# SOEN 6441 Advanced Programming Practices

# ARCHITECTURAL DIAGRAM

## Group W10 – Build 2

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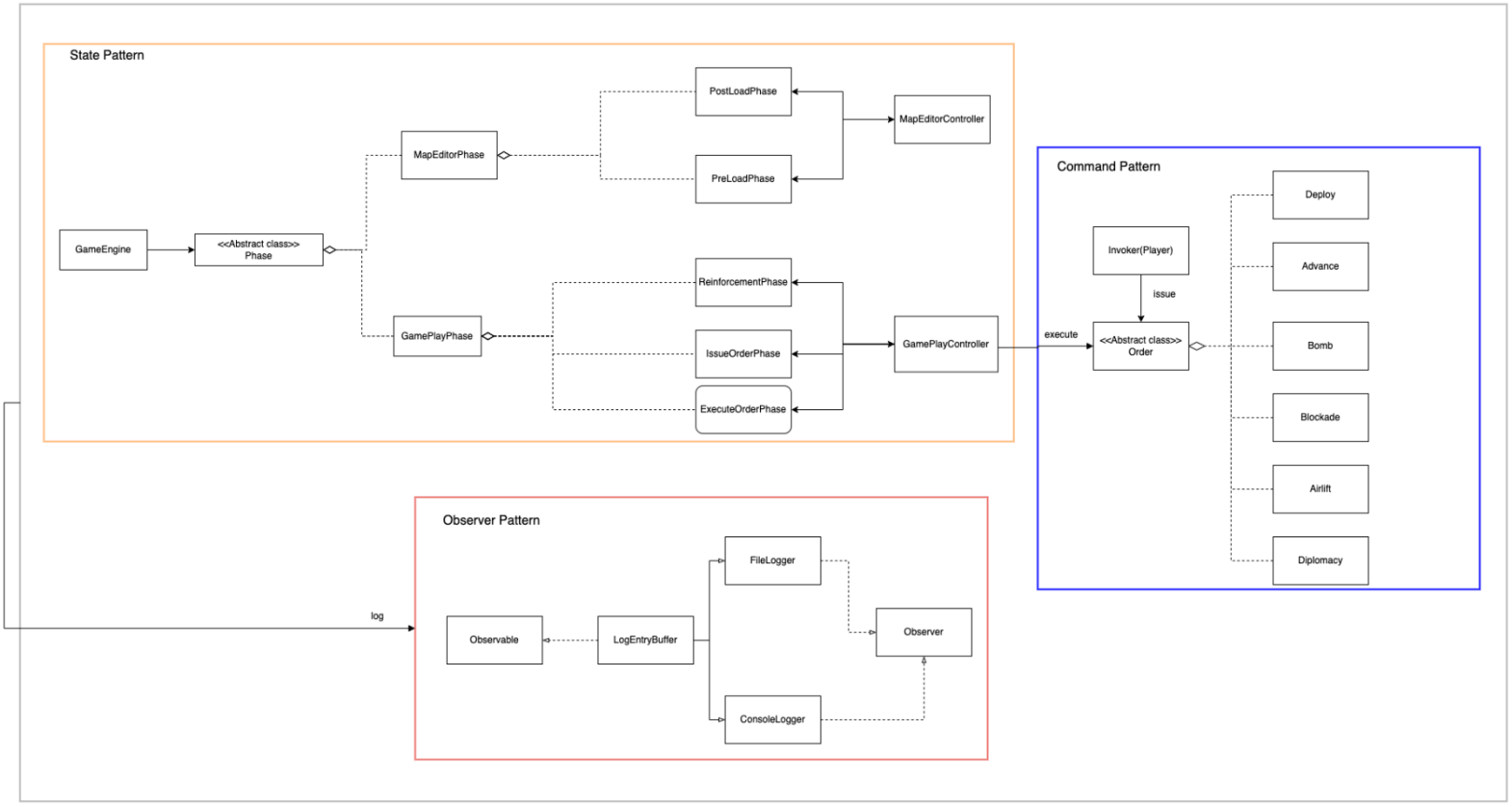
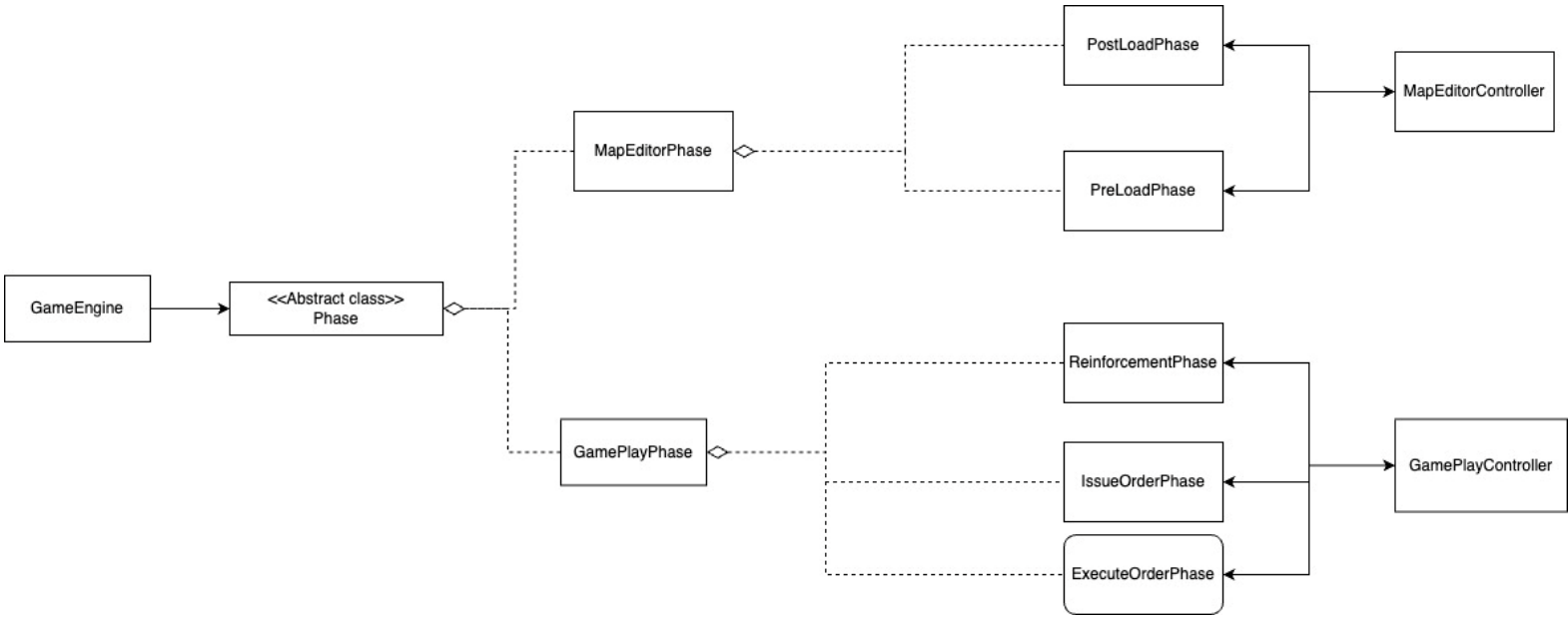



