academic year 2015-16

The Dark Mask

TECHNICAL DESIGN DOCUMENT

Antonio Ruggiero - Barbara Pagano - Marco Rusciano
Giacomo Garoffolo - Roberta Chang - Laura D'Allura

Index

1. Project Goal

1.1 Target service

Using PopCap games statistics, based Plants Vs Zombies: Garden Warfare numbers of players in game's lifecycle (from release to market withdrawal they sold 8 million of copies) we can assume that "The Dark Mask" will be played by about 5 million of players, in particular we estimate an amount of 7.500 to 9.500 players every day
We are using Exit Games's Photon Service, in particular Photon Cloud (SaaS), because there is no need to design, buy, configure and build up Game Server.
Others online services, as user authentication, leaderboards and forums will be managed by Valve Steam online store.
Also in this document we consider the case in which our game will not be accepted on Steam Greenlight and must build up a company managed online infrastructure used for auxiliary services (Game matchmaking and runtime will be in every case handled by Photon Cloud servers).

1.2 Target platform (HW & SW for development and deployment)

Software for development (more info in chapter "7. Estimated Resources Needed"):

- Windows 10 PC's for every team component
- Unity 3D Pro
- MonoDevelop / Visual Studio 2015
- Graphics software
- Sound generation software

Hardware for development (more info in chapter "7. Estimated Resources Needed"):

- 6 Windows Workstations
- Graphics devices
- Sound generation and modulation

Minimum requirements for client (Windows or Linux):

- Windows 10 (32 bit or 64 bit) / Linux distribution with kernel 3.4+
- Intel Core i3
- DirectX 11 support / OpenGL 4.1 support
- Graphic card with at least 1 GB of dedicated memory
- Internet connection
- Mouse and keyboard or Joystick
- 600 MB of free space on Hard Disk

Minimum requirements for client (Mac OS):

- OS X 10.11 El Capitan
- Intel Core 2 Duo
- DirectX 11 support / OpenGL 4.1 support
- NVidia or Inter Iris Graphic Card with at least 1 GB of dedicated memory
- Internet connection
- Mouse and keyboard or Joystick
- 600 MB of free space on Hard Disk

2. Value Added Services

Setup, support, help, community, forum, advertisements etc.
Setup and deployment of matchmaking service and game server runtime (lobby and rooms) will be performed on Photon servers. We need to offer users some services as support for players of our game.

How we implement these services depends on Steam Greenlight approval:

- **With Steam Greenlight approval:**
  As said before, the game will be distributed using Steam platform: Valve offers for every games on steam a "dedicated" section on their community forum.
  Players can use steam forum for recommend improvements, reporting bugs, discuss about the game etc.
  Because the only way for reach steam store is wait for Steam Greenlight approval, Valve offer a kit for creating banners, logos and graphics that will be used as initial advertisement system. When the game will be approved, it will become visible, playable and evaluable from the entire steam community.

- **Without Steam Greenlight approval:**
  As a start-up, we have limited budget and can't afford to buy all the necessary hardware and spend money for maintain the service up.
  Unless we have a publisher, our idea for save money is to use Microsoft Azure or another web hosting services.
  Web Hosting will be used for game website, user registration and login, forum useful for helping users and others online services.
  Also, we need a CDN (like Amazon CloudFire) used for distribute our game's binaries.

