Programming Projects

Project 2 – Programming Techniques (CA-PRTQS) title: "ATM Teller Simulator" description: "C# Programming Fundamentals Project by Marc Cavada" author: "Marc Cavada"

📘 Introduction

This project is a **prototype of ATM Teller and Inventory Management System** developed in **C# using .NET 9 and Visual Studio Code**.
It captures and manages inventory items using **EF Core and SQLite**, exposing a **RESTful API** with Swagger/OpenAPI support.

📂 TellerAPI – Code Files

Program.cs

```csharp
using System;
using TellerAPI.Models;
using TellerAPI.Services;

namespace TellerAPI
{
    public class Program
    {
        public static void Main()
        {
            Bank bank = new Bank();
            var atm = new ATMService(bank);
            atm.Start();
        }
    }
}
```

Models/Account.cs

```csharp
namespace TellerAPI.Models
{
    public abstract class Account
    {
        public string AccountNumber { get; set; } = string.Empty;
        public string CustomerName { get; set; } = string.Empty;
        public decimal Balance { get; protected set; }

        public virtual void Deposit(decimal amount)
        {
            if (amount <= 0)
                throw new ArgumentException("Deposit amount must be positive.");
            Balance += amount;
        }

        public virtual bool Withdraw(decimal amount)
        {
            if (amount <= 0)
                throw new ArgumentException("Withdrawal amount must be positive.");
            if (Balance < amount)
                return false;

            Balance -= amount;
            return true;
        }

        public override string ToString() =>
            $"{AccountNumber} | {CustomerName} | Balance: {Balance:C}";
    }
}
```

Models/CheckingAccount.cs & SavingAccount.cs

```
namespace TellerAPI.Models
{
    public class CheckingAccount : Account { }
    public class SavingAccount : Account { }
}
```

Models/Bank.cs

```
using System.Collections.Generic;
using TellerAPI.Services;

namespace TellerAPI.Models
{
    public class Bank
    {
        private readonly FileService _fileService;
        public List<Account> Accounts { get; private set; } = new();

        public Bank()
        {
            _fileService = new FileService();
            LoadAccounts();
        }

        private void LoadAccounts()
        {
            var lines = _fileService.ReadFile("Accounts.txt");
            foreach (var line in lines)
            {
                var parts = line.Split(',');
                if (parts.Length < 4) continue;

                string type = parts[0];
                string number = parts[1];
                string name = parts[2];
                decimal balance = decimal.Parse(parts[3]);

                Account account = type switch
                {
                    "Checking" => new CheckingAccount { AccountNumber = number,
CustomerName = name, Balance = balance },
                    "Saving" => new SavingAccount { AccountNumber = number,
CustomerName = name, Balance = balance },
                    _ => null
                };

                if (account != null)
                    Accounts.Add(account);
            }
        }
    }
}
```

Services/FileService.cs

```
using System;
using System.Collections.Generic;
using System.IO;

namespace TellerAPI.Services
{
    public class FileService
    {
        private readonly string _dataPath = AppContext.BaseDirectory + "Data/";

        public List<string> ReadFile(string fileName)
        {
            string path = Path.Combine(_dataPath, fileName);
            if (!File.Exists(path)) return new List<string>();
            return new List<string>(File.ReadAllLines(path));
        }

        public void WriteFile(string fileName, List<string> lines)
        {
            string path = Path.Combine(_dataPath, fileName);
            File.WriteAllLines(path, lines);
        }

        public void AppendLine(string fileName, string line)
        {
            string path = Path.Combine(_dataPath, fileName);
            File.AppendAllText(path, line + Environment.NewLine);
        }
    }
}
```

