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(P22) Problem : Consider distributing a file of F = 20Gb to N peers. The server has an upload rate of u_s = 30 Mbps, and each peer has a download rate of d_i = 2 Mbps, and an upload rate of u. For N = 10, 100, and 1000 and u = 300 kbps, 700 kbps and 2Mbps, prepare a chart giving the minimum distribution time for each of the combinations of N and u for both client-server distribution and P2P

Ans:

For client server distribution:

For N = 10 peers,

$$D_{cs} = \max\left\{\frac{NF}{u_s}, \frac{F}{d_{min}}\right\}$$

$$= \max\left\{\frac{10 \times 20 \times 10^3}{30}, \frac{20 \times 10^3}{2}\right\}$$

$$= \max\{6666.67, 10000\}$$

$$= 10000 \text{ second}$$

For N = 100 peers,

$$D_{cs} = \max\left\{\frac{100 \times 20 \times 10^3}{30}, \frac{20 \times 10^3}{2}\right\}$$

$$= \max\{66\,666.67, 10,000\}$$

$$= 66,666.67 \text{ second}$$

For N = 1000 peers,

$$D_{cs} = \max\left\{\frac{1000 \times 20 \times 10^3}{30}, \frac{20 \times 10^3}{2}\right\}$$

$$= \max\{666,666.67,\ 10,000\}$$

$$= 666\ 666.67 \text{ second}$$

For P2P distribution,

For N = 10 peers,

$$D_{P2P} = \max\left\{\frac{F}{u_s}, \frac{F}{d_{min}}, \frac{NF}{u_s + \sum_{i=1}^{N} u_i}\right\}$$

$$= \max\left\{\frac{20 \times 10^3}{30}, \frac{20 \times 10^3}{2}, \frac{10 \times 20 \times 10^3}{30 + 10 \times 0.3}\right\}$$

$$= \max\{666.67,\ 10,000,\ 6060.6\}$$

$$= 10,000 \text{ second}$$

For N = 100 peers,

$$D_{P2P} = \max\left\{\frac{20 \times 10^3}{30}, \frac{20 \times 10^3}{2}, \frac{100 \times 20 \times 10^3}{30 + 100 \times 0.7}\right\}$$

$$= \max\{666.67,\ 10,000,\ 20,000\}$$

$$= 20,000 \text{ sec}$$

For N = 1000 peers,

$$D_{P2P} = \max\left\{\frac{20\times10^3}{30}, \frac{20\times10^3}{2}, \frac{1000\times20\times10^3}{30+1000\times2}\right\}$$

$$= \max\{666.67, 10000, 9852.22\}$$

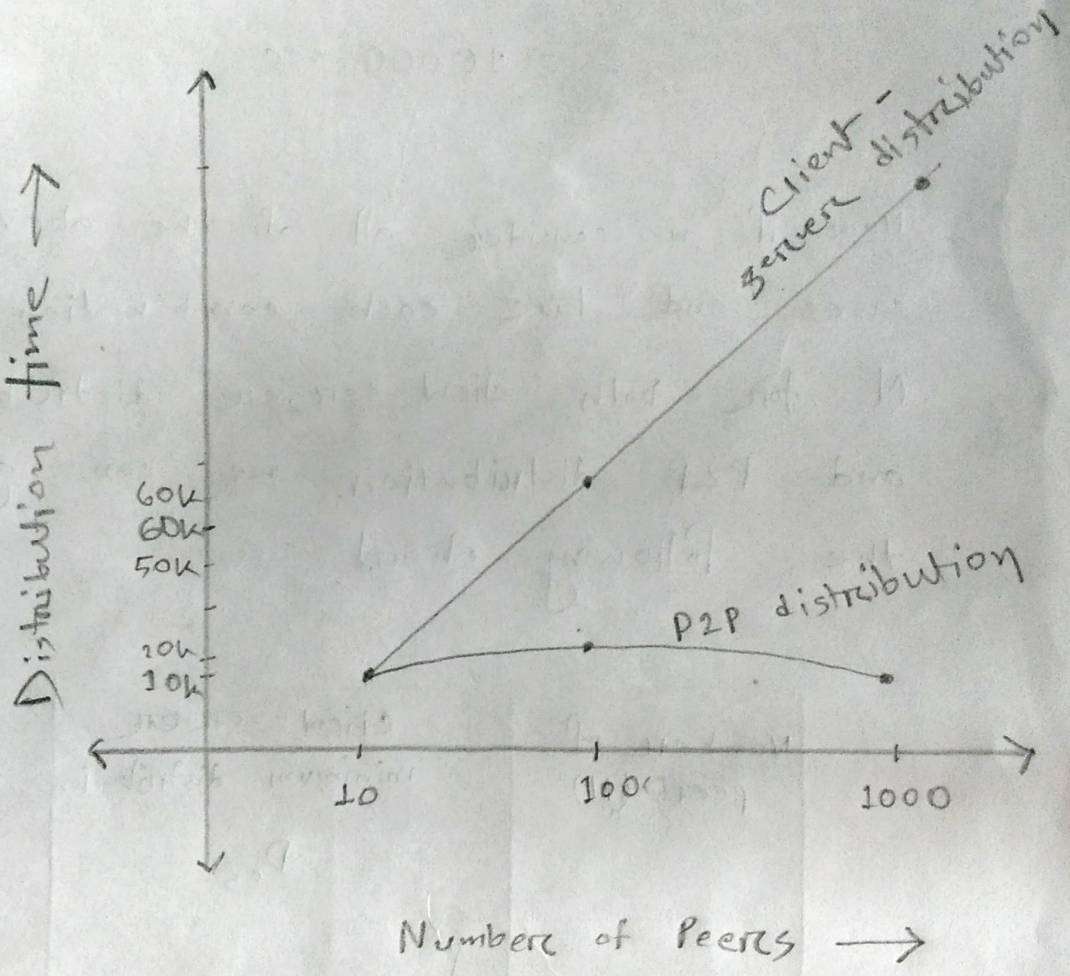
$$= 10{,}000 \text{ sec}$$

Now if we consider all of the above cases and take each combination of N for both client-server distribution and P2P distribution, we can get the following chart,

Number of peers (N)	client-server minimum distribution D_{cs}	P2P minimum distribution D_{P2P}
10	10,000 sec	10,000 sec
100	66,666.67 sec	20,000 sec
1000	666,666.67 sec	10,000 sec

P.T.O

Now considering both cases, if we draw a chart diagram for both of these cases, we will get,



Here the client-server distribution is taking more time as number of peers are increasing linearly. But on the other hand we can see a downward slope in case of P2P distribution.