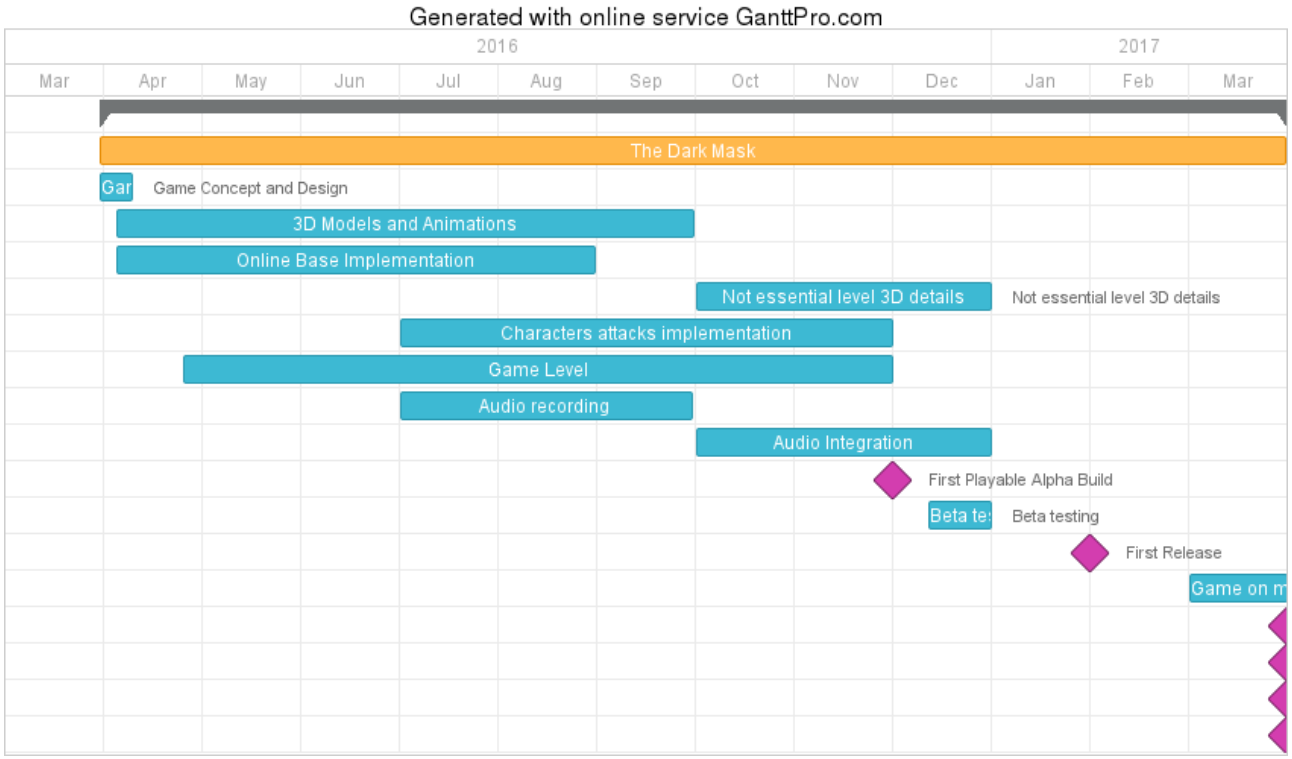
3. Market

3.1 Competing platforms

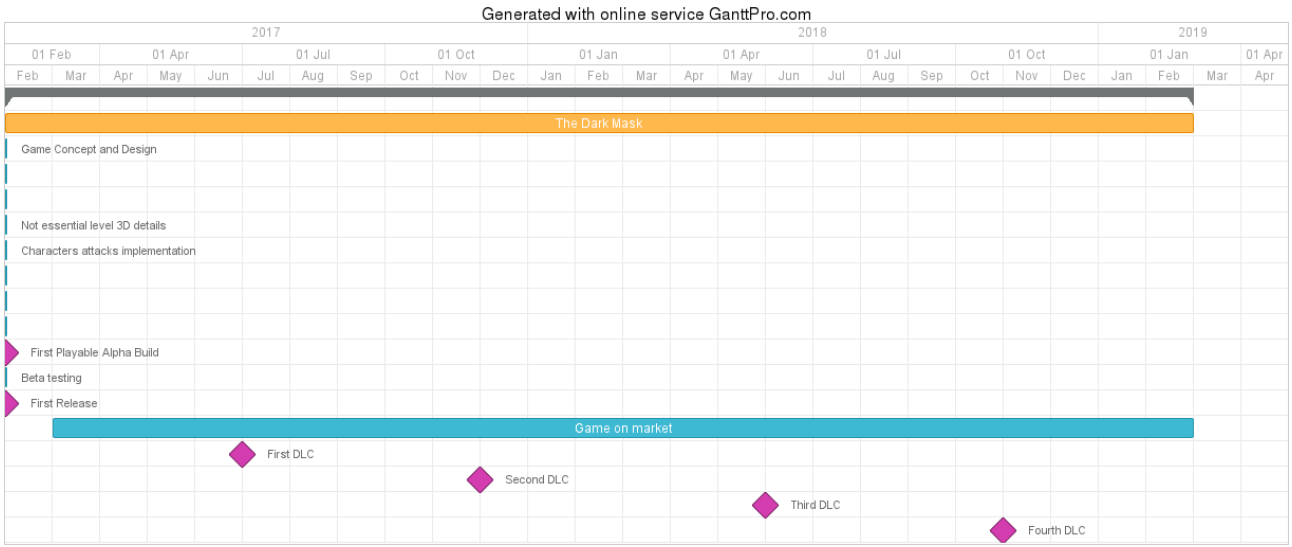
- Blizzard Overwatch
- Epic Games Unreal Tournament
- PopCap Plants vs Zombies: Garden Warfare 2

4. Delivery

4.1 Estimated delivery time



This Gantt represent the total development time and the division of development stage into more detailed pieces.



