

The Taxonomy And The Nomenclature Of The Peer To Peer Network Systems

M.S.Saranya, Dr.K.Thangadurai

Abstract: The constraints and the restraints present in the contemporary client server systems imbued the experts and the research scholars to come up with the peer to peer system which is the fundamental concept used in the distributed computing. The peer to peer system is very powerful since it takes the role of the client as well as the server depending upon the necessity of the user. The peer not only works as a client which requests for the data in the form of query and the peer which works as the server will provide the data to the requesting peer. This paper provides a clear idea about the structured and unstructured peer to peer system and discusses about plethora of application regarding the p2p network systems.

Keywords: peer to peer, p2p, structured p2p, unstructured p2p

1. INTRODUCTION

A peer-to-peer (p2p) computing or systems administration is a distributed application design that partitions the jobs of the system or share the tasks between the peers present in the p2p system. The peers are said to be a self-arranging nodes comprising of similar and self-governing entities (peers) which are used to achieve a common objective of sharing the assets present in the network without any lag and errors. In short the p2p system is a self-organizing resource and asset sharing distributed network. The peer to peer system, a peer can transmit as well as receive unlike the contemporary client server model where the server transmits and the client receives. Currently the p2p framework and the system is the most evolving technology being utilized by many applications like cloud. Here all the peers (nodes) have equal functions and they behave similarly without any difference. Each pair of nodes can convey each other straightforwardly or by means of different nodes, through the directing convention. p2p systems have great execution capacity since they balance the load present in the network skillfully. The Napster [1] a centralized system faces a major glitch which makes it fail when the node which contains all the data about the network fails. This major limitation is solved by decentralizing the network as in Gnutella [2] and Chord [10] as these don't have a central directory to store the information regarding the network.

CENTRALIZED P2P NETWORK

The centralized peer to peer network contains a central directory which comprises of the information related to the entire network. When the user request for a file or data, he/she sends a query to the centralized server which identifies all the peers which contains the query result or file and the user can decide from which peer he/she can extract the data/file or information he/she needs. A centralized p2p network is shown in the figure 1.

- M.S.Saranya Ph.D. Research Scholar (Full Time), Dr.K.Thangadurai Assistant Professor and Head, P.G. and Research Department of Computer Science, Government Arts College (Autonomous), Karur-05.



Figure 1: A Centralized p2p network

DECENTRALIZED P2P NETWORK

Unlike centralized p2p networks the decentralized p2p networks does not have a server to identify the location of the data requested by the clients instead each of the peer is connected to the other peers and when a peer needs a data it connects to the nearest peer and informs all other peers that it is live and then forwards the query until the peer which contains the data is found and the reply is acquired from that peer.

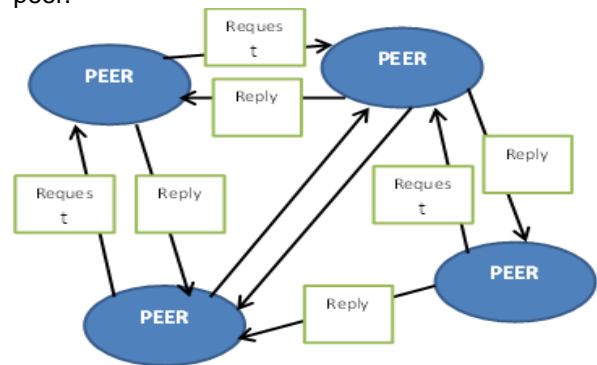


Figure 2: A decentralized p2p network

SEMI CENTRALIZED P2P NETWORK

The semi-centralized p2p network is a hybrid system which combines both the centralized and decentralized p2p network. In this type of network, the peers which has larger

bandwidth is allotted with more task and those peers will smoothly perform the tasks without any delay and errors.

TAXONOMY OF COMPUTER NETWORK SYSTEMS

The entire computer network is classified into two main classes namely, the centralized and distributed system which again sub classified according to its characteristics and traits. The figure 3 shows the taxonomy of the computer network system.

