



## Project ENORM

Exploring opportunities for creating unique experiences using a finite item economy

*Master of Science Thesis in Applied IT*

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Cover:

*A staged screenshot from the final prototype of Project ENORM*

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Göteborg, Sweden 2013

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## Summary

This thesis explores the possibilities for creating unique experiences when designing a multiplayer online battle arena game, using a finite item economy. To accomplish this the team researched games implementing concepts connected to finite economies, meaning there are only a fixed amount of resources. The concepts identified as important were: unique resources, there exists only one of a specific type of resource; forced resource dropping, players are forced to lose resources on specific conditions; power scaling, characters and resources get more important as the game progress. A concept implementing these mechanics was created from the research, and from this concept a prototype was developed iteratively using agile methods. The prototype was tested through four larger tests, from which feedback the prototype was refined. The thesis covers the entire development process through a detailed week to week report on the projects progress, from the start of creating the concept to a detailed listing of the mechanics of the finished prototype. From the testing of the prototype and the study of relevant games guidelines are suggested that can be of assistance when developing games using mechanics connected to a finite economy.

## Keywords

Game design, Game economy, Guidelines.

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## Acknowledgements

We would like thank our tutor, Staffan Björk, for his support and for leading us in the right direction, his knowledge has helped us tremendously during our work. We would also like give our thanks to the people who helped us test our game, as well as everyone that helped us make this thesis better.

This thesis is dedicated to gamers and developers alike, we hope that we have allowed gaming to take a tiny step forward.

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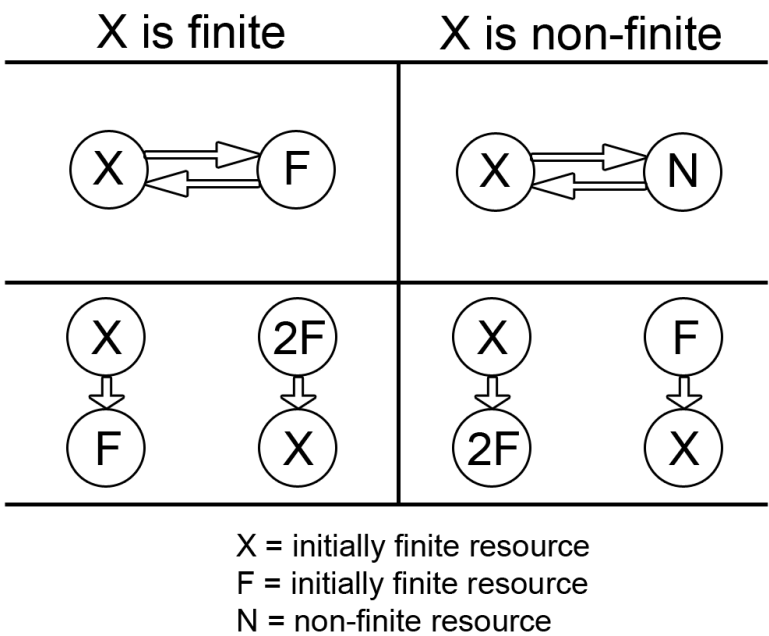
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# Terminology

Following is a list of important terminology, with short descriptions, which will be used throughout the thesis.

## *Finite and Non-finite Resources*

Through this thesis resource will be used for anything which a player can utilize in a game, this can for example be gold, cards, buildings, tokens or items. If a game only allows a finite number of a resource type to exist over the entire duration of the game that resource economy is finite. This allows for resources to be destroyed during the game session but not be added. Transforming, trading or crafting resources is allowed under this definition, and the resource economy will remain finite if all resources which can be transformed to the new resource also are finite. If an infinite number of resources can be created through transformation the resource economy is not finite.



**Figure A** *Examples of finite and non-finite resources.*

## *Real-Time Strategy*

Real-Time Strategy (RTS) games is a game genre built around controlling units in real-time in order to typically defeat an opponent's units. The real-time aspect, compared to turn-based strategy games, is important in the aspect that it leaves the player with a limited time to plan and react to the opponent's tactics.

## *First-Person Shooter*

First-Person Shooters (FPS) is a game genre where the game is shown in first-person perspective, with the gameplay built around using weapons which are fired forward from the players perspective.

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### ***Role-Playing Game***

In a Role-Playing Game (RPG) the player typically takes on the role of a character or a group of characters where the game revolves around character development and choices. The game takes place in a world where the decisions of the player plays a central role.

### ***Massively Multiplayer Online Game***

Massively Multiplayer Online (MMO) games are built around having a large amount of players who are able to interact with each other in an online game world.

### ***Massively Multiplayer Online Role-Playing Game***

A Massively Multiplayer Online Role-Playing Game (MMORPG) is a type of MMO. The games are typically built around controlling a character in the world and developing the character similarly to an RPG.

### ***Multiplayer Online Battle Arena***

Multiplayer Online Battle Arena (MOBA) is a game genre typically describing games heavily influenced by the player created Starcraft map Aeon of Strife and the more popular player created Warcraft III map Defense of the Ancients (DotA). The classical MOBA games derived from RTS games, but the genre MOBA includes games such as Bloodline Champions, which could be said having more in common with classic FPS games rather than RTS games.

### ***Ability***

In MOBA games an ability typically is something a player, or item, can use if certain conditions are met. A player ability is typically unlocked when the player's character obtained enough experience in the game. Another common way of obtaining abilities is through equipping items, which can be activated to cast an ability. Generally there is a cooldown time before an ability can be used again.

### ***Map***

A specific game world, in a multiplayer arena game, is typically referred to as a map.

### ***Mini-Map***

A mini-map is used in games to give a quick overview of the game world. The mini-map is typically a small version of the map being played, showing graphical representations of important elements in the game.

### ***Hoarding***

Through this thesis the term will be used to describe when a player collect excessive amount of resources.

### ***Non-Player Character***

The term Non-Player Character (NPC) is often used in RPGs and multiplayer games to describe a character which is not controlled by a player. An NPC typically follow a set of rules for its behavior in the game, or is controlled by a gamemaster.

# 1 Introduction

The video game industry has come a long way since Pacman and Space Invaders. Today there exists an almost innumerable amount of video games and more are getting developed each day. It is a billion dollar media industry that has surpassed the music industry (PricewaterhouseCoopers, 2013). As the video game industry starts to mature it begins to tackle more and more difficult topics regarding the experiences players have in the games. One of these topics is to understand how one can make players feel special (Dreyfus, 2010). Many video games help the player to project themselves unto the main protagonist in order to become the protagonist him or herself. Some people might want to pilot their own spaceship as a captain, others might want to be a powerful wizard wielding great arcane powers, and some might want to be a soldier fighting for his or her country. This projection works fairly well when it is in single-player games, but what happens when there are hundreds of thousands of wizards in a fantasy land, all trying to save the world using the same skills and abilities as the player? In many cases the feeling of the players uniqueness disappears and the player is yet once again like everybody else, doing the same thing as everybody else in the same way as everyone else.

One genre that has to battle this problem on regular basis is the Massively Multiplayer Online (MMO) video games. These video games can be played by hundred thousands of player in a single world (Realm Pop, 2013), where it is possible having several hundreds of players interacting with each other at the same location in the world (Wowhead, 2008). To give an example of the problem, in the endgame of the Massively Multiplayer Online Role-Playing Game (MMORPG) World of Warcraft players that have reached a certain level can participate in events called raids. The raid consist of a group of players that try to fight very tough and often difficult monsters. The reward of defeating these monster consists of certain amount of items which can be distributed in the group. Items that was acquired from the latest raid is always better than the previous raid. New raids are added in intervals ranging from several months to half a year. The items are, compared to the number of players, very few and offers almost no variation or choice. For a dagger wielding rogue there will never be much of a choice what to equip, as the dagger from the latest raid will always be the best option. This means that most people of the same class participating in these raids will all carry the same items after a certain amount of time.

The genre of Multiplayer Online Battle Arena (MOBA) games tend to have the same problems as MMORPGs. A classical MOBA game can be seen as a classical MMORPG game, but in much smaller scope. Since 2005, in World of Warcraft, players can even play in a specifically limited gameplay area, called Alterac Valley, which is very similar to a classical MOBA game. The key element to both MMORPGs and MOBAs is character development, through abilities and attributes, in a multiplayer world supporting interaction and teamwork between players. Character development can be seen as less meaningful if everyone turn out the same in the end anyway, the focus might be about staying ahead in the race instead of making choices on how the player's character will develop.

The classical MOBA allows players to pick a hero and during a game that hero will grow in strength and unlock more abilities. However, the heroes in classical MOBAs can only unlock a set of abilities in the same way as the characters of different classes in MMORPGs tend to have the same abilities available to unlock. The abilities in classical MOBAs are specifically tailored for the different heroes, the number of abilities for each hero are few and often designed to be used in a combo. There is not much room for variation in playstyle if the player want to be considered a good player. In the end most players play the same way since they will have the same abilities independent of who controls the hero, and in most cases there exist an optimal way to play that hero.

### 1.1 Purpose

The previous example of the player uniqueness problem is only one of many versions of the same problem: everyone is the same as everyone else. The purpose of this thesis is to explore the following question:

**What opportunities exist for creating unique experiences, in a multiplayer online battle arena game, by having a finite item economy?**

The rationale behind this question is that by limiting the number of items that exists in play, a world can be created where nobody can be the same item-wise. While it is assumed that this approach carries many benefits, it is also assumed that it carries many drawbacks that needs to be addressed.

The approach to explore this question was to develop a prototype MOBA game where such an item economy is implemented, in order to see if it is possible for a finite item economy to create uniqueness for players and to explore the problem more in detail. The intention with this was to help develop the concept and make sure the work on the design was not restricted in any way. It was also intended to help the team understand how the economy influence how the game is played. To help the development of the prototype the team planned to look at existing MOBA games and other multiplayer games with relevant concepts.

This thesis primary will help developers that need to tackle the player uniqueness topic. The thesis will also contain a detailed project process report regarding important project decisions, possible benefits, drawbacks and test results from player testing. The result chapter will list the important choices of for the concept as well as the prototype and how it compared to the concept. The thesis is wrapped up with proposed guidelines for developing certain features that has inherent problems such as finite economies

### 1.2 Limitations

Since a video game consists of several game mechanics, visual and auditory impressions, it is very difficult, if not impossible, to determine whether or not a specific mechanic, graphic or sound is responsible for a specific feeling the player is feeling. This is because that in many cases these impressions also influences and enhances the experience of other impressions. This makes pinpointing the cause of a players feelings almost impossible without very time-consuming user tests.

This thesis will not give a simple yes or no answer whether Project ENORM, as the prototype is called, succeed in making players feel more unique. This is due to the difficulty of obtaining accurate empirical data regarding whether or not the players feel more unique because of a single choice made. This thesis will give an indication whether or not the concept could have succeeded in making players feel unique.

Since this thesis main focus is to explore the design possibilities when creating a MOBA game, with a finite item economy, there will not be enough time to accurately gather enough empirical data regarding the resulting guidelines. The guidelines will be heavily influenced by the limited testing that was performed on the prototype, games that was researched in order to create the prototype, the discoveries and discussions that were had during the development.

## 2 Background

There exist many different types of item economies in video games, from infinite resource economies in World of Warcraft (WoWWiki, 2010) to finite resource economies such as seen in early versions of Ultima Online (Hunicke et al., 2004).

In a finite economy there exists only a certain amount of resources, and taking a resource denies that resource to the player's opponents. An example of a game containing a finite economy is the board game Monopoly (Darrow, 1984). In Monopoly there exists a fixed number of streets and when a player lands on a street, that has yet to be sold to a player, they can buy that street. A bought street will cause any opponent player that lands on that street to be forced to pay money to the owner. Buying a street will directly deny the player's opponent that street. Finite economies are easier to find in board games and turn based games where that mechanic play a central role, less so in for example First-Person Shooters (FPS) or the MMORPG genre.

In the four most popular MOBAs (Gaudiosi, 2012) (Icefrog, 2010) (Lahti, 2013): League of Legends (Riot Games Inc., 2013c), Defense of the Ancients (PlayDotA.com, 2013), Dota 2 (Valve Corporation, 2013), and Heroes of Newerth (S2 Games, 2013), the item and gold economy is infinite. The only limiting factor in those games is the number of items a player can buy, and all four games allows a player to carry a maximum of six items at any given moment. If enough time is given all players will be able to acquire the best items in the game. This generally means that there is not much strategic choices available when buying items, other than to counter the items bought by the player's opponents, and the capabilities of the opponents heroes. The largest value in items in the four most popular MOBA games is to acquire the items before the player's opponent.

### 2.1 Multiplayer Online Battle Arena / Action Real Time Strategy

In the early twenty-first century video games were expanding its horizons when players worldwide started to use subgenres in order to create very specific gaming experiences, among these is the MOBA genre. The name of the genre is still debated by players but the general consensus is to call the genre either MOBA or ARTS (Schiller, 2011), where ARTS stands for Action Real-Time Strategy. This thesis will use the term MOBA when discussing this particular subgenre.

The MOBA genre has grown so large that in 2012 the most popular MOBA game, League of Legends, surpassed World of Warcraft (Tryndamere, 2012), the previously largest multiplayer game in recent years, in amount of time played. Between the period July 2011 to June 2012 League of Legends logged 1,292,502,456 played hours in North America while the game in the second place, World of Warcraft, logged 622,378,909 hours on Xfire (Gaudiosi, 2012), a tool for social gaming which also track game statistics. This makes League of Legends the worlds most played multiplayer game in hours played per month, according to Xfire, and the most active multiplayer game, according to Riot Games. One could also compare the monthly numbers of players of League of Legends which is 32 million (Tryndamere, 2012) compared to that of World of Warcraft which is below 10 million (Stickney, 2013), as of fourth quarter 2012.



The MOBA subgenre is said to stem from a user-made map called Aeon of Strife (Machinima, 2012), in the popular Real-Time Strategy (RTS) game Starcraft (Blizzard Entertainment, 2013). In Aeon of Strife (see Figure 1) players picked one of several units with unique traits and fought along four lanes where waves of computer controlled enemies would spawn at the opposite end and attack the players base. If the players base was destroyed, all players lost that match, but if they destroyed the computer controlled base then all players won.



**Figure 1** A screenshot from the player created map Aeon of Strife in Starcraft.

There is no consensus what games are to be included in the MOBA genre, but the games which derive from Aeon of Strife and Defense of the Ancients are sometimes referred to as “classical MOBA”, while games which fit the descriptive definition “multiplayer online battle arena” are just referred to as “MOBA”.

Following are descriptions of the MOBA games which influenced the prototype. The classic MOBA games are written as one, as they have so much in common.

### 2.1.1 Classic MOBA

League of Legends, Heroes of Newerth, Defense of the Ancients and Dota 2 are all examples of so called classic MOBA games. They all have very similar functionality such as lanes (see Figure 2), heroes, upgradeable items, five versus five team play and bases.



**Figure 2** Maps from different classic MOBA games. From top left to bottom right you can see *League of Legends*, *Dota 2*, *Heroes of Newerth*, a MOBA map template and finally *Defense of the Ancients in Warcraft 3*.

The heroes in a classic MOBA use an experience and level system in order for the heroes to progress during the match. Each level the player is allowed to unlock or improve one of his three abilities, additionally one ability which can only be unlocked or improved every six level. Each player start the match with a certain amount of gold that they can spend in the shop to buy items which improves the power of the hero, and possible provide active or passive abilities. The players can gain gold by taking certain actions: killing an enemy non-player character (NPC), killing an enemy hero or destroy a building belonging to the opposing team. In classic MOBA games all players are periodically given a set amount gold. The objective for each match is to destroy the opposing teams central building which is responsible for spawning NPCs that will march towards the opponents central building via three lanes. At each lane there are several defensive buildings which has to be destroyed before the next building in the lane becomes vulnerable. Between the lanes are areas known as “the jungle”, these areas contain NPCs which players from both teams can fight.

### 2.1.2 Bloodline Champions

Bloodline Champions (Stunlock Studios, 2013) is a MOBA game where the player relies on using a wide range of abilities in a team and class oriented arena fight. the player chooses between four different classes: tank, melee, ranged, or healer. For each class there are several different champions the player can choose, each having nine unique abilities where three of the abilities require energy to be used. Energy is acquired by successfully utilizing the champions abilities, for example damaging an enemy or healing an ally. Additionally, the player can equip medallions to his or her champion, two which provides active abilities, which also uses energy, and one which provides a passive ability. The player also receive passive abilities through choosing traits for his or her champion. All champions always have the abilities to heal him- or herself and to resurrect dead ally champions. The standard game mode in Bloodline Champions is played three versus three players (see Figure 3) in one of several different maps, the map is picked randomly. Each game is divided into several rounds where the goal each

round is to defeat all opponents by using the range of abilities available. The first team to win a fixed number of rounds, usually three or five, is the declared the winner.



Figure 3 Screenshot from *Bloodline Champions*.

### 2.1.3 Warlock

Warlock (Warlock Brawl, 2013) is a player created map in Warcraft III where players fight each other in an arena, using various abilities. A game is played for several rounds, where each round is over when only one player is alive. The players are awarded gold and score for killing other players, between rounds the players can use the gold to unlock or upgrade new abilities or buy items to increase the attributes of their character. The rounds are fought on an island which shrinks during the round (see Figure 4), if the players are not standing on the island they will lose health continuously. The game relies much on pushing the opponent out of the island, the lower health a player has the further he will be pushed if struck by an ability.



Figure 4 Screenshot of the player created map *Warlock* played in *Warcraft III*.



## 2.2 Games With Relevant Concepts

In the pre-study the team considered games which incorporated concepts which fit the design. This was done partly because it was important to see how common the concepts were, and what effect they had on the games. This chapter will first describe the concept and then will start to list games which implements the concepts.

### 2.2.1 Finite Economy

If a game only allows a finite number of a resource type to exist over the an entire game session that resource economy is finite. This allows for resources to be destroyed during the game session but not be added. Transforming, trading or crafting resources is allowed under this definition, and the resource economy will remain finite if all resources which can be transformed to that resource also are finite. If an infinite number of resources can be created through transformation the resource economy is not finite. Finite economies can be used to create a situation where certain resources are more wanted than other and can cause players to compete for dominance over a resource.

#### 2.2.1.1 Real-Time Strategy Games

Many RTS games which have some sort of resource gathering tend to implement one or more of the resources as finite. This can be a means to discourage turtling, a strategy that emphasizes heavy defense in multiplayer games, and to encourage expanding the player's empire to control more resources. If matches drag on this also means that the resources at the starting location will be depleted forcing the player to relocate.



**Figure 5** Screenshots from top left to bottom right: gold mining in Warcraft III, mineral mining in Warcraft III, resource storage in Stronghold, stonehead praying in Populous III: The Beginning, mining and fishing in Settlers II.

- Gold in the Warcraft RTS series (Blizzard Entertainment, 2013) (see Figure 5)
- Minerals in Starcraft and Starcraft II (Blizzard Entertainment, 2013) (see Figure 5)
- Most resources in Stronghold (Firefly Studios, 2001) (see Figure 5)
- Wildmen and Stoneheads in Populous 3: The Beginning (Bullfrog Productions, 1998) (see Figure 5)
- Most mineral-based resources, such as iron and gold, in Settlers II (Blue Byte Software, 1996) (see Figure 5)

### 2.2.1.2 Dominion

In Dominion (Vaccarino, 2008), a card game, cards are bought to build a deck. The deck the player build will be used to buy more cards into his or her deck, to ultimately win the game. The player plays cards to get in-game currency to be able to buy more cards. The cards the player play are discarded and will be shuffled back into his or her deck once he or she need to draw cards and the deck is depleted. All resources in the game are cards which can be added to the players deck (see Figure 6). There exists only a set amount of each card type, once a card is bought by a player it can never return to the shop. A card can however be trashed, meaning it is completely removed from the game. The set of cards available sometimes mean that the player cannot directly affect another player, but the finite number of cards always let the players indirectly affect how other players play through depleting the cards available.



**Figure 6** A game of Dominion set up for two players.

### 2.2.1.3 Baldur's Gate II: Shadows of Amn

In Baldur's Gate II: Shadows of Amn (BioWare, 2000), a role-playing game (RPG), the world is mostly persistent. Enemies do not respawn once killed and stashes of items can only be found once. This means that the player can never stay in one area to farm money and items, but instead have to explore new areas to advance his or her characters. Because the game is designed and have very few random elements most items in the game are also unique. However, because there are a few random encounters in the game some resources are not finite. The player could potentially fight the enemies in the random encounters over and over for a very long time until they have enough money to buy everything in the game (see **Fel! Hittar inte referenskölla.**), even if the game is not designed to be played that way. Also, money alone in the game can only buy a limited amount of power, due to the fact that most of the powerful items cannot be found in shops.



**Figure 7** Screenshot from Baldur's Gate 2: Shadows of Amn where a player is shopping.

### 2.2.1.4 Ultima Online

In early versions of Ultima Online (Electronic Arts Inc., 2013) (see Figure 8), an MMORPG, the game implemented a finite economy (Simpson, 1999). There were a set amount of resources which could be transformed into other resources which would eventually be destroyed through wear and tear or decay. Only when the resources were destroyed would they be returned to the available pool of resources, meaning that the player could not get any wool if all wool was tied up in shirts. Because the game had too much problems with players hoarding resources the developers later implemented the more common MMORPG economy where resources flow into the game and are



drained through different mechanics such as degradation, decay, failed crafting, and trading with NPCs.



**Figure 8** Screenshot from *Ultima Online* where four players are fighting a dragon.

### 2.2.1.5 Monopoly

In Monopoly, a resource management board game, the deeds, houses and hotels the players can buy are limited. Houses and hotels can be recycled to the available resources if they are sold or if several houses are upgraded to a hotel. The deeds can never leave game, they are always either available for purchase, mortgaged or unmortgaged by some player. If a player do not have the money to pay a debt he is forced to sell houses, mortgage or sell deeds and finally declare bankruptcy. This can be seen as one type of forced item dropping and ensures that the economy does not reach a stalemate. Having a finite deed economy also creates a game where the theoretically optimal strategy might not be the best one, as all players cannot go for the same color group of properties (see Figure 9).



**Figure 9** A game of Monopoly in progress.

### 2.2.2 Unique Resources

A resource is unique if there only exist one of the resource in the entire game. Unique resources is an easy way to force players to be different.

#### 2.2.2.1 Civilization

In the Civilization games, a turn based strategy series of games, players can build wonders. Wonders have a unique effect and can only be built once per game, meaning if one player build “The Pyramids”(see Figure 10 and Figure 11) no other player can build it. This causes a race to be the first to complete wonders. Wonders are the most time consuming buildings a player can build which makes it a strategic choice if, and when, the player should attempt to build them.





**Figure 10** Screenshot from the first of the Civilization (MicroProse, 1991) games where a player have built the Pyramids.



**Figure 11** Screenshot from Civilization 5 (Firaxis Games, 2010) where a player have built the Pyramids.

### 2.2.2.2 Settlers VII

The Settlers series can be summed up as an resource flow management game. The player start with simple items such as lumber and stone. From these items the player create lumberjacks and quarries that gather more lumber and stone. Once this basic supply gathering is set up the player starts to expand. The players start creating and gathering other materials in order to create a supply chain. In Settlers VII (Blue Byte Software, 2010) there is research and trading to give players different approaches to how they can manage the supply chain. The first player who successfully researched something will permanently gain its benefit for him- or herself, and his or her team members (see Figure 12). The benefits will only apply to the first player or team that researched something, the ownership of the research can never be obtained by any other opposing player or team. Trading works in a similar fashion, the first player to successfully travel to a new trading route establishes that route that will allow the player

to trade one resource for another. Only the first player who reaches a specific trade route will be able to use it. Thus both research and trading is only available for the first player who successfully takes them.



**Figure 12** Screenshot from *Settlers VII* of the research system.

### 2.2.2.3 Card Games

In a normal deck of cards all the resources are unique, but the cards are not used as unique resources in all card games. For example in Bridge (see Figure 13) the unique value of each card is used, in contrast to for example Go Fish where only the numerical value of the cards is relevant. In most card games the resources available are known from the start, which mean that the players are given additional information of hidden cards when any other card is shown.



**Figure 13** A game of *Bridge* in progress.

### 2.2.3 Forced Resource Dropping

Forced resource dropping is when a player involuntarily lose resources, making those resources available to other players or for the player to regain, or are just removed from the game. This is often used as a punishment for character death.

