Design of Virtual Reality Interactive Applications Based on Wireless Communication Technology

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Abstract: With the rapid development of computer hardware and network systems, virtual reality technology has penetrated into many industries, representing a new application trend from server virtualization to storage virtualization. Virtual reality technology is the core of new research. This article uses MATLAB as the underlying computing environment to study the design of virtual reality interactive applications based on wireless communication technology. This paper proposes an RLMCom model for high-speed communication between domains, which covers the old network protocol stack and domain forwarding, and uses shared memory directly between domains to send and receive data, thereby reducing network communication paths. At the same time, the RLMCom model also provides compatibility with traditional network programming interfaces, allowing users to use high-speed RLMCom communications without modifying existing applications. The experimental results of this work show that the RLMCom model can significantly improve the communication efficiency between departments. The communication throughput rate based on the RLMCom model has reached 258% of TCP communication, and the delay time is about 1/5 of that of ordinary TCP communication.

1. Introduction

With the development and application of computer and electronic technology in mathematical instruments and functions, virtual reality technology can overcome the above limitations. Virtual experiments allow users to use software to simulate and simulate hardware functions. Therefore, there is no need to purchase very expensive laboratory equipment or specify parameters and functions for the laboratory equipment, and it can be easily configured to perform various functions. The combination of network technology and experimental virtual technology realizes the realization of a long-distance multi-course experiment platform. Combining various Web development technologies, an online remote experiment platform has been created, which can fully integrate traditional computer simulation experiments into the computer environment. At present, the remote test platform for communication authorization testing conducted in Japan and abroad was originally designed, and the second phase of development was carried out using the Web Labview server and

MATLAB. Only test content and user configuration settings are the default settings. Then transfer the client function to the server. On the server side, Labview and MATLAB need to be called to perform calculations, return data and results graphically, and send them to the client for viewing. Users may not use the information provided by the software, or they may not be able to combine them according to experimental requirements to obtain simulation results. This limits the freedom and flexibility of the experiment. The purpose of this research is to allow users to use relevant data to create desired shapes on a remote experimental platform according to their own experimental needs, not limited to their own experiments.

Virtual reality technology allows the therapist to control the delivery of sensory stimulation, which is a convenient and cost-effective treatment method. Maples-Keller JL reviewed the development history of virtual reality technology and its application in psychiatric treatment, and reviewed the existing literature on the effectiveness of applying virtual reality technology to the treatment of various psychiatric diseases to determine the impact on anxiety or other mental illnesses. The research on the implementation of virtual reality-based treatments for diseases has also put forward suggestions on how to incorporate virtual reality into psychiatric treatment, and discussed the future directions of virtual reality-based treatment and clinical research. However, the application of virtual reality technology in the treatment of anxiety and other mental illnesses in this article is only at the theoretical stage and lacks practical operations [1]. Lan L described the application of virtual reality technology in clinical medicine, especially in the treatment of surgical pain and mental illness. The common types of VR simulators and their operating principles are introduced, and clinical effects are also discussed. In addition, the advantages and disadvantages of using VR technology in various fields are discussed, and future research directions are proposed. It is undeniable that in the application of virtual reality technology, both doctors and patients can benefit from this new technology; however, on the other hand, virtual reality technology still has certain limitations. Modern online distance education overcomes the time and space limitations of traditional teaching methods, but due to the lack of specific observable and operable experimental equipment, online education lacks advantages in the knowledge learning process and requires strong three-dimensional effects and operability [2]. Sang Y designed and implemented an interactive truck crane simulation platform based on virtual reality technology, and discussed the structure and operation of the interactive truck crane simulation platform. The interactive truck crane simulation platform uses a browser-based structure, Java3D, virtual reality, java, applet, etc. to develop a Web3D virtual reality learning environment. This learning environment can meet the needs of many students to learn online at the same time, but the disadvantage is that the strength of the students' autonomous learning ability needs to be considered [3].

The innovation of this paper (1) proposes a high-speed model between RLMCom communication domains, which supports dynamic data migration of shared memory across domains, effectively reducing network communication paths. (2) The application of virtual reality technology in wireless communication is studied, interactive communication technology is analyzed, and some existing problems are discussed.

2. Virtual Reality Interactive Application Design Method Based on Wireless Communication Technology

2.1 Virtual Reality

(1) The meaning of virtual reality

Virtual reality (VR) is an advanced high-tech technology, with computer technology as the core, it can create a series of virtual environments (VE) that incorporate realistic visual effects, sounds and touch effects [4-5]. Users can naturally interact with specific devices, interact and interact with

objects in the virtual world to create exciting visions and experiences similar to the real environment.

