



UNIVERSITY OF MALAYA

The Leader in Research & Innovation

WIA3002

Final Year Project I

Blockchain Based VR Multiplayer Shooter Game

Supervised by:

Senior Lecturer. DR. ALI MOHAMMED MANSOOR ALSAHAG

Presented by:

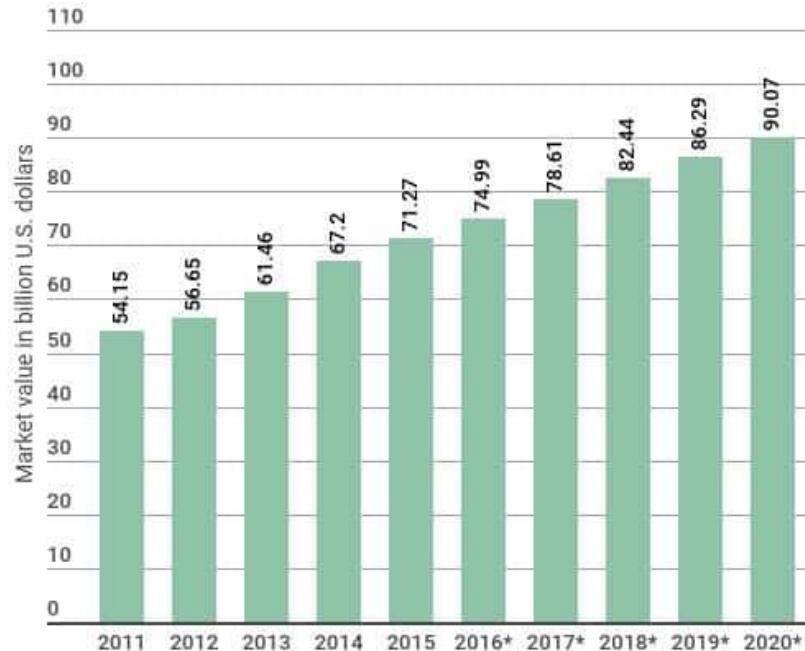
AbdIRahman Essa (WIF160711)

& Bisher Dokkmak (WIF160707)

Introduction

The gaming industry is an ever growing and evolving industry. With value expected to reach 90 billion US dollars by the year 2020.

Global video games market value in billion U.S. dollars from 2011 to 2020

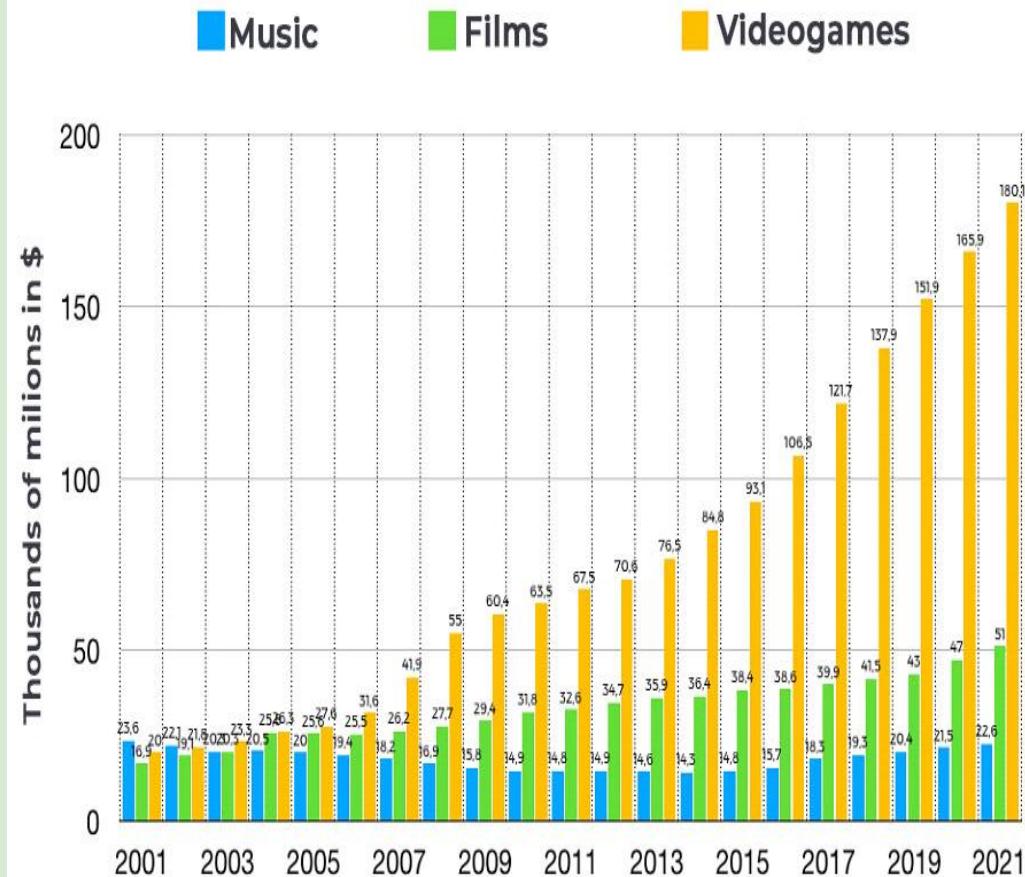


Sources: PwC; Best The News

Created by WePC.com

Introduction

Meaning Gaming Industry is worth more than the Film and Music Industry combined throughout the years since 2015.



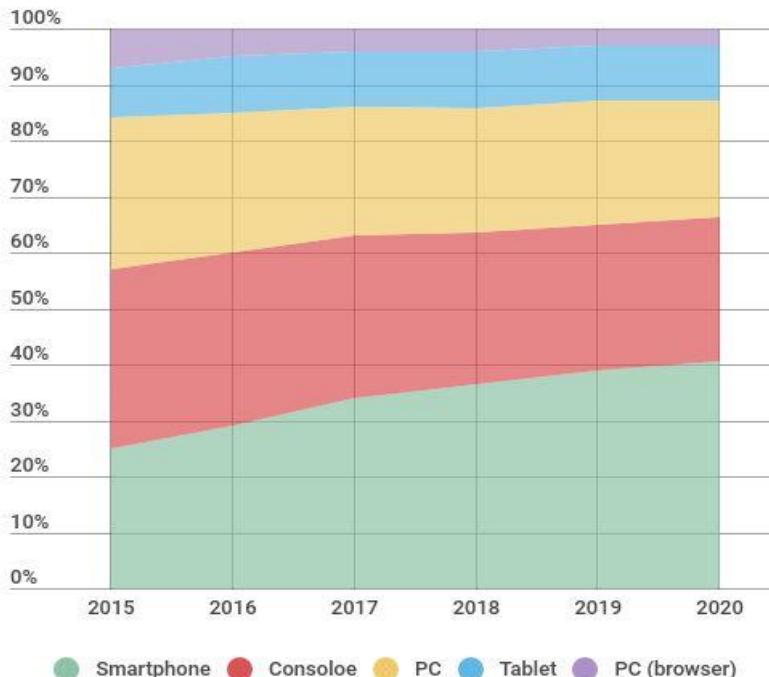
Sources

- <http://www.ifpi.org/downloads/CMI2017.pdf>
- <https://whatthebigdata.com/2017/06/02/turning-point-music-streaming-becomes-primary-form-of-recorded-music-sales/>
- <https://www.statista.com/topics/264/film/>
- <https://dynamy.wordpress.com/tag/film-industry/>
- https://www.mpa.org/wp-content/uploads/2017/02/MPA-Theatrical-Market-Statistics-2016_Final.pdf
- <https://systechnica.com/gaming/2008/06/gaming-expected-to-be-a-68-billion-business-by-2012/>
- <https://newzoo.com/insights/articles/global-games-market-reaches-137-9-billion-in-2018-mobile-games-take-half/>

Introduction

Smartphone and tablets games taking up to 34% from the entire global gaming market in 2015.

Smartphones: Leading the Global Games Market



Source: Newzoo

Created by WePC.com

Problem Statement

- Existing Games Don't support:
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 - 2- Reuse of gaming assets like weapons, skins, etc. outside of the game.
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 - 1- ‘Market hit’ Scheme
 - 2- Affordable equipment
 - 3- Complicated setup for trackers
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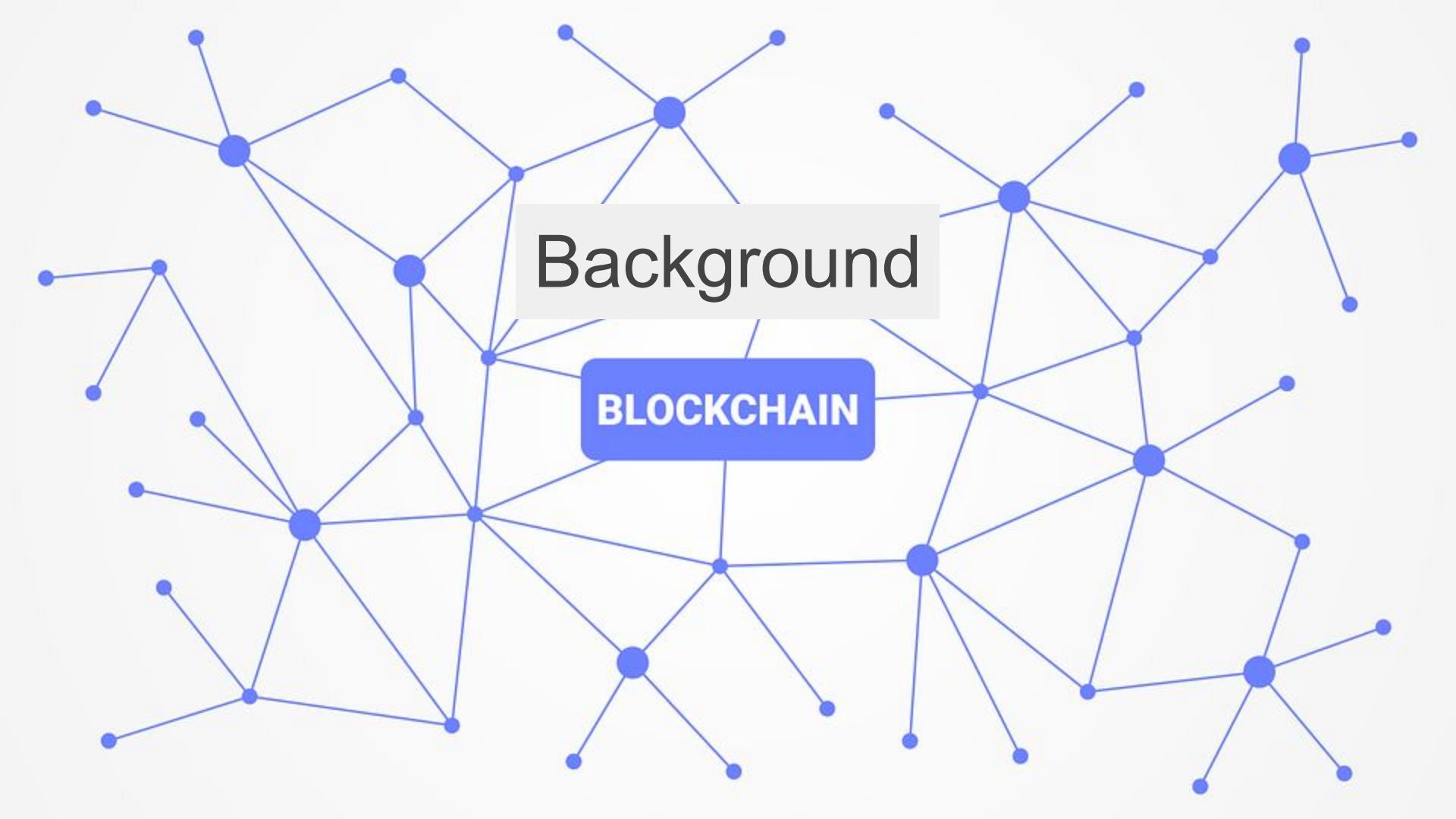
Contributions

Abdulrahman

Abdulrahman:

- Joint Development Core Game Mechanics (Unreal Engine)
- Blockchain Research and modules Development.
- Networking Research and modules Development.
- Blockchain deployment.

Technologies used: JavaScript, NodeJs & C++ for Development.
Solidity to create Ethereum smart contracts.

