

Simulation of Hybrid Peer to Peer protocol using NS3 simulator

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Introduction

P2P applications have become increasingly popular since they can make use of the under-utilized resources of edge computers [1]. P2P is mainly used in File sharing applications.

P2P networks based on centralization:

- Centralized p2p: A central server stores information of all the shared files. Ex: Napster
- Decentralized p2p: All the peers have equal capability. Information about files is shared among the peers. Ex: Gnutella, Chord
- Hybrid p2p: It is a combination of centralized and decentralized p2p networks. Ex: BitTorrent

Classification of P2P applications:

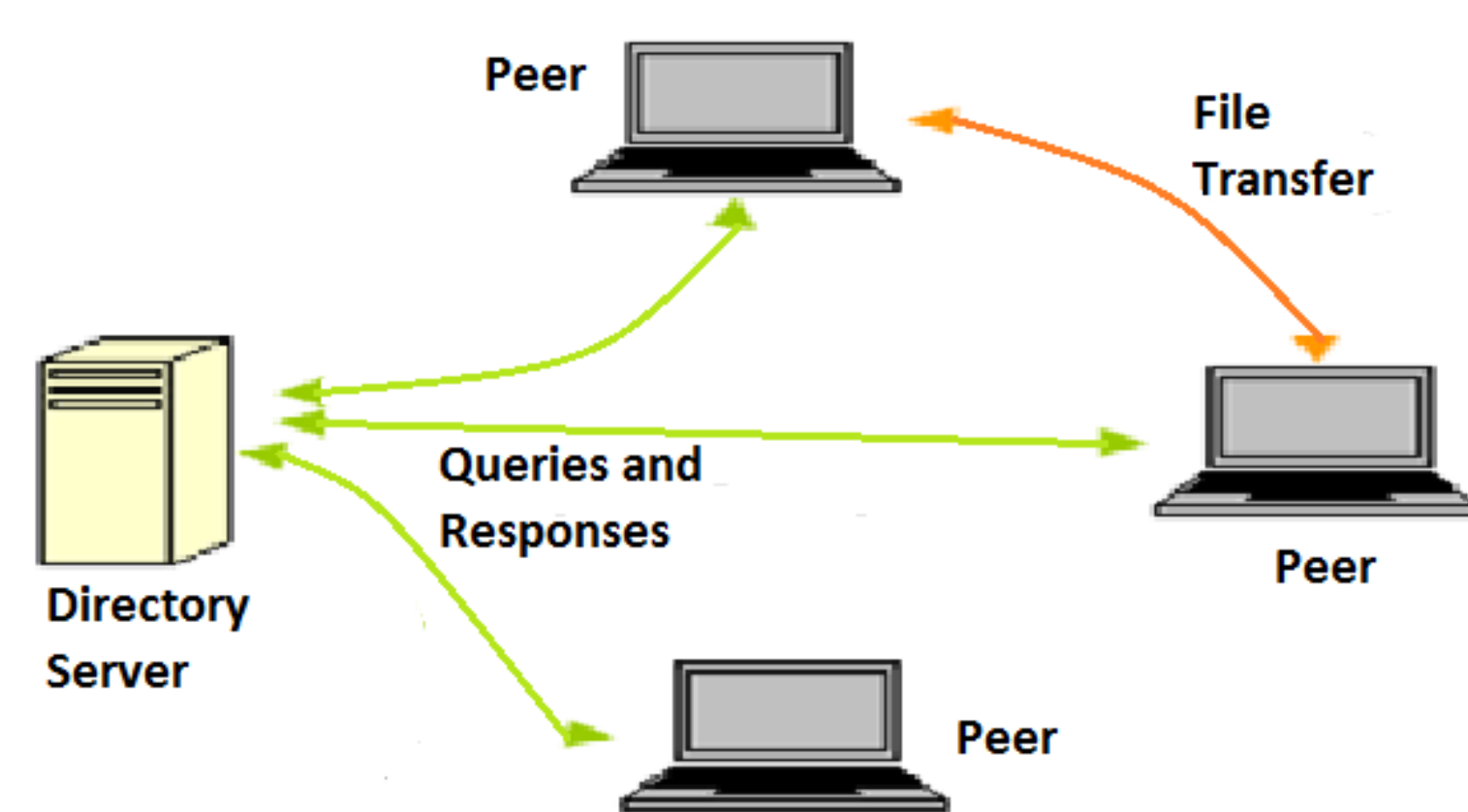
- File sharing: Napster, Gnutella, BitTorrent
- Collaboration : Online gaming, Instant Messaging and Chatting
- Distributed Computing : SETI@home
- Platforms: JXTA and .NET

