CANADIAN COLLEGE OF MODERN TECHNOLOGY

1 SILICON HILL

MILE 91

ASSIGNMENT TWO

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Q1. A client sends a 200-byte request message to a service, which produces a response containing 5000 bytes. Estimate the total time required to complete the request in each of the following cases, with the performance assumptions listed below:

i) Using connectionless (datagram) communication (for example, UDP);

ii) Using connection-oriented communication (for example, TCP);

iii) When the server process is in the same machine as the client.

[Latency per packet (local or remote, incurred on both send and receive): 5 ms

Connection setup time (TCP only): 5 ms

Data transfer rate: 10 Mbps MTU: 1000 bytes Server request processing time: 2 ms

Assume that the network is lightly loaded

ANSWER

The send and receive latencies include (operating system) software overheads as well as network delays.

Assuming that the former dominate, and then the estimates are as below. If network overheads dominate, then the times may be reduced because the multiple response packets can be transmitted and received right after each other.

By calculating:

Let me explain considering the network cases:
1) Without latency

2) With latency

Without latency:
Let us consider server request processing time be 5 MS
UDP: [(200byte x 8bit/byte)/(10 x 10^6bit/sec)x10^3]ms + 5ms + 5frames x
[(1000byte x 8bit/byte)/(10 x 10^6bit/sec) x10^3]ms
=5ms+1600bit/10 x 10^3bit/ms+5ms+5frame x
(8000bit/byte/10 x10^3bit/ms)
=5ms+0.16ms+5ms+5frame x (0.8ms)
=5.16ms+5frame x 0.8ms
=5.16ms+4ms
=9.16 ms
TCP: Let us consider connection set up time be 5ms
Connection time + UDP
5ms + 9.16ms
=14.16ms.
Case (2):
With latency:
Let the latency be 5ms
Server request processing time be 2 ms
UDP: 5ms + [(200byte x 8bit/byte)/(10 x 10^6bit/sec) x 10^3]ms + 2ms +
5frames x [5ms+ (1000byte x 8bit/byte)/(10 x 10^6bit/sec) x 10^3]ms
=5ms+1600bit/10 x 10^3bit/ms+2ms+5frame
x(5ms+8000bit/byte/10m x 10^3bit/ms)
=5ms+0.16ms+2ms+5frame x (5ms+0.8ms)
=7.16ms+5frame x 5.8ms
=7.16ms+29ms
=36.16 ms

TCP:
Let us assume the connection setup time be 5ms
Connection time + UDP
=5ms + 36.16ms
=41.16ms ans

Q2. How might the clocks in two computers that are linked by a local network be synchronized without reference to an external time source? What factors limit the accuracy of the procedure you have described? How could the clocks in a large number of computers connected by the Internet be synchronized? Discuss the accuracy of that procedure

ANSWER

To answer this synchronization protocols by using the Cristian's protocol. Briefly, the round trip time t to send a message and a reply between computer **A** and computer **B** is measured by repeated tests; then computer **A** sends its clock setting T to computer **B**. B sets its clock to T+t/2. The setting can be refined by repetition. The procedure is subject to inaccuracy because of contention for the use of the local network from other computers and delays in the processing the messages in the operating systems of **A** and **B**. For a local network, the accuracy is probably within 1 ms.

For a large number of computers, one computer should be nominated to act as the time server and it should carry out Cristian's protocol with all of them. The protocol can be initiated by each in turn. Additional inaccuracies arise in the Internet because messages are delayed as they pass through switches in wider area networks. For a wide area network the accuracy is probably within 5-10 ms.

References

1. http://www.softlab.ntua.gr/~kkontog/ECE454/sol-ch3-ed3.PDF

2. George-Coulouris-Distributed-Systems-Concepts-and-Design-5th-Edition

3. https://www.coursehero.com/file/p1cinea/How-might-the-clocks-in-two-computers-that-are-linked-by-a-local-network-be/