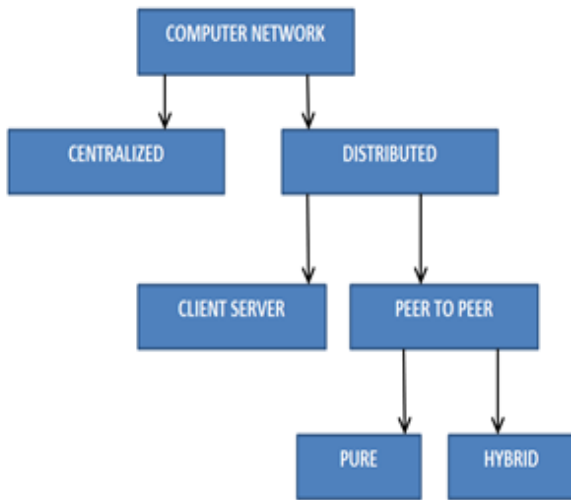


Figure 3: Taxonomy of computer network system

From the figure 3, it is clear that the centralized network system consist of a single server system which serves all the other nodes with the required data and information. The distributed network systems are on the other hand, communicates through the nodes by transmitting messages. The client is a node which is used to send the request but cannot serve for the request. The server receives the request and serves the node with the required response. The p2p enables the peers in it to share the assets and resources with other peers in the network and the peers are subjected to handle limited connectivity via wireless, routers and modems [3]. The client server network connects with a single server and communicates with all other nodes. The peer to peer network is either pure or hybrid depending existence of a centralized server like Gnutella [2] and Freenet [4]. In hybrid model like Groove [5] a main server will be present and it provides the meta information related to the identification of the peer where the requested information is stored and then after authenticating the credentials the requested information is given. Some of the solution like KaZaa [6] known as super peers will contain the meta information that are used to locate the peer with the information to be retrieved.

TAXONOMY OF P2P NETWORK SYSTEM

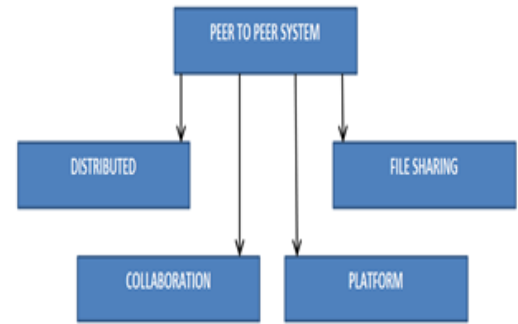


Figure 4: Taxonomy of peer to peer system

The p2p system utilizes lot of resources distributed across various networks and shares the important resources where the system makes use of the external peer or system to solve a computation like SETI (Search for extraterrestrial intelligence) [7]. This project is a fine innovation where the idle systems connected via internet is used for computation by creating a virtual network. The information sharing and exchange of data is one of the most important attribute which is adhered to the p2p systems. The information sharing in p2p emphasis on archiving and extracting information from various system across the world. The Napster [1] is a famous music exchange p2p system. The most important attribute of p2p network is collaboration and this permits application level collaboration to the users. For example Groove [5] allows the user to collaborate files, images and used to communicate the application to the users. The next important attribute is the platform present in the p2p system which provides the needed infrastructure to support distributed computing in p2p networks. JXTA [8] is a well-known p2p platform that delivers general purpose network programing and computing infrastructure to the p2p systems.