Services/ATMService.cs

```
using System;
using TellerAPI.Models;

namespace TellerAPI.Services
{
    public class ATMService
    {
        private readonly Bank _bank;

        public ATMService(Bank bank)
        {
            _bank = bank;
        }

        public void Start()
        {
            Console.WriteLine("🏦 Welcome to the Teller API");

            while (true)
            {
                Console.Write("\nEnter your account number: ");
                string? number = Console.ReadLine();
                var account = _bank.Accounts.Find(a => a.AccountNumber == number);

                if (account == null)
                {
                    Console.WriteLine("❌ Account not found. Try again.");
                    continue;
                }

                Console.WriteLine($"\nWelcome, {account.CustomerName}!");
                Console.WriteLine("1. Deposit\n2. Withdraw\n3. Check Balance\n4.
Exit");

                while (true)
                {
                    Console.Write("\nSelect an option: ");
                    var input = Console.ReadLine();

                    switch (input)
                    {
                        case "1":
                            Console.Write("Enter deposit amount: ");
                            if (decimal.TryParse(Console.ReadLine(), out decimal
deposit))
                            {
                                account.Deposit(deposit);
                                Console.WriteLine($"✅ New Balance:
{account.Balance:C}");
                            }
                            break;
                        case "2":
                            Console.Write("Enter withdrawal amount: ");
                            if (decimal.TryParse(Console.ReadLine(), out decimal
withdraw))
                            {
                                if (account.Withdraw(withdraw))
                                    Console.WriteLine($"✅ New Balance:
{account.Balance:C}");
                                else
                                    Console.WriteLine("❌ Insufficient funds!");
                            }
                            break;
                        case "3":
                            Console.WriteLine($"💰 Current Balance:
{account.Balance:C}");
                            break;
                        case "4":
                            Console.WriteLine("👋 Thank you for using TellerAPI!");
                            return;
                        default:
                            Console.WriteLine("Invalid option. Try again.");
                            break;
                    }
                }
            }
        }
    }
}
```

TellerAPI.csproj

```
<Project Sdk="Microsoft.NET.Sdk">
  <PropertyGroup>
    <OutputType>Exe</OutputType>
    <TargetFramework>net9.0</TargetFramework>
    <Nullable>enable</Nullable>
    <ImplicitUsings>enable</ImplicitUsings>
  </PropertyGroup>
</Project>
```

Data Files

TellerAPI/Data/ ├── Accounts.txt # Holds account information ├── Customers.txt # Optional: customer data └── DailyBalances.txt # Optional: daily transaction records

---

TellerAPI – ATM Simulator

Folder Structure

TellerAPI/ ├── Data/ # Account, Customer, and DailyBalances data files ├── Models/ # Account, Bank, CheckingAccount, SavingAccount classes ├── Services/ # ATMService, FileService ├── Program.cs # Entry point └── TellerAPI.csproj

Key Features • Loads accounts from Data/Accounts.txt. • Supports deposit, withdrawal, and balance check for accounts. • Protects Balance with a protected setter in Account. • File operations handled via FileService (read/write/append). • ATMService handles account operations, now supports both Account and Bank.

Accounts Data Format (Accounts.txt) Each line represents an account, with values separated by commas:

```
<AccountType>,<AccountNumber>,<CustomerName>,<Balance>

 • <AccountType>: Checking or Saving
 • <AccountNumber>: unique string of digits
 • <CustomerName>: name of account holder
 • <Balance>: decimal number (e.g., 1000.50)
```

Example:

Checking,12333444,John Doe,1500.00 Saving,123445566,Jane Smith,2500.75

Current Behavior • Prompts user for account number. • Finds account in Bank.Accounts. • Starts ATM menu for selected account. • Note: Account lookup fails if Accounts.txt lines are malformed or numbers do not match.

Usage

dotnet run --project TellerAPI/TellerAPI.csproj

• Enter account number to access. • Follow the menu to deposit, withdraw, or check balance.

If you like, I can also add a short section about DailyBalances.txt and Customers.txt so the README fully documents the required data files. That way anyone can run TellerAPI without confusion. Do you want me to add that too?

📁 InventoryAPI – Code Files

1. Program.cs

```
using Microsoft.EntityFrameworkCore;
using InventoryAPI;

var builder = WebApplication.CreateBuilder(args);
```

```
builder.Services.AddDbContext<InventoryDbContext>(options =>
    options.UseSqlite("Data Source=inventory.db"));

builder.Services.AddEndpointsApiExplorer();
builder.Services.AddSwaggerGen();

var app = builder.Build();

if (app.Environment.IsDevelopment())
{
    app.UseSwagger();
    app.UseSwaggerUI();
}

app.UseHttpsRedirection();

app.MapGet("/", () => "Inventory API is running.");
app.MapGet("/items", async (InventoryDbContext db) => await db.Items.ToListAsync());
app.MapGet("/items/{id}", async (int id, InventoryDbContext db) =>
{
    var item = await db.Items.FindAsync(id);
    return item != null ? Results.Ok(item) : Results.NotFound();
});
app.MapPost("/items", async (Item newItem, InventoryDbContext db) =>
{
    db.Items.Add(newItem);
    await db.SaveChangesAsync();
    return Results.Created($"/items/{newItem.Id}", newItem);
});

app.Run();
```

