# Course Introduction

## Welcome

# Prerequisite

- Should have completed the Go tour https://tour.golang.org/welcome/1
- Should understand interfaces, struts and receiver functions
- Object oriented programming principles

# Project

- Banking application
- Open new account for customer
- Making a Deposit or Withdrawal Transaction
- Role based access control (RBAC)

# Objective

- Dev environment and the right tools
- Hexagonal Architecture
- Dependency inversion in Go and working with stubs
- JWT Tokens
- Banking-Auth microservice based on OAuth standard
- Unit test for routes and other components using mocks and state based tests

# Getting Started

## Dev prerequisite tools

# Install Go

**https://golang.org/doc/install**

# Project Code

https://github.com/PacktPublishing/Building-Microservices-API-in-Go

https://github.com/PacktPublishing/Building-Microservices-API-in-Go/tree/banking-auth

# Hello World

**The fun begins here...**

# Objective

- Mechanism of HTTP web server
- Handler Functions and Request Multiplexer (Router)
- Request and Response Headers
- Marshaling data structures to JSON and XML representations

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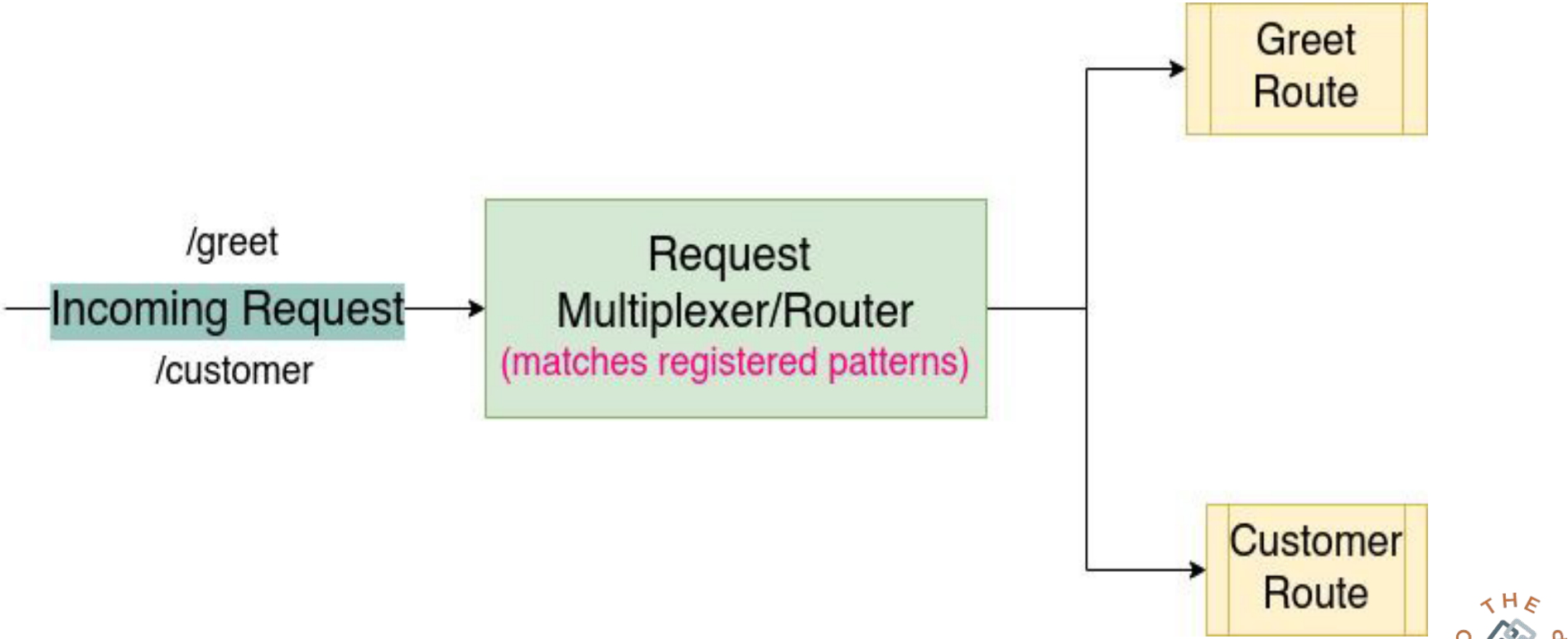
/greet
Incoming Request
/customer
Request
Multiplexer/Router
(matches registered patterns)
Greet
Route
Customer
Route

{JSON}

# Router basics: Sending response as JSON

# Objective

- ✓ Mechanism of HTTP web server
- ✓ Handler Functions and Request Multiplexer (Router)
- Marshaling data structures to JSON representation
- Response Header
- Marshaling data structures to XML representation
- Request Headers

