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UDP-Based Multi-Stream Communication Protocol

Vandana Vijay Belkhode

Computer Science and Engineering Sipna Coet, Amravaty Maharashtra,India.
vandanabelkhode@gmail.com

Prof. D. M. Dakhane

Computer Science and Engineering Sipna COET, Amravaty Maharashtra,India.

Abstract: *In these we have to discuss about two basic protocols one is connectionless and other is connection-oriented. In connectionless protocol handshaking are not required but in connection-oriented protocol handshaking process are most important. UDP (user datagram protocol) is an example of connectionless protocol, TCP (transmission control protocol) is connection-oriented protocol. A connection-oriented communication is a data communication made that requires an overhead in setting up a request for connection before sending any type of data communication message. In Connectionless Protocol cannot require any type of handshaking process for sending a data. The communication method , in which communication occurs between hosts. The device at one end of the communication transmits data to the other, without first ensuring that the delivery report is available and ready to accepting the data. The server sending a message to sends it addressed to the intended recipient. The Internet Protocol (IP) and User Datagram Protocol (UDP) are connectionless protocols, but TCP/IP (the most common use of IP) is connection-oriented. Here we have to study how to use UDP connectionless protocol as a connection oriented protocol. But these two protocols are not sufficient for today's internet. Today we want more flexible, more efficient protocol. For fulfill is requirement we developed the new generation protocol SCTP. The full name is Stream Control Transmission Protocol. SCTP is fulfilling the each and every requirement of today's internet very effectively. It is basically more similar with TCP because it is also a connection-oriented protocol. In SCTP there are four step connection setup processes. All basic features of TCP and UDP are included in SCTP protocol.*

Keywords*: SCTP protocol, multi-streaming, multi-homing , wireless network*

1. INTRODUCTION

This work is totally base on the study of the reliable communication from single user to multi- stream, on available multiple devices. The major purpose behind this paper is to provide reliable communication functionality from one single user to multiple users. It should be noted that similar transport layer contain two Transport protocol TCP and SCTP don't provide the kind of functionality that this protocol provides. The Stream Control Transmission Protocol (SCTP) is a reliable message-oriented protocol with transparent support for multihoming. It allows multiple not dependent complex exchanges which all share a single connection and congestion context. SCTP is a multi homing and multi streaming supported which only deals with communication between two single user endpoints, on work interfaces, which is assigned multiple IP addresses ; it does not able to deal with communication that contain multiple user endpoint. Our main purpose is to provide an application running on a machine to connect to a collection of machines a single one. The Load Balancing is one of the feature can implemented, which is absent in SCTP. Load balancing is the management of traffic across network without use of complex routing protocol. Load balancing distributes workload across one or more CPUs, CD and DVD drives and other resources in an effort to use network resources more efficiently and avoid network overload. Load balancing may be accomplished through software or hardware. Add load balancing to current more than one user server communication in order to achieve high availability. Load balancing can be implemented quickly and easily as an add-on to your current server solution to share the load between your web servers, using a simple script to replicate the data on the servers. By using approach of virtualition, it is a set machine under the same endpoint, each machine accessible under many-stream. In computer networking, the Stream Control Transmission Protocol (SCTP) is a transport layer protocol, performed in a similar role to the popular protocols Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). It provides some of the same service features of both: it is message-oriented like UDP and ensures reliable, in-sequence

transport of messages with congestion control and data flow like TCP. TCP provides reliable and strict order-of-transmission data transferred.

