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An Implementation of cloud gaming model using Google cloud platform and Parsec

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ABSTRACT
Cloud gaming is a new way to play games. It can run any computer game virtually, no matter system requirements, to be played on almost any local machine with internet access. Its done by servers that do all the graphic intensive computations normally done on a local machine, whether a game console or gaming computer, and sending the visual game footage to a client. Its done by servers that do all the graphic intensive computations normally done on a local machine, whether a game console or gaming computer, and sending the visual game frames to a client software. Client software is merely liable for displaying the received frames and subsequently sending back to the server the user commands. A system like this has the potential to scale back costs for consumers and expand the individuals willing and ready to play games that traditionally have required an upscale piece of hardware in-home to play. This Study provides an in-depth explore how cloud gaming works as an entire currently and also how it could work in coming times. However, it is necessary to consider the challenges and possible solutions of development to ensure that the whole sector runs smoothly.
Keywords - Cloud Gaming, Game Streaming, MMOG, Cloud, Online Streaming, Parsec, MMORPG, Video Game streaming.

I. INTRODUCTION

The widespread use of cloud computing is the result of the game industry on a revolution that changes the way people play games. The new technology called cloud gaming, also known as gaming on demand, is a concept that includes many computers through a synchronized communications network. The file service has been modified and has shared games in the game industry to develop the development of cloud gaming.[10]

Gaming is an innovative bid that offers new opportunities for upcoming and existing games. Depending on the game in cloud mode, the games are stored on the operators or game company to stream video sequences directly to electrical devices such as computers and consoles on the Internet. The client does not provide low-end, but applications for application servers that control these applications and the gaming experience of the power in response. The games are run and run on external servers so you do not have to download on the client side and all updates within these servers are completed.[2]

Cloud gaming is also known gaming on demand. It is a kind of online gaming that permits on demand streaming of games onto a computer that has minimum specifications. it's comparable video on demand. The program of the game is provided by "thin client" means. That means the game is stored on the Cloud Service provider company's servers and is streamed to computers accessing the server through the client.[9] So access to games without the need of a console to a certain extent, the capabilities and specifications of the gamer's computer is irrelevant. The input key/button presses from the gamer are responded to at the server.

While the cloud for gaming purposes started development in the early 2000s, it couldn't get very far because of the slow broadband speeds and other technology issues, which are now being sorted.[4] We use emails to send videos or photos, Facebook or YouTube, then you will have been using cloud storage to upload, share and enjoy this data. In its most simple terms, the cloud is an online hard drive that can be accessed anywhere, at any time, and services such as Dropbox have utilized this extremely well.[3]

There are Big advantages of cloud gaming to gamers, service providers, game developers.

For Gamers:
1. Access to the game anytime and anywhere.
2. Can buy games on-demand
3. There is no need to upgrade the hardware.

4. It has features where we can see the live tournaments and also share game reply's with friends.

For Game Developers:
1. No piracy of games because as the game software is never downloaded to client computer.
2. It reduces the testing costs and porting concentrate on a single platform.

For Service Provider:
1. creates more demands on already deployed resources.
2. Leads to new business model

There is a Cloud Virtual machine setup which runs the game on the respective servers of the Cloud Service Provider. The servers could be changed by user requirement or not that depends on the service provider. The Internet connection to the Cloud Virtual Machine is also provided by the Cloud Service provider. Which is used to connect the Cloud Virtual machine to the Client machine. A Thin Client is used on the Cloud Virtual machine to process the video footage of the actual game from Host Cloud Virtual Machine to Client Machine.[6] The basic concept of the Cloud Gaming is easy understood using the Fig. 1.
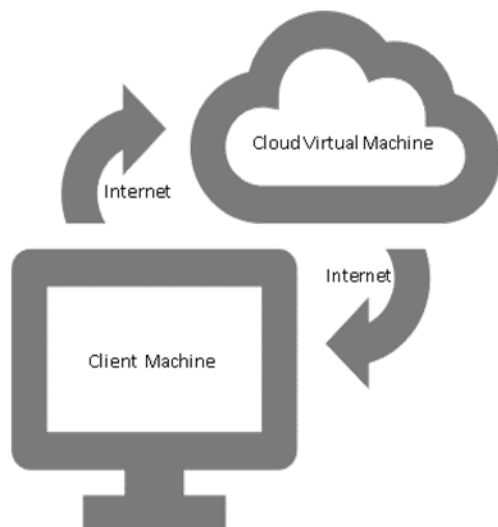

