Wired Up

Technical Design Document

Online Game Design
a.y. 2020-2021

Team:
Distortion Reality

Distortion Reality Members

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Changelog

Version	Date	Author	Description
0.01	02/05/2021	Marco Siragna	Structure, Project Goal, Provided Services
0.02	04/05/2021	Marco Siragna	Workload Estimation
0.03	08/05/2021	Luca Gaeta	General Architecture (Frontend)
0.04	08/05/2021	Andrea Tassi	General Architecture (Backend)
0.05	09/05/2021	Andrea Tassi	General Architecture (Backend) continued)
0.06	12/05/2021	Luca Gaeta	Development (Hardware and Software)
0.07	15/05/2021	Andrea Tassi	Development (Major Software Development Tasks and Gantt)
0.08	19/05/2021	Marco Siragna	External Services
0.08	23/05/2021	Luca Gaeta	Connection and Delivery
0.08	26/05/2021	Andrea Tassi	Staff and Location
0.09	29/05/2021	Marco Siragna	Cost Estimation
0.10	02/06/2021	Marco Siragna	Advertising and Potential Security Issues
1.0	05/06/2021	Luca Gaeta	Verification and Approval

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1 Project Goal

Wired Up is an online action-rpg available for Windows and playable through the Steam Client. The game is designed with a client-server architecture and is only playable online providing a multiplayer co-op experience. For this reason, the service will be running 24/7.

2 Provided Services

The services provided to our customers, beside the game, are the following:

- website with the latest news about the game;
- social media pages to get feedback from our users and create a community around the game;

3 Client Side

3.1 Hardware and Software Requirements

See §3.3 of the Game Design Document.

4 Workload Estimation

4.1 Competitors

In order to estimate the workload of our game we first took as a reference our top-performing competitors mentioned in §3.4 of the Game Design Document.

4.1.1 Genshin Impact

Genshin Impact is a fairly new game which is still growing a lot in popularity, reaching millions of players among most platforms (Windows, PS4, PS5, Android, iOS). We expect to have a much lower player base at the beginning, due to the dimension of our game and it's only target platform being Windows. Moreover, a factor which contributed to it's success was the pandemic, which in our case, we believe won't be as much relevant due to the increasing number of vaccinations.

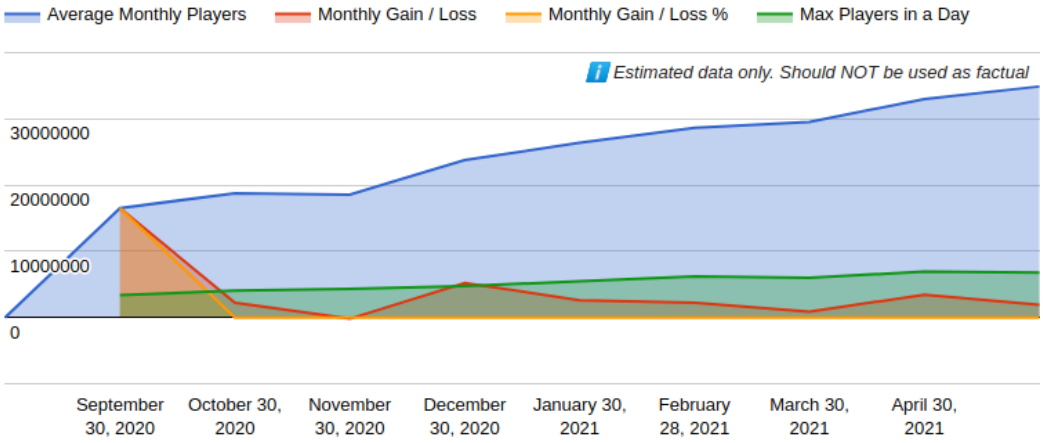

Figure 1: Players chart of Genshin Impact - ActivePlayer

4.1.2 Monster Hunter: World

Monster Hunter: World provides us more realistic data to compare with, having peaks of around 300,000 players at launch and after the release of the Iceborne expansion in January 2020. As shown in Figure 1, the curve lowers towards 40,000 daily concurrent players after the hype is over. We expect to have a similar trend, albeit with lower numbers, having peaks at launch and during expansions to then reach a nearly stable amount of players within a certain range.

