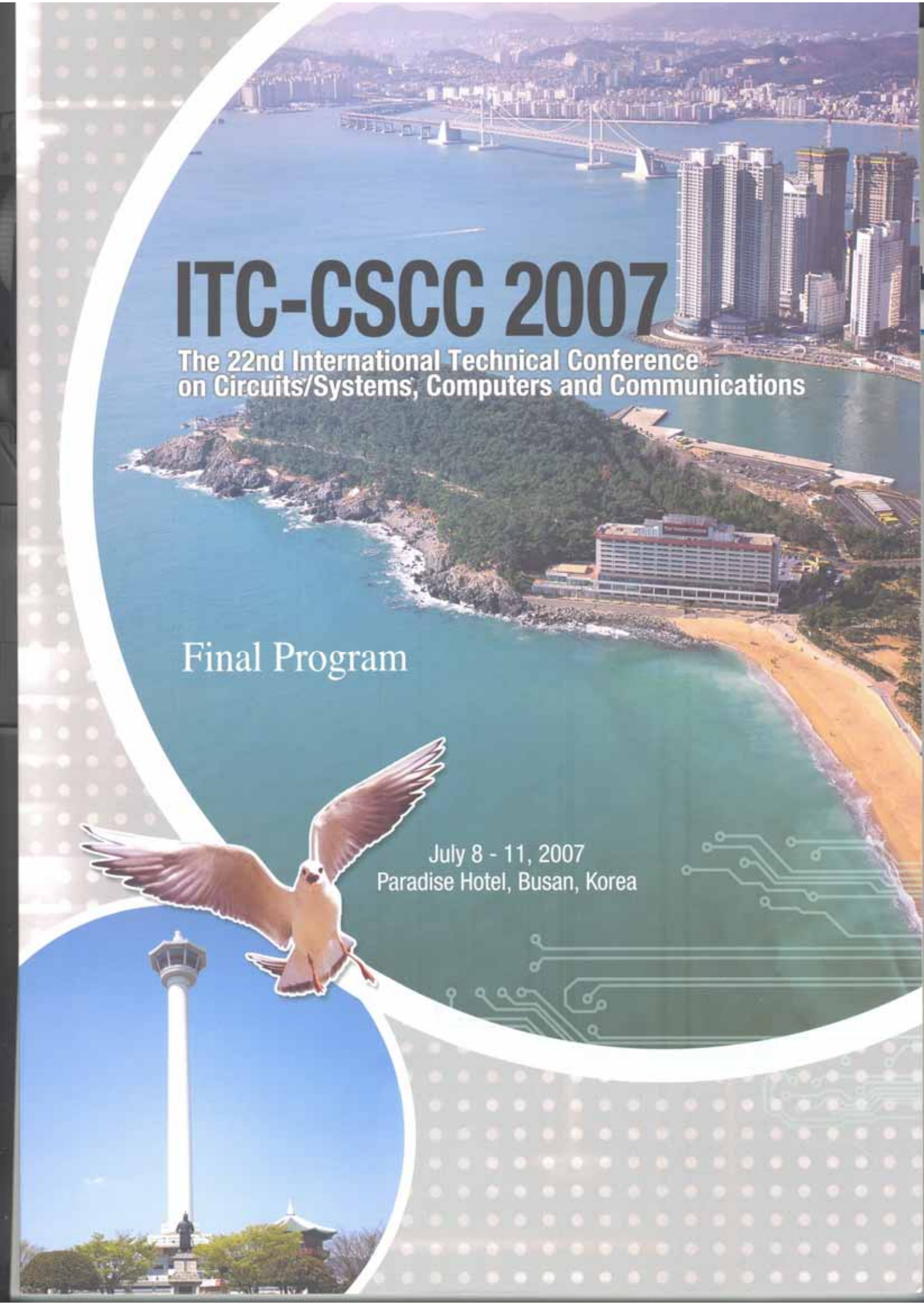

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Analysis of SCTP Performance by Multi-streaming Feature

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Abstract: In this paper, we analyze the performance of the Stream Control Transmission Protocol (SCTP) in the viewpoint of its multi-streaming feature. From the experiments, it is shown that there exists an optimal number of SCTP streams in terms of the throughput performance in the lossy networks.

1. Introduction

The Stream Control Transmission Protocol (SCTP) is a new transport layer protocol. This is a message-oriented protocol and serves reliable services. It serves many innovative feature, 'multi-streaming', 'multi-homing' etc.

