

# **Software Modelling 214**

## **Group Assignment**



**UNIVERSITEIT VAN PRETORIA**  
**UNIVERSITY OF PRETORIA**  
**YUNIBESITHI YA PRETORIA**

**Denkleiers • Leading Minds • Dikgopolo tša Dihlalefi**

**A Practical assignment submitted in partial fulfilment for the module  
Software Modelling 214 offered at the University of Pretoria.**

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## Additional Resources

### Compilation Instruction:

Open a terminal within the System folder

Enter make

Enter make run

Video link -> <https://www.youtube.com/watch?v=DThB28O4IXQ&feature=youtu.be>

GitHub link -> [https://github.com/KarelSmit/runtime\\_terrors---COS214\\_Assignment](https://github.com/KarelSmit/runtime_terrors---COS214_Assignment)

Catch2 Unit Testing Framework -> <https://github.com/catchorg/Catch2>

doxygen link -> <https://doxygen.nl/>

Our Doxygen -> <https://glowing-begonia-f06d21.netlify.app/index.html>

Microsoft Word -> [COS214\\_Assignment\\_Draft.docx](#)

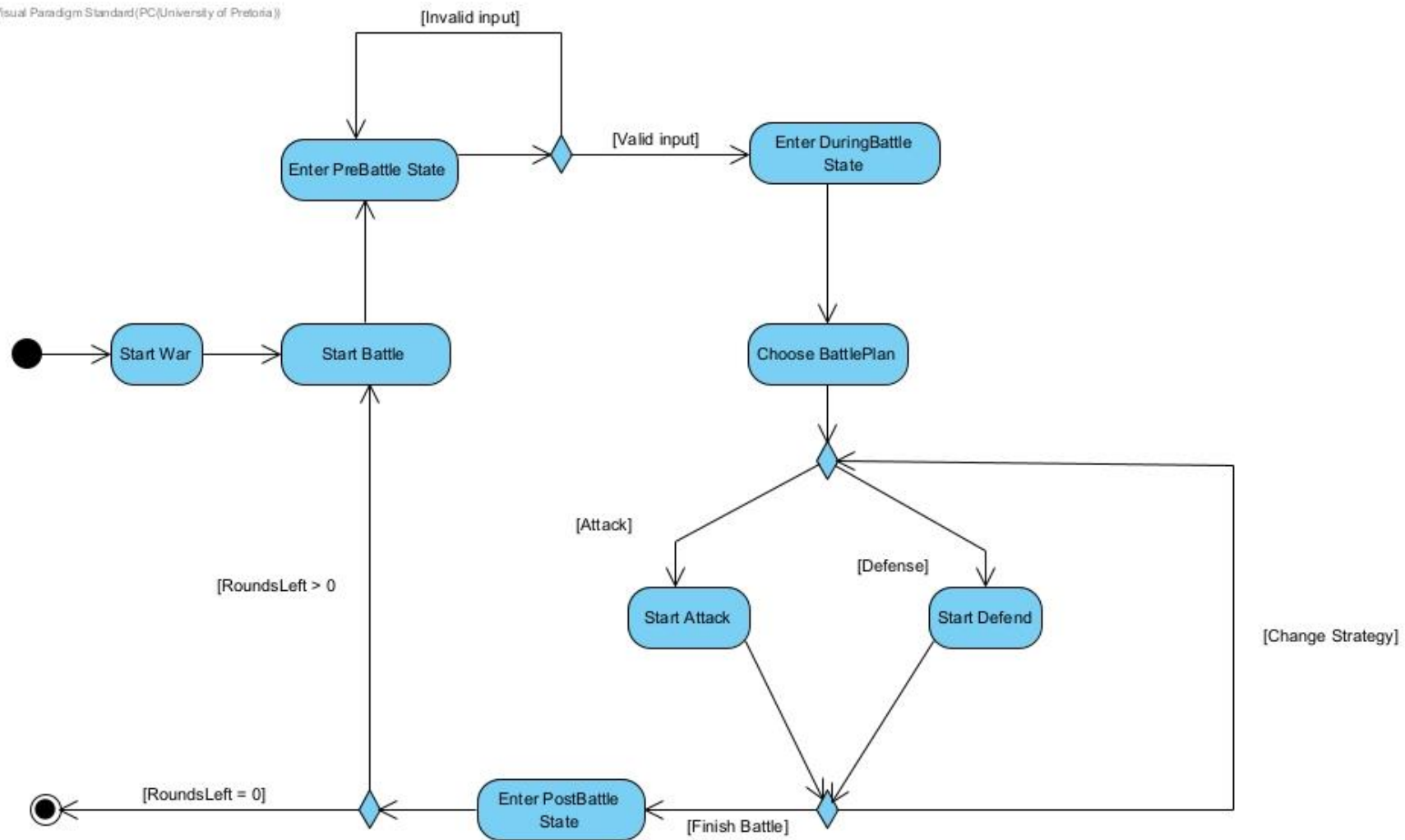
Google Doc Report ->

<https://docs.google.com/document/d/1rXABCUyyhZzCVbN5J6A27BkYGNSGtWOcGYYsqWdJcMQ/edit#>