TYPES OF P2P NETWORK

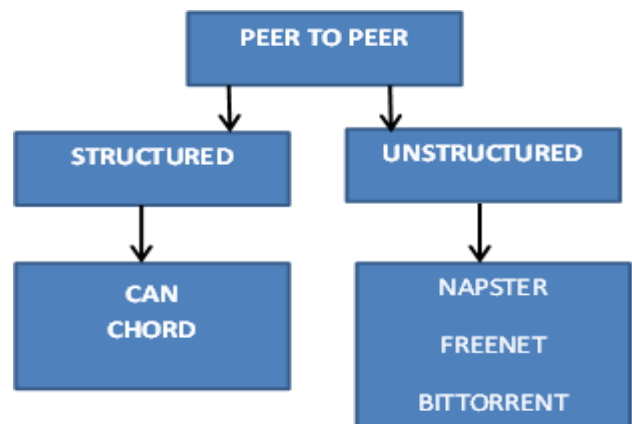


Figure 5: Types of p2p network

NAPSTER

Napster is a mainstream p2p application based in the centralized model where a server is used to index the meta information. Here a central directory server keeps up an index on the metadata of the considerable number of files in the system. The metadata in the server contain information like file names, date of creation, and information related to copyright. The server likewise keeps up a table of client association information including client's IP address and line speed. A file query is sent to the server initially and query contains a string of wanted words. At the point when the server gets a query, it looks for matches in its index. The query results including a rundown of clients who keep the file are sent down to the peer who requested the query.

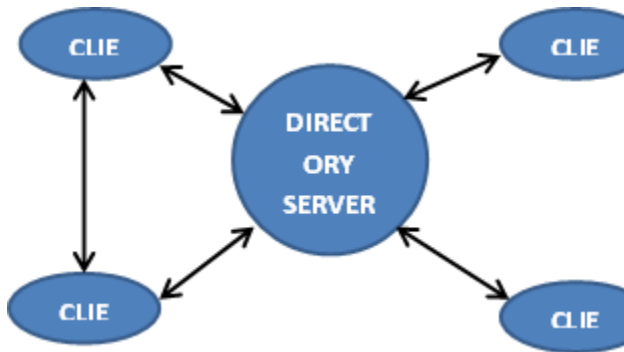


Figure 6: Napster architecture

GNUTELLA

Initially the Gnutella was developed as a decentralized system but on later stages it was converted into a semi-centralized network since the ability to handle large queries is not possible and balancing the load is practically difficult in decentralized network. But Gnutella does not have any centralized control points or server but the higher level peers or nodes are considered as super peers or ultra-peers which act as the centralized control point. One of the most popular Gnutella is LimeWire (open source software). The LimeWire supports sharing partial files which its parent Gnutella protocol doesn't support directly.

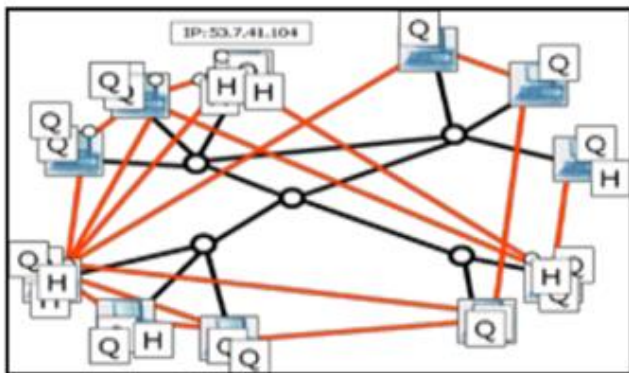


Figure 7: Gnutella architecture

FREENET

The Freenet is one of the most popular decentralized storage systems that mainly focuses on secrecy and privacy of the user, but these are carried out at the cost of erratic retrieval times. Each of the peers present in the Freenet stores its neighbors' addresses along with a keys corresponding to items stored in a routing table. This table also helps route requests to the peers and in finding the best possible route to the information. The search works with the aid of the backtracking algorithm that forwards messages for a maximum number of hops and back tracks to follow a different path if the available information is not present.

BITTORRENT

Bit Torrent is a p2p framework that uses a central area to deal with clients' downloads. The central area is a tracker that is reached when you dispatch a torrent for file downloading. The tracker monitors every one of the clients who have the file (both mostly and totally) and associates clients to one another for downloading and transferring. The Bit Torrent has provision to simultaneous download data from multiple sources and at the same time it has a provision to upload a file while still the peer downloading it.