One of the distinctive features of SCTP is 'multi-streaming', which enables the sender to transport multiple data streams in a single association. In particular, it is expected that the SCTP multi-streaming could be used to overcome the so-called Head-of-Line (HoL) blocking problem of the TCP. In this paper, we analyze the performance of the SCTP in terms of the multi-streaming feature by experiment.

This paper is organized as follows. In Section 2, we review the SCTP features briefly. In Section 3, we perform the experimentation for performance analysis. In Section 4, we conclude this paper.

2. SCTP Overview

SCTP is a message-oriented protocol like UDP. But, the SCTP can support the reliability unlike the UDP. The SCTP is the connection-oriented and reliable protocol like the TCP.

In particular, the SCTP allows the multi-streaming feature in the association.The 'stream' means a flow of data. The TCP uses only one stream, whereas the SCTP can send more than one data streams at the same time using the tulti-streaming feature. With the help of the SCTP multi-streaming, even one stream is blocked, the other streams can successfully be transmited to the receiver side.

On the other hand, in the SCTP multi-homing, one SCTP endpoint can use multiple IP addresses. By this multi-homing feature, even if one IP address is failed, the association can continue by using the other backup IP address.

3. Experiments and Results

3.1 Testbed

For experiment, we setup the experiemtal test bed with the three Linux hosts. [2][3], as shown in Fig. 1.

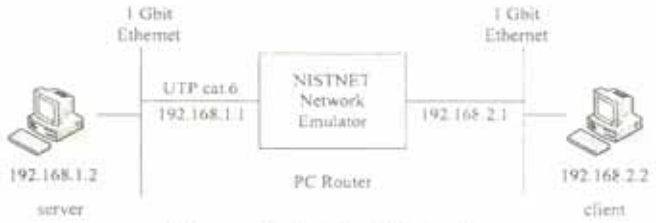

Figure 1. Test bed Network

In the figure, the two hosts are for the server and the client. The other is the PC router which installed the network emulator, NISTNET 2.0.12.c [4]. We measured the packets exchanged in the connection/association by using the packet analyzer, Wireshark-0.99.5 [5].

3.2 Test Scenarios

For the performance analysis, we test the SCTP transmission as follows:

1) Performance comparison of SCTP with TCP for different transmission delays;
2) Performance comparison for the SCTP Multi-streaming feature in the networks with different packet loss rates.

All the tests are performed 10 times, and the average results are described.

3.3 Results and Discussion

Fig. 2 shows the experimental results for the throughput comparison of TCP and SCTP in the networks with different transmision delays. In the experiment, the transmission delays are given randomly with a pre-configured delay variation.

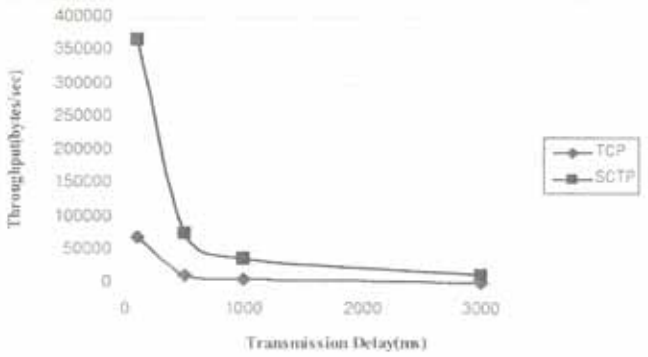

Figure 2. Comparison of Throughput by Transmission Delay

In the figure, we see that the SCTP provides better throughput than TCP for all the delays. This implies that the normal SCTP can give the performance gain over TCP in the networks with some delay variations.

On the other hand, for analysis of the SCTP multi-streaming, we experimented the three tests with the packet loss rate of 0%, 5%, and 10%. For each test, the number of SCTP streams increase, and the throughput of the SCTP and TCP cases are compared.
Fig. 3 shows the results of the experiment for the networks with the packet loss rate of 0%.