# <XML>

## Router basics: Sending response as XML

# Objective

- ✓ Mechanism of HTTP web server
- ✓ Handler Functions and Request Multiplexer (Router)
- ✓ Marshaling data structures to JSON representation
- ✓ Response Header
- Marshaling data structures to XML representation
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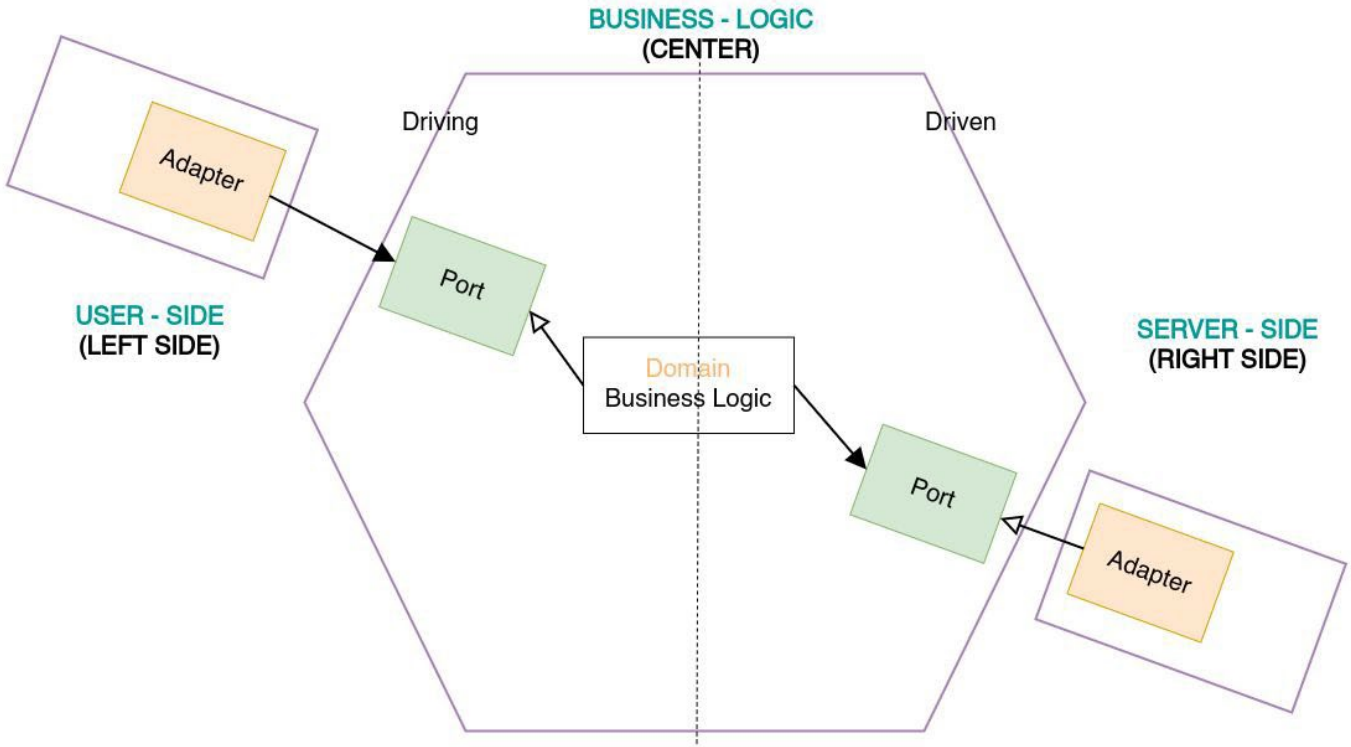
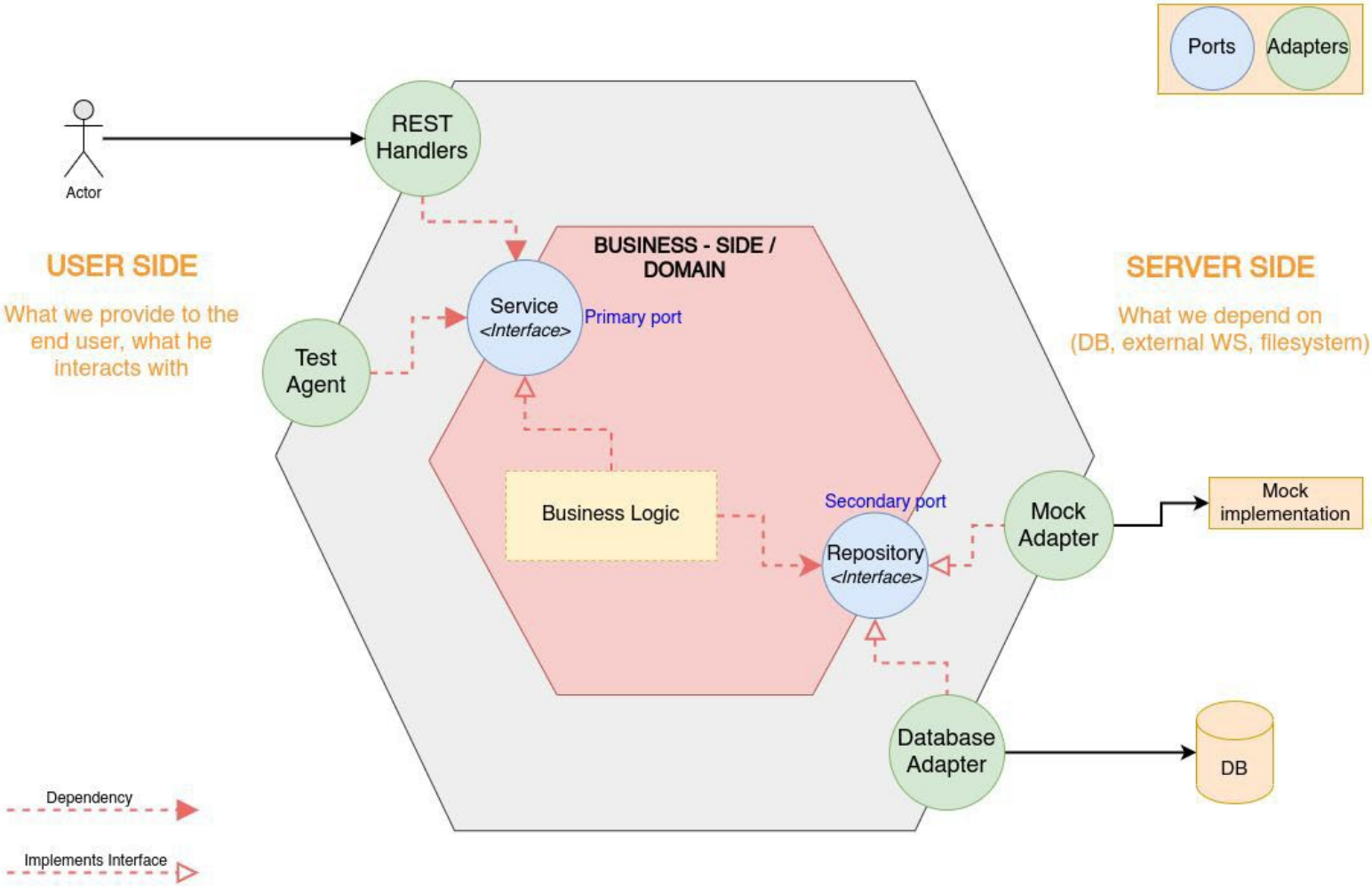
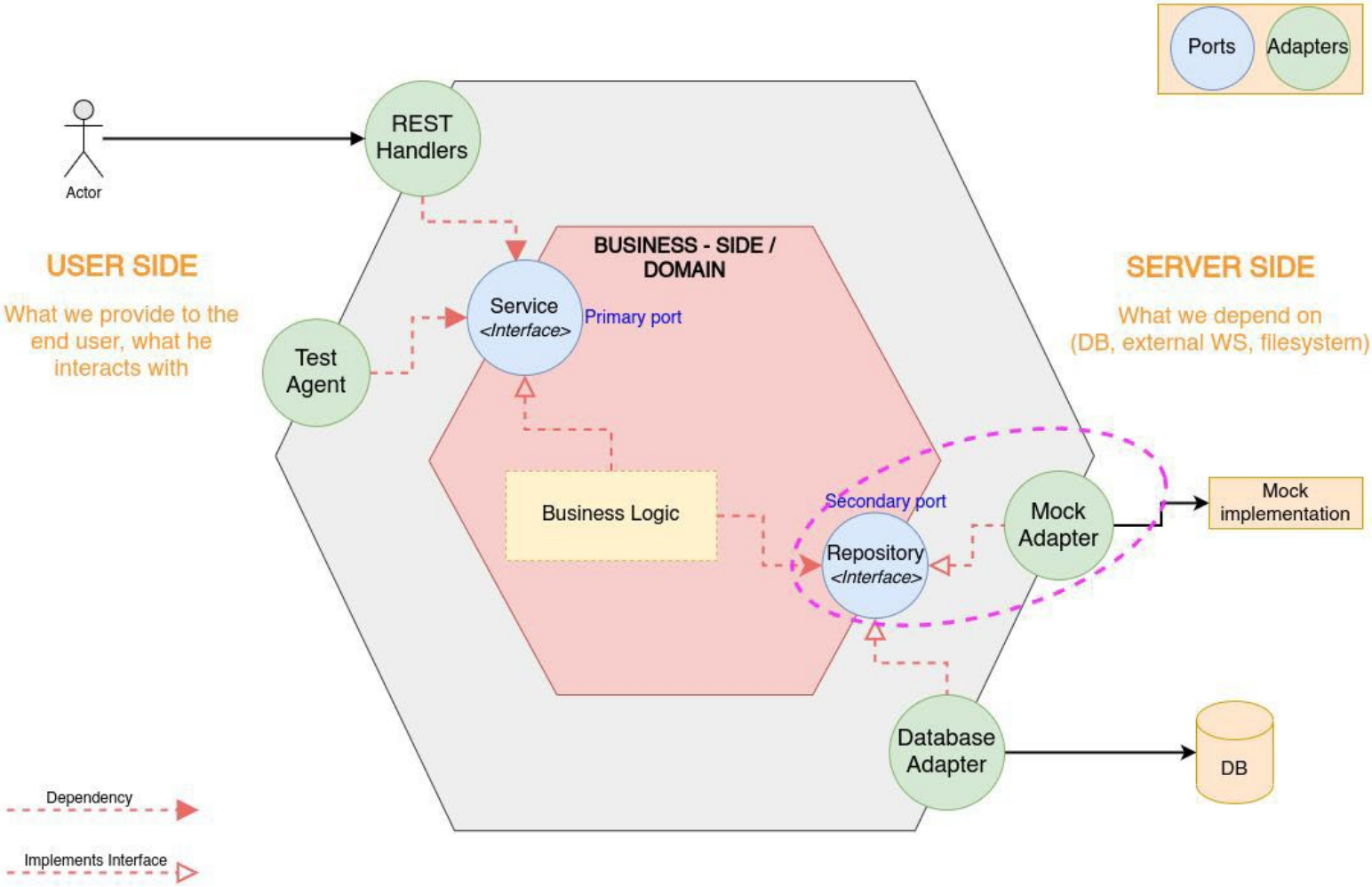
# Hexagonal Architecture

## Ports & Adapter


BUSINESS - LOGIC
(CENTER)
Driving
Driven
Adapter
Port
USER - SIDE
(LEFT SIDE)
Domain
Business Logic
SERVER - SIDE
(RIGHT SIDE)
Port
Adapter