2. InventoryDbContext.cs

```
using Microsoft.EntityFrameworkCore;

namespace InventoryAPI
{
    public class InventoryDbContext: DbContext
    {
        public InventoryDbContext(DbContextOptions<InventoryDbContext> options) :
base(options) { }
        public DbSet<Item> Items { get; set; }
    }
}
```

3. Item.cs

```
namespace InventoryAPI
{
    public record Item(int Id, string FirstName, string LastName, double Price);
}
```

4. InventoryAPI.csproj

```
<Project Sdk="Microsoft.NET.Sdk.Web">
  <PropertyGroup>
    <TargetFramework>net9.0</TargetFramework>
    <Nullable>enable</Nullable>
    <ImplicitUsings>enable</ImplicitUsings>
  </PropertyGroup>
  <ItemGroup>
    <PackageReference Include="Microsoft.EntityFrameworkCore.Sqlite" Version="8.0.7"
/>
    <PackageReference Include="Microsoft.EntityFrameworkCore.Tools" Version="8.0.7">
      <PrivateAssets>all</PrivateAssets>
      <IncludeAssets>runtime; build; native; contentfiles; analyzers;
buildtransitive</IncludeAssets>
    </PackageReference>
    <PackageReference Include="Swashbuckle.AspNetCore" Version="6.7.0" />
  </ItemGroup>
</Project>
```

5. InventoryAPI.http

```
GET https://localhost:7255/items
GET https://localhost:7255/items/1
POST https://localhost:7255/items
Content-Type: application/json

{
  "id": 101,
  "firstName": "Apple",
  "lastName": "Box",
  "price": 499.99
}
```

🧰 Setup Instructions

Prerequisites • .NET 9 SDK • Visual Studio Code or Visual Studio • SQLite CLI (optional)

Build & Run

cd InventoryAPI dotnet restore dotnet build dotnet run

API will run on: • HTTPS: https://localhost:7255 • HTTP: http://localhost:5091

Database Migrations

dotnet ef migrations add InitialCreate --project InventoryAPI dotnet ef database update --project InventoryAPI

💾 Database Model

Item.cs

```
public class Item
{
    public int Id { get; set; }
    public string FirstName { get; set; }
    public string LastName { get; set; }
    public double Price { get; set; }
}
```

InventoryDbContext.cs

```
using Microsoft.EntityFrameworkCore;

public class InventoryDbContext: DbContext
{
    public InventoryDbContext(DbContextOptions<InventoryDbContext> options) :
base(options) { }
    public DbSet<Item> Items { get; set; }
}
```