Fig. 1. Basic Idea of Cloud Gaming

So by that point the most of the services that are launched either are not available in the Certain Countries Depending to the Service Provider Preference or lack of availability of the Servers available to handle that task.[8] The major factor that is in between that is the availability of a faster internet connection at least on the Client Machine. It requires the bandwidth of 2 Mb/s or more high-speed connection is put forward for high quality game streaming.[1] Which is stated by the Service Provider and it can vary depending on the architecture the Service Provider uses. So basically a new system can be made by using all current innovations in the technology to make a system that runs the games efficiently and on a low bandwidth as possible.[5]

II. IMPLEMENTATION

First, a Client sends requests to the cloud data platform, logs in the system and selects the objective game. Second, the cloud operator data center chooses the appropriate data center / node based on the network delay/ bandwidth between the user and nodes and the load conditions on the node, and sends a launching demand with the CPU/GPU/ Memory configuration to the edge node based on the type of game. In the meantime, the cloud data center returns the address of the Virtual Machine to the user.

Third, the user begins to play the game and the game client sends the input signals to the user input control, such as the keyboard events, the mouse clicks and joystick movements. Fourth, receiving the user's input, the user input control updates the game logic, renders the game scene, and streams the game scene as a video sequence back to the user.

Server Side:

Google cloud Platform[27] is used to implement the proposed method due to the widespread availability of the servers worldwide. A cloud server Microsoft Server 2016 Datacenter[28] is used as a host to provide a Virtual machine to run the programs. The GPU is provided by the Google cloud platform[27].

Respective Drivers are used to provide better functionality like Directx3d 11 and Nvidia GPU drivers.[11]

Virtual Audio Cable software is used to start the streaming game audio VB-Audio Cable[24]. UDP protocol is used to communicate between host and client.

Additional software's like game clients of Steam[21], Epic games[22] are used to provide the actual games to play.

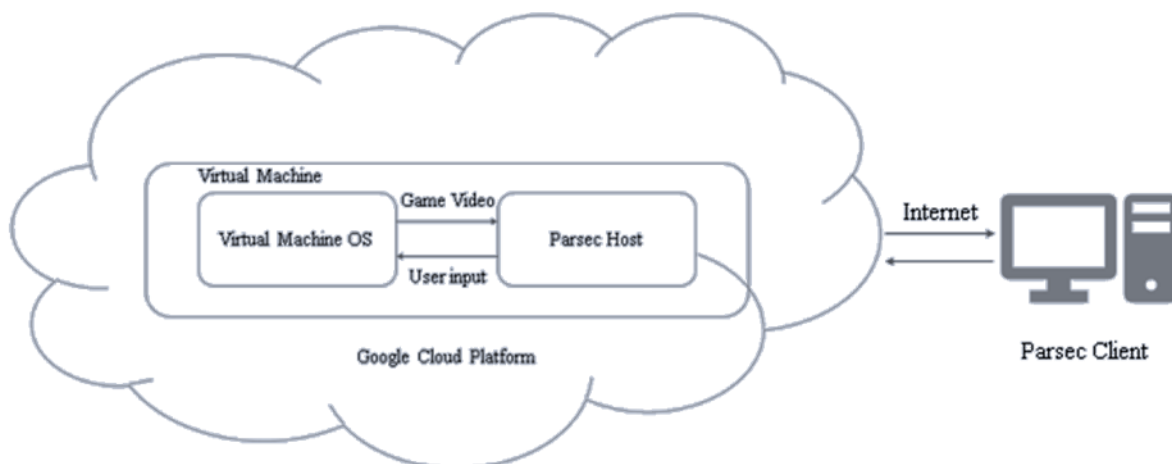Parsec is used to host the Streaming of actual game footage.[13]

Fig. 2: Basic Idea of Implemented Cloud Gaming System.