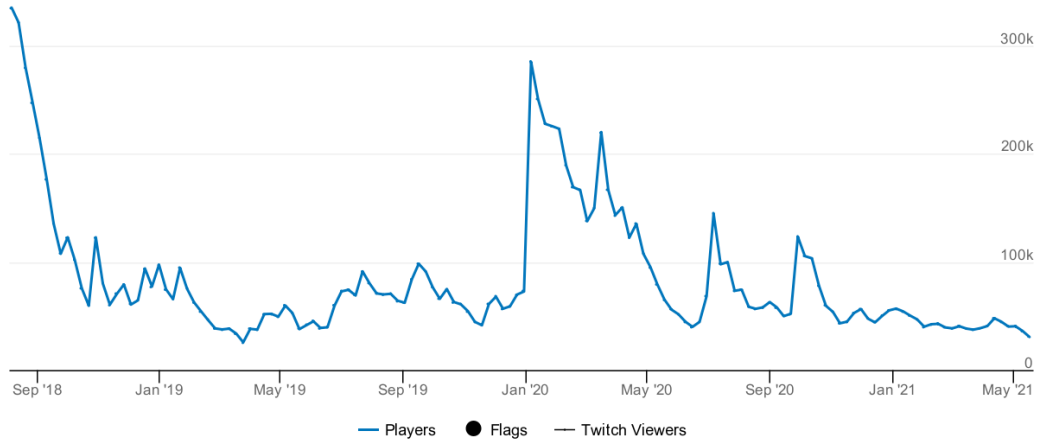

Figure 2: Players chart of Monster Hunter: World - SteamDB

4.2 Our Game

We estimate an average of 2,000 concurrent players, meaning we will have to manage about 670 game rooms simultaneously, given each room can have exactly 3 players. Daily peaks could make the number rise up to 3,000 concurrent players, while at game and expansions launch we can expect even higher peaks up to 6,000 players.
we will need to keep track and store for each user their characters with all the associated data, game progress and in-game statistics, resulting in an approximate size of 200 KB per player.

5 General Architecture

5.1 Frontend

Steam acts as frontend through Steamworks API used by our game. Doing so, regarding software and hardware, we rely on Steam Servers and on the Steam Client installed on the player's machine.
The game website is also part of the frontend and will be hosted on Amazon Web Services two months before the closed beta.

5.1.1 Hardware

The website will run on a T2 instance by Amazon Elastic Compute Cloud (Amazon EC2), in particular on a t2.small which will suffice since we expect a low amount of traffic. We opted for a one year reserved instance plan in order to get a 29% discount compared to the on-demand counterpart, considering our website will be lightweight with a steady data usage.

Table 1: Website's hardware specifications and cost

Instance	vCPU	Memory	Avg. Monthly Cost
t2.small	1	2 GiB	€11.46

5.1.2 Software

An Apache web server will be installed and configured on the EC2 instance running Linux.

5.1.3 Services

Steam provides all the main required features for our frontend, such as authentication, matchmaking, achievements and leaderboards. For more details see §7.1.
The website will showcase our game providing the latest news and insights about it, with also links to all our social media and Steam page.

5.2 Backend

Our backend consists of game servers and database that will be hosted on Amazon Web Services starting from the closed beta. For the prototype and internal testing, instead, we will use the free plan of Photon Cloud since we don't need require such high computational power and resources.

5.2.1 Hardware

Game servers will be running on Amazon GameLift Spot instances of type C4. Specifically, we will need c4.8xlarge instances which provide high computing and networking performances, hosted on Europe, North America and Asia in order to reduce latency for players located in these regions.

Table 2: Game servers' hardware specifications

Instance	vCPU	Memory	Dedicated EBS Bandwidth	Network Performance
c4.8xlarge	36	60 GiB	4,000 Mbps	10 Gigabit

Table 3: Game servers' location and cost

Location	Instance	Avg. Monthly Cost
Frankfurt	c4.8xlarge	€184.07 + VAT
California	c4.8xlarge	€177.31 + VAT
Singapore	c4.8xlarge	€170.85 + VAT
	Total	€649.32

Our game servers will communicate with DynamoDB, provided by Amazon Web Services, to store and retrieve data. We opted for on-demand capacity mode, paying per request for the data reads and writes our game performs on tables. Our reads and writes will be mostly transactional, being done at the start and at the end of a session to retrieve and update players' data in batch, while lobbies's metadata is managed by Steam. In addition, we have to take into account that reads will be a lot more frequent compared to writes and the first 25 GB stored per month is free.
Based on our estimates in §4.2, through AWS Pricing Calculator we computed a total cost of €147.14. However, this cost is just an estimate and may change depending on the demand.