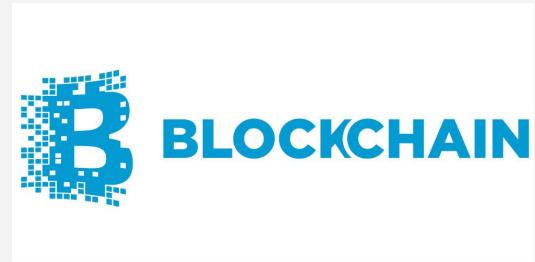


Background

BLOCKCHAIN

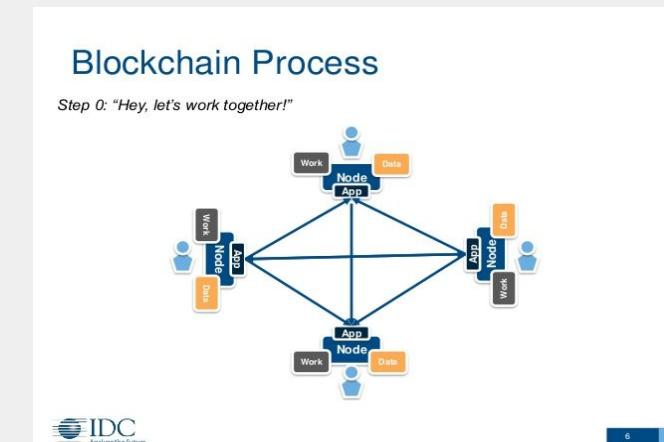
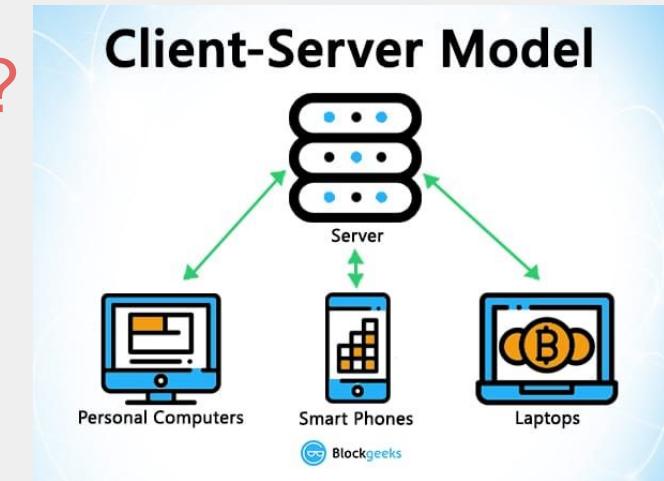
Quick intro: What are Blockchains?

- Blockchain isn't Bitcoin and isn't crypto currency.
- It is Essentially a chain of blocks
- Each block contains data of value without any central supervision.
- It is cryptographically secure and immutable.



What Blockchains allow us to do?

- Assets are owned by Identities.
- Identities are public keys.
- Transactions are signed by a digital signature which connects it to an identity.
- Each block contains the cryptographic hash of the previous block.
- Integrity is protected by secure hashes.



Our Scope: Blockchain games

- ❖ Are they even possible?

How are blockchain games different from traditional games?

Traditional Games

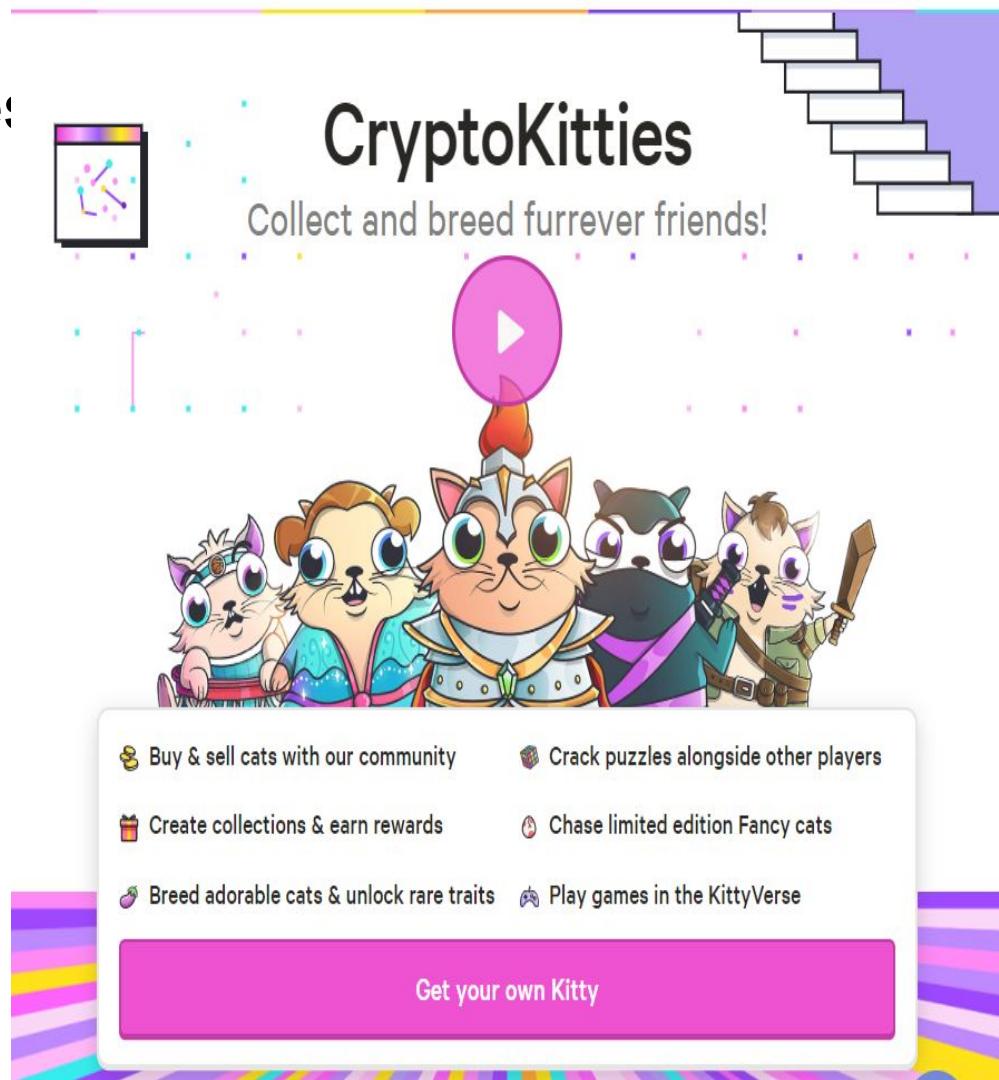
- Assets are owned and controlled by the game developer
- Game assets are not transferable between games
- Player history is hard to track and share between games

Blockchain Games

- Assets are owned and controlled by the player
- Blockchain game assets are interoperable across games
- A continuous record of player and data history allows developers to create personalized content

Literature review : Crypto Kitties

- Buy and sell cats in exchange for cryptocurrency.
- Pay to use existing functions to breed new cats with new traits.



List of Blockchain games on DappRadar

- The most famous games on DappRadar lack the appeal for a mass gamers.
- For example, if I go to top apps on DappRadar or State of Dapps, I cannot find a single game with compelling gameplay.

#	Name	Category	Protocol	Balance	Users 24h	Volume 24h	Volume 7d	Txs 24h	Txs 7d
	 CryptoWars	Games	LOOM	♦ 0	179	\$ 0 ♦ 0	\$ 0 ♦ 0	34.1k	312.7k
1	 PROSPECTORS	Games	EOS	♦ 10.69	3.2k -1.14%	\$ 0 ♦ 0	\$ 0 ♦ 0	58.7k	435.1k
2	 EOS Knights	Games	EOS	♦ 968.21	2.4k +0.55%	\$ 216 ♦ 60.58 -25.20%	\$ 1.7k ♦ 479.84	45.9k	305.6k
3	 My Crypto He...	Games	ETH	♦ 258.44	2.3k -7.24%	\$ 368 ♦ 1.95 -88.18%	\$ 11.1k ♦ 58.9	2.6k	19.6k
4	 EOS Dynasty	Games	EOS	♦ 2.4k	1.7k +0.95%	\$ 974 ♦ 273.37 -39.55%	\$ 11.7k ♦ 3.3k	59k	472.6k
5	 HyperDragon...	Games	ONT	∅ 0	1.3k -3.27%	\$ 352 ∅ 2.1k -47.99%	\$ 7.4k ∅ 43.2k	3.7k	32.4k
6	 SuperPlayer	Games	ETH	♦ 12.09	843 -15.45%	\$ 562 ♦ 2.98 -15.54%	\$ 4.8k ♦ 25.4	1.1k	8.8k
7	 HyperSnakes	Games	ETH	♦ 70.38	731 -4.44%	\$ 5.9k ♦ 31.27 -17.13%	\$ 42.4k ♦ 224.8	831	6.1k
8	 HyperSnakes	Games	ONT	∅ 0	613	\$ 4.9k ∅ 28.6k +1.67%	\$ 34.3k ∅ 200.2k	3.9k	26.1k



M4A1 In three different shooter games. Same weapon but different drawings.

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VR Set

Mobile Gaming

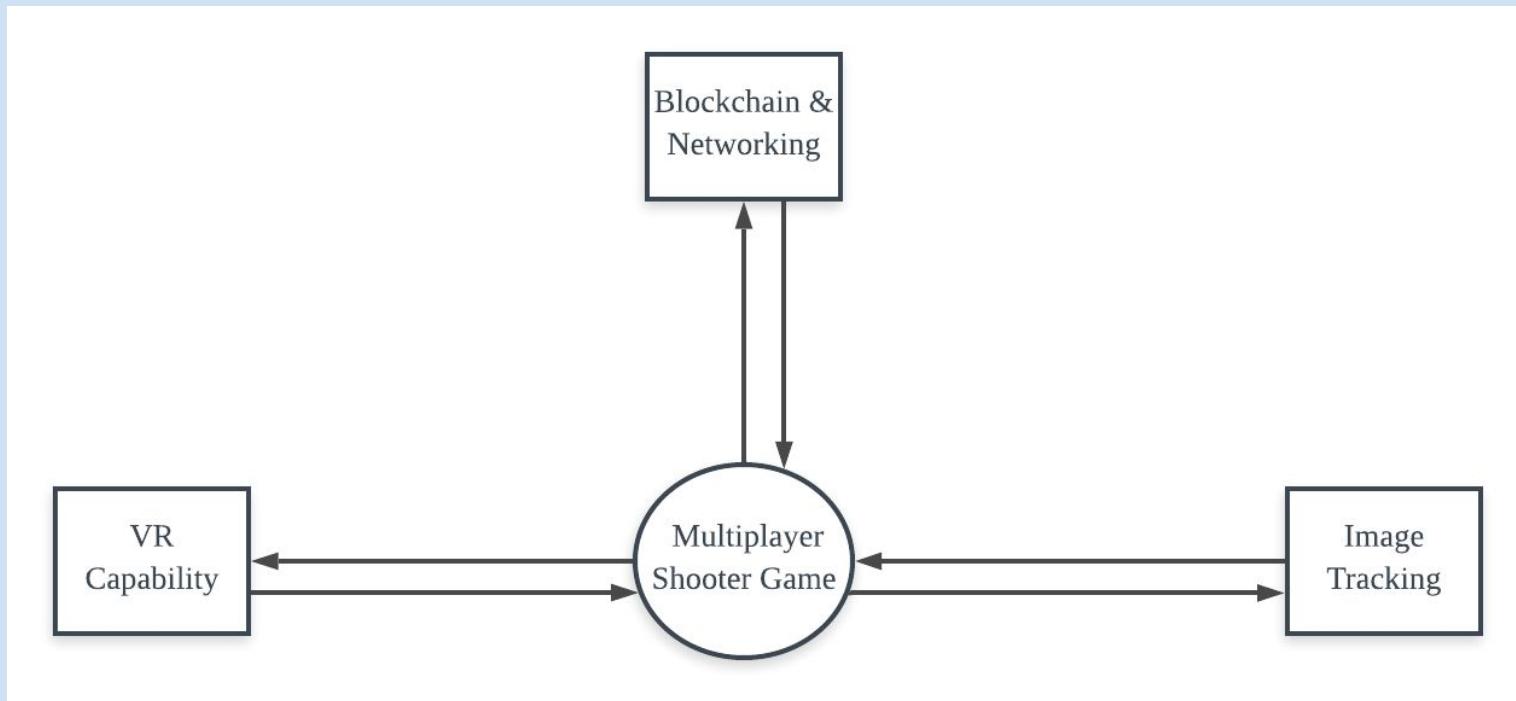
Hand Tracking

BlockChain
Asset

Project Objectives

- Development of a online multiplayer Shooter game which encompasses:
- Unique non-fungible assets owned by gamers using blockchain.
- Ownership is proven by digital signatures and is protected by Distributed Ledger.
- Items are tradeable and reusable in other games.
- Game uses VR and Image Tracking capabilities.