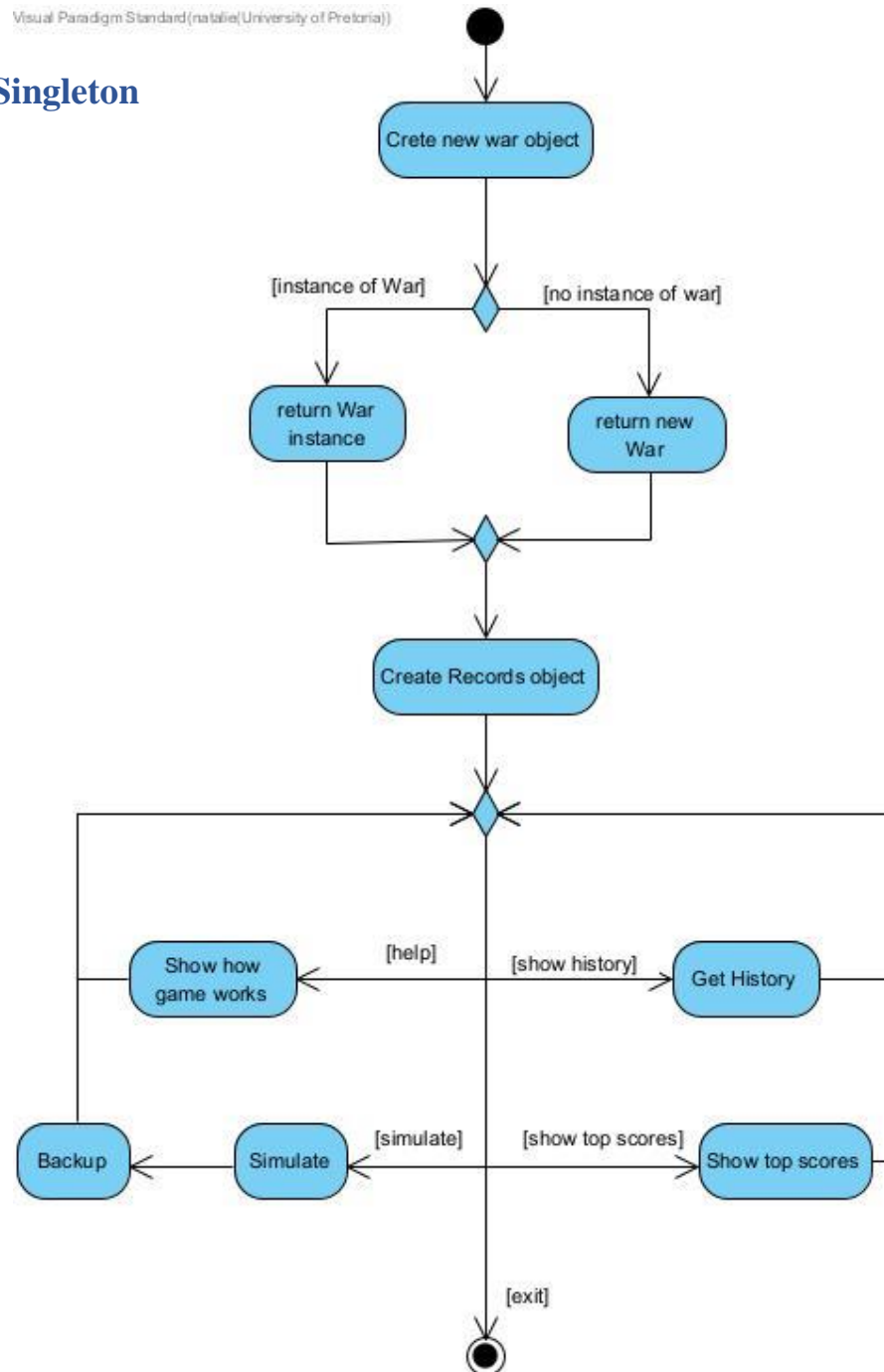
## TASK 2

### Activity diagrams - State and Strategy

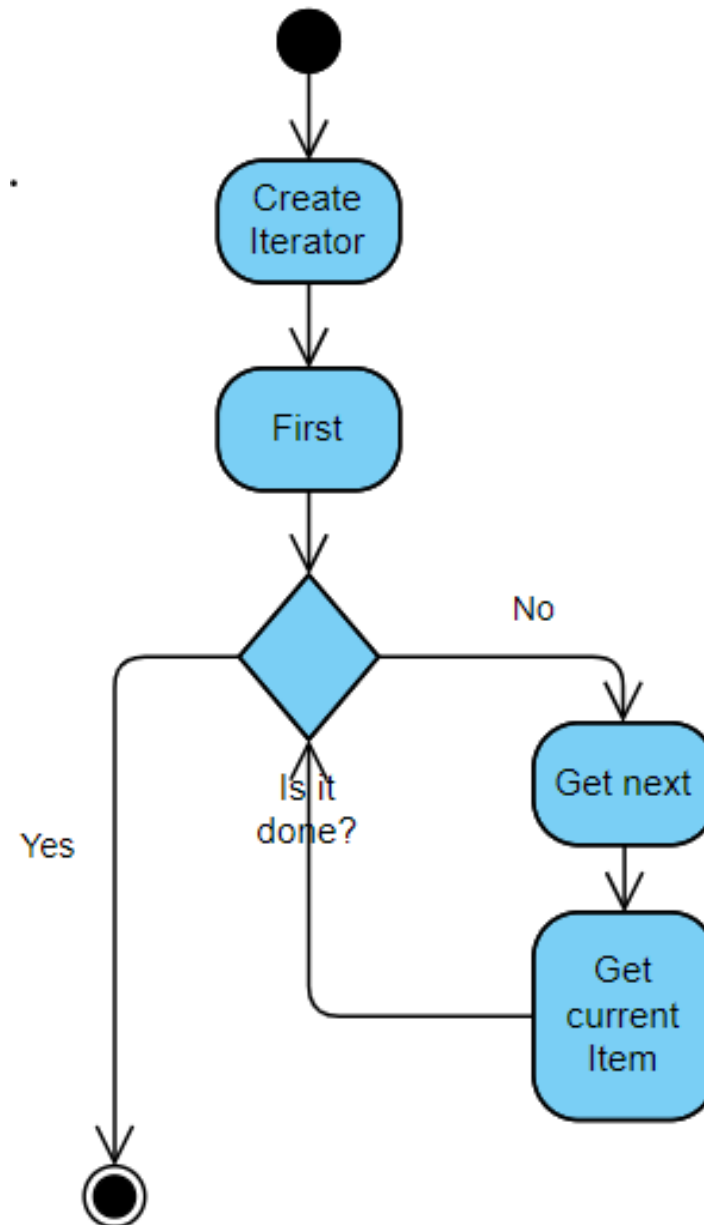
Visual Paradigm Standard (PC (University of Pretoria))



## Activity diagrams - Memento and Singleton

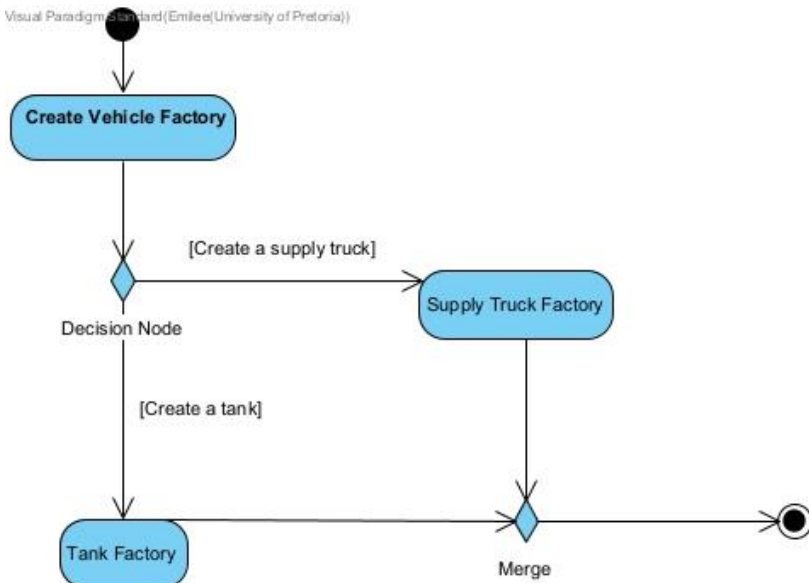


## Activity diagrams - Iterator

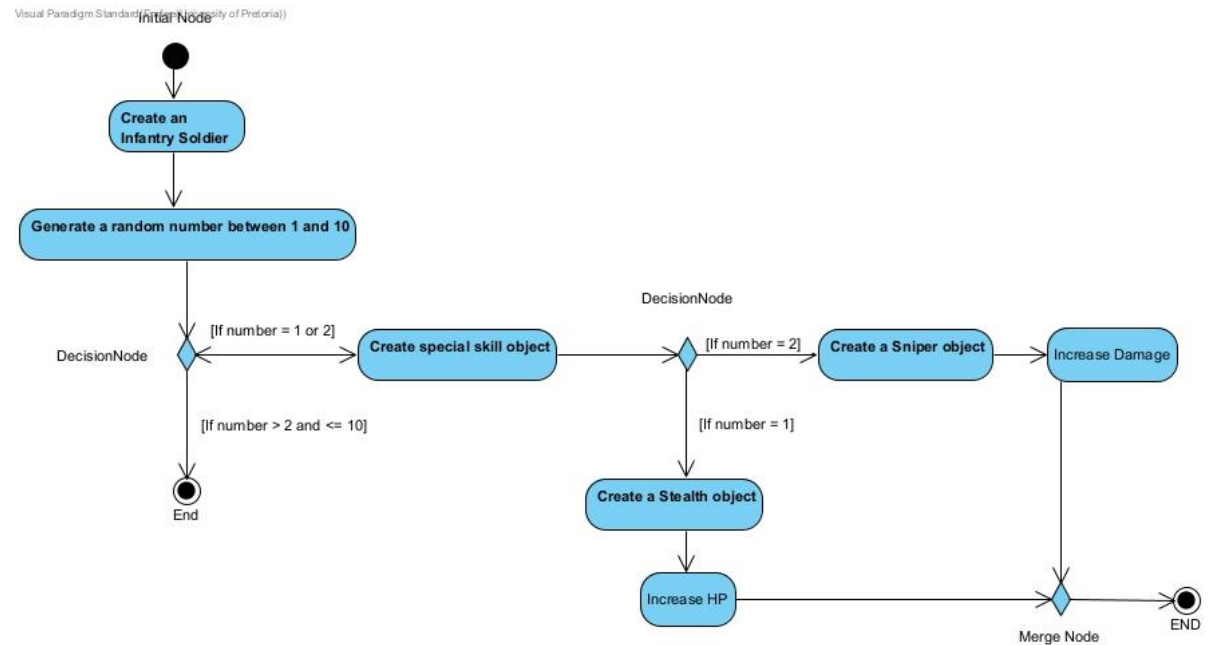


## Activity diagrams – Factory, Abstract Factory and Decorator

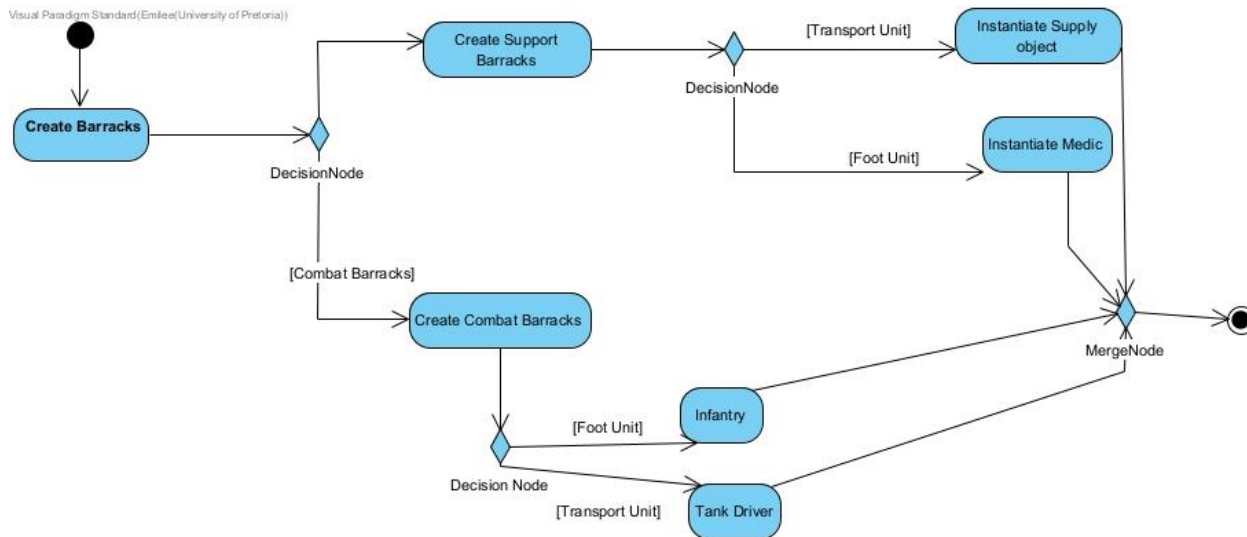
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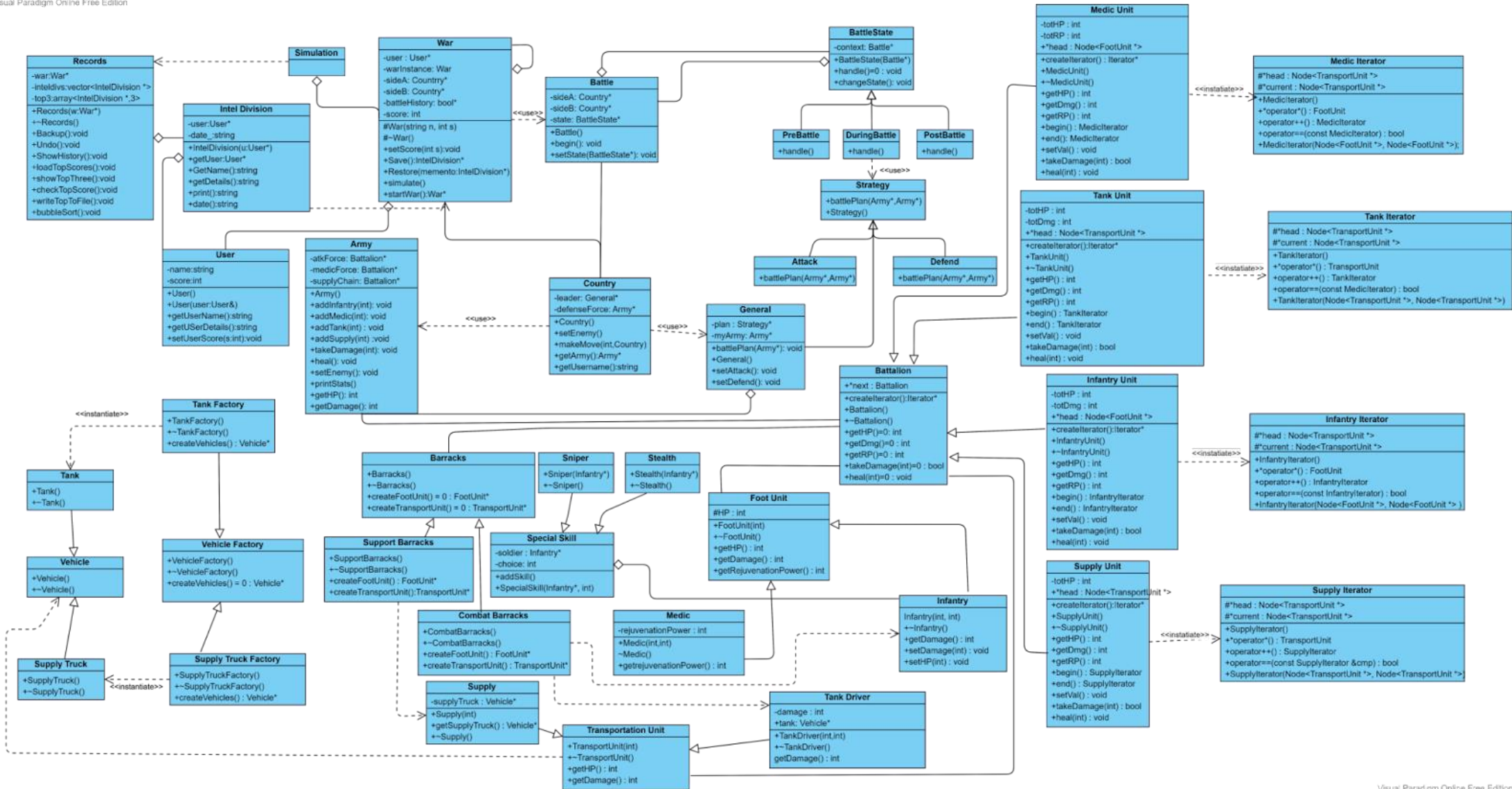
Visual Paradigm Standard (Emile University of Pretoria)



