Original Research Article

Realization of Time Synchronization Server Based on C/S

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ABSTRACT

Computer network refers to the multi-computer with independent functions and their external devices, which are connected by communication lines. The resources are realized under the management and coordination of network operating system, network management software and network communication protocol. Sharing and information transfer of computer systems. The topic of this computer network is based on the C/S time synchronization server implementation. Time server is in the LAN as a unified time to publish the server, which uses the computer network to pass the time information to the user. Refer to the existing time server principle and effect to achieve a time server and client. The server opens the specified port release time to the network, and the other client obtains the time from the network and synchronizes the local time. This design is based on Visual Studio 2010 as the development platform, to discuss the design of the view of the process from these 5 aspects: the topic background, program demonstration, process discussion, analysis of the results and conclusions.

KEYWORDS: time synchronization; client; server; TCP/IP

1. Background

1.1. Questions Raised

For a computer system which composed of computers, each node of computer has its own amount of system time, consistency and accuracy of computer network control system in the sub-system time segment is one of the core issues in the network control system. The network control system has a significant impact on the real-time and accuracy. However, due to design defects, environmental temperature changes, electromagnetic interference, load and other factors, the computer clock is mostly inaccurate, with the passage of time, this error gradually accumulated, the time deviation will be greater the bigger. In some important applications (such as real-time data acquisition, monitoring, industrial control networks, and telecommunications), time accuracy is more stringent and demanding, so time synchronization becomes particularly important, and to achieve an accurate system time change. There are common hardware and software methods in time synchronization of the realization: hardware synchronization through the simulation nodes are connected to a dedicated clock signal line, its accuracy is relatively high, but the cost is high, the operation relative more complex; software synchronization method is to use the software to complete the distributed system in the clock synchronization. For the software synchronization method, the current time commonly used protocols are NTP protocol, SNTP protocol and PTP protocol. The general implementation of these time synchronization protocols is achieved through the computer network and other means of communication, but because of some of the potential threats to the computer network, such as accidental or malicious reasons have been broken, change, leak, the network system cannot be continuous and reliable. The normal operation resulting in time synchronization system cannot function properly. Due to limited resources and time, software is used in this synchronization server based on the C/S time.

1.2. Software Use

Visual Studio 2010 is used based on the C/S time synchronization server implementation. Visual Studio 2010 is Microsoft's development environment, which is the most popular Windows platform application development environment. The C++ compiler for Visual Studio 2010 now supports automatic types deduction for lambda expressions, rvalue references, compile-time assertions, expression type infusions, and C++0X standards. Visual Studio 2010 C++ Compiler has a model that can be backward compatible with Visual Studio 2008 tools and class
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libraries. This will give the developer a personal upgrade to provide great convenience even if there is someone in the team do not want to switch to Visual Studio 2010. You can create and use text templates in any version of Visual Studio without any other components. In Visual Studio 2010 that introduces preprocessing text templates, it becomes easier to generate any type of text file from an application. The generated source code will always be in the source model after any changes to keep updated through better integration with the build system and improved support for code integration. Visual Studio 2010 is a powerful visualization software development tool. Visual Studio 2010 has socket support for network programming, WinInet support, MAPI and ISAPI support. Among them, Windows Sockets API is TCP / IP network environment, but also on the Internet to develop the most common API. In the TCP / IP network communication environment, Socket data transmission is a special I / O, it is also equivalent to a file descriptor, with a function similar to open the file call Socket (). Socket is designed for the client / server model, for the client and server programs to provide different Socket system calls. The client randomly applies for a Socket (the equivalent of a person who wants to call can dial on any network phone call), the system assigned a Socket number; server has a globally recognized Socket, any customer can send a connection request to it and an information request (which corresponds to a called telephone having a caller's known telephone number). Socket uses the client / server model to intelligently solve the problem of establishing a communication connection between processes. The server socket semi-correlation is very important for the overall recognition. Readers may wish to know how two completely random user processes between the establishment of communication? If the communication does not have any side of the Socket fixed, like the two sides do not know each other's phone number, this call is impossible.

1.3. Expected Target

Visual Studio 2010 is used based on the C / S time synchronization server implementation. Time server is in the LAN as a unified time to publish the server, which uses the computer network to pass the time information to the user. Refer to the existing time server principle and effect to achieve a time server between server and client. The server opens the specified port release time to the network, and the other client obtains the time from the network and synchronizes the local time. Give the relevant principles, design ideas and design process; draw time synchronization server and client algorithm flow chart; to achieve the server and client and give instructions; test server and client, write the test results.

