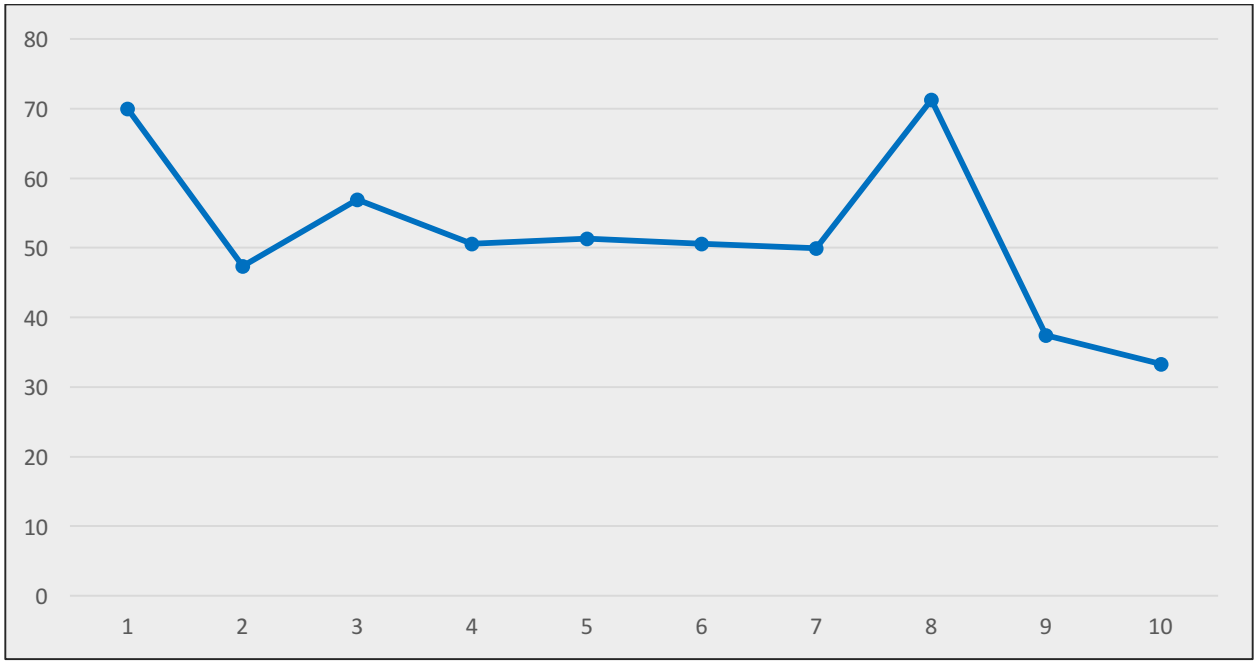
STAR TOPOLOGY

Different File Sizes Download

File size in kb	Time Taken in milli secs
1	69.98
2	47.36
3	56.95
4	50.55
5	51.29
6	50.55
7	49.9
8	71.3
9	37.45
10	33.33