Ports
Adapters
Actor
REST Handlers
USER SIDE
What we provide to the end user, what he interacts with
BUSINESS - SIDE / DOMAIN
Service <Interface>
Primary port
Test Agent
Business Logic
Secondary port
Repository <Interface>
Mock Adapter
Mock implementation
SERVER SIDE
What we depend on (DB, external WS, filesystem)
Database Adapter
DB
Dependency
Implements Interface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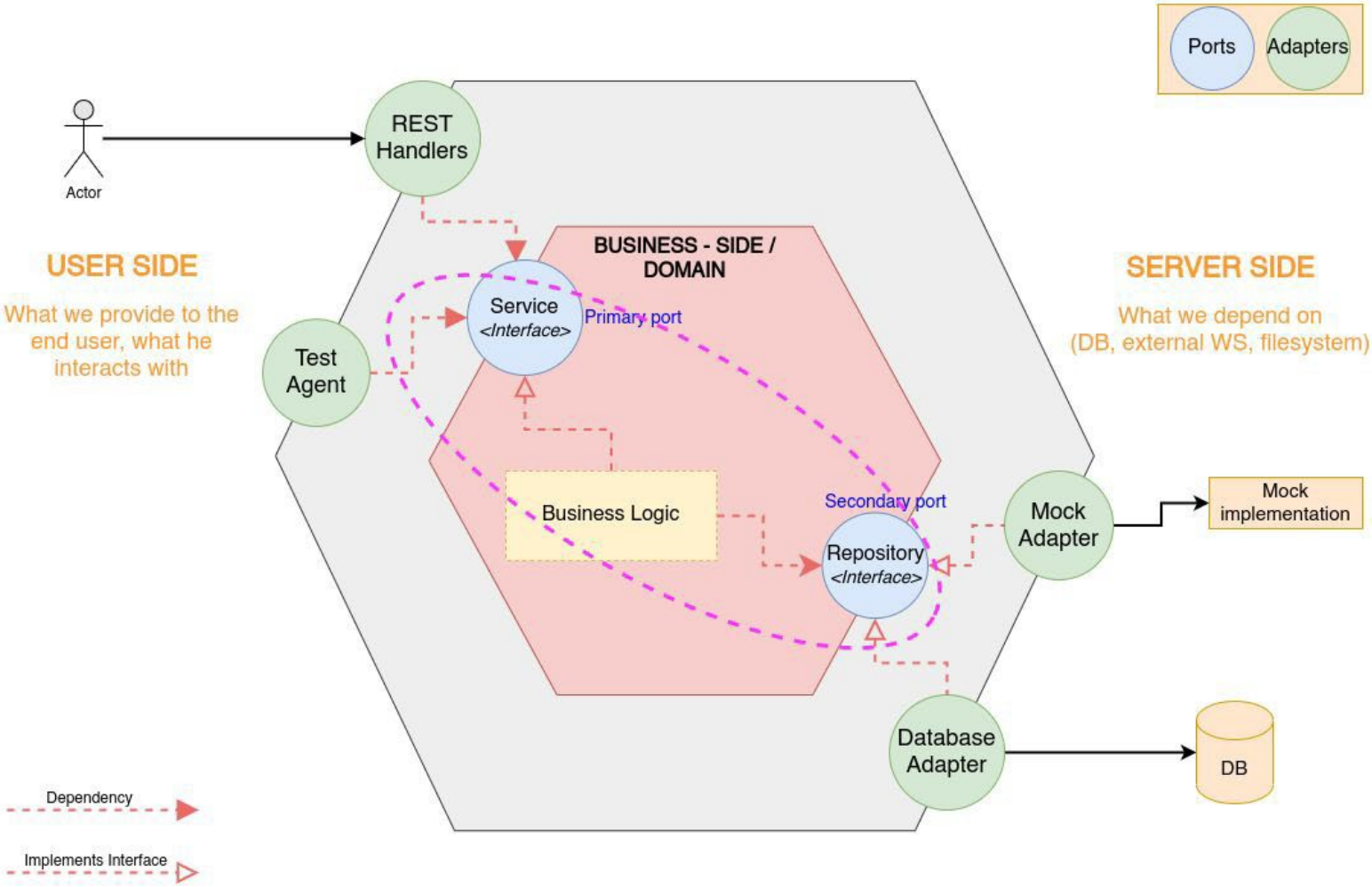
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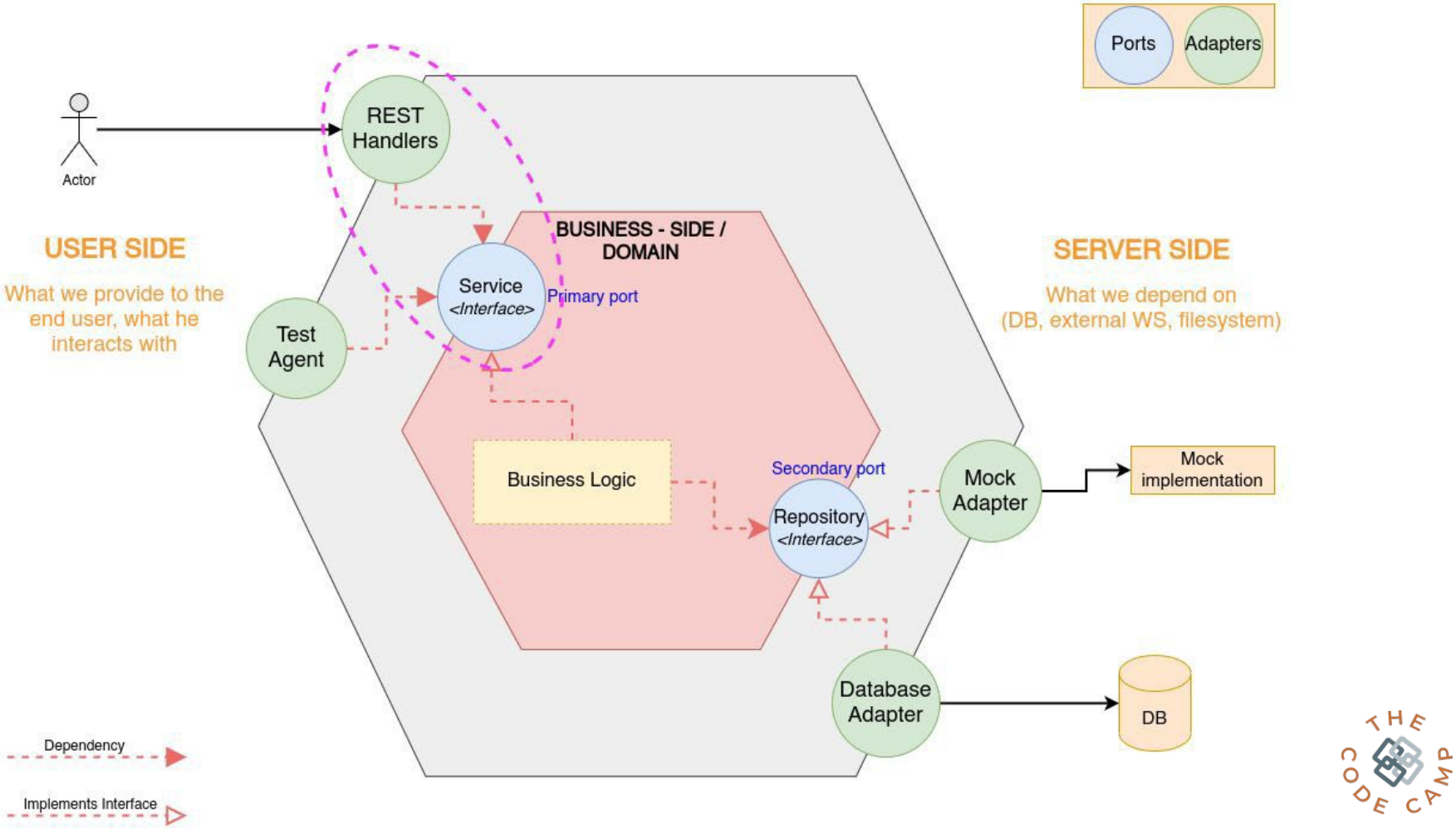
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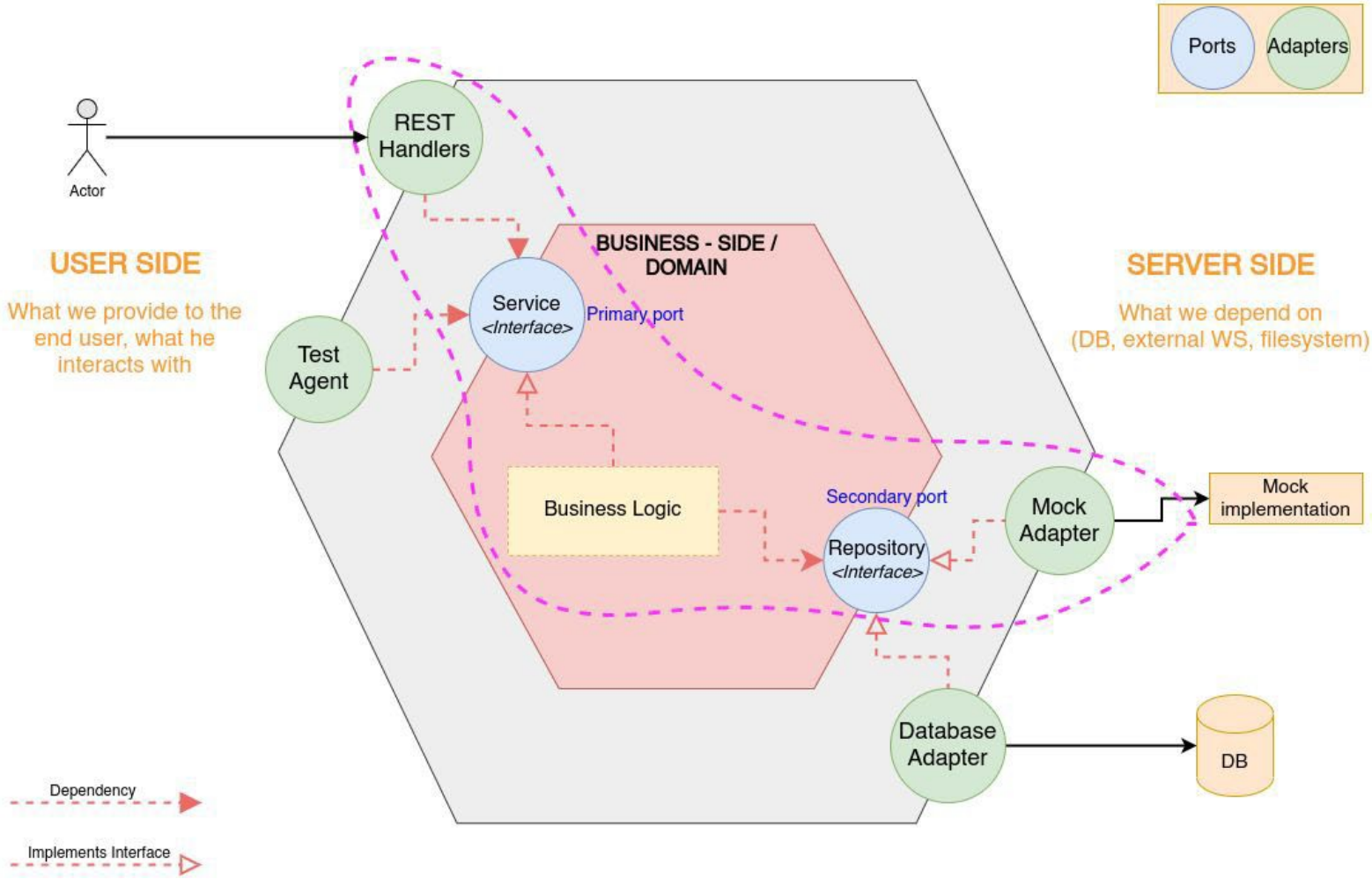
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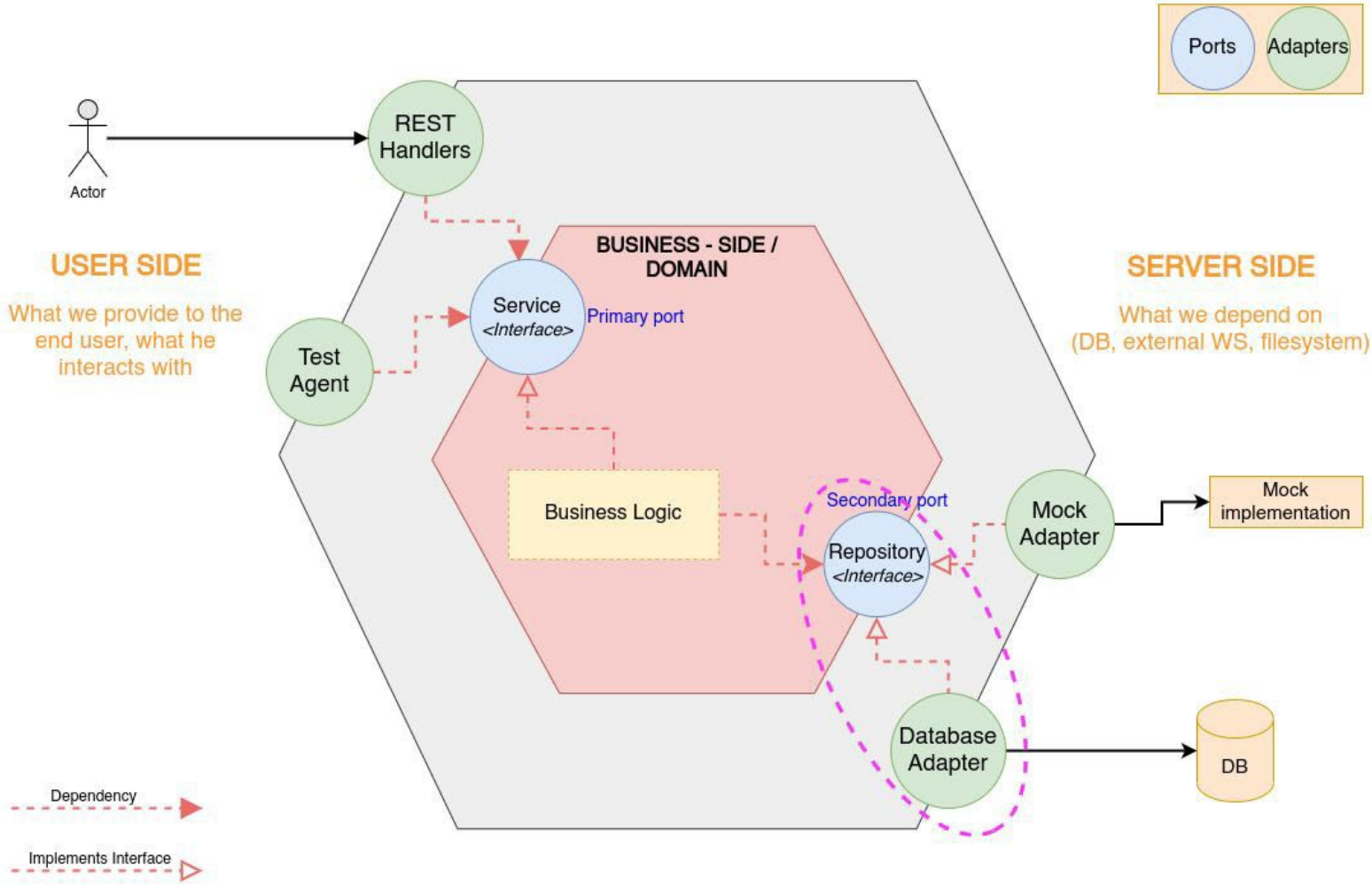
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Dependency
Implements Interface