2. RELATED WORK

2.1 Stream Control Transmission Protocol (SCTP)

We know only to basic protocol one is TCP and another one is UDP. These are used to connect distributed applications and allow messages to flow between them. These protocols have been used successfully to design and developed Internet applications as we know them: e-mail, HTTP, name services and so forth. In modern generation we required most powerful protocol which provides stream data transmission and reliable data transmission and most important is more secure. The combination of these features protocol is stream control protocol. The Stream control transmission protocol [1] stack and provides transport layer functions to many Internet applications. SCTP has been approved by the IETF as a proposed standard in 2000 and updated over the years. SCTP is a reliable transport protocol operating on top of a connectionless packet network such as IP[2]. SCTP protocol is a combination of TCP and UDP because each has some advantages and some drawback. UDP transmit the data in the form of stream and TCP transmit the data in the form of bytes. Transition of the data in the of stream is faster than transmission of bytes.
SCTP (Stream Control Transmission Protocol) is a protocol for transmitting multiple streams of data at the same time between two end points that have established a connection in a network. Sometimes referred to as "next generation TCP" (Transmission Control Protocol) - or TCPng. SCTP is designed to make it easier to support a telephone connection over the Internet (and specifically to support the telephone system's Signaling System 7 - SS7 - on an Internet connection). A telephone connection requires that signaling information (which controls the connection) be sent along with voice and other data at the same time. SCTP also is intended to make it easier to manage connections over a wireless network and to manage the transmission of multimedia data. SCTP is a standard protocol (RFC 2960) developed by the Internet Engineering Task Force (IETF)

2.1.1Multi-homing

SCTP was designed to handle the signaling of telecommunications over IP[4]. Since telecommunications are very susceptible to time delays, every millisecond counts. Multi-homing enables systems that have multiple interfaces, for redundancy, to use one over the other without having to wait. Within SCTP one interface is established as the primary and the rest become secondary. If the primary should fail for whatever reason, a secondary is selected and utilized. When the primary becomes available again, the communications can be transferred back without the application being aware there was an issue. While establishing the connections, the primary and secondary interfaces are checked and monitored using a heartbeat/heartbeat acknowledgement process that validates addresses, and maintains a Round Trip Time (RTT) calculation for each address. The RTT can indicate that the primary is slower than a secondary and allow for the communications to migrate to the secondary interface.

2.1.2Multi-streaming

Using TCP, only one single data stream is allowed per connection[4]. All of the information must be passed through that one stream. SCTP allows multiple simultaneous data streams within a connection or association. Each message sent to a data stream can have a different final destination, but each must maintain message boundaries. For example, systems cannot send parts of the same message through different streams; one message must go through one stream. When running an ordered data delivery system, if one of the packets is out of order or missing, the stream is blocked pending resolution to the order. This is called “Head-of-Line Blocking.” With the use of multi-streams, only the stream that is affected would be blocked; the other streams would continue to flow.

3. EXPERIMENT AND RESULT

To test the protocol, several applications were implemented and some tests were performed. All tests were realized over wireless connection. While the signal strength was at 95% and speeds are at maximum, packet losses can still occur. This is on purpose to check that the protocol
shows no issues. All computers have an Intel Core i3 CPU, but at different frequencies, have at least 1 GB of free RAM, and no other programs running at the same time. All this experiment as run over the NS2 network simulator using Linux’s Fedora. The desire was to have more than one core per

computer. CPU frequencies are not that important as the CPU load never increases over 1% while using the test applications

3.1 File Download

The experiment performed was the measurement of the time it took to transfer a file from a single server. The goal was to see if the time increased in a more than linear fashion if the file size increased linearly. Normally the increment in time should be proportional with the increment in file size. If this does not happen, that means there is a problem with the protocol when large quantities of data are transferred.
This can be a synchronization issue that makes the protocol block for a small period of time, a small buffer that gets filled up quickly or something else. Also, using this simple experiment, one can check for any performance benefits by tweaking different parameters of the transmission algorithm. The transfer time was measured by measuring the time since the transfer application started and until the time the application finished. Linux's time utility was used in this regard.

3.2 Throughput

In this project report, there are three study parameter they show that UDP Using SCTP protocol is better than UDP protocol. All three study parameter such as Throughput, Delay time and Energy. Show that the comparison of throughput, delay time and energy. First two values for throughput. First test show that the throughput of UDP Using SCTP protocol is higher than the throughput of UDP protocol.
Throughput of UDP protocol – 53391.51
Throughput of UDP Using SCTP protocol – 54582.00

Delay Time

The experiment was run with random data files of sizes 1, 2, 4, 8 and 16MB (see the results in Tables 1,2,3 and 4). In each case, a client transferred the file to a server in pieces of a certain size and received the same data back with an ACK. The client checked the data to validate it and make sure it is the same one sent and proceeded to the next chunk of data. First four tables show that comparison of delay time in UDP protocol and SCTP protocol. This test shows that single stream protocol means UDP protocol having more delay time and higher rate of packet loss. Than the result of second test is UDP Using SCTP protocol having less delay time and rate of packet loss is less than the UDP protocol.