⚙️ API Endpoints

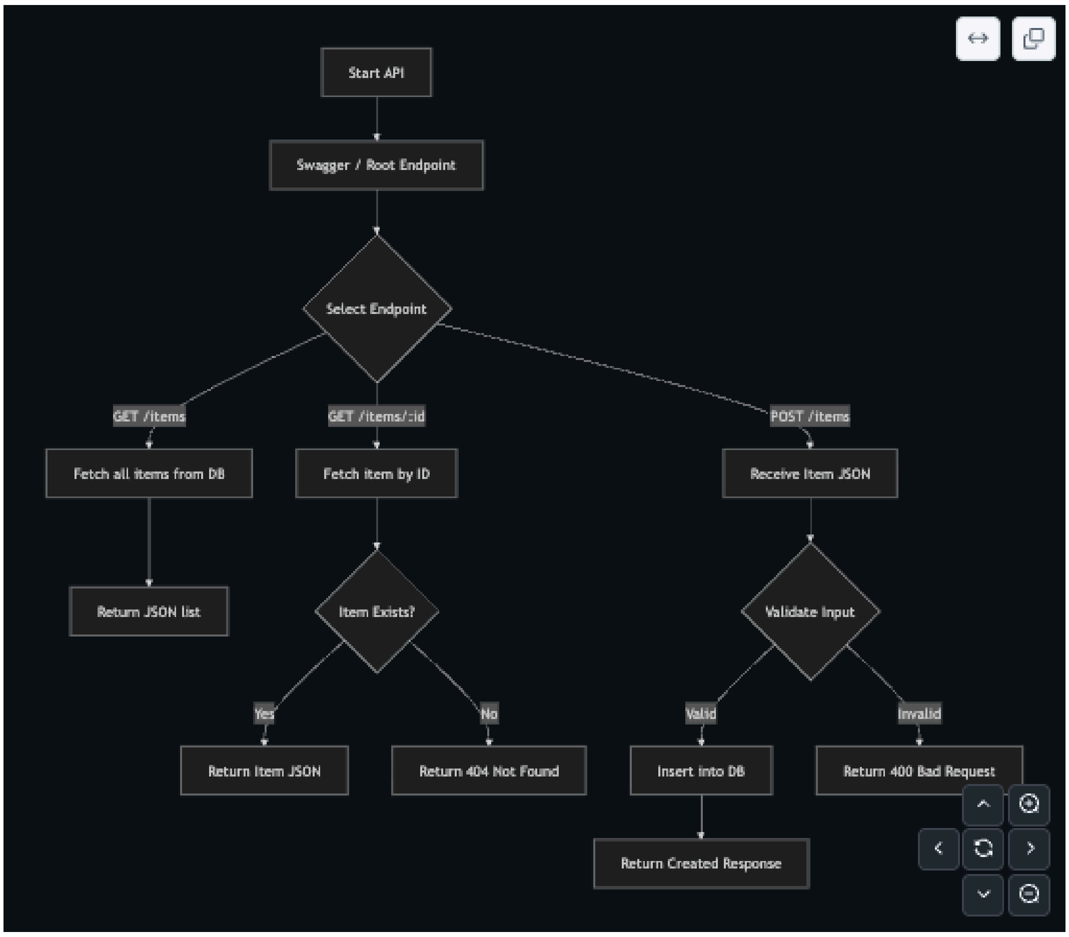
Endpoint Method Description / GET Health check / Root message /items GET Fetch all items /items/{id} GET Fetch a single item by ID /items POST Add a new item

Swagger UI: https://localhost:7255/swagger

📊 Program Flow (Diagram)

Teller API

📊 Program Flow (Diagram)