Table 4: Database's cost details

Operation	Monthly Cost	Total Monthly Cost
Read	€0.23/million	€24.35
Write	€1.14/million	€118.20
Data Storage	€0.23/GB	€4.59
	Total	€147.14

5.2.2 Software

Amazon GameLift instances will be running our dedicated game server build, which will be automatically deployed in fleets based on the previously specified regions.

5.2.3 Services

Amazon GameLift's autoscaling feature automatically turns off game servers when they are not needed and adds new game servers when more players arrive. This will save us up to 70% in comparison to on-demand instances, adapting the allocated resources based on player demand.

5.3 Workload Capacity

Our frontend's workload will not be a problem given it will mostly be managed by Steam and the website will have very little traffic.
Based on our workload estimation in §4.2, we expect the backend to hold the fluctuating number of players thanks to it's scalability which will adapt on low and high peaks of players.
Finally, considering Steam and Amazon Web Services' high availability and reliability we believe to not encounter any issue that could disrupt the game services.

6 Development

6.1 Hardware

We will need a mid-high end pc for each member of our team and a drawing tablet for the artist.
In addition, we require a NAS, firewall and UPS in case of power interruptions.

Table 5: Hardware required for the development

Hardware	Specifications	Price	Quantity
Desktop PC	Gaming PC Pack: • Intel Core i7-10700F 8x 2.90GHz • Nvidia GeForce GTX1660 Super 6GB GDDR6 • 16GB DDR4 • 480GB SSD + 1TB HDD • 24" LED Monitor • Mouse, Keyboard and Headeset included • Windows 10 Home	€1,438.99	4
Drawing Tablet	Wacom Intuos Pro Medium PTH-660	€355.99	1
NAS	TERRAMASTER F2-210 2-bay Quad Core 1GB DDR4	€159.99	1
	WD Red 4 TB 3.5" NAS Hard Disk 5400 RPM	€102.90	2
Firewall	Cisco RV260W	€330.31	1
UPS	VulTech 1500VA PRO	€105.31	4

6.2 Software

Our programmers will use Unity Professional 2020.3 LTS, together with Visual Studio Professional, to develop the game. The produced code will be versioned with Git and hosted privately on GitHub. Given the small size of our team, GitHub Team will be enough for us.
The artist, instead, will use Blender, which is free, and Adobe Photoshop with the annual plan.

Table 6: Software required for the development

Software	Monthly Cost	Quantity
Unity Professional	€123.30 + VAT	4
Visual Studio Professional	€37.95	4
GitHub Team	€3.30	4
Adobe Photoshop	€24.39	1
Blender	Free	1

6.3 Major Software Development Tasks

- **Game Design**:
  - Game Concept
  - Camera and Controls Design
  - Combat System Design
  - UI Design
  - AI Design
  - Level Design
  - Storyboarding
- **Game Programming**:
  - Software Analysis and Design
  - Camera and Controls Programming
  - Combat System Programming
  - Networking Programming
  - Steam Integration
  - UI Programming
  - AI Programming
  - Level Programming

- **Graphics**:
  - 2D Artworks
  - 3D Models and Textures
  - 3D Rigging and Animations
- **Audio**:
  - Soundtracks
  - Sound Effects
- **Testing and Fixing**:
  - Software Testing and Debugging
  - Playtesting and Fixing/Tuning
- **Trailer**