# Error Handling

## Sending error in response

# Refactoring

## Error infrastructure & handlers

# Assignment 1: Fix GetAllCustomers API

## Acceptance Criteria

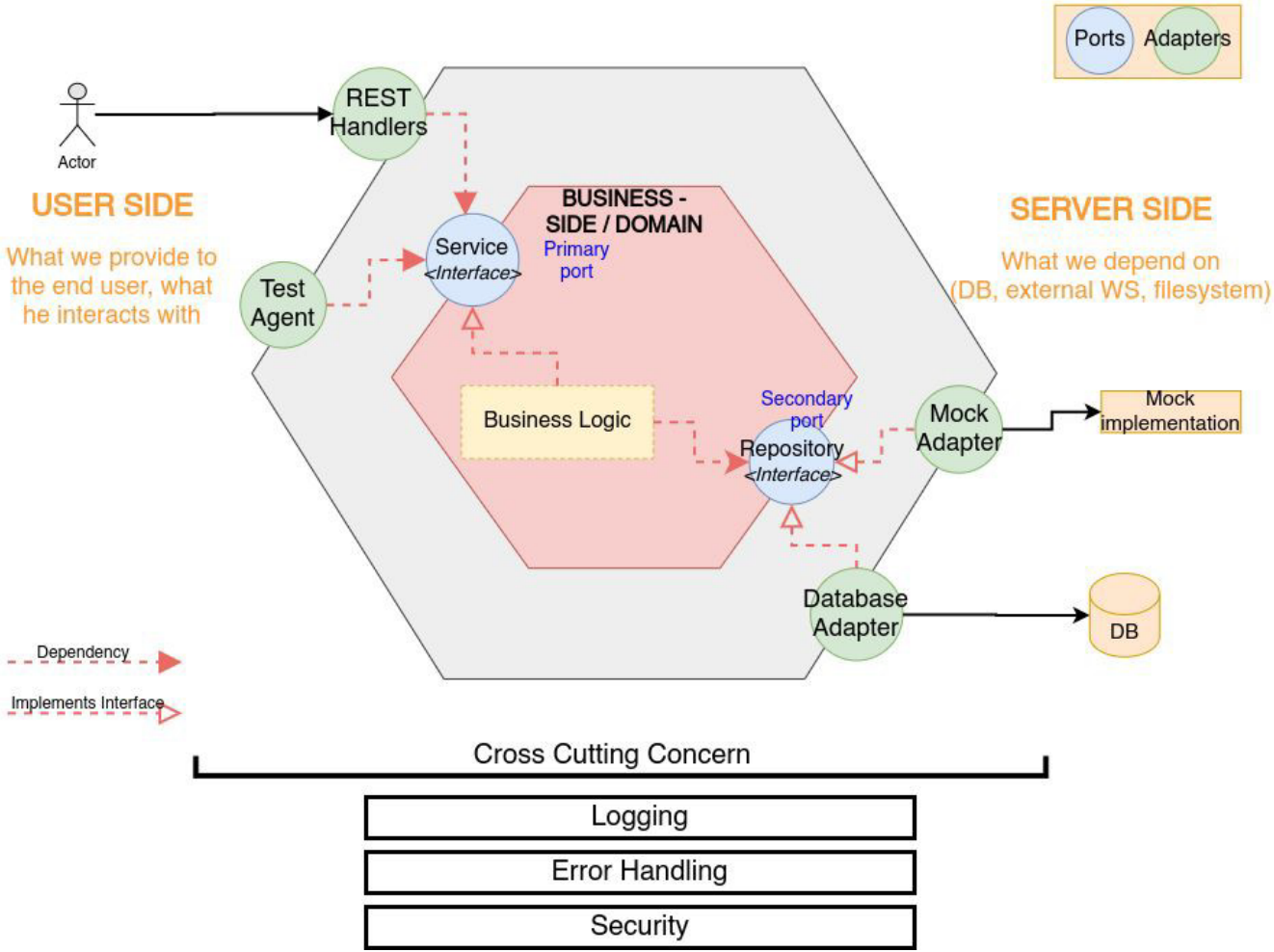
- API should only return JSON response
- API should return HTTP status code 500, in case of some unexpected error from server-side
- API should return HTTP status code 200 and the data in case of successfully retrieving customers from the server-side

# Assignment 2: Enhance GetAllCustomers API

## Acceptance Criteria

The API should provide an option to fetch the customers by status. For. e.g.

- `/customers?status=active` should return all active customers
- `/customers?status=inactive` should return all inactive customers
- `/customers` should return all customers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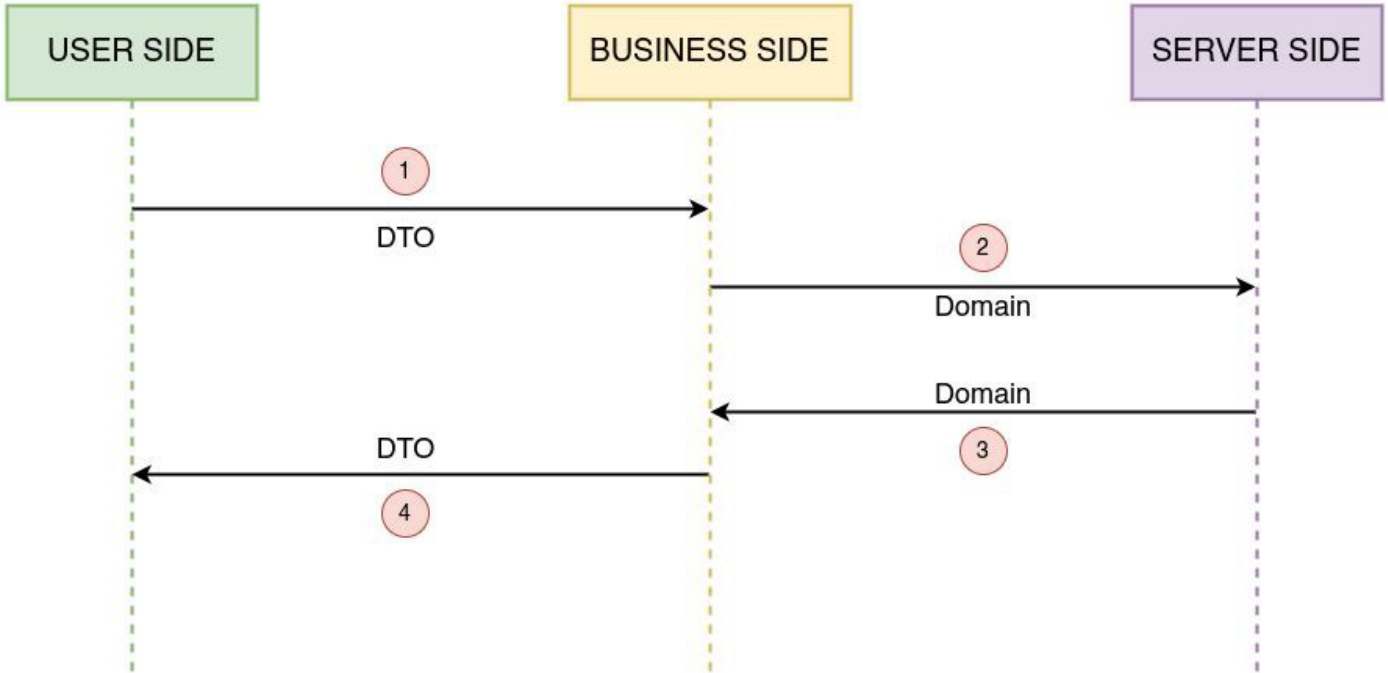
Dependency
Implements Interface
Cross Cutting Concern
Logging
Error Handling
Security