AIMS OF P2P NETWORK SYSTEMS

The following are the most important aims of the peer to peer network system,

1. COMPUTATIONAL COST

Since the p2p system utilizes the resources of various network across the world the additional cost required for the hardware is curbed and it reduces the overall cost of the system.

2. ENHANCE THE TRUST AND SCALABILITY

Since the p2p network don't have a central control over the network, the necessity to improve the trust and the scalability is imperative.

3. ASSET AGGREGATION

The p2p system aggregates the resources located at various places and then combine their capabilities to solve large computations.

4. PRIVACY

The user or the client will not like to share his/her most important credentials which has to be safeguarded and in client server model the server will identify the client details and this is avoided in p2p by sharing the information locally and there by maintaining the privacy of the user.

CHALLENGES IN P2P NETWORK SYSTEM

The P2P systems provides plethora of advantages over client-server model related to scalability, cost and privacy. However, there are some challenges that are enumerated here in this section,

1. SECURITY

The P2P systems provide additional challenge to the network since all the peers acts as an individual entity to receive, transmit and store information related to other peers but most of the other peer will not trust the peer and this issue has to be solved. Also the protections like firewall

are not applicable to the p2p network and this issues are to be dealt with care to ensure utmost security to the users.

2. TRUST

A dependable framework is a framework that can be recouped when a failure happens. The factors which ought to be considered for dependability are information replication, node failure and recuperation, presence of numerous certifications for location information to maintain a strategic ploy from failures.

3. FLEXIBILITY

The most important feature of the p2p network is that the peers can join and leave the network without any rules and regulation. This allows the p2p to grow and shrink dynamically just like KaZaa [6].

4. LOAD BALANCE

The Load balancing among the computing nodes in p2p systems is usually implemented by agent-based self-organization models. Usually the p2p system comprises of a distributed hash table DHT to balance the load.

APPLICATIONS OD P2P SYSTEMS

1. DATA DELIVERY/SHARING

The main purpose of the p2p system is to share the information or content and file sharing networks like Gnutella made the p2p very popular among the users.

2. EXCHANGE OF SERVICE

The peer to peer system rent the needed services, infrastructure and software on the web platform and reduces the burden of the user to a greater extent.

3. COMMUNICATION

The p2p is used in communication services and Skype one of the most popular communication network uses the concept of p2p.

4. SEARCH ENGINES

Distributed search engines developed on the basics of p2p architecture is on the rise and FAROO a peer to peer web search engine is gaining popularity recently.

CONCLUSION

There are many types of p2p system employed for various purposes like file sharing and data distribution. Each and every p2p system has its own advantages and disadvantages and according to the user's requirement it is imperative to select the p2p scheme. The main reason for the immense popularity is the privacy but most of the current p2p network is concentrating on accuracy of the trust methods and its robustness against malicious attacks. This paper has showcased the taxonomy, types and the applications of a typical peer to peer network.

REFERENCES

- [1] Napster, [Online] Available: <http://www.napster.com/>.
- [2] Gnutella. [Online] Available: <http://www.gnutelliums.com/>.
- [3] A. Tanenbaum, M. Van Steen, "Distributed Systems: principles and paradigms", prentice Hall, pearson Education, USA, 2002.
- [4] Freenet, [Online] Available: <http://www.freenet.com/>.
- [5] Groove, [Online] Available: <http://www.groove.net>.
- [6] Kazaa, [Online] Available: <http://www.kazaa.com/>.
- [7] David p. Anderson, Jeff Cobb, Eric Korpela, Matt Lebofsky, Dan Werthimer, "Seti@home: "an experiment

in public resource computing", Commun. ACM 45(11):56-61, 2002.

- [8] Project JXTA, [Online] Available: <http://www.jxta.org>.
- [9] A. Montresor, H. Meling, A. Montresor, "Messor: Load balancing through a swarm of autonomous agents", 2002.
- [10] Stoica, I., Morris, R., Karger, D., Kaashoek, M.F., Balakrishnan, H.: Chord, "A scalable peerto- peer lookup service for Internet applications", In: Proc. ACM SIGCOMM'01, San Diego, California (2001).