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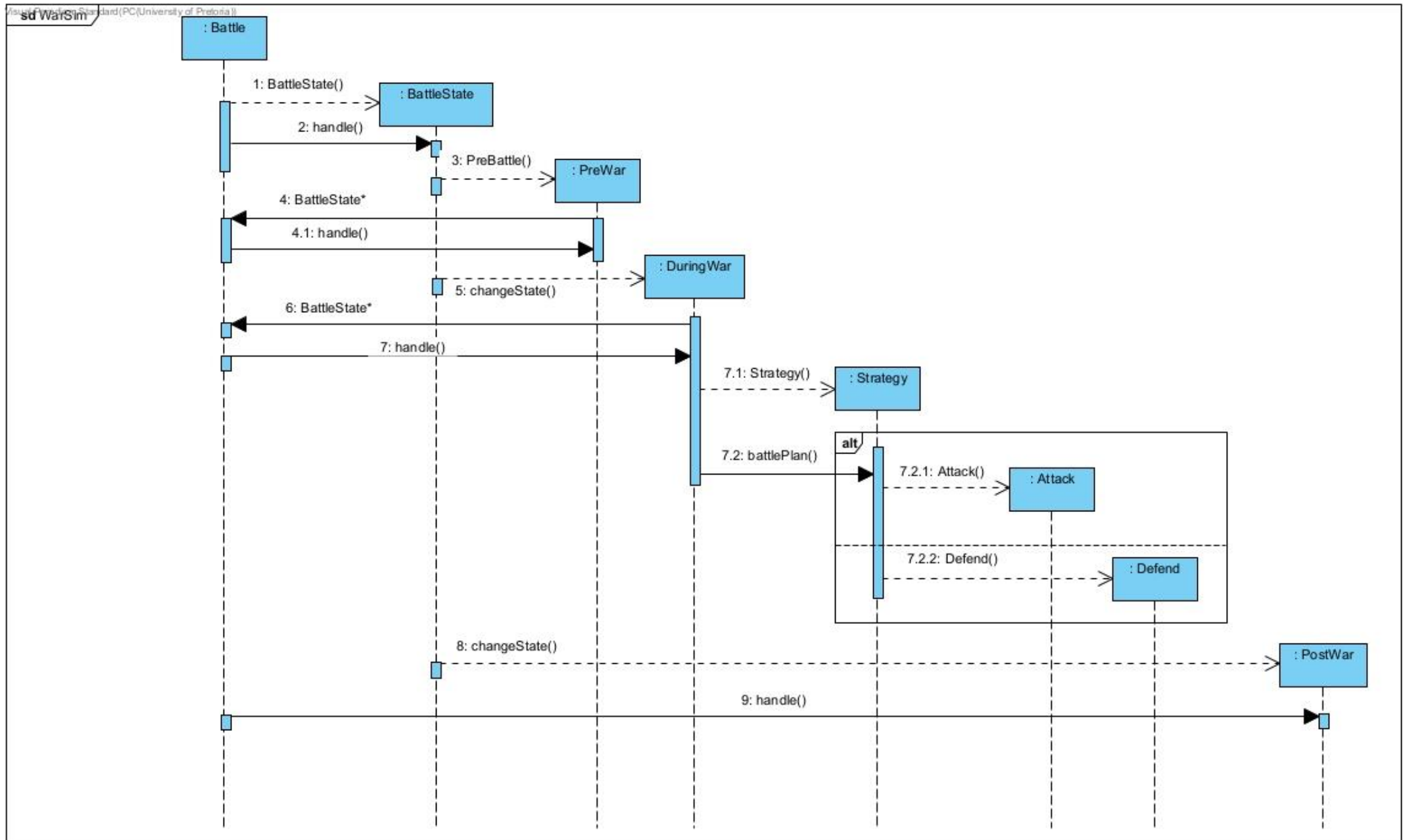


