
Top Level DFD – Step 4

- Identify the other data flows.

  update new balance

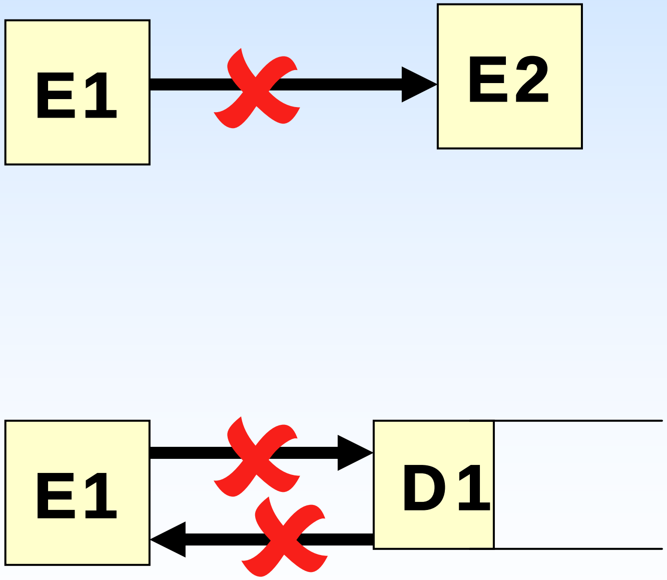


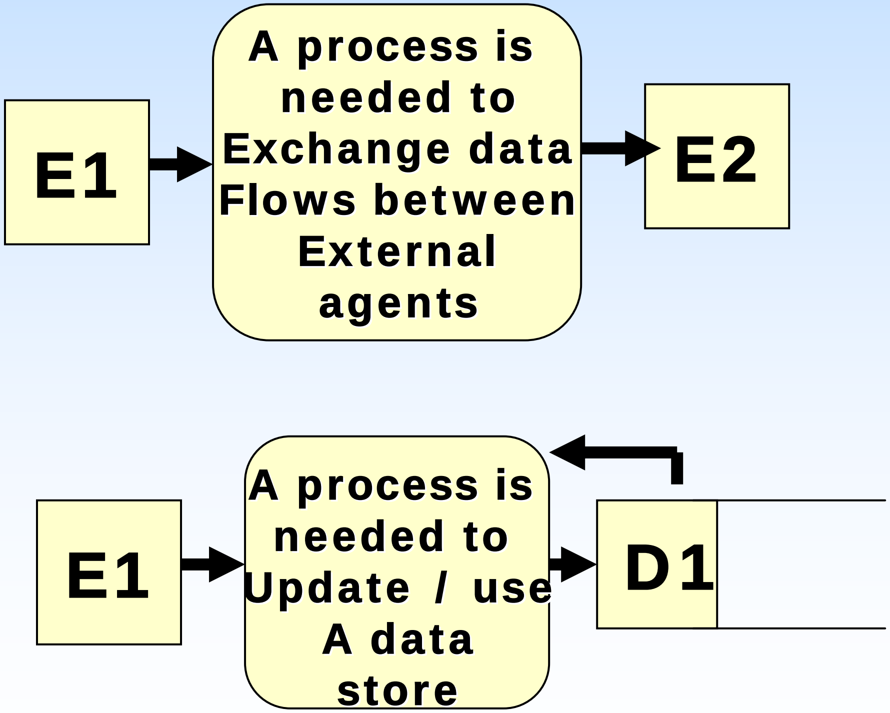
Top Level Diagram



Illegal Data Flows

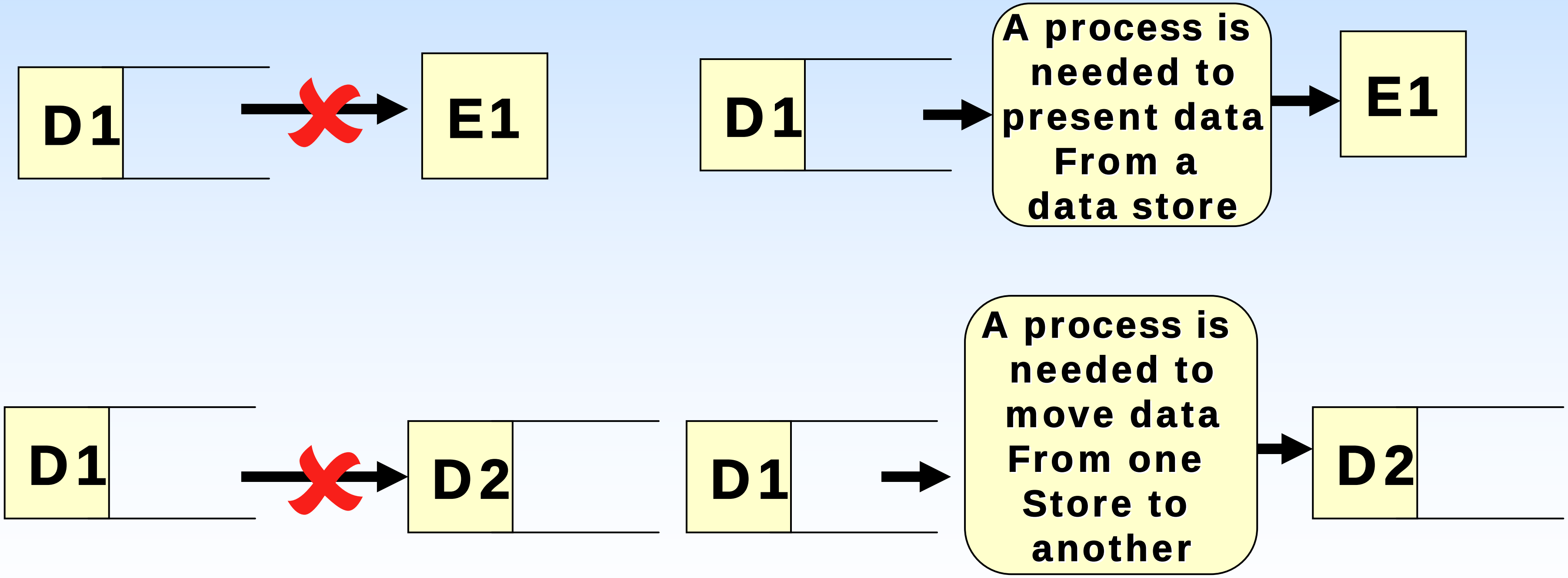
Illegal data flows **Corrected data flows**




E1
A process is needed to Exchange data Flows between External agents
E2
E1