### 2.2.3.1 Lineage II

When dying in earlier versions Lineage II (NCSOFT, 2003) (see Figure 14), an MMORPG, the players would drop items when they died. They would also lose experience, required to advance in the game. Those mechanics were there to make it really painful to die in the game, so that the players would have to take things more serious and play carefully. In later versions of the game the players will only drop items if they had engaged in killing other players who did not agree to fight.



**Figure 14** Screenshot from *Lineage II* from a fight for the possession of a castle.

### 2.2.3.2 Defense of the Ancients

In Defense of the Ancients, a MOBA game often just referred to as DotA, there are two specific items which would drop if the player died while those items were in the players inventory. One is the Gem of True Sight, which grants perception to see nearby invisible objects, and one is the Divine Rapier, the item which provides the most damage in the game. The Gem of True Sight reveal heroes even if they are using a stealth ability, which is the stealth heroes most important ability. Both the items which drop on hero death were basically too powerful to be kept permanently, but also needed in the game by design. There is also a boss character in the game, named Roshan (see Figure 15), who will drop the Aegis of the Immortal. The Aegis of the Immortal is a unique item which will resurrect a player once if he or she is killed. The Aegis of the Immortal will automatically be returned to the game after a set amount of time, to later be once again held by Roshan.





**Figure 15** Screenshot from *Defense of the Ancients* showing the stone golem Roshan who will drop *Aegis of the Immortal* on death.

### 2.2.3.3 Diablo

In the first *Diablo* (Blizzard Entertainment, 2013) (see Figure 16) game players take the role of either the warrior, ranger or sorcerer. The player arrives at the troubled village of Tristram where terrible events are starting to unfold inside the cathedral where someone is trying to bring the prime evil Diablo into the world. When playing multiplayer in *Diablo* death is punished by causing the dying player to drop all of his or her items and have to restart in the town. It is still possible to return to the point of death to try and acquire the lost items, but while the items are on the ground another player can pick them up.



**Figure 16** Screenshot from *Diablo* featuring from left to right the Ranger, Warrior and the Sorcerer who stands against the resurrected King Leoric and his army of undead.

### 2.2.3.4 Counter Strike

Counter Strike (Valve Corporation, 1999), an FPS game, is about a battle between terrorists and anti-terrorists. The game is based on rounds or time, each round consist of either completing the map objectives or killing the opposing team (see Figure 17). Each round ends when specific timer ends. A player starts the game with a certain sum of money that he or she can use to buy better weapons or armor at the start of each round. Any player killed during the previous round is resurrected with a basic pistol and some money. Any player killed during the round drops any weapon he or she currently had equipped.



**Figure 17** Screenshot from a gunfight in *Counter Strike*.

### 2.2.4 Power Scaling



Power scaling is the concept of increasing the capabilities of the elements in the game as the game progress. This is easy way to cause players to become gradually more powerful while giving them time to learn how things work before having to master the game.

### 2.2.4.1 Role Playing Games

RPGs very often resort to using power scaling as a tool to show character growth (see Figure 18). This growth in RPGs usually comes from a so called level system where the characters start at a low level and the items are weak. As the characters overcome challenges and obstacles they are rewarded with experience that allows the characters to advance in level and power, which could help them acquire more powerful items.

Some of the more successful franchises with power scaling as a central game mechanic:

- Level and items in the Final Fantasy RPG series (Square Enix Co., Ltd., 2013)
- Level and items in the Dragon Warrior series (Square Enix Co., Ltd., 2013)
- Level and items in The Elder Scrolls III: Morrowind (Bethesda Game Studios, 2002)



**Figure 18** Screenshot of different armor sets in *Elder Scrolls III: Morrowind*

## 2.3 Tools

As in all work where one produce something, the tools that are used will decide what will be possible and how efficient one can work. In game creation a wide range of tools are necessary.

### 2.3.1 Tools Used

Following were the tools used when developing the prototype.

### 2.3.1.1 Game Engine - Unity

Unity (Unity Technologies, 2013) (see Figure 19) is a program appropriate for creating games quickly without having to think too much about the technical details, which allows one to focus on the game design. Thanks to easy asset handling and tools to help one build and edit the game world in runtime testing and developing takes less time. Unity comes with Monodevelop, a text editor with visual help for programming such as syntax-highlighting. One of the features that was considered to be very beneficial was the view-port editor that allowed for easy map designing, and the ability to pause the game simulation and change variables at runtime. As an example it is possible to pause the game, add a cube, then unpausing will cause this newly added cube to interact with the game, for example affecting the physical objects of the game world. The ability to pause a game and see the values of the variables would prove to be the best way to find bugs and recreate them.

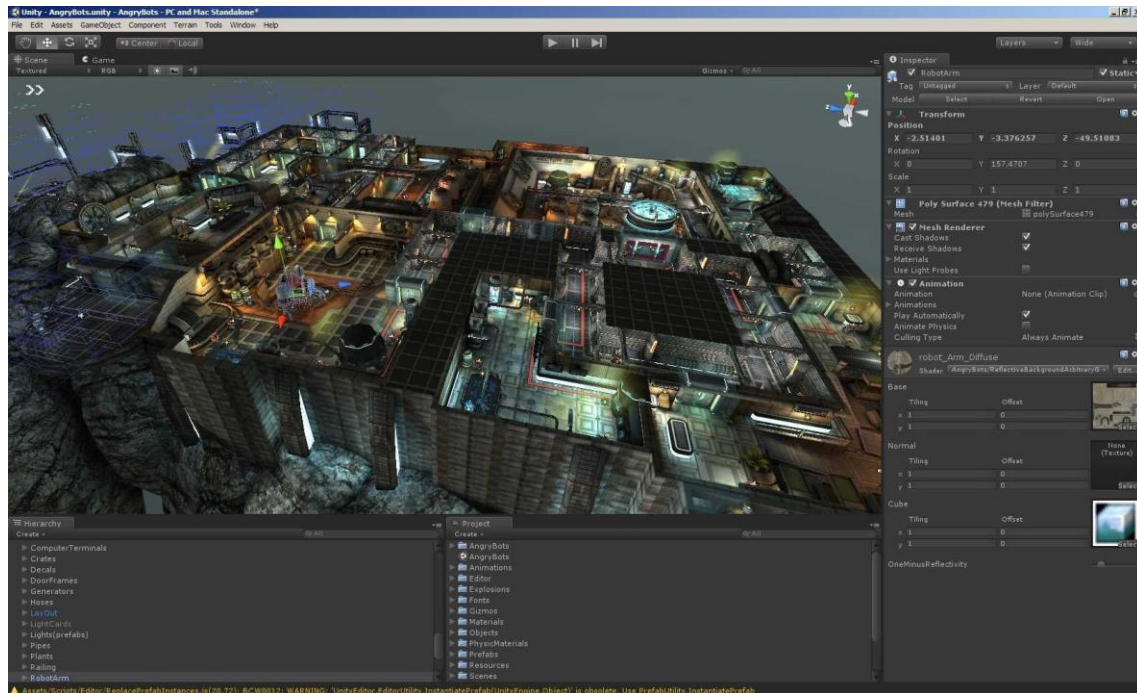
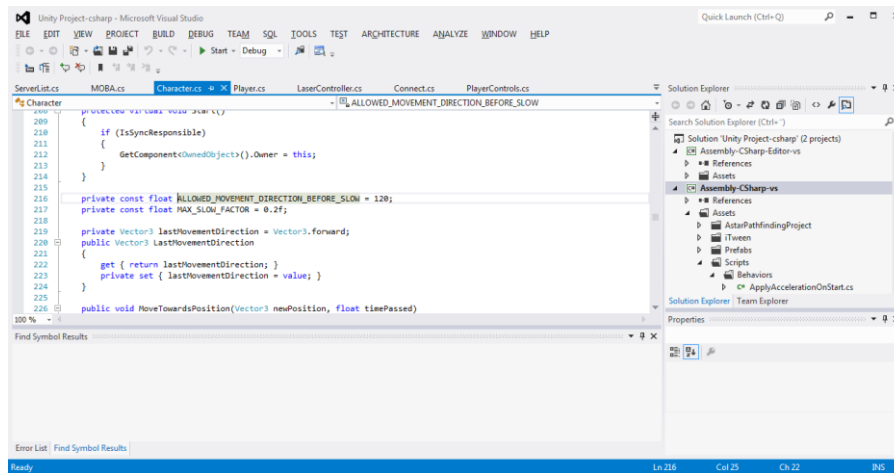


Figure 19 Screenshot of Unity

### 2.3.1.2 Code Editor - Visual Studio 2012

Visual Studio (Microsoft, 2013) (see Figure 20) works well together with Unity and speeds up the process with quick refactoring and error listing. Visual Studio 2012 was used instead of Monodevelop due to the team having previous experience developing in Visual Studio, the fact that Chalmers' have a deal with Microsoft allowing students to use their products for free under certain restricting licenses, Visual Studios more extensive feature set and better possibilities for support.

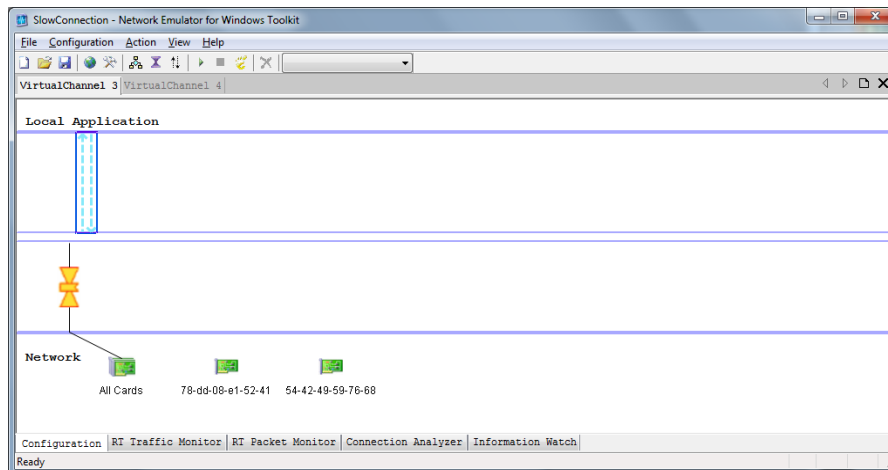
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**Figure 20** Screenshot of Visual Studio 2012.

### 2.3.1.3 Latency Emulation - Network Emulator for Windows Toolkit

Network Emulator for Windows Toolkit (Pol, 2010) (see Figure 21) can be used to simulate latency for outgoing and ingoing network traffic, making the computer behave like it or someone else's computer have a slow connection or are far away from the connected computer. Note that the stand-alone version of the program never was officially released and might be difficult to find support for, the program was developed to be an integrated part of Visual Studio 2010.



**Figure 21** Screenshot of Network Emulator for Windows Toolkit.

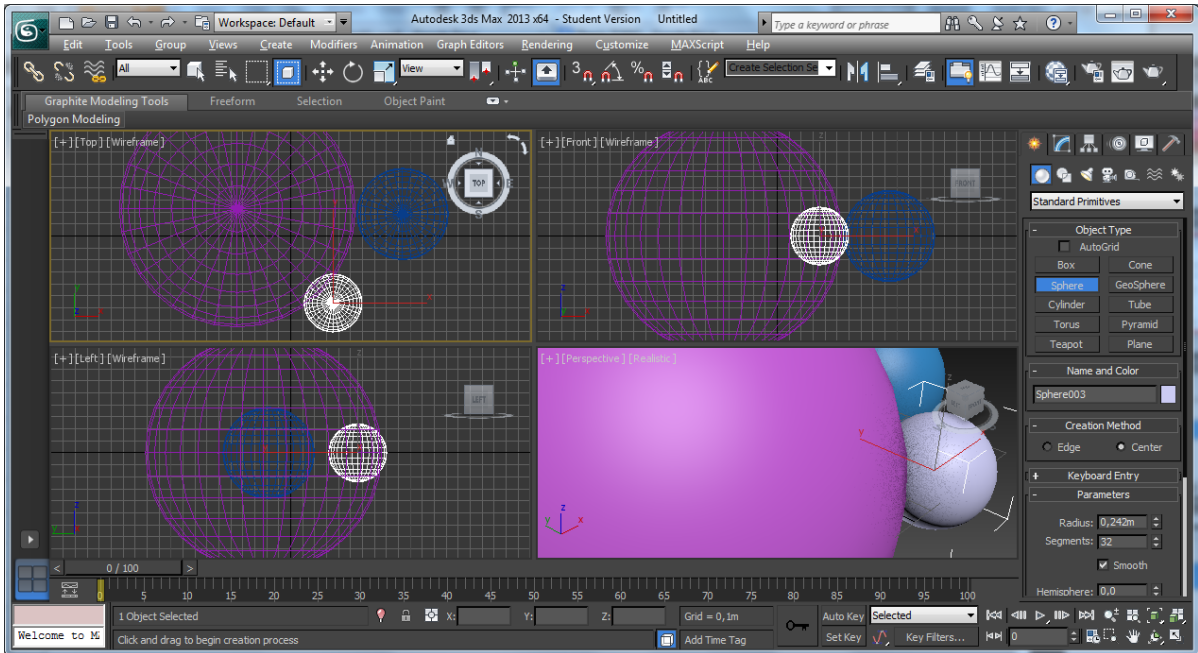
### 2.3.1.4 3D Modeling - Autodesk 3ds Max 2013

Autodesk 3D Studio Max (Autodesk, 2013a) (see Figure 22) was chosen as modeling tool as it is an industry standard in game development along with several other of Autodesk's products. As such it have many features that allows for quick asset creation and animation. Because it is a professional product it is very feature heavy and has a very high learning curve. One of the reason for using this product over Blender, which



## 2 Background

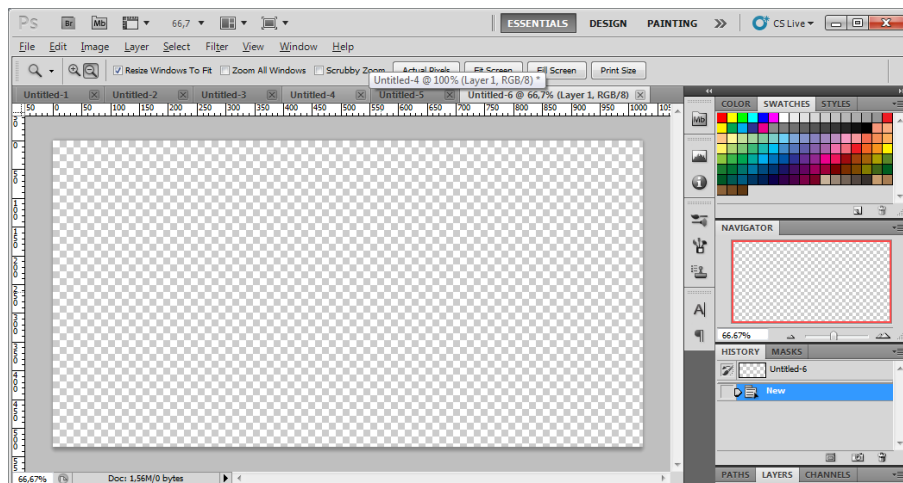
is discussed later, is due to the powerful features that reduces modeling time, and more importantly the teams existing knowledge of Autodesk products.



**Figure 22** Screenshot from Autodesk 3ds Max 2013.

### 2.3.1.5 2D Graphics - Photoshop CS5

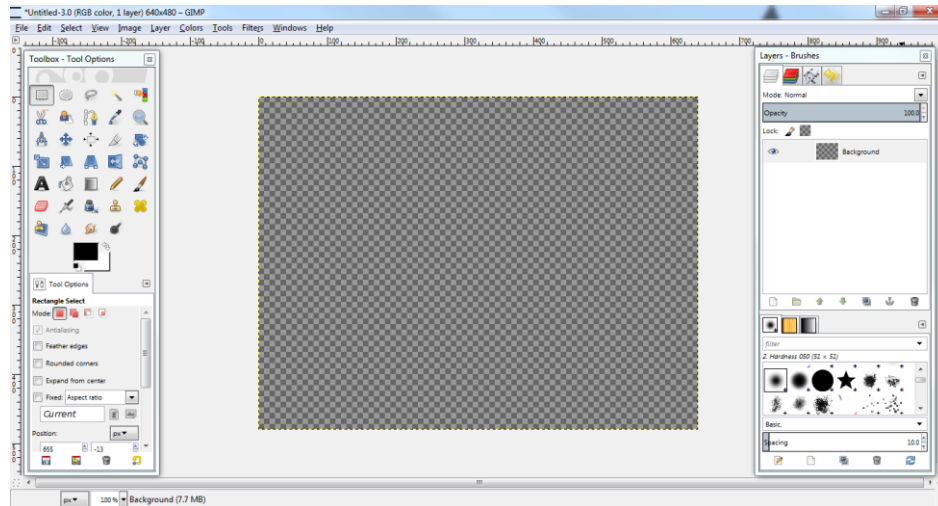
Photoshop (Adobe, 2013) (see Figure 23) is a powerful tool when working with graphics, in this case creating 2D textures. It is widely used by professionals due to its extensive feature set. As many other professional tools used in the market it has a very steep learning curve and a large portion of time is required to spend on the program and tutorials before one starts to see results. One of the team members did use this program since he already had access to it and had previous experience using it.



**Figure 23** Screenshot of Photoshop CS5.

### 2.3.1.6 2D Graphics - GNU Image Manipulation Program

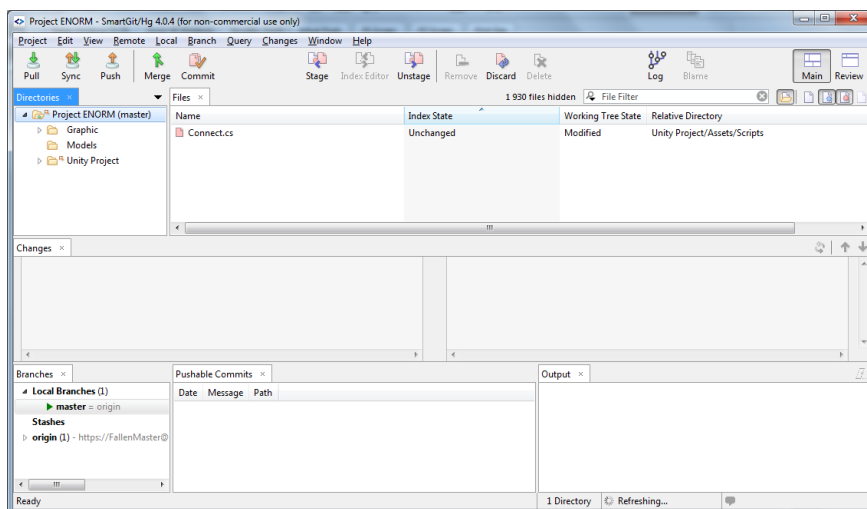
GNU Image Manipulation Program (The GIMP Team, 2013) (see Figure 24) is, as the name implies, a program meant for editing and creating images. It is a freely distributed program that, while containing less features than Photoshop, is a very powerful tool for anyone between beginner and amateur. This program was used to create several 2D textures. One team member used this program since he had no access to a Photoshop license and had previous experience in using the application.



**Figure 24** Screenshot of GNU Image Manipulation Program.

### 2.3.1.7 Version Control - SmartGit/Hg 4

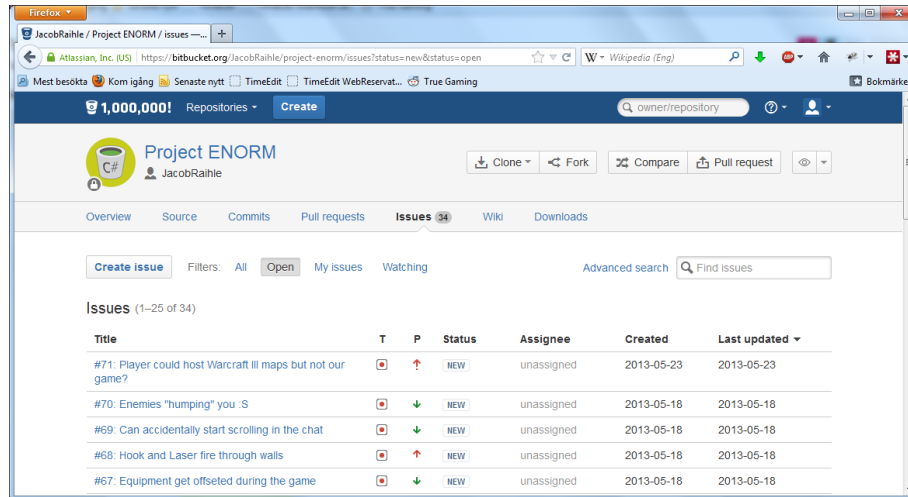
To be able to work in parallel SmartGit (Syntevo, 2013) (see Figure 25) is one of several alternatives for easily syncing and merging work. The reason for using this software was the familiarity with the product. This reduced the time needed in order to learn how to use the program, and reduced time needed to clear out problems that could otherwise damage or take extra time from development.



**Figure 25** Screenshot of SmartGit/Hg 4.

### 2.3.1.8 Git Repository and Issue Tracker - Bitbucket

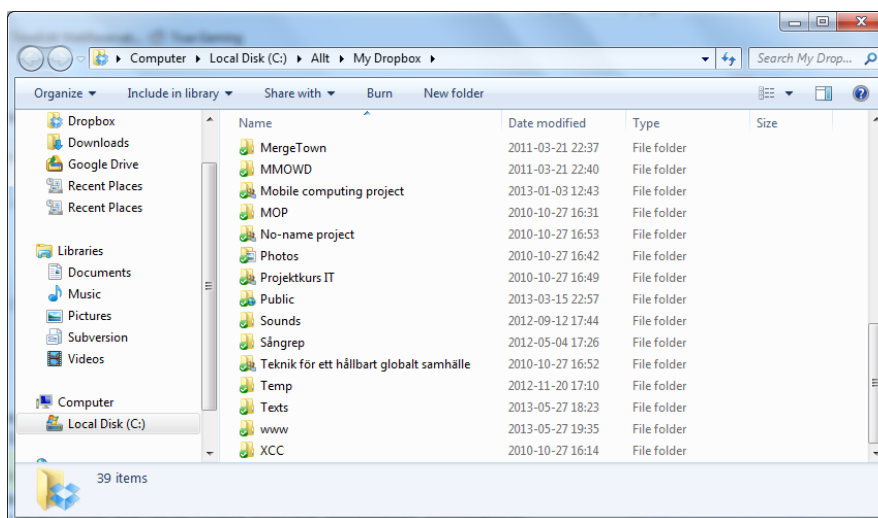
Bitbucket (Atlassian, 2013) (see Figure 26), which is primarily used as a Git repository, also has a built in issue tracker for each project. The repository was used for storing and sharing updated versions of Project ENORM, and the issue tracker was utilized to keep track of bugs and tasks in a structured manner. As with the version control the main reason for picking Bitbucket is the teams familiarity with that service, reducing the time needed before work on the project could start.



**Figure 26** Screenshot of the issue tracker for Bitbucket.

### 2.3.1.9 Shared File Storage - Dropbox

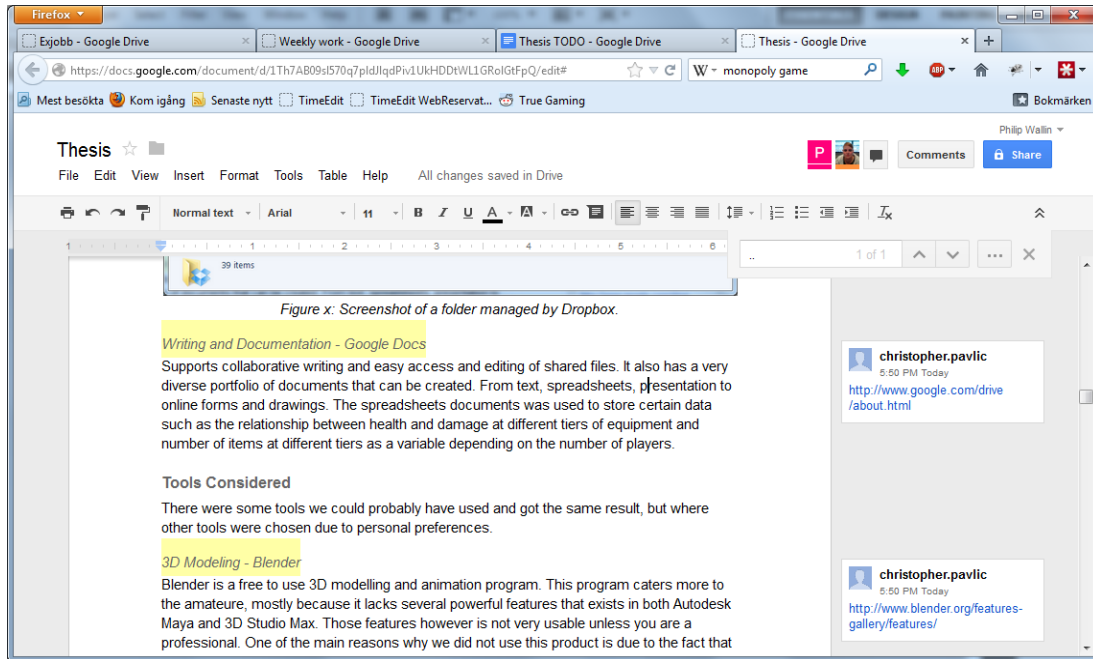
Dropbox (Dropbox, 2013) (see Figure 27) is a easy way to share files within the project in a shared folder. Only certain files was shared using Dropbox, such as text-documents and pictures. Project related files was handled using Git while thesis related files was stored in Dropbox. Dropbox was also used when the team shared development builds for testing within the team.