6.4 Development Gantt

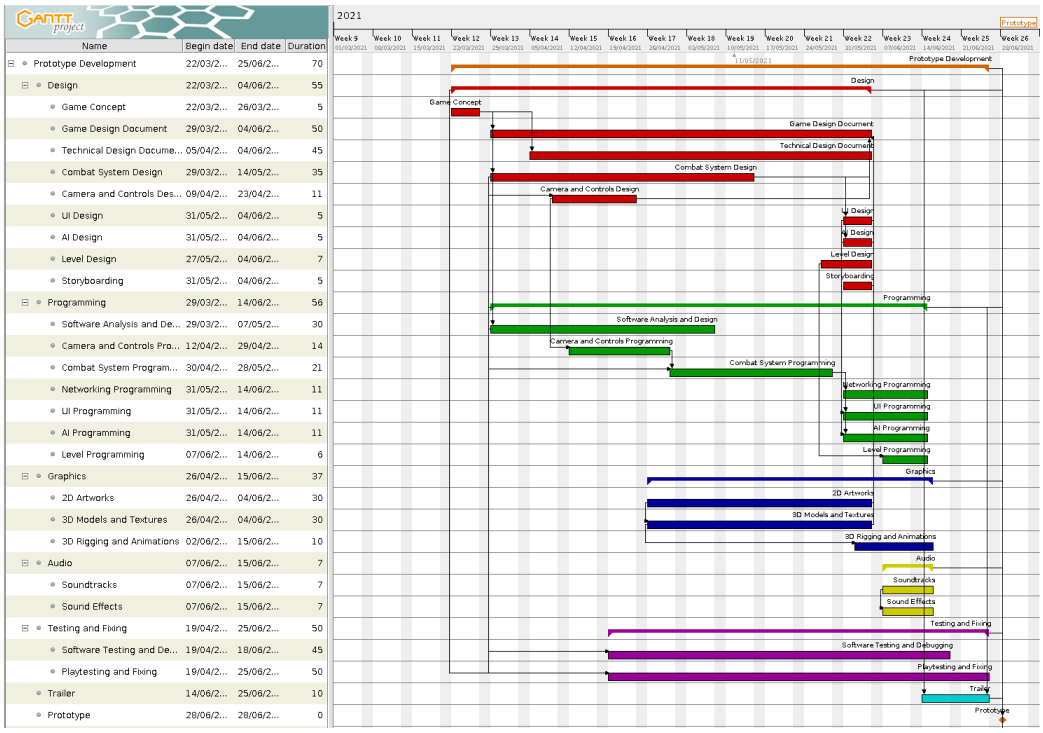

Figure 3: Prototype Development Gantt

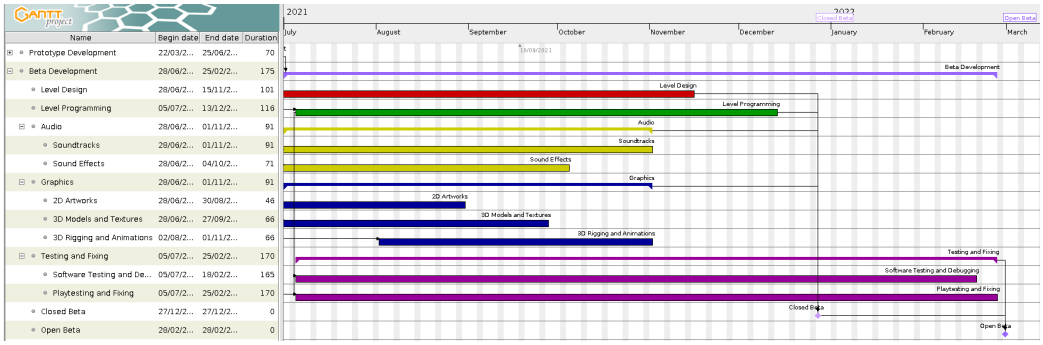

Figure 4: Beta Development Gantt

7 External Services

7.1 Steam

7.1.1 Authentication

Our users will authenticate through Steam using the Steam Client and we will use their Steam ID to manage their identity in the game. This way we don't have to store or manage any personal data of the player.

7.1.2 Matchmaking and Chat

We decided to use Steam Matchmaking & Lobbies to handle the entire matchmaking process in order to reduce our workload and, at the same time, take advantage of Steam friends and invitation system. This suits us well since our game is purely cooperative. Players will be able to create, search and join lobbies and invite friends to play together.
The same system will be used to handle in-game chat among players in the same lobby, without the requirement of another external service integrated separately.

7.1.3 Payment System

Players will purchase the game with any additional content, such as expansions and cosmetics, inside the Steam Store. As for the authentication, we don't have to manage any personal data during the payment process which is delegated to Steam.