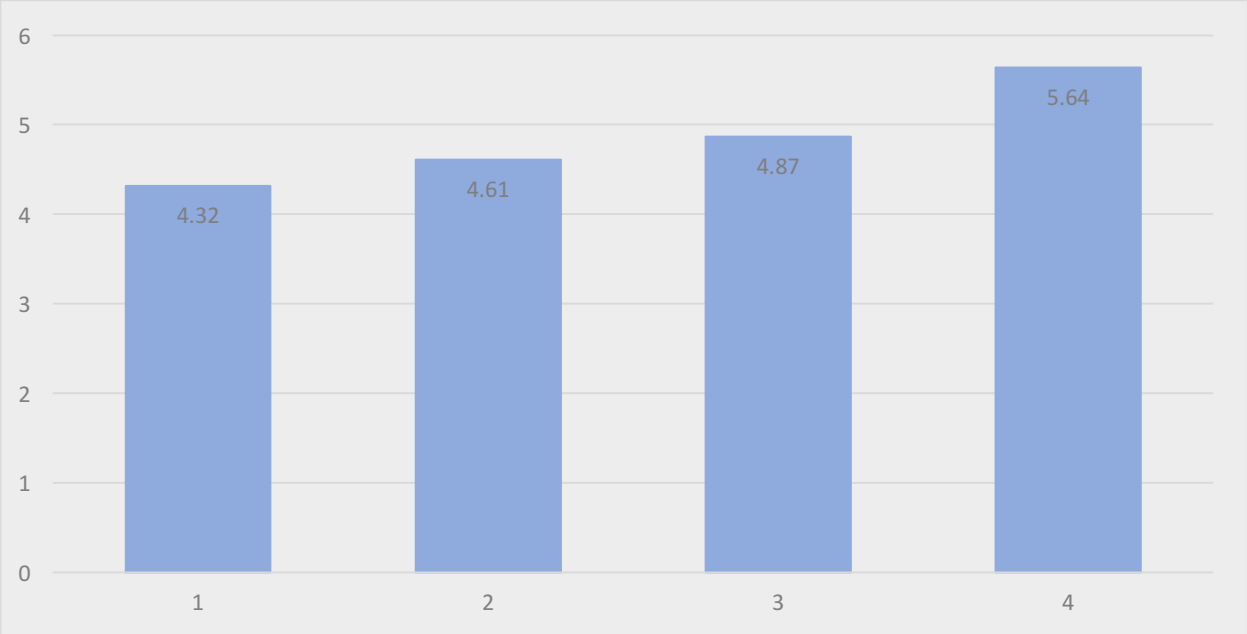


The above graph shows the plot of file size in KB (X-axis) vs the time taken to request and download the file in milli seconds (Y-axis). We can clearly see here that the time required to download the file varies with each file size. This is because, if the file is available with the central node of the topology then the requestor must go only one hop to download the file. On the other hand, if the file is not available with central node, then the requestor must carry out two hops to download the file and hence the time required is more.

Concurrency Performance Measure

(File size = 5KB, 200 requests)