Note- All the value of delay time in ms.

Table1. *Delay Time for 1 Stream Data of UDP Protocol*

File Size(MB)	Delay Time(ms)
1MB	0.001022
2MB	0.001231
4MB	0.001339
8MB	0.001582
16MB	0.001686

Table2. *Delay Time for 1 Stream data of UDP Using SCTP Protocol*

File Size(MB)	Delay Time
1MB	0.001
2MB	0.001101
4MB	0.001220
8MB	0.001338
16MB	0.001438

Table3. *Delay Time for 4 Stream data of UDP Using SCTP Protocol*

File Size(MB)	Delay Time
1MB	0.000634
2MB	0.000922
4MB	0.001086
8MB	0.001209
16MB	0.001366

Table4. *Delay Time For 16 Stream data of UDP Using SCTP Protocol*

File Size(MB)	Delay Time
1MB	0.000521
2MB	0.000659
4MB	0.000715
8MB	0.00084
16MB	0.000907

3.3 Energy

The experiment was run with random data files of sizes 1, 2, 4, 8 and 16MB (see the result in Tables 5,6,7 and8). In each case, a client transferred the file to a server in pieces of a certain size and received the same data back with an ACK. The client checked the data to validate it and make sure it is the same one sent and proceeded to the next chunk of data. Last four tables show that comparison of energy in UDP protocol and UDP Using SCTP protocol. This test shows that single stream protocol means UDP protocol having more energy and higher rate of packet loss. Than the result of third test is UDP Using SCTP protocol having less delay time and rate of packet loss is less than the UDP protocol.

Note- All the value of energy in the mj.

Table5. *Energy Time for 1 Stream data of UDP Protocol*

File Size(MB)	Energy (mj)
1MB	101.853585
2MB	103.979719
4MB	105.375790
8MB	106.361976
16MB	112.203316

Table6. *Energy Time for 1 Stream data of UDP Using SCTP Protocol*

File Size(MB)	Energy(mj)
1MB	100.421186
2MB	98.405617
4MB	97.312788
8MB	102.284820
16MB	108.000000

Table7. *Energy Time for 4 Stream data of UDP Using SCTP Protocol*

File Size(MB)	Energy(mj)
1MB	92.474180
2MB	93.004368
4MB	93.166094
8MB	94.822813
16MB	97.921485

Table8. *Energy Time For 16 Stream data of UDP Using SCTP Protocol*

File Size(MB)	Energy (mj)
1MB	90.12282
2MB	90.992348
4MB	91.423178
8MB	93.000121
16MB	95.200001

4. SEGMENTED FILE DOWNLOAD

A practical implementation for the protocol is a seg mented downloading program. A client connects to multiple servers at the same time and asks each of them for different segments of a file. This can also be done via existing protocols, but in these protocols a connection must be created for each server. With our protocol, a single connection can be created that touches every server and opens a stream with each of them. This makes implementation much simpler and error free. We only performed validation tests for this scenario.

5. APPLICATION

Following are the application of SCTP protocol .

1. SCTP protocol used in mobile technology.

2. It is used in commercial wireless networking.

3. It is used in long distance communications like Skype or Team Viewer

CONCLUSION

In this thesis we presented a new approach for communication from one point to multiple endpoints. Our communication protocol is implemented on top of UDP and tries to provide the same facilities as TCP, but with extra functionality. The implementation of multiple endpoints is reliable, unlike multicast over UDP, and is not limited to only two endpoints that may have multiple IPs, like SCTP's implementation of multi-homing. Using the new protocol, applications can easily choose the type of connection they desire with the endpoints. Connection oriented multicast, any cast and load balancing are all fully integrated in our protocol. Experimental results showed that our protocol can provide good data transfer performance

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