

## 4. ANALYSIS

### 4.1 DATA RATES VS FILE SIZE

We were asked to observe the upload and download rates for different file sizes ranging from 1000 bytes to 10 MB and also for sizes of 50MB, 70MB, 100MB, 150MB, 200MB. The below table gives us the details of the upload and download rates for different file sizes and an fixed packet size of 1000 bytes

File Size(in MB)	Upload Rate(in bits/second)	Download Rate(in bits/second)
1	751870933	569144718
2	576477751	498284288
3	546347097	489807898
4	612430524	609914677
5	511425840	495980133
6	623688525	594290653
7	617010497	593745798
8	594578658	590310886
9	512427548	495709104
10	554534490	557938782
50	598615958	599992616
70	542271624	539855662
100	579624437	578024858
150	586967089	586039253
200	432302129	433821381

I was basically expecting for smaller file sizes, the upload and the download rate would be much faster than for larger file sizes, because for the larger files, the host will be context switching with the concurrent processes, so the time would be rate would diminish for bigger files.

But it doesn't turn out as expected in case of download rates is concerned, the download rates of some bigger files are higher than that of smaller files, which mainly depends on the host's other processes and network traffic.

### 4.2 DATA RATES VS PACKET SIZE

I performed a file transfer for different packet sizes mentioned in the table below. The size of the file used is 200 MB which is a larger file that gives an accurate result because bandwidth for smaller file sizes are not trust worthy. This was my expected result i.e. upload and download rates would be higher for higher packet sizes, as the overhead for the send and the receive calls are greatly reduced for larger packet sizes

But I am not sure, if this trend will continue for even larger packet sizes like 3000 bytes or more

Packet Size(in Bytes)	Upload Rate(in bits/second)	Download Rate(in bits/second)
100	73548720	73781196
200	133134009	133941233
400	205854825	207853271
600	480615429	492198985
800	559139571	574376363
1000	531867496	544693284
1200	632976197	636510648
1400	640409505	660059898

#### 4.3. DATA RATES VS LOAD VARIATIONS

For performing the analysis of data rates for different load variations, I used a packet size of 1000 bytes and a file size of 70 MB

- 1) Performed an upload from underground to embankment where the upload rate was 397948880 bits/second and the download rate was 397160789 bits/second
- 2) Downloaded two 70MB files from underground and embankment to euston where the average upload rate was 466090495 bits/sec and the average download rate was 473335212 bits/second
- 3) Again, used the DOWNLOAD command to download three files and the results were similar as 2

The results were expected except for the speed increase in the multiple download in 2 and 3 which was because of the network traffic. Usually, downloading different files from different connections would be faster because of parallel processing, which is not implemented in our system.

#### 4.4 MEASURING NETWORK BANDWIDTH USING IPERF

IPERF was installed in all the machine and dokken.cse.buffalo.edu was used as the server.

IPERF in one client - bandwidth is 944 M bits/second

IPERF in two clients- Bandwidth is 693 M bits/second for one client and 344 M bits/second for the other

IPERF in three clients- Bandwidth is 356 M bits/second for first client, 551 M bits/second and 259 M bits/second for the third.

The total bandwidth seems to increase when the number of clients are increased which happens to be similar in 4.3 where the rates were higher for multiple downloads.