SOFTWARE ENGINEERING LAB

EXERCISE – 3

TOPIC – 5

UML DIAGRAMS – COMPONENT

Component Diagram

A **Component Diagram** is a type of UML (Unified Modeling Language) diagram that shows how a system is organized into **smaller parts** called **components**. These components work together to form the **whole system**. It helps to understand:

- **What parts** the system is made of.
- **How these parts connect** to each other.
- **How the system works** by looking at how each component functions.

What are Components?

- **Components** are the **building blocks** of a system, just like parts of a machine.
- Each component is a **self-contained unit** that does a specific job.
- Components **communicate** with each other through **interfaces**, which are defined connection points that allow components to work together.
- **Example:**
- *In a **car**, components include:*
- **Engine***: Provides power.*
- **Brakes***: Stops the car.*
- **Transmission***: Controls how the power is used to move the car.*
- Similarly, *in a software system, components could be:*
- **Login system**.
- **Database**.
- **User interface**.

Characteristics of Components

- **Reusable**: Components can often be used in different parts of a system or even in **other systems**. This reduces duplication and saves development time.

- **Replaceable**: If a component stops working or needs to be updated, it can be replaced without affecting the other parts of the system.

- **Modular**: Components are designed to work **independently**, making the system easier to maintain and update.

Symbols Used in a Component Diagram

- **Component**:
- Represents a **part** of the system, like a software function or hardware part.
- **Symbol**: A rectangle with two smaller rectangles (tabs) sticking out from the left side.
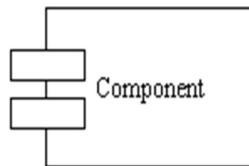

- Example: A **login system** or a **database**.
- **Interface**:
- Shows **how a component interacts** with other parts of the system, like a connection point where other components can communicate.
- **Symbol**: A small circle (called a "lollipop") connected to the component.
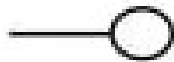
- **Provided Interface**:
- This means the component **offers a way** for others to use its functionality.
- **Symbol**: A lollipop symbol (circle) connected to the component.
- **Required Interface**:
- This means the component **needs** something from another component to work properly.
- **Symbol**: A half-circle (socket) connected to the component.
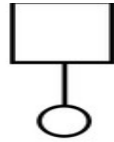
Provided
Interface
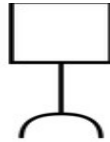
Required
Interface

-
- **Dependency**:
- Shows that one component **depends** on another to function properly.
- **Symbol**: A dashed arrow pointing from the dependent component to the component it relies on.

DEPENDENCY

- **Connector**:
- Shows a **connection** or communication between two components.
- **Symbol**: A solid line with an arrow between components.

CONTROL
FLOW

Example: Key Components of an ATM System

The ATM is made up of several components, and each one has its own function. Here's how they work together:

1. **ATM Machine (Main Component):**
   - This is the physical machine you see and interact with.
   - It has several important sub-components:

1. User Interface: The screen where options like "Withdraw" or "Check Balance" are shown, and you interact with the machine.
2. Card Reader: The slot where you insert your card. It reads the card's information, like your account details.
3. Cash Dispenser: The part that gives you money after a successful withdrawal.

2. **Bank Database (Main Component):**

   o This is the server that stores your account information, such as your balance and transaction history.

   o It checks if you have enough money for a withdrawal and updates your account after the transaction.

3. **Network (Main Component):**

   o This is the communication line between the ATM and the bank's database.

   o It transfers your requests (like a withdrawal) to the bank's system and sends back confirmation (whether the transaction was successful or not).
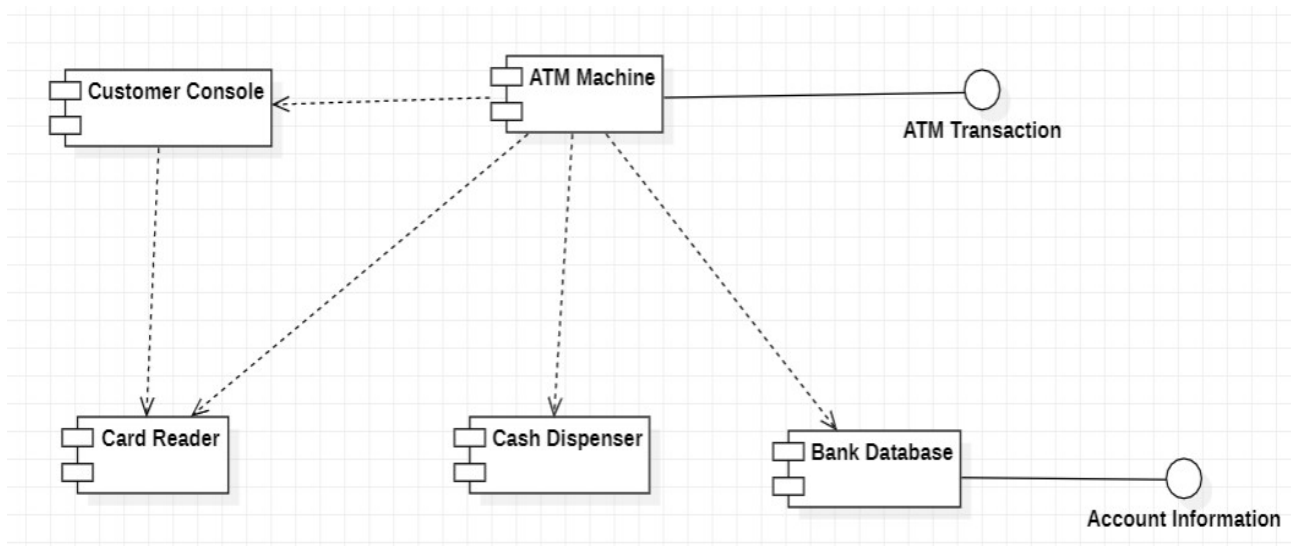
How Components Work Together in the ATM System

1. **Customer Interaction:**

   o The customer interacts with the ATM machine by using the User Interface and Card Reader.

2. **Communication:**

- o The ATM communicates with the Bank Database through the Network to confirm account information and transaction status.

3. **Actions:**
   - o If the transaction is approved, the Cash Dispenser will give the customer their money.

Why Component Diagrams Are Useful

- Helps in understanding how a complex system is organized by showing the individual parts and how they work together.
- Makes systems easier to manage since each component can be changed, replaced, or updated without affecting the whole system.
- Ensures modularity: Systems are broken down into smaller, manageable pieces, making them easier to develop, maintain, and scale.