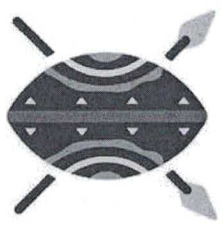


1

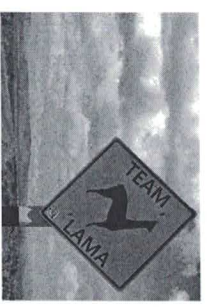
# Technical design



## Hypogeum

the faction battle

**Abstract**  
 Since humans had left the Earth, centuries have passed and the blue Planet is now inhabited only by the animals, that have learned to manage the technology of our descendants and to create their own. From that moment, a long war among the different species has taken act, to establish which was the best one. Inspired by the ancient books on "mythology", they decided to set their battles in a huge arena: the Hypogeum. Rather than kill each other in "primitive" ways, they clashed each other using different cars, depending on the species they belong. Now, only four teams have left – Eagles, Lions, Rhinos and Sharks – and the outcome is more uncertain than ever. Who will be the audience's favorite? Who will win the war? And, most important, who will obtain the supremacy?



Team lama			
927539	Carrarini	Andrea	andrea.carrarini@studenti.unimi.it
894173	Cerrato	Loris	loris.cerrato@yahoo.it
939930	De Cosmo	Andrea	andrea.decosmo@studenti.unimi.it
931468	Maione	Michele	michele.maione@studenti.unimi.it

OK

2004

1 Log	3
2 Project Goal	4
3 Provided Services	4
4 Client side	4
4.1 Hardware Requirements	4
4.1.1 Minimum requirements	4
4.1.2 Recommended requirements	4
4.2 Software Requirements	5
5 Workload Estimation	5
6 Front-end	5
6.1 Platforms	5
6.2 Features	5
6.3 Scalability and Extensibility	5
7 Back-end	6
7.1 Platforms	6
7.2 Hardware	6
7.2.1 Cloud server	6
7.2.2 Monthly price	6
7.2.3 Monthly forecast quantity-use	7
7.3 Software	7
7.4 Workload Capacity	7
7.4.1 Estimate of users	7
8 Development	8
8.1 Platforms	8
8.2 Hardware	8
8.3 Project roles	8
8.4 Software	9
8.5 Major Software Development Tasks	9
8.6 Development GANTT	10
9 External Services	10
10 Communication	10
10.1 Global Infrastructure Outline	10
10.2 Network Requirements	11
10.3 Network Hardware	11
11 Delivery	11
11.1 Estimated Delivery Time	11
11.2 Delivery Platform	11
11.3 Delivery Methodology	11

~~110g~~

11

### 12.2.2 For Infrastructure Management

11

### 13.1.1 Fixed costs

### 13.2 Monthly cost

### 13.3 Estimated cost

[illegible]

## 2 Project Goal

Hypogeum aims to provide to customers a 24/7 service to Microsoft Windows users via Steam. It requires a connection to play, there's no offline mode. It is designed as a client-server architecture where the players can start their own client connecting to a central server over the internet.

## 3 Provided Services

Since Hypogeum is a competitive game for killer players, we expect some tension and complaints about the game itself and also connection problems, so we need to provide the players a customer support at least to let them feel their complaints and opinions are heard.

We also want to integrate social networks, at least Facebook, in order to let the users show their friends how good they are at the game.

Another feature needed is a website where users can see their stats and the game state: which faction is winning the war, in which position they are in their faction leaderboard or in the general one.

What we don't want is to keep their personal data, especially password, so we want Steam to take care of that.

We also want to provide an in-game store where to buy aesthetic personalization for the cars.

For that Steam offers its Steam Microtransaction APIs that let you create your own in-game store without taking the responsibility of keeping personal credit cards data.

## 4 Client side

### 4.1 Hardware Requirements

#### 4.1.1 Minimum requirements

CPU	2,4 GHz Dual core
RAM	2 GB
Video card	NVIDIA GTX 260; ATI 4850
Network	Broadband Internet connection
HD	150 MB of free space
Input devices	Mouse and keyboard

#### 4.1.2 Recommended requirements

CPU	2,5+ GHz Quad core
RAM	4 GB
Video card	NVIDIA GTX 660 or better; ATI 7950 or better
Network	Broadband Internet connection
HD	150 MB of free space

Input devices

Mouse and keyboard

### 4.2 Software Requirements

OS	Windows 7 sp1+ or newer
DirectX	9.0c
Other	Steam

CONVCTION

## 5 Workload Estimation

We expect to have around 20 thousands players per month with an average 720 daily players, the expected peak is 2100 players in a day.