No of connections	Time Taken in secs
1	4.32
2	4.61
3	4.87
4	5.64

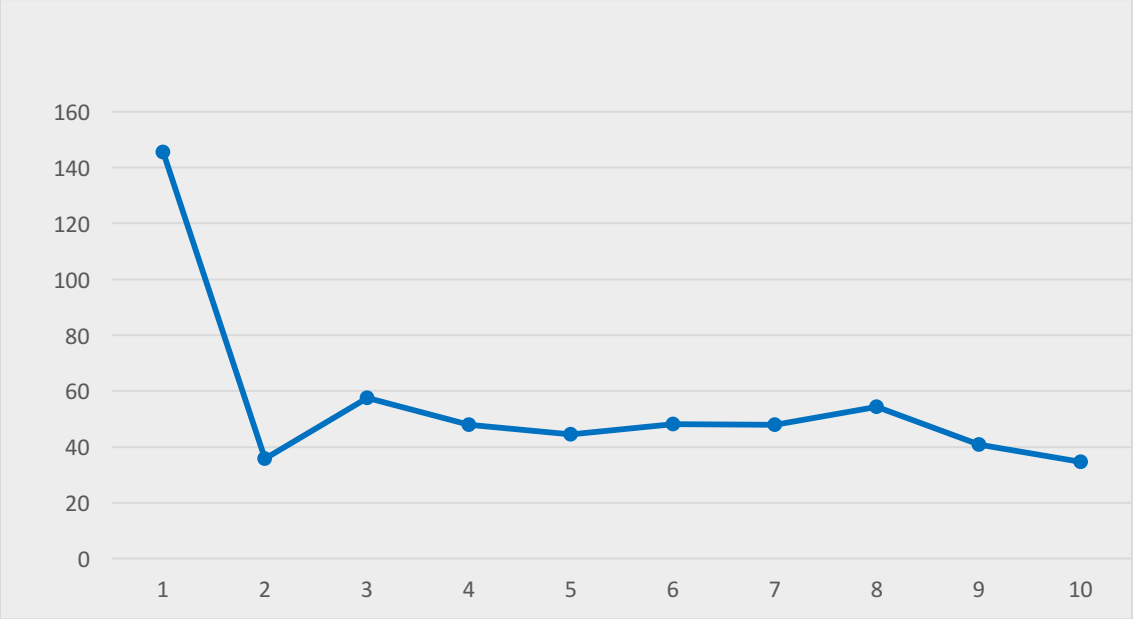


The above graph indicates the time in seconds required to send and download a 5KB file, 200 times. We can see from graph that this depends on number of peer clients connected. With more number of peers connected on the network and working concurrently, the time for 200 requests increases slightly. This is because all the peers are acting both as client and server simultaneously and hence need more time to process the requests.

LINEAR TOPOLOGY

Different File Sizes Download

File size in kb	Time Taken in milli secs
1	145.47
2	35.92
3	57.5
4	47.98
5	44.43
6	48.11
7	47.92
8	54.46
9	40.85
10	34.75

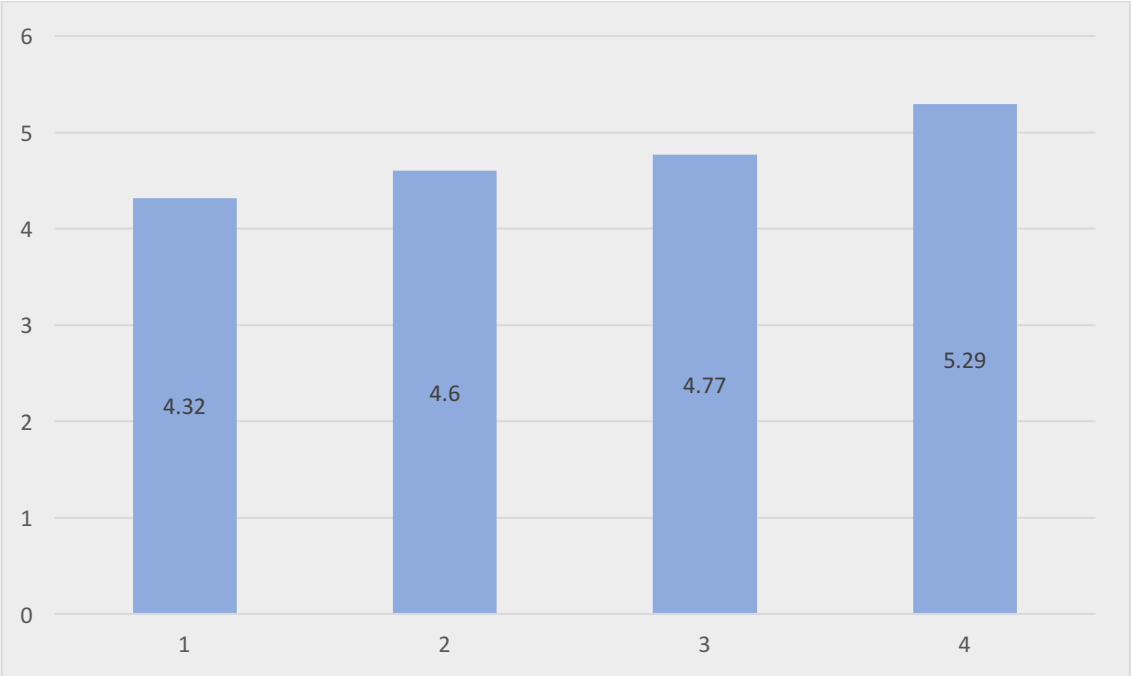


The above graph shows the plot of file size in KB (X-axis) vs the time taken to request and download the file in milli seconds (Y-axis). We can clearly see here that the time required to download the file varies with each file size. This is because, the time to find and download the file depends on the node that has the file. If a node is far away from the requestor, then the query message must travel linearly, hopping from one node to another, till the file is found and then download the file. If the file is available nearby then its distance will be less and can be found quickly.