Objectives:

- To simulate a peer to peer network based on hybrid protocol to analyze time taken for file download
- Compare the results obtained with that of normal peer to peer network
- Scale the system for the higher number of peers and validate the results for all cases

Modeling

Hybrid P2P network combines the good features of both centralized and decentralized models



Representation of Hybrid P2P structure

- To obtain the location of content, the peer initially queries the central directory server
- Once the location of peers is identified, the actual file transfer happens through direct connection between the peers [2]

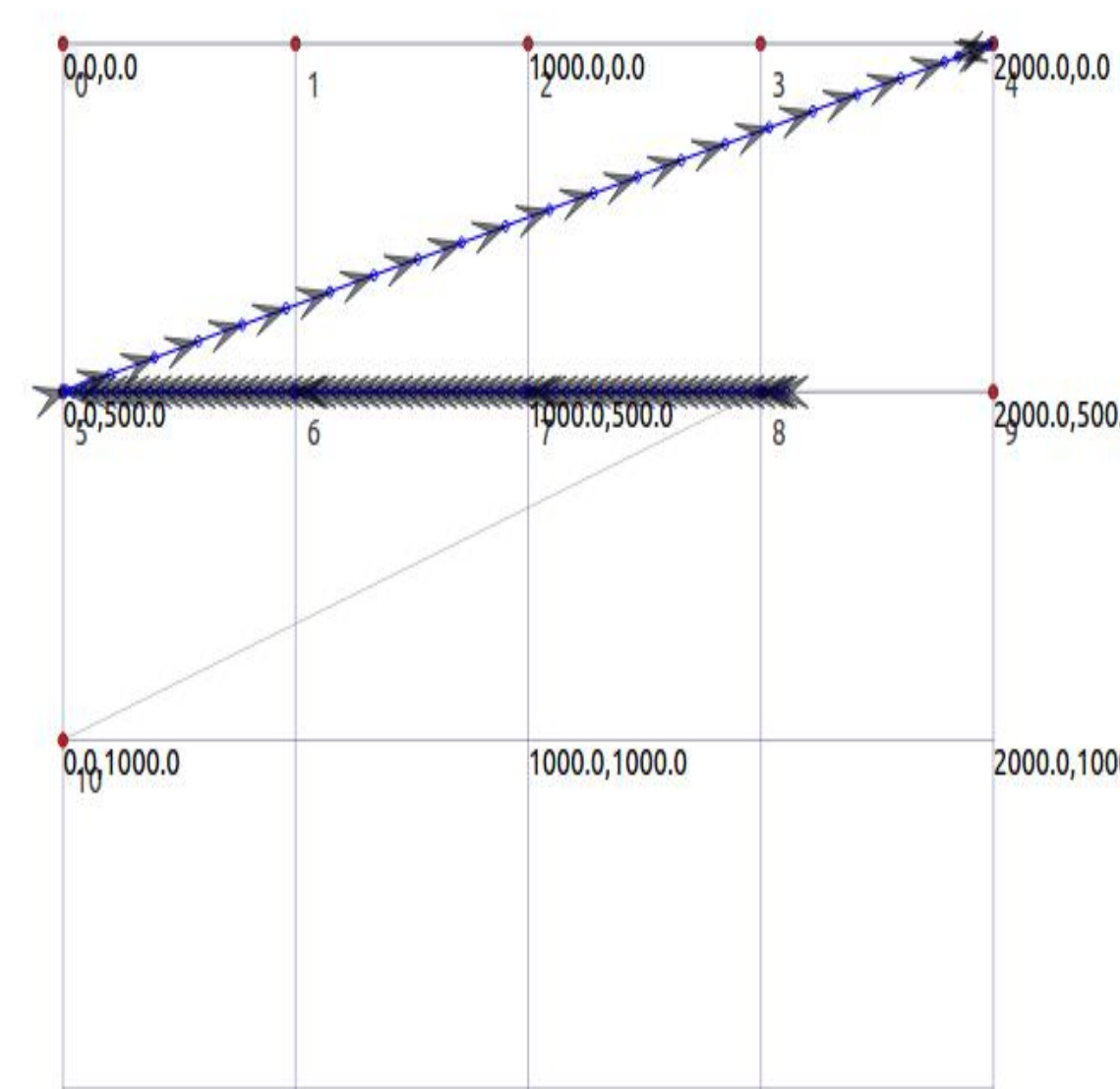
Design Approach

Event Steps:

- Initially, administrative server send file location to all users in the network
- User send download request to primary peer
- Primary peer send Ok and download starts
- Router identifies congestion near primary peer
- Updates administrative server regarding congestion
- Server intimates the user to contact secondary peer for certain amount of file
- Process completes until complete file download

The below figure shows the simulation of hybrid peer to peer network.