(2) The history of virtual reality development

In 1956, the great Morton Highrig invented Sensorama, as shown in Figure 1. Sensorama is an interactive 3D terminal with the latest sensor equipment, which has a built-in 3D technology display, scent generator, stereo speakers and vibration panel [6-7]. Of course, it also looks very large, just like a medical device, it cannot be a major entertainment device.

Figure 1: Sensorama (this picture is borrowed from Baidu Encyclopedia)

In 1961, the world's first screen Headsight [8] was launched. This was developed by Philco, which integrates head-to-head and CCTV surveillance systems, and its development is actually used to display hidden information.

1966 GAF Viewmaster is one of the earliest 3D headsets in the world, as shown in Figure 2. The device can be equipped with two lenses and present a specific 3D effect through the lens to achieve a transparent view, which is more suitable for children's toys from professional 3D audio-visual equipment. In the newer version, audio functions are also added to realize simple multimedia functions [9-10].

Figure 2: GAF Viewmaster (this picture is borrowed from Baidu Encyclopedia)

The Eye Tap in 1980 is indeed a kind of augmented reality device in a sense. It looks similar to Microsoft's HoloLens. It can be docked with a computer camera to display the data on the screen in front of you [11]. Although virtual reality and augmented reality are very familiar to people of this era and know what real virtual reality and augmented reality are Eye Tap has an indispensable significance for the development of virtual reality technology.

The design and installation method of RB2 in 1984 is very similar to today's virtual reality equipment. This is the world's first virtual reality equipment. RB2 is equipped with physical sensing monitoring gloves that can interact with the virtual world [12].

In 1985, NASA developed a head-mounted device with an LCD optical head-mounted display. The structure of today's virtual reality headset is designed to imitate the equipment installed on the NASA head, and then use OLED to replace the LCD display. The purpose is that OLED has lower energy consumption and better display effect than LCD displays [13-14]. Because it is developed to simulate space operations, it is also equipped with a head and hand tracking system to present a more realistic virtual space experience.

In 1995, students from the University of Illinois established a three-sided projection control. People wear three-dimensional liquid crystal shutter glasses to watch virtual reality images in the middle of the three-sided projection, and thus developed CAVE. CAVE's immersive experience effects and scientific research results have greatly promoted modern virtual reality technology [15].

Until 2009, the advent of Oculus Rift brought virtual reality technology back to the eyes of the world [16].

2.2 MATLAB

MATLAB language is the most powerful and dynamic software in the international scientific community today [17-18]. It comes from matrix functions and evolved into a very complete computer language. MATLAB has powerful mathematical functions, convenient and practical design functions and advanced language integration [19]. MATLAB stands for Matrix Lab. In addition to its excellent numerical functions, MATLAB also provides professional-level annotations, word processing, visual modeling and simulation, and real-time control functions. The basic unit of data in MATLAB is a table, and its instruction format is very similar to the format commonly used in mathematical engineering [20-21]. Therefore, using MATLAB to solve the problem is much simpler than using C, FORTRAN and other languages to accomplish the same thing. The application of MATLAB in other fields of science and engineering other than mathematical calculations is also becoming wider and wider, and it has broader application prospects and endless potential. It can liberate users from tedious and meaningless low-level programming, and spend more limited precious time in solving problems, which will undoubtedly improve work efficiency [22]. At present, MATLAB has become the most popular software tool for scientific and engineering calculations in the world. Now MATLAB is no longer just a "matrix laboratory", it has become a new high-level computer programming language with a wide range of applications. Some people call it the "fourth generation" computer language, and it is playing an important role in universities and research departments at home and abroad [23-24]. The function of MATLAB language is becoming more and more powerful, constantly adapting to new requirements and proposing new solutions. It is foreseeable that MATLAB language will maintain its unique position for a long time in the fields of scientific calculation, automatic control, scientific drawing, communication simulation and so on. Especially in the field of communication, MATLAB has obvious advantages, because many problems in the field of communication are to study system performance. The traditional method only has to build an experimental system and use various instruments to measure the required data, which not only needs to spend a lot of money The funds are used for the construction of the experimental system, and the cycle of system construction is long, and the system configuration is also very difficult [25]. With the advent of MATLAB, communication system simulation can be performed through computer simulation. It not only saves the problem of creating a test system, but also is very easy to use. Different system performance can be achieved by inputting parameters [26-27].

2.3 Wavelet Analysis Theory

(1) Wavelet transforms

Wavelet transform is a time-scale analysis method, which has the characteristics of multi-resolution analysis, and can use a fixed window area and a variable resolution format to characterize the local characteristics of the signals in the two video areas [28].

Given a real function $\varphi(x)$, if it's Fourier transform $\varphi(\omega)$ satisfies the following allowable conditions:

$$\int_{+\infty}^{-\infty} \frac{|\varphi(\omega)|^2}{\omega} d\omega < \propto \tag{1}$$

Call $\varphi(x)$ the wavelet mother function.

