COS214 Group Project Report

By Spice Girls

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Overview

Definition of war

War is an intense armed conflict between states, governments, societies, or paramilitary groups such as mercenaries, insurgents, and militias. It is generally characterised by extreme violence, destruction, and mortality, using regular or irregular military forces. Warfare, in general, occurs in spaces or grounds known as war-theatres. In the said war-theatres, there are various key points in which the countries, or alliances, at war engage and inflict damage to the opposing country, or alliances.

War Planning/ Laying Plans

The Earth comprises distances, great and small; danger and security; open and narrow passes; the chances of life and death. In this regard, one must surely plan before enduring the intricacies of war. One should consider the military force and support from any formed alliances. Self-informing questions: Which army is stronger? Which army is the most advantaged in certain key points - such as in terrain, aerial or aquatic battles.

War Theatres

Carl von Clausewitz defines the term war theatre, in his book *On War,* as: “Denotes properly such a portion of the space over which war prevails as has its boundaries protected, and thus possesses a kind of independence. Such a portion is not a mere piece of the whole, but a small whole complete in itself; and consequently it is more or less in such a condition that changes which take place at other points in the seat of war have only an indirect and no direct influence upon it”. As per our implementation, war theatres are the areas that house the specific other areas wherein the actual battles, that make up the overall war, take place. These specific areas are key points. However, in addition to war theatres housing key points, they can also house other war theatres. We have made it that there is an overall war theatre, that houses other war theatres - sub war theatres - which each contain a various number of key points.

Attack by Stratagem

During different stages of war, countries, or alliances, perform different military attacking strategies. The commander/general will then analyse the war’s situation and deploy a necessary strategic move, which would either be aggressive, defensive, or passive. The aggressive strategy entails the general sending in more troops/entities, of between 5 and 10, into a key point in trying to ensure said key point is secured by their alliances. While the defensive strategy, also entails the general sending in more entities, of between 1 and 5, into a key point for the purpose of trying to add to their alliances’ defensive capabilities. And, the passive strategy entails the general retreating entities, of between 5 and 10, from a keypoint.

Types of Weaponry

In battle-wars, a variety of weapons are used. The weapons used may be biological, chemical or physical - also the Earth's natural resources may be used as ammunition.

Phases of War

There are 4 four phases in attacking and occupying a country:

Phase 1: Intelligence. Understand who you are fighting, his intentions and capabilities, and what war is meant to achieve.

Phase 2: War. Initiate movement and firepower intended to break the enemy's will and ability to resist.

Phase 3: Occupation. Occupy the country, or that portion that is necessary to achieve the political end desired.

Phase 4: Pacification. Pacify the occupied terrain and break the will of the people to resist.

Objective

The assignment given is to implement:

- generic War Simulator using at least 10 design patterns, in C++. The said War Simulator should be able to simulate actual wars, which could happen.
- A generic war simulator that allows users to set-up the battle/war environment and automatically simulate the outcome.

The Realisation of a War Simulator

Fundamental Requirements

Our fundamental requirements include: being able to save the War Engine's instances and being able to restore them. For this, the Memento design pattern is used. The creation of entities, which is done using the Factory Method design pattern. The ability to change how an alliance performs its military progression at a particular keypoint, which is accomplished using the Strategy design pattern. The ability to regulate weather's state for the key points which has an impact on the amount of damage that occurs between alliances at battle and the ability to regulate the state of the entities produced to determine whether they will be of an aquatic, terrain or aerial nature, which is made possible by the State design pattern. Creating the war theatres which house key points wherein the battles take place, which make use of the Composite design pattern. The ability to add additional functionality to the entities, such as protective armour and enhanced damage capabilities to their attack, which is made possible through the use of the Decorator design pattern. The ability to observe an alliance's entities at each key point, which is

done using the Observer design pattern. Providing a means through which alliances can communicate with each other, which has been done using the Mediator design pattern. Having the ability to create only one instance of the war engine, which is done using the Singleton design pattern. Making provision for some classes to be cloneable, through the use of the Prototype design pattern. And, taking the responsibility of the set up and running of the simulation away from the client, which is accomplished using the Facade design pattern. Overall, the 11 design patterns used to accomplish the system requirements are, namely: Memento, Factory Method, Strategy, State, Composite, Decorator, Observer, Mediator, Singleton, Prototype, and Facade

Class Diagram

Design Patterns Usage

Factory Method

Create factories that will be used by alliances to produce entities involved in the war simulation. The factories being the vehicle factory, the personnel factory, and the support factory. The corresponding entities they produce are vehicles, personnel, and support.