Client Side:

A basic Workstation or laptop required for Streaming setup.

Parsec is used to get the Streaming of actual game footage.[13]

Parsec is a open source desktop capturing application primarily used for cloud-based gaming through video streaming. Using Parsec, a user can stream video game footage through an Internet connection, allowing one to run a game on PC but play it remotely.

Parsec can also be used as low-latency desktop sharing software. A Proprietary Freeware application, Parsec is available on most modern operating systems.[13]

Parsec is used to encode video footage from the host and to decode the footage client side   using H.265 encoder/ decoder[26].

Host to client Flow:

So the Parsec[13] is used in the thin client role to connect the Host Cloud Virtual Machine to the Client Local Machine. It uses a H.265 Encoder[26] to encode the video footage of the game to send it through the network.
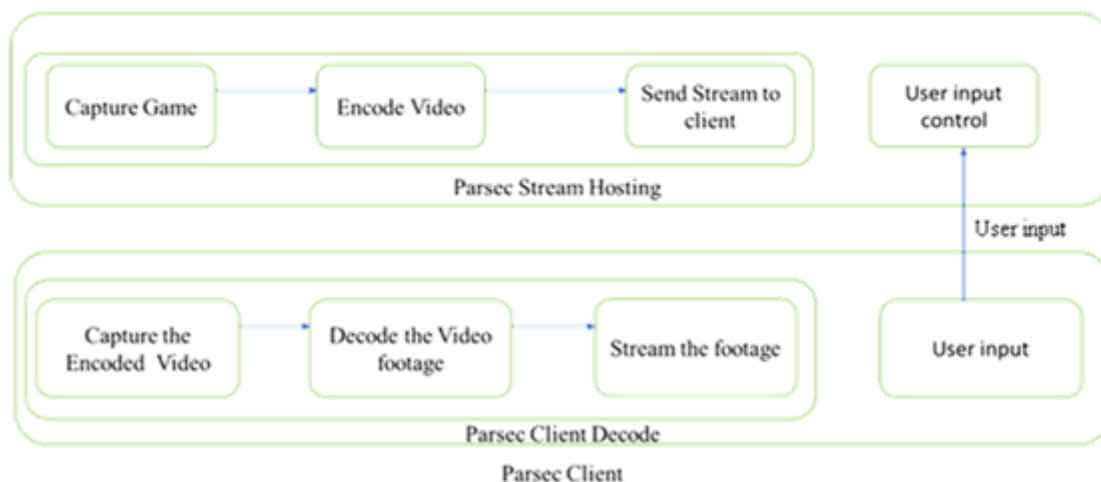

Fig. 3. Parsec Host - Client Flow

Parsec Host:

UDP protocol is used to Connect Host to Client Machine.

The Parsec host captures the running game footage from the Host Machine. The Game footage is Encoded using the H.265 Encoder.[26] Then the Video Footage is Sent to the Client.

A User input Control module is used to pass the user interaction through the Client to Host machine. It is given Priority access so the lag between user input and game action is nominal to acceptable.

Parsec Client:

The Parsec Client captures the Encoded game footage from the Host Machine. The Footage is

Decoded and Processed as per the client settings. The Decoded Footage is shown in the Display as output for the Client Machine.

User input is given priority module is used to pass the user interaction through the Client to Host machine.