The translation wavelet is a set of functions that are expanded and translated by the wavelet mother function $\varphi(x)$:

$$\varphi_{a,b}(x) = |a|^{-1/2} \varphi(\frac{x-b}{a}) \tag{2}$$

Among them: a, b $\in$ R, a$\neq$0. We call "a" is the scale parameter and "b" is the time center parameter.

Continuous wavelet transform is also called integral wavelet transform. If f(x) $\in$ L^2(R), then its continuous wavelet transform can be defined as:

$$W_f(a,b) = \int_{-\infty}^{+\infty} f(x)\overline{\varphi_{a,b}(x)}\, dx \tag{3}$$

According to the above formula, the scale a and 1/a of the parameter a correspond to the frequency in a sense, the smaller the scale, the higher the frequency, the higher the scale, the lower the frequency, and the b value shifts the waveform. At any value b, the time window and wavelength window will change with their changes, and the window area will not change.

When continuous wavelets are used in algorithms, they must be discretized. The "a" and "b" of the continuous wavelet are sampled as follows:

$$a = a_0^j, b = kb_0 a_0^j \tag{4}$$

Among them, $a_0 > 1, b_0 \in R$; j, k $\in$ Z. From this, the discrete wavelet can be obtained:

$$\varphi_{j,k}(x) = a_0^{-j/2}\varphi(a_0^{-j}x - kb_0) \tag{5}$$

The discrete wavelet transform is:

$$W_f(j,k) \le \varphi_{j,k}(x), f(x) \ge \int f(x)\overline{\varphi_{j,k(x)}}\, dx \tag{6}$$

If $a_0 = 2, b_0 = 1$ is taken, the discrete wavelet at this time becomes an orthogonal wavelet as:

$$\varphi_{j,k}(x) = 2^{-j/2}\varphi(2^{-j}x - k) \tag{7}$$

It constitutes the orthonormal basis of space L^2(R). Meet the following conditions

$$\langle \varphi_{j,k}, \varphi_{l,n} \rangle = \delta(j-l)\delta(k-n) \tag{8}$$

At this time, for f(x), there is the following wavelet series expansion:

$$f(x) = \sum_{j\in Z}\sum_{k\in Z} A_{j,k}\varphi_{j,k}(x) \tag{9}$$

The coefficient $A_{j,k}$ in the formula is determined by the formula (10) given.

$$A_{j,k} = \int f(x)\overline{\varphi_{j,k(x)}}\, dx \tag{10}$$

$A_{j,k}$ is the value of $W_f(a,b)$ at the point $(2^j, 2^jk)$ formed by the discrete point 2^j where a takes a binary integer and the discrete point 2^jk where b takes a binary integer. Therefore, $A_{j,k}$ is actually a discrete wavelet transform of the signal f(x).

(2) Mallat algorithm

The Mallat algorithm is a component of the wave theory based on the Mallat algorithm principle, and it provides fast and practical applications for the algorithm. This method is suitable for active noise control [29-30].

U_{m+1} is the low-pass approximation of L^2(R), and any signal f(x) can be approximately regarded as:

$$f(x) = \sum_{n=-\infty}^{+\infty} D_{m,n}\phi_{m,n}(x) \tag{11}$$

In general, $D_{m,n}$ can be regarded as the sampling value of f(x) according to the period 2^{-m}. Then the process of decomposing U_{m+1} into U_m and U_n can be described as the following equation:

$$f(x) = \sum_{n=-\infty}^{+\infty} D_{m,n}\phi_{m,n}(x) + \sum_{n=-\infty}^{+\infty} d_{m,n}\Psi_{m,n}(x) \tag{12}$$

Among them, $\phi_{m,n}(x)$ and $\psi_{m,n}(x)$ are wavelet functions.

For most high-frequency images, certain edges, shapes, and surfaces converge in the normal direction, indicating that the image details have changed. First enter a filter:

$$g_k = 2^{\frac{1}{2}} \int_{-\infty}^{+\infty} \phi(2x - k)\overline{\phi(x)}\, dx \tag{13}$$

$$h_k = 2^{\frac{1}{2}} \int_{-\infty}^{+\infty} \phi(2x - k)\overline{\psi(x)}\, dx \tag{14}$$

Among them: when k=0, h_0 is the analysis low-pass filter, g_0 is the comprehensive low-pass filter; when k>0, h_k is the analysis high-pass filter, and g_k is the comprehensive high-pass filter.