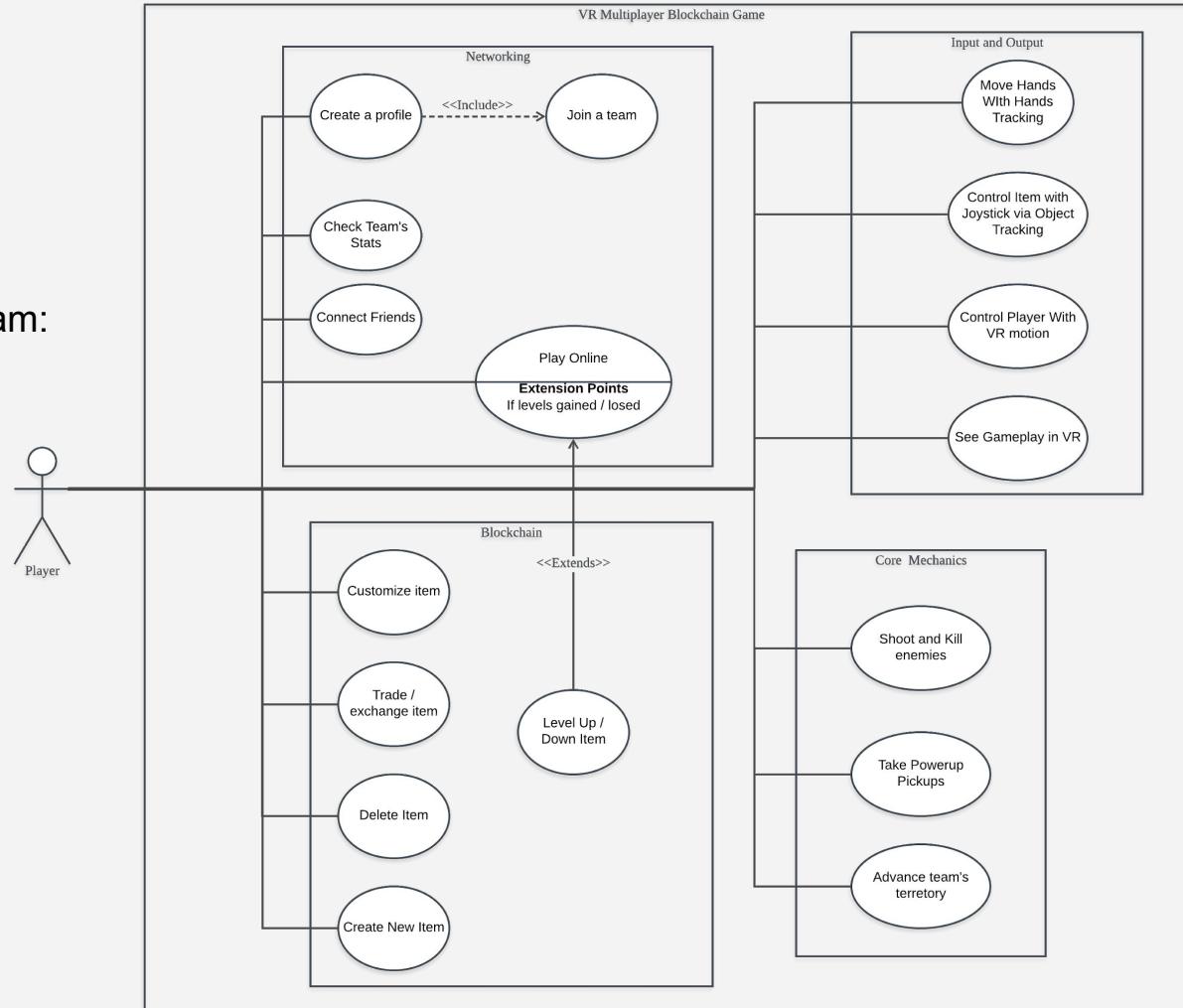
Context Diagram



Design & Implementation

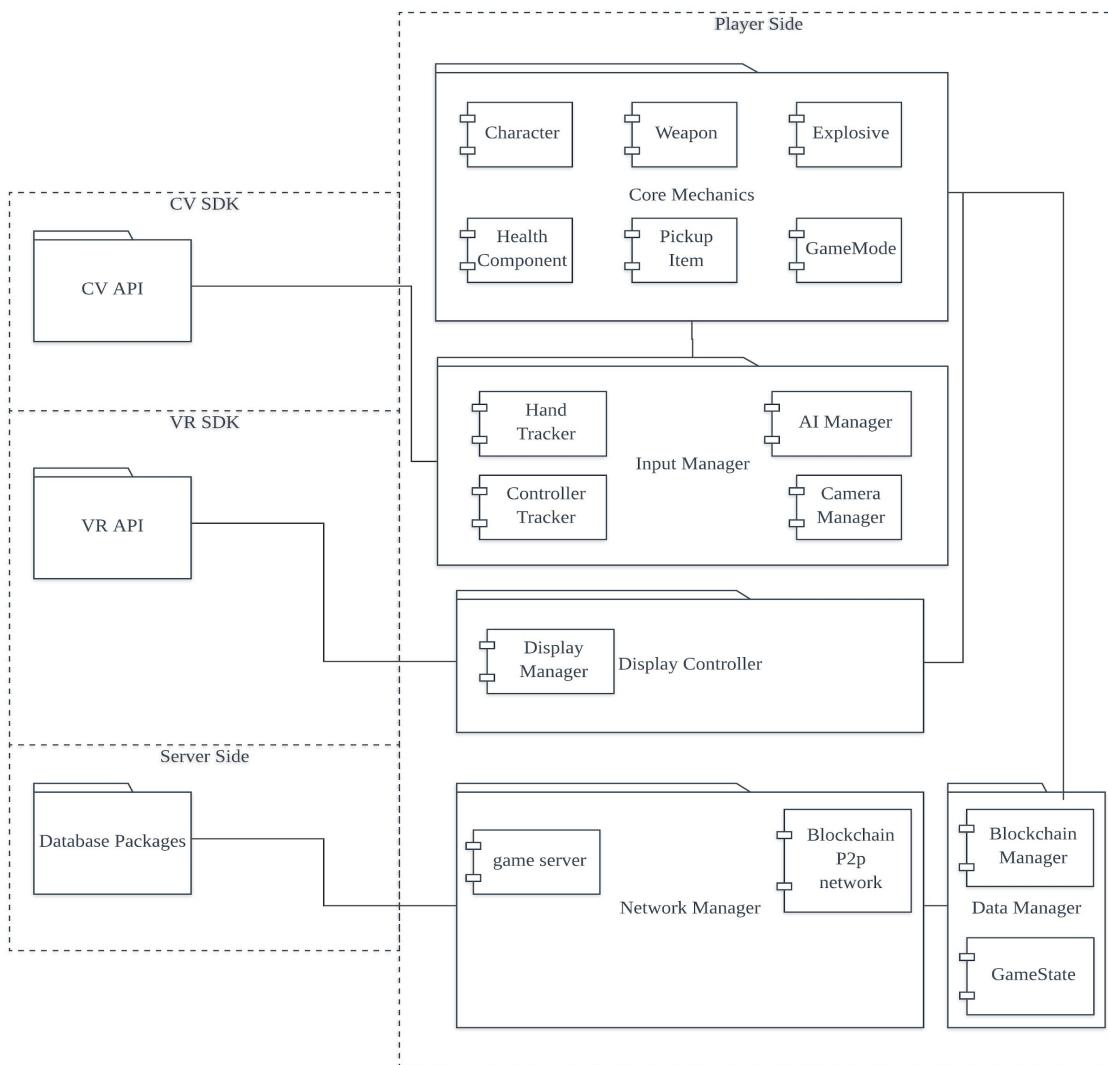
Design

1- Use Case Diagram:



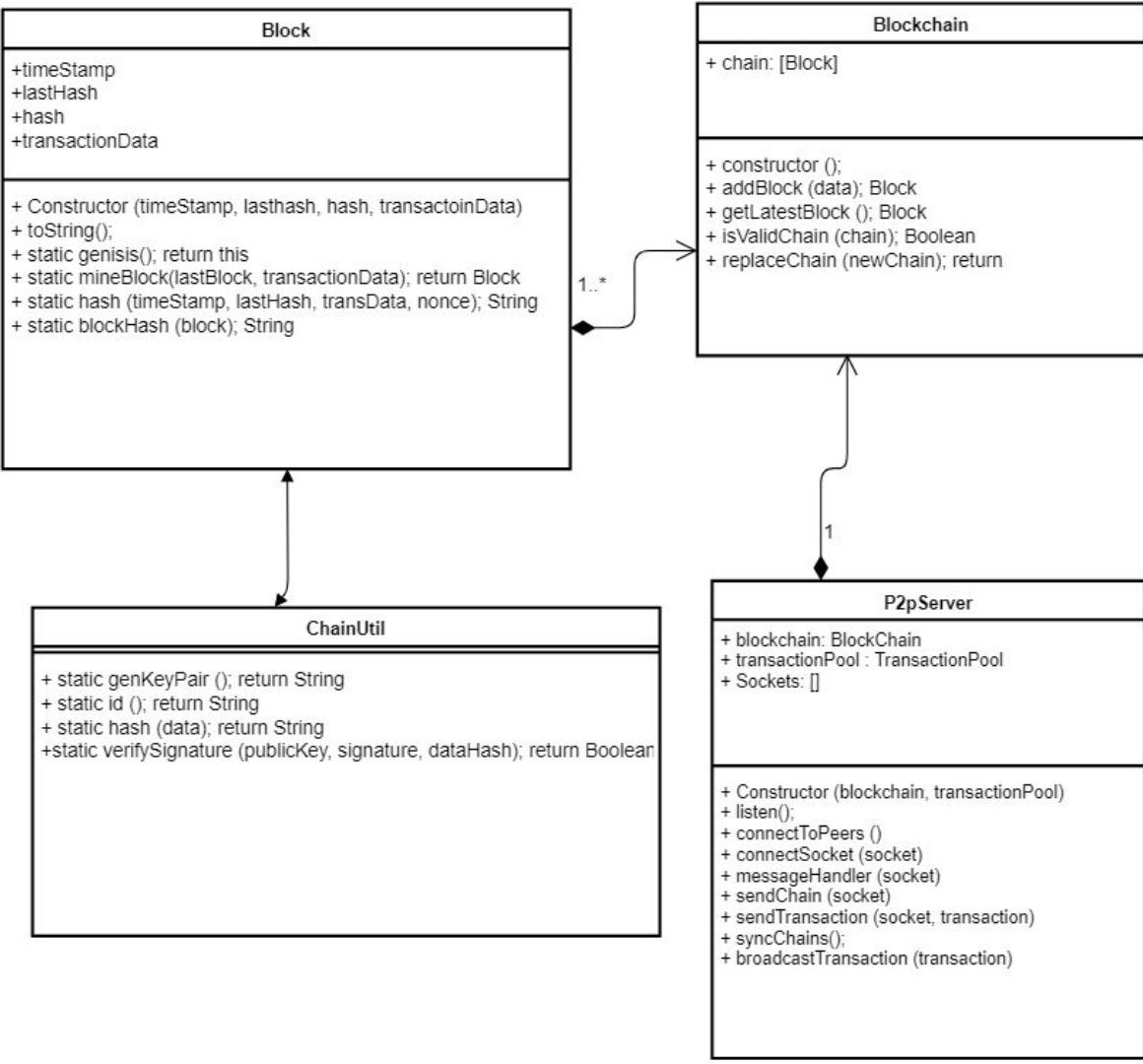
Design

1- Package Diagram:



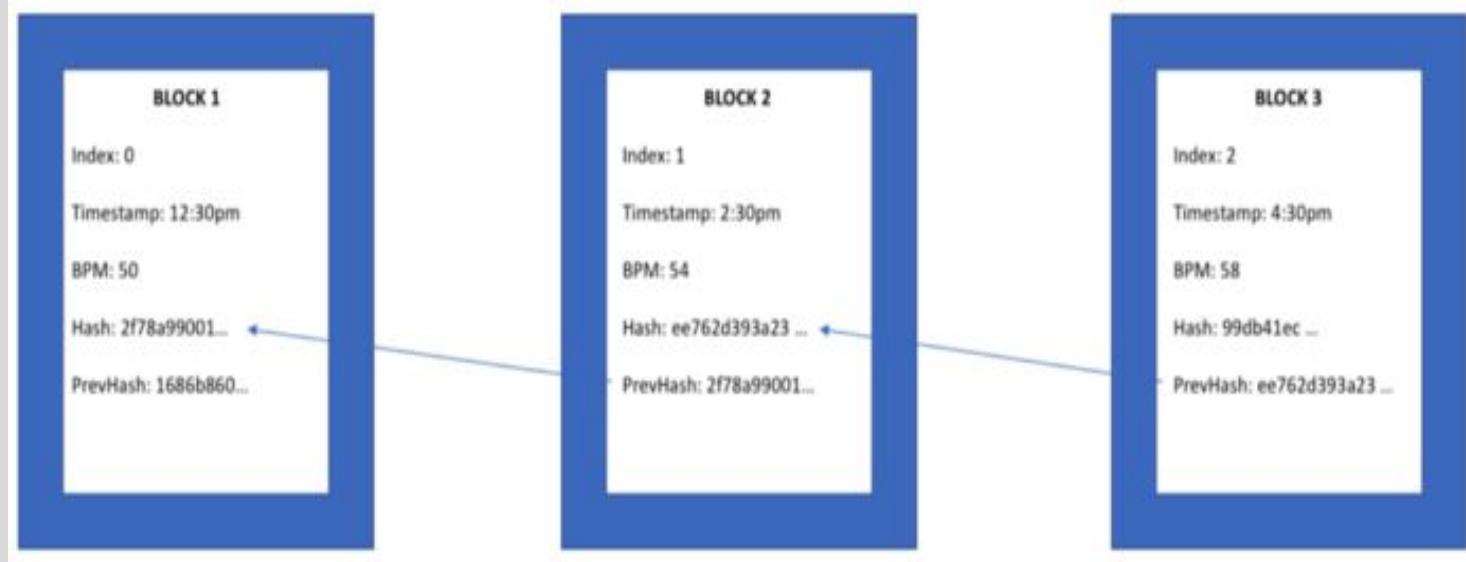
Design

1- Class Diagrams:



VR Blockchain Game Main working scheme

- Assets are represented by Non-fungible tokens.
- Identities own Assets and are represented by public keys.
- Authority is proven by digital signature.
- Transactions are signed by digital signature that connects it to an Identity.
- Transactions Integrity is protected by public Ledger.