As shown in the architectural design diagram, our project is divided into three main parts: state pattern, command pattern, and observer pattern. Specifically, the state pattern is to implement the phase of the application. The command pattern is to implement the orders. The observer pattern is to implement a game log file. The details of these three patterns will be shown in the following sections.




## State Pattern

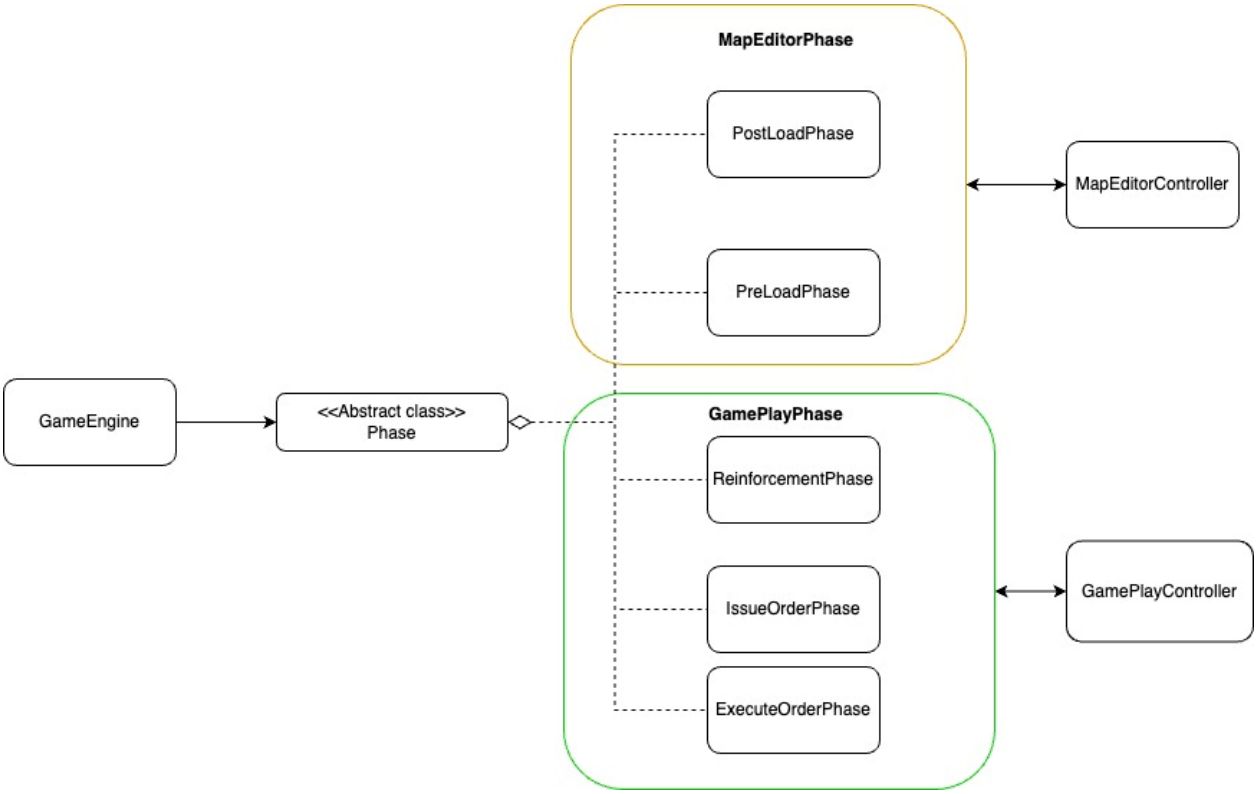
State pattern is to implement the phase of the application.

The state pattern contains the following classes:

- **`Phase`**: this class is an abstract class.
- **`MapEditorPhase`**: this class is an abstract class and extends the `Phase` class.
- **`GamePlayPhase`**: this class is an abstract class and extends the `Phase` class.
- **`PreLoadPhase`**: this class is a concrete class and extends the `MapEditorPhase` class.
- **`PostLoadPhase`**: this class is a concrete class and extends the `MapEditorPhase` class.
- **`ReinforcementPhase`**: this class is a concrete class and extends the `GamePlayPhase` class.
- **`IssueOrderPhase`**: this class is a concrete class and extends the `GamePlayPhase` class.
- **`OrderExecutionPhase`**: this class is a concrete class and extends the `GamePlayPhase` class.

Advantages of using State Pattern:

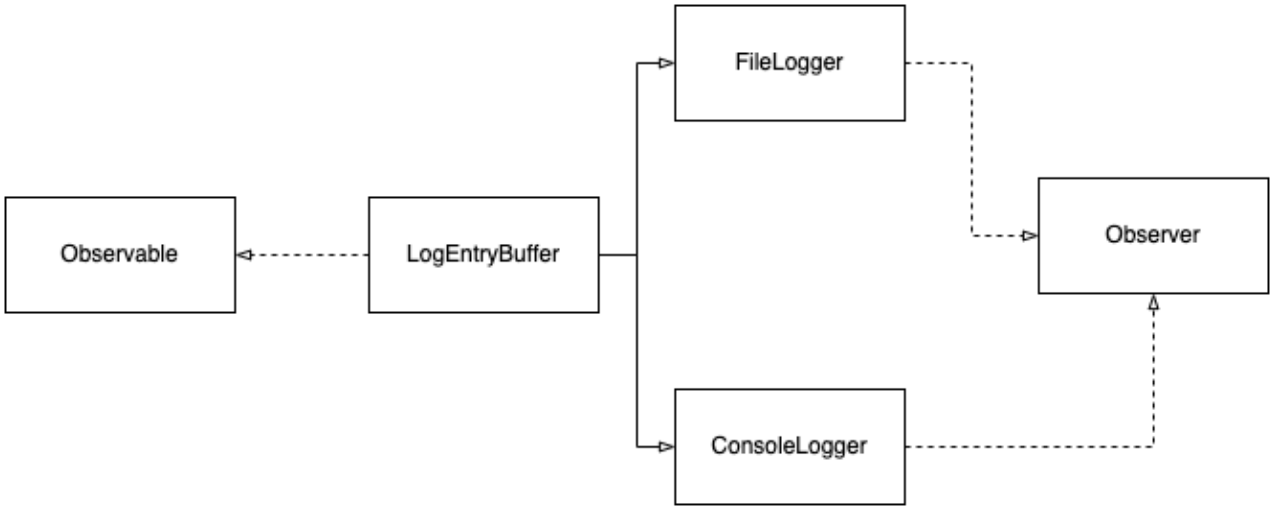
1. It allows for cleaner, more modular, and maintainable code by separating different states into distinct classes and providing a structured way to transition between them.
2. Each command is separated by phases.
3. If the command does not belong to the phase, it does not execute within that phase and shows an invalid command as an error message.
4. It dictates the GameEngine to run commands in a sequential manner for example: `editcountry` command does not run once we are in `GamePlayPhase`




Work-flow of the State pattern:

1. In the beginning, the `GameEngine` will set phase to Pre-load.
2. Only loadmap command is valid in this phase.
3. After loading the map, the phase will automatically be set to Post-load.
4. In the post-load, only the map editor commands are valid.
5. Once the game map is ready, after editing, the `next` command will set the phase to `PlaySetup,` which is inside the `GamePlayPhase`.
6. In the Playsetup phase, we can add players and assign countries.
7. Once the assigncountries command is placed, the Phase will change to `ReinforcementPhase,` which is included in the `GamePlayPhase.`
8. In this phase, we can use reinforcement commands.
9. Then the phase will be set as `IssueOrder` Phase.
10. After issuing orders and committing, the phase will be set as `ExecuteOrderPhase`.