**Figure 27** Screenshot of a folder managed by Dropbox.

### 2.3.1.10 Writing and Documentation - Google Docs

Google Docs (Google, 2013) (see Figure 28) supports collaborative writing and easy access and editing of shared files. Many different types of documents are supported: text, spreadsheets, presentation, online forms and drawings. The documents were used to store certain data such as the relationship between health and damage at different tiers of item, number of items at different tiers as a variable depending on the number of players, documentation and to perform questionnaires.



**Figure 28** Screenshot of a document open in Google Docs.

### 2.3.2 Tools Considered

There were some tools that could probably have been used for similar results, but where other tools were chosen due to personal preferences.

#### 2.3.2.1 3D Modeling - Blender

Blender (Blender Foundation, 2013) (see Figure 29) is a free to use 3D modeling and animation program. One of the main reasons why this product was not used was due to the fact that one of team members had previously worked with Autodesk products.

## 2 Background

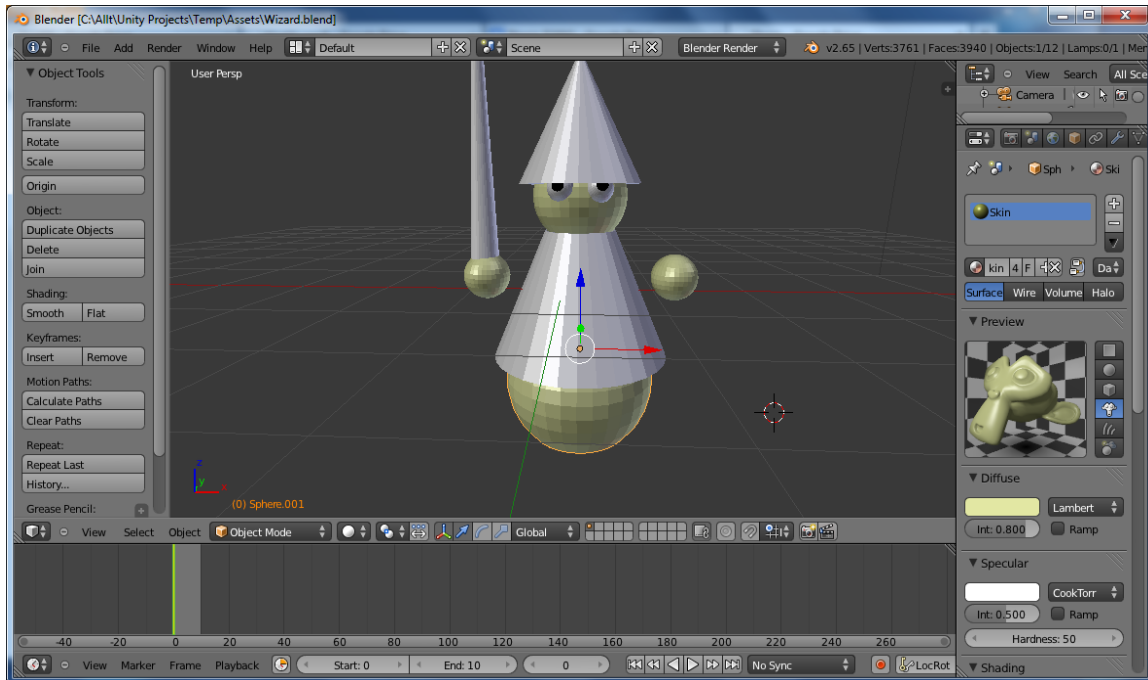


Figure 29 Screenshot of Blender.

### 2.3.2.2 3D Modeling - Autodesk Maya

Maya (Autodesk, 2013b) (see Figure 30) is a professional tool much like that of 3D Studio Max. Because of both Maya and 3D Studio Max being products owned by Autodesk they both share many features, the biggest difference between them is the workflow. One of the team member had previous experience with Maya, but that was two years ago, and the time spent with the product was only a couple of months. Because of this there was no good reason to pick one over the other.

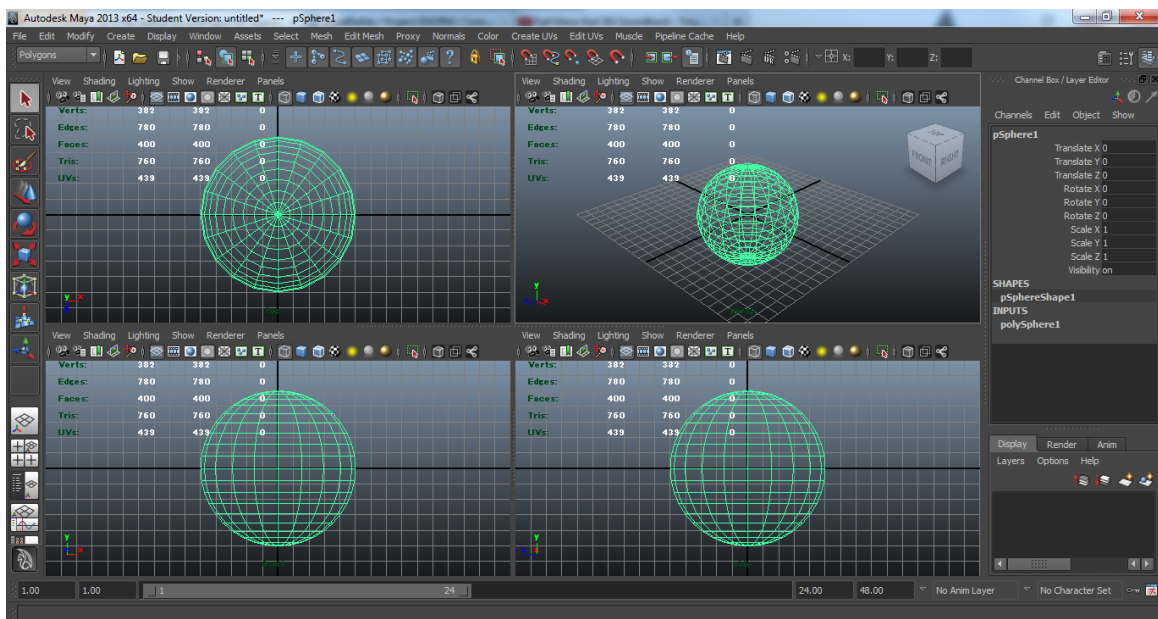


Figure 30 Screenshot of Autodesk Maya.



### 2.3.2.3 Game Engine - Unreal Development Kit

Unreal Development Kit (UDK) (Epic Games, Inc., 2013) (see Figure 31) is a free to use game engine, however using this engine will cost if the game would come to earn more than 50,000 US dollars. UDK features tools for working with graphics, audio, networking, scripting and artificial intelligence.

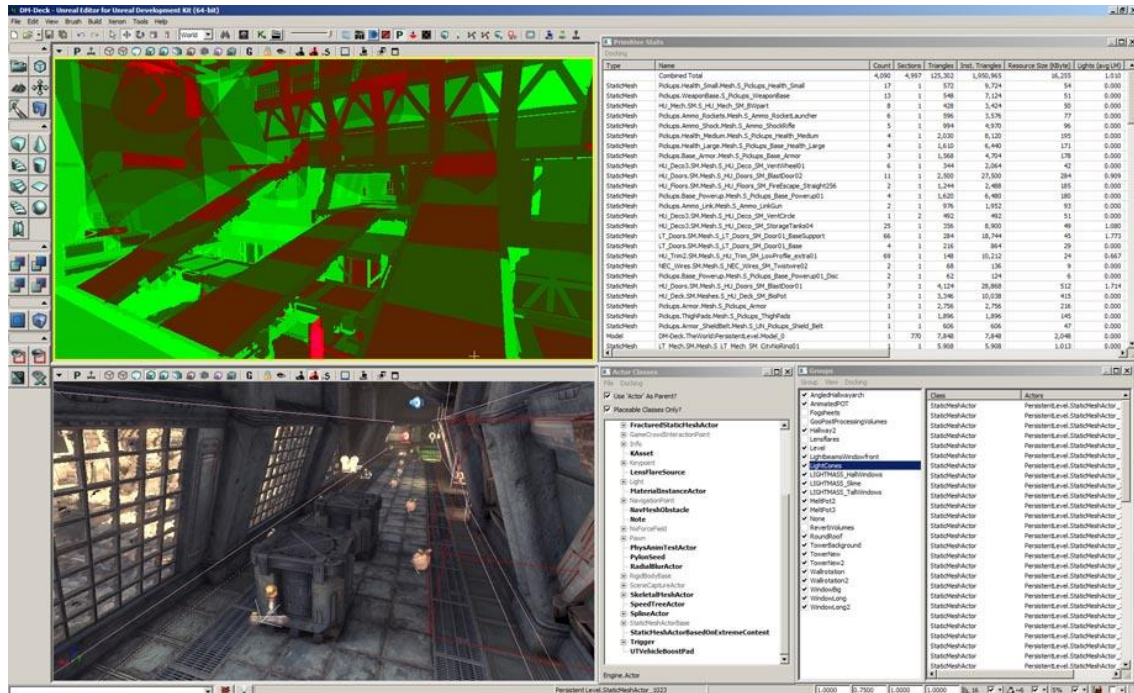


Figure 31 Screenshot of Unreal Development Kit.

## 3 Theory and Methodology

In order for the reader to become more familiar with certain terminology and research this chapter will focus on describing the theory and methodology used in the project.

### 3.1 Mechanics, Dynamics, and Aesthetics

The framework of mechanics, dynamics, and aesthetics (MDA) (Hunicke et al., 2004), was used in this project. The reason for this was unify the team's definition of what a game mechanic is when discussing what game mechanics should be included in the prototype, and to help the team think about how certain dynamic behavior is created.

Mechanics are the building stones on which a game is built upon, they are the actions a player can take, the controls a player can use. Mechanics also include rules on how things behave in the game. As an example in a game of Monopoly rolling the dice is a mechanic of the game, drawing a card and buying an estate is also mechanics of the game.

Dynamics consist of looking at the greater picture, analyzing and predicting how a player will react to a certain system. Compared to mechanics the dynamics can require a great deal of knowledge on the subject of psychology, since it can be hard to know beforehand how a player will react to a set of mechanics.

Aesthetic is best described as the feelings that the player should feel when playing a game. Typically people tend to explain good games as “fun” and bad games as “boring”. The problem with this is quite obvious, “fun” is a very individual value judgement. What one person think is fun might not be fun for another. Instead of “fun” the MDA framework proposes a more extensive taxonomy so that it becomes easier to explain the desired feelings a game should give its players. The taxonomy that is suggested is the following:

- Sensation - Game as sense-pleasure
- Fantasy - Game as make-believe
- Narrative - Game as drama
- Challenge - Game as obstacle course
- Fellowship - Game as social framework
- Discovery - Game as uncharted territory
- Expression - Game as self-discovery
- Submission - Game as pastime

It is important to note that these are not exclusively the only correct taxonomy, and Hunicke et al. believes that there are other words to help describe what a player should feel during his or her playthrough.

### 3.2 Agile Game Development

When trying to explore a topic you are not going to know the requirements before starting to develop, and any requirement that is found is most likely subject to change. Due to this it was decided that an iterative development cycle would best fit Project ENORM.

Agile software development is a development method that is rising in popularity (VersionOne, Inc., 2013). The reason for using this methodology is to take advantage of the short development cycles that allows the team to quickly change the direction of the project. This is needed as the development is bound to change many times when exploring design opportunities.

Comparing to for example the Waterfall model (Royce, 1970), where one finish up one step in the development completely before moving on, there are several benefits if one would instead work iteratively. When working with something as complex as a game one usually have many different mechanics working together to create a specific experience. There are just too many variables affecting each other, this makes it impossible to predict how the game will be played in the end. When working iteratively one will most likely add and remove elements often to try to achieve the experience that was desired.

In Scrum development (Scrum.org, 2011) the stages of the development are called sprints. A sprint is a time interval for developing features in a specific way. The sprint starts with the creation of a so called “backlog” in which features, decided by both the development team and the customer, that needs to be finished during the sprint interval will be added. Features at the end of a sprint are only those features that have been fully implemented, tested, delivered, and accepted to the customer. If a feature is not accepted by the customer it is not removed from the backlog and must be dealt with.

### 3.3 Pathfinding Algorithms

Two pathfinding algorithms were used during the development of the prototype: Dijkstra's algorithm (Dijkstra, 1959) and the A\*, or A-star algorithm (Hart et al., 1968).

Dijkstra's algorithm is a graph search algorithm which search for the shortest path between two nodes in a graph. The edges of the graph must have an non-negative cost when traveling between nodes. The results of Dijkstra's algorithm is a shortest path tree that contain which nodes to traverse in order to reach the end node from the start node while minimizing the edge costs, the longest path can also be obtained.

A\* or the A-star algorithm is an extension of Dijkstra's algorithm where the algorithm sacrifices accuracy for speed. By using heuristics the algorithm searches for the shortest path by checking the distance from the target node, while not guaranteeing an optimal solution this will result in a close approximation of the shortest path and will instead be a faster algorithm since less nodes are visited each time a path needs to be found.



### **3.4 Interviewing Technique**

When testing the prototype it was decided that a semi structured interview should be used (Robson, 2002). When conducting a semi-structured interview the interviewers prepare questions before the tests. However, unlike structured interviews where the questions are asked in a specific order, the order of the questions in an semi-structured interview is not necessarily fixed. It is allowed for the interviewers to ask additional questions when the interviewed gives an answer that might be of interest for the interviewers.

## 4 Planning

The plan the team made before starting working on Project ENORM was based on the team's previous experience in game development, the fact that the team needed to learn new tools and the difficulty of developing real-time multiplayer games.

The team split the development intervals in so called sprints, from the Scrum process. The sprint was the time remaining until the next test and the features was decided by the team while considering the input from the testers that were gathered from the test at the end of the previous sprint. The exception lies during the first sprint that does not have any input from the testers. The first sprint will therefore only have features decided by the team. Instead of a physical more detailed backlog there were only a formal agreement on what features and mechanics that needs to be done during each sprint.

### 4.1 Initial Rough Timeplan

Here is shown what was the initial plan before the thesis started, for the work over the course of 20 weeks. Below is the timeplan that was pitched together with the thesis proposal, the timeplan was polished during the pre-study.

- **Week 1-3**  
Examining games which used similar systems or subsystems we plan to implement, and means of development and testing.
- **Week 4-10**  
Get up an easily extended game system, testing functionality continually with user tests to see if the basic game is interesting so the economy will be relevant.
- **Week 11-13**  
Focus on adding item to the game and possibly computer controlled monsters that carry items. User testing and data collection.
- **Week 14-16**  
Adding content, abilities to make the game more interesting and giving better test results. User testing and data collection.
- **Week 17-20**  
Finalizing thesis.

## 5 Execution

This chapter will explain the goals the team had, how concepts of relevant games were researched, the work progress with the choices made and the motivation behind the choices.

### 5.1 Pre-Study

The first sprint was spread out over four weeks and had very special goals. Instead of starting development on the first sprint it was used to study existing software tools and try to get a common ground regarding the vision of Project ENORM.

#### 5.1.1 Week 1 - Tool Research

When starting the thesis the first thing that needed to be done was to look into what type of tools could be used to increase the development speed. The type of tools that was going to be needed were: 2D image editor, 3D modeling, document handling, version control and an integrated development environment. One particular game engine, 3D Unity, was already being considered as one possible choice due to being known to one of the team members before the project started. Several other engines were researched in order to find the best fitting game engine for the project. The engines that were considered were Unity, Unreal Development Kit, OGRE (Torus Knot Software Ltd, 2013) and CryEngine 3 (Crytek GmbH, 2013). OGRE and CryEngine 3 were discarded as alternatives early due to them appearing to be more difficult to get started with. Some features that are included in UDK but not in the free version of Unity are: shadows, advanced lightning, artificial intelligence support and built-in subversion support. However, Unity was chosen over UDK due to many posts in forums was labeling UDK as a more difficult to use engine with a high learning curve (Gamedev.net, 2013).

As for the 3D modeling tools there was three choices that stood out: Autodesk Maya, Autodesk 3D Studio Max and Blender. At first Blender was the main choice of the 3D modeling tools as it is free and still contained all features that this project would ever need. However after some problems with learning Blender and upon learning that Chalmers University had a deal with Autodesk to be given free student licenses Blender was soon discarded and instead the choice was between Maya and 3D Studio Max. Both the programs are owned by Autodesk and most functionality can be found in both products, what sets them apart is the workflow. With no clear advantages or disadvantages for either of the tools that would matter for the team it was decided that the team would use 3D Studio Max.

For the document handling it was very quickly decided that Google Docs would be sufficient as it had version control built in and easy folder sharing allowing any document created in that folder instantly being shared amongst all with access to that particular folder. It also allowed multiple users to edit the same document at the same time which was the main reason for using Google Docs.

There were two options that was being considered for the version control: SVN or Git. Since two of the group members had been using Git and a specific version control tool called SmartGit 3 it was quickly decided that the project would use SmartGit combined with the repository hosting service Bitbucket.org as the tools for version control.

Finally the choice for the 2D image editing was split between three choices: Paint.NET, Photoshop, and GIMP. While Photoshop would be preferred, as it is an industry standard, there was no way for the team to acquire student licenses so the team had to rely on private licenses and working at the school. However, it was argued that it did not matter if everyone used different products since all 2D image editor tools could output the image formats which was used anyhow. So in the end it was decided that everyone should use the tool they felt they could produce the best result with.

After the tools were decided the discussion to unify the vision of the game began, as all three team members had different takes on the project. There would be discussions regarding the game vision and concept during the entire project, but during the first week the subject that was discussed was what genre the game was going to be. The suggestions were mainly about a minimalistic MMORPG and a third-person action game. In the end it was concluded that the genre being discussed was a MOBA game, which was basically a combination of the ideas.

The team discussed how to handle hosting servers for the game. The alternatives were to have an external server software running or having an instance of the game run as server. The team looked at different alternatives for hosting game servers but came to the conclusion that this would add too much extra work, as it was not possible to use the features of Unity and would need duplicates of some data on the client and server. The decision to run a game instance as server would mean the difference between server and client would be minimal.

### **5.1.2 Week 2 - Creating a Concept**

The second week was a week for learning the tools that was picked in the previous week. The team members would work by themselves and try out the functionality of Unity and Autodesk 3D Studio Max. While testing the tools several discussions were made regarding the mechanics of the game. However two of the most basic type of mechanics was agreed upon and implemented within a few days.

One of those more basic mechanics that was needed was a control scheme for the player so that they could interact with the world. It would be a very basic control scheme allowing only the player to move in eight directions, using four buttons on the keyboard. The camera was placed a fixed distance above the player tilted with a 30 degree angle. This angle was chosen to let the player to get an overview of the environment while still having full visualization of the avatar, allowing items placed on the avatar to be visible. This was a decision based on the idea that a player should be able to see what an opponent has equipped before engaging in battle, allowing the player to know the capabilities of the opponent.

The discussion continued where it left off the previous week. Project ENORM was now defined as a MOBA game, and plenty of mechanics would be borrowed from games within this genre. This game would start with most of the mechanics from the MOBA game called Bloodline Champions, such as the game's movement and ability mechanics. The reason for this was due to the team preferring the high skill ceiling of Bloodlines Champions, and discussing every mechanic in detail would take too long time.

The cornerstone mechanic of Project ENORM is the abilities, which are typically the main form of combat in MOBA games. However there were two paths that was discussed regarding how abilities should work. The first way was how League of Legends implemented most of its abilities: something that player would always succeed in doing. Such as abilities that if within range could never miss, under normal circumstances. This choice would allow for more casual players to enjoy the game since the entry skill level that is required in order to play the game is lowered significantly as many of the ability does not require any more skill than selecting what opponent that they want to hit with their ability. The second path is one that contrast this by requiring that abilities to be aimed, or have reduced effect if certain conditions are not meet. Bloodline Champions took this path and the result is a game that requires much skill, and takes long time to learn. It was decided that this game was going to cater to the player wanting to have a game requiring a little more skill than the average person. The design principle "Skill equals power" was created in order to help the team create abilities that requires skill in order to be used to its full effect.

In order to regulate how often an ability could be used it was decided that a cooldown mechanic would be implemented along with a cast time mechanic, two mechanics which are usually tied to the ability system of a MOBA game. The cooldown mechanic is a simple timer that starts when an ability is used and prevents the player from using that ability again until the timer finishes. The cast time mechanic means that when a player use an ability they are forced to wait a certain amount of time between player input and the actual action being performed.

After the decision that the game combat would be centered around abilities the number of abilities a player would have at his or her disposal was discussed. The discussion was dominated with how many abilities that was at the players disposal in other ability based MOBA games such as League of Legends and Bloodline Champions. Since the previous games let the player use between four and eleven abilities, depending on what you count as an ability, during the course of play it was argued that seven abilities should be used. The number of abilities were supposed to not make the game too complicated, while still allowing players to combine interesting effects with the abilities. Due to time constraints only six of these seven were implemented, but that will be explained in later chapters.

Next was the discussion regarding how a player should acquire abilities. One of the choices was that players picked a specific avatar that already had a specific set of abilities. This choice mimicked the design choice that League of Legends, Defense of the Ancients, Heroes of Newerth and Bloodline Champions all had. In those games the player picked a "hero" and that hero had a fixed number of abilities that always was present, or would be unlocked during a game. Another choice was that abilities would

be gained by killing some kind of NPC. This choice was not present in any other game, but the game Defense of the Ancients had an item that was obtainable by killing a special NPC and League of Legends have NPCs which when defeated temporarily gives the player enhanced powers. The idea was also partly inspired by Path of Exile (Grinding Gear Games, 2013), where the abilities are stored in gems which can be placed in weapons and armor. The discussion then continued with examples of buying abilities. This idea came from the shops often found in MOBA games. An example is League of Legends, where it is possible during the game to buy items that can be used as an ability. The last major choice regarding abilities was using a king of the hill system where a player needed take control over an area for a specific time before obtaining an ability. King of the hill was argued to incur a gameplay that would be far too passive since the players would be restricted to a certain area for a specific time. Creating presets of abilities bound to certain avatars is a mechanic that is used by a lot of MOBA style games such as League of Legends, Defense of the Ancients, Dota 2 and Heroes of Newerth and people know what to expect from it. On the other side it can be seen as overused and not interesting anymore, since so many games already does it. In the end a mix between the NPC idea and ability locked to items was decided upon. NPCs would drop specific items that a player could pick up, and these items would then allow the players to use certain abilities.

The discussion then went to the problems with the first alternative with having abilities tied to certain heroes or avatars; normally the player can not change these abilities during the game and some set of abilities can have a strong advantage over other set of abilities. This means that even if two players have equal skill if they pick the wrong set of abilities they will have no chance of winning against an equally good opponent with a set of abilities that counters the players set of abilities. The solution was that players should be able to change items during the game. This would allow the players to respond when another player has a specific set of abilities.

The next discussion was centered around the idea of the NPCs that should hold the items. The idea come from looking at MMORPGs such as World of Warcraft where players are rewarded with gold and items when defeating NPCs. However there were arguments made whether or not the NPCs were needed at all. Could not the items simply be placed on the map in the same manner as the FPS games Quake and Unreal Tournament? In those games the guns are placed on the ground for anyone to pick up immediately. The main reason for having NPCs was to make the hunt for NPCs a strategy. The player would have to choose to either attack other players or hunt for NPCs. This could lead to scenarios where players would be attacking an NPC and suddenly be attacked by a player, creating favorable position for the attacker. However defeating the NPC would grant the player an advantage in abilities. This lead the team into the next discussion about how to best implement a finite item economy.