This Gantt diagram represent the lifecycle from release to market withdrawal of our game, and how we intend to continue development to add new features

4.2 Major software development tasks

As explained into first Gantt Diagram, our development phase starts with a definition and writing of a game design document, used later for split the entire development on the different components of the team, so we divide development into these task:

- **3D Models and Animation:** performed by graphics artists, it focuses on the modelling of 3D models of the first 3 playable characters and essentials 3D level object (expected about 2 and half months of developing)
- **Online base implementation:** performed by programmers, consist into creation of a game basic structure in which every object is synchronized among clients. (expected 5 week of development)
- **Not essential 3D level details:** performed by graphics artist, it's a low-priority task concentrated into the modelling of decorative items for the level. (expected about 2 week of development)
- **Characters Attacks Implementation:** performed by programmers, consist into implementation of attacks on local client, synchronization of attack's animation, spawned objects and eventual need of respawn (succeeded for example after too many enemy's hits received) (expected about 2 month of development)
- **Game Level:** performed by game designers and graphics artists, consist into design and modelling of 3D level structure (expected 5 week of development)
- **Audio Recording:** performed by audio director, simply it consists of recording (or generation) of audio assets that will be used in our game (expected 3 weeks)
- **Audio Integration:** performed by audio director and programmers, it is necessary for synchronizing different audio assets to the corresponding actions (expected 2 weeks)
- **Beta testing:** performed by team and external player, it's a complete test of all features of our games, useful for finding and fixing bugs before release (expected 2 weeks of testing)

4.2 Delivery platform and strategy

4.2.1 Hardware

The game will be distributed only as digital copy.

4.2.2 Software

Client:

- **Steam Game Approval:** Game will be available as a digital copy from Steam Windows store
- **Without Steam Approval:** Game will be distributed by download from game's website. After payment, our server will generate and send a unique activation-key that will must be used by players in order to install and play the game.

Server:

- Server will provide services like content delivery (amazon CloudFire), user account management (steam or Microsoft azure services), payment (steam or PayPal services), matchmaking (Photon) and website hosting (Microsoft azure).

4.2.3 Impact on budget

As a Steam Greenlight wait-for-approval game, until approval we are working out business, after approval the game will be available on steam store as an Early Access game, until final release.
In order to insert out game as Steam Greenlight game, we have to pay $100, plus hardware and software needed for development and deployment, and finally pay our team members every month.
We will insert our game on Greenlight as first as we have a playable version of our game, so we can get back feedback from early access users.

5. Development

5.1 GUI specification and workflow

For GUI Specification see Game Design Document Chapter 5.3 section 5.3.1.

6. Infrastructure Details

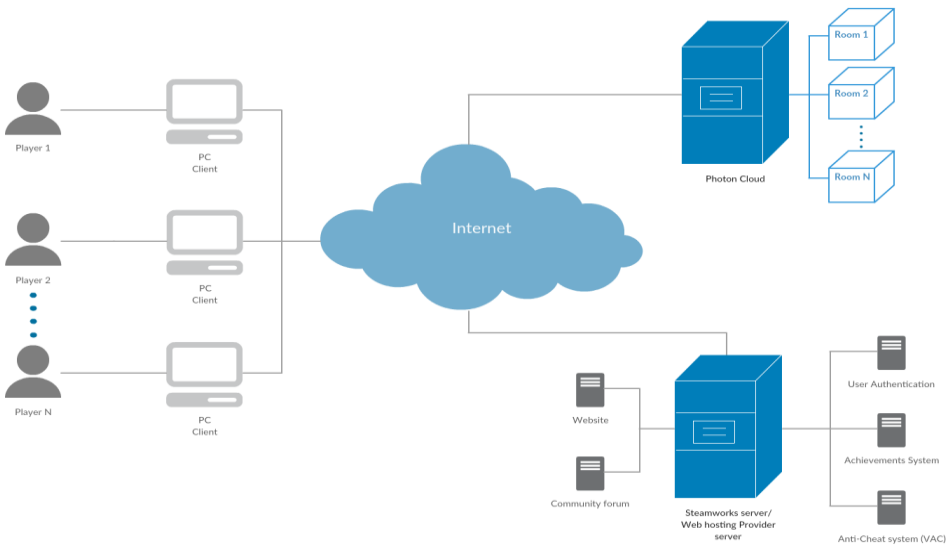
6.1 How services are deployed on servers

