Methodology for the optimization of resources, applied to virtual reality, through the use of WIFI network 6

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Abstract

Virtual reality is allowing to revolutionize many activities and allowing to achieve a realism very close to reality, one of the requirements to achieve these objectives is the use of computer resources for this work, such as memory, processor, storage capacity among others. The use of various devices where each one performs a specific task and then can be integrated, requires a connectivity structure that allows them to perform this work without problems at maximum speed and without loss of connectivity. This connectivity is achieved thanks to the use of the WIFI 6 protocol in its 5GHZ band, in this work a methodology is proposed that uses this connection in an educational application, where resources and information are shared between a computer and virtual reality glasses from the Oculus quest 2 brand, the results obtained are encouraging, having an ideal realism which is demonstrated by the child's concentration on the visualization of a high speed and maximum resolution video. The research concludes that the WIFI 6 protocol, in its 5GHZ working band, is the optimal one for virtual reality applications, managing to work with the security that connectivity is not lost and achieving an ideal realization by the shared use of the resources available in all the devices that make up the solution.

Keywords 1

Virtual reality, Oculus quest 2, resources, WIFI 6, 5GHz.

1. Introduction

With the development of technology, many technological barriers and applications are broken that previous years were difficult to be applied, today can be solved, the issue of connectivity and access to wireless devices for shipping and the possibility of sharing resources is one of The problems that are trying to solve with the new communication protocols, in this development we find works related to the connectivity of wireless networks where ways of measuring performance through latency and reliability are used, with the advances in RAN technology (Radio Access Network), having flat user latency in a transmission between the transmitter and the station dedicated to the user, measuring transmission and reception parameters such as wireless propagation, MEC (Mobile Edge Computing), queue delay, errors in the physical layer such as BLER (Block error rate), where we can check the error correction code, modem, di versatility and retransmission [1]. We find jobs where these networks are used to search for large volumes of information. Such as the review of the subject with Preferred Reporting Items for Systematic Reviews and Meta-Analysis Guidelines together with a protocol accepted by PROSPERO, for which a search was made in the databases of PubMed, Embase, BioMedCentral, available until October 31, 2019, for which a backward snowball was applied to retrieve manuscripts, and articles related to the subject, relevant results and risk of bias, no missing data information was provided, for which it is concluded that if we have a connection wireless with

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high speed we can perform searches with data integrity, not allowing the loss of connection [2] [4]. We also find jobs related to D2D communication from which a lot of data can be obtained, to be able to transfer it between nearby mobile devices, with which data can be transmitted through unicast, groupcast and broadcast transmission, through D2D you can transmit audio files and high-speed videos with low energy facilitating transmission such as Google Chromecast, IPTV with the use of clusters and broadcast data, this link works without any obstacle, where a device can be used as a hotspot as long as it has good connectivity [3] [5]. In the development of applications dedicated to the verification of connectivity through techniques to saturate and stress communications equipment, with the intention of measuring connectivity and the response to different uses and applications, with an emphasis on urban-type connections, trying to verify maximum coverage and signal quality using devices that can increase the range of WIFI networks [6] [7]. One of the factors that is commonly used in the analysis and performance of a wireless network and with emphasis on a WIFI network, is the number of connections that it can support, in this analysis it is important to verify the performance and the number of users connected in a way. simultaneously and concurrently, one of the places where this behavior can be verified are the university campuses, where we have a considerable number of users between students and professors and the computers that are connected to the same network [8]. Among the different studies trying to compare the performance between the different protocols related to wireless communication, we found a comparison between the 3G mobile network and the WIFI wireless network, where the results show that each of them has its applicability mainly related to the amount of users that can be connected and the type of applications, the configurations of these can be of great help when you have to work in parallel with both protocols, distributing the load depending on the uses and applications [9]. One of the factors that makes it possible to indicate a good connectivity between the devices and the transmitter, is the propagation lobe analysis that generates the configuration of the before, therefore if the device is located between the area covered by the lobe it will have a better reception of the signal, as we move away from the lobe, reception begins to decrease directly proportional to the distance between the device and the lobe [10].

2. Materials and Methods

In order to develop and test the methodology, a sequence of structured steps is proposed in such a way as to present and verify the results that can be obtained in each of the blocks, then the block diagram of the methodology, which we solve in detail below.

Figure 1: Block diagram of the proposed methodology.