## Visual Paradigm Online Free Edition



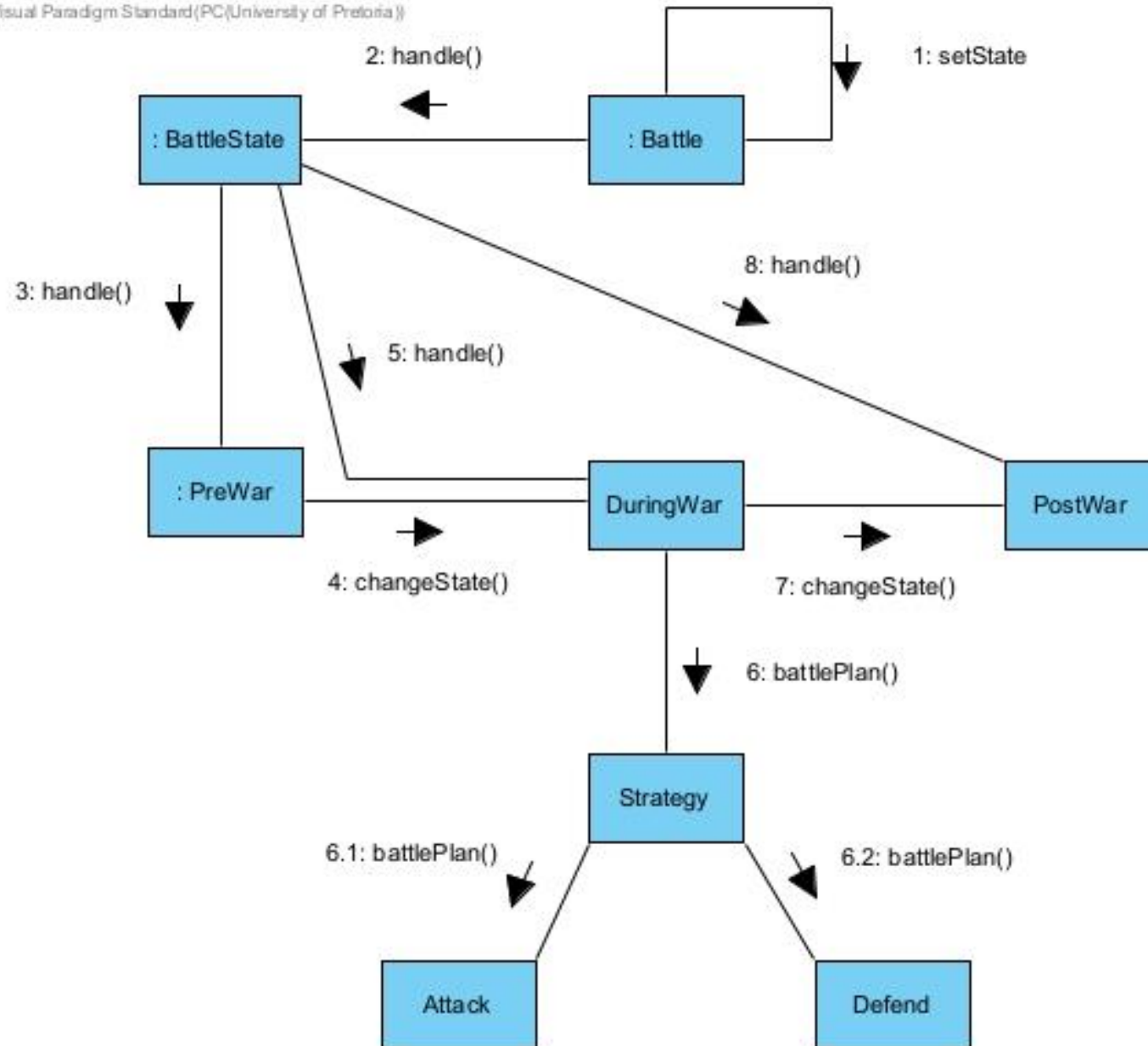


## Sequence and communication diagrams – State and Strategy

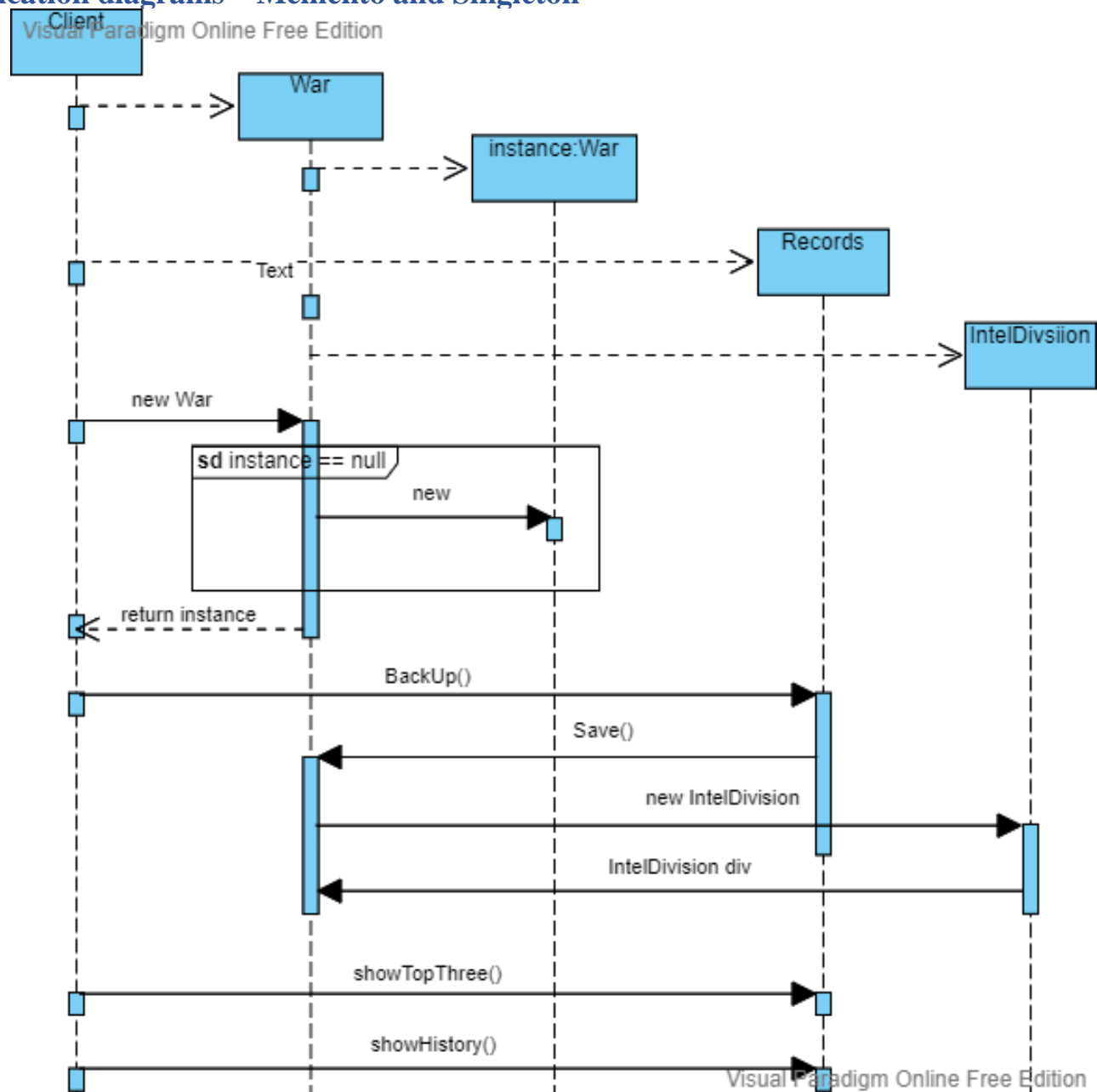


## Sequence and communication diagrams – State and Strategy

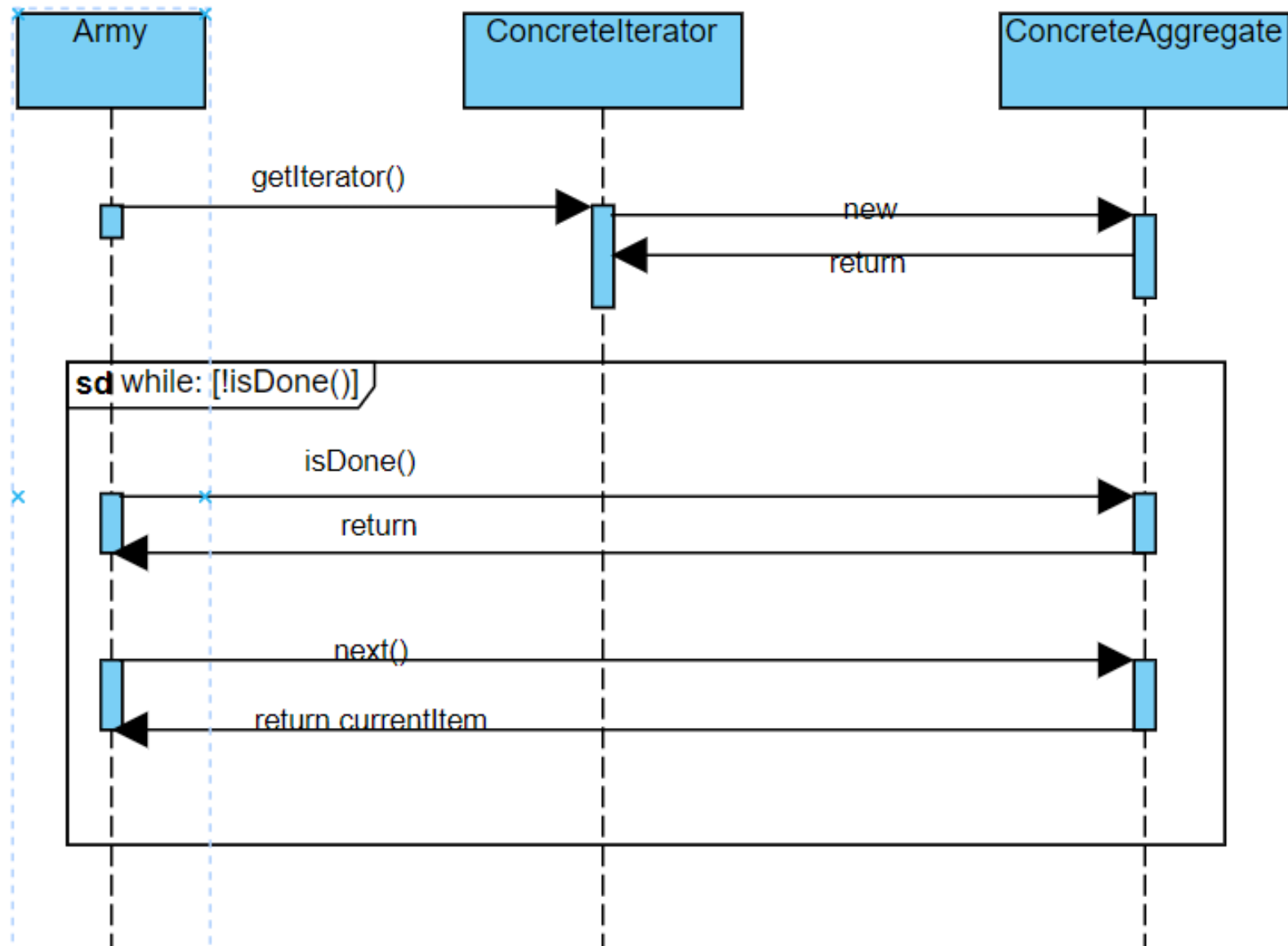
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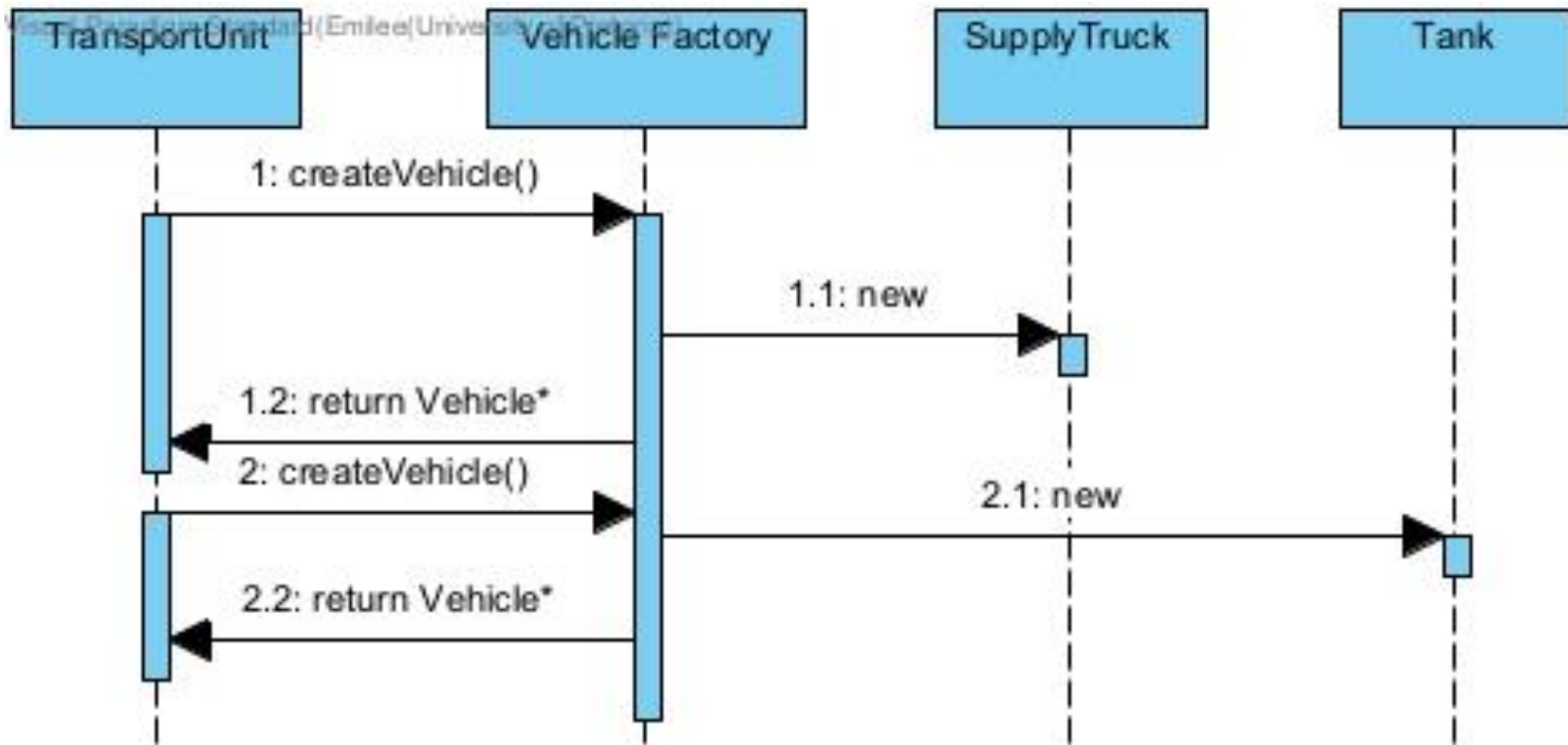
## Sequence and communication diagrams – Memento and Singleton