Code Snippets:

Block Class:

```
1  const SHA256 = require('crypto-js/sha256');
2
3  class Block{
4      constructor(index, timestamp, data, previousHash = ''){
5          this.index = index;
6          this.timestamp = timestamp;
7          this.data = data;
8          this.previousHash = previousHash;
9          this.hash = this.calculateHash();
10
11
12      }
13      calculateHash(){
14          return SHA256(this.index + this.previousHash + this.timestamp + JSON.stringify(this.data)).toString();
15      }
16  }
17
```

Code Snippets:

Blockchain module:

```
class Blockchain{
    constructor(){
        this.chain = [this.createGenesisBlock()];
    }

    createGenesisBlock(){
        return new Block(0, "17/08/2019", "Genesis block", "0");
    }

    getLastestBlock(){
        return this.chain[this.chain.length - 1];
    }

    addBlock(newBlock){
        newBlock.previousHash = this.getLastestBlock().hash;
        newBlock.hash = newBlock.calculateHash();
        this.chain.push(newBlock);
    }

    isChainValid(){
        for (let i = 1; i<this.chain.length; i++){
            const currentBlock = this.chain[i];
            const previousBlock = this.chain[i-1];

            if(currentBlock.hash !== currentBlock.calculateHash()){
                return false;
            }
            if(currentBlock.previousHash !== previousBlock.hash){
                return false;
            }
        }
        return true;
    }
}
```

Code Snippets:

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            }
        }
        return true;
    }
}
```

Code Snippets:

P2p networking module:

```
var initHttpServer = () => {
  var app = express();
  app.use(bodyParser.json());

  app.get('/blocks', (req, res) => res.send(JSON.stringify(blockchain)));
  app.post('/mineBlock', (req, res) => {
    var newBlock = generateNextBlock(req.body.data);
    addBlock(newBlock);
    broadcast(responseLatestMsg());
    console.log('block added: ' + JSON.stringify(newBlock));
    res.send();
  });
  app.get('/peers', (req, res) => {
    res.send(sockets.map(s => s._socket.remoteAddress + ':' + s._socket.remotePort));
  });
  app.post('/addPeer', (req, res) => {
    connectToPeers([req.body.peer]);
    res.send();
  });
  app.listen(http_port, () => console.log('Listening http on port: ' + http_port));
};