2.1. Device Description

The first block is related to the description of the devices to be used to demonstrate the methodology, it is important to analyze, depending on the hardware used, we can exploit their maximum capacity, in our particular case. The intention of the methodology is to be able to optimize the computer resources necessary to be able to execute applications related to Virtual Reality, to demonstrate the methodology a router with the WIFI 6 protocol will be used, some virtual reality glasses of the Oculus quest 2 model and a computer, the details of each of them are described below:

Router WIFI 6

- Two working bands: 2.4GHz and 5GHz.
- Channel bands from 20 to 160 Mhz.
- 1024-QAM modulation
- Cat speed 10000 Mbps

Oculus Guest 2

- Resolution: 1920 x 1832 per eye
- Processor: Snapdragon XR2
- Panel: LCD
- Refresh rate: 90 hz
- Connectivity: Wifi 6, Bluetooth 5.1, USB Type-C
- Storage: 64/256 GB
- Sound: Integrated 3D Speakers
- Weight: 503 grams

Computador

- Core i7 processor
- 8GB memory
- 512 GB solid hard drive
- 32 inch monitor
- USB device with WIFI connection 6

2.2. Device Configuration

One of the main characteristics that these three main components share is the connectivity to the WIFI 6 protocol, with which we take advantage of the 5GHz working band provided by the router, with the Oculus quest 2 virtual reality glasses, we connect to the network 5GHz, also with the computer we connect to the 5GHz network, in this way the 3 devices are connected to the same network and through a single band, to take advantage of its maximum data transfer capacity. Next we present in figure 2 the configuration of each of the devices.

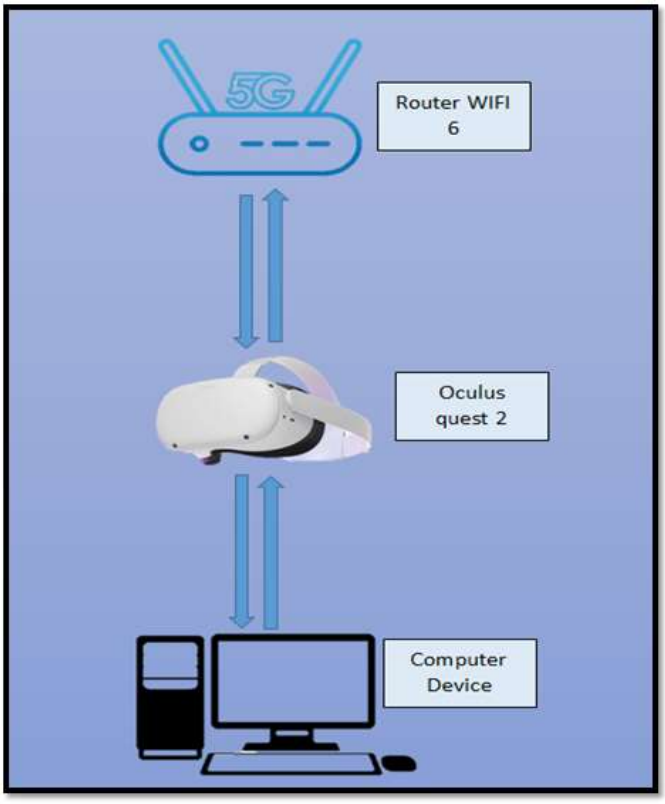

Figure 2: Device connection diagram using the 5GHz band.

Having configured the three devices through the same wireless network, it remains to decide how to share the same information between the computer and the Oculus quest 2 lenses, in order to synchronize the contents, making it possible to view the same information on the lenses. computer, the software that provides us with this task is the Virtual Desktop, which allows us to synchronize content between the virtual reality glasses and the computer, one of the main characteristics is that it needs large computational resources, between memory, hard disk and processing capacity, so with the Oculus quest 2 lenses, we can provide these resources thanks to its internal configuration that was described above, as well as the characteristics of the computer, described whose characteristics meet the requirements of the application.

Figure 3: Synchronization application between the lenses and the computer.

In figure 4, you can see the final configuration ready to be able to operate any type of application related to virtual reality, it is important to indicate that the diagram shows how the hardware described and the necessary software interchange.

Having the virtual reality architecture configured, the next step is to test the methodology, applying some need, trying to get the most out of this configuration in such a way that it can be demonstrated to perform virtual reality applications, trying as much as possible for maximum synchronization., connection, nitides and effects of virtual reality.

2.3. Application Example

As a third process of the methodology, an application example is presented where it is required to test the configuration and synchrony between the virtual reality glasses and the computer. The chosen example is related to the educational area which is the topic known as the reading plan, where children read stories and interpret what they have understood, for the practical case the story is presented in video form, but in this case, to the child it is presented to you through the virtual reality glasses. The Oculus quest 2 lenses have built-in speakers which gives the possibility of emitting sound without the need for headphones.