Concurrency Performance Measure

(File size = 5KB, 200 requests)

No of connections	Time Taken in secs
1	4.32
2	4.6
3	4.77
4	5.29



The above graph indicates the time in seconds required to send and download a 5KB file, 200 times. We can see from graph that this depends on number of peer clients connected. With more number of peers connected on the network and working concurrently, the time for 200 requests increases slightly. This is because all the peers are acting both as client and server simultaneously and hence need more time to process the requests. This is almost same as that of Star topology indicated above.

PERFORMANCE COMPARISON WITH PA1

PA1

Concurrency Performance Measure

(File size = 5KB, 1000 requests)

No of connections	Time Taken in secs for sending 1000 download requests
1	27.393
2	25.935
3	34.521

PA2

Star Topology

(200 continuous requests, file size = 5kb)

No of connections	Time Taken in secs
1	4.32
2	4.61
3	4.87
4	5.64

Linear Topology

(200 continuous requests, file size = 5kb)

No of connections	Time Taken in secs
1	4.32
2	4.6
3	4.77
4	5.29

The above tables show the results of concurrent operations on the network. PA1 was Napster style P2P where majority of the operations were dependent on a central indexing server. PA2 is a Gnutella style P2P system where all peers connected on the network act both as client and server. We can clearly see that the time taken to find the find the file and download is less in Gnutella style P2P file sharing when compared to Napster style. This is because Napster style is a centralized system and has the whole load on indexing server whereas Gnutella is distributed and hence the workload is divided. We can also compare the Star and Linear topologies and see that both behave almost same when it comes to concurrency for the given number of requests and a fixed file size.

PA1

Different File Sizes Download

File size in kb	Time Taken in secs
1	0.284
2	0.243
5	0.246
10	0.275
85	0.294
125	0.313
200	0.358
450	0.754
1000	0.963
3000	1.069

PA2

Star Topology

Different File Sizes Download

File size in kb	Time Taken in milli secs
1	69.98
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Linear Topology

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9	40.85
10	34.75

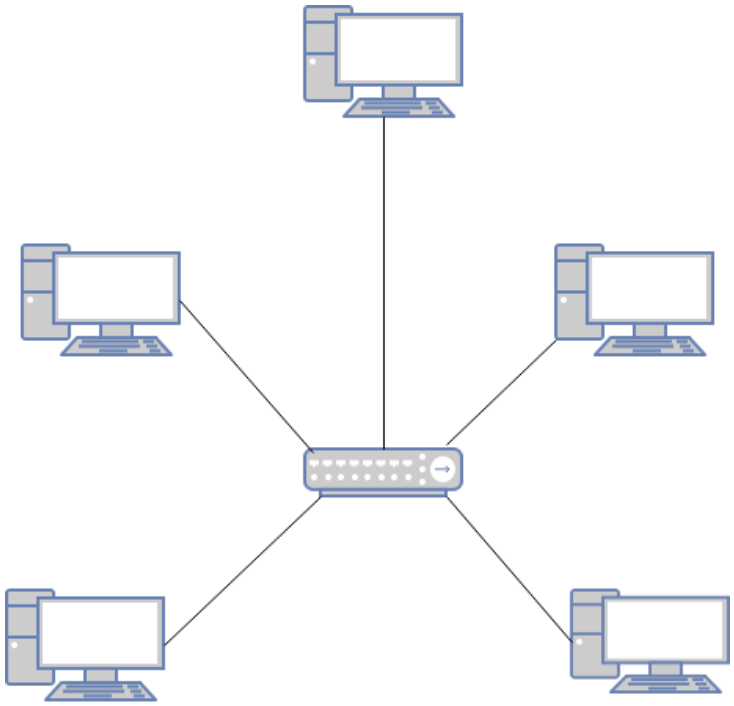
The above tables show the results for the time required to find and download the files of different sizes. We can clearly see that the file of the same size requires more time on Napster style P2P (PA1) than the Gnutella style P2P (PA2). For instance, 1kb file needs 284 ms on Napster whereas same size file requires just 69.98 ms on Gnutella system.