7.2 Customer Support

We opted for Starloop Studios to take care of our customers for any help they may need. This outsourced service provides out-of-game player support for gaming in multiple languages and platforms. We chose this company because of it's flexibility to respond through any social media we will use, other than email or live chat. This will ease our burden when targeted on multiple social media platforms, providing us regular reports with up-to-date statistics on our game community, helping us track issues, bugs and players' feedback.

8 Connection

8.1 Global Infrastructure

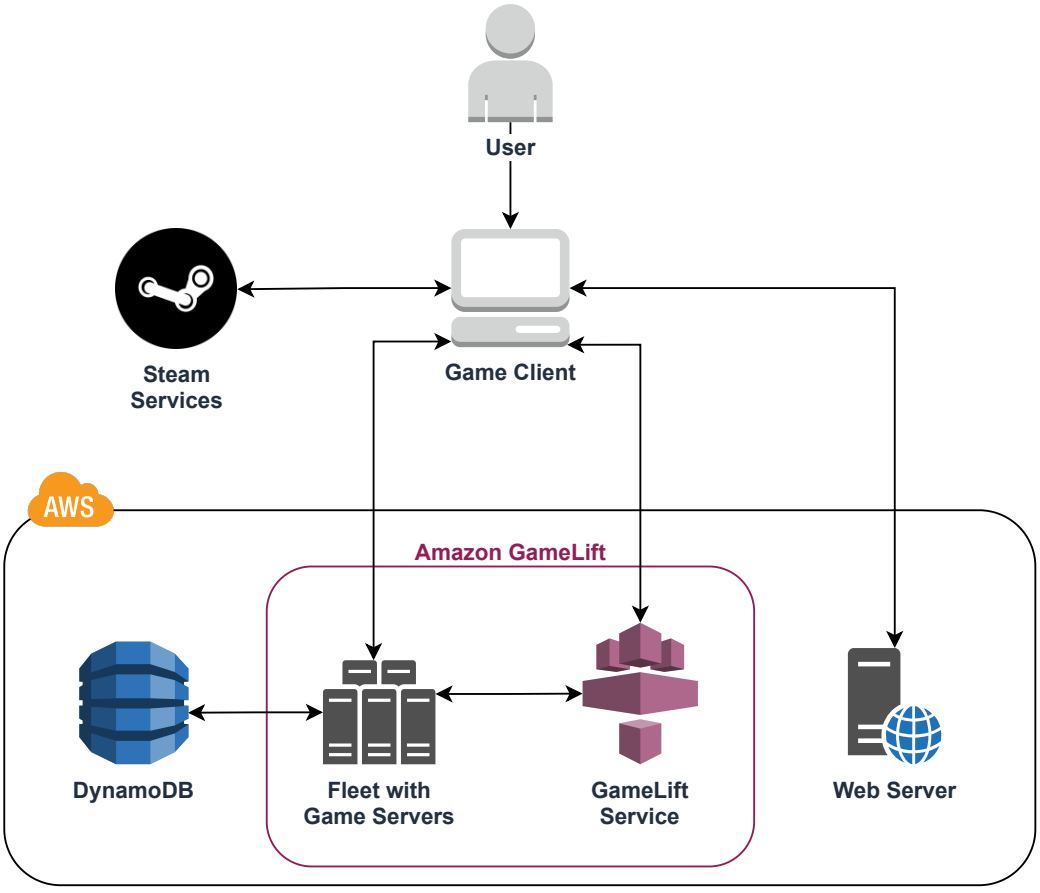

Figure 5: Global infrastracture

8.2 Network Requirements

Inside our infrastructure we rely on AWS and Steam, therefore, due to the scalability of their services we don't have to address any specific requirement. For our users, instead, we recommend a bandwidth of at least 8 Mbps and latency of 50ms due to the fast response time required by our game mechanics. An ADSL internet connection will suffice.

9 Delivery

9.1 Estimated Delivery Time

We plan to deliver our final product on 29th August, 2022. Before that, there will be a closed beta starting from 27th December, 2021, to then transition into an open beta on 28th February, 2022.
Updates and expansions after the final release have not been scheduled yet.