## Observer Pattern

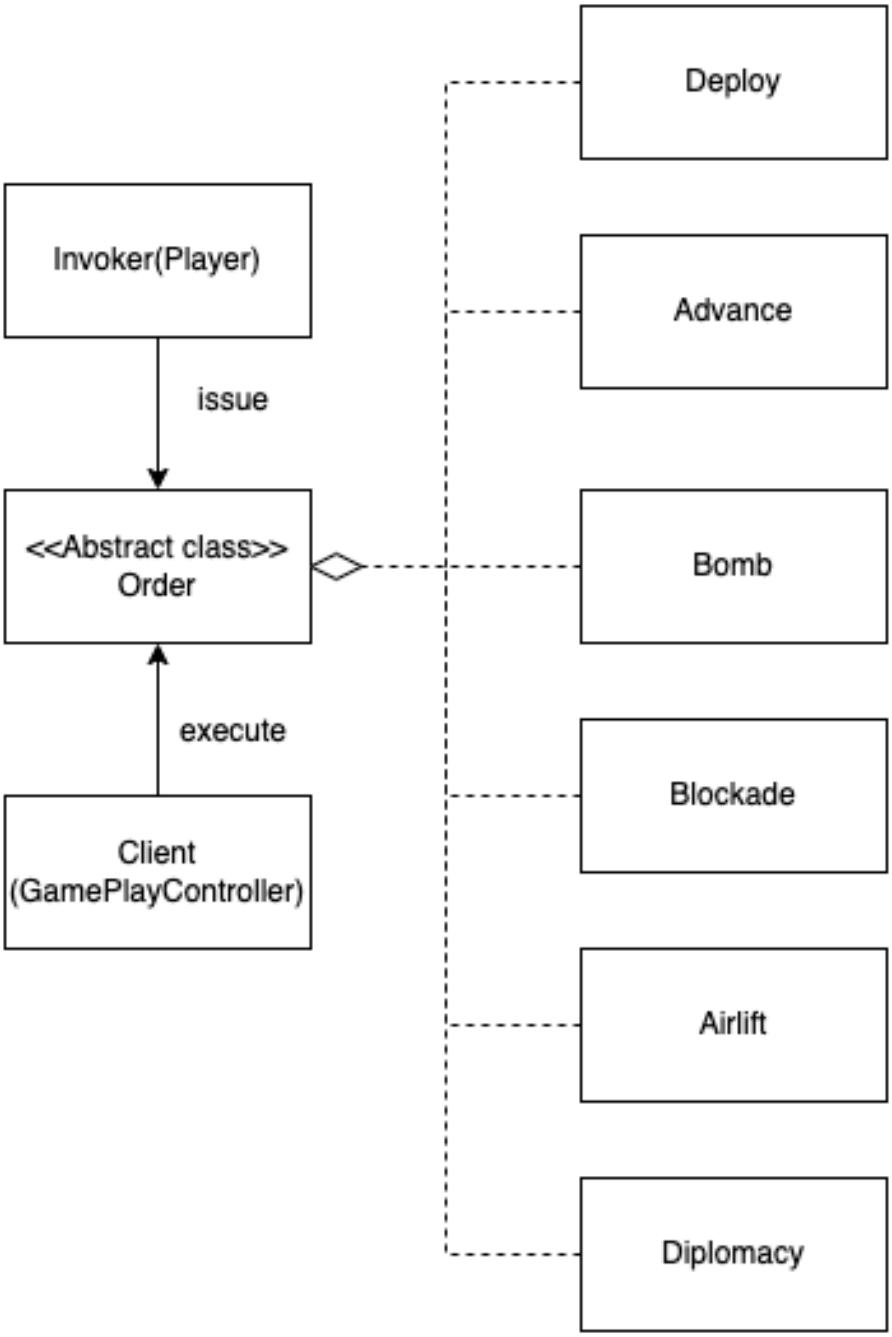



Observer pattern is to implement a game log file.

This observer pattern contains the following classes:

- **`Observable`**: This is an interface.
- **`Observer`**: This is an interface
- **`LogEntryBuffer`**: This is a concrete class that implements `Observable` interface.
- **`FileLogger`**: This is a concrete class that implements `Observer` interface.
- **`ConsoleLogger`**: This is a concrete class that implements `Observer` interface.

## Command Pattern




This command pattern is to implement the Orders.

This command pattern contains the following classes:

- **`Player`**: This is a concrete class to create orders by using the `issueOrder()` method.
- **`GamePlayController`**: This is a concrete class to execute orders by using `execute()` method of the Order.
- **`Order`**: This is an abstract class having an abstract `execute()` method.

- **`Deploy`**: This is a concrete class that extends the `Order` class and implements the concrete `execute()` method.
- **`Advance`**: This is a concrete class that extends the `Order` class and implements the concrete `execute()` method.
- **`Bomb`**: This is a concrete class that extends the `Order` class and implements the concrete `execute()` method.
- **`Blockade`**: This is a concrete class that extends the `Order` class and implements the concrete `execute()` method.
- **`Airlift`**: This is a concrete class that extends the `Order` class and implements the concrete `execute()` method.
- **`Diplomacy`**: This is a concrete class that extends the `Order` class and implements concrete `execute()` method.

## Project Structures:

- **`App`**: This class initializes the application by creating a new **`GameEngine`** instance.
- **`GameEngine`**: The class handles the command line user interface for the game, including the map editor, start-up phase and gameplay phase.Controllers

**`GameEngine`**: The GameEngine class is responsible for managing the game flow, handling user input, and executing commands in the Risk game.