var initP2PServer = () => {
  var server = new WebSocket.Server({port: p2p_port});
  server.on('connection', ws => initConnection(ws));
  console.log('listening websocket p2p port on: ' + p2p_port);
};
```

Background

Virtual Reality

Background



VR / AR / MR



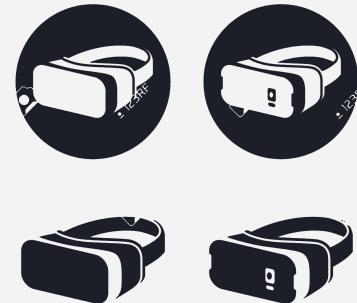
VS.



Stereo Vision



Trackers

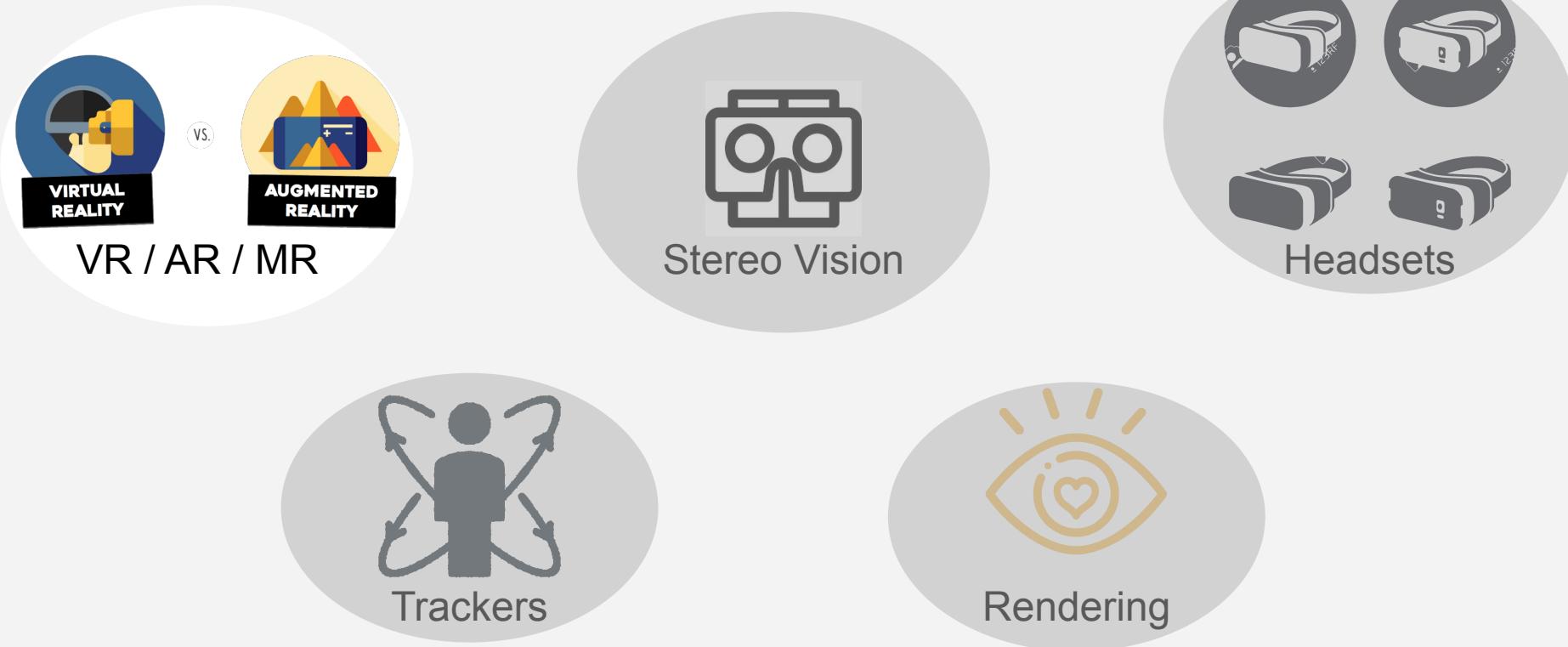


Headsets



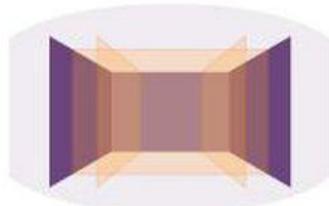
Rendering

Background



VIRTUAL REALITY (VR)

Fully artificial environment



Full immersion in virtual environment

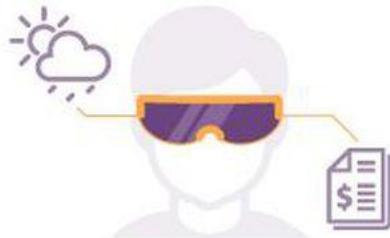


AUGMENTED REALITY (AR)

Virtual objects overlaid on real-world environment



The real world enhanced with digital objects

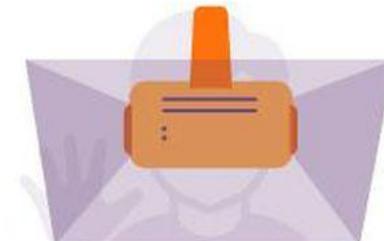


MIXED REALITY (MR)

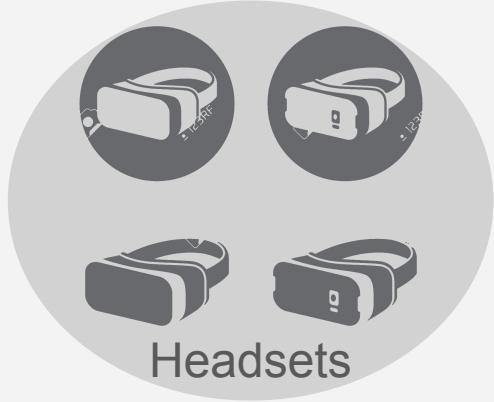
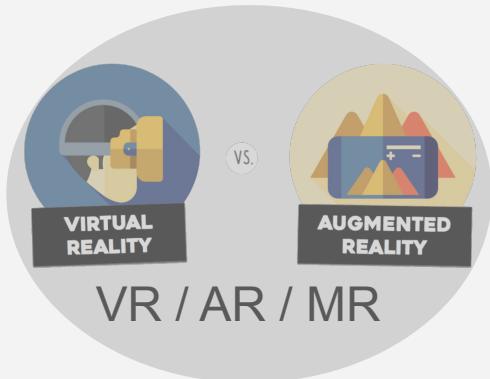
Virtual environment combined with real world

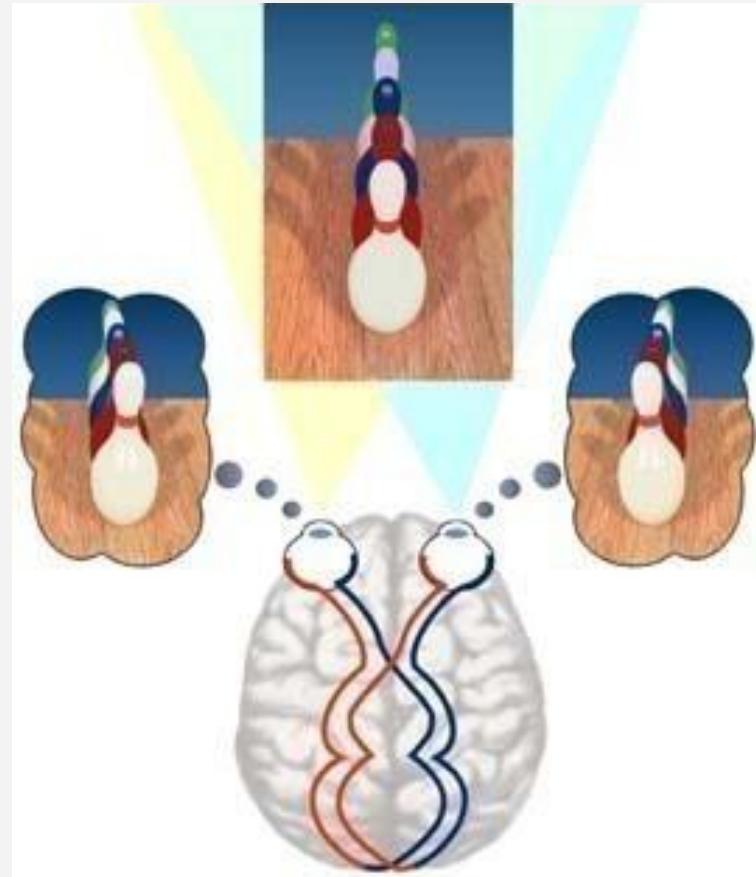


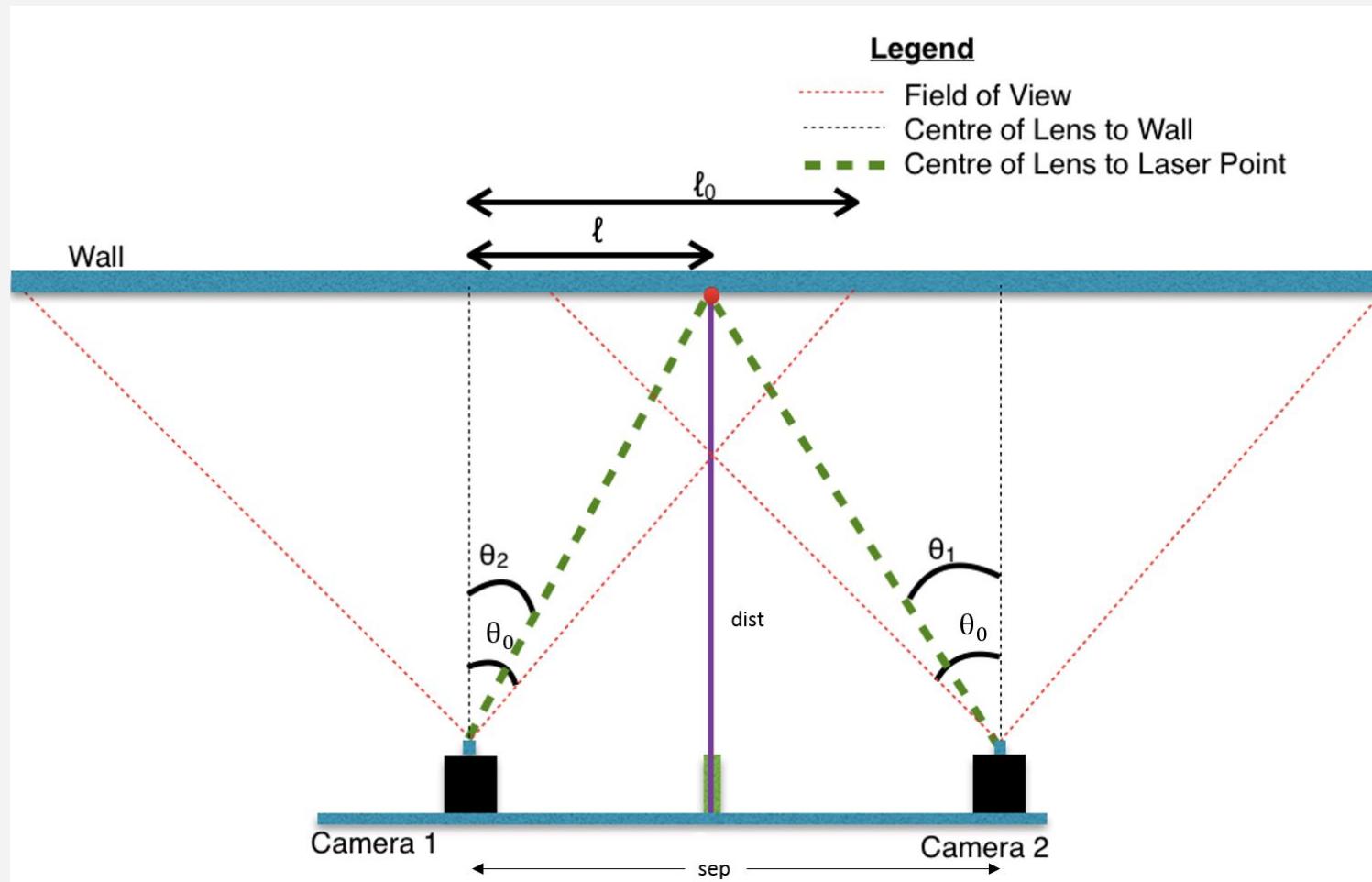
Interact with both the real world and the virtual environment



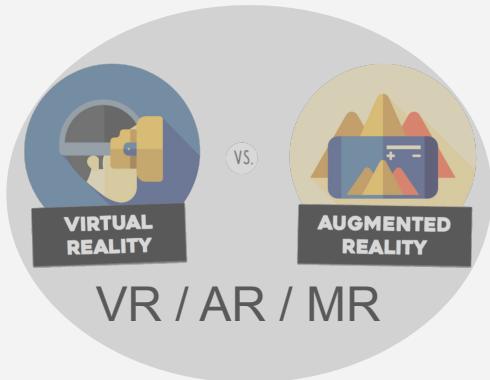
Background







Background



MOBILE VR HEADSETS



Smartphone-powered

Smartphone slots into the headset



Standalone

All-in-one mobile headset

TETHERED VR HEADSETS



PC-controlled

Headset connects by wire to a PC

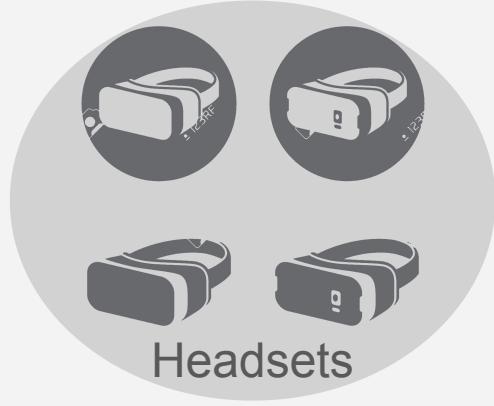
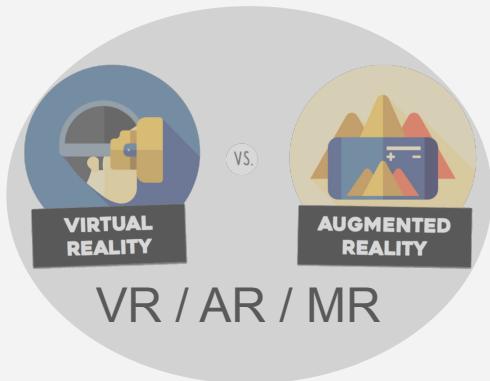
UNTETHERED VR HEADSETS



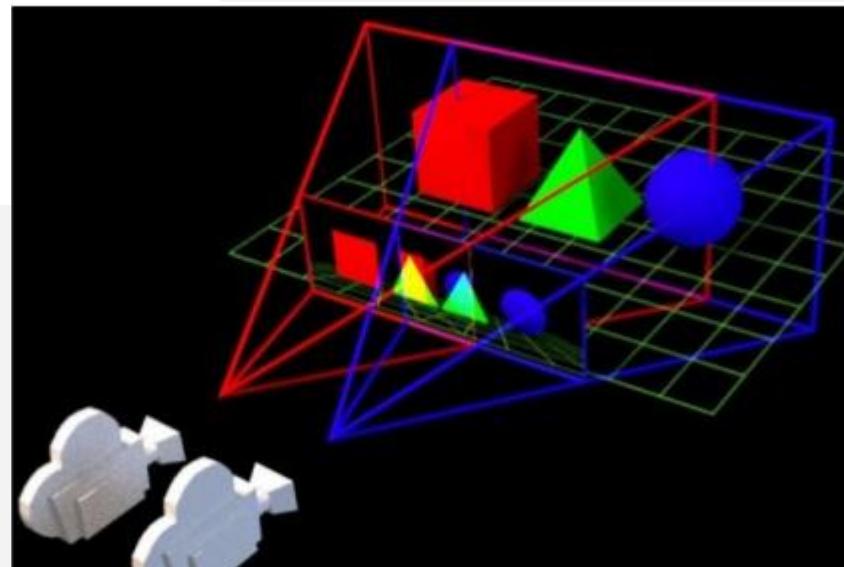
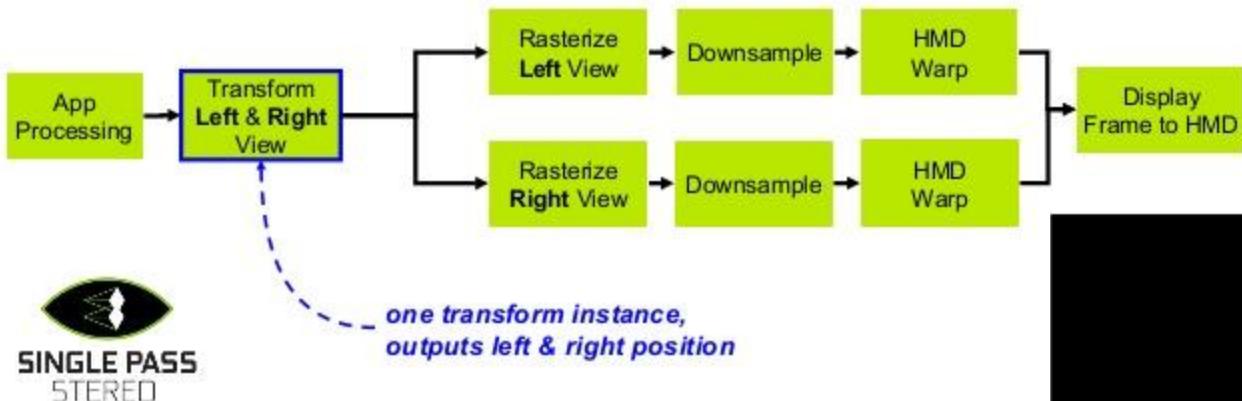
Wireless

Don't require a PC or a smartphone

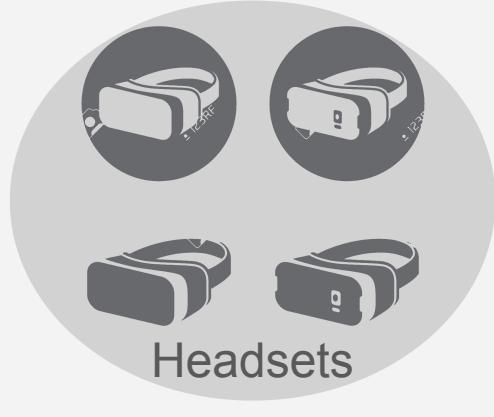
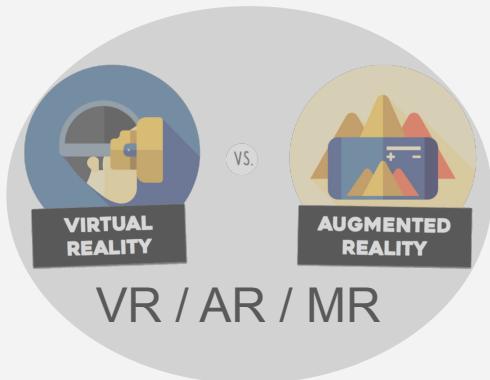
Background



Virtual Reality Rendering Pipeline With Single Pass Stereo



Background





Problem statement

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Gaming Industry Revenues by 2018 (Billions) (by Game Industry and SuperData)



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PlayStation
VR



\$800

Oculus
Rift



~\$1,376*