The most important core mechanic of the game was identified as abilities that was used by the player in order for them to compete against each other. Since the finite item economy should be in focus combined with the decision that abilities are going to be connected to a specific items meant that the finite economy of items also meant a finite number of abilities. It was then decided that the NPCs should become guardians for the items, forcing the players to fight the NPC in order to gain new and more powerful

abilities. The items would grant one additional benefit, extra maximum health. Players that equipped powerful items would gain a bonus to their maximum health.

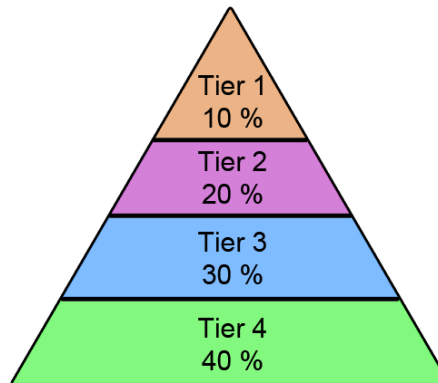
Since the economy is finite it became clear that if players were allowed to keep all items that they found the game would revolve around who found the best item first. The team decided that the best way to combat this behavior is to let players lose a random item when they are defeated. This way it would be possible to have players become weaker even if they are strong. However, the team saw the problem with this, as well as the player with better items would undoubtedly defeat the weaker player several time before the weaker player defeated the stronger player once. This would create a “snowball effect” that will leave the weaker player at a terrible disadvantage. A snowball effect is when an event keeps growing in proportion until it becomes unmanageable. The weaker player will become weaker when defeated and the stronger player gets stronger, the next fight is most likely going to be even more in favor of the stronger player.

After the pros and cons of that particular topic had been examined, the discussion continued with related issues: should power scaling be added to the abilities? Should there be several different versions of the same ability that behaved the same way but that are more or less powerful? It was decided that all abilities should be given five tiers, where tier five is considered the weakest and tier one considered the strongest version of that ability (see Table 1).

Defender Attacker	Tier 5	Tier 4	Tier 3	Tier 2	Tier 1
Tier 5	10	14	18	24	30
Tier 4	7	9	12	15	20
Tier 3	5	6	8	10	13
Tier 2	3	4	5	7	9
Tier 1	2	3	4	5	6

**Table 1** Proposed approximately number of hits to kill a player, when having full set of specific tiers and facing a player with full set of a specific tier, with approximately 50 % power increase per tier.

While power-scaling is not directly connected to the finite economy it can be used to create more unique matches, this is accomplished by using the finite economy to the game's advantage. By limiting the number of strong items and having more of the weaker items, and then randomizing what items are available at what tier each match, the idea was to offer the players a unique experience every match. The items should be distributed in such a way that the top tier items are unique, while the lower tiers are more common. The number of items available would be the number of item slots times the number of players, with the distribution over tiers as shown in Figure 32. This would mean that when all items are in play every player would be equipped with full tier 4 items or better. The players would start with tier 5 items which could not be dropped, if dropping a higher tier item it would be replaced with a tier 5 item.



**Figure 32** *Proposed distribution of item of different tiers.*

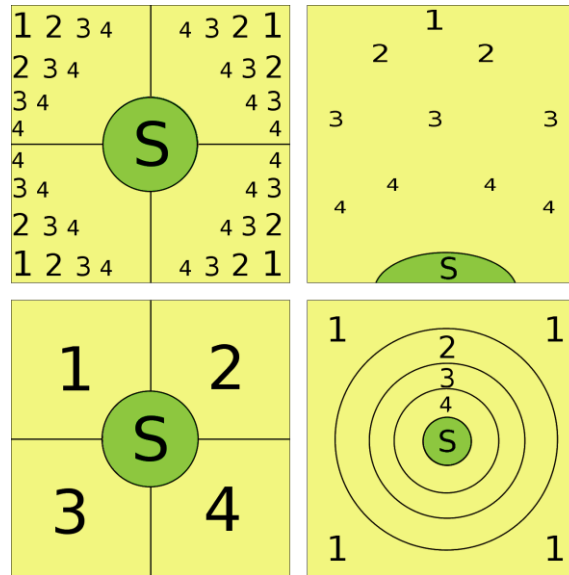
Almost all games have a so called victory state where a player is considered to have won and the match is over. It was considered whether or not it was possible to simply have some kind of endless play where people fought for as long as possible. The counter argument was that without a goal players would quickly get bored, and it would be difficult to test such a game to get any interesting results. In the end there was no good argument as to why the game should be endless so the game was given a goal. The player would all compete in order to be the first player to reach a certain amount of score.

There were different suggestions regarding how player would earn score. One of those suggestions was that players would be rewarded with score if they defeated another player. However, it was argued that this type of scoring system would drag attention away from the item economy, by putting the focus more on the combat than the items. The next idea was the king of the hill idea that was also considered for how a player should obtain items. It was however decided against again due to it being deemed too passive for the game. Finally it was decided that a new type of item would be introduced into the game. The new item, named “relic”, would be a collectible item that players would pick up and they would periodically be given score for each relic they possessed. It was argued that since direct confrontation was not necessary to win, players could try and get more powerful items once they picked up a few of these score generation items. Having different paths to go, focusing on score or power, was also meant to encourage different playstyles.

The next discussion was regarding the map design. The team came up with four different versions for possible map designs (see Figure 33). The numbers represents the placement for different tiers of NPCs. The idea is that number one represents the most powerful and difficult NPC for players to fight but will in turn drop the best items in the game. At the opposite end are the tier four NPCs that are the easiest type of NPCs to defeat but also drop the weakest item. The first map (see top left map in Figure 33) was designed so that players would have more areas where they could fight NPCs and get items without being forced to fight more powerful players too often. The second (see top right map in Figure 33) was designed so that players would converge and fight near the strongest NPC so that they could get the most powerful item. The third map (see bottom left map in Figure 33) was divided into four areas much like the first map but instead of having all different tiers of NPCs in each area it would have only one tier of NPC in each area allowing weaker players to fight weaker NPCs in peace and become



more powerful so they could eventually fight the more powerful players that would be gathering around the tier 1 and tier 2 areas. The fourth and final map (see bottom right map in Figure 33) was designed much like the first map but having less designated fighting area. The team did not use any games as reference for these basic map templates, instead the team thought how they wanted the players to interact with the NPCs and other players. The templates were primarily used to as a tool to help the team think how the game will play out depending on how the NPC areas were placed.



**Figure 33** Four design templates that was used when considering how the map should be structured. The green area with the “S” showing the spawn area for the players and the numbers showing spawn areas for Monsters of different tiers.

It was decided however to postpone the actual construction of the maps until a later time since the map visuals and functionality will differ depending on what mechanics that are implemented. Another discussion point was a potential problem with too large maps. If the map was made too big the players might feel the travel time between some places to be far too long. However, the team agreed that removing large maps because of this was a bad idea and instead introduce a way to decrease travel time on large maps. That discussion ended with the addition of a teleportation devices that would allow players to travel long distances across the map in the blink of an eye. The teleportation device was never implemented for reasons that is discussed during the results chapter.

Players would undoubtedly fight each other and NPCs, and because of this take damage from other players or NPCs attacks. The next discussion was in regard as to whether or not players should be able to heal themselves between each fight. It was argued that players should not be able to heal themselves or at least should only be able to heal a small amount of health. The argument was that if a player has a few successes they have more time to become stronger and therefore will win even more battles. The losing player will not need to heal since he lost and is returned with full health, after a time penalty where the losing player can not interact with the game. This means that the one that needs to heal will most likely be the winner of the battle. Because of this it was agreed that if no healing was available the weaker player would eventually be able to defeat the stronger player.

The next discussion was about the number of items each player should be able to have at any given time. A humanoid character was decided to be used, the following slots would be used for the items: main hand, off-hand, boots, armor, and helmet. The left and right hand could be combined to form a new slot that would be called the two hands slot. The armor was going to be placed so it covered both the chest and legs of the avatar. A novel idea was presented in the form of a pet slot, the pet slot was intended as the players ultimate ability, meaning a strong ability which has a long cooldown before it can be used again. The pet was also meant as a vanity slot where the player could customize the pet mesh and skin in order to increase the players affection towards their avatar and their pet. After the discussion seven item slots were confirmed, meaning that the player was going to have seven abilities available to use at any given time, if the abilities were not on cooldown. The pet slot would however never be implemented due to time constraints, but would be considered a part of the final concept in the result chapter.

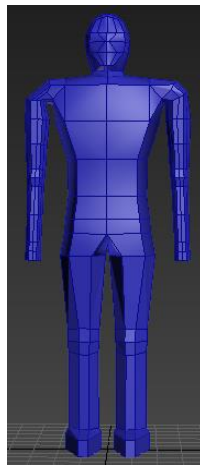
One of the last discussion of the week was about the two hands slot. One of the team members thought that player should be able to wield heavy two-handed weapon such as a longspear or greatsword with only one hand. This suggestion only required restrictions to the 3D model for the items that would be placed in the two hands slot. After some discussion this was expanded into an animation sequence where the avatar would put away his two one handed weapons and pull out his or her two handed weapon. This animation was never completed as the team decided it would take too much time to implement. This would impact the game mechanics of the game forcing the player to either use their powerful two handed weapon or two one handed weapons. There were also discussions regarding if the power of the two handed weapons should be more powerful, in return they should also be more difficult to use. An example could be that a greatsword might have a larger swing arc but is slower to use. You were to be able to swap between using either using main and off-hand or the two hands slot, a swap delay was also discussed but would never be implemented.

### **5.1.3 Week 3 - Researching Tool Capabilities**

This week the focus was on examining network possibilities and animation. The team looked up the basic ways of communicating using the built in network framework for Unity and the different options for animating a character. Because the game was meant to be possible to test over network the team also examined how other games handled network delays, and possibilities to simulate network delay to be able to test the game easier.

There was a built in network emulation system in Unity, however it was poorly implemented, unsupported and did not even seem to work. After researching and testing several different programs the team settled for Network Emulator for Windows Toolkit, due to the ease of use of the application. However, the tool could not emulate network traffic from and to the same computer, this would mean that the game would have to run on two different computers to be able to test how it would run if having a normal network latency.

Only one in the team had any prior experience with 3D modeling, and that was two years ago and only for a brief time in Autodesk Maya and not in 3D Studio Max. Because of this the team expected the time required to animate and port the animations to Unity would take the entire week or longer. In 3D Studio Max there existed two tools that allowed the team to easily create animations for humanoid characters (see Figure 34). These were the CAT animation tools, which had a wide selection of premade bone structures, and the Biped animation set that had a humanoid skeleton premade. Among these it was easier to find good tutorials on Youtube regarding how to use CAT animation rather than Biped animations. Quick Google searches regarding CAT animation and Unity however showed that some people had problems with CAT animations. In the end despite the potential problems of using CAT it was chosen as the main method of animating the players avatar.



**Figure 34** *Screenshot of the avatar from 3D Studio Max*

Another feature that was needed in animation was the ability to have clothes and armor naturally follow the movement of the body. Since the item was going to be changeable on the avatar it became important that it was possible to add and remove skinned meshes from the avatar, skinned meshes being a model which is transformed with the skeleton. Because then one can simply use the same bone structures for the avatar as for the clothes and they will both be animated at the same time. This proved to be an enormous hurdle that would take several weeks before even showing signs of working. One of the reasons for this was the poor documentation regarding skinned meshes and how they worked in Unity. Another was the difficulty of debugging the code which did not always have very useful error messages or values when something was wrong. From the pre-study week the team decided upon several important design goals and design principles as well as important game mechanics that was going to be implemented during the span of the project.

### 5.2 Design Goals and Principles

During the pre-study the team researched other MOBA games, articles and papers. From the pre-study the team decided that the game should be developed with certain goals and principles in mind. Some of the MOBA games such as League of Legends

and Defense of the Ancients were known to the team before the thesis. This might have had influence regarding some of the choices made.

### 5.2.1 Stop the Leader

People should be encouraged to attack players who are leading. An example of a game with stop the leader mechanic can be found in the Mario Kart series. Mario Kart is a racing game where players is able to grab so called “pickups” on the racing track. One of these pickups is the blue shell (Wikia, 2009), the blue shell will when used seek out the leading player. If the blue shell hit a player it will cause the player to get knocked into the air for a short duration and have his or her speed greatly reduced.

#### *Motivation*

The idea is to give people who are behind a chance to catch up. This is also meant to create a more interesting game both for the leader, who will have a too easy game otherwise, and the ones who are behind, who will feel they still have a chance.

#### *Potential Problems*

If not balanced correctly a game could be too even, and it could feel pointless taking the lead as it will not matter how well you play.

### 5.2.2 Perfect Imbalance

All options must not be equal in potential usefulness. An example of this is Defense of the Ancients where the heroes often introduces new mechanics that have large impact on the game, shift how people play and the setup of the heroes they use.

#### *Motivation*

The idea is that the game should play out different each time by having the players use different strategies, to counter the strategies of the opponent. There should be several viable strategies, meaning that the opponents will not play the same way every time.

#### *Potential Problems*

If you design for imbalance there will of course be the problem of a not completely balanced game. When two players are playing against each other one will most likely have the upper hand, which could result in the player with the disadvantage feeling that the game is not fair. Having enough options to create the imbalance will also most likely increase the complexity of the game, making it more difficult for beginners to see what the best options are and how to counter different strategies.

### 5.2.3 Skill Equals Power

Every action should require some degree of skill in order for it to be useful, meaning you can be awarded for having for example good reflexes, good aim or quick thinking. The actions can be fairly easy to execute, but should always be more powerful if used

correctly. An example where skill equals power would be Bloodline Champions or Warlock, where your damage output is directly connected to how quickly you react and how well you aim.

### ***Motivation***

When skill equals power the player can be certain of one thing: the outcome of the match is determined by the players actions. Player are encouraged to train and become better at using the game mechanics to his or her advantage and they can only blame themselves or their team when they lose.

### ***Potential Problems***

As always when you make games which requires skill you will be excluding potential players. If the skill affect the game heavily this could mean that the person with for example the best reflexes always will win.

## **5.2.4 Minimize Complexity**

Any game mechanic introduced must not contain unnecessary complexity. The players should be able to understand what the abilities do by using them, they should not have to read a text about their effect. Tetris (Bullet-Proof Software and Nintendo, 1989) is an example of a game with low complexity. In Tetris the player is given a piece, which can have different shapes, that falls from the top of the screen and moves towards the bottom. The player must try to fit the piece so that it forms a row together with the other pieces. The player is only able to rotate the block while it falls and see the next block that they will receive.

### ***Motivation***

If a player has difficulty when determining the rules of a fast paced game they might make bad decisions that could have been averted if mechanics were easier to understand.

### ***Potential Problems***

If the mechanics are too shallow the game might become boring, as the optimal choice is easy to discern.

## **5.2.5 Player Uniqueness**

At a given time preferably no player should have the same options and capabilities as any other player. When both players are different compared to other players they will have to adapt their own playstyle against that of their opponent, this is meant to create a more interesting experience. In Defense of the Ancients and Dota 2 whenever a player picks a hero that hero becomes unavailable for the other players, because of this each match will never have two of the same hero.

### ***Motivation***

If no player have the same capabilities each match can become more interesting as each player will have a unique way of playing, forcing the other players to adapt his or her playstyle.

### ***Potential Problems***

If players do not have the same capabilities it can be very difficult to make a game balanced, in worse-case scenario the match will be unbalanced and boring.

## **5.2.6 Not Getting What You Want**

The idea to not always provide the player with what they want in the game builds mostly on creating a desire to advance in the game. This is also connected to creating conflicts and making players unique by have limited resources in the game. A game that uses this principle is World of Warcraft where the items are randomly generated from a set of items for a specific type of enemy, meaning that a player has only a certain percentage chance to get what they want.

### ***Motivation***

Limited resources will mean that all players cannot get what they want, which will create conflicts over the available resources. The limited resources is also meant to force players to utilize resources they might not initially want, to get the resources they do want. The lack of resources will lead to resource races where players will compete for the best resources due to not wanting them to fall into the hands of the enemy.

### ***Potential Problems***

It may be difficult to find the right balance between giving players what they want and denying them what they want. If the players gets too few resources they want it is possible that they will dislike that game and feel like they never accomplishes anything, and if the player gets what they want all the time the game runs the risk of becoming stale and boring.

## **5.3 Game Mechanics for Creating Unique Experiences**

There were several mechanics considered where the ideas were to create unique experiences in the game, following is a list of the mechanics explored.

### **5.3.1 Finite Item Economy**

There exists only a fixed amount of items during any specific game session. This amount should never be changed during the game session, but can be changed in between. Examples of games with this kind of economy can be found in the Background chapter when discussing Games With Relevant Concepts.



### ***Motivation***

Making players adopt different playstyles by having limited number of items. This means that even with time not every player can have the same items, as long as the item economy is balanced after expected number of players.

### ***Potential Problems***

When not everyone can get the same items there is a large risk of developing content that few players will experience. Balance becomes a big hurdle here since having too few items will cause frustration for players never finding any items. On the other hand having too many items will cause the finite part to cease to be visible since everyone can get everything due to abundance of items. If there are not as many players in the game as the game is designed for the players might end up with a surplus of items.

In competitive games running over a longer period of time a finite economy risk encouraging an escalation of time spent to obtain and keep the top resources. A developer should have this in mind when designing a game with finite resources.

Another problem that could arise is lack of resources, if players are allowed to hoard resources. This is of course only a problem if the player has a large or infinite storage space, and there is no way of losing resources. Having a finite item economy also created another problem when a player that collected items then quit the game. This is problematic when the game never ends as in many MMOs, unless the items can somehow drop or become available again when the player rejoins.

## **5.3.2 Resource Shortage**

A limitation on finite game economies; when there is a great abundance of resources in a game the players will never experience that they are finite. By providing only a small amount of resources it greatly increases the value of those resources. Most games implementing a finite economy also have resource shortage, as it help create an interest for the resources.

### ***Motivation***

The main reason for using resource shortages is to make sure that there are very few of the most powerful resources in the game. This will create tension as the acquisition of such a resource will deny the opponent the resource as well as making the player more powerful.

### ***Potential Problems***

It can be difficult to balance the right number of resources when creating a resource shortage. If the player have too few resources it will slow down the game and frustrate the player.

### 5.3.3 Forced Resource Dropping

This concept is tied to having a finite economy, as without any resource dropping players can forever hold on to a resource once they get it. Examples of games with forced resource dropping can be found in the Background chapter when discussing Games With Relevant Concepts.

#### *Motivation*

Resource dropping is one of the easier way to handle the resource hoarding problem described when talking about finite item economies. By allowing players to take resources from other players the economy will never come to an stalemate due to one player hoarding all the resources. It also makes it less interesting who get a resource first, and instead put focus on being able to hold on to a resource.

#### *Potential Problems*

Depending on how difficult a resource is to obtain, and how easy it is to lose that resource, there is a risk that players will not try to obtain it since the frustration of losing the resource combined with the difficulty of getting the resource.

### 5.3.4 Power scaling

Power scaling is about having the statistics or strength of the players capabilities increase during the gameplay. Traditionally used in early RPG such as Final Fantasy or Dragon Warrior where a character usually used a special type of item such a only swords or only lances or only bows. In these games the further into the game the more powerful versions of that type could be found. Power scaling is useful to display growth and give the player a feeling of progress.

#### *Motivation*

Power scaling can when used right visualize character growth. Usually when the player starts they are weak and the game often points that out in order for the growth be shown more easily. Player will slowly grow stronger and when they reach the end of the game they will find that the enemies that were once strong are now weak compared to them. This can give the players a feeling of accomplishment as they can clearly see how much stronger they are.

#### *Potential Problems*

With power scaling any game session might end up with a snowball effect, one player becoming more powerful because he already is powerful. This is commonly used in MOBA games to different degrees: one player killing another will gain advantage while the losing player will get a disadvantage. This is related to the problem of feeding, a feeder being a player who either willingly, or unwillingly, causes his opponent to gain power at a faster rate than the opponent normally would be while not gaining as much power him- or herself. This could mean that when facing an opponent for the first time who is of equal skill to the player the opponent could still have the advantage because other team members acted as so called feeders.

### 5.3.5 Locked Item Slots

A item slot represents the possibility to carry one item. If the slot is locked that means that only items that belong that specific slot can be placed there. As an example, if there are the slots upper body and lower body and the items shirt and pants, the shirt is locked to the upper body slot and pants locked to the lower body slot. This means that the player can not place the shirt at the lower body slot and vice versa for the pants and upper body slot. In World of Warcraft the player has 20 locked item slots such as legs, chest, and shoulder.

#### *Motivation*

A strong reason for locking item slots is to remove the need to make everything balanced with every possible combination of items. An item slot can have a specific purpose, making the game easier to balance.

#### *Potential Problems*

One of the more obvious problems is the fact that this severely limit the number of combinations of items a player can have, from  $XY$  to something like  $(X / Y)Y$ , where  $X$  is the number of different items and there are  $Y$  item slots. This would mean if there are 18 different items and six item slots the game would go from 34 million combinations to about 700 combinations. Even if most of the combinations are not viable it would still mean that many emergent gameplay elements will be lost due to restricting the players.

### 5.3.6 In-game Ability Switching

One of the core mechanics is the possibility to switch abilities during the game. Allowing players to switch abilities encourages changing strategies during the game, to counter the strategies of the opponents. In Path of Exile the players characters are given gems that grants the player new skills and abilities, these gems can be removed and added again or changed to a new item.

#### *Motivation*

In traditional MOBA games abilities are fixed on a certain hero making the initial decision very important since it is possible to pick heroes with a set of abilities that can counter the abilities of a previously picked hero. Instead of having to switch hero only in between matches and being in severe disadvantage during the duration of an entire match the players should be able to counter an opponent's strategy after the game has started.

#### *Potential Problems*

By allowing players to switch abilities during a game it becomes very difficult to predict the abilities of an opponent. In traditional MOBA the abilities are tied to a specific hero so it is very easy to connect a certain set of abilities to a specific hero since they can only be found on that hero.

### 5.3.7 Non-Player Characters

Non-Player Characters (NPCs) are controlled by the game and can interact with the players. In all classical MOBA games there exists computer controlled characters that will attack the enemy faction along the lanes they travel.

#### *Motivation*

Non-player characters is helpful when a developer needs the player to invest into a fight. Since the NPC is not another player the rules that are enforced on the players can be broken and remade without fear of making the game unbalanced. This can be used to create fights that are both very easy or very difficult for the player to beat. A suitable reward can then be distributed for the players upon success. NPCs can also create interesting situations in a multiplayer environment, as players can interrupt battles with NPCs and use them to their advantage.

#### *Potential Problems*

It is very difficult to make an NPC battle as interesting as a player versus player battle. NPCs are also prone to be easy to abuse in a complex game, that is fighting them in a manner which was not intended. This problem can potentially change the dynamics of the game if the developers are not careful.

### 5.3.8 Score Generating Items

Score is commonly used to guide the players in a game, or as a clear indicator who is winning. In this case holding specific items generates score over time. One game that used this was the Nintendo 64 game GoldenEye 007 (Rare, 1997). In one of the multiplayer modes the players had to find and hold a flag a certain amount of time before they won. When holding the flag the player could not defend themselves in any other way than running away. When killed the player would drop the flag upon the ground.

#### *Motivation*

The idea here is to create additional conflicts between players. By adding additional rules the dynamics of the game can greatly change. All player will have to find and hold one or several of these score generating items or they will lose.

#### *Potential Problems*

If score generating items is the only way to obtain score then the player currently generating most score have no motivation to fight, and might as well try to play as passive as possible. The score generating items also need to change owner in some way, for example by item dropping. However, if all score generating items drop they might all quickly gather at one player and then move on to another player once the carrier lose them.

### 5.3.9 Multiplayer

Multiplayer is one of the core mechanics in the concept. By adding multiplayer to the game each game will be different, as no player is able to play the exact same way as another player.

### ***Motivation***

By using human opponents the idea is that no match should be the same as the previous. If the rules are not too simple and the actions you take are not too easy to execute you should rarely experience two games which play out the same way.

