5G Improved Cloud Service Experience and Promotes the Data Collection for Big Data Analysis

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Abstract—5G will be a revolution technology for cloud service based on the high speed and low delay internet to improve the user service and provide more possibility for cloud service. The low internet delay allowed more users interaction happened based on the service provider without complicated limitation to user's hard ware and software, making the auto driving come true, free the people from driving giving more chance for communicate and access to more information, which could also create the environment of cloud service ecology for service provider to collecting more data for bigdata analyze.

It will be useful on especially cloud gaming, streaming service, VR education, science and culture communication, light working and driverless driving, all these services meaning more data feed to server, and more kinds of data can be use in data analyze.

This article points out the relevant field which will extremely change by 5G and the connection between the changing and bigdata development, giving a vision about bigdata developing.

Keywords—5G; cloud service; low network delay; high speed data transferred; STADIA; light working; driverless driving; big data; VR educationg; real-time; higher interactivity, science communication, culture communication

I. INTRODUCTION

The advance of 5G comparing with 4G and wired network currently are larger bandwidth and low network delay with lower cost of data transferred, it is 100 times faster than 4G, even more efficiency than optical fiber. Larger bandwidth, highspeed and low delay could support for the visual data with extremely high quality in short time, like the HD movie or VR signal. It allows more high-precision work can be done by remote control through the 5G network. In current time, a surgery was success in China by using the 5G network to remote a mechanical arm with only 1ms delay.

In the other side, even the current hardware is lighter than the past, but the cost of the handiness always meaning low hard ware performance which make the handiness devise cannot use for complicated working or working in low efficiency. The problems of current cloud service are network delay, the user cannot use the cloud service comfortable because it must wait for quite a long time in several steps, but the 5G network is nearly no delay that user can feel, this is the reason that it could use for surgery. Support by 5G network, this kind of complicated work like movie editing, large image editing or something else can be finished on the cloud servers and transferred by 5G

network just like using locally, which can free the users from heavy device to working. More working finish through the cloud server means more data will be feed to the server which could use for bigdata analyses.

To the application of 5G network, Huawei Wireless X Labs support the 10 best potential situations for 5G network application: cloud AR/VR, smart vehicle, smart manufacturing, intelligent energy, telemedicine, wireless family entertainment, internet UAV, social internet, personal AI assistant, smart city.

II. IMPROVING THE STREAMING MEDIA QUALITY AND THE POSSIBILITY FOR HIGH-QUALITY VR SIGNAL TRANSFERRED

As it mentioned before, the specifics of 5G network are highspeed, which allow 4K even 8K video transferred, extremely low delay and low cost of data transferred. It is clearly to see it will be the basic upgrade for the streaming media like online TV or movie. The point is 5G network will be totally change and upgrade the user experience for several kinds of cloud service.

Cloud VR is a kind of service that request large bandwidth and low internet delay in high standard, as Qiyong Zhao from Huawei Wireless X Labs mentions, a VR head mounted display is hard to support for 4K video display, cloud VR is inexorable trend [1]. In one face, cloud VR could decrease the cost of VR head mounted display, even more support by 5G network it could bring more powerful flow experience. Yang Tan from China Central Television (CCTV) also mentions that: the combination of the 5G and VR technology is the development tendency, the application of 5G and VR will expend to higher formation, support deeper flow experience, using the specific of 5G network render the video on cloud servers and transferred in low delay make a combination with the VR head mounted display support by 5G make the process of VR streaming from resources shooting to display to users device all in wireless [2].

Besides the VR streaming for TV program, the VR education was also a growth points [3], as far as the 5G VR streaming technology improving, it is also possible for VR streaming using for visual class through VR directly.

Because of the low delay and large bandwidth, 5G provide the environment that easier for interaction between the streamer and audience. In the experiment of 5G streaming of the TV program *I'm going to watch the Spring Festival party,* it was already used the VR panoramic interactive comment that shows

the comment graph in real-time, at the same time the audience could use the multi-screen interaction to communicate with the program real-time as well with low delay. The low delay of the information transmission removed the time distance, and the VR technology removed the physical distance in some way, which makes the interaction more like reality communicate, it could get the reflection in real-time, it makes the TV program broadcast more interactivity. For the VR distance education, the low delay communication break both physical distance and time distance, the visual class could be more like the real class, not a video but real-time VR class that the student asked the question that the tutor could response at once without long delay.

As the application of VR education, one more field will also be helped with 5G, that is science communication. Through of VR and 5G, it is possible to "borrow" the advance device from developed area. For example, Guangxi province is lack of advance device, but it is possible to simulate the operating environment by VR, and remote control the real device in the other city like Shanghai or Beijing to response the user, based on 5G's large bandwidth and low delay, to simulate the real situation as far as possible. It can save a great number of funds to purchase the latest devices, if the simulate can be possible. It is also a great path for culture communication as well, the extremely high-quality VR visual will be the directly way to exhibition the culture production. For the place which are having great culture resource, is also a chance to build a visual database of VR exhibition.