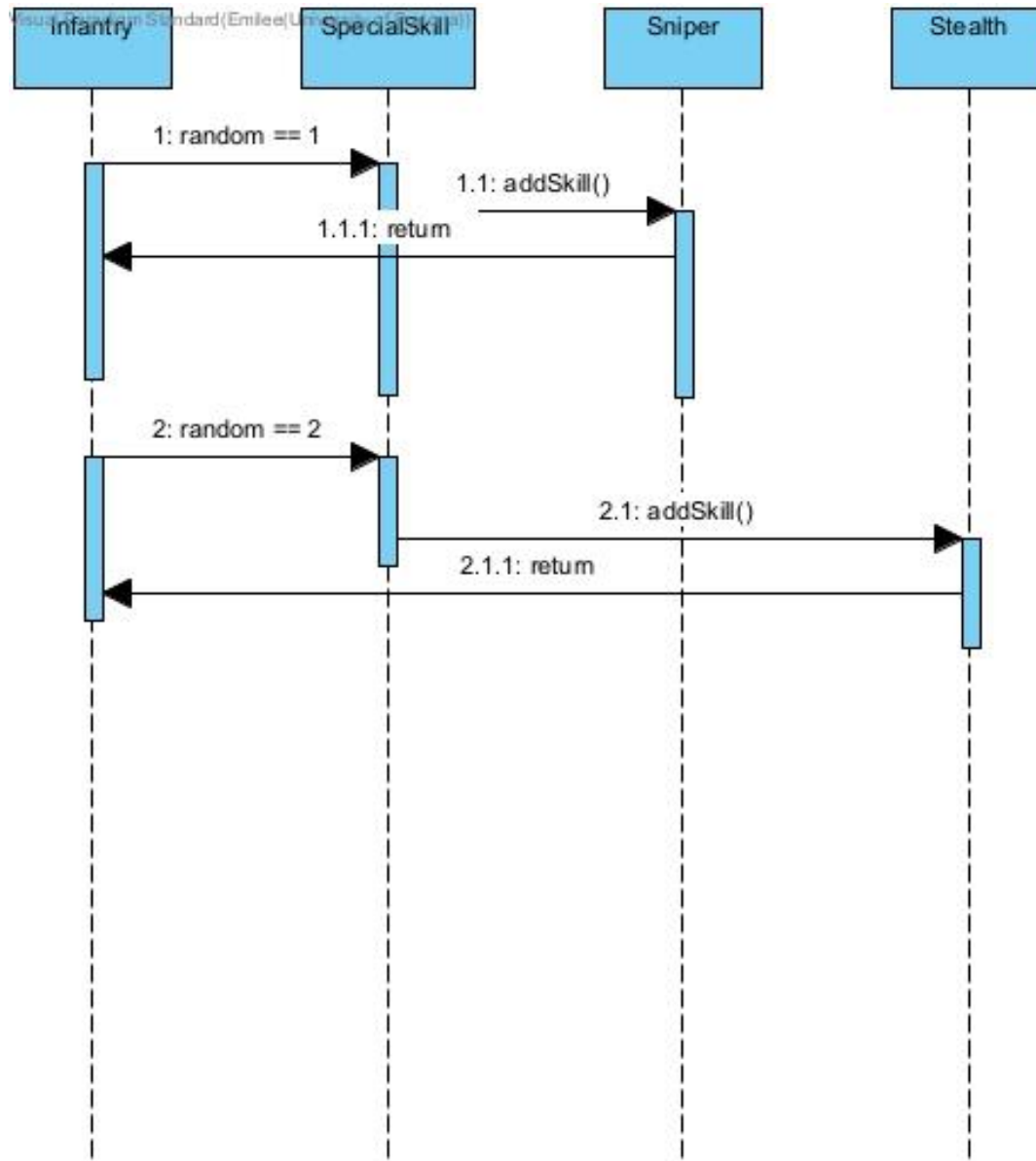
## Sequence and communication diagrams – Iterator



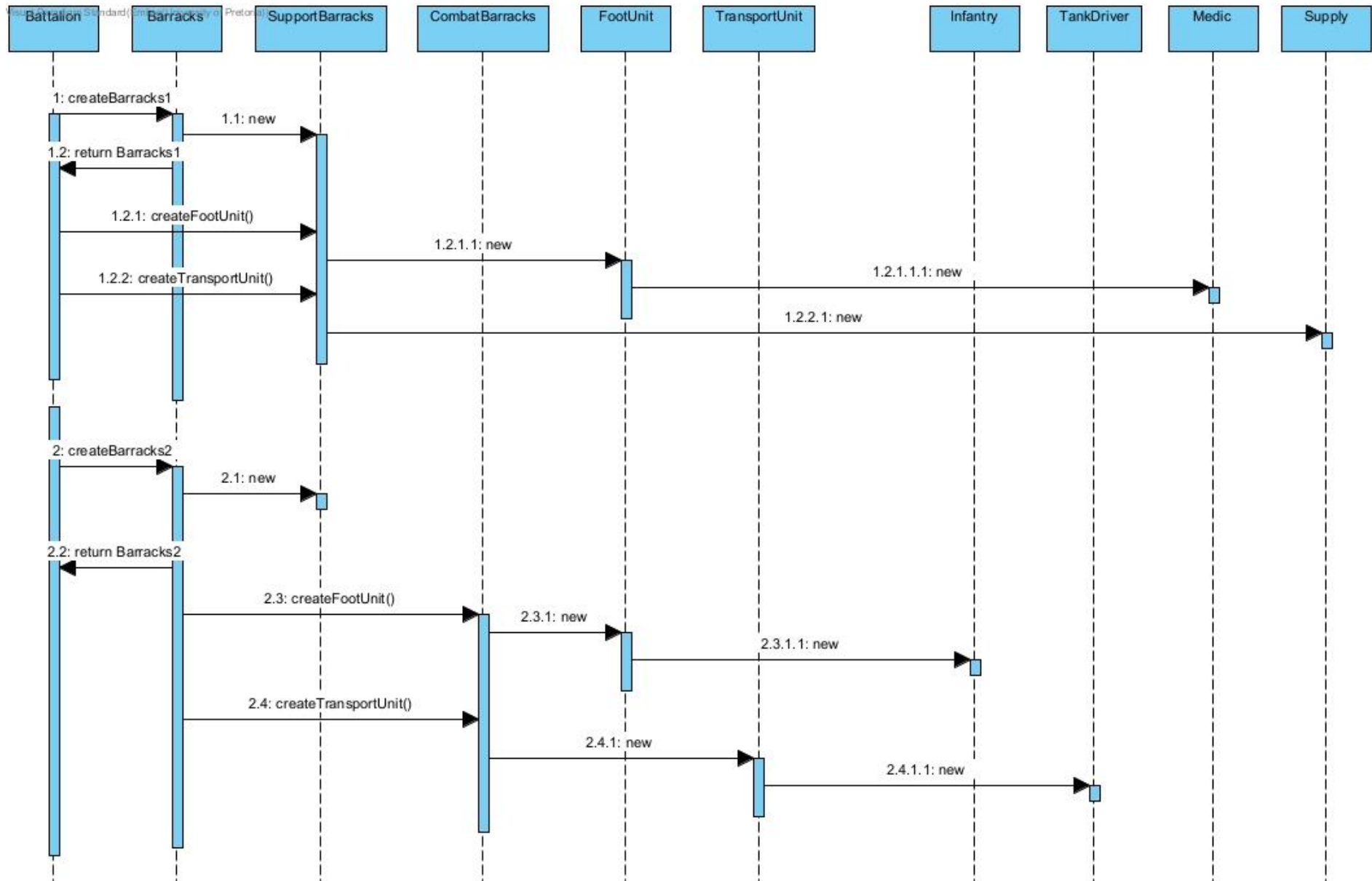
## Sequence and communication diagrams – Factory