HTC
Vive



~\$1,599

Gear
VR



\$649

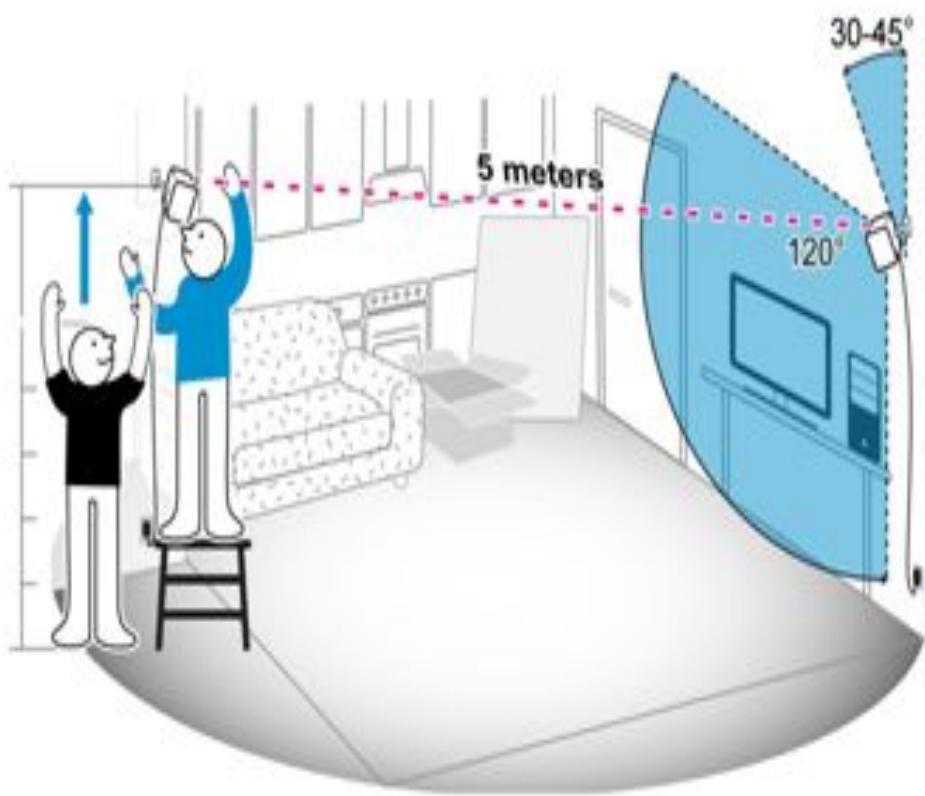
Daydream
View



\$728

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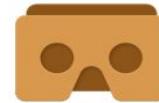


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Mobile VR Devices

Samsung
Gear VR



merge VR
VIRTUAL REALITY

DODOCASE

ZEISS

VR Devices

Oculus VR™

HTC VIVE



AVEGANT

FOVE

SULON

STAR VR

Controllers

Omni
By Virtuix

nod

VIRZOOM

SIXENSE™

LEAP

Developer Tools

unity

Gameworks VR



HIGH FIDELITY



UNREAL
ENGINE

VALVE

OSVR

MOZVR

Camera / Mapping

JAUNT

STRUCTURE
SENSOR

HOVER
Project Tango

matterport™

VideoStitch

kolor

Content



FELIX & PAUL
STUDIOS

RELOAD
STUDIOS

livelike

Vrse

NEXT VR



VISIONARY
SPACE VR

Social / Content Platform

SECOND LIFE

AltspaceVR

VRVIDEO

EMERGENT

WEARVR
LITTLE STAR

Education / Medical

PSIOUS
toolsuite

Woofbert

DISCOVR

mindmaze
DEEPSTREAM VR

VIVID
VISION

Business / Enterprise

Pi
Autodesk

InsiteVR

irisVR

inreal

sdk

Literature review

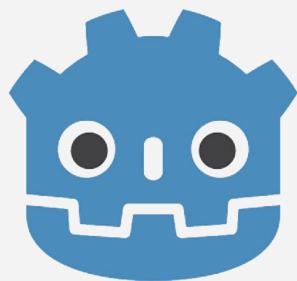
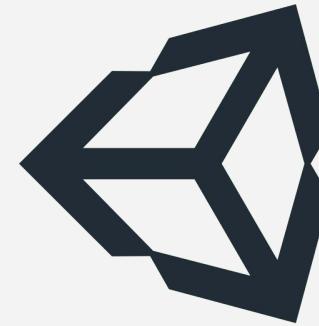
VR Games

Literature Review

- Game Engines
- VR SDK
- Motion Tracking
- Games

Literature Review

1- Game Engines



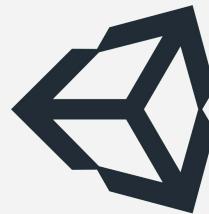
CRYENGINE®

Literature Review

1- Game Engines



Optimization
Mult-Framework Environment
Active Community
Highly Supported
Complicated
Forces blueprint system



Friendly Environment
Light Renderer
Active Community
Highly Supported
No Low-level access
C# Only



Optimization
Mult-Framework Environment
Deserted Community
Not Supported



Friendly Environment
Mult-Framework Environment
Mildly Supported

Literature Review

2- VR SDKs



Cardboard



oculus



Daydream



STEAM VR

SAMSUNG
Gear VR



Literature Review

2- VR SDKs



Cardboard



oculus



Daydream



STEAM VR

SAMSUNG
Gear VR



VIVE

Literature Review

2- VR SDKs



Cardboard



oculus



Daydream



STEAM VR

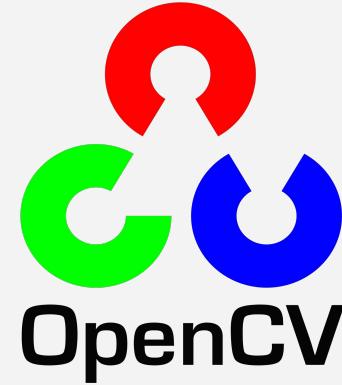