2. Program Demonstration

Client / Server structure of the relational database system has been widely used because of high performance, high efficiency, open, easy to expand, scalable and other superior features. In the relational database application system of Client / Server structure, a lot of application is used like: When the user inserts and modifies the data in the client, the data is inserted and modified in the corresponding table of the database for statistical analysis. In order to ensure the accuracy of future statistical analysis by time, each client must provide a unified time to the database server DBMS. Hardware synchronization is through the simulation nodes which connected to a dedicated clock signal line, its accuracy is relatively high, but the cost is high, the operation is relatively complex; software synchronization method is to use the software to complete the distributed synchronization of the clocks in the system. Software synchronization is relatively simple, fast, convenient, easy to use, and suitable for our student party to do the computer network research, the effect is better, so the test performed by using Visual Studio 2010 as a platform, based on the C / S time Synchronization server implementation.

3. Process Discussion

3.1. Relevant Principles

The connection process between sockets can be divided into three steps: server listening, client request, and connection confirmation, depending on how the connection is started and the destination to which the local socket is to be connected.

(1) Server monitoring: server-side socket does not locate the specific client socket, but in a state waiting for the connection, real-time monitoring of network status.

(2) Client request: refers to the client's socket to make a connection request, to connect the target is the server-side socket. To do this, the client's socket must first describe the socket of the server to which it is connected, indicate the address and port number of the server-side socket, and then make a connection request to the server-side socket.

(3) Connection confirmation: refers to the server-side socket to listen to or receive a client socket connection request, it responds to the client socket request, create a new thread, the server set the description of the word is sent to the client, and once the client confirms the description, the connection is established. While the server-side socket continues to be listening and continues to receive connection requests from other client sockets.
The basic working principle of NTP is shown in the following figure. Device A and Device B are connected through the network, they have their own independent system clock, through the NTP to achieve their own system clock automatic synchronization. For the sake of understanding, make the following assumptions:

- Before the system clock synchronization of Device A and Device B, the clock of Device A is set to 10:00:00 am and the clock of Device B is set to 11:00:00 am.
- Device B as the NTP time server, that is, device A will synchronize its own clock with Device B's clock.
- The time required for one-way transmission between Device A and Device B is 1 second.

![Figure 1 NTP Protocol Working Principle Diagram](image)

- Device A sends an NTP message to Device B with the timestamp when it leaves Device A, which is 10:00:00 am (T1).
- When the NTP packet arrives at Device B, Device B adds its own timestamp, which is 11:00:01 am (T2).
- When the NTP packet leaves Device B, Device B adds its own timestamp, which is 11:00:02 am (T3).
- When Device A receives the response, the local time of Device A is 10:00:03 am (T4).

At this point, Device A already has enough information to calculate two important parameters:

- \[ \text{NTP packet delay} = (T4-T1) - (T3-T2) = 2 \text{ seconds}. \]
- \[ \text{Time difference between Device A and Device B offset} = \frac{(T2-T1) + (T3-T4)}{2} = 1 \text{ hour}. \]

### 3.2. Design Process

There are many applications in the LAN In order to work together. In order to correct the local time, you need to ensure that the time on the client is unified, and the client read the time from a time relatively correct server. According to the C / S model to establish a time synchronization server, the system is divided into server (Server) and client (Client), respectively, the server and client has algorithm design and software programming, so that they can compile. At the same time, the client (Server) is waiting for the server (Server) to send a time synchronization request to the client (Client) to send a time synchronization request. This time, the client (Client) is waiting for the server (Server). After the client (client) received the request, it respond according to the corresponding design of the algorithm for time synchronization. This is the purpose of time synchronization.
3.3. Algorithm Flow Chart

![Algorithm Flow Chart Image]

4. Result Analysis

1. Run the server-side program on Visual Studio 2010 to get the following results

![Server Result Image]

2. Continue to run the client program on Visual Studio 2010 to get the following results

![Client Result Image]

3. Continue clicking (1) to get the following result

![Continued Client Result Image]
5. Conclusions

Whole process of synchronization can be observed from the fourth part of the image, and the server implementation based on the C / S time synchronization is very successful. This design is rich in content and involving a wide range of knowledge. I have learned a lot of professional knowledge through the search of information for the design in the early stages of the design. Many knowledge which previously very vague and very isolated has grasp more firmly through this design. In addition, I get know that I am still lack of skill for software programming through this design. By looking for reference materials gradually familiar with the previous C ++ programming knowledge. In the previous computer examinations and the process of learning, it has some basic understanding. I further understand the computer network knowledge through this design, as well as C / S mode and time synchronization server to achieve the principle, and understand the VC 6.0 version of the upgraded version of Visual Studio 2010, which is a great harvest. But in the design process a lot of problems also appeared, such as programming logic problems, but ultimately problem is solved by analyzed each module carefully. Through this design, I not only deepen the understanding of the computer network theory and apply the theory to the actual environment, and also can program each part of program independently. I also own a serious independent thinking from this design: to understand every step of the programming process, has a better understanding for time synchronization server knowledge, need to focus on a lot of exercise to applied theory to actual practice. Learning is a process of understanding doubts and then solve the doubts. This design is to provide such an opportunity to find their own knowledge loopholes, and to explore the opportunity to solve doubts.

References