The results of the application of the methodology are presented below, where a video of a story is presented, in Full HD resolution, where the visualization has its particular characteristics that we present to describe below:

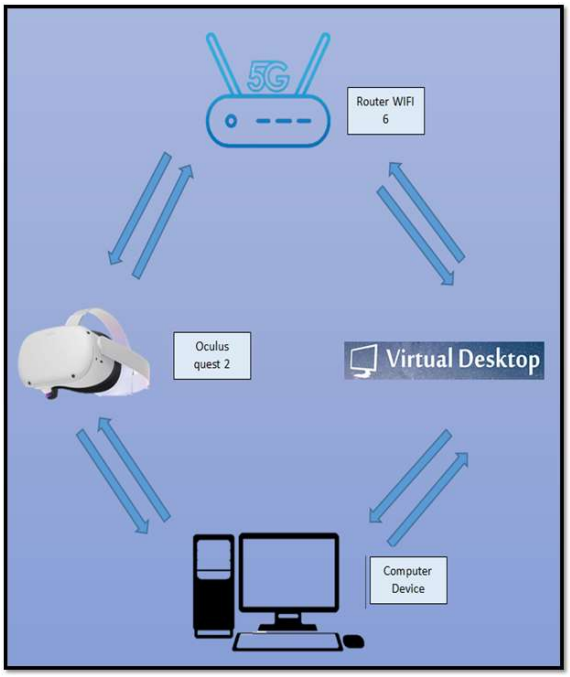

Figure 4: Synchronization diagram between hardware and necessary software.

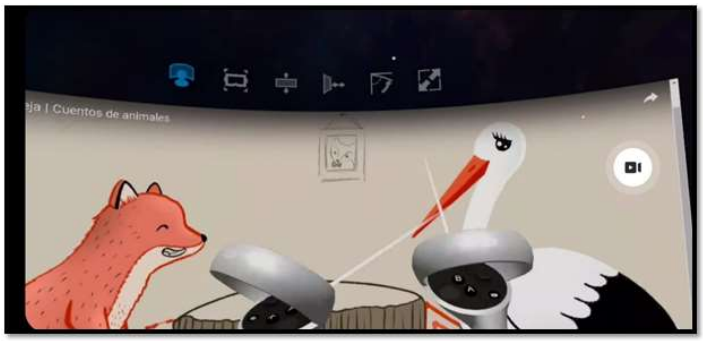

Figure 5: View of the tale through Oculus quest 2 glasses

The Oculus quest 2 virtual reality glasses present a configuration in the presentation of objects, in this case the effect represented by the story with the child is the feeling that the child has as if he were participating in the story, which causes the The child understands and interacts with the story, thus better understanding and interpreting what is being presented in the video, achieving a better understanding and consequently improving learning through the effect of virtual interaction.

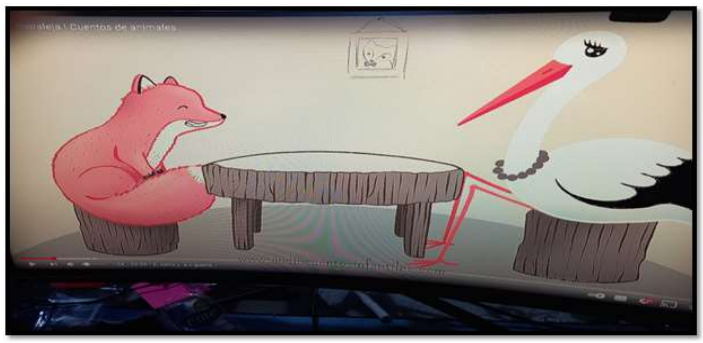

Figure 6: View of the View the story on the computer.

In figure 6, the story is presented on the computer screen, with a different perspective compared to virtual reality glasses, in the development of the methodology, a control of what is being presented in the lenses is required, therefore The control is in the computer and is achieved thanks to the Virtual Desktop software, which sends through the WIFI network, the content to be viewed, in our it is required to control from the computer what is displayed in the lenses, in this way In a real situation, the teacher can control what her students see in the glasses.

3. Results

The results that are presented are related to the application of the methodology, we can indicate that in the demonstration with the example about the presentation of a story at high speed and maximum resolution, we can indicate that no type of interference was perceived, slowness, disconnection or other factor that may interfere with communication and control from the computer with virtual reality glasses.

We can indicate that with the use of the WIFI 6 network through its 5GHz band, it allows greater connectivity and we can execute applications where it is required to send a greater amount of data, measured by the transmission speed, as well as ensure the continuity of the connection. The application allowed the sending of a video at high speed and maximum quality through the 5GHz band, managing to demonstrate that the 5GHz band is suitable for Virtual Reality applications, where the calculation is required to be carried out on the computer and the results presented through virtual reality lenses, where this transmission is as fast as possible without loss, giving the sensation that it is running in the lenses.