III. THE IMPACT TO ONLINE GAMEING AND THE IMPROVING TO CLOUD GAMEING

Network delay always a problem for online gaming, the unreliable network with high delay will decrease the players experience, epically in the game like MOBA or FPS, the player who has low delay owns much more advance to the player who are playing in awful internet environment, but in 5G network environment there is nearly not internet delay which could makes the gaming more fair.

In current time, cloud gaming might be the biggest beneficiary from 5G released. Cloud gaming is a kind of game service that the service provider will provides the server which could running the game, in most of the time it uses to running the game which request high distribution device to performance the full effect that is very expansive for users. To use the service of cloud gaming means the user need not download and stored the game client locally to save their disk space, change whatever the game it is without long waiting from installing and be free from buying the expensive device because the server will do nearly all the calculation just transferred the ultra-high-quality image and voice for users enjoy them, expect a problem: the delay between user's action and the image caused by internet delay. Because the current 4G network or wired network is not so fast reaction that people can feel it distinctly, if the user are used to playing action game it will be terrible to control the avatars with high delay.

Even facing several problems now, there are still some cloud gaming platform were getting online. Like google, it released STADIA cloud gaming platform at 20.03.2019.

However, the problem caused by internet delay can be solved by 5G that the player will notable to feel the delay between their action and the image display. The larger bandwidth also allows the player to enjoy the ultra-high-quality image even it does not own a luxury gaming device.

5G will extremely upgrade the reflection speed between user and server and improve quality of the data.

IV. NEW POSSIBILITY OF CONVERGENCE IN 5G ERA

5G providing more possibility to media convergence. For example, the game playing on the cloud which also means break barrier of playing and watching easily, google also plan the function that the people could invite the audience through YouTube to take over the game when it was playing on STADIA, because the game is operating on the server, the cloud gaming allowed all the live image of the gaming access to the STADIA, YouTube and users device at same time. In the game which is support for malty players will be much easier to make an interaction with the game anchor that the user is watching. In the industry of game streaming, it was the single way of node-to-surface broadcast, the cloud gaming could change the single way to double way, it makes the audience directly join in the game without download the game. This is a new streaming mode for game streaming industry and in the future, it will be not difficult that the audience having a 5G device to use this function. This is not only streaming the game on the YouTube, it is the possibility that even the single player game could be played by several people. From the angle of the hardware, the device that google will be provide in the future is the game cancel convergence with any device with 5G function with a game pad or a touching monitor, and that device could be a game console.

The specific of game streaming are real-time and interactivity, 5G network will enhance the real-time that what audience see is what the video game streamer doing, the communication between the streamer and audience will also be nearly without delay and provide higher interaction function in the future.

The features of real-time and highly interactivity also is what actually telecommuting needs, which make the more handle device with 5G becoming possible, light working device will be popular because of 5G.

In current time, the light device always means less hardware performance compare with the heavy but powerful device. With the support of 5G network, it is possible that to use a device like a surface to control a high-end desktop to do the work like large image or video editing, user could use their own computer or rant a "machine" online to do this kind of heavy work online with stable imagine signal transferred in low delay, just like the cloud gaming, 5G network could make the experience just like working locally. The needs to user's device are support 5G network and could play the HD video fluently, which is the same request as cloud gaming.

Both of this kind of new service are based on the low delay and high-quality image data transferred and which are used to free the user from heavy and expensive devices. In fact, remote

assistance is not a new concept and it is no doubt that in 5G environment the connection will be more stable and react just like use its own computer, at current time it is facing the same problem to the cloud gaming, that is high delay, and also another problem which is low bandwidth that using it need a long time to download the project file and finished product and it will be no problems with the support with 5G network.

It shows a trend that the light device with the support with 5G will be an important function in the future.

The most important thing of 5G is high speed data transferred and lower delay, which could support the better experience which relevant to data distribution and it allows more process could finished on the server which provide the foundation for more types of cloud service which closely relating to the interaction between users.

V. 5G DRIVERLESS DRIVING AND PROSPECT OF PERSONAL CAR MEDIA

In current time, most of the driverless car are rely purely on AI [5], but with the combination of 5G, it is possible for all the car with 5G unit could be the sensor in the 5G car network, all the car with 5G unit connect with other cars to further improved the security level. Not only the car, the security camera, the street lamp even the road itself can be connection with 5G, which make driverless car using cloud AI connect with 5G technology come true. The future driverless car will be not only relying the local AI, by the connection with the cloud AI by 5G, the cloud AI could process the road condition and all the car condition together to make sure the security. With the help of security camera, it could warn even stopping the traffic accident by discover the people who is crossing the road illegally and making all the car which are in danger stop on time, if without the 5G low delay transforms, it is impossible to make a lot of vehicles stop at the same time on time. In fact, the speed of human's reaction to most people are between 20-30ms, which is much longer than 5G internet delay, after the technology of driverless come true, it will be more secure than man driving.