Multiply both ends of formula (12) by $\varphi_{m,j}(x)$ and $\Psi_{x,y}(x)$, and then integrate, and the expressions of the coefficients on the right side can be obtained as:

$$D_{m,j} = \sum_n D_{m+1,n}\langle\phi_{m+1,n}, \phi_{m,j}\rangle = \sum_n D_{m+1,n}g_{n-2,j} \tag{15}$$

$$d_{m,j} = \sum_n D_{m+1,n}\langle\phi_{m+1,n}, \psi_{m,j}\rangle = \sum_n D_{m+1,n}h_{n-2,j} \tag{16}$$

Recovery algorithm:

$$D_{m+1,j} = \sum_n D_{m,n}\,\overline{g}_{k-2n} = \sum_n d_{m,n}\overline{h}_{k-2n} \tag{17}$$

The above is the mathematical description of Mallat's algorithm.

3. Virtual Reality Interactive Application Design Experiment Based on Wireless Communication Technology

3.1 Design Goals of the RLMCom Model

The proposed RLMCom model needs to achieve the following goals: to greatly improve the inter-domain communication speed without the user's perception. At the same time, it does not modify any behavior of the system, so that users are completely transparent to the behavior of RLMCom.

(1) High speed. Compared with the traditional inter-domain communication method, the RLMCom model has a greatly improved communication speed.

(2) Transparent programming. The application binary interface (ABI) provided by this model for application layer programs should be consistent with the traditional inter-domain communication method, otherwise it will cause great trouble for users to use RLMCom.

(3) Support dynamic migration. Live migration is a feature provided by many virtual machines, but when inter-domain shared memory is used to accelerate inter-domain communication, the dynamic migration of virtual machines will become unavailable. Therefore, it is very important to take corresponding measures to make RLMCom support dynamic migration.

Aiming at the design goal (1), RLMCom uses inter-domain shared memory for inter-domain data communication. By sharing memory, the inter-domain communication speed will be significantly improved than the original inter-domain communication method.

Aiming at the design goal (2), the RLMCom model dynamically intercepts socket system calls to achieve exactly the same ABI as in ordinary network communication. Users can use the RLMCom model transparently without modifying any program code.

For the design goal (3), RLMCom switches the inter-domain shared memory connection to traditional network communication when users are dynamically migrating, so that users can still dynamically migrates virtual machines when using RLMCom.

3.2 RLMCom Model Architecture

(1) Basic principles

In order to achieve the above design goals, a fast communication model between RLMCom virtual machines that supports online migration is introduced. The basic principle of the RLMCom model is shown in Figure 3. The RLMCom model modifies the system calls related to network data transmission and reception, and determines whether the communication destination address is a different virtual machine on the same physical node during data transmission and reception. If yes, use the shared memory to send and receive data, if not, use the traditional network to send and receive data. In the figure, FIFO-1 and FIFO-2 are two first-in-first-out queues based on shared memory between domains. The sender writes data to the queue, and the receiver reads data from the queue.
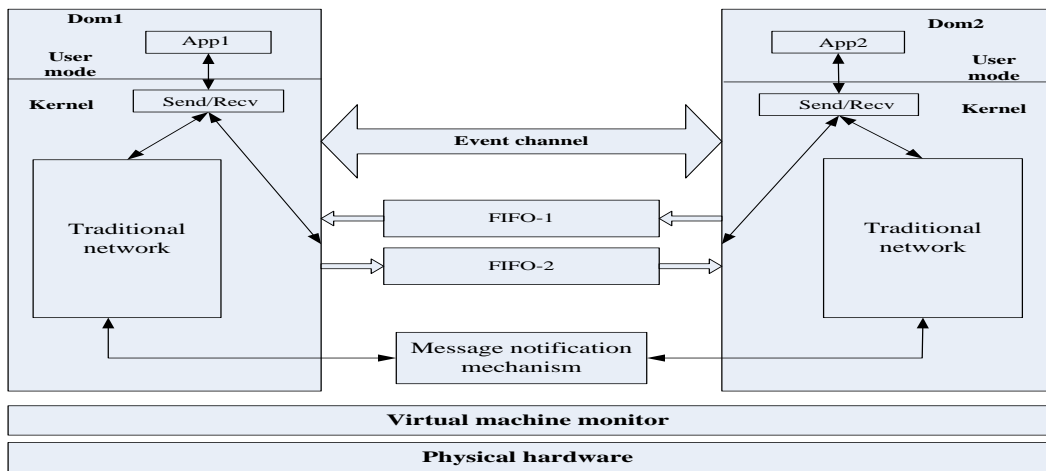

Figure 3: Basic schematic diagram of RLMCom model

After writing the data, notify the other party through the event channel. The message notification mechanism is used to transmit various events and messages between the communicating parties.

(2) Overall structure

In order to realize this model, the existing virtual machine system and its configuration will be upgraded, and a virtual machine system supporting RLMCom will be created. Similar to the overall structure of the traditional virtual machine system, the system is divided into three parts from bottom to bottom. The lower layer is the physical hardware of the computer, the middle layer is the virtual machine screen, and the upper layer is the host.