# Sqlx

**General purpose extension to database/sql**

# DTO

## Data Transfer Object

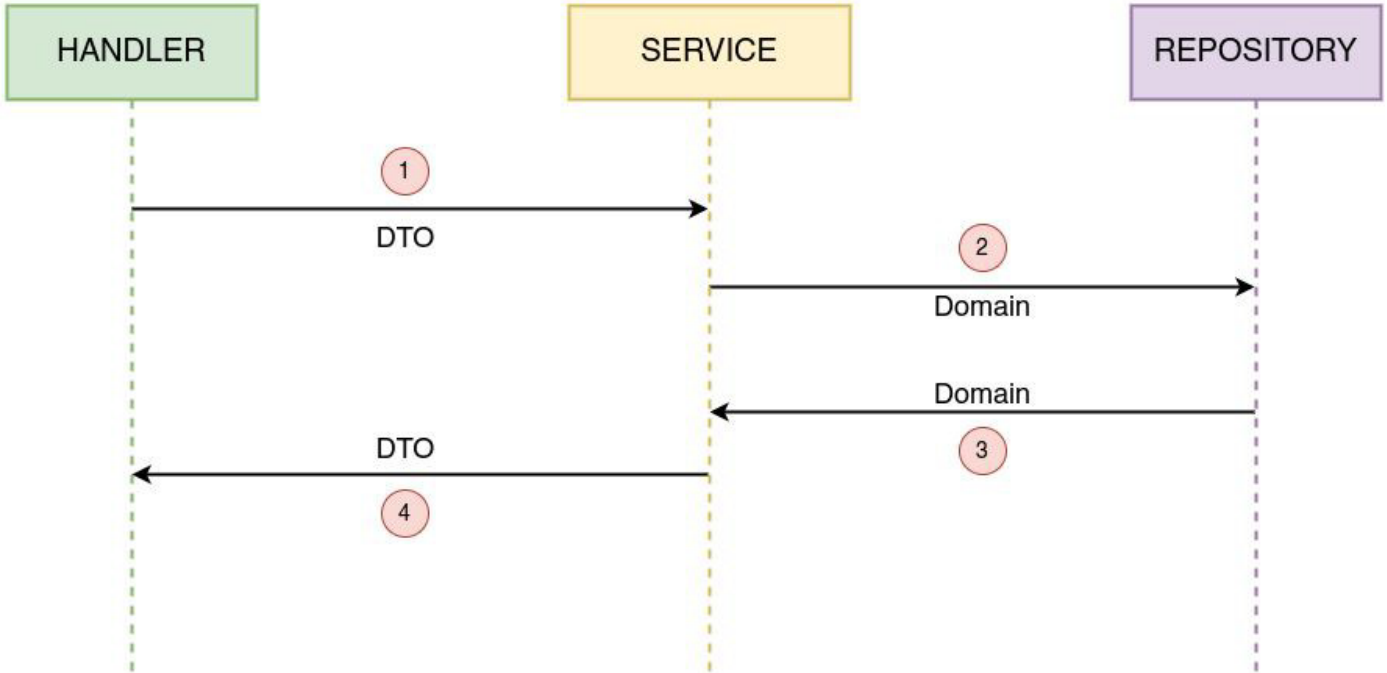

USER SIDE
BUSINESS SIDE
SERVER SIDE
1
DTO
2
Domain
Domain
3
DTO
4

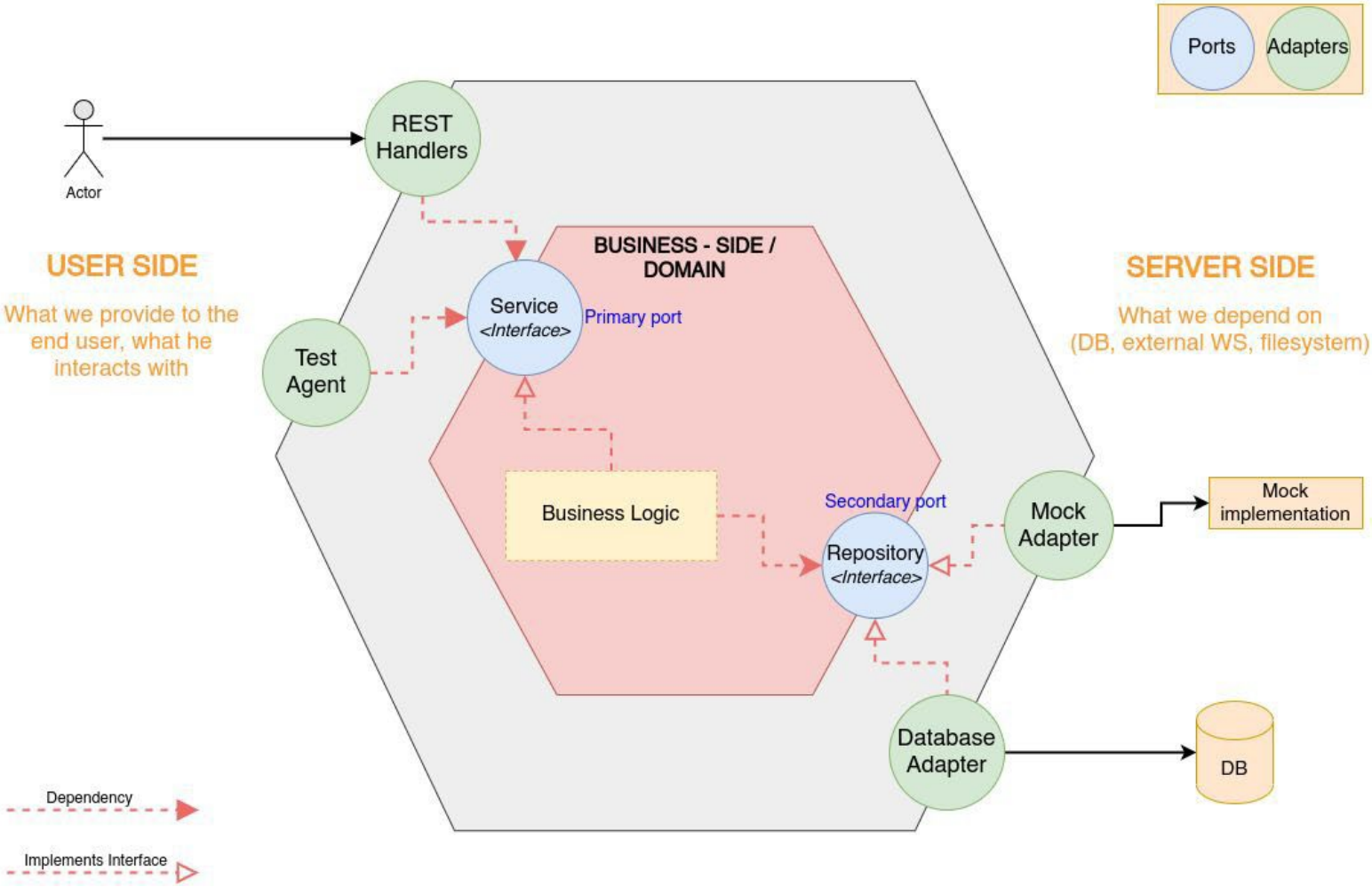
# Application Configuration

## Using environment variables

# New Bank Account

## Part 1: Business and Server side


HANDLER
SERVICE
REPOSITORY
1
DTO
2
Domain
Domain
3
DTO
4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Dependency
Implements Interface

# New Bank Account

## Part 2: User and business side

# Assignment 3: Make a transaction in bank account

## Acceptance Criteria

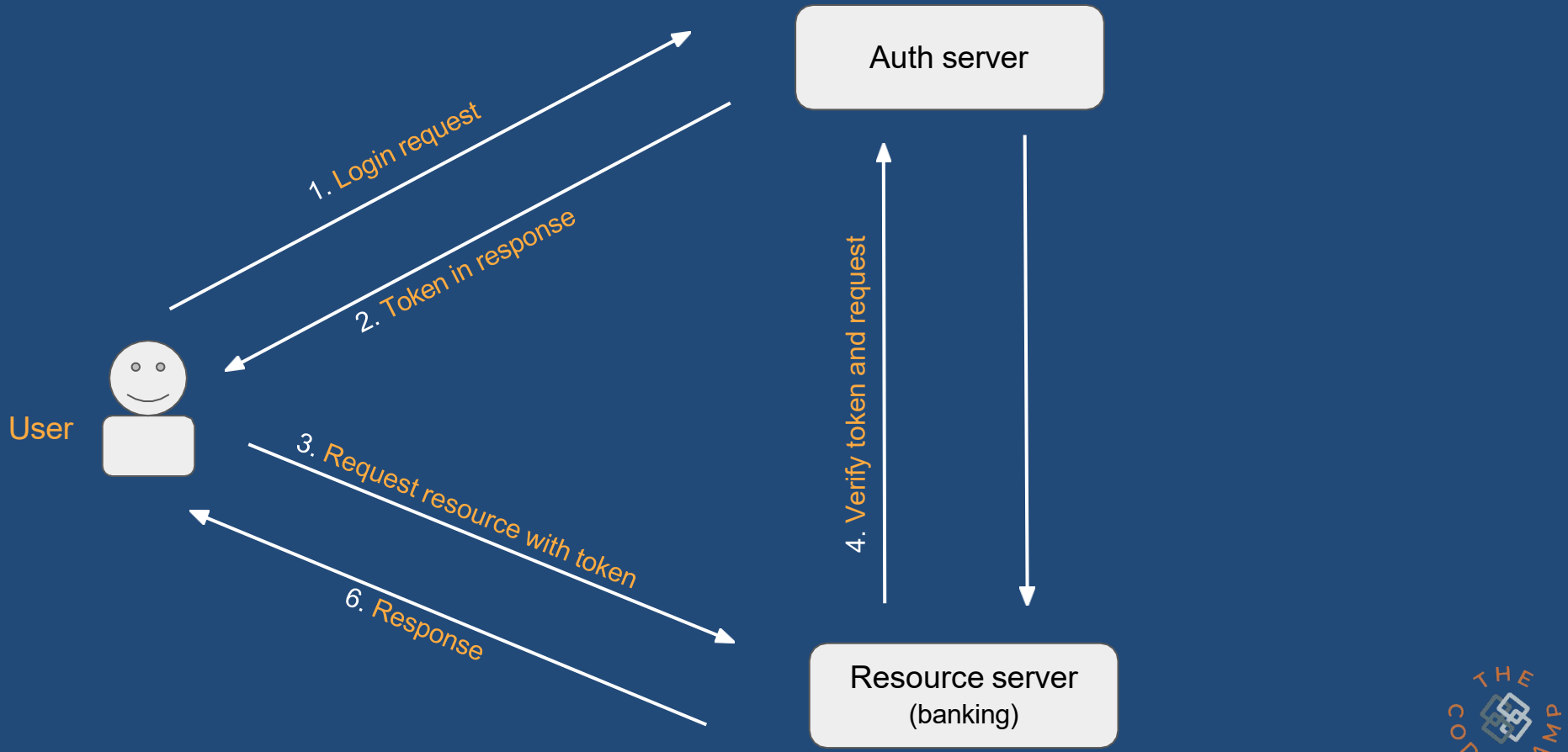
Write an API to create a new transaction for an existing customer