A process is needed to Update / use A data store
D1

Illegal Data Flows

Illegal data flows **Corrected data flows**



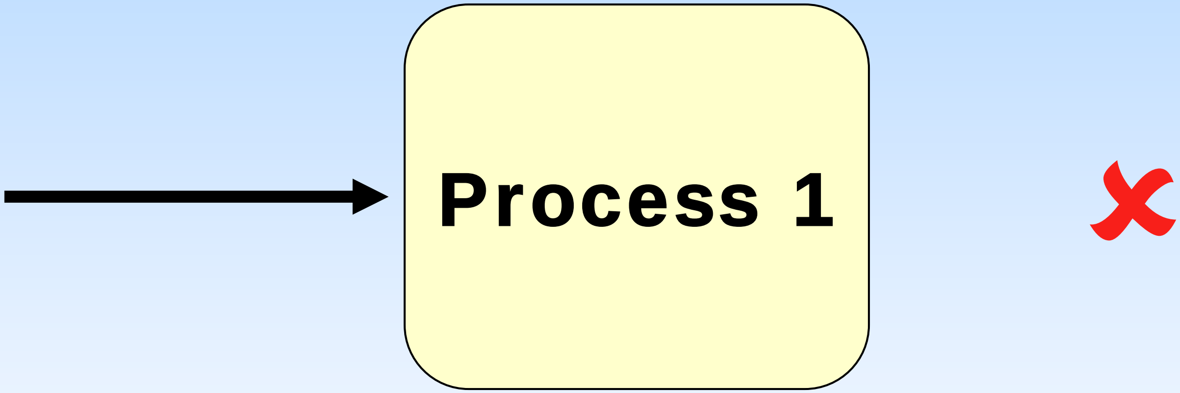
D1 → E1

D1 → A process is needed to present data From a data store → E1

D1 → D2

D1 → A process is needed to move data From one Store to another → D2

Another Common error


Process 1

✗

No data flow should ever go unnamed