Next we present the images that correspond to the results of the application, from the perspective of the sensation of virtual reality. The sensation that the child has is very important to evaluate because he is focused on the story that is being presented, the continuity of the WIFI 6 signal, allows the child not to perceive any interruption in the projection of the video, which causes a conformity of the use of the wireless network in virtual reality applications. What is required in virtual reality applications is to present the maximum possible reality, and it is achieved through a fast connection and without interruptions.

Figure 7: Top and side view of child with virtual reality glasses.

In figure 7, observe the child with the Oculus quest 2 lenses, where it can be seen that the child is totally focused on what is being projected, and this is achieved thanks to the use of the 5GHz band.

4. Conclusions

The conclusions that we must consider are related to the use of the WIFI 6 protocol in its 5GHz band, which allows high connectivity without delay or losses, achieving a secure and available

connection so that it can be used as a tool for certain applications where more data traffic is required. Virtual reality applications have a particularity, which is to be able to provide the greatest amount of realization, so it requires a large calculation capacity as well as available resources, the use of a computer where the calculation is carried out and the visualization through the Oculus quest 2 lenses, allowed to evaluate the joint work of these two devices, having as a means of connectivity the WIFI 6 network in the 5Ghz band. We can indicate and recommend that for virtual reality applications, using the use of development applications such as UNITY, UNREAL ENGINE, among others, where it is required to perform large-scale calculations and be able to send to the devices that allow us to present virtual reality, we recommend use the WIFI 6 protocol in its 5GHZ band, to ensure the maximum possible realism.

5. References

[1] Won, J. W., & Ahn, J. M. (2020). 3GPP URLLC patent analysis. ICT Express. Korean Institute of Communication Sciences. https://doi.org/10.1016/j.icte.2020.09.001

[2] Scquizzato, T., Pallanch, O., Belletti, A., Frontera, A., Cabrini, L., Zangrillo, A., & Landoni, G. (2020, July 1). Enhancing citizens response to out-of-hospital cardiac arrest: A systematic review of mobile-phone systems to alert citizens as first responders. Resuscitation. Elsevier Ireland Ltd. https://doi.org/10.1016/j.resuscitation.2020.05.006

[3] Kar, U. N., & Sanyal, D. K. (2018, December 1). An overview of device-to-device communication in cellular networks. ICT Express. Korean Institute of Communications Information Sciences. https://doi.org/10.1016/j.icte.2017.08.002

[4] Zhou, B., Wang, G., Hong, Y., Xu, S., Wang, J., Yu, H., … Yu, L. (2020, May 1). Mindfulness interventions for rheumatoid arthritis: A systematic review and meta-analysis. Complementary Therapies in Clinical Practice. Churchill Livingstone. https://doi.org/10.1016/j.ctcp.2020.101088

[5] Osseiran, A., Boccardi, F., Braun, V., Kusume, K., Marsch, P., Maternia, M., ... y Fallgren, M. (2014). Escenarios para las comunicaciones móviles e inalámbricas 5G: la visión del proyecto METIS. Revista de comunicaciones IEEE, 52 (5), 26-35. 10.1109 / MCOM.2014.6815890

[6] Afanasyev, M., Chen, T., Voelker, GM y Snoeren, AC (octubre de 2008). Análisis de una red wifi urbana de uso mixto: cuando el metropolitano se convierte en napolitano. En Actas de la octava conferencia ACM SIGCOMM sobre medición de Internet (págs. 85-98).

[7] Afanasyev, M., Chen, T., Voelker, GM y Snoeren, AC (2010). Patrones de uso en una red WiFi urbana. Transacciones IEEE / ACM sobre redes , 18 (5), 1359-1372.

[8] Chen, X., Jin, R., Suh, K., Wang, B. y Wei, W. (2012, noviembre). Rendimiento de la red de dispositivos portátiles inteligentes en una red WiFi de campus universitario. En Actas de la Conferencia de medición de Internet de 2012 (págs. 315-328).

[9] Gass, R. y Diot, C. (2010, abril). Una comparación de rendimiento experimental de 3G y Wi-Fi. En la Conferencia Internacional sobre Medición de Redes Pasivas y Activas (págs. 71-80). Springer, Berlín, Heidelberg.

[10] Rademacher, M., Jonas, K. y Kretschmer, M. (2018, abril). Cuantificar la ocupación del espectro en una red WiFi exterior de 5 GHz con antenas direccionales. En 2018 IEEE Wireless Communications and Networking Conference (WCNC) (págs. 1-6). IEEE.