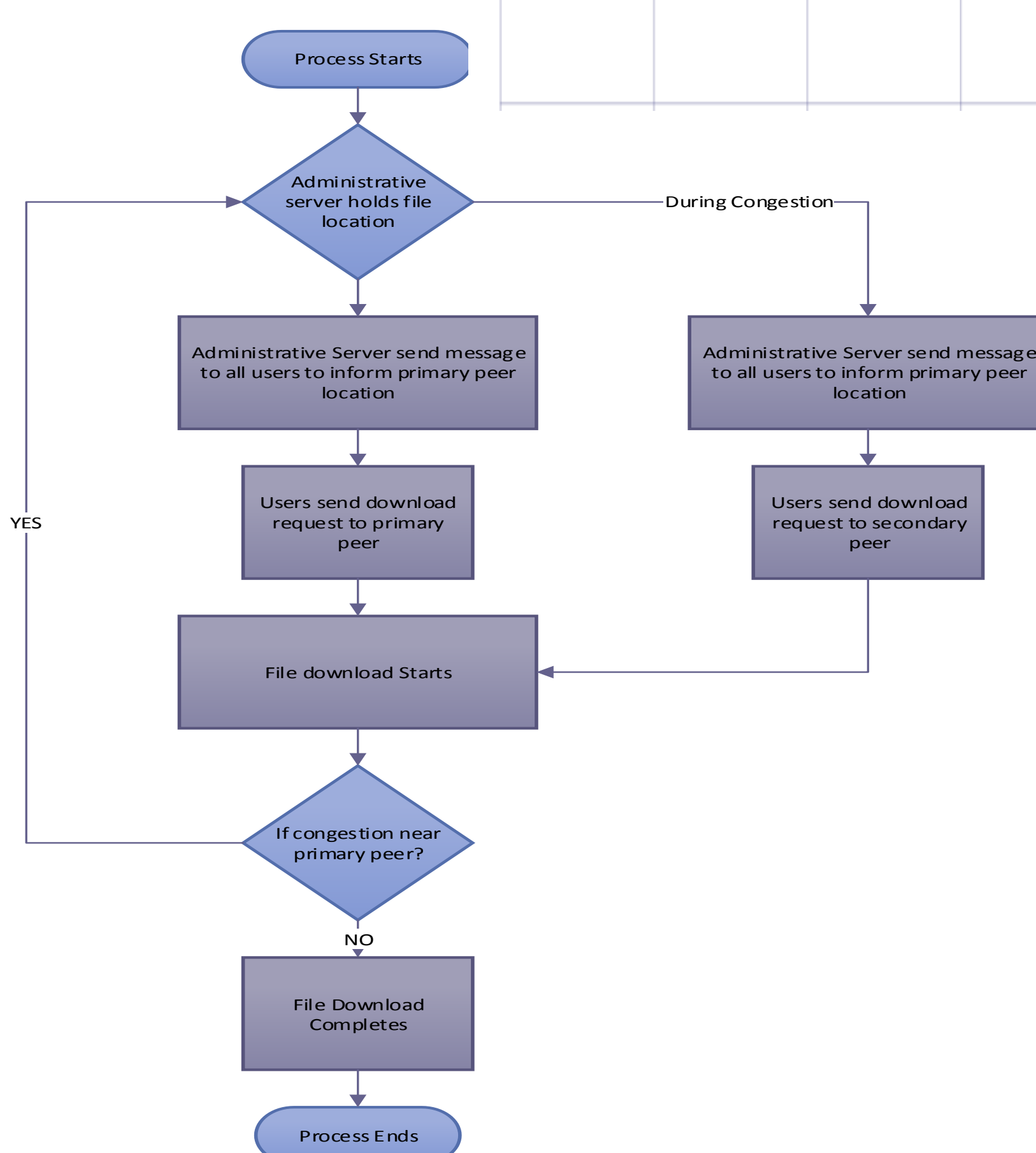
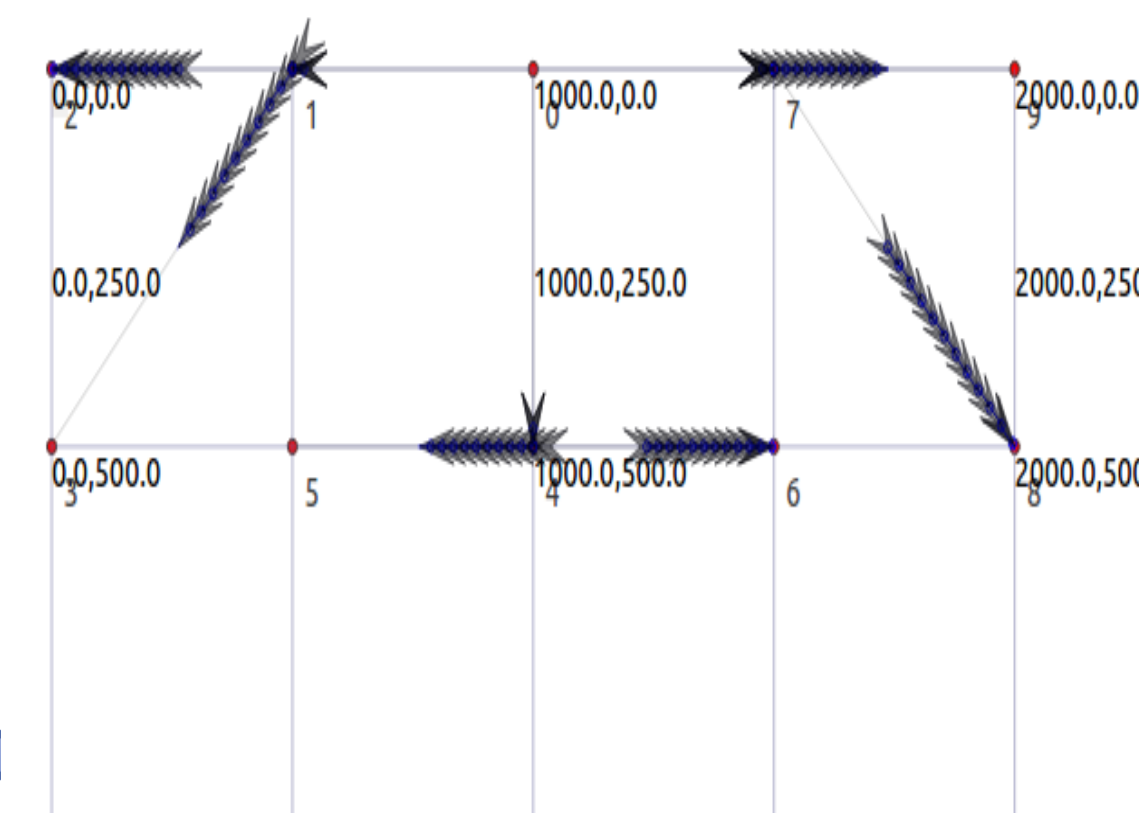
- The administrative Server is located at '0'
- Router is placed at '8'
- Nodes are connected using 1Mbps link
- when congestion appear near '9', router inform server