## Sequence and communication diagrams – Decorator

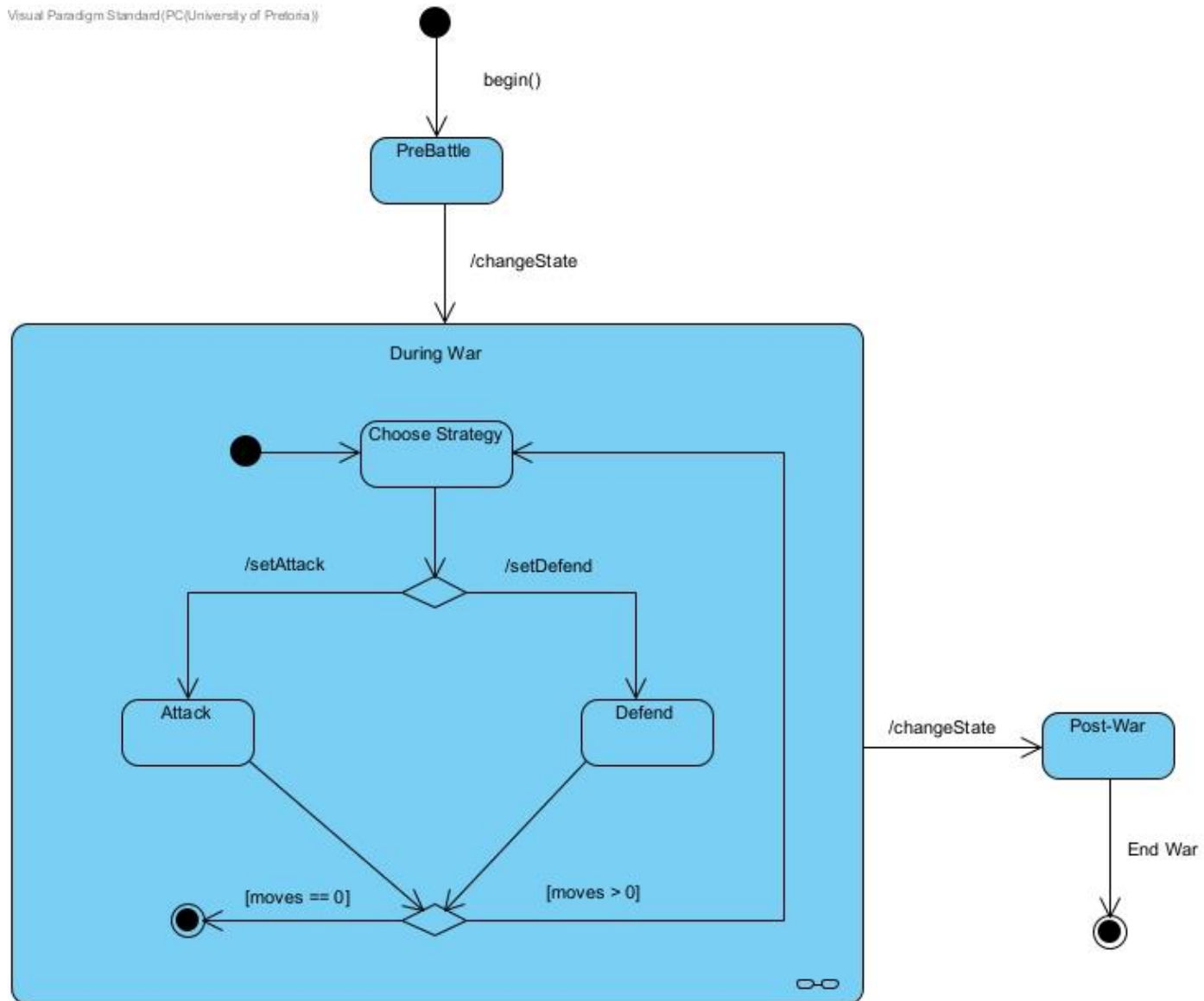


## Sequence and communication diagrams – Abstract Factory



## State diagrams – State and Strategy

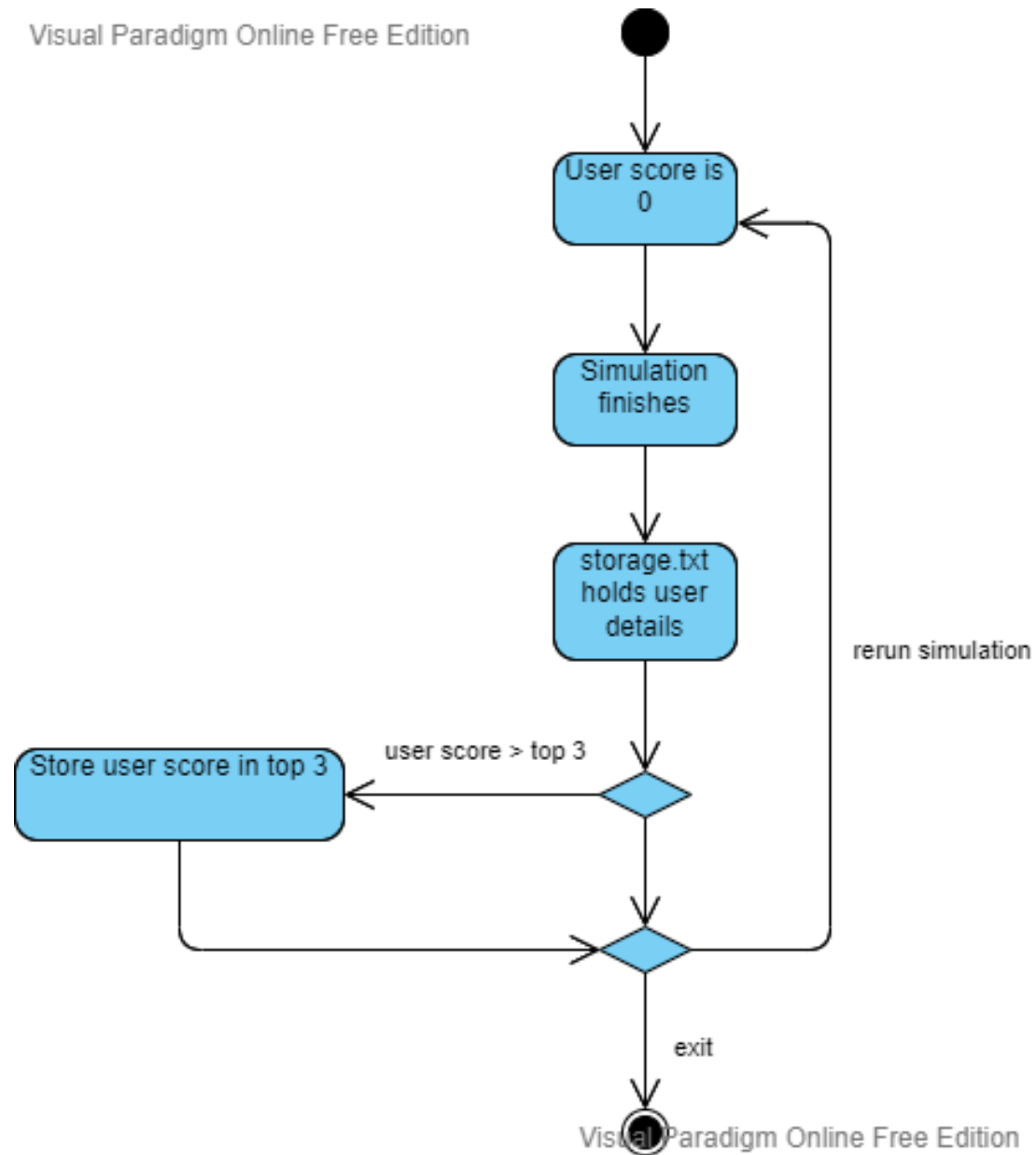
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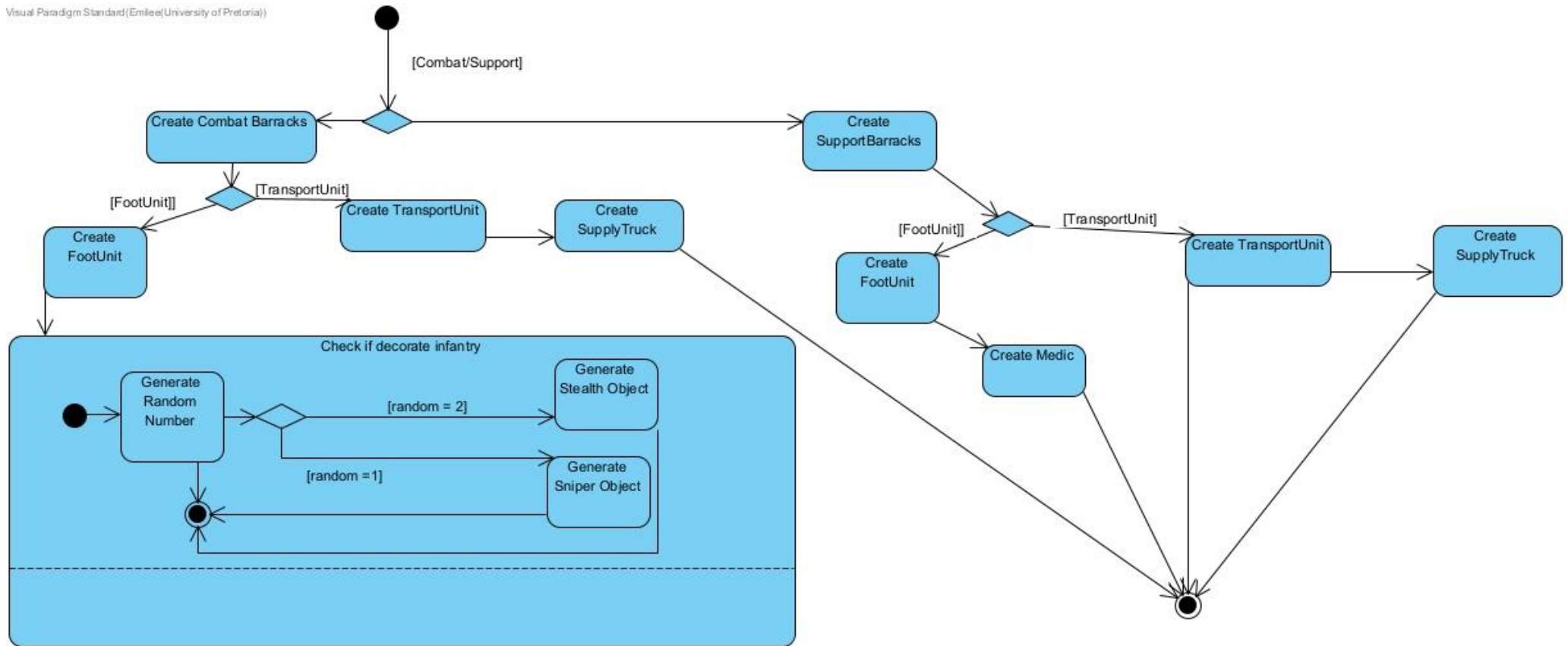
## State diagrams – Memento and Singleton