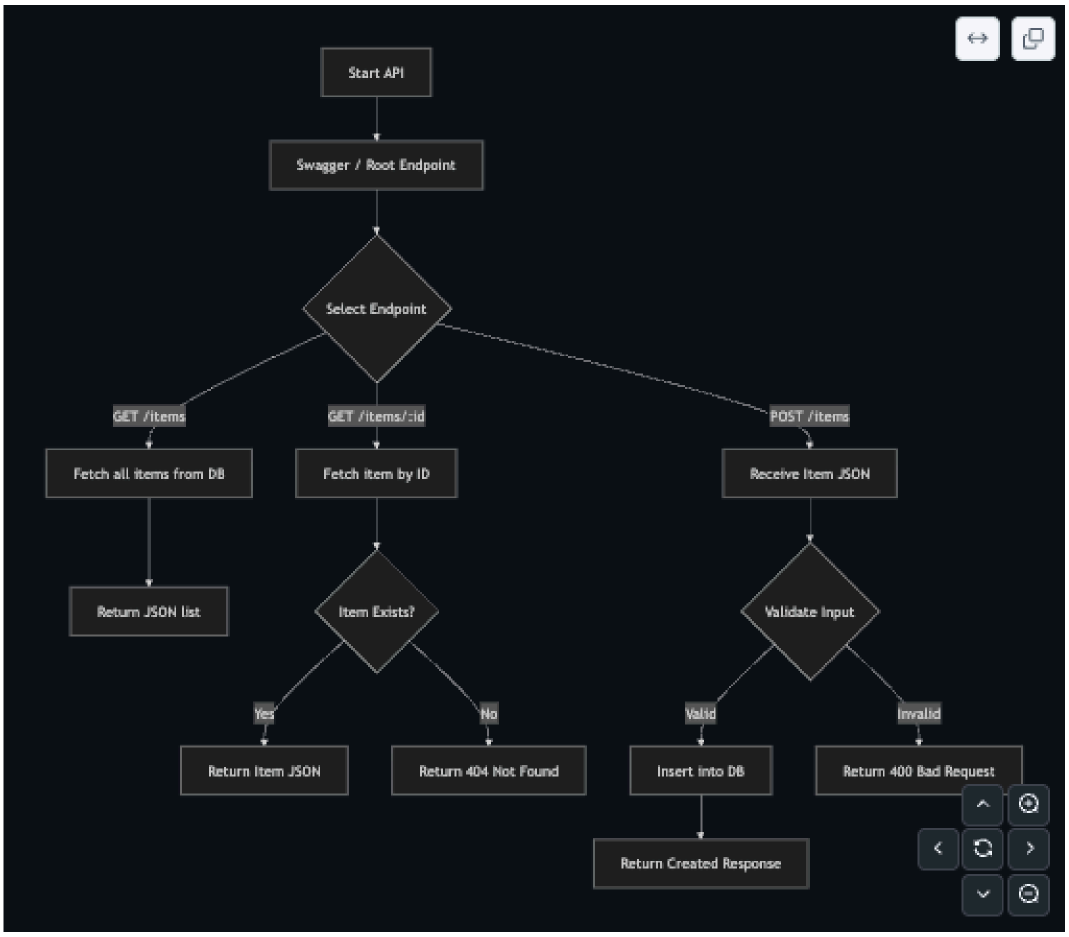


[illegible]

```
flowchart TD
    A[Start ATM] --> B[Login Screen]
    B --> C{Validate Name & PIN?}
    C -->|No| D[Display Error Message]
    D --> B
    C -->|Yes| E[Main Menu]

    E -->|Deposit| F[Select Account Type]
    F --> G[Enter Deposit Amount]
    G --> H[Update Balance]
    H --> E

    E -->|Withdraw| I[Select Account Type]
    I --> J[Enter Withdrawal Amount]
    J --> K{Validate Funds?}
    K -->|No| L[Insufficient Funds Message]
    L --> E
    K -->|Yes| M[Dispense Cash & Update Balance]
    M --> E
    E -->|Transfer| N[Select Source & Target Account]
    N --> O[Enter Transfer Amount]
    O --> P{Validate Funds?}
    P -->|No| Q[Display Error]
    P -->|Yes| R[Transfer Funds & Update Balances]
    R --> E

    E -->|Bill Payment| S[Enter Bill Amount]
    S --> T{Validate Amount & Balance?}
    T -->|No| U[Display Error]
    T -->|Yes| V[Process Payment + Fee]
    V --> E

    E -->|Supervisor Mode| W[Login as Admin]
    W --> X[Access Admin Menu]
    X -->|Pay Interest
```

Inventory API

📊 Program Flow (Diagram)



```
flowchart TD
    A[Start API] --> B[Swagger / Root Endpoint]
    B --> C{Select Endpoint}

    C -->|"GET /items"| D[Fetch all items from DB]
    D --> E[Return JSON list]

    C -->|"GET /items/:id"| F[Fetch item by ID]
    F --> G{Item Exists?}
    G -->|Yes| H[Return Item JSON]
    G -->|No| I[Return 404 Not Found]

    C -->|"POST /items"| J[Receive Item JSON]
    J --> K{Validate Input}
    K -->|Valid| L[Insert into DB]
    K -->|Invalid| M[Return 400 Bad Request]
    L --> N[Return Created Response]
```

🔧 Development Highlights • Minimal API with ASP.NET Core • EF Core SQLite integration • Input validation for IDs and prices • Async/await for database operations • Swagger/OpenAPI for endpoint testing

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🧩 Folder Structure

InventoryAPI/ ├── Program.cs ├── Item.cs ├── InventoryDbContext.cs ├── appsettings.json ├── appsettings.Development.json ├── Properties/ ├── bin/ ├── obj/ └── InventoryAPI.csproj

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🧑‍💻 Author

Marc Cavada Programming Fundamentals – CDI College Project: CA_PRFND – Inventory Management System

✅ This version is **GitHub-ready**:
All C#, XML, and HTTP blocks are fenced separately.
Mermaid diagram is standalone.
Folder structure uses its own code block.
Text and headings are outside code blocks, so everything renders correctly.