Decorator

Adds additional functionality to entities. Said functionality being health protective armour and damage enhancing piercing.

Composite

Creates the war areas on which the war battles between opposing alliances will take place. Said areas being war theatres and key points. War theatres having the ability to contain other war theatres and key points, and key points being the specific areas whereon the actual battles taking place during the war occur.

State

Creates the different weather states - namely: sunny, rainy, and cloudy - which affect the amount of damage dealt by the different opposing alliances to each other during their different battles depending on the current weather state at the key points (battlegrounds). Also used by the factories to produce entities of specific states. Said states being the aquatic state, the terrain state, and the aerial state. Each state provides certain functionality for the different entities produced.

Observer

Serves as the general to oversee the activity of the alliance’s entities in the key points and responds to said activities in a manner stipulated by the general’s current strategy.

Strategy

Provides the generals with different strategic moves that stipulate how the generals will progress with respect to the movement of their alliance's entities into and out of the key point. The strategies being aggressive, defensive and passive. The aggressive strategy entails the general sending in more troops/entities, of between 5 and 10, into a key point in trying to ensure said key point is secured by their alliances. While the defensive strategy, also entails the general sending in more entities, of between 1 and 5, into a key point for the purpose of trying to add to their alliances' defensive capabilities. And, the passive strategy entails the general retreating entities, of between 5 and 10, from a keypoint.

Mediator

Serves as the negotiator to provide means of communication between the different alliances. Said communication being proposing peace with or surrendering to other alliances.

Singleton

Used to ensure that we only ever have one instance of our war engine.

Prototype

Provides a means to clone the current instances of certain classes' information for storage purposes.

Memento

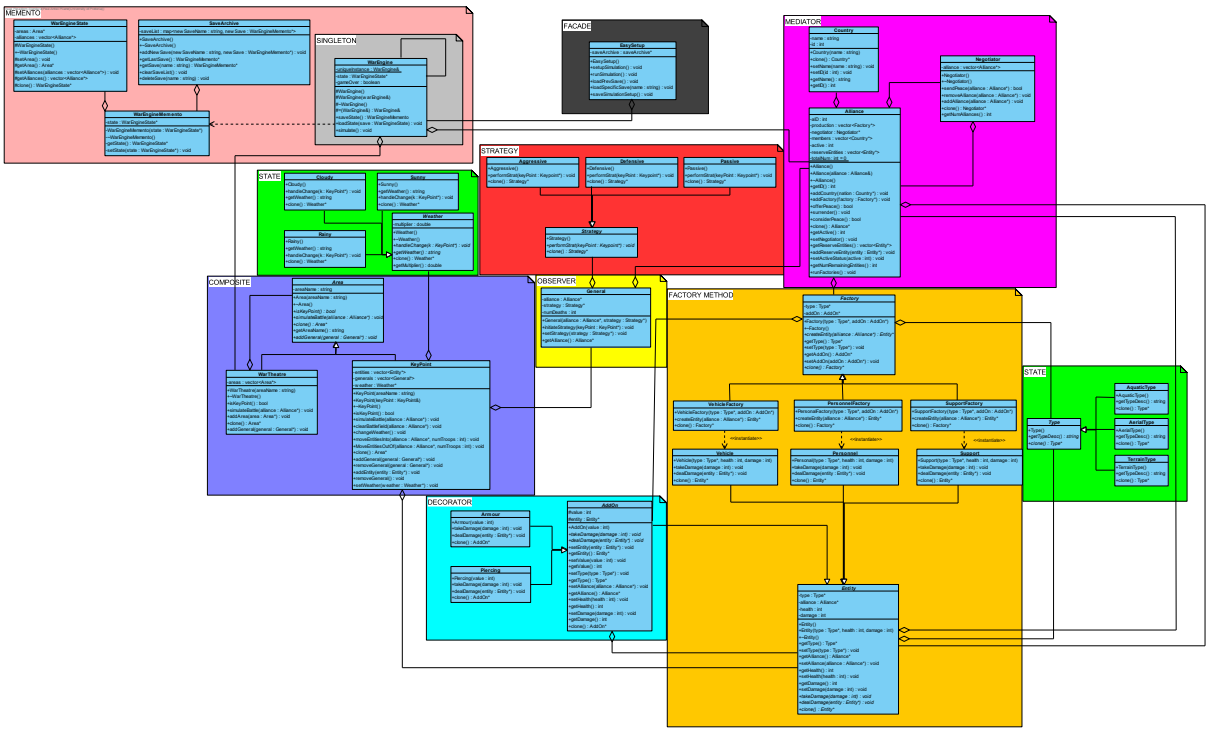
Enables us to save, store and manage the different saved instances of our war engine's internal information. Through this, a simulation's set up instance information may be saved and restored for later use