SAMSUNG
Gear VR



VIVE

Literature Review

3- Motion Tracking



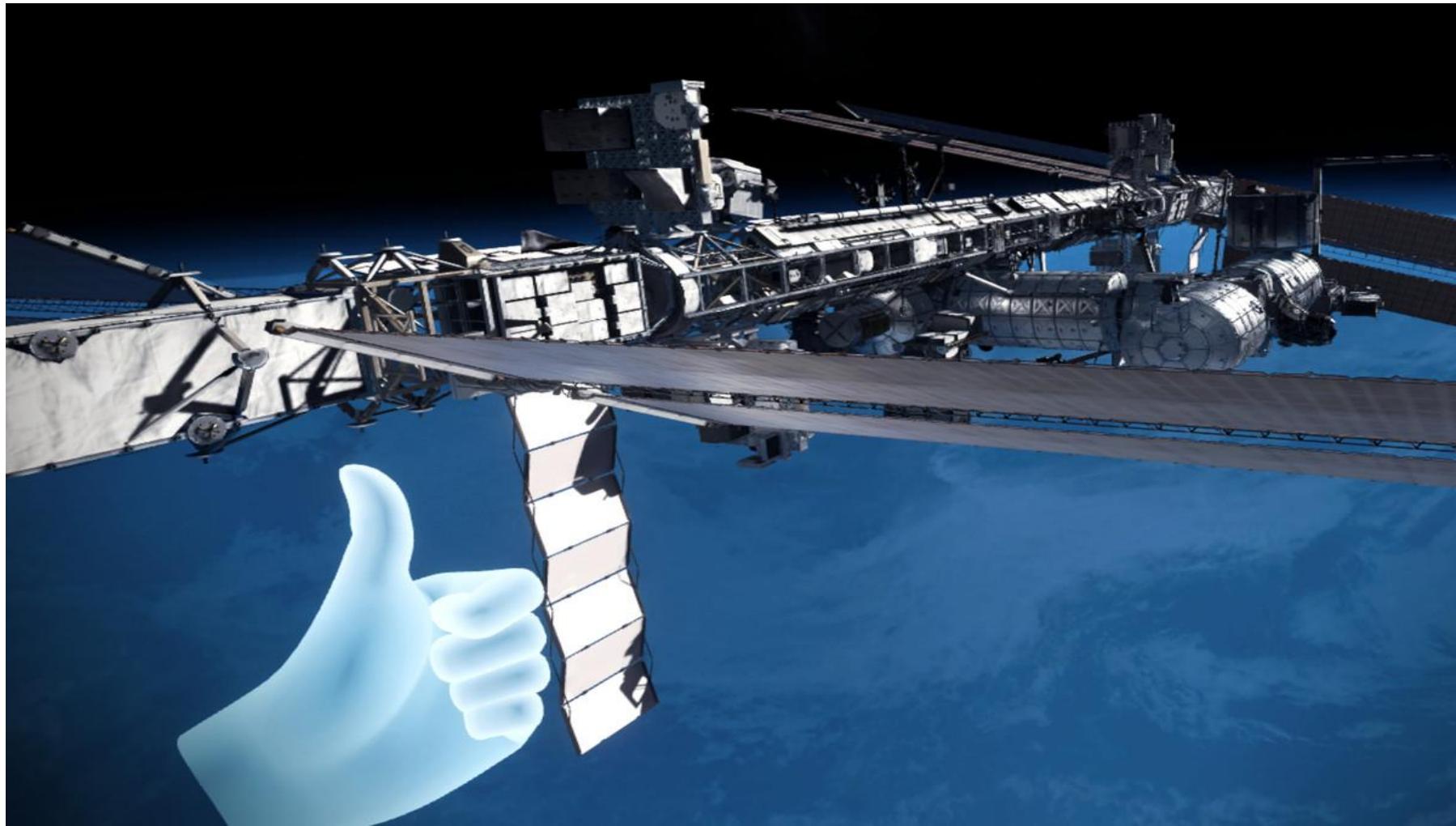
Literature Review

4- Games

- VR Specific
- Need specific equipments
- Lack gameplay
- Just an importation









The Elder Scrolls V

SKYRIM®



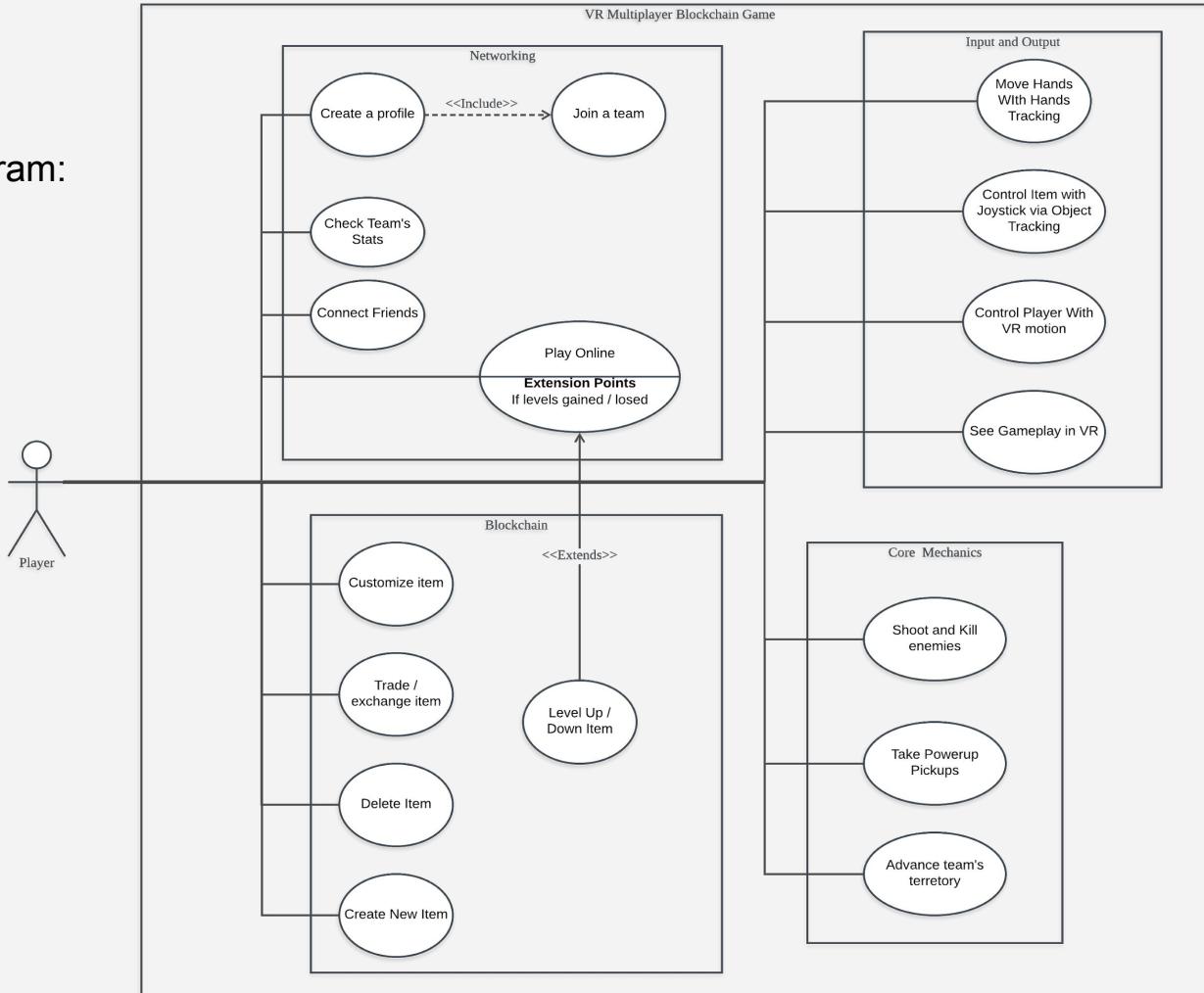
**There are some good
Games...**



Design

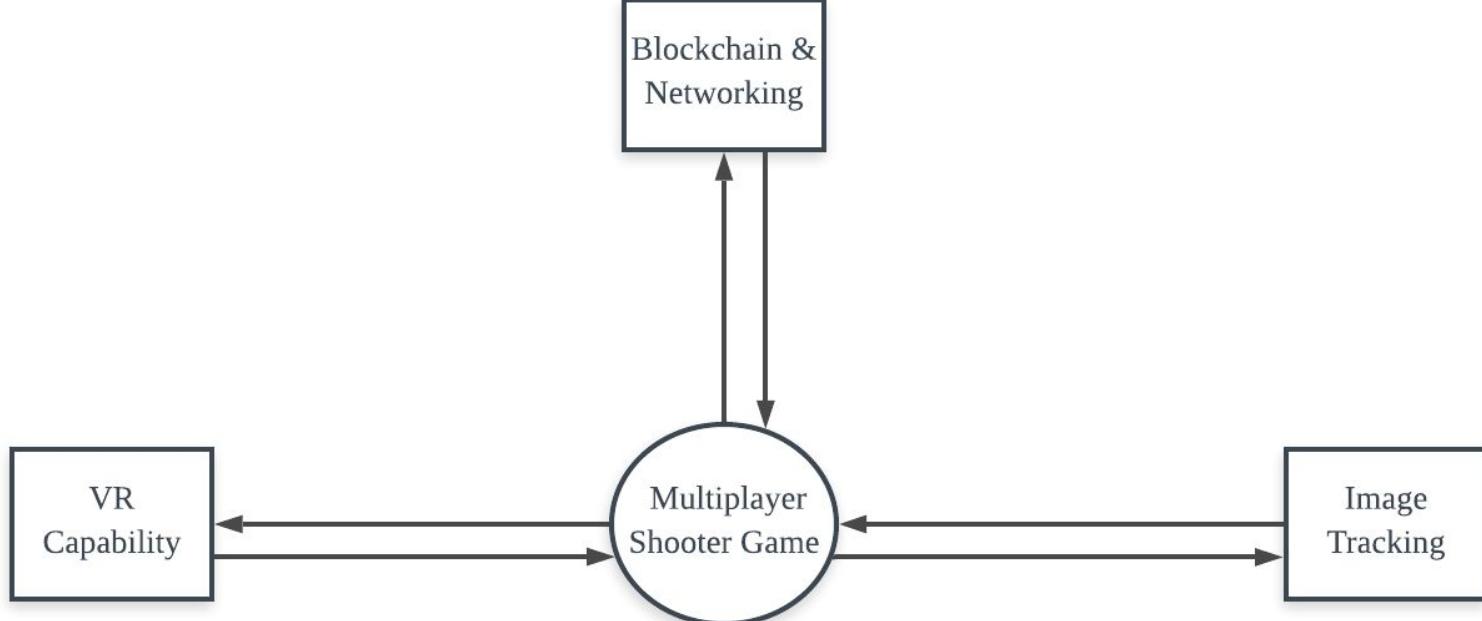
Design

1- Use Case Diagram:



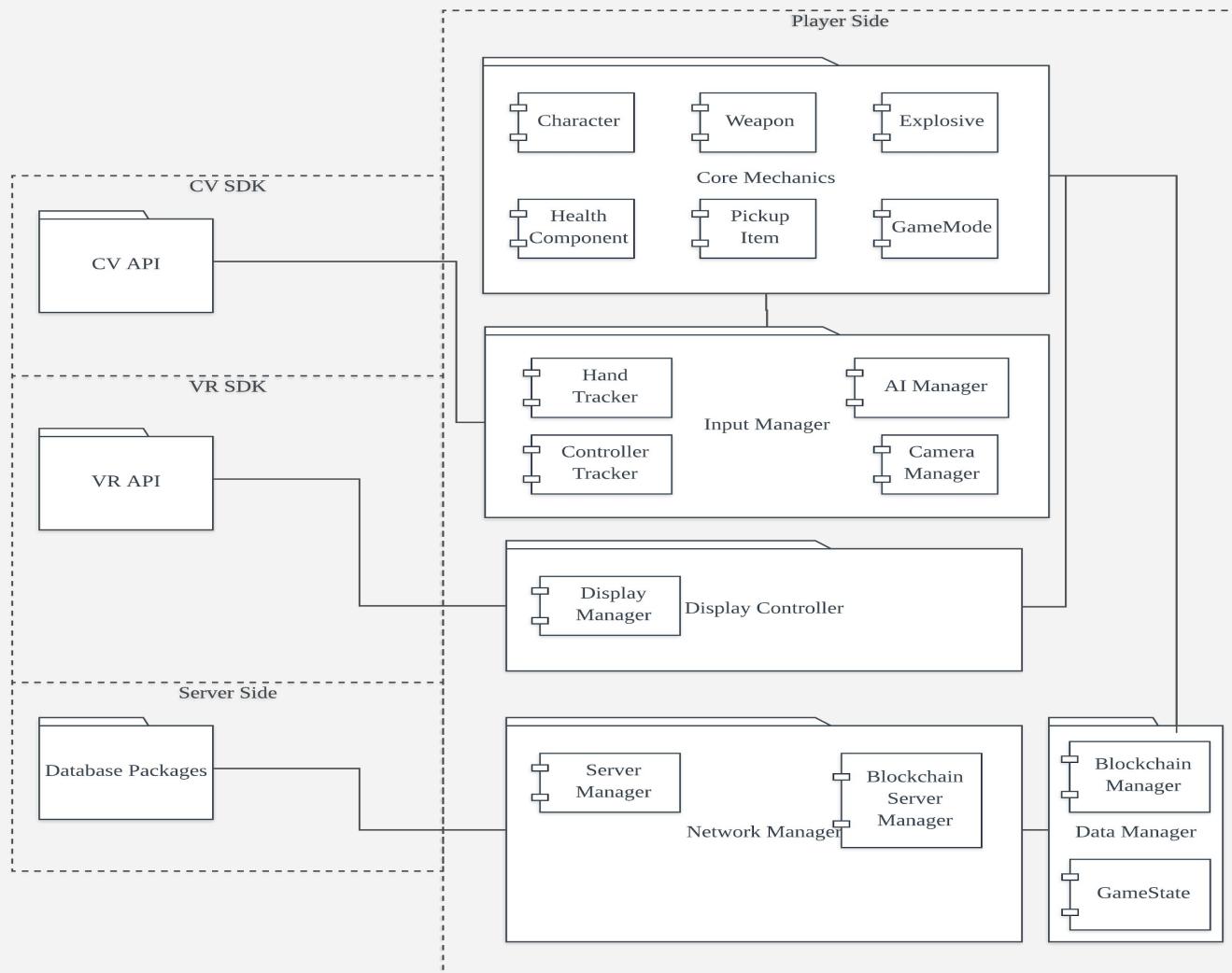
Design

2- Context Diagram:



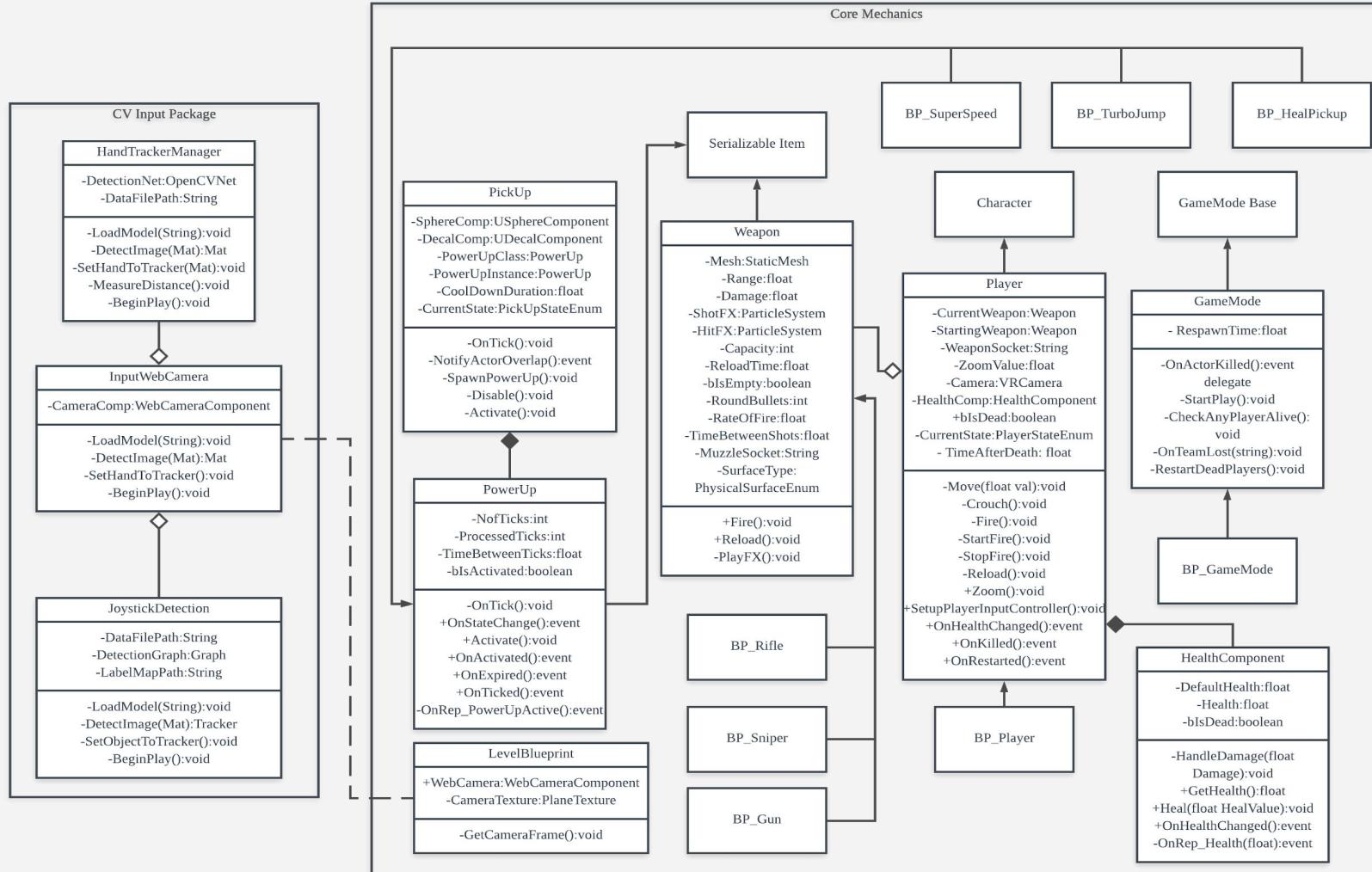
Design

3- Package Diagram:



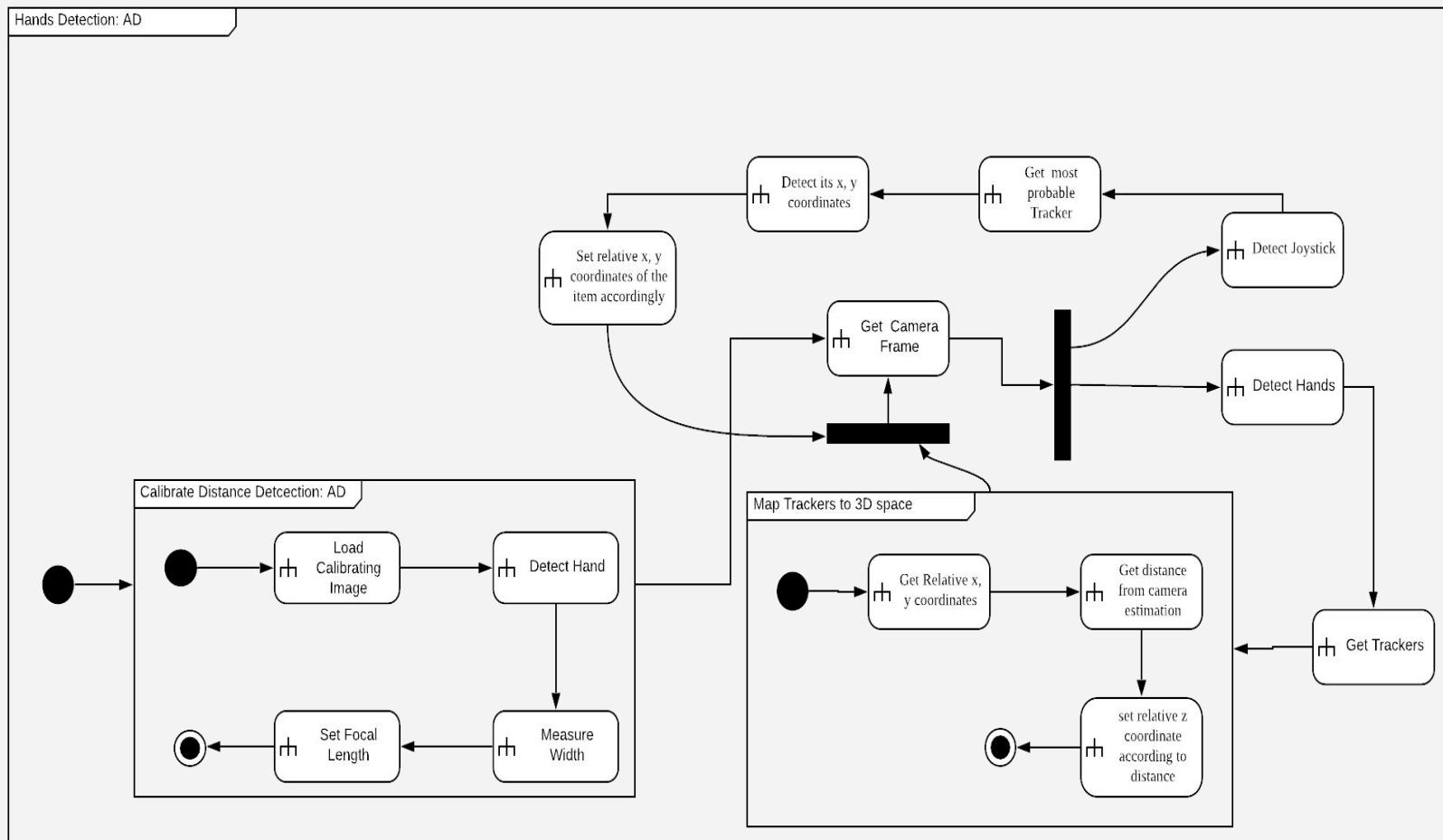
Design

4- Class Diagram:



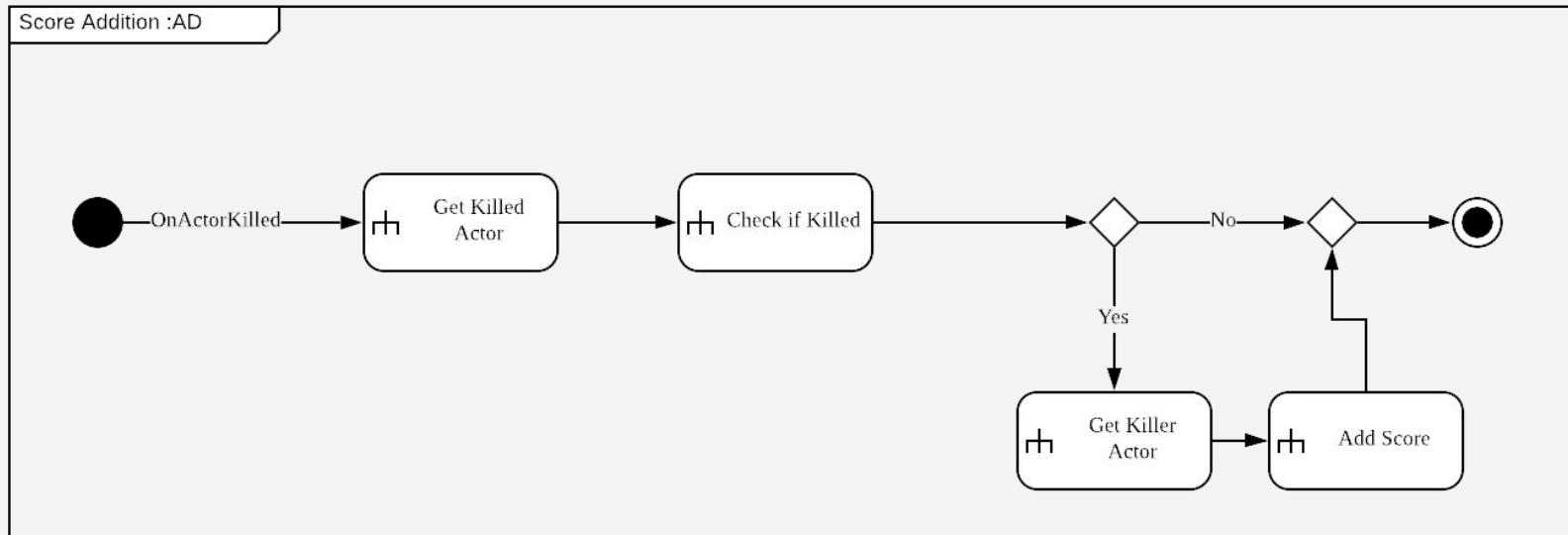
Design

5- Activity Diagram:



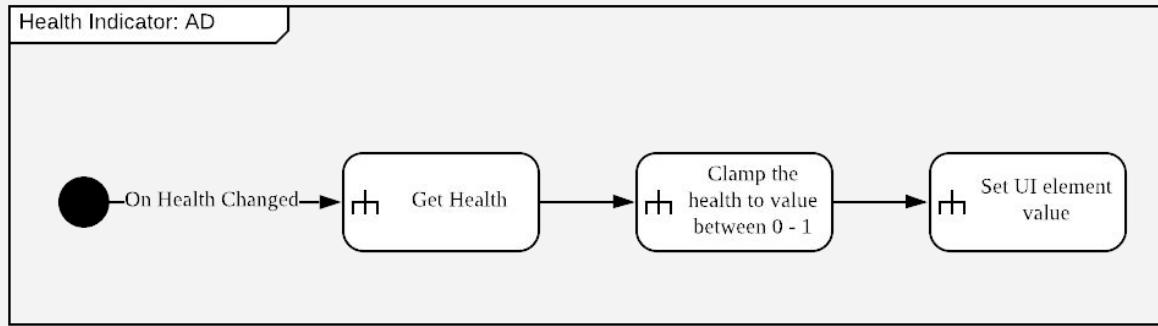
Design

5- Activity Diagram:



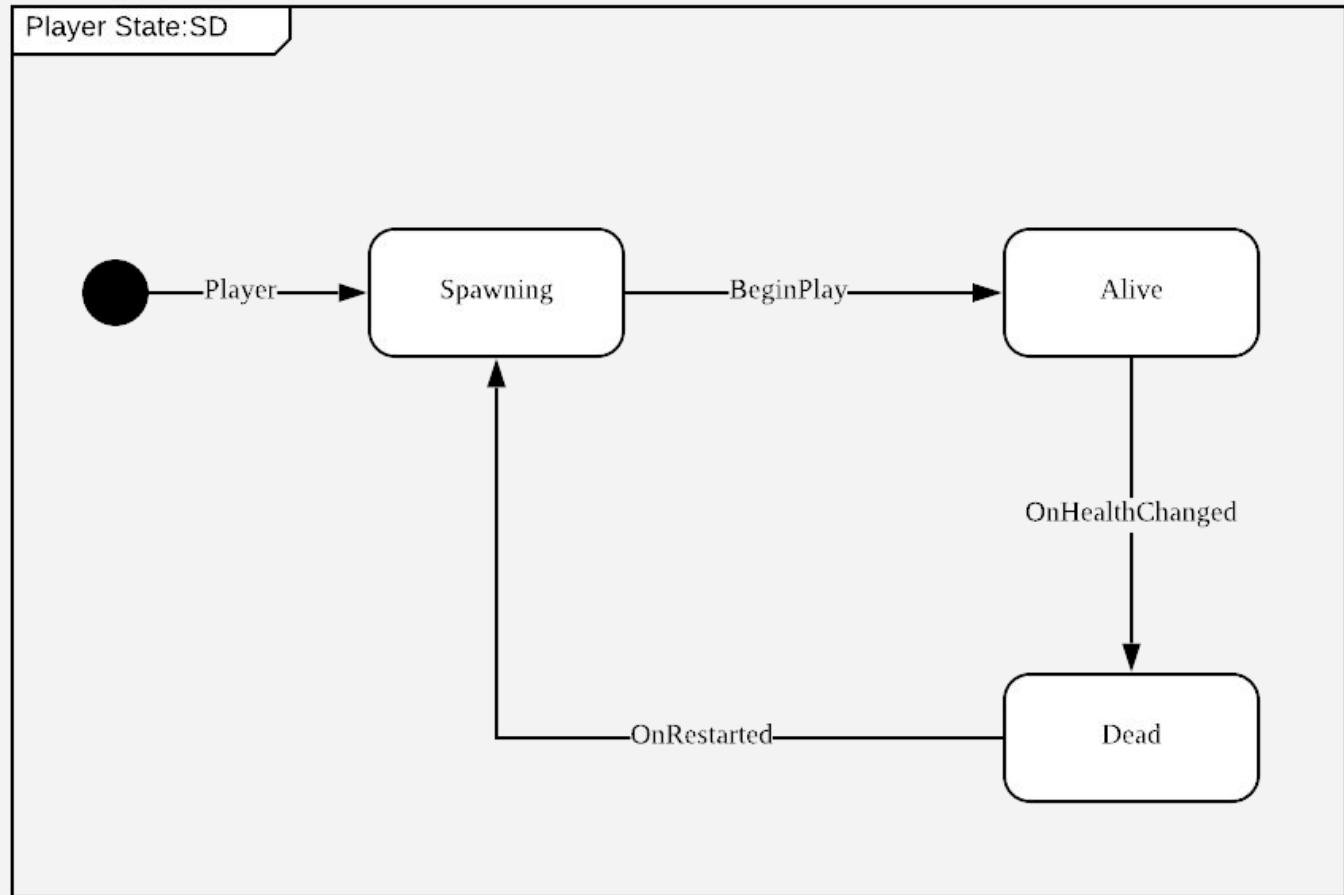
Design

5- Activity Diagram:



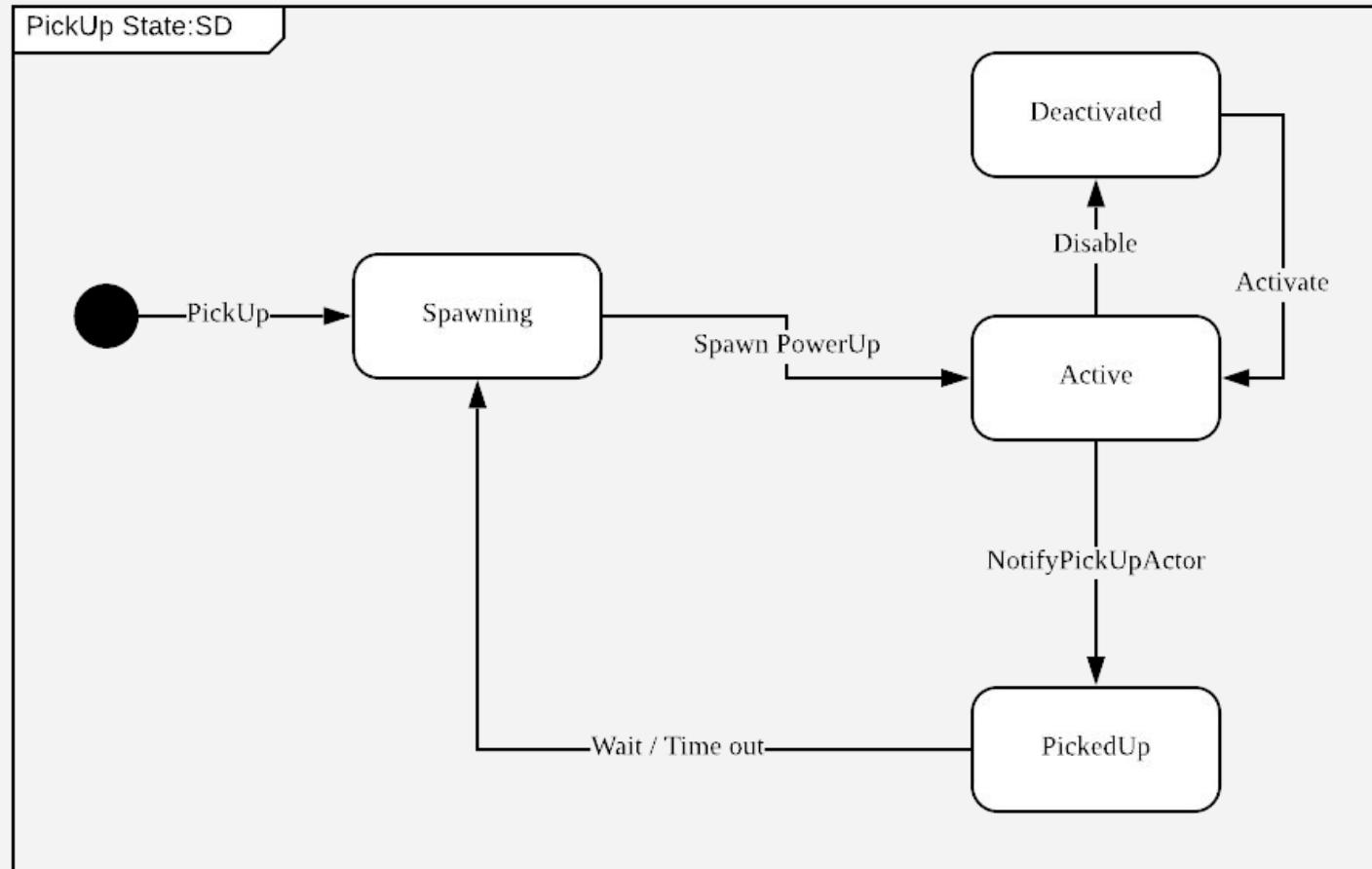
Design

5- State Diagram:



Design

5- State Diagram:



Contributions

Bisher

Bisher:

- Joint Development Core Game Mechanics (Unreal Engine)
- Multiplayer Networking(Unreal Engine).
- VR SDK and Motion Tracking(Google Cardboard).
- Hand Tracking (OpenCV).
- Joystick Tracking(TensorFlow)

Languages used: C++ , Python, C#, Unreal Blueprint System.

Industry Collaboration

- 1- Zakti Strategic Design SDN. BHD.
- 2- Unreal Developers Meetup
- 3- GameDev Hangout



Raj Sreenivas
online



Alright

6:20 PM

YESTERDAY

My friend and I need to collaborate with the industry for our Final Year Project...
I think you might be interested...

6:20 PM ✓✓

What's it about?

6:20 PM

We are developing a Multiplayer online game that uses Blockchain for game assets and VR with Hand Tracking

6:21 PM ✓✓

Very nice. Why don't you both develop it here we could sponsor.

6:21 PM

we would love to do that ... 6:22 PM ✓✓

Yes I'll be very happy to support. You have done well Bisher

6:22 PM