Table 7: Delivery summary

Stage	Delivery Date
Closed Beta	27/12/2021
Open Beta	28/02/2022
Final Release	29/08/2022

9.2 Delivery Platform

The game will be delivered digitally through Steam. In particular, players will be able to purchase, download and install the game through the aforementioned platform.
We chose Steam because it's the world's largest digital distributor of PC games, taking up 75% of the global market share. There will be a €86.00 fee in order to sell our product on Steam, which will be recoupable after our game has at least $1,000.00 Adjusted Gross Revenue for Steam Store.

9.3 Delivery Methodology

The game will cost €9.99 during the beta and will get a 20% launch week discount after the final release. During the beta, there will also be a Supporter Bundle containing exclusive in-game cosmetics in addition to the base game, available for €14.99. This will let players who are willing to spend more money in order to support our game to be rewarded, increasing at the same time our initial revenue.
Further additional content will be purchasable separately or in bundles for a cheaper price to attract new players.

Table 8: Products summary

Item	Price
Wired Up	€9.99
Wired Up - Supporter Bundle	€14.99

10 Staff

10.1 In-House

In addition to the current team members, we will hire in-house the following figures to develop our game:

- Senior Programmer
- 3D Artist
- Testers (x2)

10.2 Outsourced

Other professional figures that we need but will be outsourced are:

- Music Artist
- Web Developer
- Localization

- Security Manager
- Legal Support
- Social Media Manager
- Accountant

11 Location

We chose to rent an office of 60 squared meters for €800/month in Milan to accommodate our internal staff. The place will be equipped with all the required furniture and services in order to provide a suitable working environment for our team.
We will also have to pay €300/month for electricity, heating and office fees and an additional €50/month for an internet connection.

12 Cost Estimation

In the following table we present all the estimated costs up to the open beta.

Table 9: Cost summary

Requirement	Cost	Time Frame	Total Cost
FRONTEND			
Steam	€86.00		€86.00
Website	€11.46	4 months	€45.84
BACKEND			
Game Servers	€649.32	2 months	€1,298.64
Database	€147.14	2 months	€294.28
HARDWARE			

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Table 9 – continued from previous page

Requirement	Cost	Time Frame	Total Cost
Desktop PC (x4)	€5,755.96		€5,755.96
Drawing Tablet	€355.99		€355.99
NAS	€365.79		€365.79
Firewall	€330.31		€330.31
UPS	€105.31		€421.24
SOFTWARE			
Unity Professional (x4)	€493.20	11 months	€5,425.20
Visual Studio Professional (x4)	€493.20	11 months	€1,669.80
GitHub Team (x4)	€13.20	11 months	€145.20
Adobe Photoshop	€24.39	8 months	€195.12
STAFF			
Senior Programmer	€5,000.00	11 months	€55,000.00
3D Artist	€3,000.00	6 months	€18,000.00
Testers (x2)	€3,000.00	2 months	€6,000.00
Music Artist	€7,500.00	whole project	€7,500.00
Web Developer	€4,000.00	1 month	€4,000.00
Localization	€2,000.00	whole project	€2,000.00
Security Manager	€4,000.00	2 months	€8,000.00
Legal Support	€20,000.00	whole project	€20,000.00

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Table 9 – continued from previous page

Requirement	Cost	Time Frame	Total Cost
Social Media Manager	€3,000.00	3 months	€9,000.00
Accountant	€5,500.00	1 year	€5,500.00
Customer Support	€2,500.00	2 months	€5,000.00
LOCATION			
Office Rent	€800.00	11 months	€8,800.00
Office Fees and Bills	€300.00	11 months	€3,300.00
Office Cleaning	€400.00	11 months	€4,400.00
		Total	172,889.37
		Budget	185,000.00
		Surplus	12,110.63

13 Advertising

The €12,110.63 savings will be used for marketing purposes, advertising our game on the most popular platforms through ads and streamers.

14 Potential Security Issues

We believe cheating in our game won't be a relevant issue since our game is only cooperative, therefore it won't be possible to cause direct damage to other players through exploits, as it would be in a PvP game. Nonetheless, the authoritative game server will employ basic measures to prevent cheating. For a possible DDoS attack on our hosted servers we rely on Amazon Web Services to handle it, while our security manager will help us identify and deal with security issues in our internal network.
Finally, players' sensible data exposure will not require our attention since we don't manage any personal information. As a matter of fact, this issue is already managed by Steam.