Façade

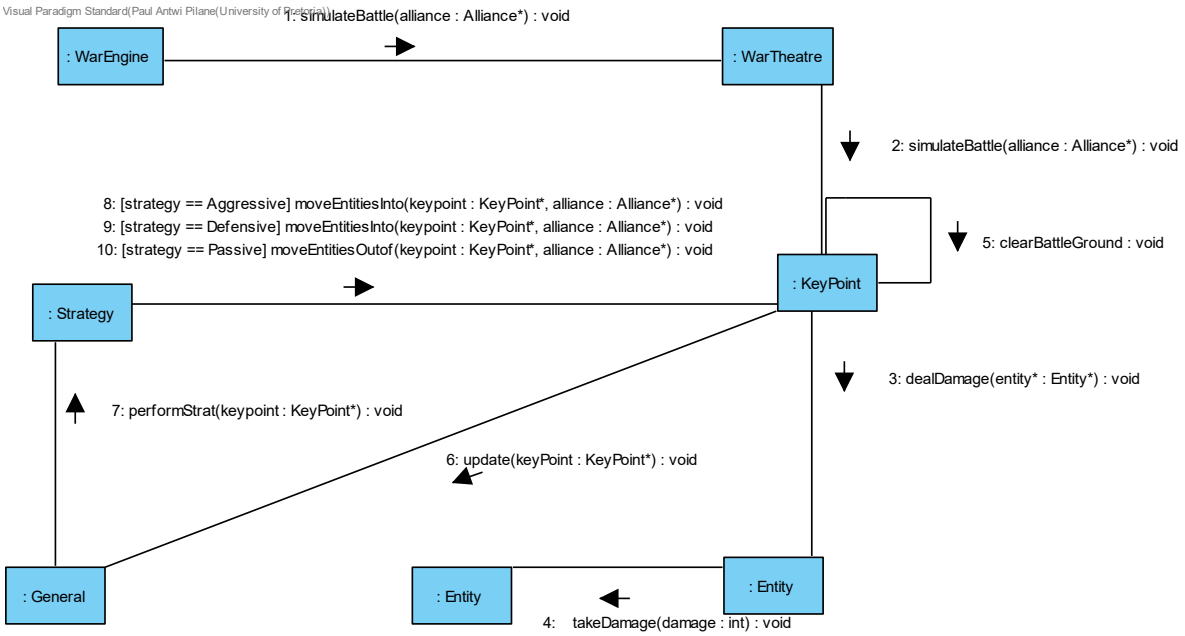
Provides a simple, straightforward and user-friendly interface to set up, save, load, and run the war simulation.