Exit Games deploy their Photon server SDK on their machines, as Valve create a section on steam store for our game. We don't have any privileges on this.
Our website will be deployed by us on a web hosting provider

6.2 What is on each server

- Photon server SDK on every machine offered by Photon.
- On Steam server there is a steamworks instance, that offer matchmaking, user authentication and cloud management.
- If we not have Steam Greenlight approval, matchmaking, user authentication and other user support services will be performed by web hosting provider, as we must use Amazon CloudFire (CDN provider) to allow the download of game's binaries. We chose CloudFire from Amazon because it's a "pay-as-you-go" service, so we shouldn't worry about servers sizing and optimization.

6.3 How servers are connected



6.4 Capacity planning

6.4.1 Storage:

- **With Steam Greenlight approval:** as mentioned many times before, Steam offer us a complete infrastructure for store user information.
  In fact, we can use information that steam have already about each user (name, surname, age, username, games played, etc.) and update them on every match end (win/lose statistics, users who he played together, achievements unlocked, position into leaderboard, etc.)
  We estimate an amount of data for every user equal to 20 MB, so steam servers must dedicate us about 100 TB of storage.

- **Without Steam Greenlight approval:** we must use a self-build online infrastructure for provide all these features.
  We can assume that one user data will take about 7-8 MB on our servers, so with a user base of about 1-1.5 million users registered, we need at least 7 TB of storage. As we use separated backups servers, we need at least 10 TB of storage for every backups server.

6.4.2 Bandwidth

- **With Steam Greenlight approval:** Most of the network traffic will be handled by Steam and photon servers. Our servers are useful just for keep the game website online.

- **Without Steam Greenlight approval:** We predicted a peak of 4000 unique users connected every day, so we can assume a peak of 700-800 matches played at the same time. On match, every client produces about 15 kbps of network traffic amount. Assuming a match with maximum of players (6), we can calculate the bandwidth that our game produces: 15 kbps x users into match (6) x number of matches (1250) = 120 Mbps ~ 150 Mbps.
  We must consider that part of this traffic will be handled by photon cloud server and not reach our self-made online infrastructure.

6.5 Scalability and extendibility:

Photon allow us to exceed users number defined into Pricing Plan (Photon call this "CCU Burst"). If our previsions about user number will reveal underrated then Photon will assign our game to upper pricing plan, which cost about 50% more than normal.

6.6 Potential security issues:

regardless of approval of our game on Steam Greenlight, we are using someone else online Infrastructure to offer our services to players, so we don't have to worry about server security.
In case of non-approval on Steam, the only critical point on security is the user authentication service, which will be implemented and maintained by webmaster (to hire) and deployed on web hosting provider chose.

7. Estimated Resources Needed

7.1 Hardware for development machines

Development PC's components:

Every team component has a workstation with this minimum requirements:

- Processors: Intel Core i5 Quad-Core
- Graphic Cards: Single 4GB* NVIDIA GeForce GTX 970
- Memory: 16GB
- Hard Drive: 2TB Solid State Hybrid Drive
- Primary Display: 24" Full-HD
- Secondary Display: 24" Full-HD

From website like originpc.com, a workstation with these components cost about $2,500/unit. In our team, we need 5 pc with these specifications
Also, for audio generation, our Sound Director need an Apple iMac pc, we chose a computer with these specifications:

- Processor: Intel Quad-Core i5
- Hard Drive: 1TB HDD
- Memory: 8GB
- Graphics Cards: Intel Iris

7.2 Hardware for servers

Cloud services used by us implement an automatic scaling system, so resources used at given time can change. As said previously, we don't have much decision-making power on server's behaviour.