(3) System composition

1) The composition of the host operating system

Based on the existing host operating system structure, an announcement processing module has been added, and the original online migration sub-module has been modified.

①Online migration module

In order to ensure that the inter-domain communication of shared memory is still available during dynamic migration, it is necessary to switch shared memory communication to traditional network communication. Compared with the original online migration program in the host operating system, the modified online migration program ensures that the migrated virtual machine does not use shared memory to communicate with other virtual machines before implementing the dynamic migration.

②Host notification processing module

The host system uses the notification processing module to inform the guest that the system is

about to be migrated, and at the same time, it also receives feedback from the guest. When delivering event notifications, the notification processing module also needs to deliver some data in the event notification, such as shared memory parameters.

2) The composition of the communication acceleration kernel module in the guest operating system (VM)

It is composed of initialization sub-module, system call analyzer sub-module, virtual unit management sub-module and dynamic migration module.

①Initialize the sub-module

After the initialization sub-module successfully starts the VM, the communication acceleration kernel unit of the operating system is loaded, and the boot unit will be activated. First, call the virtual group management subsystem to create a blank virtual group, and then initialize the notification and notification processing sub-module; then use the notification processing sub-module to report its own MAC address and IP address to other virtual machines while letting other virtual machines send their own MAC addresses And the IP address to find all the virtual machines on the machine, then call the virtual machine group management sub-module to put these <MAC, IP> two-tuples into the virtual machine group that is initially initialized; finally call the system call analysis sub-module, open RLMCom inter-domain communication is accelerated.

②Virtual unit management sub-module

The virtual machine group management sub-module maintains an array of all virtual machines on the current physical machine inside the system each item in the array stores a <MAC, IP> two-tuple. When the RLMCom module is loaded, unloaded, and virtual machines are migrated, the virtual group management module will call the notification processing module to notify other virtual machines. The virtual machine that receives the notification will add the corresponding virtual machine to the array or delete it from the virtual machine. When there is a network data sending and receiving request from the user layer, the data sending and receiving module first calls the virtual group management module to determine whether the communicating parties are on the same physical machine.

③System call analyzer sub-module

The system call analyzer subsystem first checks system call requests from network applications and blocks system calls that are not related to network functions. For network calls, first call the virtual group management part to check whether both parties are enabled. The traditional TCP/IP network protocol mechanism of its own physics engine is still used to communicate between VMs on other computers. In order to communicate between VMs on the same computer, the connection management control module or the transmission management module must be called to perform functions such as establishing or terminating a connection or sending data. Thanks to the system call analysis module, the RLMCom model can speed up communication between user domains without changing the application.

④Dynamic migration module

The dynamic migration module is divided into a dynamic migration auxiliary sub-module and an online migration sub-module. The connection and control management subsystem and the data transmission management subsystem call the dynamic migration support subsystem to detect and manage the migration. The online migration sub-module is mainly used to complete the switching of the system on the two channels of shared memory connection and traditional network communication.

4. Design and Analysis of Virtual Reality Interactive Applications Based on Wireless Communication Technology

4.1 Experimental Environment Analysis

(1) Hardware environment:

The hardware environment during the experiment is shown in Table 1:

Table 1: Hardware environment

CPU	Intel(R) Core(TM) i5 750
Cache	8192KB
Address Sizes	36 bits physical, 48 bits virtual
Memory	4GB

(2) Software environment:

The software environment during the experiment is shown in Table 2.

(3) Specific settings

Here, the third-party reference test program Netperf is selected as the performance test tool of the RLMCom version. The Netperf running server is a network server that listens to client connections, and the client is Netperf for starting network tests on the server. First, establish a control connection between the client and the server to send test configuration data. Once the control link is created and the test configuration data is passed, a test link is created between the client and the server to drive specific traffic patterns to test network performance.

Table 2: Software environment

Operating system version	CentOS 5.5
Operating system kernel	Linux 2.6.18.8
Testing software	Netperf 2.4.5