Our objective is to provide a multiplayer game that fills the gap of reachable, affordable and easy to use VR with the implementation of real unique items that are stored in the blockchain to provide real uniqueness of items for each player to differentiate his experience, then assets can be sold/exchanged or even used in other games... assets could be anything owned by the player (weapons in our case)...

6:26 PM ✓✓

Raj Sreenivas

Yes I'll be very happy to support. You have done well Bisher

thanks very much 😊

6:26 PM ✓✓

You

Our objective is to provide a multiplayer game that fills the gap of reachable, affordable and easy to use VR with the implementation of real unique items that

You

Our objective is to provide a multiplayer game that fills the gap of reachable, affordable and easy to use VR with the implementation of real unique items that are stored in the blockchain to provide real uniqueness of items for each player to

Very nice. Looks like a fantastic project. Let's chat on this tomorrow. 🤝

6:30 PM

Very exciting!

6:30 PM



6:36 PM ✓

[Connect](#)[Message](#)[More...](#)

Raj Sreenivas · 2nd

CEO and Co-founder at Zakti Strategic Design Sdn Bhd

Petaling Jaya, Selangor, Malaysia · 500+ connections ·

[Contact info](#)



Zakti Strategic Design Sdn
Bhd



Raj Sreenivas

A production engineer and a systems analyst by profession, Raj found that his real passion lay in creative production and user experiences. He sees the choreography of content, digital media, electronics, AI, AR, and VR, and the interaction of the human senses as being fundamental to creating the immersive experience that will convey the imagination of the storyteller.

About the company...

A 360 design, content and technology company dedicated to delivering your story by crafting positive and impactful experiences with our expertise. We elevate the human experience through design, architecture, technology and carefully curated content, turning a given space into a coherent immersive experience and creating lasting impressions.

Demo

Conclusion

Q & A

Thanks very much for listening