- transaction can only be "withdrawal" or "deposit"
- amount cannot be negative
- withdrawal amount should be available in the account
- successful transaction, should return the updated balance with transaction id response
- error handling should be done for bad request, validation and unexpected errors from the server side and should return the appropriate http status code with message

# Securing Application

## Authentication & Authorization, JWT Tokens and RBAC

5. Token verification response



# JWT

## Json Web Token

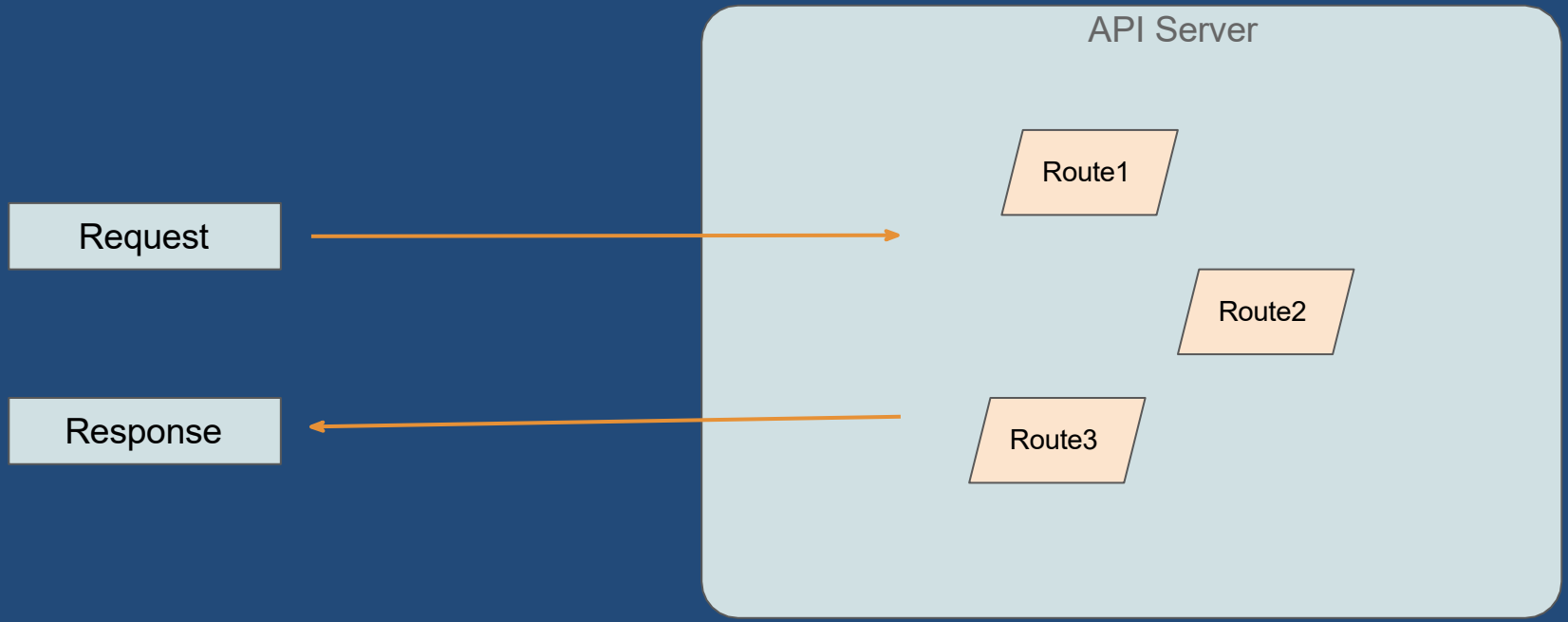
Header
Signature
aaaaaaaaaaa.bbbbbbbbbbb.ccccccccccc
Payload

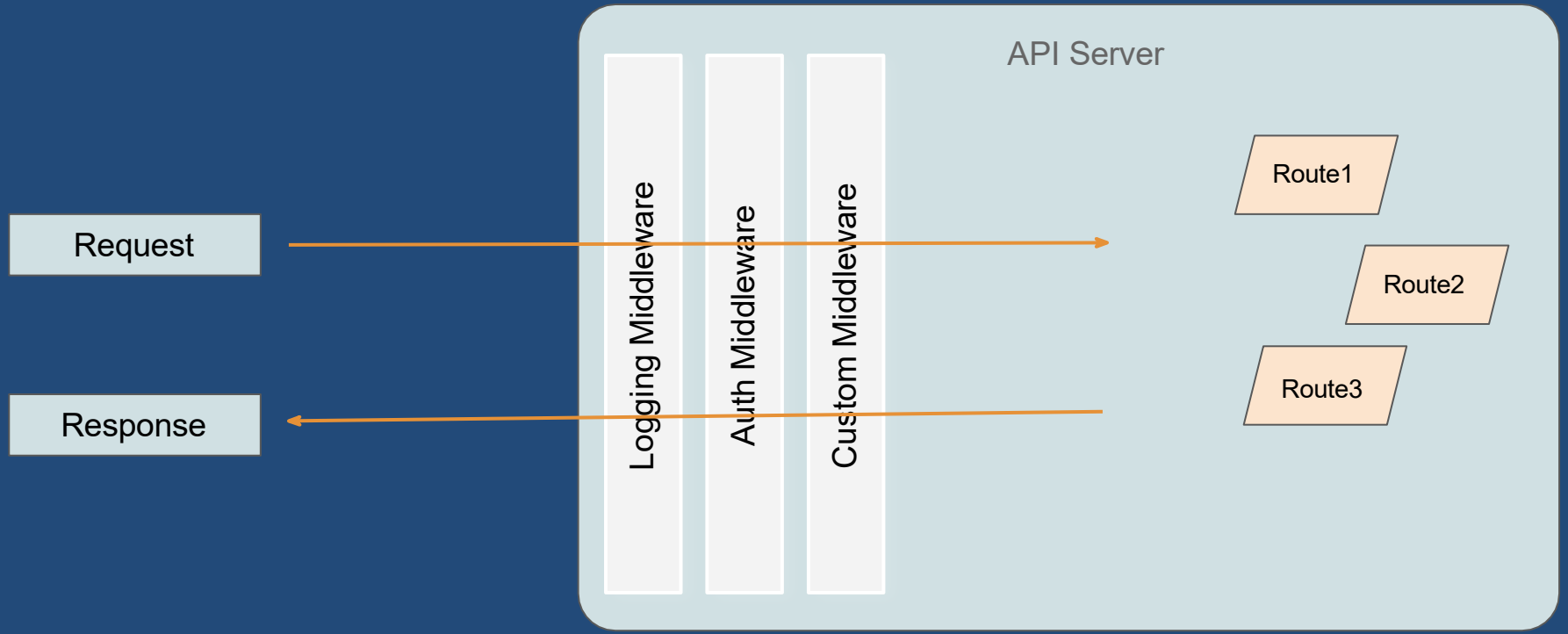
# Auth Server

## Login API

# Auth Server

## Verify Authorization API


API Server
Route1
Route2
Route3
Request
Response


API Server
Request
Response
Logging Middleware
Auth Middleware
Custom Middleware
Route1
Route2
Route3

# Unit Testing

## State based test

# Unit Testing

## Testing routes: using mocks

# Unit Testing

## Testing services: using mocks

# Advanced Topics

## Introduction

# Topics

- AppError and logger as go-module [naming it as banking-lib]
- Integrate banking-lib with banking and banking-auth
- Versioning and publish a go module (banking-lib)
- Generate refresh token
- New access token from refresh token