For TCP network communication, this article sets the following measurement methods: 1) Throughput rate of inter-domain network communication. Use Netperf's TCP_STREAM method to test. The test parties first establish a TCP connection, and then send network data at the fastest speed through this connection. 2) The delay of inter-domain network communication. Use Netperf's TCP_RR method to test. The test parties first establish a TCP connection. Then, the client sends the request to the server, and the server sends its feedback to the client after receiving the REQUEST, and the cycle repeats. The test result counts REQUEST/RESPONSE sending and receiving frequency. 3) CPU efficiency of communication. The communication method in the test is still the throughput test method, but the statistics are the CPU usage in the communication and according to the transmitted data and CPU usage to calculate the communication CPU usage efficiency. In addition, in order to ensure the reliability of the data, all data in the test are tested 7 times, and the average value is taken after removing the highest and lowest values.
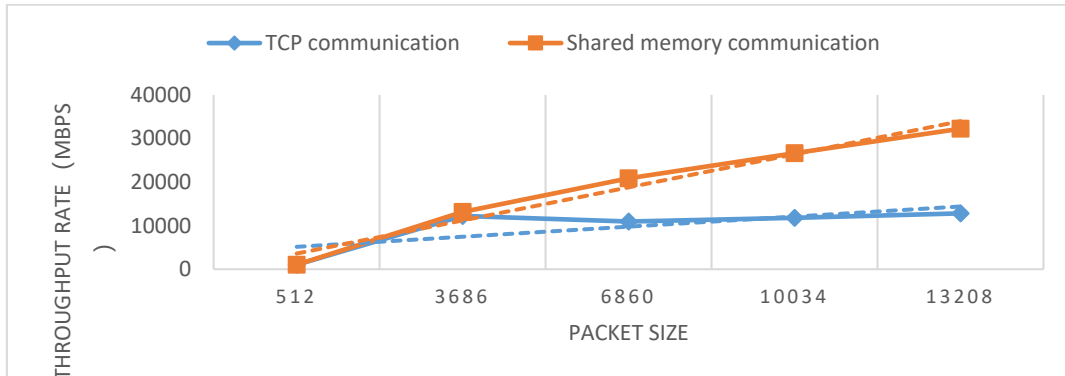
4.2 Test Results

Figure 4: TCP_STREAM test results

The throughput test result is shown in Figure 4. The data in the figure is measured using Netperf's TCP_STREAM method. The client continues to send packets of a given size to the server within 10 seconds. In the figure, the horizontal axis is the size of the data packet sent each time in bytes, and the vertical axis is the network throughput rate in Mbps.

Analyzing the curve in the figure, we can find that when the data packet is small, the throughput rate of RLMCom and ordinary TCP communication is not much different. With the further increase of data packets, the throughput rate of the RLMCom method further increased, while the throughput rate of traditional TCP network communication remained basically stable at 10000Mbps. When the packet size reached 13,208 bytes, the throughput rate of the shared memory method reached 258% of TCP communication.

First, we test the delay time of the two communication methods within 1024 bytes. The delay time of the TCP communication method within 1024 bytes is shown in Table 3.

Table 3: Delay time of TCP communication

Packet size(B)	Delay(ms)
1	0.115
64	0.119
256	0.121
512	0.121
1024	0.122

The delay time of shared memory communication within 1024 bytes is shown in Table 4:

Table 4: Latency of shared memory communication

Packet size(B)	Delay(ms)
1	0019
64	0.020
256	0.020
512	0.020
1024	0.020

The delay time of the two communication methods is not obvious within 1024 bytes, but the shared memory communication method is much faster than the TCP communication method. Next, expand the size of the data packet from the original 1-1024 to 512-8192. The network delay test results are shown in Figure 5 and Figure 6. The data in the figure are all measured by Netperf's TCP_RR method, and the statistics are calculated within one second the number of times that the

other party sent REQUEST and received RESPONSE. In the figure, the horizontal axis is the data packet size of Request and Response in bytes, and the vertical axis is the delay in milliseconds. The delay time of TCP communication mode within 512-8192 bytes is shown in Figure 5:
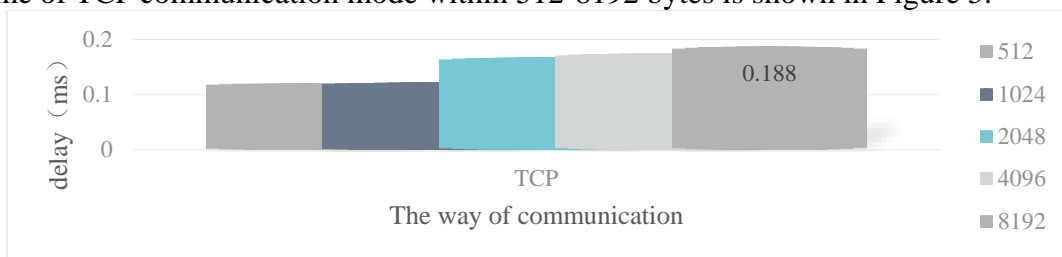