Since Hypogeum is based on a "season mechanics" we don't expect a drastic fall of the users after 2 months, so after the peak there will be a slower decrease than normal curve.

Each match is for 8 players, so if we expect a peak of 720 concurrent players, we have to handle around 90 matches concurrently. Please refer to 8.4 Workload Capacity.

For each player the server is in charge to save his stats, matches statistics, factions ranks, for around 200KB.

## 6 Front-end

Since we have a website where players can check their personal stats, their position in the game ranks and also the game state (the leaderboard of the factions, the time left until the season change) we have the necessity to have a front-end server in order to fulfill these requests.

### 6.1 Platforms

We opted for a Linux Hosting Packet on Aruba since the volume of traffic is completely different from backend and here we only need few datas to build leaderboards or to show players their in-game stats.

### 6.2 Features

Disk space	unlimited
Traffic volume	unlimited
Bandwidth	2 GB/s
Database	5
DB space	1 GB on SSD
Backup	✓
Monthly price (+ IVA)	11.99 €

7 WPSSBLE :)

### 6.3 Scalability and Extensibility

If the game's a great success we might need to change to a better plan of hosting, the next is 29.99 € per month.



It's possible also to get more than one since our game datas are in the back-end DB and here we need just to show them to players, so the bottleneck is not the storage but the maximum number of clients connected at the same time.

## 7 Back-end

### 7.1 Platforms

The project will be hosted on the Cloud. The value for money of the Cloud of Aruba S.p.A., led us to choose this type of solution. We can also manage the natural abandonment of the game by users over time, decreasing the virtual resources of the Cloud (<https://www.cloud.it/cloud-computing/cloud-pro.aspx>).

### 7.2 Hardware

5786M 08 P100Y77925?

#### 7.2.1 Cloud server

Component	Description
Server manufacturer	DELL.
Storage manufacturer	Equallogic.
O.S.	Ubuntu Server 18.04 LTS 64 bit.
CPU	Intel Xeon 5600 - 3.46 GHz - L3 cache 12 MB - 130 W.
HD	Redundant and replicated SSD storage in sync; Dual controller enterprise storage, hardware RAID aggregation and replication on twin storage.
Network	3 Network cards, 1 Gbit/s full duplex.
Network load	Maximum number of concurrent HTTP sessions (active) 40,000 (estimate to reach 90% of system load).
Balancing protocols available	HTTP (with and without sticky session); HTTPS (in SSL Accelerator mode); Generic TCP.

#### 7.2.2 Monthly price

Component	Price
+10 GB HD	1,44€
+1 vCPU	11,52€
+1 GB RAM	3,60€

### 7.2.3 Monthly forecast quantity-use

	Launch	Growth	Maximum	Decline	Minimum
vCPU	1	8	8	4	1
RAM (GB)	1	8	32	6	1
HD (GB)	10	20	30	30	30
Price (month)	16,56€	123,84€	211,68€	72,00€	19,44€