Even through, there are still a lot of technical problems needs to be solved, including the AI developing, the basic devices updating and so on. According to the developing planning of China, United States and Japan, the volume production of autonomous vehicles will be true at 2025 reached a scale of a trillion dollars [5]. At 5.15.2019, China Information Communication Technologies Group Corporation released their first phase results of 5G auto driving: remote driving [6]. In this step, the 5G remote driving is control by human via the 5G network and VR device allowed the users control the car with 360°immersion experience. No matter how the driverless car or remote driving, both free the driver, during the driving, there is no need for driver to drive by their-selves, which provide the similar situation like public transport, all the passenger should something to do while they are waiting, at this time even the driver will be the passenger, they will have their spare time while "driving". In current time the car is popular is because of it could provide the necessary information to drivers and provide the entertainment that will not disturb their driving, on the auto driving car, it might be replaced by drivers'

smartphones or even a computer on the car. It also has a connection with 5G, and it can read the location data of the car, it could be a new advertisement platform face to the car owner, it knows the destination of the car and could provide the relevant information and advertisement. It could also be the good news for car owner, at current time, the cost of the auto driving car has the problem of high price, to the users the price also an important point to care. The auto driving car, remote driving and driverless driving service itself can be sold in lower price by selling more the advertisement to car owner just like the public transport, the different is after access the 5G network and the location information it could provide more custom-made information.

VI. MORE INFORMATION ACCESS: PROMOTE THE INFORMATION ACCESS AND BIG DATA ANALYSIS

As the development of 5G, no matter the streaming service, game service and auto driving are all rely the specific of high bandwidth and low delay, it free the device connection from the cable, allow the light device to doing the complex work with the help of the advance device by connecting to 5G network, it shows the trends of cloud service will be use in more area it also means more data will feed to the servers of the service provider, and more valuable information based on big data analyzed could also helped the consumers.

High bandwidth and low delay in fact is improving the experience of interaction, the more information sending and accept in the short time, the higher interactivity it would be. The essence of 5G is providing the more interactivity platform and experience, ignoring spatial distance between the device and people, and all the user of these cloud service will return the operating data feed the server, which is feeding the service provider, and the data collect by the service provider could also being use in users working as well. Telecommuting will be more fluently, and the equipment can be lighter, working in high efficiency could rant a high standard device through the cloud, and working in the cloud also means more data feeding.

To the immature service, which has significant defect because of the bandwidth limitation and high delay, the meaning of 5G will complete the drawbacks and put it into practical, there are more users be, more relevant data can be collected. Like the cloud gaming, after it put into practical, all the gaming behaviors through the cloud gaming platform can be recorded by the servers, the service of changing the player in the streaming platform expend the range of the data collection, more kinds of information from the streamer and the audience will be feed to the server for analyzing.

In the practical using of VR education, the stable real-time interactive might make it more popular rather than just having a class through a record, and because of the communication all go through the server, so the question of student ask, the most important knowledge point that student cares, what is the difficult part of the class and all kinds of the data could also collecting through the class and use it to improving the quality of the class, helping the student to understanding the hardest part, making the sturdy more efficiency.

By the way, the car combine with big data is not a new things, in the apps like Baidu map and Didi has already providing the result of the road condition to the driver, it is based on the GPS data from navigating system, until the 5G driverless car and service get into practical in larger scale, more condition information could analyzed in real-time by the cloud AI through the 5G network to make sure the higher security level and efficiency road using, it might decrease the accident and the traffic jam. The auto driving also free driver's hands they will have more time to using internet, while they are using the internet, more data produce and can be collected as well. By using the cloud AI access, the mass information in short time to control the car must analyzed the data which is collected in real-time in extremely low delay, that is what only 5G can do and in the future the real-time data analyzed will potentially promoted the developed of the manless working in the future.

VII. CONCLUSION

5G has the specific of high bandwidth and low delay, it extremely developed the potential of cloud service, breaking the barrier of spatial and time distance making more working and service can finish on the internet through cloud service, it expend the scope of the data collection by providing more cloud service in better experience, including the lighter device, the higher quality image, having a class through VR, which could be widely use in several field like science communication, culture communication and so on.

Combine with AI, 5G network linked nearly all the sensor together, cloud AI which access more device is meaning analyze the more data in the same time, it is the using of big data itself. Driverless driving also free the people from driving, provide more spare time to do more information access, it is also providing more data.

In conclusion, 5G provide better experienced cloud service that could increase the users to expend the scope of data collection for bigdata analyzed, and provide the new format of the service to developed the new types of information; in the other face, 5G could combined with AI and cloud AI could through 5G network getting more feeds and doing the real-time data analyzed to complete the driverless service or something else to free people from some working, saves people's time while they are waiting to produced more data.

The core value of 5G is enhance the interactivity to make the interaction ignore the distance of time and space making hardware and software integration with data centralization and real-time data analyze on cloud service.

Bigdata is using to developing the value from the data, 5G will helping to producing more valuable data, and more active using of the data in real-time and developed more automation service to free people's hands in the future.

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