System Design Diagrams

System Class Diagram

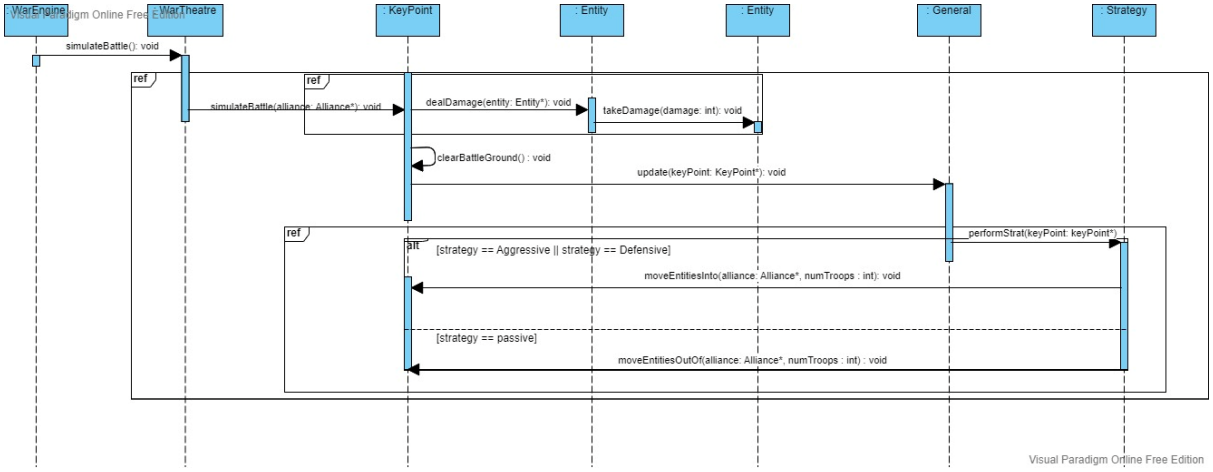


Communication Diagrams