### ***Potential Problems***

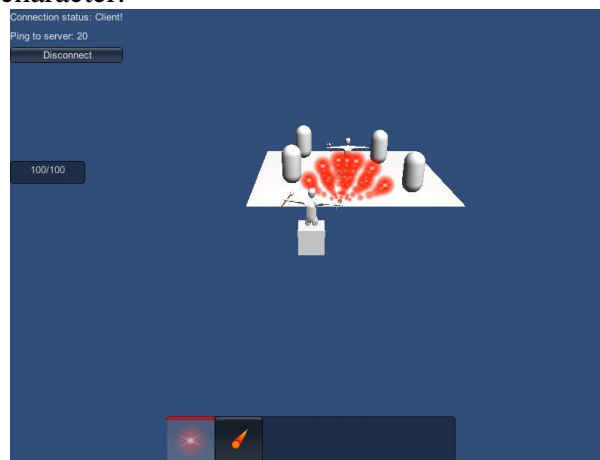
While human opponents are capable of adding tension and depth to a match, human players are very different from one another. This can create unbalanced matches that are very boring for both parts since the better player will not face any interesting competition and the weaker player will have a far too tough opponent. You will also need one or more players to play against, or you cannot play the game at all, if the game is solely built around multiplayer.

## **5.4 Sprint 1**

After three pre-study weeks the implementation of Project ENORM started. The goal for the first sprint was to build a basic skeleton structure for the game with core mechanics such as: movement, health, abilities, camera, network, items and for the players to be able to swap item lying on the ground.

### **5.4.1 Week 4 - Basic Game Mechanics**

The team started implementing the basic rules such as: control scheme and cooldown for the abilities in the game. Two abilities were added to the game: Magic Missile and Fireball (see Figure 35). The Magic Missile would shoot several small projectiles in the shape of small red orbs that would seek out the nearest opponent. The Fireball was a projectile with a fire-looking particle system that would travel straight and explode if it hit anything. The abilities were shown in a Graphical User Interface (GUI) with an icon and the cooldown remaining before the player could use them again. The abilities used the built-in particle system of Unity to be more distinct and fun to use. At this stage a player could walk around in a network game and try to destroy other players using the two abilities. At this point the abilities would originate from the position of the item held by the player's character.



**Figure 35** Screenshot from an early network test where the player is using the Magic Missile ability

For development to be easier the team decided on using the International System of Units (SI-units) (BIPM, 2013) for variables in the game to have consistency and ease for calculations.

It was discovered in the previous week that skinned meshes would not be easy to port from 3D studio Max to Unity, it was still considered very important however as the team believed that lack of animations for a humanoid character would bother the testers and distract them from the test. Therefore this entire week was spent working on creating a human model, skinning said model to the CAT bones and animating them and finally trying to import them in Unity and get them to work. Some of the more problematic errors were for example the skinned meshes after being visible in the editor disappearing at runtime and never becoming visible again even after restarting Unity. Another problem was the skinned mesh getting stretched out from the avatars position to the worlds  $x = 0$ ,  $y = 0$  and  $z = 0$  coordinates. Once a model and idle animation was in place there was a quick stress test to see how many skinned meshes that could run on the screen at once on a low-end gaming laptop, to see if the approach could be used with several players on screen.

### 5.4.2 Week 5 - Extending the Basics

Two abilities were added this week, the Ice Spike and Lightning Trap. The Ice spike would send out a projectile, and if the projectile hit an opponent it would slow that opponent's movement speed for a short duration. The Lightning Trap is a created from the idea of a thundercloud sending down a lightning strike and stunning the first enemy that would step near the cloud. However creating such a thunder effect would take far too much time for the team at this moment, instead the ability simply created a colored sphere that would slowly grow into a fixed size and stun the first opponent that entered the field.

Physics was added to make it possible to create more variation in the abilities, for example pushing abilities and the possibility to block players.

Unity has a very powerful animation tool called Mecanim that allows the user to easily blend two animations together. This allows the user to smoothly let the animation transition between run and walk, making it look fluent with very little work from the animator. The first set of animations however was never completely set up in Mecanim, causing the model to perform the first animation endlessly. The reason for never completing it was due to the fact that the animations was going to be remade. This was because the animation was choppy and in many cases looked bad when being blended in Mecanim.

### 5.4.3 Week 6 - Polishing Basic Mechanics

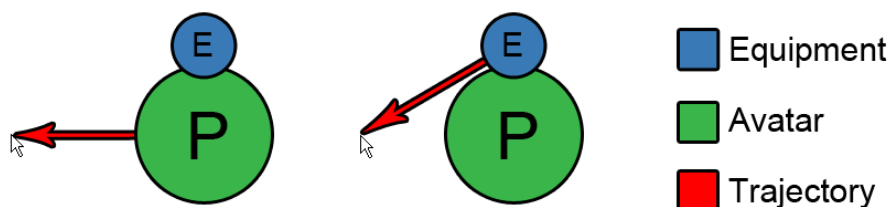
Projectiles from abilities were destroyed after a certain amount of time, this combined with their speed meant that they only traveled a certain length before disappearing. This became a potential problem if two player were fighting. If the first player keeps running away while the second player chases the first player, then the first player will run away



from the projectiles and the second player will run into the projectiles. This means that a running player might be out of the chasing players attack range while the chasing player is within the attack range of the player running away. To counter this problem it was decided that player would have decreased movement speed if they did not face the direction they were running at. Meaning that if they wanted to run away while attack another player they would be slowed down allowing the chasing player to catch up.

The discussion about the two hands slot came back up during the week. The reason it was brought back up was due to one of the team members wanting the two hands slot abilities to contain two abilities since it was decided that the players would be time-penalized by being unable to use abilities while the player was switching abilities, causing them to become vulnerable for a short duration. The reason for this penalty was to force the player to pick between using two weaker one handed weapons and the more powerful two handed weapon that always would carry some negative aspect when being used. The original discussion was only to let the abilities on the two hands slot have a single powerful ability. The counter argument was that by giving the Two Hands slot two abilities it would become too similar to the two one handed slots if the abilities were made weaker or that it would make the one handed slots too weak if each ability on the items on the Two Hands slot were made more powerful than the one handed items. It was discussed if items on the Two Hands slot should have a chargeable ability instead. By pressing and holding the attack button the ability should charge, the longer the player would charge the ability the more powerful the attack should be, up to a limit. In the end none of the suggestions were accepted by the rest of the team and the original idea was left intact.

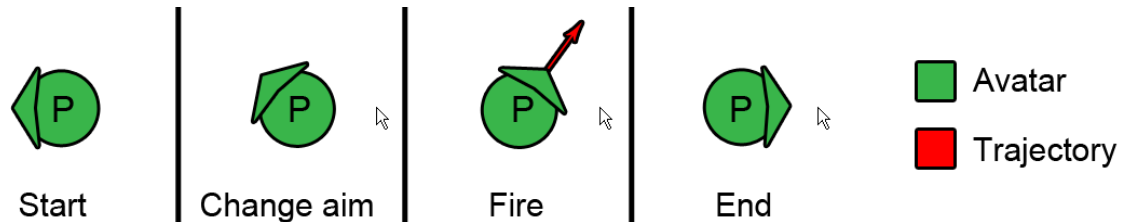
While on the discussion on abilities another discussion took place regarding where the effect, such as projectiles, of an ability should spawn when used by a player. There were two options that the team discussed. The first was to create the ability in front of the item itself and this was also the way abilities worked at the moment. This has the advantage of it giving the feel that the item is actually using the ability. However, this creates a problem when aiming towards the mouse position the projectile will not go straight (see Figure 36). This was an undesirable effect as it was confusing. After some consideration it was decided that the projectile should be created in front of the middle of the avatar. This way it will always go straight since the avatar will always be rotated towards the mouse position.



**Figure 36** *How the effect of an ability moves when originating from the avatar (left) or the equipments location (right).*

At this stage it was decided to skip having a noticeable turn speed for the player. There were unexpected behavior arising when moving the cursor quickly and firing an ability, making the ability go towards neither the last cursor position or the new one, but in between (see Figure 37). This was not something one would expect in a game in which

quick reactions are important, since forcing the player to wait for his or her aim to change before firing goes against the player's twitch reflexes. It was considered to wait until the avatar aimed towards desired position before firing, but decided that this would create an unexpected delay instead.



**Figure 37** Showing the problem arising when changing aim and firing quickly, when rotation takes time.

#### 5.4.4 Week 7 - Ranged Ability Set

Instead of seven abilities it was decided that only six abilities would be used for the prototype. It was discussed that the pet abilities would take too much time to implement, without changing the gameplay proportionally to the time required to implement it.

The first set of abilities was finalized this week after a discussion. These abilities would be the abilities developed the previous weeks, additionally Laser and Dash. For more information regarding these abilities see Appendix I – Prototype Item List.

Previously the Ice Spike and Lightning Trap had their slow and stun hardcoded. This week a new mechanic was created in order to streamline such mechanics as slow and stun, this mechanic would be called modifiers. The modifiers would alter variables of the player during certain conditions. As an example: the Ice Spike will add a modifier to an opponent on hit that will slow the opponents movement speed for a short duration.

More decisions regarding the score mechanics and the victory conditions were made. Each map would have a fixed number of so called relics on them. A relic is an item that does not require an item slot in order to be picked up. The relic can be picked up by a player simply by walking near it, there is no upper limit as to how many relics a player can have. When a relic is picked up it starts to generate score for the player who picked it up. If a player is killed all relics that is carried by he or she will be scattered across the map. The more relics a player had when he or she died the further would the relics scatter from his or her position. The relic mechanic was not finished during this week.

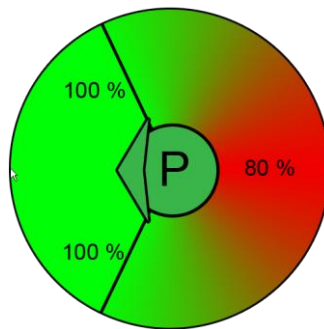
#### 5.4.5 Week 8 - Alpha Version

The first user test, which was called the Alpha test, was scheduled on the Wednesday eight weeks into the project. The time before Wednesday was spent on preparing questions for a semi-structured interview, and polishing current mechanics of the game. There was a mechanic that was never finished from last week that was deemed necessary for the test, the relic mechanic. This mechanic was finished before the test, but due to time constraints there were no time to implement any victory conditions.

Instead it was decided that during the test an arbitrary score, which would set during the test, would grant victory to the first player who reaches the goal and the game would manually be aborted at that point.

Before the test the most important mechanic to polish was the item balance, to try and make sure that some abilities were not too powerful.

Back in week six it was discussed that players should be slowed down when walking backwards, that mechanic was however not implemented until this week. If the player was aiming in the opposite direction of the walking direction the player would have an reduced movement speed (see Figure 38). It was designed in such a way that it should not be too noticeable or too limiting, as in smaller tests it was noted that it was annoying having to aim directly towards the target since players were forced to aim where the target was going not where the target were at that specific time.



**Figure 38** Showing how a player's movement speed is affected by the players aim, if a player is moving backwards he or she will move at 80 % of maximum speed.

### 5.4.6 Alpha Test



**Figure 39** Image used for advertising the Alpha test event.

Before the Alpha test the game had only been tested within the developing team consisting of three people. During the alpha test there were six people playing the game, no one from the development team played during the test. The testers were students from Chalmers University of Technology and Luleå University of Technology (see Figure 40), who had signed up for the test through a Facebook event (see Figure 39).



**Figure 40** A picture that was taken after one of the scenarios.

Three different test scenarios were performed using a map consisting of a plane and some rectangular blockades (see Figure 41). In each scenario there were different availability of items. After each scenario the testers were divided into two groups. Two arbitrarily picked tester would be chosen to be asked the same questions as the group, but without being able to hear the responses from others. The rest of the group would all be asked the same question as the single testers, but would be allowed to discuss the question with each other. The reason for this was that the team hoped that by allowing people to discuss the questions the tester could uncover more mechanics that might be missing, and the reason as to why two of the testers were questioned alone was to see if their answers differed in any particular way. The team tried to formulate the questions that were asked so they were not leading questions. The questions were mainly to discover any apparent flaws in the basic gameplay of the game.



**Figure 41** Staged screenshot from the Alpha test version.

### 5.4.6.1 Scenario 1

In this scenario only the lowest tiered items, tier 5, was available to the testers. The testers could not change the items they started with. After the scenario the following questions were asked:

- What was your opinion on the abilities?
- What was your opinion on the speed of the game, was it too fast or too slow?
- Was there any game mechanic you felt were missing?

### 5.4.6.2 Scenario 2

In this scenario there were only available middle tiered item, tier 3. The players could not change the items they started with and could not drop items. After the scenario the following questions were asked:

- What was your opinion on the abilities?
- What was your opinion on the speed of the game, was it too fast or too slow?
- What was your opinion on the abilities compared to the previous test?

### 5.4.6.3 Scenario 3

In this scenario the players started with lowest tiered item, but there were item of all tiers spread out across the map for the player to pick up. After the scenario the following questions were asked:

- What was your opinion on the abilities?
- What was your opinion on the speed of the game, was it too fast or too slow?
- What was your opinion on picking up item?
- What was your opinion on dropping item?

## 5.4.7 Result and Reflection

When the testers were asked what they thought about the abilities they said that they enjoyed the different types of items that were available, but thought there were too little variation. It was discussed before the test that the game needed a great amount of items

available so that the players could have more variation in the fights, this test reinforced the initial thought that this was true.

One of the problems the testers described was that the game world was too large and empty. The testers liked that the Fireball ability could push people around, this was enjoyable and since the arena visually was above the clouds some of the testers asked for ways of pushing people off the platform, which would result in a very large change in the map design. Instead of a flat plane it was decided that people were going to fight on smaller islands connected by bridges. These small islands and the small bridges would give ample amount of opportunities for players to knock their enemies off the platform.

During the testing a bug made it possible for the tester to equip either two Lightning Traps or two Dash abilities. Because of this the testers all tried to acquire two movement abilities. The players who got the double movement abilities said they enjoyed it, but this made it impossible to have any fair fights since the testers with two movement abilities could easily escape at any time. Overall the game got too passive because players could escape as quickly as someone could hunt them, though people enjoyed the high mobility. It was decided that the mobility ability should not move they players further away from the opponent, but work well when moving towards the opponent. This decision made the team split the Dash ability into two separate abilities: one with a shorter range similar to the one which was tested, which should be used for dodging, and one firing a projectile which will move the player only if they hit a character.

Another problem that the testers mentioned during the questioning was that the testers had a hard time finding the leader. The team knew that this would be a problem since the mini-map, that would fix the problem, had yet been implemented. Most of the time the players who was gaining the most score ran and hid in the corners of the map. The testers, during the interview, requested some kind of mini-map to show where the other players were in the game. There were a few ways this mini-map could work: simply creating a mini-map that would show all the players location on the mini-map; showing nearby players; arrows pointing towards the players with most score or relics; show special icons, for example a gold, silver and bronze icon, for the three top players on a mini-map. The team decided upon the last mentioned approach after arguing that no one would be interested in the player in for example the seventh position, except when that player was carrying several relics. Because of that extra case it was decided that relics would be shown on the mini-map and the relic icon would be become larger if several relics were very close to each other, such as when picked up by the player. This way it became possible to track the leading players and the point generating relics. Only showing the top players was meant to give the other players a chance to catch up.

Toggling between two weapons and two handed weapons was confusing and cumbersome according to the testers, which meant barely anyone used the two handed weapon. The two handed weapon being too underpowered also contributed to this. The game was very fast paced with new player being forced to learn five abilities plus the two handed weapon at once, and the additional requirement to press a button in order to switch weapons might have been too complicated for beginners to fully utilize. Since it



was so complicated to use it was not worth using, even if the fireball allowed the player to greatly increase his or her damage output, it was not desirable due to its complexity reducing the overall damage output. It could also be that since the GUI did not visualize the switch in any way it became even more confusing whether the player had switched or not.

### **5.5 Sprint 2**

A mini-map mechanic was added and together with the NPC mechanic from the original vision these became the main focus of the second sprint. A team member leaves which makes the team have to re-prioritize and cut back on features, mainly graphics and sound.

#### **5.5.1 Week 9 - mini-map and NPC basics**

During the first week of the new sprint the team was reduced from three to two people. This happened because of the third member's examiner decided that the goal of this thesis was not applicable for that team member. As such the scope of the project was forced to be reduced by roughly a third in order for the rest of the team to be able to cope with the loss of the team member. The team thought that the most difficult part in the project were the graphical components, and the part which would hopefully affect the gameplay the least. In order for players to feel a connection through the visual style of the game the models, textures and animations needs to be of a higher quality than the team could provide at the moment and the team was very unsure whether or not it was possible to acquire the skills necessary to do so during the rest of the project. Therefore it was decided that the animations, which already had been proven to be difficult, would be left as they were in the current state. The graphical models would be designed much simpler than planned, and without textures.

A very early version of the mini-map was created which would show the top players and the relics. The team tested different methods of showing how many relics were at one location: drawing a bigger icon, showing a numeric representation, or a combination of the two ideas. In the end icons with a number showing how many relics a player had was concluded to be the best idea, as it clearly shown how many relics were at one position.

How the basics of NPC would work was discussed and added, such as aiming towards a player and attacking them using a projectile attack. The actual model for the NPC was created using simple cubes. The NPC is also given an item that is shown on top of it, which will drop onto the ground when the NPC is defeated.

#### **5.5.2 Week 10 - Mini-map and NPC Refinement**

During this week it was decided that much of the code was in need of refactoring, meaning it needed to be restructured to be more logical and manageable. This was due

to much of the code being added during the pre-study when the team was testing the Unity engine.

A new ability was added this week: the Absorbing Shield. The Absorbing Shield would create a barrier which would stay in front of the player for a short time and absorb damage from attacks until destroyed. The idea was that it should be able to counter a laser beam and provide more variation in strategies.

The NPCs were given a new name, mostly for the teams amusement: MOBILE Adversary, also called MOBA. MOBAs will still be referred to as NPCs to not cause too much confusion to the reader. The NPCs were also given a new attack behavior to respond to players abusing them being stationary. Since the NPCs were stationary the player could just walk into attack range, attack and then run away. To counter this behavior the NPCs would regain health if the attacking player ran away from its attack range. The attack pattern was however very simplistic and was easy to dodge. The team considered this a bad thing as this allowed player to kill the most powerful NPC from the start of the match and get one of the few most powerful items in the game. To counter this the NPC was given more health and a new attack. The new attack was an undodgeable attack that the NPC would use after a certain amount of time, which was set to be enough for the player to defeat the NPC if the player had sufficiently good items. The attack was a sphere that expanded quickly in all directions and did very high amount of damage to any player in the vicinity, but not to other NPCs as this would cause a chain reaction of NPC aggravation.

### 5.5.2.1 Spontaneous Test

The week before the next larger test, a smaller test was performed to see if there were any major problems that could be avoided before the bigger test. The test was done with two students from Chalmers, who happened to be available to play, and two developers. The first map prepared for the Beta test was tested, and got comments on the map being too big, which could be because there were only half the amount of players the map was designed for. It was also too easy to shut off bridges because the Lightning Trap duration was too long. Because the test was not prepared the players did not have any computer mouse for their laptops, it was somewhat difficult to play the game without a computer mouse since the game require high precision mouse movements.

### 5.5.3 Week 11 - Beta Version

The team had another discussion regarding the mini-map. With the addition of NPCs the group thought that a similar problem would exist in regards to how people should find the NPCs. It was decided that NPCs should be shown on the mini-map (see Figure 42) so that players would know where to encounter them. However, since it was also decided that NPCs should have random items when they spawned this would create the problem where it would not be easy for players to see what an NPC would drop. It was not possible however to add such information onto the mini-map since it would take too much space.



**Figure 42** *Cropped screenshot containing only the mini-map. The blue square representing the player, the skulls representing NPCs of different tiers, the circles items of different tiers and the stars are relics.*

To counter this a second larger “mini-map” was created. On this overview map the ability icon would be found on top of the NCP symbol, allowing players to quickly determine if there was a specific item that they wanted available. At this stage the finite economy for the items in the game would be designed: what items that could be spawned during a match, how often NPCs with an item would spawn, and how many NPCs could spawn during an entire match.

When an NPC is defeated it drop an item to the ground, but if no one picks up the item for a set time the item will recreate the NPC which will once again pick up the item. This was to enforce the players feelings that the economy was a finite economy. If the items would disappear the players might never experience the maximum number of items of a certain tier. Instead of NPCs being manually placed onto the map the map designer would place spawn points that would spawn certain tiers of NPCs.

Until now players had been respawning in the center of the map within a radius. This was not a desired behavior as it forced players to respawn very close to other respawning players. A respawn point was added and a player would randomly be assigned a respawn position every time they were defeated.

A new starting ability set was decided upon as well as added to the game, the melee ability set with the following abilities: Pushing Strike, a melee attack that would push back the opponent; Hook, which would drag an opponent that was hit to the player; Dash, which was a shorter range version of the original Dash.

New maps were designed to create scenarios where there were more possible ways for players to fall off the map, and to limit other players movement. Two smaller spontaneous test were performed before the Beta test, to find out if there was some obvious problem that had been introduced without the team knowing.

During the week the team implemented the changes made to the movement abilities. To make the movement ability stronger when approaching another player the ability used a projectile which must hit another player in order to move the user. This would mean that players cannot use the ability when running from someone, they would require another player nearby to jump to.

### 5.5.3.1 Spontaneous Test 2

A smaller test was performed with three testers from Chalmers University and one developer. The test gave the team an insight regarding NPCs and items: items turning into NPCs after a set time quickly made the map too covered in NPCs. This would happen because players would switch out tier 4 items for tier 3 or better, leaving the tier 4 item on the ground to respawn. Because there were no minimum distance between NPCs they could spawn next to each other creating gatherings of NPCs that would attack the player together. The power of the grouped NPCs was enhanced because of the slow from their attack, getting hit by one attack would mean that the player would most likely get hit by more attacks. This in turn meant that a single mistake would cost the player a lot more health than the team originally had planned.

### 5.5.3.2 Spontaneous Test 3

The test was done the day after the previous test. A test done with two testers that the team found during a so called gaming night, where people gather in the evening and play video games until late night. The testers were retro gamers who did not usually play MOBA style games. During this test, even though the time it takes for an item to go back to NPC form was increased, the problems from the previous test was still present: the NPCs crowded the map far too quickly. The players felt that the items was not very balanced and that there were too many buttons to use

### 5.5.4 Beta Test



**Figure 43** Image used to advertise the Beta test event.

The Beta test (see Figure 44) was done with an average of six people playing at a given time from both Chalmers University of Technology and Luleå University of Technology, with a total of 10 different players who came and left at different times. The testers were invited through a Facebook event (see Figure 43). Some of the testers from the previous test returned to play again. Two of the players were playing from home, they were also connected through Skype and could both hear all the other players as well as talk to them. This was done so that the online testers experience would be as similar as possible to the others. This time the group was not divided for the questioning between the different scenarios. The reason for this was due to the problem that the NPCs were far too difficult for the average player during the first scenario and needed

to be hotfixed before the next scenario could start. This meant that there was only one team member available for the actual questioning.



• **Figure 44** Staged screenshot from the Beta test version.

Three different maps were used in the tests: one large with obstacles, one small with obstacles and one small without obstacles. After each test the testers were asked the following questions in a semi-structured interview:

- What is your opinion on the map you just played?
- What is your opinion on abilities?
- What is your opinion on gameplay speed?
- What is your opinion on the number of items?

The test on the first map had to be stopped prematurely because relics got stuck beneath NPCs, which were too difficult to defeat. There were problems with NPCs respawning too close to each other, making them nearly impossible to fight due to fighting one meant to fight the entire group. After the first map was tested the amount of health the NPCs had was hotfixed to be about 60 % of the original value, and the game length was decreased by 30 % by reducing the total amount of points that was needed in order to win. The reason for the change was that people were unable to get a hold of the relics due to the NPCs and because the new map was smaller causing player to be unable to hold the relics for any significant time. After all three maps were tested the testers were asked:

- What game element was most the important to you?
- What game element was the least important to you?
- Was there a game mechanic you thought was superfluous?
- Was there a game mechanic you thought was missing?

### 5.5.5 Result and Reflection

The NPCs did not work as intended. When asked, all testers thought that the NPCs were too powerful and got in the way. The majority of players said that they tried to ignore the NPCs as long as they could because when they fought against even the easiest NPCs they almost always died. The game was balanced too much around people playing perfectly, one major reason for overlooking this was due to the development team knowing exactly how to behave to maximize damage output while minimizing number of time when an NPC hit them.