Visual Paradigm Online Free Edition



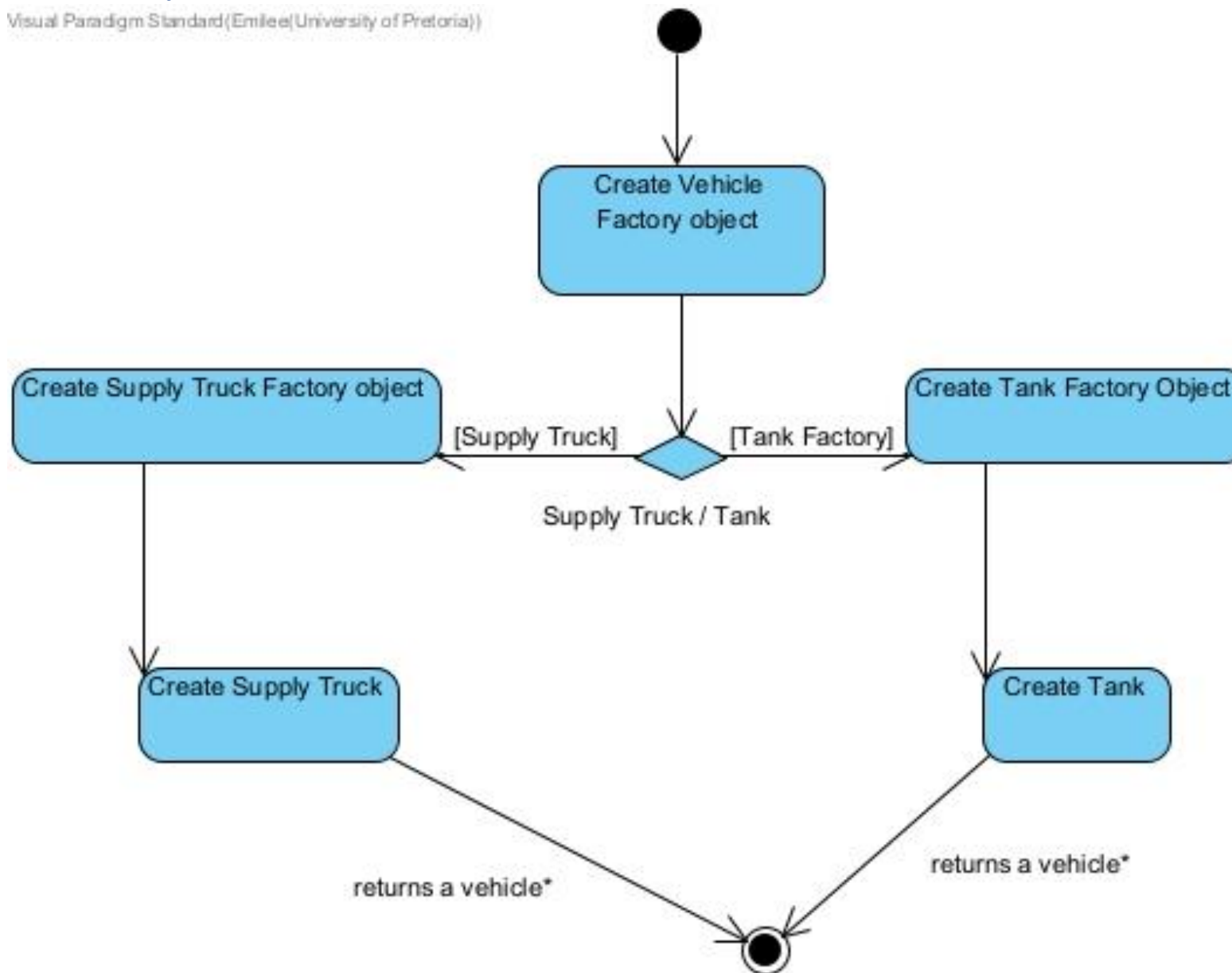
## State diagrams – Decorator and Abstract Factory

Visual Paradigm Standard (Emileef/University of Pretoria)

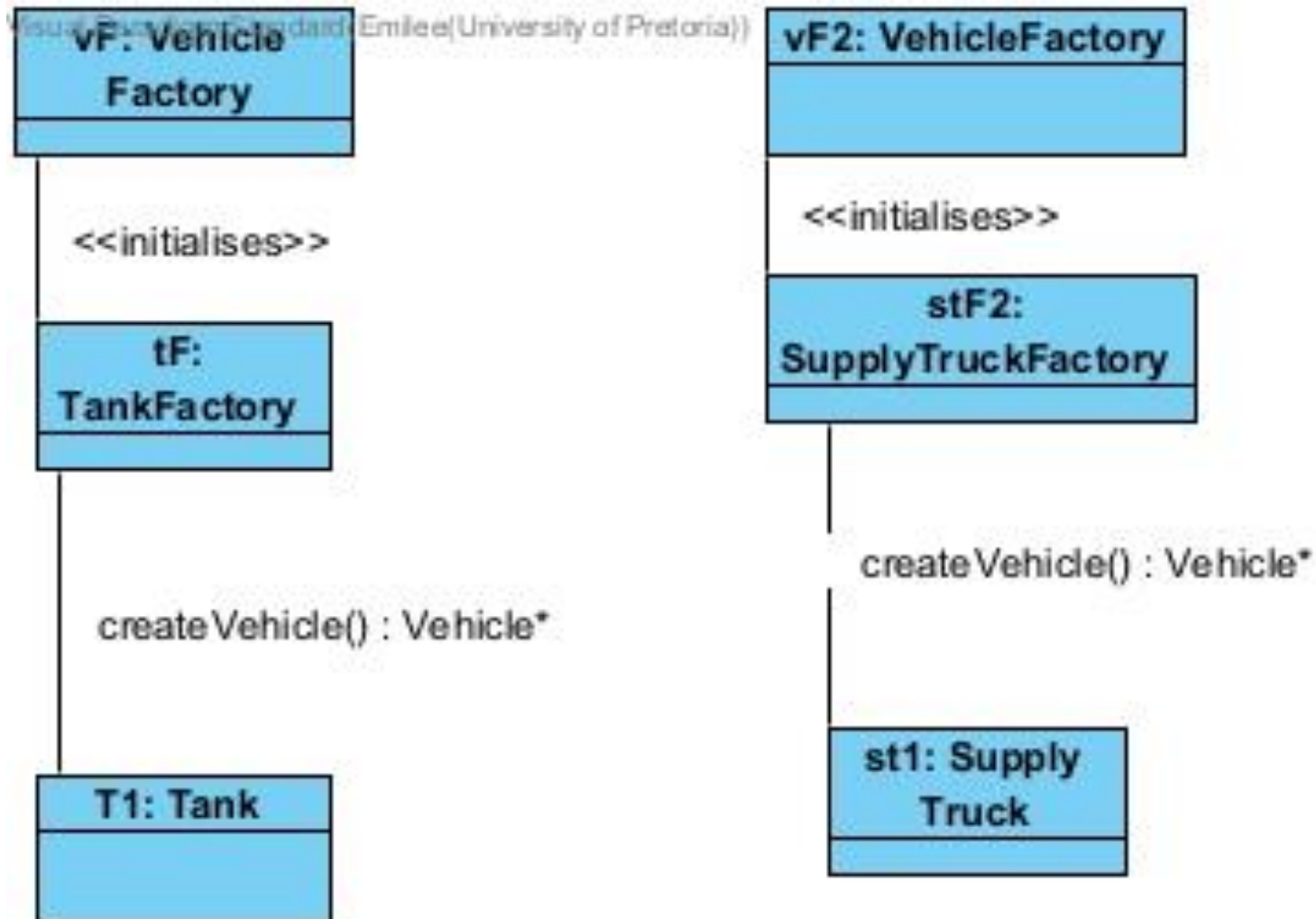


## State diagrams – Factory

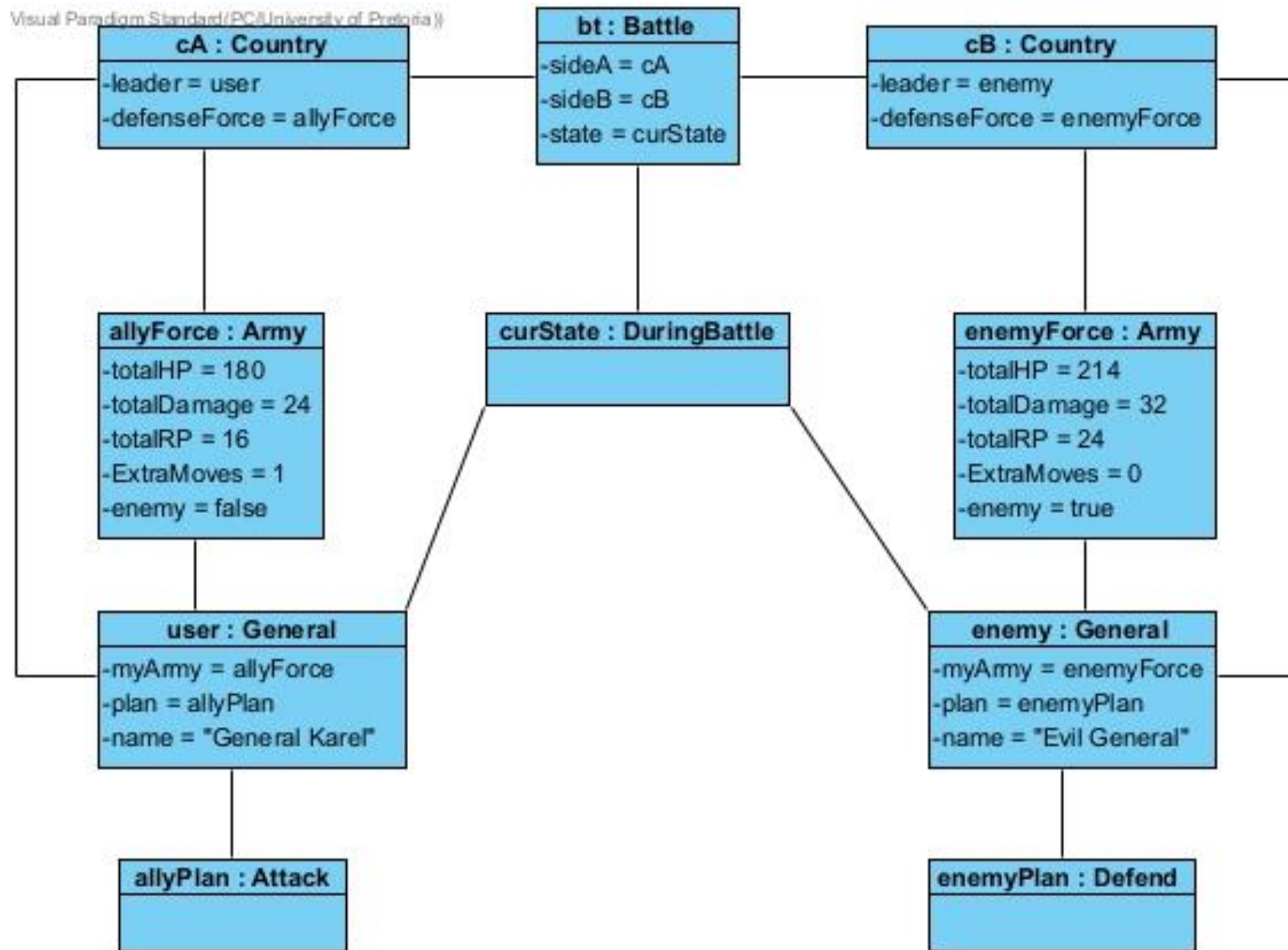
Visual Paradigm Standard (Emilee University of Pretoria)



## Object diagrams – Factory



## Object diagrams – Strategy and State



## TASK 4

### What is War

A war is a violent conflict between two groups of people, most commonly between states and nations. War often begins due to a dispute between two parties, government, countries, societies or groups and the objective is to destroy the enemy's will and ability to fight. War has been around for thousands of years; Historians believe the first recorded War occurred in 2700 B.C. The most notable battles over the past century have been World War I and World War II, where countries formed alliances with one another to fight other alliances. Researchers from many different fields of study have analysed War. Some have done so mainly to understand why wars continue to be as prevalent as they are, others to explore strategies and successes, and others to determine wars' economic and human impact on societies.