Figure 5: The delay time of TCP communication at 512-8192 bytes

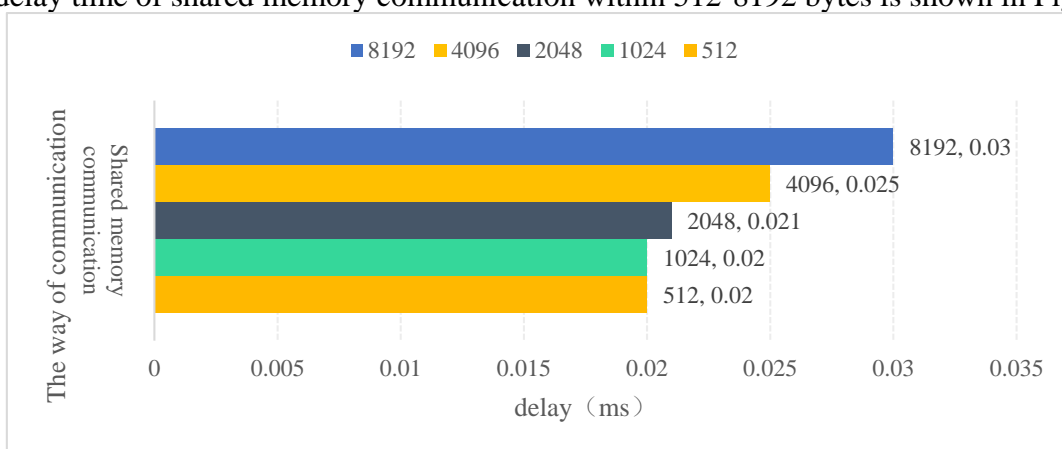The delay time of shared memory communication within 512-8192 bytes is shown in Figure 6:

Figure 6: The delay time of shared memory communication at 512-8192 bytes

To sum up: The latency of shared memory is about 1/5 of that of ordinary TCP communication. When the data packet size is less than 1024, the delay between TCP and shared memory is basically stable. When the data packet is larger than 1024, the delay of TCP increases obviously while the shared memory method is basically stable.

The communication CPU efficiency test results are shown in Table 5 and Table 6. Comparing Table 5 and Table 6 shows that the CPU efficiency of the inter-domain shared memory method is much higher than that of TCP communication. When the packet size is 1024, the communication CPU efficiency of the TCP communication mode is only 20% of the shared memory mode. The CPU efficiency statistics of TCP communication mode are shown in Table 5:

Table 5: CPU efficiency of TCP communication

Packet size(B)	CPU efficiency(%)
1	52.36
4	50.03
16	45.84
256	31.28
1024	18.92
4096	41.81

The CPU efficiency statistics of the shared memory communication mode are shown in Table 6:

Table 6: CPU efficiency of shared memory communication

Packet size(B)	CPU efficiency (%)
1	100.00
4	100.00
16	99.99
256	99.98
1024	99.96
4096	99.92

5. Conclusions

In recent years, virtual reality technology has developed rapidly and has been applied in many fields. This article implements a high-speed domain communication method that supports dynamic migration. This method significantly increases the network bandwidth of the virtual machine while also reducing the CPU time consumed for transmitting unit data, increasing the CPU usage efficiency of network communication, and increasing the scope of application of the inter-domain high-speed communication method. First of all, it is theoretically proved that the RLMCom model is correct and effective. Secondly, the software environment and hardware environment experiment test methods of specific experiments are introduced. Finally, specific experimental data is given, and the experimental data is analyzed. This chapter proves the correctness and efficiency of the RLMCom model on the basis of data analysis, and draws the conclusion that the RLMCom model can greatly improve the performance of inter-domain network communication. However, the existing RLMCom method only implements TCP communication, and does not implement UDP communication, and cannot transmit UDP data. The next step is to implement the RLMCom high-speed communication model for UDP, so that it can play a role in general UDP communication.

References

[1] Maples-Keller J L, Bunnell B E, Kim S J, et al. The Use of Virtual Reality Technology in the Treatment of Anxiety and Other Psychiatric Disorders[J]. Harvard Review of Psychiatry, 2017, 25(3):103-113.

[2] Lan L, Fei Y, Shi D, et al. Application of virtual reality technology in clinical medicine[J]. American Journal of Translational Research, 2017, 9(9):3867-3880.

[3] Sang Y, Yu Z, Zhao H, et al. Study on an Interactive Truck Crane Simulation Platform Based on Virtual Reality Technology [J]. International Journal of Distance Education Technologies, 2016, 14(2):64-78.

[4] Cao D, Li G, Zhu W, et al. Virtual reality technology applied in digitalization of cultural heritage[J]. Cluster Computing, 2017, 22(4):1-12.

[5] Reski N, Alissandrakis A. Open data exploration in virtual reality: a comparative study of input technology[J]. Virtual Reality, 2020, 24(7):1-22.

[6] Washburn A. A New Virtual Reality for 3D Technology in the Utility Industry[J]. IEEE Power and Energy Magazine, 2018, 16(2):96-98.

[7] Yao S, Zhang J, Hu Z, et al. Autonomous-driving vehicle test technology based on virtual reality[J]. Journal of Engineering, 2018, 2018(16):1768-1771.