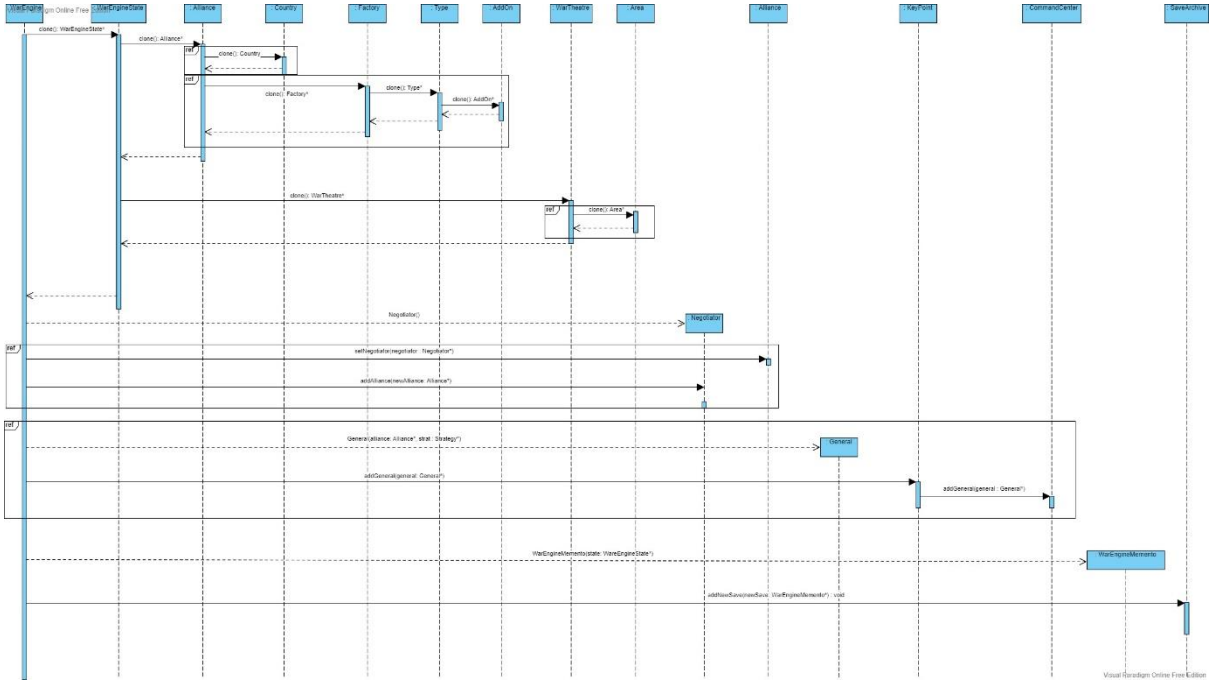


Sequence Diagrams

Single Turn

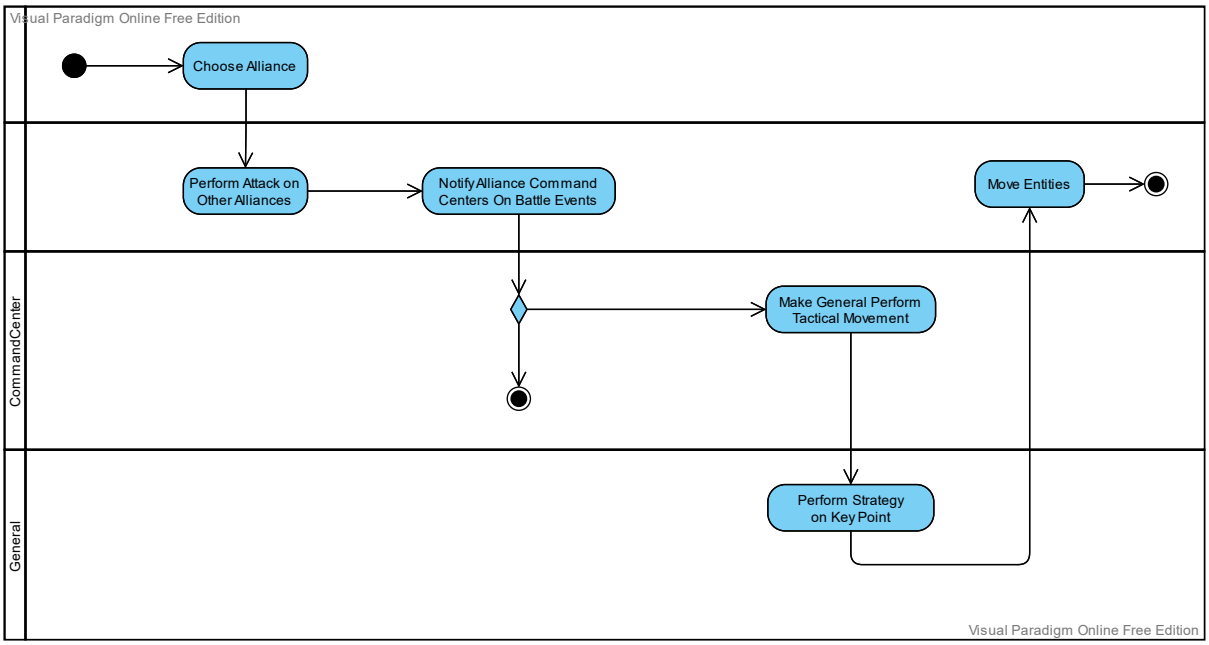


War Theatre Save:



Activity Diagrams

Single Turn: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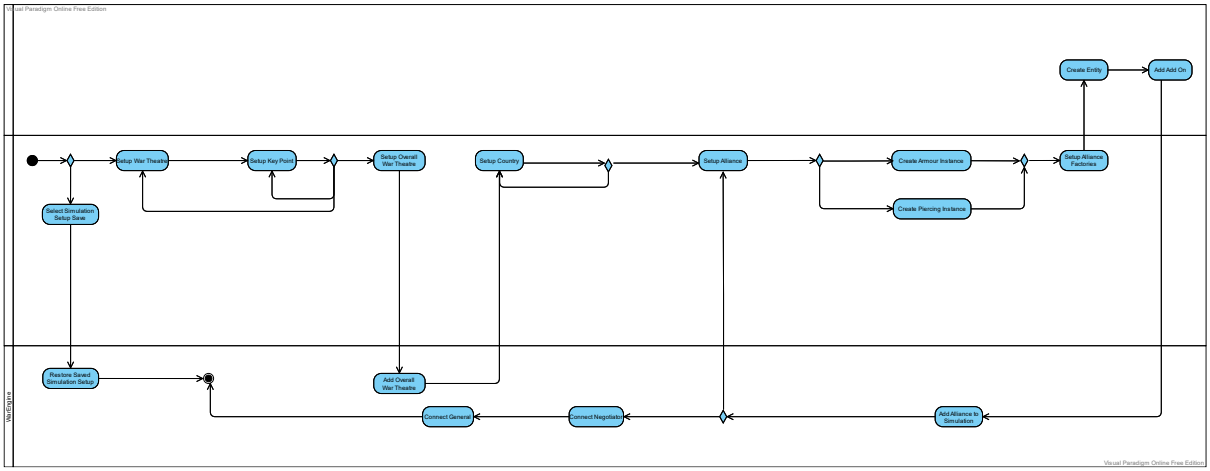
War Engine: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Setup Key Point
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Setup Country
Setup Alliance
Create Armour Instance
Setup Alliance Factories