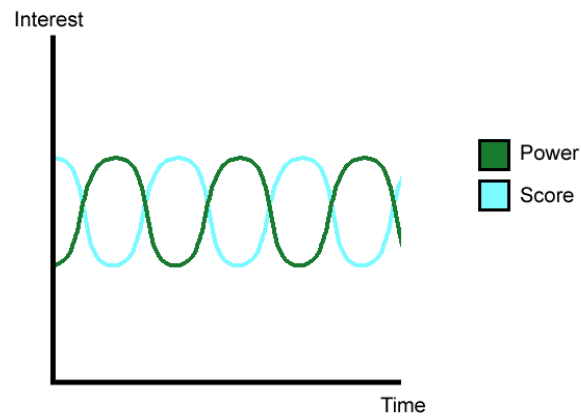
On the smaller maps the testers said that the NPCs were even more annoying since they were almost unavoidable. When the maps were smaller it was easier for other players to interfere with the players trying to acquire items by fighting NPCs. In almost all cases the fight with an NPC started with a player accidentally hitting the NPC with an attack, most often one of the two attacks which seeks out the nearest enemy. The NPC fights also had a timer ticking down that when reached zero started to use undodgeable attacks that once again increased the difficulty of an already very difficult fight. The area of effect of the undodgeable attack was so large on the smaller map that it was very difficult to avoid. The NPC reused the Ice Spike projectile as attack, this caused the player who failed to dodge an attack to have a higher risk of getting hit again since that the player now had the chill modifier applied to them, slowing his movement speed. Because of those issues it was not possible to see how the players would interact with the finite economy system that was now in place. This also meant that there were never any point in using the bigger overview map when playing, as the only new information that was presented there was the items, which the testers did not care about.

The current scoring system with relics did not give the desired effect (see Figure 45) on the game, testers said that they did not care about the items (see Figure 46). The relics took focus away from the items in the game and encouraged passive play, by hiding when a player had more relics than other players. The testers however did not feel that the relics were in the way. They said that the way the relics spread after defeating a player with many relics was annoying. The more relics a player had when being defeated meant that the relics flew further away from that point. The reason for this was to avoid one player getting a hold of all the relics after a single fight. This however did not work as intended since very often the relics would be spread so far away that they would fall down from the floating islands. If that happened the relics would be placed on the edge of the closest island. During the test when this happened it meant that relics could fly away from the victorious player but allow most of the relics to land next to another opponent instead, and would sometimes even be picked up by the player who was just defeated.

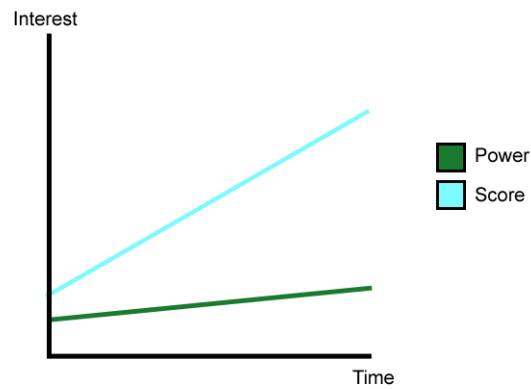
The relic mechanic was added for the players to be able to play in different ways, for example trying to get score instead of power or stealing relics from more powerful players. The problem with this mechanic was that there were two competing mechanics, power and score, which would be very hard to balance in such a way that it did not get uninteresting to change focus between them (see Figure 47). If score would be most interesting in the beginning, which it was in the test, you would be unwise to pursue power. If power was most interesting early there would come one point where score



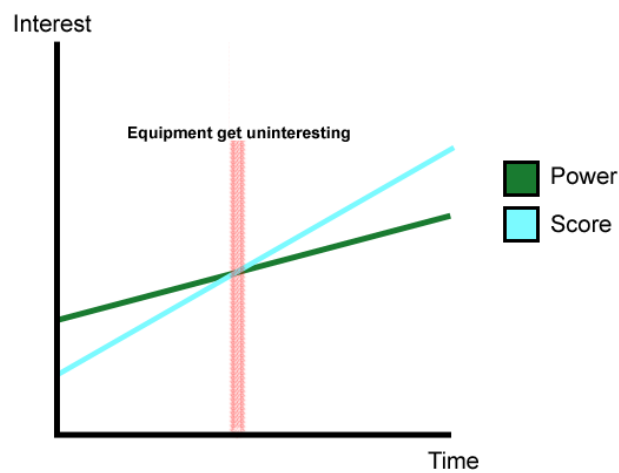
would be more interesting, since in the end the players want to win. Meaning that the most powerful items might never come in play.



**Figure 45** Graph showing the interest of power and score hoped for.



**Figure 46** Graph showing the interest of power and score which was observed in the test. Note that this is mainly to visualize the issue and not any measured values.



**Figure 47** Graph showing the breaking point where score will be more interesting and item will be disregarded, even with a more balanced system. Again, note that this is mainly to visualize the issue of what was expected and not any measured values.

This problem could not be solved by balancing, but would need one or more new mechanics to be added, so the team reflected if there was a better way to give score to players. The options discussed were: killing NPCs, killing players, per item over time, instant one-time score objects, items increasing score when picked up and lost when dropped. Because the idea was to put focus on the items in the game it was decided to go with item giving score over time and scrapping the relic concept. It was also decided to implement score stealing when attacking more powerful NPCs, or players with either better score or better items, to encourage players to engaging in difficult fights that they might not win.

Many of the testers said during the interview that they wanted some way to heal themselves after combat. While it might sound reasonable for players to want to heal themselves it might not be in the best interest of the game to allow it, as argued earlier when discussing healing that healing will almost always only help the better player, since that player is mostly likely the one who won. The reason for players wanting to heal themselves is most likely due to the fact that they are penalized upon death. Since players when killed actually lose power being defeated becomes something that the player wants to avoid at all costs.

The testers all thought that the unavoidable attack made by the NPC disrupted their gameplay. As stated before most of the NPC fights were initiated unwillingly when the players used the homing missile, which would automatically seek out the closest player or NPC, or accidentally hit the NPC with other abilities. However if the player did not run away and instead started to dodge the NPC attacks while fighting another player the NPC would eventually start to use the undodgeable attack. This became far too big of a problem and it was decided that the idea of a undodgeable attack should be removed.

For the players the NPC was in the way of the gameplay which according to the testers was to fight other players and collect score from relics. The team decided that the NPC implementation with the best of intentions negatively influenced the testers experience. However, since the team had the idea of fighting NPC as a very big mechanic of the overall game it was decided that NPCs should stay but needed to be heavily reworked.

### **5.6 Sprint 3**

The introduction of the NPC had left the testers with a negative experience of the game. If the NPC was going to stay as a mechanic in the game it would need to be reworked. This would mean new more interesting attack pattern, pathfinding and removing the undodgeable attack. Besides the NPC the score system needed to be reworked as well.

#### **5.6.1 Week 12 - Score and NPC Reworking**

The undodgeable attack was removed as it was decided that it was better to allow players to fight the NPCs in any way they wanted instead of punishing several players when someone uses a certain playstyle. Pathfinding was added the NPCs, so that they could chase players to make the fight a bit more complex and interesting. The NPCs

were also getting their own attack projectiles and a new melee attack they would use when in close combat.

A mechanic was added, if a player defeated an enemy that was stronger than him or her that player would be healed, depending on the relative strength between the combatants. If the enemy is weaker than the player, however, that player will not be healed. If the opponent was more powerful than the player when the opponent was defeated he or she would spawn a healing orb that would seek out the player that dealt the last blow. The team still thought that the argument that the healing was most beneficial for the players that was already winning was valid, however it became clear during both the Alpha and the Beta test that the testers wished for some way to heal themselves.

The biggest change was regarding how score was generated. Relics were removed and instead the items dropped by NPCs would generate score. It was also discussed whether or not killing a player should reward score and even further if it should steal score from the defeated player.

### **5.6.2 Week 13 - Artificial Intelligence**

This week continued to implement features that was started the previous week. The NPCs pathfinding was still being implemented. The pathfinding was based on Dijkstra's algorithm (Dijkstra, E. W., 1959), but after unexpected trouble when using the algorithm and optimization problems, it was decided that a third party open source version of the A\* algorithm (Hart, P. E. et al., 1968) would be used instead. With the A\* pathfinding the movement artificial intelligence was completed.

The GUI was changed in order to show power levels, which is a value used to determine how powerful a player is. Colors were also added to the names of NPCs and players to show if it was a dangerous or easy opponent relative to their own strength calculated by their items.

### **5.6.3 Week 14 - Pre-Final Version**

The test week was used to develop new abilities for the melee starting ability set: Hammer Throw, a projectile that stuns and then slows the opponent if it hits them; Mini Snare Strike, that causes a hit character to be stuck in the ground for a very small amount of time; Circle Shield, which creates several small shielding boxes that was placed in a circle around the player.

### 5.6.4 Pre-Final Test



**Figure 48** Image used for advertising the pre-final test event.

The team recruited testers for the pre-final test (see Figure 49) by creating a Facebook event (see Figure 48). This test was done about twelve weeks into the project. The test was performed with 12 people from both Chalmers University of Technology and Luleå University of Technology: six in one room, five in a room next to the first room and one person playing from home. There were several testers that returned from previous tests. The test was designed for around eight people, but five people showed up unannounced of which four participated, two of them shared the same computer and took turns playing. The extra participants were accepted as the team thought that they could just add another server and have two testing groups. There was however a bug which made the server list only able to show one game at a time, so all 12 players was playing a map designed for eight players meaning there were not enough items on the map. This also meant the games took much longer than planned. Due to the influx of extra players that was spread over two rooms it became very difficult to organize the entire test. In this test a questionnaire, that was created in Google Docs, was used. The reason for no longer doing interviews was to prepare for the final test, which was planned to be completely online without anyone from the team helping the testers. In addition to the questionnaire some testers were asked about their gaming habits, which varied from non-gamers to FPS and RTS gamers. The testers played two game sessions, one larger and one smaller map. Some of the testers that joined the test had to leave quickly and were unable to fill in the questionnaire.



**Figure 49** Staged screenshot from the pre-final test version.

These were the questions that the testers answered from the questionnaire:

- What is your opinion on the starting items?
- What was the least important element in the game?
- What is your opinion on the number of items in the game?
- What are your thoughts on the variety of items?
- Was there a game mechanic you thought was missing?
- Was there a game mechanic you thought was superfluous?
- What are your thoughts on the scoring system?
- What was your thought on the first map?
- What was your thought on the second map?

### 5.6.5 Result and Reflection

The players more or less played the game as it was planned for the game to play out, which was: players trying to stop the leader, trying different items and chasing specific type of items.

One of the goals was for the players to gang up on the leader. The leader would be the one with the most powerful items and he or she would most likely be capable of fighting several people at once. This behavior was desired in order for players to want that position of being more powerful than everyone else, acquiring such a position would hopefully make the player feel more unique and be the pinnacle of the match. This would also create different scenarios when player might both help each other and backstab each other to further increasing their power, and create interesting scenarios. Many of the testers during the test would loudly declare who the leader was and to attack the leader to stop him or her from winning.

Another of the goals was for people to chase their own favorite items. This combined with many different types of items would hopefully cause players to develop certain playstyles, and when people get different abilities they would get different type of fights due to the difference in abilities. The testers had different opinions regarding this, only some thought that it was important to get a hold of their favorite weapon while other picked up everything they could.

The testers reported that they had problems using the Lightning Dash and Rock Arena abilities, some testers thought that the abilities did not have any practical use. During the test it was noted that no one tried to use the ability in the way they were designed for. It was decided that these abilities should be dropped as a part of the starting items to avoid forcing players to use abilities that are more difficult to use. Instead the easier to use Dash was made the starting movement ability for each start set of abilities.

The effect of the score stealing was too strong, which meant it was very difficult for a player to win. This, together with the fact that there were too many players in the test, meant the game took much longer than planned. In regards to this the testers said that the game was too long and that they lost too much score when they died.

### **5.7 Sprint 4**

The NPCs were now a lot easier for the testers to defeat this time around. This could be because of the changes made to the prototype, but there is also a chance that this is because the player already had previous experience fighting the NPCs. Satisfied with that aspect of the prototype, this sprint was focused on adding the last set of abilities that the team would have time to implement. The last ability set would be called the specialist, which would be an alternative ranged set of abilities. In addition, a goal was to make the game easier to understand for people that had not previously played the game, to prepare the game for the public online test.

#### **5.7.1 Week 15 - Items and GUI**

With the core mechanics implemented and in acceptable condition the final sprint was very focused on adding more abilities: Off-Hand Cooldown Gun, which was a main hand weapon that when its projectile hit would reduce the current cooldown of the off-hand item by a set amount; Global Cooldown Gun, which was a off-hand weapon that when its projectile hit would reduce the current cooldown of the all the items by a set amount. During this week that the team started to write the report half the work days. Since the last test was going to involve outsiders, or rather people from different media sites that will be explained further below, that the team could not speak directly to it was very important that new players could understand how to play without any or very little contact with the team. Therefore the GUI was given extra time this week.

#### **5.7.2 Week 16 - Final Version**

The final week was mainly used to balance existing abilities and maps, fixing the starting screen GUI and preparing a questionnaire for the testers to answer. The team had several mini tests in order to iron out some bugs so that the game was as bug free as possible. The thesis was given half of the work time, except for the day of the test. A special map called Helpless Tutorial was created to help new players test the game before they played with other people. On the Helpless Tutorial map all tiers of all items were placed onto the map, and all tiers of NPCs as well as two computer controlled player characters, which would repeat a very simple movement pattern, so that new players could learn how to use their abilities.

### 5.7.3 Final Test



**Figure 50** Image used for advertising the final and final-final test events.

In the final test the goal was to use forum and other media-sites to try and gather as many new players as possible. The reason for this was that previous tests were only made with people from Chalmers University of Technology and Luleå University of Technology. In order to remove the possibility of biased opinions the aim was to have as many people from around the world as possible for the final test. To reach out to a lot of people at the same time three media-sites were used: Facebook (see Figure 50), Reddit and Kongregate. There were problems getting the players to join the game at the same time, so even though there were enough testers in total they all joined one at a time and left quickly due to there not being enough players to play a game. Basically the test succeeded in getting new random people to play, but the team had failed to realize there needed to be a base of players for the game to be possible to play.

## 5.8 Sprint 5

Due to the failure of getting enough testers to play during the last test this sprint existed simply as a mean to redo the final test in order to get feedback on the project.

### 5.8.1 Week 17 - Retesting

No additional work was made on the prototype for the second attempt of the final test. Since the previous test had failed it was important to have a test where players could give negative and positive feedback on the game, therefore a new test was going to be planned. For this test the team again tried to get more outside players by posting on same sites as last time, plus the Swedish forum Flashback. In addition the test was planned similar to the earlier tests, where there had been people from Gothenburg playing at the same location, in order for the new testers to have someone to play with. The posts on Reddit were never really noticed, and fell too quickly in the topic lists before anyone could notice them. Kongregate did not give much, probably because the game was no longer a new game. At Flashback the team got a discussion going, but people did not seem very interested in playing the game.



### 5.8.2 Final-Final Test

Overall in the final-final test (see Figure 51) there were only a few people that were not located in the same room as the team who joined during the test, and they all left rather quickly without saying a word. The team can only guess that they left because the game was too complicated, there was a lack of tutorial, or that the game simply was not their genre of preference. There is also the worst case scenario that the outside testers thought the game was bad, but as they did not leave any feedback the team can only guess. The people who did test the game in Gothenburg seemed to enjoy the game, even if the game required some explanation. In addition to the few anonymous testers overall there were 12 different testers of which half had not played the game before, but not all had the time to fill out the questionnaire. Two of the testers played from home and the rest played sitting in one room.



**Figure 51** Staged screenshot from the final test version.

The testers that were in the room with the team were asked to fill out a questionnaire online. After the test the players were asked to fill out a questionnaire with the following questions:

- What did you feel as the most important thing to do in the game?
- What was the least important element in the game?
- What was your opinion on the number of items that existed each game?
- What was your opinion on the different starting item sets?
- What was your thoughts on the scoring system?
- Could you describe the best moment in the game?
- Could you describe the worst moment you had in the game?
- Did the items you got vary between games?
- Any other comments?

### 5.8.3 Result and Reflection

The testers were mostly positive about the direction of the game, but they had problems understanding the score system. They said it was difficult to understand how the numbers were calculated and how the score was actually obtained. Currently scores are generated in intervals depending on the power level of the items the player carries. The score can only be seen if the player constantly watches the small scoreboard in the bottom right, something no player had the time to do. The player score stealing was also confusing for people since the values differed almost every time they killed someone. The reason for the player score killing to differ was in order to promote the “stop the leader” style of thinking.

A new way of displaying stolen score is needed to help players understand their path to victory, for the next iteration of the project. However several players thought that winning itself might not be as important in the game as the actual gameplay. This is something that might be worth checking out, the game might have potential as a more casual party style game than a hardcore skill game.

### 5.9 Final Weeks

The prototyping was now finished, and focus was put on documentation. During these last two weeks the thesis is finalized and a presentation of the project is prepared, additionally another two weeks were needed to really finalize the thesis.

## 6 Result

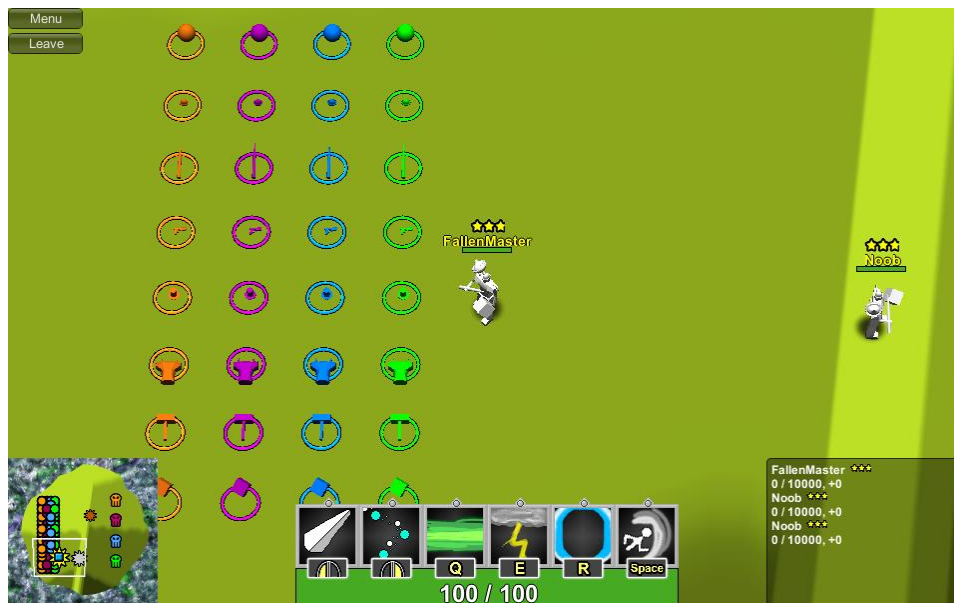
This project will have three important result regarding the exploration of designing games with a finite resource economy to create unique player experiences. The first part of the result will be a summarization of the functionality of Project ENORM. The second part of the result will be about the functionality that was in the concept but there were no time to implement. The third and final result is guidelines regarding finite economies, unique experiences and MOBA games.

### 6.1 Project ENORM

Project ENORM mechanically was very close to the team's vision of the final prototype. This chapter will list the features of the prototype and explain shortly how they work. This list will not contain implementation details unless it is necessary, or reasons as to why the features is included.

#### 6.1.1 Items

All items in the game has one ability and can only be placed in a certain slot. Each item exists in five different tiers, with only tier 5 not available in item form (see Figure 52). All items of a certain tier gives the player a fixed amount of power level that when summed up will be displayed as stars above the avatar's head. Different tiered items also gives the player different amount of extra maximum health. A tier 1 item gives the most amount of extra maximum health and a tier 4 item gives very little extra maximum health, compared to tier 5 item giving no health bonus. Items can only be acquired by defeating an NPC, the Helpless Tutorial map being an exception(see Figure 52). If no player picks up the item it is transformed into an NPC again. If a player leaves the game all his or her items of tier 4 or better will be randomly scattered all over the current map.



**Figure 52** Roughly half of the available items visible lined up on the ground in the “Helpless Tutorial” map.

Six slots are created with the intention to limit how a player can equip items. These slots are named as following: head, upper Body, lower body, main hand, off-hand, and two hands. Each slot is given a very specific purpose. Meaning that any item belonging to a specific slot is only allowed to have certain abilities attached to it.

There are 18 different ability types implemented (see Figure 52), for a detailed list see Appendix I - Prototype Item List.

### 6.1.1.1 Head Slot

A head slot item is given the main purpose of utility. As such any item that is an head item had the highest degree of freedom as to what its ability can do. Visually head slots is shown as a type of headgear.

### 6.1.1.2 Upper Body Slot

A upper body slot item is given the main purpose of defense, shielding the player from harm. Any item on this slot has to, in some way, reduce or remove incoming damage. Visually the upper body slot is represented as a chest plates of different sorts.

### 6.1.1.3 Lower Body Slot

A lower body slot item is given the main purpose of movement, enhancing the movement capabilities of the player, or changing his position. Any item on this slot have to one way or another help the player transfer to another location. Visually the lower body slot is represented by a pair of pants.

### 6.1.1.4 Main Hand

A main hand slot item is given the main purpose of damage dealing, allowing the player to often and quickly deal damage to opponents. Any item on this slot must have abilities that causes direct damage to an opponent. This is the most straightforward slot of all, having simple and easy to use ability with low cooldown allowing for it to be used often. Visually the main hand is an item that is placed in the right hand, such as a sword or a staff.

### 6.1.1.5 Off-Hand

The off-hand slot item is given the main purpose of damage, but should also have a secondary effect to it. This slot should generally be allowing the player to use a more powerful ability. Any item on this slot should be stronger than the main hand slot, it

should also generally have a longer cooldown. Visually the off-hand is an item placed in the player avatars left hand.

### 6.1.1.6 Two Hands

A two hands slot item is given the main purpose of being special, allowing the player to greatly customize how he or she plays. This slot is the players most powerful and iconic ability. Its function is very similar to the head slot but with the difference being that this slot is focused on having great offensive abilities. Visually the two hands slot is represented by an item that is carried by two hands such as a larger staff or a heavy axe, which is placed on the back of the player avatar.

### 6.1.2 Abilities

In the prototype there exist 18 different types of abilities, all with five increasingly more powerful tiers. Each ability has a cooldown that will trigger once an ability is used. Once an ability is on cooldown it cannot be used until the cooldown has reached zero again. Each ability has an attribute called casting time, which is currently not used in the prototype. The casting time of an ability is the time that it takes to cast the ability, during this time no other ability can be used. Each ability is constructed by combining several types of so called behaviors. These behaviors could for example be: make an projectile deal damage or heal the target when hit, slow or speed up a player for a short period of time. In total there existed over 20 different behaviors that could be used to create the abilities.

Several abilities are capable of adding a so called modifier to opponents when they are hit by the ability. A modifier is a temporary change to a player, there exists three different types of modifiers:

- Movement slow, slows down the movement speed of the affected opponent
- Stun, locks the opponent movement, rotation and prevents the player from using abilities
- Snare, locks the player's movement

### 6.1.3 NPCs

An NPC when defeated transforms into an item. The player is able to use the overview map to know what type of item that is going to be dropped by what NPC. It is also possible to visually see the item on top of the NPC, if the player is close enough to the NPC. The NPC has a separate movement and attack AI. The movement AI tries to find the closest path to the attacking player using the A\* algorithm and move as close as possible without traveling too far from the NPC spawn point. If the NPC moves too far

away it will stop attacking the player and return to its spawn point while regenerating a tenth of its health every second. The NPC has two attacks: a ranged projectile attack and a melee attack with the ability to push away the player, which is used if the NPC get close enough to the player.

### 6.1.4 Score

In order for a player to win he or she must accumulate a certain number of score, the first player that reaches the set amount is declared the winner and will stop the game. The players that did not reach the set amount of score have lost. Player have two ways of acquiring score. The first way for the player to acquire score is for the player to find items that is of a tier better than tier 5. When the player has one or several items that is of tier 4 or better the player will in a constant rate gain score depending on the tier of the items.

The second way to get score is for a player to steal score by defeating other players. When a player defeats another player the winning player will steal score from the losing player. The score differs depending on how well things are going for both the winner and the losing player. There are two different calculations that adds up to the final amount of score that are stolen from the losing player. A player can only at most steal as much score as the defeated opponent currently has, meaning a player can never get a negative score.

If the losing and winning player have the same tier of items this will mean that a set amount of score is stolen. If the losing player have the best possible items while the winning player has the worst possible items this will mean that three times the set score is stolen. If the losing player have the worst possible items while the winning player has the best possible items this will mean that only a very small amount of the set score is stolen.