### Why wars happen

People have been studying War and the factors driving it for decades. Rummel (1975) noted, "personality, society, and culture form a continuous whole that is more than the aggregation of these elements". Society and culture modify the dynamic field in which warfare occurs.

Individuals are driven by significant needs such as hunger, protectiveness, curiosity, security, and self-assertion (Rummel, 1975), which influence their social behaviour. Society and cultural norms are influenced by language, religion, ethics-law and status components such as wealth, power and prestige (Rummel, 1975), and in the right mix can make a society more likely to turn to warfare.

Nations and other groups are said to go to War with each other if the benefits of War outweigh the disadvantages. These often include economic, religious, or political reasons. (National Geographic Society, 2022)

### War Statistics

Denton (2003) has analysed warfare during the 19th and 20th centuries and recorded the frequency of wars in particular areas, who initiated the War, the relative power of the parties at War, the success of the War etc. Some notable results from this work are that those who initiated warfare were more

likely to fail than those who were attacked. When Western nations started the War, they had a success rate of 52%, but when Western countries were attacked, they won almost 80% of the time. When non-Western groups initiated warfare, they had about a 20% chance of winning but a 50% chance of winning when attacked. The low success rate of the attacker, even when considering the relative power of the parties involved, was noted to be more profound in the 20th century than in the 19th century. Denton (2003) proposed that this variation can be "related to holding the moral high ground.". This illustrates that it is not necessarily the strongest and mightiest power that wins the War.

Denton (2003) comments, "Some 600,000 died in the 1860s, 8 million or more died after August 1914, upwards of 40 million were butchered in World War II, and in Vietnam, after American intervention, some unknown millions perished. In each case, the party that decided to fire the first shot did not achieve its aims in undertaking the War. Millions died in the failed efforts."

### War Strategies

Historians have studied warfare strategies at great length, and children have learnt about the likes of well-known great war strategists such as Napoleon, Hitler, Alexander the Great, and Genghis Khan. (Regenesys Business School, 2021). Napoleon understood every aspect of the battlefield, such as artillery, cavalry and infantry placement to attack the enemy forces and when and how the army should move (Tutorialspoint, 2019).

A War strategy is a plan made for a country to try and win the War. There are two main strategies for fighting a war: defence and offence. In a defensive technique, the country will devise a plan to defend the attacking country's attempts to win the War. An attacking strategy is when the country tries to do anything to get an advantage over the other country.

This interest in strategy has resulted in online and board strategy games.

### War entities and phases of War

War can take place on land, sea or air and depending on the scale of the War, more than one mode of warfare can be used. For this research, warfare will be limited to land battlefields.



A lot of thought, planning, training and resources go into preparing powerful armies. Women and men are trained to become medics, infantrymen, snipers or operators of war vehicles such as supply trucks and tanks to serve in an army. Individuals are trained to lead subordinates or develop strategies to deal with the logistics of War such as getting sufficient resources to the right place at the right time. These resources include medics, mechanics, men and women, vehicles as well as ammunition.



*Figure 1: 47th Armored Medical Battalion of World War 2*

In general terms, an army is a large, organised group of people who are trained to fight on land in a war. An army consists of several battalions and a battalion consists of several companies or units (three or more), such as an infantry battalion. A battalion is the smallest military unit capable of "limited independent operations" (Wikipedia, 2022)



*Figure 2: Infantry of World War 1*

Infantries are soldiers who fight on foot rather than in tanks or horses. A tank is a large military vehicle that is equipped with weapons and moves along on metal tracks that are fitted over the wheels. (Collins Dictionary, 2022)



*Figure 3: A tank in a battlefield*

Supply units manage the logistics of providing resources to the battalions and Medics provided the necessary medical care that may be needed. Incidentally from August to November 1944, 23000 American truck drivers and cargo loaders moved more than 400,000 tons of ammunition, gasoline (see Figure 4), medical supplies and rations to battlefronts in France, Belgium and Germany. Some believe that "logistics shape what is possible on the fields of battle." (Delmont, 2022)



*Figure 4: Filling of Gasoline tanks in World War 2*

Strategists, usually highly ranked army individuals, determine how best to use these entities. These efforts result in several phases of War, where a phase is marked by the attempt to achieve some goal. Not all phases include combat as there is preparation that needs to be done such as intelligence gathering, assembly, logistics and operations management. Then during the actual exploitation phase there could be offensive and defensive phases, or even a lull in combat, which is usually unplanned. One of the more notably lull's in combats was the Christmas truce of the first world war when many unofficial ceasefires occurred along the western front as soldiers from UK, France, Austria-Hungary, Germany and Russia put

down their arms five months after the hostilities had begun, even if just for a day. (Ray, 2018) A sustained fight between large organised armed forces is known as a battle and is usually well defined in duration, area and force commitment. (Wikipedia, 2022) A war usually consists of many battles e.g. the famous Battle of Dunkirk and the Battle of Monte Cassino are just two of the many battles of World War 2.

## War Simulation

The World of War Simulation will try to mirror some key aspects of wars. There will be two opposing parties who will fight a war against each other. The one party will be controlled by the simulation user (who plays the role of a War strategist) and the other party controlled by "Evil General" (the computer) who randomly makes decisions. The first task is to select an army configuration from 5 possible army configurations. Each combination offers a different mix of 6 battalions where each battalion can either be a Tank, Infantry, Medic, or Supply Battalion. Tank and Infantry Battalions have both damage (DP) and health (HP) points associated with them. Medic Battalions have rejuvenation power (RP) and a Supply Battalion increases an army's HP and grants the army an extra move in a battle.

Once the opponents have selected their army configurations, they will take turns attacking or defending their opponent's attacks. When an opponent attacks another opponent, the total damage points (DP) from all the attacker's available tanks and infantry units will issue damage against the opposing players' total health points (HP).

When an opponent defends the opposing party, the medics' total rejuvenation power (RP) will be added to the opponent's total HP to restore it after the damage has occurred. Medics cannot rejuvenate a dead tank or infantry unit. Once a tank or soldier is dead, their HP is completely lost. Nor can a medic heal a fully healed army.

Each War will consist of three battles in which each party can attack or defend five times. This mimics the different phases of a battle. An additional move is granted to a party for every supply unit in their army's configuration. The opponent with the highest HP at the end of the battle wins the battle.

During the phase of the players choosing to defend or attack, no limitation is put on the strategy

allowed, i.e. if a player wishes to try to attack with no attack units, The simulation will not restrict this. In the words of Napoleon Bonaparte, "Never interrupt your opponent when he is making a mistake."



## Bibliography

Chy, R. K. (2021, June 3). Essay on War | War.

Collins Dictionary. (2022). *tank*. Retrieved from Collins:

<https://www.collinsdictionary.com/us/dictionary/english/tank>

CrashCourse (Director). (2014). *War & Human Nature: Crash Course World History 204* [Motion Picture].

Delmont, M. (2022, April 7). *The forgotten story of Black soldiers and the Red Ball Express during World War II*.

Retrieved from The Conversation: <https://theconversation.com/the-forgotten-story-of-black-soldiers-and-the-red-ball-express-during-world-war-ii-179743>

Denton, F. (2003). *Knowing the roots of war: analyses and interpretations of six centuries of warfare*. Retrieved from

War Roots: <https://www.hawaii.edu/powerkills/WAR.ROOTS.HTML>

Illustration of a Surgical Truck and Tent, as introduced by the 47th Armored Medical Battalion. (1943). Tunisia .

Marks, M. G. (2017, January 01). *Leadership and the Principles Of War Applied To Business: Two Sides Of The Same*

*Coin*. Retrieved from Thayer Leadership: <https://www.thayerleadership.com/blog/2017/leadership-and-the-principles-of-war-applied-to-business#:~:text=1.,defined%2C%20decisive%20and%20attainable%20end>.

National Geographic Society. (2022, May 20). *War*. Retrieved from National Geographic - Learn with us:

<https://education.nationalgeographic.org/resource/war>

Ogorkiewicz, R. M. (2022, September 15). *tank*. Retrieved from Britannica:

<https://www.britannica.com/technology/tank-military-vehicle>

Ray, M. (2018, September 17). *Christmas Truce: Additional Information*. Retrieved from Britannica:

<https://www.britannica.com/event/The-Christmas-Truce>

Regenesys Business School. (2021, August 3). *10 Great Strategists*. Retrieved from Regenesys:

<https://www.regenesys.net/reginsights/10-great-strategists/>

Rummel, R. (1975). *Understanding Conflict and War Volume 1: The Dynamic Psychological Field*. John Wiley & Sons.

Tutorialspoint. (2019, July 30). *Why is Napoleon Bonaparte called a Great War strategist?* Retrieved from

Tutorialspoint: <https://www.tutorialspoint.com/why-is-napoleon-bonaparte-called-a-great-war-strategist#:~:text=Napoleon%20was%20both%20a%20great,move%20forward%20and%20how%20etc>

Wikipedia. (2022, August 29). *Battalion*. Retrieved from Wikipedia: <https://en.wikipedia.org/wiki/Battalion>

Wikipedia. (2022, October 30). *Battle*. Retrieved from Wikipedia: <https://en.wikipedia.org/wiki/Battle>

WorldWar1. (1918, September 10). The 1st Division Assembles at Gondrecourt. Washington DC.