Note that the bit rate of the video is adjusted adaptively to accommodate the dynamical network. At the same time, the Host uploads the log of the user's input to the cloud data center. During the game, the last two procedures execute alternately until the game ends. The preparation can be finished during the game starting/loading/ two-sided matching.
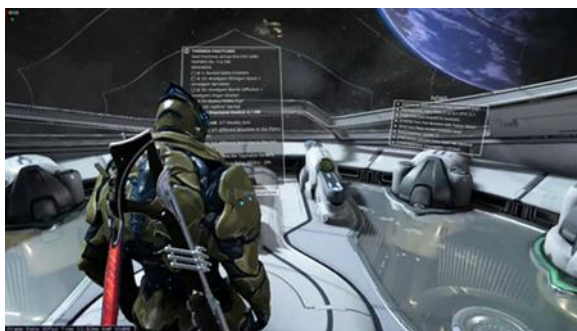

Fig. 4. Warframe in game Screenshot

III. TESTING THE IMPLEMENTED SYSTEM

By Testing the Potential system there were some factors to be concerned. Not all games support 4K and the GPU Provided by the Cloud Service Provider is locked on 30fps and 60fps depending the user preference. Which means It has maximum limit on FPS. So after testing the results of the system were quite satisfactory and impressive at the same time.

The System is quite responsive considering the game is playing on the server Virtual machine. There is very less to none latency which is much preferable.

The system is set up using the games available to the user so the game Warframe[25] is used to conduct the comparison. Which is online single player and multiplayer. So far the system performs well. No stutter in the frames and no input lag between the user input and avatars response.[7]The Network connection between the Host and Client is strong and it performs quite well considering it is Running on a 5 Mb/s bandwidth the system is able to stream video optimally at Higher resolutions.

Table 1: Implemented System Performance Data

Latency (ms)	Encode (ms)	Network delay (ms)	Resolution (Pixels)	FPS (fps)	Result (playable Experience)
0.43	9.08	4.13	1080p	60	Yes
0.63	9.65	5.12	1280p	30	Yes
0.69	7.62	9.18	4K	30	Yes
0.65	5.64	7.15	1320p	60	Yes
0.58	8.03	5.17	1080p	60	Yes
0.44	4.62	6.21	1280p	60	Yes
0.39	7.21	3.27	1320p	60	Yes
0.51	5.49	4.64	1080p	60	Yes
0.62	6.15	9.16	4K	30	Yes
0.58	9.78	1.22	720p	60	Yes
0.47	5.62	4.08	1080p	30	Yes
0.64	7.01	3.14	1080p	30	Yes
0.61	6.14	8.01	1080p	60	Yes
0.58	5.97	9.14	1080p	30	Yes
0.69	5.57	6.09	1080p	60	Yes

IV. PROBLEMS ENCOUNTERED AND SOLUTION

There are Certain compatibility issues that are providing access to the components to use screen capture on a third party or open source apps are not accessible through conventional means because you are not supposed to change certain settings which can inflict damage to Operating System or the virtual machine itself.

A major Compatibility issue occurs when you try to stream the game through host to client. The Cause of this is the Virtual machine is not made to make use as a separate local machine so sending a video footage with audio occurred in GPU errors and all system failure. To note that the Host system is maintained by the service provider the SLA between the provider and consumer apply to the problem due to not a full machine access or installing user specific software and applying fixes to the system os.

There is a compatibility issue using the GPU and other installed software that requires a third party app called VB-Audio Cable[24] to route the audio of the game.

V. CONCLUSION

In this paper, the basic cloud gaming concept and a Cloud gaming setup using Google Cloud Platform and Parsec. The System is setup and tested for the usability in actual cloud gaming. The

implemented system performs well using the 5 Mbps bandwidth to streams at a high resolution. The system is really inexpensive compare to the current ongoing systems. The is no Effective input lag between the game stream and It is like the actual game is running on the client machine. The implemented system works and it is feasible to play actual multiplayer games on it. So a cloud gaming system could be made by using currently available technology. Some Cloud gaming Services providers are already available like Project Atlas[20], Paperspace[14], Stadia [16], XCloud [19], LiquidSky[12], GeForce Now[23], PlayStation Now[19] and they believe that this is the way to go for the future of gaming. we are on the Verge of a technologically advance era of full of new technology and advancements, which can eventually results in future generation cloud gaming services.

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