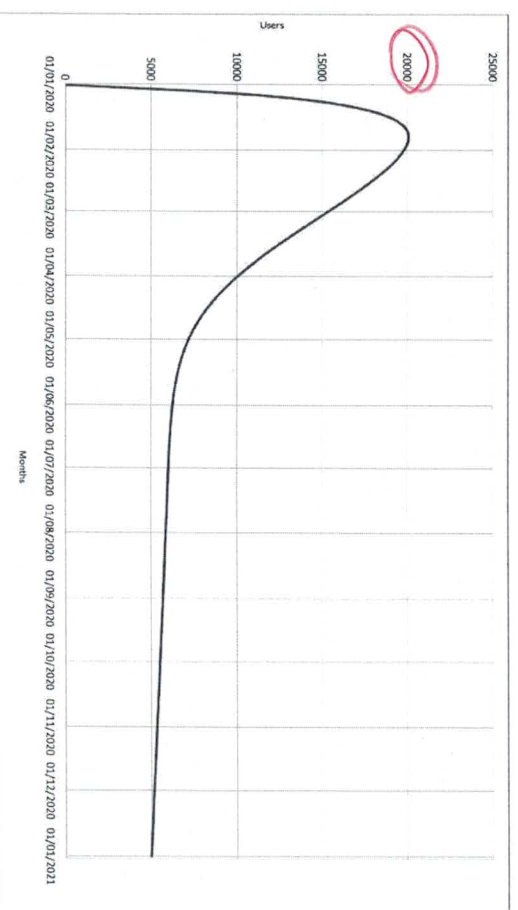
### 7.3 Software

Since the project will be implemented with Unity, in C#, on top of the mono framework, the game server will be implemented in C# with the mono framework. This is another reason why we have chosen an Ubuntu server. For more information refer to 8.3 Software.

### 7.4 Workload Capacity

Users	Process (users ± 8)	RAM (MB) / process	CPU (MHz) / process	Network (Mbit/s) / process
720	90	88	307	11,11
1.000	125	64	221	8,00
1.600	200	40	138	5,00
2.400	300	27	92	3,33

#### 7.4.1 Estimate of users





## 8 Development

### 8.1 Platforms

The project will be developed on Windows 10 Professional.

### 8.2 Hardware

Development computers were chosen on Amazon. The technical specifications are:

Type	Price	Component	Description
Monitor	79,99€		LG 22MK400H 21.5" - 1080p Full HD
Keyboard and mouse	25,07€		Trust Classicline Set
Pre-assembled PC	469,99€	CPU	RYZEN 5 2400G - 3,60 GHz - 8 threads
		GPU	Radeon RX Vega 11 - 1250 MHz - 8 GB GDDR4
		RAM	Crucial 8Gb - 2400MHz - DDR4
		HD	1000GB Western Digital Blu SATA III 7200rpm
		OS	Windows 10 Professional
		Case	Deepcool Visckase
		Power supply	450W
		Motherboard	Asus Prime A320M-K 1x VGA 1x HDMI 5x USB 3.0 3x USB 2.0
	575,05€		

### 8.3 Project roles

Symbol	Description
D	Game and level designer
A	Artist
P	Programmer
M	Musician

### 8.4 Software

Group	Roles	File type	Extension	Software	Price
Environment	D, A, P, M	O.S.		Windows 10	0,00€ (included in the pre-assembled pc)
Organization	D, A, P, M	Issue tracking		Pivotal Tracker (online)	0,00€
		Version control	.git	Git 2.19	0,00€
		Flowchart	.xml	Draw.io Desktop 8.8.0	0,00€
		Office suite		Google Docs	0,00€
		Document presentation	.pdf	Adobe Acrobat Reader DC 2019	0,00€
Asset editing	D, A	Raster image	.png, .jpg, .tiff	GIMP 2.10	0,00€
	D, A	Vector image	.svg	Inkscape 0.91	0,00€
	D, M	Music and sounds	.mp3	FL Studio 20	0,00€
	A	3D models	.blend, .fbx	Blender 2.79	0,00€
General editing	D, A, P, M	Other text file		Notepad++ 7.5.9	0,00€
Prototyping	D, A	Tiled map	.tmx	Tiled 1.2.0	0,00€
Development	P	C# project	.sln	Visual Studio 2017 Community	0,00€
	D, P	Unity project	.unity	Unity Personal 2018.3	0,00€ (if revenue/funding in the last fiscal year < 100,000\$)

### 8.5 Major Software Development Tasks

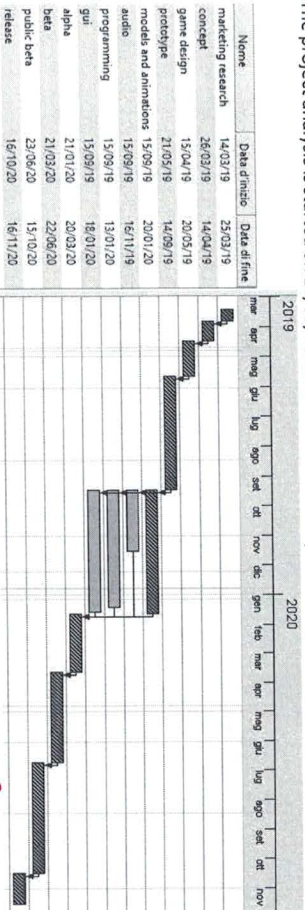
The project will follow this steps:

- Analysis and design;
- Prototype;
- Game develop:
  - Asset creation:
    - Models;
    - Animations;
    - Audio.
  - GUI design;
  - Programming;
- Testing;

- Release.