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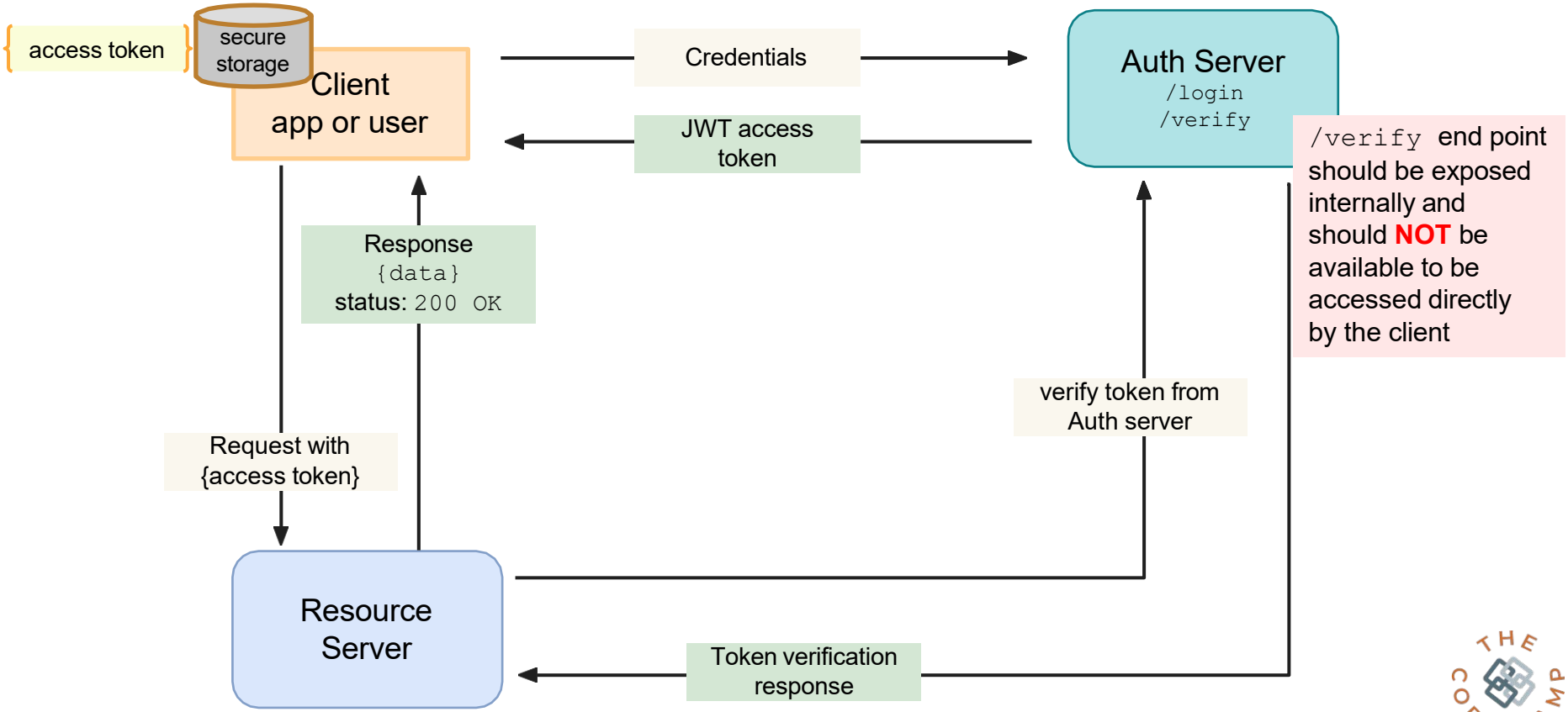
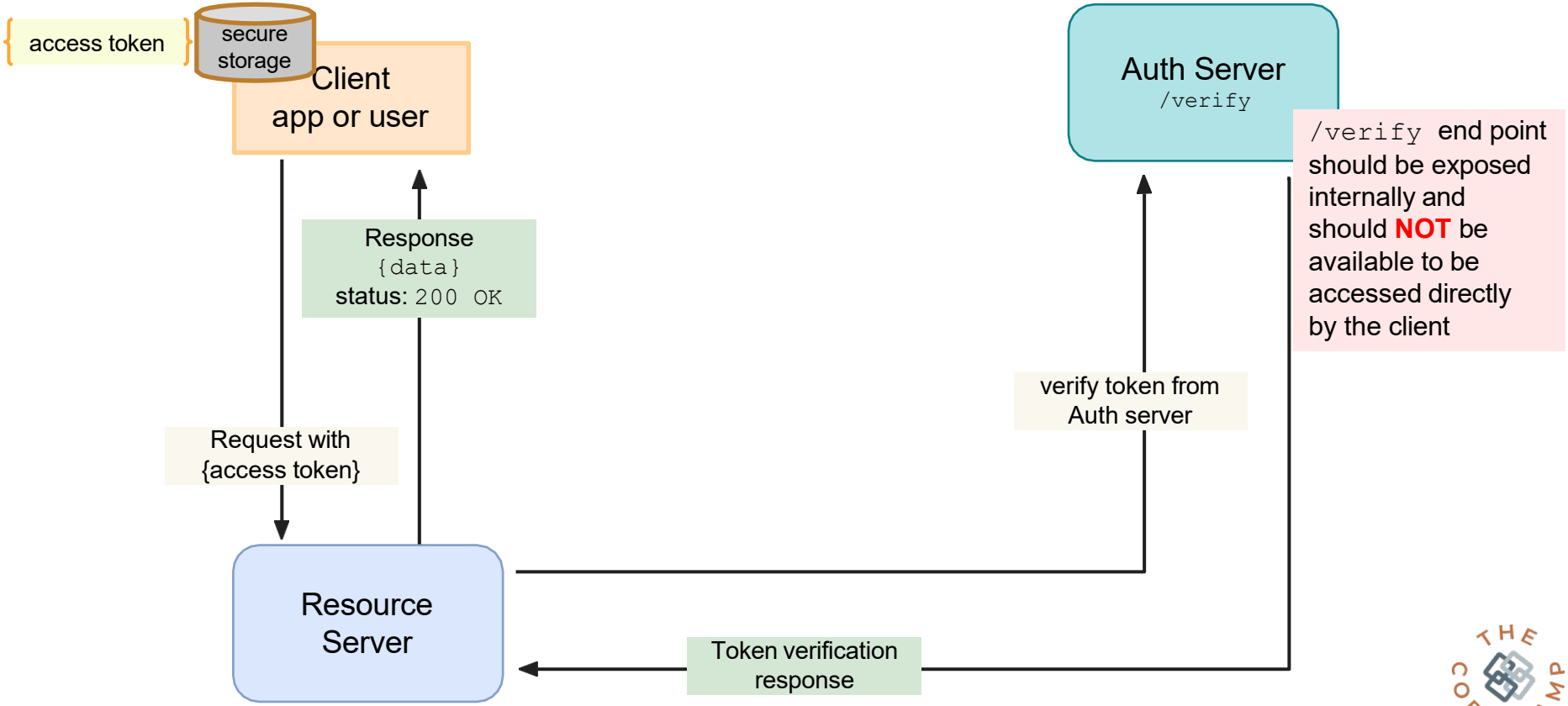
# Refresh Token

## Introduction

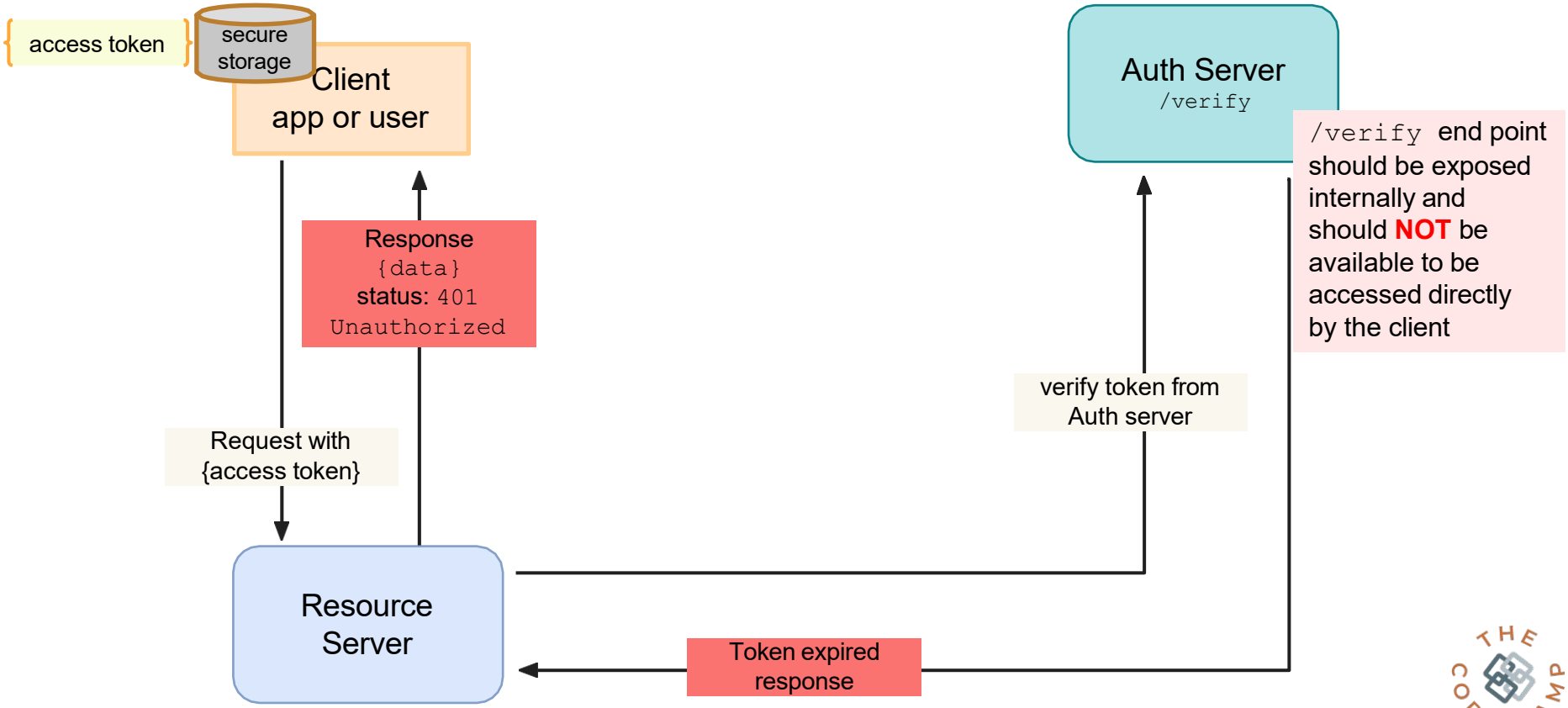
# Login: access token



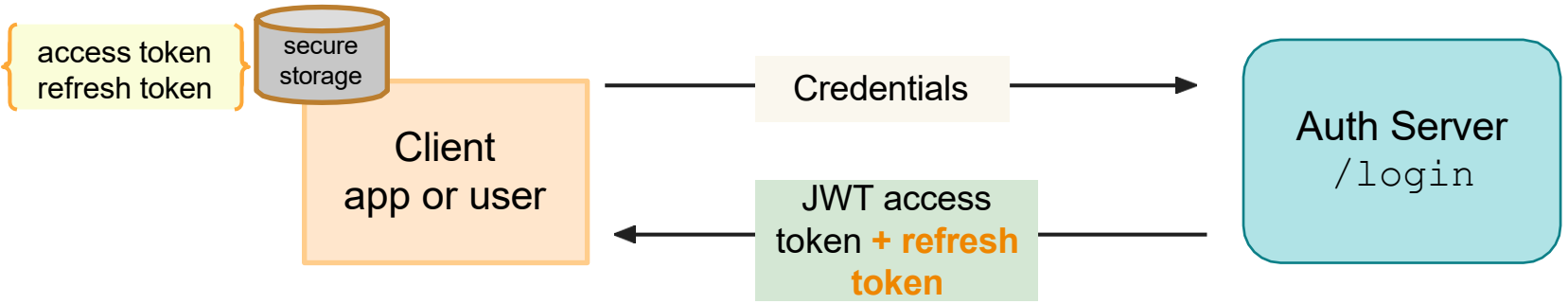
# Continued…


access token
secure storage
Client app or user
Auth Server
/verify
/verify end point should be exposed internally and should NOT be available to be accessed directly by the client
Response
{data}
status: 200 OK
Request with {access token}
verify token from Auth server
Resource Server
Token verification response