Select Simulation Setup Save
Create Piercing Instance
WarEngine
Restore Saved Simulation Setup
Add Overall War Theatre
Connect General
Connect Negotiator
Add Alliance to Simulation
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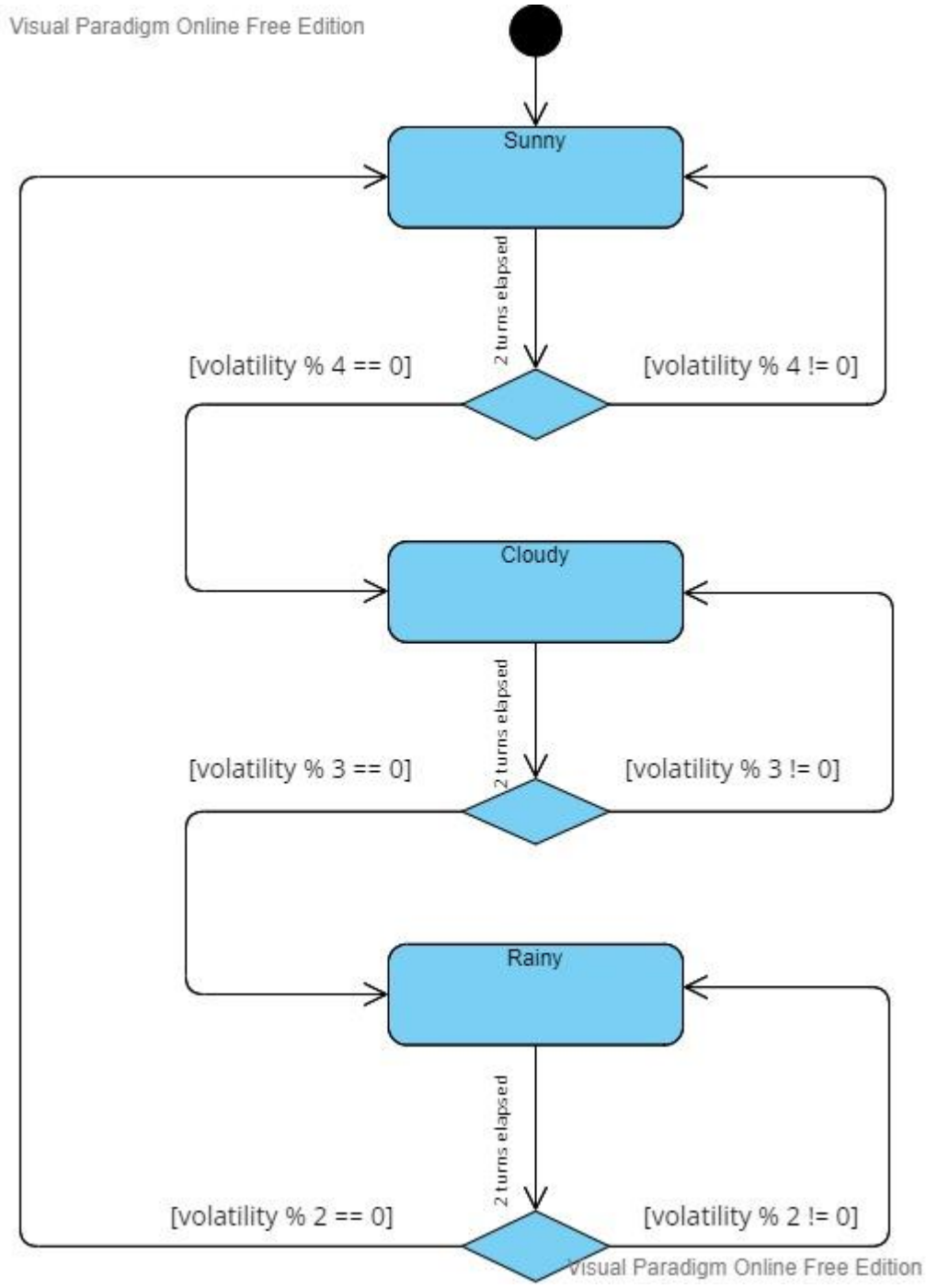
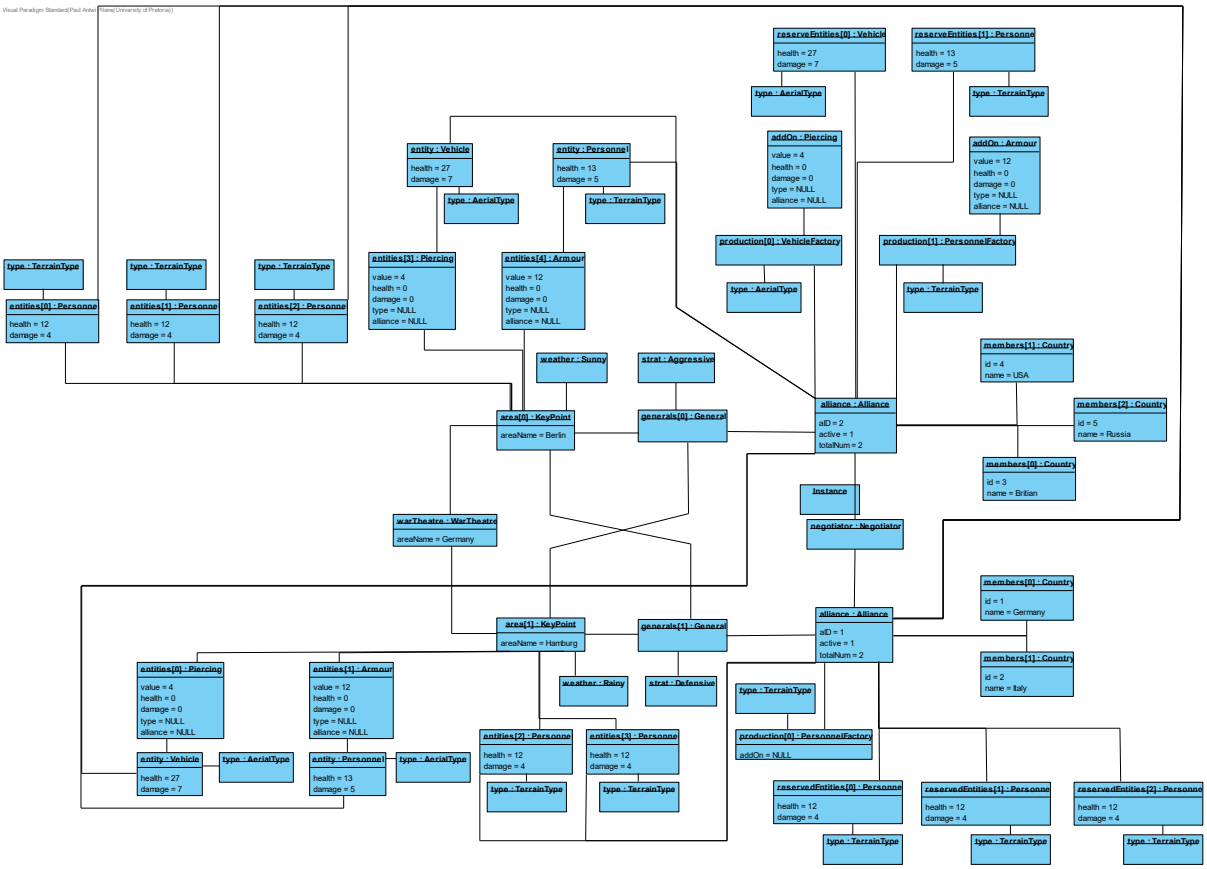
State Diagrams