A player can steal a large amount of score depending on the difference in score between the players. If a player is close to winning while the other player have zero score when he or she defeats the player close to winning he or she will steal the most amount of score. If the losing player have same or less amount of score compared to the winning player this will mean that no score is stolen.

### 6.1.5 Health

When a player acquire higher tiered items the health will increase. The maximum health a player can have is three times the normal amount of health, when the player has acquired six tier 1 item. When a player's health is reduced to zero that player dies. When a player dies he or she will drop a random item that is better than tier 5, but only items which are of maximum one tier lower than that which the player who killed the dead player has in the same slot. If a player dropped any item that slot will be filled with an tier 5 item from the players starting item set. The dead player is then respawned, after a time which depends on how powerful items he or she has, near a respawn location.

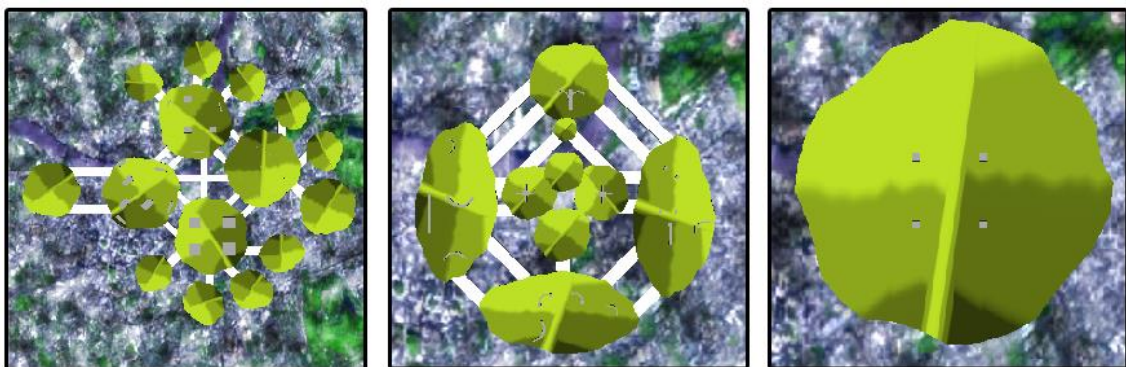
When a player respawns that player will be briefly invincible and unable to use abilities, this is so that the players near the newly spawned player will have a chance to respond to the fact that a player just appeared from thin air next to them. The invulnerability also made sure that respawning players does not get hit by attacks that just happens to be traveling towards that player. The player can with certain abilities become temporarily invincible such as with the Dash and Lighting Dash abilities. When a player defeats an opponent who is more powerful there will spawn a health orb that will seek out the player that delivered the last blow. When the orb reaches any player that player will be healed by an amount set from the power difference between the player who dealt the last blow and the player who died.

### 6.1.6 Movement

The player can only move in eight cardinal directions: north, northwest, west, southwest, south, southeast, east and northeast. The reason for only using eight directions is due to the limitation of moving using the four keys on the keyboard. The player moves at a constant speed or zero. This movement speed can be reduced by slow modifiers.

### 6.1.7 Maps

The prototype features three different maps (see Figure 53): one large, one smaller and one single island map with few obstacles. Each map is built using one or several islands of different sizes. The different islands are connected using bridges that placed with a 45 degree intervals of angles to accommodate for the eight cardinal movements that the player is capable of moving in. On the islands there are often immovable and invincible rock obstacles that will block all abilities except Dash and Lightning Dash teleportation. If the player tries to walk outside of the islands or bridges the player will fall down and after a short while die and respawn on one of the maps respawn points. Any item that falls out of the islands or bridges are teleported to the edge of the islands that is closest to the current position of the item.



**Figure 53** *The three level designs implemented in the prototype. The gray is obstacles, the white are bridges and the background is sky where you fall down.*



The first map is called In the Sky and is the largest of the three maps (see Figure 53). The four islands connected to the larger southern island are spawn locations for tier 4 NPCs, the northern islands are spawn locations for tier 3 NPCs, the west are spawn locations for tier 2 NPCs and the final eastern island is the only spawn location for a tier 1 NPC. The player can spawn on one of the four larger islands near the middle of the map.

The second map in is called Close Quarters and is the smallest map (see Figure 53). The player has five different spawn locations: the second smallest island north of the middle of the map and the large islands at west, north, east and south. The NPC spawn locations are more mixed together on this map. On the first island south of the middle and the last island to the north have a tier 4 NPC spawn location on them. The last western island have a tier 3 and tier 1 NPC spawn location and the last eastern island has an tier 2 and tier 1 NPC spawn location. The last island to the south have a tier 3 and tier 2 NPC spawn location.

The third map in is called Gladiator and is the most open map (see Figure 53). The players spawn in the northeast, northwest, southeast and southwestern parts of the island while the NPCs spawn in the north, west, south and eastern parts of the islands. The respawn timer on this map was heavily reduced since each NPC tier only had one spawn location each.

There is also a fourth map, named Helpless Tutorial, which is a testing ground for items and NPCs.

### 6.1.8 Helpless Tutorial

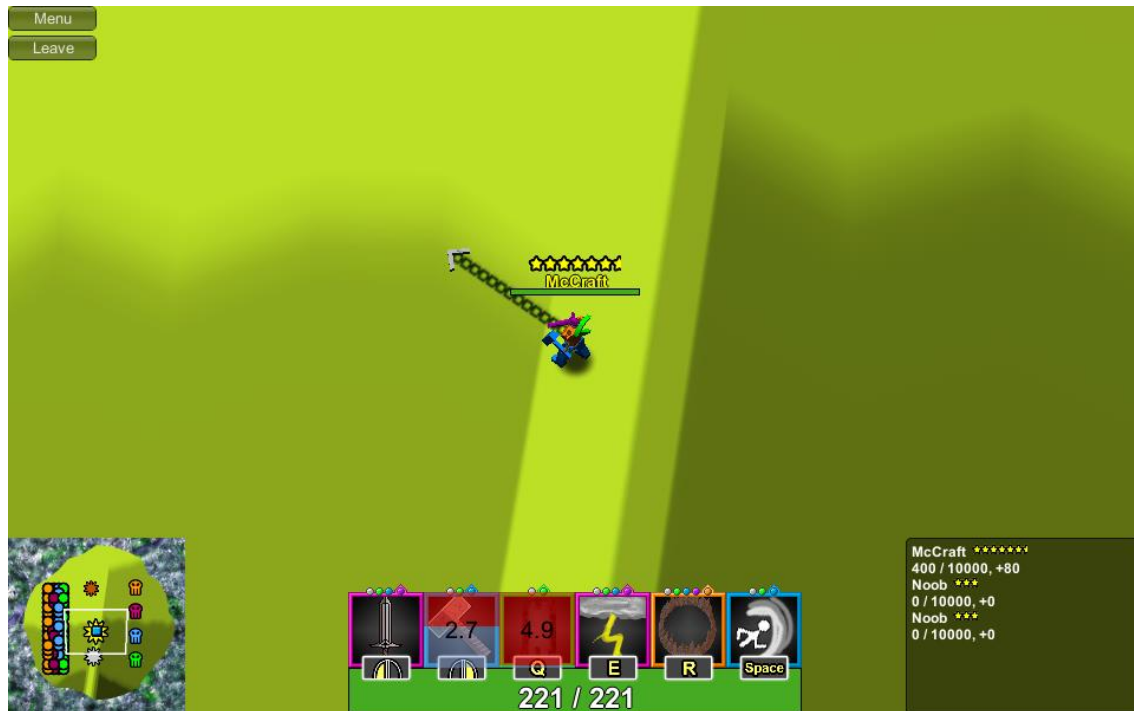
The tutorial map is designed as a single large island where all items from all different tiers are placed on the map so that the player can pick up and test all the items and all combinations of items. The items placed on the map do not return to their NPC forms. However the items dropped by the NPCs still follow the normal rules and will return to their NPC form. In order to test fighting, all different tiers of NPCs are available, and also a special type of NPC that is a computer controlled player. These computer controlled player characters move in a predictable way in order to train players to hit with certain abilities. The tutorial map do not contain any description or give any hints to the player, the player has to discover everything him- or herself. This is mainly due to time-constraints since making a good tutorial is difficult, and a bad tutorial might confuse the player.

### 6.1.9 Physics

The prototype uses Unity's built-in physics engine which is applied to NPCs, players, items and certain projectiles. There is also a custom made “cartoon” physics implemented that is applied for players that are about to fall off a island or bridge. This effect will cause the player to hover for a brief period of time before starting to fall, to allow the player to save him- or herself by using a movement ability.

### 6.1.10 GUI

Several GUI functions have been implemented in order to convey important information and feedback to the player. In the top left corner in there is a “Menu” button (see Figure 54), if the player clicks on the “Menu” button the player will leave the current match and returned to the menu screen without a confirmation screen



**Figure 54** A screenshot on the Helpless Tutorial level where the player is the host.

In the bottom left corner the player has his or her mini-map. The mini-map allows players to see important information, such as the three top players symbolized by the gold, silver and bronze stars. The player is represented by a blue square. The different tiers are tied to different colors to help the player identify them: tier 5 is white, tier 4 is green, tier 3 is blue, tier 2 is purple and tier 1 is orange, this is the same color scheme that is used in World of Warcraft for their white normal, green magical, blue rare, purple epic and orange legendary items. Those colors always represent the specific tiers for both NPCs, abilities and items. On the mini-map the tier colored dots are items that the player can pick up. The tier colored skulls are differently tiered NPCs. The larger green area is the actual island and the edges of the mini-map the clouds and the ground can be seen. If there were any obstacles on the map they would show up as gray rectangles on the mini-map.

The player has two different health bars that represent the player's health: one bar can be found over the avatar and the other bar can be found under the ability bar in the middle bottom (see Figure 54). The bottom bar is larger and displays the player's health with a green colored bar, but also with numbers.

When pressing and holding the overview button an overview map would cover most of the screen, showing the same information as the mini-map but larger. Additionally, in the overview map items show their ability icons (see Figure 55).



**Figure 55** A screenshot from the *Helpless Tutorial* level with the overview map displayed.

Over the bottom health bar the player's ability bar is shown. The abilities are sorted in the slot order: main hand, off-hand, two hands, head, upper body and lower body. Each of these slots have a image representing how to use that ability. The ability icon itself is a visual representation of the ability. Around the ability icon is a colored border that uses the items tier to show how powerful that ability is. This representation is also enhanced by the colored dots above the border. An ability of a certain tier will always show colored dots of the abilities current tier and a dot for each tier beneath it. If for example an ability is tier 1, meaning that it is better than tier 2 to tier 5, it has one colored dot for each tier below itself (see the fifth ability, counting from left, in Figure 54). The reason for using colored dots was to try and help the player by seeing that the number of dots increased and then become more powerful.

If a player uses an ability that ability becomes unavailable until that abilities cooldown has been reduced to zero. The cooldown is based on a timer that will start to tick down as soon as the ability is used. This cooldown is represented by darkening the ability picture as well as displaying the remaining cooldown on top of the ability icon in the ability bar (seen on the second ability from the left, and third ability from the left, in Figure 54). When a player is defeated and he or she drop an item, this item drop is visualized by having the ability icon jump out of the bar and then falling below the screen.

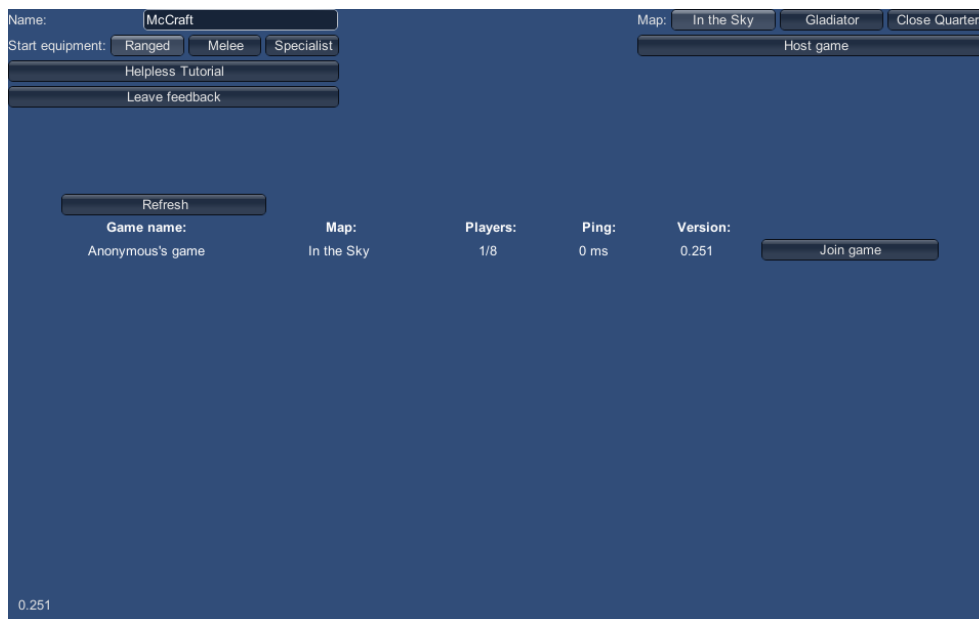
On the bottom right of the screen the player has the scoreboard (see Figure 54). The scoreboard is used to show the three players with the highest score, plus the player him- or herself. If the player is amongst the top three players the scoreboard will only display three players. A player on the scoreboard is represented by two rows. The first row displays the players name and how many stars that player has, stars are explained

below. The second row display how much score a character has, the score a player needs to reach in order to win and how much score the player generates.

Any player visible on the screen will have a health bar over their name. Over the health bar that players name will be displayed with a certain color. The players own character will always have a yellow name. The color of the name indicates how powerful a character is compared to the player's character. A yellow name means that player is equal or very close in terms of power level. The colors range from gray when the opponent is much weaker than the player to green to yellow to orange and finally red when the player is much weaker than the opponent. Above the player's name the player's stars are displayed, the stars represents the player's power level, more stars equals a higher power level.

### 6.1.11 Host Game

A player can start a online multiplayer session by pressing the “Host game” button (seen in the top right corner of Figure 56). The host can also decide which of the three maps he or she wants to play. The different maps are: In the Sky, Gladiator and Close Quarters.



**Figure 56** Screenshot from the menu of Project ENORM.

When a player hosts a server they automatically join the game, and the match start at that moment even if the only player on the server is the host. The maximum number of players that can play on a server at the same time is eight. If the host wishes he or she can leave the game by pressing a “Leave” button without shutting the server down, doing so will cause the host to lose all his or her score made during the match and any items he or she carries will be scattered onto the map. The same is true for any non-host player joining the server as well, if anyone leaves the match all their items will be

scattered and their points lost. The host can rejoin a game he or she left by pressing a “Join” button which replaces the “Leave” button if the host leave the game.

### 6.1.12 Join Game

The primary way of joining a server is through the server list (see Figure 56). If the game is run from the Unity editor another choice is also present, the direct connect. The direct connect was kept as a tool for the team to use during special occasions when debugging the server list. Another debug tool was the ability to observe a match even if the number of players had reached the maximum eight. In the top left corner of the menu screen the player have the option to change his or her name as well as changing his or her starting items (see Figure 56). The different starting item sets are ranged, melee and specialist.

The ranged starting set started the player with:

- Ice Spike
- Homing Missile
- Laser
- Lightning Trap
- Circle Shield
- Dash.

The melee starting set started the player with:

- Mini Snare Strike
- Hammer Throw
- Hook
- Lightning Trap
- Absorbing Shield
- Dash.

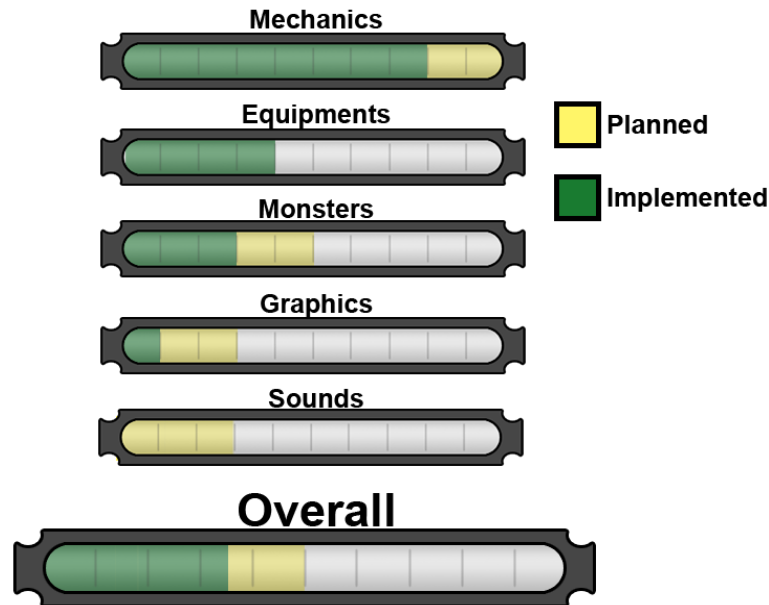
The specialist starting set started the player with:

- Off-Hand Cooldown Gun
- Global Cooldown Gun
- Fireball
- Gigabomb
- Absorbing Shield
- Dash.

These items are explained in Appendix I: Prototype Item List.

## 6.2 Unimplemented Features of the Concept

This chapter explain the parts of the concept which was not implemented in the prototype. As mentioned before most of the mechanics that were envisioned was actually implemented however many of the mechanics are in great need of polish (see Figure 57).



**Figure 57** Bars showing roughly the progress of the prototype, compared to what was planned and the concept.

### 6.2.1 NPCs

The NPCs should arrive to the map by falling from the sky like a meteorite and crashing into the islands. The NPC are items that has transformed into NPCs, once they have turned into an NPC they still exhibit traits from their item form causing all NPCs to have a unique appearance. Each item that is turned into an NPC is capable to use the ability of the item or new abilities based upon the original ability, causing every fight to be slightly different. If a Fireball staff is transformed into an NPC that NPC might look like burning beast, and will be able to use the Fireball ability. In addition to using the item ability the NPC will have a specific NPC ability, for every NPC tier upgrade the NPC will get an additional NPC specific ability.

### 6.2.2 Maps

The maps are designed with islands and bridges, the bridges have the appearances of being made of light rays. Islands will contain bridge points, which will create the light bridges between them. Some islands will move around slowly on the map, and when

two bridge points are close enough to each other a bridge of light will extend between the two bridge points. When two islands drift too far apart the bridge between them is severed. The fact that the bridge is getting severed could be shown by slowly letting the bridge color turn more red the closer to severing it is. It will then be important to make certain that players are not stuck on islands. This could be managed by good map design where when one bridge breaks another might be formed, alternatively the time it takes until a bridge reappears must be very low.

### 6.2.3 Items and abilities

The original concept included a seventh item slot, the pet slot. This slot is given the main purpose of being the players ultimate ability, allowing the player to use more powerful attacks than the normal abilities that the player have. The pet slot can be compared to the “ultimate” that heroes have in MOBA games such as League of Legends, Defense of the Ancients, Dota 2 and Heroes of Newerth. These abilities have long cooldowns but in return they are very powerful in terms of disruption, deception and damage. Visually the pet slot would some kind of creature that follow the player around.

All items will not exist on all tiers. Several types of items might only exist on higher tiers and some might only exist on lower tiers. This will make some items rarer, and increase the value of its ability. There will exist a unique item model for each ability.

There should be more abilities available for the player, but not so many abilities so that it becomes impossible for player to learn all the different abilities. The abilities should vary a lot more and have many different effects and modifiers. Some abilities should be more difficult to use than others.

The item dropping in its current form goes against the teams design principle: skill equals power. This is due to the randomness of what item is dropped when a player is defeated. Currently the item that is dropped is picked at random from items which the winner might want. This could mean that a player might never drop his or her best item even if defeated several times in a row, especially if given the time to pick up new items. One way to fix this problem could be to simply have the players drop their highest tiered item each time they are defeated, or have the items in the item slots drop in a predetermined order.

### 6.2.4 Graphics

The game needs better quality models instead of the current placeholder models, and each model should have a texture made especially for it. Many of the models needs to be animated so that the game seems less stale, some items would be animated as well. Each NPC, and tier of NPC, should have a unique model which is connected to its item form. The tiered versions of an NPC should have a strong resemblance, players should immediately be able to connect an NPC to an ability, even if they only have seen another tier of that NPC.



### **6.2.5 Sounds and Music**

The game needs feedback sounds so that the player can hear what has happened, such as a sound that represents a projectile hitting a player and a sound for a projectile hitting a shield. Both music and ambient sounds are needed to help make the game feel more complete.

## **6.3 Suggestion of Guidelines**

During the development of Project ENORM, and the study of relevant games and concepts, the team came up with eight different guidelines for designing for a finite economy, unique experiences and MOBA games.

### **6.3.1 Designing for a Finite Economy**

As with dealing with any economy one have to be very careful how the rules are designed, as poor rules can easily crash an economy or make it useless. In contrast to an infinite resource economy, where there is the problem of inflation, in a finite economy one might instead have the problem of lack of resources or a unused economy.

#### **6.3.1.1 Expect Hoarding**

This guideline was proposed after the research of the early resource economy of Ultima Online (Simpson, Z. B., 1999), and personal experiences of players collecting everything that is possible to collect in various games.

Having an in-game economy work like in the real world might not be the best idea, since most monetary systems are built around the concept of inflation and increasing amount of money. It is also very difficult to create a realistic economy system which cannot be abused, because like most real world economies they can and will be abused. One way to abuse a finite economy is by hoarding resources. The basic concept of supply and demand will create higher prices for rare resources, which mean players are encouraged to hoard resources to increase the resources value. Because it is in the human nature to accumulate resources the players might even hoard because they can, not because they gain something from it.

The maybe simplest way to avoid players hoarding resources is by just not giving them too much of a storage space, if they can only store a set amount of resources it is just not possible for them to hoard.

Another way to deal with hoarding is by introducing resource loss over time. Weapons might rust, food might spoil, magical items might be drained of energy, technical items might lose their power, or any item be stolen from storage or while players sleep. If the resources can be lost that will also mean that they must be introduced back into the

game world somehow. An alternative version of resource loss is to have storage costing resources over time, again the resources paid for storage need to be reintroduced to the game world in some way.

One can let the players manage the economy by introducing player interaction which change owner of a resource. For example a player could be allowed to steal resource from another player through a set of game rules. Another example is to introduce resource dropping from for example being killed, overpowered, frightened or some other way which fits the specific game.

### 6.3.1.2 Design for the Expected Number of Players

This guideline was proposed after the problems in the Pre-Final Test, and observations of strategy games and Monopoly.

How the developers distribute the resources during the game will greatly affect the balance of the game. If there is not enough players in the game the players will have too much resources, and if there are too many player they will not have enough resources to play the game as it was designed. For example a game of Monopoly will differ greatly depending on the number of players participating, due to the same amount of resources are used independent of the number of players. When playing Monopoly with a large number of players there is a greater risk of the game going into a stalemate, because it will be more difficult for a player to own all of the properties in a color group, meaning no one can build any houses or hotels. If a developer want a consistent gameplay experience it is a good idea to adapt the resources available depending on the number of players before game start, much like most multiplayer RTS games have maps designed for play with a specific number of players.

### 6.3.1.3 Make the Resources Desirable

This guideline was proposed after observations of classic MOBA games and World of Warcraft.

For an economy to be interesting the resources in the economy, or what the resources can be used for, has to be interesting. In games this is most often achieved by having resources which will be indirectly connected to the goal state of the game, for example recruiting an army in an RTS game which will make it more probable that player will defeat his or her opponents, or buying items in a classic MOBA game which will help the player in future fights and make it more likely to get gold to buy more items and eventually win the game.

Another way is to create value to the resources is through the players personal preferences of playstyle. This can for example be a player preferring to play as a ranged character over a melee character, because he or she like attacking from afar and prevent others from coming close. These are mechanical differences which might be equally

powerful, but with a player preferring one over another either because he play better with it, or just consider it more fun to play with.

A third way to add value to resources is to add attributes which invoke feelings towards the resources or what can be obtained by them. For example a player might like to feel like a blacksmith rather than a tailor, even if the results of the professions mechanically are the same. It can also be having cosmetic variations of items in a role-playing game to make some items more desirable than others, or just a player's preference for choosing a specific token in a game of Monopoly (see Figure 58), which has no impact on the game mechanics.



**Figure 58** *Different tokens from the board game Monopoly.*

### 6.3.2 Designing for Unique Game Experiences

For a game to be interesting to play more than one time, something which multiplayer games often is built around, the game need elements adding to replayability. This can be done for example through designing the game for unique game experiences.