## 8.6 Development Gantt

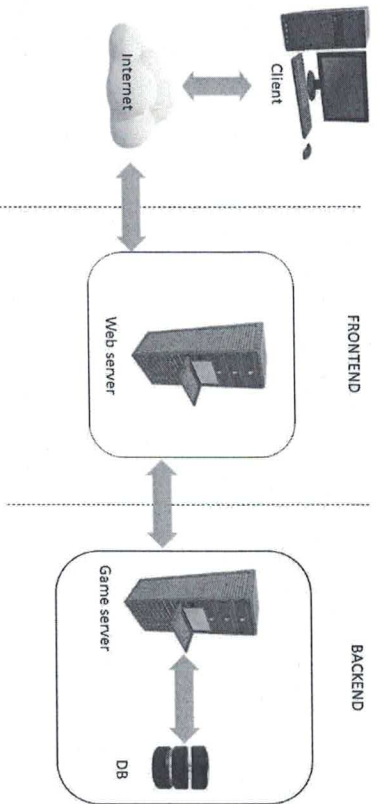
The project analysis is started on 14/03/2019. The release will be presumably 16/11/2020, before Christmas.



## 9 External Services

Since Hypogeum is designed as a competitive PVP for killer players, the probability of complaints is really high, so to provide the best customer care to our players is to delegate this service to a third-part company: SCA. SCA adopts a price philosophy of "pay what you use", so the total price cannot be foreseen in advance, but it depends directly on the dimension of our player base.

## 10 Communication



## 10.2 Network Requirements

For the frontend we have a 2GB/s whereas for the backend the contract is for a 1GB/s full duplex. Since Hypogeum is a real time driving/shooter the latency is a big deal, but a normal connection should be enough to play, obviously the faster the better.

## 10.3 Network Hardware

We opted for a Cloud solution, so we can't manage the hardware directly.

## 11 Delivery

### 11.1 Estimated Delivery Time

According to the Gantt, the game will be released in 2 years, but our business model allows us to release additional contents through all the game life, map addition, new species, new weapons, etc.

### 11.2 Delivery Platform

We will publish the game on Steam so the users will have to download it from there and install it on their PC.

### 11.3 Delivery Methodology

We expect to deliver a closed beta after 11 months (from the prototype) to have an idea of the players feedback.

## 12 Staff

### 12.1 For Infrastructure Setup

We need one person for DevOps, who configures the Cloud server, install the program, configure the DB and so on. We need this person for a few days.

### 12.2 For Infrastructure Management

One person to care of the maintenance of the system with occasional checks and solve problems in case of "disaster recovery".

## 13 Estimate for the realization of the project

13.1 Fixed costs	
Description	Costs
Development hardware x 4	2.300,20€
Development software x 4	0,00€
Game server hardware	0,00€
Game server software	0,00€
<b>Total</b>	<b>2.300,20€</b>



### 13.2 Monthly cost

Description	Monthly costs
Game server hardware	211,68€
Game server software	0,00€
Regus Coworking Room (x 4) - Porta Venezia	700,00€
	911,68€

### 13.3 Estimated cost

	Launch (1m)	Growth (6m)	Maximum (8m)	Decline (24m)	Minimum (36m)
Fixed cost	2.300,20€	0,00€	0,00€	0,00€	0,00€
Game server hardware	16,56€	123,84€	211,68€	72,00€	19,44€
Game server software	0,00€	0,00€	0,00€	0,00€	0,00€
Regus Coworking Room (x 4) - Porta Venezia	700,00€	700,00€	700,00€	700,00€	700,00€
Monthly cost	716,56€	823,84€	911,68€	772,00€	719,44€
Active cost	716,56€	4.835,76€	6.559,12€	19.011,12€	27.644,40€

- Office and everything in it? see
- developers foodst/supplies? ok
- Marketing? no