[8] Malone D. Virtual Reality: How Three Firms Are Using Vr Technology[J]. Building design & construction, 2017, 58(1):46-47.

[9] Yel Ve Rton W. Virtual reality set to become a mainstream care modality by 2021-are you ready?[J]. Health Management Technology, 2018, 39(6):28-29.

[10] Hsu K S, Jiang J F, Wei H Y, et al. Application of the Environmental Sensation Learning Vehicle Simulation Platform in Virtual Reality[J]. Eurasia Journal of Mathematics Science & Technology Education, 2016, 12(5):1477-1485.

[11] Huang Y, Huang Q, Ali S, et al. Rehabilitation using virtual reality technology: a bibliometric analysis, 1996–2015[J]. Scientometrics, 2016, 109(3):1547-1559.

[12] Zhang X, Jiang S, Patricia O D P, et al. How virtual reality affects perceived learning effectiveness: a task–technology fit perspective [J]. Behaviour & Information Technology, 2017, 36(4-6):548-556.

[13] Dempsey, P. The teardown: Razer OSVR HDK2 virtual reality headset[J]. Engineering & Technology, 2016, 11(10):80-81.

[14] Chen T N, Yin X T, Li X G. Application of 3D virtual reality technology with multi-modality fusion in resection of glioma located in central sulcus region.[J]. Zhonghua Yi Xue Za Zhi, 2018, 98(17):1302-1305.

[15] Baker S, Wa Yc Ott J, Robertson E, et al. Evaluating the use of interactive virtual reality technology with older adults living in residential aged care[J]. Information Processing & Management, 2020, 57(3):102105.1-102105.13.

[16] Ahmad M, Eslam M S, Anshasi H A. Virtual Reality Technology for Pain and Anxiety Management among Patients with Cancer: A Systematic Review[J]. Pain Management Nursing, 2020, 21(6):601-607.

[17] Lin X, Song S, Zhai H, et al. Physiological reaction of passengers stress metro fire using virtual reality technology[J]. International Journal of System Assurance Engineering and Management, 2020, 11(3):728-735.

[18] Mai W, Fang L, Chen Z, et al. Application of the Somatosensory Interaction Technology Combined with Virtual Reality Technology on Upper Limbs Function in Cerebrovascular Disease Patients[J]. Journal of Biomedical Science and Engineering, 2020, 13(5):66-73.

[19] Hyun K Y, Lee G H. Analysis of Change of Event Related Potential in Escape Test using Virtual Reality Technology [J]. Biomedical Science Letters, 2019, 25(2):139-148.

[20] Akb A, Hha B, Mza C. The application of virtual reality technology in architectural pedagogy for building constructions [J]. Alexandria Engineering Journal, 2019, 58(2):713-723.

[21] Shaw C, Washington E, Alavi C C, et al. Enhancing Dementia Care And Building Empathy Through The Integration Of Virtual Reality Technology And Art Therapy[J]. Alzheimer's and Dementia, 2018, 14(7):P934-P935.

[22] Chao N, Liu Y K, Xia H, et al. A sampling-based method with virtual reality technology to provide minimum dose path navigation for occupational workers in nuclear facilities[J]. Progress in Nuclear Energy, 2017, 100(sep.):22-32.

[23] Phoon S Y, Yap H J, Taha Z, et al. Interactive solution approach for loop layout problem using virtual reality technology[J]. International Journal of Advanced Manufacturing Technology, 2017, 89(5-8):2375-2385.

[24] M Żmigrodzka. Development of Virtual Reality Technology in the Aspect of Educational Applications[J]. Marketing of Scientific & Research Organizations, 2017, 26(4):117-133.

[25] Wang V, Liu L, Xu J. Study on the design of the railway vehicle running control system based on the virtual reality technology [J]. Revista de la Facultad de Ingenieria, 2017, 32(13):799-808.

[26] Gayer-Anderson, Charlotte. The application of virtual reality technology to understanding psychosis[J]. Social Psychiatry & Psychiatric Epidemiology, 2016, 51(7):1-3.

[27] Solomon B. Virtual Reality Tech Support [J]. Dealerscope, 2018, 60(9):14-16.

[28] Adrienne, Zimmer. Train in Virtual Reality [J]. Law enforcement technology, 2018, 45(3):18-24.

[29] Morra L, Lamberti F, FG Prattic ó, et al. Building Trust in Autonomous Vehicles: Role of Virtual Reality Driving Simulators in HMI Design[J]. IEEE Transactions on Vehicular Technology, 2019, 68(10):9438-9450.

[30] Sharma A, Bajpai P, Singh S, et al. Virtual Reality: Blessings and Risk Assessment[J]. Indian Journal of Science and Technology, 2017, 11(20):1-20.