#### 6.3.2.1 Utilize Randomness

This guideline was proposed after observations of Dominion and discussions on what way one can guarantee games to be different each time.

By having random elements in the game the game will most likely play out different each time, depending on how important the random elements are. If the core elements of the game is randomized each time the game will be different, for example what cards are available in Dominion or the players start position and the resources available in the Civilization series. This can be done either by computer picked random variables or human randomness.

#### 6.3.2.2 Utilize Human Randomness

This guideline was proposed from observations of the prototype tests and experiences of MOBA games.

Utilizing human randomness to create unique experiences is partly connected to having many different options and strategies. If players do not play optimally the human component of randomness will be a part of the game, even if the choices are rational considering what the player know the choices will appear random to the other players. If there also are options available which relate to personal preferences the choices will appear even more random, and then it will be more likely that a game will be different from the previous one. For example a player in League of Legends might pick a champion based on preference of playstyle, or simply because he or she wanted to play a green champion that specific game.

### 6.3.2.3 Make Players Different

This guidelines was proposed after testing, and discussions on how to make it more likely that player end up different in the end.

Making players different from each other can for example be done either by randomness or human randomness, such as randomly picking what resources are available or having players block each other from taking specific resources. If one does not allow players to fall back on habits they are forced to try something new.

Another way of making players different is to lock content, which can only be accessed when certain conditions are met. An example of locked content is League of Legends that locks heroes. Each week 10 new heroes are available for all players, however League of Legends has over 100 heroes (Riot Games Inc., 2013b) and if a player wants to play a specific hero they will have to unlock that hero. Once unlocked that hero is permanently available to that player. More importantly if there are different content to unlock, which may even block other content from being unlocked, players are more likely to choose different paths. A classical example of this would be World of Warcraft. In World of Warcraft a player typically chooses one class which unlocks a set of abilities, while at the same time forever locking the other classes abilities for the same character. The more of these forks of choices in unlocking content will make it more probable that two players are different from each other, as long as the paths are viable to go. Another example of locking content which create more unique characters can be found in earlier versions of World of Warcraft, where there existed several items which could only be acquired and used if players had a high enough player versus player (PvP) score. The best PvP items could only be bought and equipped as long as the player kept the top score on the server, while for the lower PvP items the player only needed a high enough score (WoWWiki, 2012).

### 6.3.3 Designing for MOBA Games

MOBA games typically have the traits of many different game genres: the reaction speed requirement of an FPS, the strategy of an RTS, the character development of an RPG and the player dynamics of an MMORPG. This mean that there are some things a developer need to consider extra carefully when designing these kinds of games.

### 6.3.3.1 Show Capabilities

The guideline was proposed early in the development of the prototype, because of the importance of being able to anticipate the capabilities of an opponent in a game where capabilities are changed frequently. Also influenced from observations of League of Legends.

No game can really be played in a fair manner until the player is aware of the possibilities in the game. Because of this the abilities of a character should be clearly visible in an encounter with another player, so that the players does not have to make decisions based on lack of information. In an encounter with an opponent the player should also have been given the information on alteration to other statistics and other important information of that player, this could for example be health, passive abilities or resistances. If there are hidden capabilities this should be by design choice, and it should be considered that the hidden capabilities can be used as a possibly unwanted moment of surprise in the game. For example in League of Legends there is a graphical effect on a player if he or she has Guardian Angel (Riot Games Inc., 2013a), an item which resurrect the player on death, as long as it is not on cooldown. However, there are also equally powerful items which do not have a graphical effect, for example Zhonya's Hourglass, which can be activated to make the players champion completely invulnerable and immobile for two and a half seconds. In League of Legends it is possible to select a character to show what items the character has, but it is not likely the player will have the time to do this before or during each encounter as the game is very intense.

### 6.3.3.2 Number of Abilities Depending on the Audience

This guideline was proposed as a result of discussions about the prototype, what were the desired complexity, and designing for hardcore gamers.

The number of options and buttons the game have should depend on if the game is designed for a casual or more hardcore audience. A casual audience does not expect to be required to spend much time learning the game, while a more hardcore audience will want a game with higher skill cap and will often allow for a longer time to learn the game. For example in FPS games the player typically have one main weapon that they are using, possibly a alternative weapon that the player can swap to, or items that he or she can use. This is a quite approachable genre, the player do not need to consider very many options at a given time. On the other end of the spectra are games like Bloodline Champions, where the player normally have between six to eleven different abilities to use.

## 7 Discussion

During the development of the prototype the team held several discussions regarding the mechanics of the prototype, but also regarding how the finished prototype should look and feel. Some of the discussions were never resolved as there was no clear answer. In this chapter one will find the most important discussions and how the team reasoned about them.

### 7.1 Result Discussion

The team followed the rough timeplan very closely, only some steps were done one week earlier or one week later at times. Because the team lost its third team member eight weeks into the project work on graphics was kept to a minimum, and sound skipped entirely. However one of the easier and most powerful way of making a player feel unique lies in those discarded assets.

The teleportation device that was mentioned briefly during the pre-study chapter was never implemented because the map were never very big, and the teleportation added some problems regarding how the transportation would work and what would happen on arrival.

When looking at different examples of finite economies in games the team came to the conclusion that if a game is to implement a finite economy the whole game from ground up has to be built around the concept. In the case of the early version of Ultima Online's economy they did consider the economy in many aspects of the game. However, they basically took a classic MMORPG concept and tried incorporating a finite economy, instead of considering each mechanic in the game in relation to the finite economy.

A finite economy will only affect the game first when the resources becomes sparse. Often, as in Monopoly, Dominion, most strategy games and Project ENORM, this will mean that the finite economy is most visible in the end-game when all resources are collected and no additional ones are added.

During the development there was one question that continually returned to the team, should this game cater to the casual players or the hardcore players. Even at the end of the project it was incredibly difficult to choose since the game could go both ways. The game originally was meant to cater the more hardcore audience, those that wanted a higher skill ceiling and reward good players. However the people that tested, while not proven, had a more casual approach to the game. Several times the testers acted strange such as ganging up on a certain person even though that person might not even be close to winning or carrying any interesting items. It is possible that this behavior occurred because the testers knew each other, but there was insufficient time to make certain of this claim. Since some of the testers knew each other and was testing in the same room it gives the indication that when playing together a more casual approach might be taken. The testers appeared to enjoy playing the game in this casual style. Because of this, changes could be made in order to create a more casual experience to cater this type of play.

As an example, one way of creating a more casual game by manipulating current implemented mechanics could be: creating far crazier abilities in order to try and reach a state where the abilities are perfectly imbalanced. Instead of having six ability slots the number of slots should be reduced to five: main hand, off-hand and three special slots where all items that are not considered to be main or off-hand weapons are placed in the special slot. The tier system should be removed and the player should be allowed to choose their main hand and off-hand weapon between each defeat. These changes would allow players to always have 40% of the items they want as well as allowing the players to match the rest of the 60% of their abilities in the most unbalanced way they can. These changes would go against many of the design principles and core decisions the team have already made, but those choices were to begin with made in order to cater to the hardcore audience. If one were to change from a hardcore audience to a more casual audience the design principles would most likely have to change as well.

As stated in a paper regarding mechanics, dynamics and aesthetics (Hunicke et al., 2004) there is a problem when design a game by starting with mechanics. According to the paper players will discover the game's aesthetics first and after that dynamics and then finally the mechanics. This means that the mechanics the developers think is the most interesting might actually be very different from what the players think is the most important mechanic. This is something that happened in the project. Project ENORM was designed around the mechanic of a finite economy, but when asked this was never what the testers thought was the most important mechanic, in fact the limited items was only mentioned during the pre-final test when the server was populated with 50% more people than expected and thus contained 50% to few items for that amount of players.

Having a unique customizable avatar is very common in western and South Korean games and especially in RPGs. There is a large amount of MMORPGs coming from South Korea, and it is very common for those games to have avatar customization. World of Warcraft is a prime example on how important the visual style of the avatar is. Recently in World of Warcraft they added the service of “Transmogrification”, a service to change the way items look within the game. Players pay with in-game currency to change a single item to look like another item of the same type. This meant that players would be able to use the look from their favorite weapon and armor and thus differentiate themselves from others even though they have the same items. While this solves the problem in World of Warcraft this solution would not work for Project ENORM in its current format, since players would not have been able to see the abilities of their opponents.

By omitting sound from the game the game missed out on an important way of providing feedback to the players. Sound could for example have been used for feedback if an ability hit a player. The lack of feedback became more problematic near the end when the testers would not know why certain skill did not work. The reason for the testers to discover such things now might be because they have become more familiar with the game and learned how different mechanics worked. During the last test it was found that people would very narrowly use certain items to block abilities used by other players. However this was barely noticeable during the test often requiring the tester to register an event the only took a split second to happen. If there had been sound



feedback in the game the testers would not been forced to look for events such as an opponent blocking the players ability to understand how the abilities work.

One thing the team noticed was that during the tests the testers almost never got the majority of the items they wanted. This is mostly due to the randomization algorithm that picks one random item from a random slot that have been spawned the least. This means that if five of the slots already have a drop then the sixth slot will drop the next time an NPC will spawn. The fact that most of the testers got only one or two of their favorite weapons can be seen as both good and bad. It can be seen as good since this means that they have to adapt to the situation with the majority of the other items that are in the game. It can also be seen as bad since the player might never truly be able to play as they want to since they can never acquire enough of their favorite items.

Another interesting point was thought of during the beta test. The NPCs were so powerful during the beta test the team were forced to hotfix their health down to 60% of their original health and they were still too difficult for the testers to handle. Yet the team could fight the NPCs with their original health without any problems. The main difference here of course is the time spent playing the game. The developers have naturally tested for far longer than all testers combined time played. The question the team asked themselves was whether or not the NPCs after the hotfix had become far too weak for players that had spent more time playing. While it was agreed that the NPCs had become too weak the problem would still exist for the weaker players that was starting to learn the game. One possible solution that the team came up with was different AI behavior for the different tiers of NPCs. The weaker NPCs would be easier to kill, allowing the beginners to gradually learn how to fight the NPCs.

In retrospect the NPCs might actually be too weak at the moment since the testers have only played this game max nine times, each match lasting for roughly 15-25 minutes this means that the testers have only a rough maximum total of 3 hours and 45 minutes spent playing the game. This is a very small amount time to learn good strategies regarding how to utilize abilities, and more importantly how to fight NPCs.

Through testing it was concluded that the prototype managed to create unique game sessions and encouraged players to use different items. Due to not having enough abilities implemented players often had similar or sets of abilities, but even then very rarely items of same tiers.

The prototype has the most important mechanics implemented but could do with a lot more mechanics, item, sounds, music, models and animations. The biggest problem faced during this thesis was the time limit. It was expected that creating a prototype from scratch would be difficult, but the team managed to create reasonable goals and prioritize features.

The designing and testing of the prototype helped in creating design guidelines for finite economies as well as a help to detect faults in the concept. The guidelines should be useful as they list many problems that designers needs to think about, even if the results are not empirically tested. The suggestion of guidelines stated should serve as a starting

point for designers and developers so that they can discuss, test, prove or disprove whether or not the guidelines are valid.

### **7.2 Future Work**

Since the team size was reduced there were features in the prototype that needed to be cut such as models, animation, sounds and music. It would be interesting to add better looking models with textures and animation so that player could more easily see the difference between items.

The guidelines are currently not empirically tested, and would need to be tested so that they can verified or disproved. The tests would require the development of several new games where the guidelines were followed each time. After developing the games they need to be tested in order to see if the guidelines had a positive or negative effect on the result.

## 8 Conclusion

This thesis has been focused on exploring the opportunities for creating unique player experiences in an online multiplayer battle arena game by having a finite item economy. The concept was explored through developing a prototype, Project ENORM, and user testing it. Project ENORM was designed to be played by up to eight players in one game. One match would take between 20 to 30 minutes. During one match up to 48 items, one per player and item-slot, of different tiers could spawn in an NPC form, which would drop the item once defeated. 18 different types abilities were used, each existing in five versions, which created a total of 90 abilities and items. Project ENORM focused on making players feel unique and creating unique game experiences through a finite item economy with resource shortage, where the resources were items which each granted an ability. The game was designed to make players use different strategies by having abilities tied to the items, and due to the resources shortage be unable to pick the same items every time; while this will hopefully create unique experiences the prototype needs to be further developed and play tested to validate this. Additionally, Project ENORM and the related game study helped in creating suggestions for eight guidelines that have been placed in the following three categories:

### Designing for a Finite Economy

- Expect hoarding
- Plan for the expected number of players
- Make the resources desirable

### Designing for Unique Game Experiences

- Make players different
- Utilize randomness
- Utilize human randomness

### Designing for MOBA Games

- Visible capabilities
- Number of abilities depending on the audience

The guidelines are suggestions as they are not researched exhaustive enough, but are based mainly on the user testing, problems observed in other games during the pre-study and during the development of Project ENORM.

After exploring different design possibilities to develop Project ENORM the team have come to the conclusion that there exists several ways to use finite economies to create unique experiences. With the tests, that were performed with Project ENORM, as an indicator the team believe that the play-testers enjoyed the game and that each match played out differently than the previous match.

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## Appendices

### Appendix I – Prototype Item List

#### Main-Hand Slot

Main-hand item have low cooldown and is your primary source of damage.

##### Ice Spike

Fires a projectile which will slow and damage a character on hit.

*Increased damage and size per tier.*

##### Mini-Snare Strike

A melee attack which snares a character to the ground if hit.

*Increased damage and size per tier.*

##### Offhand Cooldown Gun

Fires a projectile which will reduce cooldown on your offhand item on character hit.

*Increased damage per tier.*

#### Off-Hand Slot

Off-hand item have medium cooldown and is your secondary source of damage and utility effects.

##### Magic Missile

Fires several missiles which will target the nearest enemy.

*Increased number of missiles per tier.*

##### Homing Missile

Fires a seeking missile which will push a character on hit.

*Increased damage, size and push force per tier.*

##### Hammer Throw

Fires a projectile which will stun and slow a character on hit.

*Increased damage per tier.*

### Global Cooldown Gun

Fires a projectile which will reduce cooldown on all item on character hit.

*Increased damage per tier.*

### Two-Handed Slot

Two-handed item are powerful with longer cooldown and often has a small negative impact for the player using it.

### Fireball

Fires a fireball which will explode on your aim position or on character hit. Deals damage and pushes on explosion, can also hit the player if he or she is too close.

*Increased fireball size, explosion size and damage per tier.*

### Laser

Roots you to the ground, slows down rotation speed and fires laser in a line in front of you.

*Increased damage and size per tier.*

### Hook

Roots you to the ground, pulls a hit character towards you.

*Increased damage and hook length per tier.*

### Pushing Strike

A melee strike which will push characters on hit.

*Increased damage and size per tier.*

### Head Slot

The head slot is used for utility item.

### Lighting Trap

Places a trap on the ground which will quickly grow to a set size. If a character walks on the trap he will take damage and be stunned.

*Increased trap size and damage per tier.*

### Gigabomb

Throws a grenade which will create an area that slow characters who are in it.

*Increased slow area size per tier.*

## **Upper Body Slot**

Upper body item are mainly defensive.

### **Absorbing Shield**

Creates a shield in front of your character which will absorb damage.  
Increased size and shield health per tier.

### **Circle Shield**

Creates a shield around your character which will absorb damage.  
Increased shield health per tier.

### **Rock Arena**

Creates a circle of pillars around your position which will trap you and anyone near inside.  
Increased pillar health per tier.

## **Lower Body Slot**

Lower body item are mainly used for movement item.

### **Lightning Dash**

Fires a projectile which will transport you to the position you aimed at when firing the projectile if it hits. You are invulnerable while traveling to the position and will deal damage to characters you pass through.  
Increased travel speed and damage per tier.

### **Dash**

Makes you invulnerable and move you towards the direction you are moving for a short distance.  
Decreases cooldown per tier.

## **Appendix II - Pre-Final Test Questionnaire Answers**

### **What is your opinion on the starting item?**

Pretty decent

Melee seems far stronger then range at everything level 1, but the range combined with 1 or 2 OP high levle makes range far better. I feel the dash is very bad

I'm confus. Melee was ok?

I think they where ok. However unnecessary with two classes since they can equip everything anyway. In my opinion one would suffice with only the right and left mouse options as start item.

The ranged set of weapons feels more fun to use.

trevliga, lite svagare än avstånd

Melee starting weapon felt too weak. Hammer(?) is too slow.

Hard to hit with the hammer, with a long cd. The stone ring was mostly useless, causing more problems than good

The brawler seems to have better starting item, especially with the pull ability. However once you get the epic ranged... (see next question)

Good, maybe more tutorial-Ish.. eg: start with just melee and shield. on level up unlock more weapons.

### **What did you feel was the most important to do in the game?**

Gather items and survive!

Get OP items,

Kill the others/creeps -> Get new weapons!

Try to maintain a good inventory, and defeating enemies to do so.

Items, items, items and lasthit

To fire ma lazz000rz!

Få igång snöbollen, ha död på ledaren

Kill #1!

Gather items and keep them

Grab the biggest ranged epic weapon and farm all the monsters for phat loot and drops (a lot of item, even when shitty, is important to make sure you get to keep your epic stuff), then kill players

getting to keep the best item

### **What was the least important element in the game?**

Damaging, the most important part was the "kill"

Kill people as most gave u nothing, so people are in the fucking way and u want them to l2p and ignore u.

Getting points

Intrusive RDM.

farming

The summoning of wooden walls round my character

döda personer som inte har mer poäng än du

Farm monsters

The guided missiles was not good enough. I would rather see a skill that moved irregularly to strike behind obstacles

verbose score board, text indication of debuff

### **What is your opinion on the number of items in the game?**

not enough, but could be because we were 10ppl?

Far to few,

It was nice with variety, but too many of the items were on the Q button. Also, Q was a very useful button, but annoying to reach when using wasd.

great (Y)

Enough to play a character with a wide set of skills

Som i olika typer: bra. Som i tillgängligheten av dom : dålig Lätt omöjligt att ta död på senare monster eller komma ikapp/döda spelare som har bättre saker Cooldown på olika saker är konstigt satta

There's enough variation, but usually not enough items available.

About enough

Fine, not too many and not too few

Maybe too many weapons available simultaneously

### **What are your thoughts on the variety of items?**

It was nice, but a mid range attack?

Not varied enough, furthermore I would like to be able to set items at any button, e.g Use all Q weapons and not be limited to only one item that is to be at Q, especially now when the items are not corresponding to each other and because of that they are not mutually exclusive

Great variety with ranged and melee weapons. Another weapon that is placeable, a mine?

Fascinating!

great (Y)

Good!

There's enough variation, but usually not enough items available.

OK, would like to see more different abilities

Pretty good actually, not always clear how they worked from the icons though.

great!

### **Was there a game mechanic you thought was missing?**

jump, over small cliffs or gaps

A lot of different projectiles. Stealth. Boomerang. More diverse close combat mechanics, e.g push etc. Self sacrifice abilities



Clearer way of telling what type a weapon laying on the ground is! Better regeneration of HP? Is this item better than what I have? Handicap, too hard to get back in the game if you lose once.

Facebook integration.

Teamplay and some way to regenerate hp besides killing

Gaining speed, and maybe more item combinations. Maybe more ways to push enemies off the edge. Mac and Linux support

Nånting som bromsar snöbollen

Something to prevent the super-snowball

More of a knockback effect on some skills. Not to spawn on other players. Not being able to drop items.

I think maybe there should have been a healing mechanic.

Regenerate life somehow other than killing enemies; eg. finding life or regeneration out of battle

### **Was there a game mechanic you thought was superfluous?**

monsters health, TOO MUCH

The first dash sucked way too much, the stone wall thing is far too strong/ boring.

The "ring of pillars"-"attack"?

the tp by hitting a character + space. Better with a classic blink or a smaller jump

The ranged stun was fun, also the hooks.

Boxars förmåga att knuffa en av banan

Getting more points for having better item

No

Not really

### **What are your thoughts on the scoring system?**

Better than last time, could work overall

Horrible

More points should be awarded for killing players!

A little confusing. Also health...

Unclear, but seemed ok. Slow.

Maybe a bit confusing

Intressant, tar en jävla tid att avsluta spelet,

Too snowbally

Good

Too high total score, very easy to lose lots of score

Too much info on screen, could be a simpler indicator of "your score, leader score and score required to win, just represented by numbers on a line.. eg: [20,40,100].. or something like that :)

### **What was your thought on the first level (BetaTest 3)**

Better then no.4, closer map, more combat.

TO narrow and way to much costnatl battles. Both maps have a very bad spawn points

Easy to get around on, compact, great melee level!

Pretty nice.

I liked the levels. Great with some dead ends. Would be nice with a smaller arenastyle map

Small but fun

Väldig liten, känns instängd, vars man än spawnar så finns det redan fiender där

Too small

Easy to fall off

Nothing to complain about

### **What was your thought on the second level (BetaTest 4)**

To big, make teleport for ppl that isnt in the top three? took a while to get to the leaders and usually you die on the way there.

Huge lack of items Both maps have a very bad spawn points

Large stage, moving too slow. Dash move? Too many camping spots, need a way to prevent camping. Better teleportation?

Pretty nice. The dead ends were... interesting.

Bigger more suited for more players

nice, lite lite sätt att hoppa mellan öarna

Not enough ways to move around, middle got clogged up, easy to camp with the upgraded homing missile, trap, fireball or laser

ÖVRIGT: Alright, the hard monsters was usually too tough to kill, even with good items

I think I enjoyed this the most, but it may mostly be due to me having the best grip of the game by now. It's quite easy to sneak away and farm the creeps though...

Better, more "hiding spots"

## **Appendix III - Final-Final Test Questionnaire Answers**

### **What did you feel as the most important thing to do in the game?**

Learning the gameplay FAST

To have a good flow, and to fight strategically.

Kill Rippe!!! AARRRGHH! Most important was to identify my largest threat from two aspects: 1. The skill of the player 2. the item. If the item is good, then try to kill the player to make them lose that item. Otherwise, run and attack other players. Item was really important, something I did not realize first. Hard to see how good weapon was, or what it did.

attack ryu so he would be sad avoid conflict and farm items

Kill all other players!

### **What was the least important element in the game?**

The scoring system, the fun was in playing, not winning

Enhanced gameplay through Kinect

Hmm, nothing, I suppose.

trying to work together with others

Falling to your death.

### **What was your opinion on the number of items that existed each game?**

I didn't find all the items, but there seemed to be a fair deal of items, and they were fun and varied. Perhaps it would be too few after playing a while.

The amount is pretty good :)

Too many for the level of feedback on the items. I had problems seeing what item did what (unclear icons), did not see how good weapon was (the dots were hard to see at a glance) and hard to see what category/keybinding the item has that you pick up. Will it replace my other good weapon? Couldnt really see.

not too many items, but too many buttons to keep track of, and they change all the time... keeping track of 6 abilities that also change a lot is tricky!

Some kind of upgrade system would be neat.

### **What was your opinion on the different starting item sets?**

Only tried one

I liked the ranger, because I play defensively, and i like skillshots.

Meele was dope! (Y) Did not try specialist

Ranged was lots of fun, but felt very helpless in melee. The melee guy could at least hookshot when he was too far away

The one with the hook/sword was incredibly funb.

### **What was your thoughts on the scoring system?**

Didn't even notice it was there until I lost.

It is exciting and interesting. It promotes aggressive playstyles.

Could have been a clearer score counter. Did not easily see who was in the lead. It was good beside those points.

??? I dont really understand it exacly. It was hard to know what to do to maximize my score since it depended both on kills and loot (and the kills gave different score)

Didn't really see how it worked. TEST

### **Could you describe the best moment in the game?**

When I had learned to play well enough to score a kill for myself

#winning The random drop of loot when dying/defeating someone is a thrill!

When Rippe died, even though he had good items. Would have wanted more opportunities to heal yourself.

when I could track someone down and steal an important item

Killing someone you know.

**Could you describe the worst moment you had in the game?**

My throat hurts from screaming too much while playing.

When Rippe was OP ;\_;

when a lag spike killed me :C

When some one steals 'your' kill.

**Did the items you got vary between games?**

I guess.

Hmm... Perhaps, played two times, and did not really register what items I had during the first run.

yes?

**Any other comments?**

Develop this more! I would definately play it when it's released :D

The GUI is a bit intrusive when aiming downwards.

Good work you guys! :D <3

More item synergies. Clearer feedback (when you die, if you hit, when you are stunned, and so on and so forth) Felt a bit weird without feedback in the beginning, did not know if you hit something really. Playing for some time made it easier to understand that something happened.