7.3 Network hardware

Network hardware	Cost
D-Link AC3200 Ultra Wi-Fi Router	$219

7.4 Storage

Network hardware	Cost
Asustor AS-602T (NAS)	$250
Western Digital Red (Nas Hard Disk)	$233

7.5 Other hardware

Hardware	Cost
Hanvon Art Master III (Graphics tablets)	$219 /artist
Scarlett 2i2 (Audio Board	$160 /artist
Yamaha hs80m (Audio studio monitor)	$269 /artist
Audio recording studio	10€ (~$11,5)/hour

7.6 Software licenses

Software	Licenses cost
Unity Pro	$125/month
Photon Cloud	$95/month
Windows 10 Pro	$119/machine
Visual Studio 2015	$499
Autodesk 3D Studio Max 2016	$185/month per machine
Adobe Creative Cloud for Teams	$69/month per machine
Smithmicro Anime Studio Pro 11	$299/machine
Crazybump	$299/machine
Logic pro x	$199/machine
Navite Instrument Kontakt 5	$399/machine
Pure Data	Freeware
Izotope RX 5 Audio Editor	$349/machine
FireFlight Tecnologies FMod	$500

7.7 External services (e.g., cloud or CDN)

Services	Cost
Steam Greenlight submission fee	100

7.8 Connectivity

Services	Cost
Fastweb Web business	50€ (~$56)/month

7.9 Staff for development (people and time)

As a start-up company founded by our team, we are not going to hire other people. Our team is composed by:

- 3 Unity/C# Programmers
- 2 2D/3D Graphics
- 1 Sound designer

With this staff, we estimated that the development time required is approximately 3 months.

7.10 Staff for production stage (people and time)

- **With Steam Greenlight Approval:** online infrastructure will be managed by Steam and Photon. In addition to the development team we only need to hire customer care staff, who will manage social network's pages and take care of user support on our game.
- **Without Steam Greenlight approval:** we need to develop website for authenticating users and offer a method for distribute our game. In this case, we need to hire a webmaster for the realization of the website, a database, and eventual maintenance of the entire system. Of course, we also need in this case the customer service described above.

7.11 Estimated cost

7.11.1 ... for everything above

Name		Amount	Cost
Network Hardware		X1	$219
Programmers Software	Unity 3D	X3	$139/month
	Windows 10	X3	$357
	Visual Studio 2015	X3	$499
	Total	$995 (first month) $139 (from second month)	
Graphics Artist Software	Autodesk 3D Studio Max 2016	X2	$370 / month
	Adobe Creative Cloud for Teams	X2	$138 / month
	Smithmicro Anime Studio Pro 11	X2	$589
	Crazybump	X2	$589
	Total	$1.704 (first month) $508 (from second month)	
Sound Director Software	Logic Pro X	X1	$199
	Native Instrument kontakt 5	X1	$399
	Pure Data	X1	Free
	Izotope RX 5 Audio Editor	X1	$349
	FireFlight Tecnologies FMOD	X1	$500
	Total	$1.447	
Team Development Hardware	Windows-Based Development PC	X5	$12.500
	OSX-based Development PC	X1	$1.729
	Total	$14.229	
Other Hardware	Hanvon Art Master III (Graphics tablet)	X1	$219
	Scarlett 2i2 (Audio Board)	X1	$160
	Yamaha hs80m (Audio studio monitor)	X1	500
	Total	$648	
Network hardware	Asustor AS-602T	X1	$250
	Western Digital Red	X1	$233
	Total	$483	
Fastweb Web business		X1	$56 /month
Total amount		$19.781 (first month) $703 (from second month)	

7.11.2 Maintenance/Insurance

Using a someone else service, we don't have to take care of maintenance or insurance of online infrastructure

7.11.3 Staff salaries

Staff Component	Amount	Cost
Game Programmers/Designer	**X3**	**$2.700 /month**
Graphics Artists	**X2**	**$2.400 /month**
Sound Artist	**X1**	**$3.000 /month**
(No Steam) Webmaster	**X1**	**$2.000 /month**
Total amount	**$17.900 /month**	

7.11.4 Total

Initial Development and build-up cost	Cost
Estimated Cost for hardware and software (first month)	**$19.781**
Estimated Cost for hardware and software (after first month)	**$703 on every development month (about 7 Month) ~$4.921**
Staff component	**$17.900 on every development month (about 7 month) ~$125.300**
Total amount	**$150.000 over 7 month**

Cost for keep active service and updates development	Cost
Estimated Cost for hardware and software (after first month)	**$703 on every development month (about 2 years) ~$16.872**
Staff component	**$17.900 on every development month (about 2 years) ~$429.600**
Total amount	**$446.472 over 2 years**