

Results of the factorial experiment

Delay (in seconds)	Fragment Size (in bytes)		
	1000	10,000	MAX=32,000
0	Mean Transfer Rate: 2.2475 bytes/micro seconds Duration: 15493 micro seconds	Mean Transfer Rate: 48.0966 bytes/micro seconds Duration: 724 micro seconds	Mean Transfer Rate: 52.1287 bytes/micro seconds Duration: 668 micro seconds
2	Timeout in client side Bytes Received: 4920	Mean Transfer Rate: 0.004344 bytes/micro seconds Duration: 8 seconds 15463 micro seconds	Mean Transfer Rate: 0.008694 bytes/micro seconds Duration: 4 seconds 5087 micro seconds
10	Timeout in client side Bytes Received: 984	Timeout in client side Bytes Received: 9984	Timeout in client side Bytes Received: 31984

Notes:

1. Experiment was done only on one machine using "localhost" as the hostname.
2. File size: 34822 bytes, filename: temp.dat containing unix manual pages of system calls.
3. Maximum datagram size supported approximately 32,000 bytes.

Results of the factorial experiment
Between different machines: carlsberg.cs.ubc.ca (client) & giraf.cs.ubc.ca (server)

Delay (in seconds)	Fragment Size (in bytes)		
	1000	10,000	MAX=32,000
0	Mean Transfer Rate: 0.808438 bytes/micro seconds Duration: 40363 micro seconds	Mean Transfer Rate: 4.575936 bytes/micro seconds Duration: 7131 micro seconds	Mean Transfer Rate: 1.179121 bytes/micro seconds Duration: 27674 micro seconds
2	Timeout in client side Bytes Received: 5904	Mean Transfer Rate: 0.004075 bytes/micro seconds Duration: 8 seconds 7666 micro seconds	Packet loss Out of packet sequence packet at client
10	Timeout in client side Bytes Received: 984	Timeout in client side Bytes Received: 9984	Timeout in client side Bytes Received: 31984

Notes:

1. File size: 32631 bytes, filename: temp.dat containing unix manual pages of system calls.
2. Maximum datagram size supported approximately 32,000 bytes.

Conclusion drawn from the experiment:

1. When server side delay is large, larger the packet size, higher is the probability of a successful transfer.
2. With 0 delay on the server side, and smaller packet size, meaning large number of packets, probability that the client would drop packets increases. We tested this with packet size of 50 & the client could only receive 8602 bytes. This means, with smaller server side delay, larger the packet, greater is the probability that it will be successfully received.
3. UDP is potentially unreliable with no guarantee that the packets are received in order & with no handshaking; the client has every chance to drop packets when the client & server speeds do not match.

Improvements Suggested:

1. More handshaking between client & server with specific state machine implementation has to be maintained on both sides for a successful operation.
2. Other commands related to a general ftp application can be implemented.
3. Support for text as well as binary file transfer can be incorporated.
4. A tracing service can be incorporated for debugging.