### Controllers:

- **`MapEditorController`**: This class holds the logic to update the game map.
- **`GamePlayController`**: This class is responsible for managing the players, issuing orders, executing orders and their interactions in a game.

### Models

- **`GameMap`**: This class contains data and functions to retrieve and manipulate game map properties such as countries and continents
- **`Continent`**: This class represents a continent in a game, with properties continent ID, name, list of countries, list of neighboring countries, and bonus points.
- **`Country`**: This class represents a country in a game, with properties country ID, name, continent ID, army count, and owner.
- **`Player`**: This class represents a player in a game, with properties name, countries owned, orders, and leftover armies.
- **`CardType`**: This class is to define the cards can be used and give random cards when it is needed.
- **`Phase`**: This class is an abstract class that represents a phase in a Risk game and provides methods for various game commands.
  **`Phases`**:

- **`MapEditorPhase`**: This class is an abstract class that extends the `Phase` class and provides default implementations for various methods related to map editing in a game.
- **`GamePlayPhase`**: This class is an abstract class that extends the `Phase` class and provides default implementations for various methods related to game play in a game.
- **`PreLoadPhase`**: This class is a subclass of `MapEditorPhase` that handles the pre-loading phase of a game, allowing the user to load a map file and transition to the next phase.
- **`PostLoadPhase`**: This class is a subclass of `MapEditorPhase` that represents the phase after loading a map in a game editor, allowing for editing and saving of the map.
- **`PlaySetupPhase`**: This class is a subclass of `GamePlayPhase` that handles the setup phase of the game, including creating and removing players, assigning countries, and transitioning to the main play phase.
- **`ReinforcementPhase`**: This is a subclass of `GamePlayPhase` that handles the reinforcement phase of the game.
- **`IssueOrderPhase`**: This class is a subclass of `GamePlayPhase` that represents the phase of the game where players issue orders.
- **`ExecuteOrderPhase`**: This class is a subclass of `GamePlayPhase` that represents the phase of the game where player orders are executed.

## Utils

- **`MapReader`**: This class reads a map file and initializes continents and countries.
- **`MapEditor`**: This class operates on the current game map, adding and removing game map elements.
- **`MapDisplay`**: This class populates and formats a table to display information about countries, continents, players, and neighboring countries on a game map.
- **`MapValidator`**: This class provides methods to validate a game map by checking for various conditions such as empty map, non-existent continents or neighbors, self-referencing neighbors, inaccessible countries, and disconnected continents.
- **`CommandInterpreter`**: This class provides methods to extract the main command and argument list from a given command input.
- **`Constants`**: This class contains various constant values used throughout the code.
- **`Reinforcements`**: This class contains methods to reinforce armies for each player.
- **`Observable`**: This is an interface for implementing Observable with notify Observers, attach and detach functions.
- **`Observer`**: This is an interface used to implement the Observer design pattern, which allows objects to be notified of changes in the state of another object (observable object).

  **`Loggers`**:
  - **`LogEntryBuffer`**: This class is a singleton implementation that acts as a buffer for log entries and notifies observers when new log entries are added.

- **`FileLogger`**: This FileLogger class implements the Observer interface that writes data to a file.
- **`ConsoleLogger`**: This class implements the Observer interface in Java that prints the given data when the update method is called.

## Commands

- **`Orders`**: This class is an abstract class for order. It defines the basic behavior (execute) of an order.
- **`Deploy`**: This class is the deploy order class. It extends the Order class. It defines the specific executing behavior for deploying.
- **`Advance`**: This class is the Advance order class. It extends the Order class. It defines the specific executing behavior for advancing.
- **`Bomb`**: This class represents a player's order to bomb a specific country, reducing its army count by half.
- **`Blockade`**: This class represents a blockade order in a game, where a player blocks a country and triples its army count while removing it from their owned countries.
- **`Airlift`**: This class represents an order to move armies from one country to another in a game.
- **`Negotiate`**: This class is to negotiate with other players. In this turn, the two players can not attack each other.
- **`Command`**: This class is to define an enum for commands that can be used in the game.

## Exceptions

- **`ApplicationException`**: This class is a custom exception class that wraps all checked standard Java exceptions and can be used to handle risk-game-specific errors in Java.