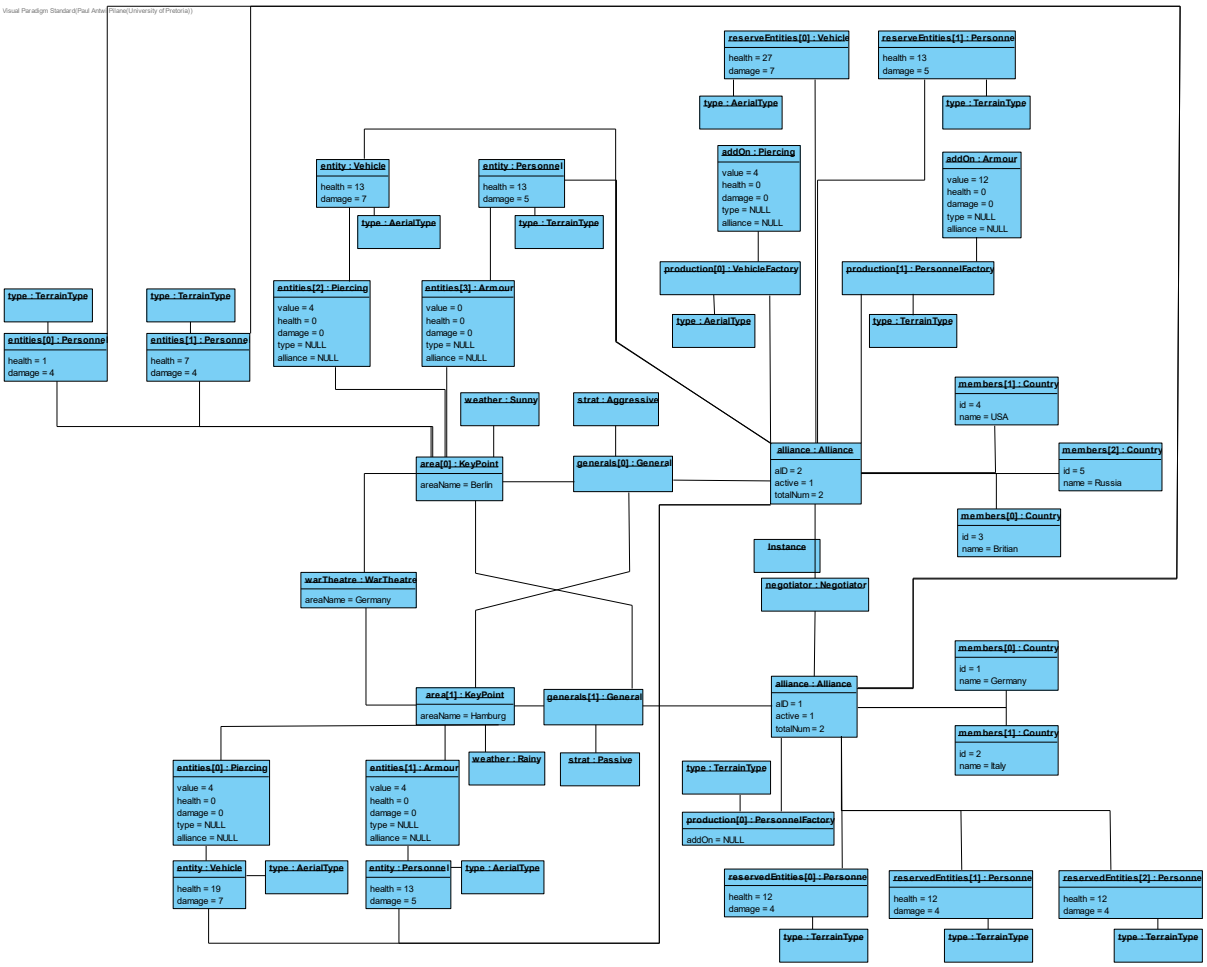


Object Diagrams

Before Simulation



After Simulation:



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