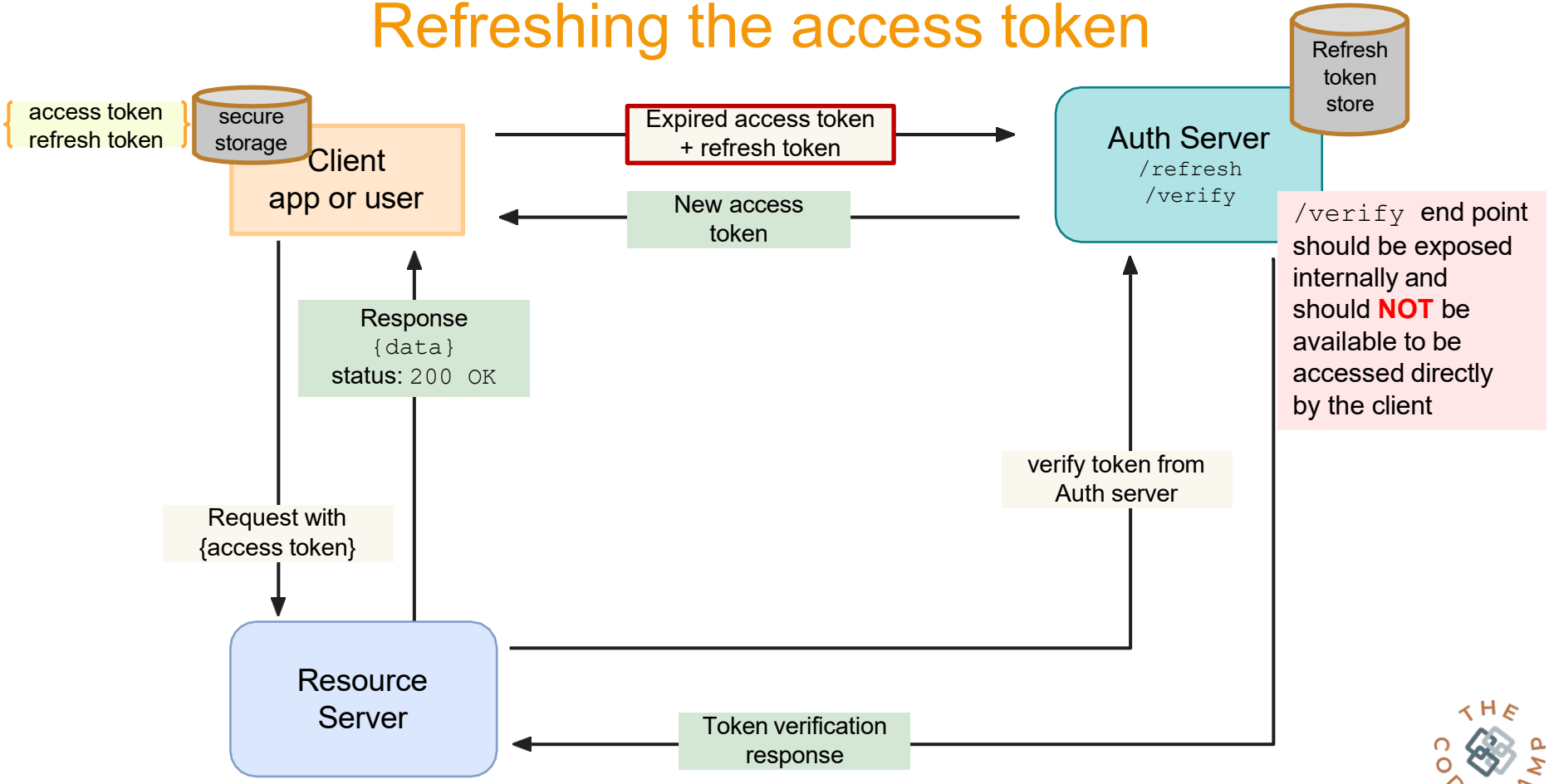
# Expired token flow



# Login: access token + refresh token



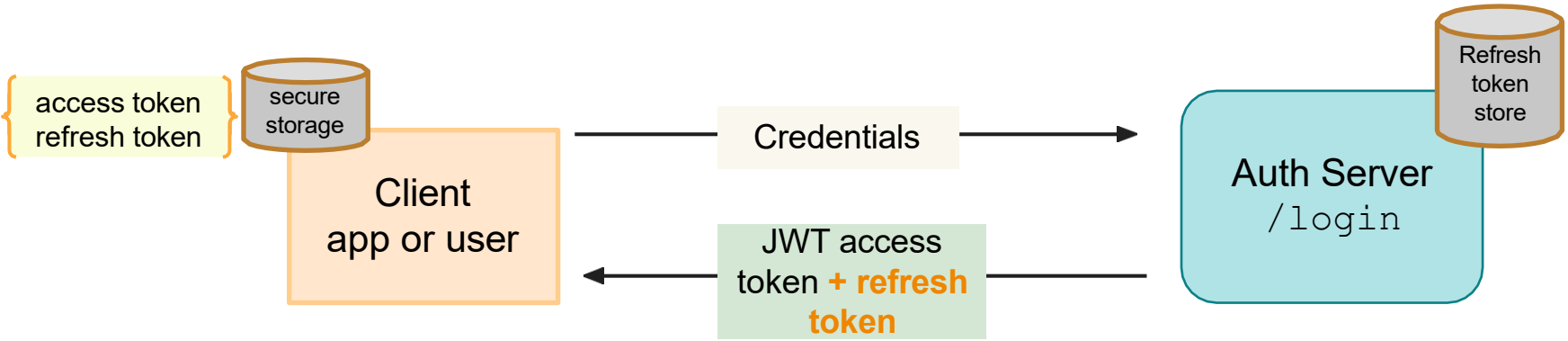
# Refreshing the access token



# Refresh Token

## Generating refresh token: Part 1

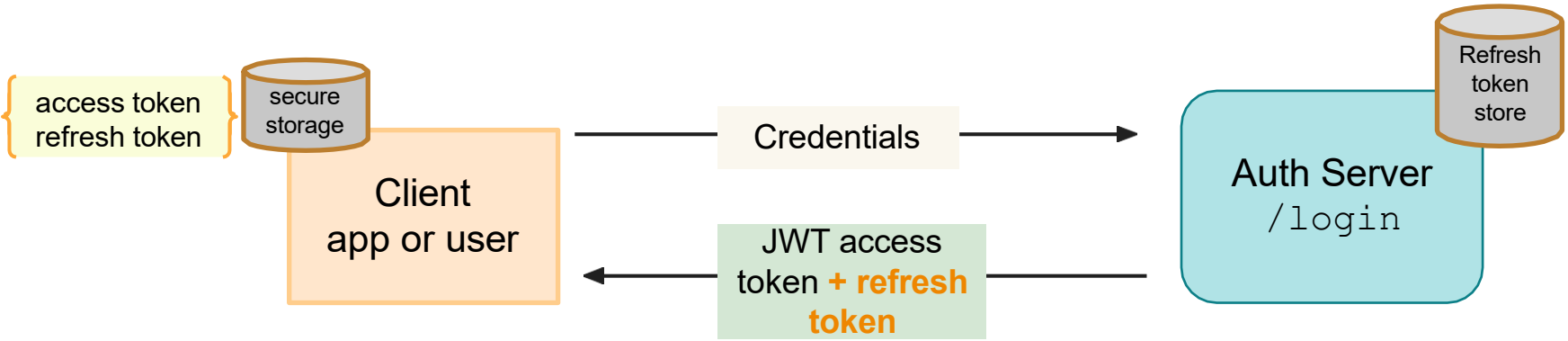
# Login: access token + refresh token



# Refresh Token

## Generating refresh token: Part 2

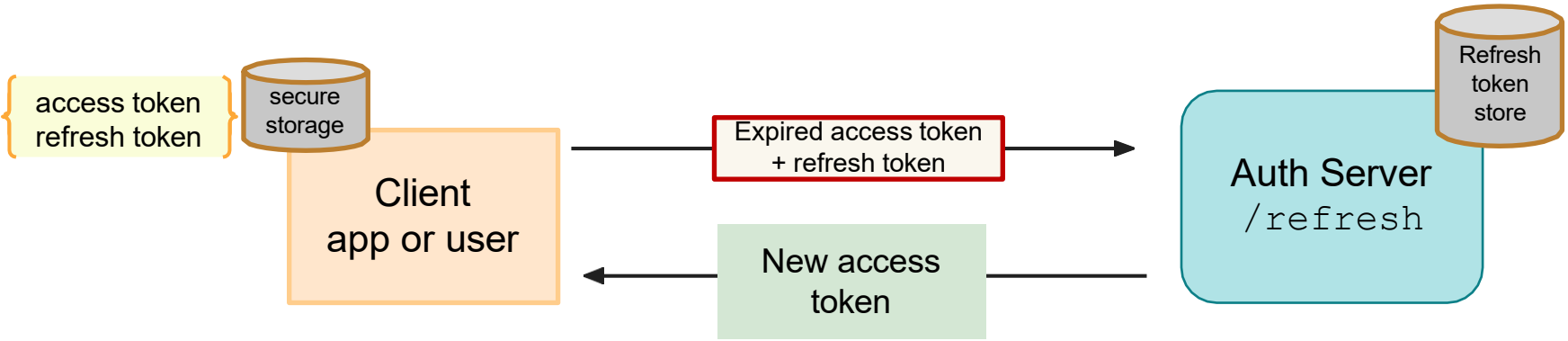
# Login: access token + refresh token



# Refresh

## Refreshing access token

# Refreshing access token



# Validations

- ~~access token should be valid and should be expired~~
- ~~Valid = should be signed by us~~
- refresh token should exist in the store
- refresh token should be valid and should not be expired

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