Napster and Gnutella each present a unique peer-to-peer model. Napster presents a model where discovery and download of files among peers are centralized. Gnutella removes the centralization and extends the model further by requiring the peers to contribute to the coordination and discovery efforts. Napster is very scalable but its resiliency is reduced since discovery and coordination are centralized. In contrast Gnutella is resilient since there are no centralized components, but it is not scalable since the structure of Gnutella produces an exponential number of messages.

ADVANTAGES, DISADVANTAGES AND APPLICABILITY OF STAR AND LINEAR TOPOLOGIES

Star Topology

This is a topology where in which all the nodes are individually connected to a central node (a connection hub such as hub or a switch) that acts as a conductor of messages. The topology looks like below diagram.



Advantages of Star Topology

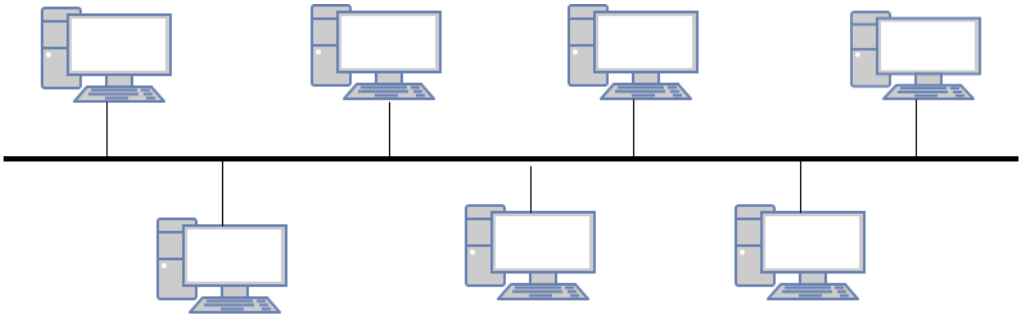
1. As compared to linear topology it gives far much better performance, messages don't necessarily get transmitted to all the workstations. A sent message reaches the intended destination after passing through no more 2 links (every node is just 2 hops away).
2. Easy to connect new nodes. In star topology, new nodes can be added easily without affecting rest of the network. Similarly, components can also be removed easily.
3. Centralized management. It helps in monitoring the network.
4. Failure of one node doesn't affect the rest of network. At the same time, it's easy to detect the failure and troubleshoot it.

Disadvantages of Star Topology

1. Too much dependency on central node has its own drawbacks. If it fails whole network goes down and no 2 nodes can reach each other.
2. Performance and as well number of nodes which can be added in such topology is depended on capacity of central node.

Linear Topology

In this topology, the nodes are connected linearly, on a common bus. This is also called as a Liner Bus Topology. The topology looks like below.



Advantages of Linear Topology

1. It is easy to set-up and extend bus network.
2. Bus topology costs very less.
3. Linear Bus network is mostly used in small networks. Good for LAN.

Disadvantages of Linear Topology

1. Dependency on central cable in this topology has its disadvantages. If the main cable (i.e. bus) encounters some problem, whole network breaks down.
2. It is difficult to detect and troubleshoot faults.
3. Efficiency reduces as the number of devices connected increases.
4. It is not suitable for networks with heavy traffic.
5. Security is very low because all the computers receive the sent signal from the source.