- Server asks users to contact peer '10' for 40% of file and the process continues until entire file is downloaded.

The below figure shows the simulation of normal peer to peer network.

- file is located at '0'
- file location not known to any users
- user queries all peer for file location



Results

We used two scenarios in extracting the result for the design.

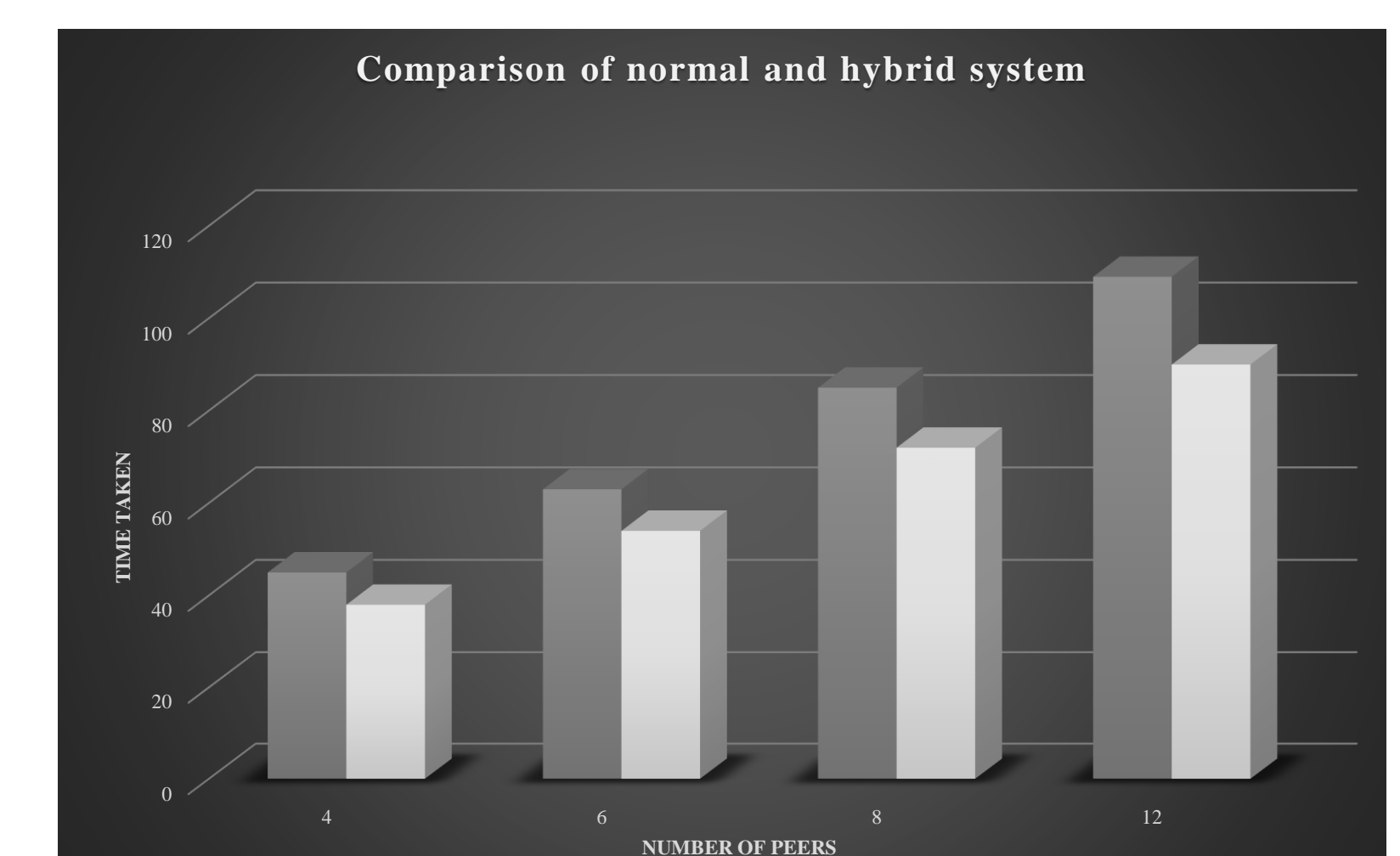
Scenario 1:

We simulated a normal peer to peer system without any administrative servers and initialize the file transfer among the peers. The simulation is done for varying number of peers to analyze the scalability of the system. The data are collected from the simulations.

Scenario 2:

Here we simulated the proposed hybrid peer to peer system which includes an administrative server and a router to analyze the traffic for the purpose of load sharing for a varying number of peers. The results are collected from the simulation.

Finally the results obtained from the above two scenario are combined together in the below mentioned graph and analyzed. From the graph it is proved that when we use an administrative server there is a reduction in the overall time taken to download the file rather than the peer to peer system without such an administrative server.



Conclusions

We successfully simulated hybrid peer to peer protocol using the administrative servers along with a load sharing mechanism with the help of router to reduce congestion in the network. Through a series of simulations between the proposed design and the normal peer to peer design it is proved that the overall time taken for the file download is reduced for the hybrid peer to peer system than its normal peer to peer counterpart. This obtained results are validated by analyzing the data obtained through the simulations such that without the use of administrative server and the load sharing router in the network the user experiences more time to download the file. The obtained result also proved to be correct when the number of users increase which are validated using the data obtained.

Key References

- [1] W. Kim, S. Graupner and A. Sahai, HP Labs report on "A Secure Platform for Peer-to-Peer Computing in the Internet," HPL-2001-324, 2001.
- [2] X Shen, H Yu, J Buford, M Akon, "Handbook of Peer-to-Peer Networking," ISBN 978-0-387-09750-3, Springer New York.
- [3] Beverly Yang & Hector Garcia-Molina, "Comparing Hybrid Peer-to-peer Systems," Computer Science Department, Stanford University.
- [4] Min Yang & Yuanyuan Yang. (2009), "An Efficient Hybrid Peer-to-Peer System for Distributed Data Sharing," Computers, IEEE transaction, vol. 59, Issue. 9, pp. 1158-117

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For further information

Please contact jeeva.eu@gmail.com, nived.mce@gmail.com. The simulation tool and coding modules used can be availed by contacting through above mentioned emails.