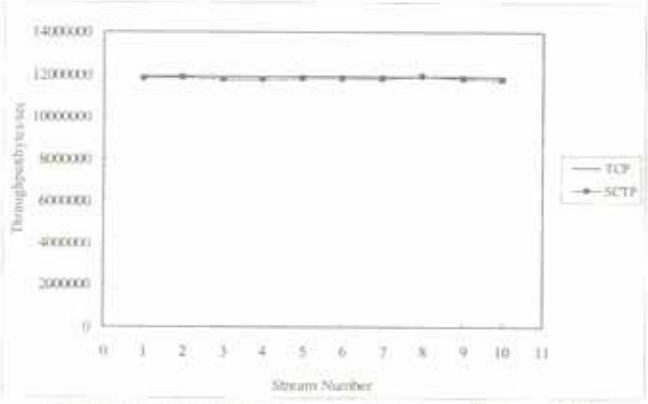

Figure 3. Throughput for Packet Loss Rates of 0%

SCTP shows a equality of TCP throughput. That is, SCTP has a similar error control as TCP.
Fig. 4 and 5 show the results of the experiments for the networks with the packet loss rate of 5% and 10%.

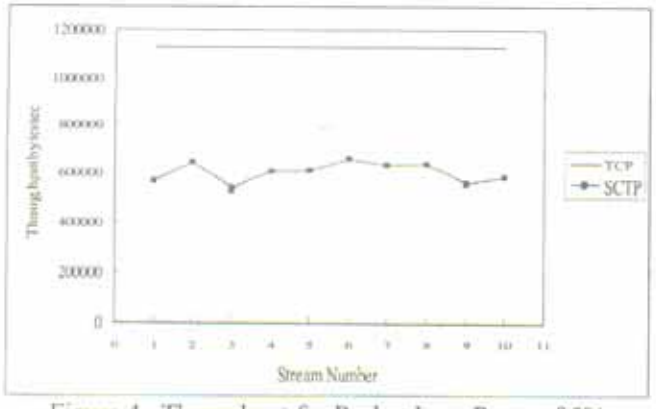

Figure 4. Throughput for Packet Loss Rates of 5%

TCP and SCTP performance is remarkably low in the lossy network. They retransmit dropped packets(not arrived packet in time) after the retransmission timeout.
SCTP throughput is lower than TCP by 5% packet drop. SCTP is affected by error control in the lossy network highly.
There is a little gap in SCTP stream number.

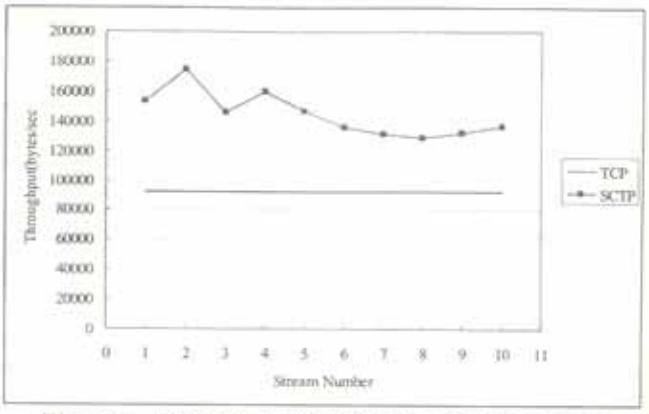

Figure 5. Throughput for Packet Loss Rates of 10%

In the fig. 5, we see that the performance of the SCTP gets better as the number of streams increase. But, the performance enhancement stops when the number of streams get larger above a certain number of streams. This implies that there is an optimal number of streams in the performance perspective. In the experimentations, the optimal number of SCTP streams corresponds to 6 (for case with 5% loss rate) and 2 (for case with 10% loss rate). Throughput of stream number 2 and 4 is better SCTP single stream and TCP in the 10% loss rate especially. Throughput of over stream number 5 is reduced gradually.
That is, optimal number of SCTP multi-streaming is exist respectively.

4. Conclusion

In this paper, we analyze the performance of the Stream Control Transmission Protocol (SCTP) by its multi-streaming feature. From the experiments, we can see that there exists an optimal number of SCTP streams in terms of the throughput performance in the lossy networks.

Acknowledgement

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References

[1] R. Stewart, Q.Xie, K. Morneault, and C. Sharp *et. al.*, "Stream control transmission protocol." RFC 2960, Oct 2000.
[2] Ubuntu Linux 6.10
http://www.ubuntu.com/
[3] LK-SCTP-2.6.16-1.0.6
http://lksctp.sourceforge.net/
[4] NISTNET-2.0.12.c
http://www.itl.nist.gov/div892/itg/carson/nistnet/index.html
[5] Wireshark-0.99.5
http://www.wireshark.org/download.html