**Peer-to-Peer Content Distribution and Distributed Query (Java NetBeans)**

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## Introduction

A peer to peer network is a kind of distributed network whose nodes within the network make the resources within the network available other participants in the same network (Hassan et al., 2017). The peers can act as both suppliers and the consumers of the network resources within the network.

A peer network is different from the traditional network in which the servers are the suppliers and the clients are the main consumers.

Some of the characteristics of peer networks can be identified as:

* Loosely-coupled systems with no connections and relationships between them.
* The systems are completely autonomous with each other
* The peer nodes are independent with each other.

A peer-to-peer network is built on an existing network usually on the world wide web (McDysan, 2015). The overlay networks enable the peers to communicate with each other and be able to locate other peers within the network. The logical identifiers are used to identify peers with the network whereas the IP address is not used to locate the peers. Some of the functions of peer overlay networks include file sharing and streaming of real-time data.

## Definition

The peer network in this project is modeled in such a way that the peer can act as a client and both server. A server is a program which listens for incoming connections from the clients, whereas the clients are able to join and communicate with other programs after establishing a successful connection to the server.

The server is termed as the controller or host whereas the client is the node which joins the network in order to communicate with other peers. Once the connection is initiated, each of the peer within the network can be able to operate as both a client or a server (Dinha, 2017).

In the implementation of a peer network, the structure and the impact of the peers is measured, rather than just considering the peer network. In a peer network, any of the peers can be able to cooperate with another peer within the same network and access resources. The peers have equal rights within the same network and this might not be the case for different networks. A single peer can be able to access and use the services used by other peers. The data is distributed by the network nodes connected to the same network as the peers and not through servers connected to the internet

## Compiling and starting the application.

The application must be compiled using java compiler. The compiler can be downloaded from the official site and installed in the instance of the operating system. The program can then be run using the command line tool. The compile can use the javac command whereas the start and the run of the application can use java followed by the name of the executable class.

**During run of the application, the peers are able to communicate with each other within the multicast network. All the questions are validated before they can be broadcasted into the other peers within the same network. Either the answer is single or multi, they must be validated. The instructions are therefore used to cover both the single and the multi answers.**

**A single client can act as both the server and a client. In this case, the client can be upgraded to a server in the instance that the server needs to serve the resources to other peers within the network.**

## Structure

SON network architecture is assembled and used in the implementation of this peer network. The network of peers communicates with each other and connect to one another within a local area network which takes place over the internet. Authentication of the peers within the networks can be done to limit access to resources within the network by some other nodes not allowed to operate within the network (Afergan, Leighton and Parikh, 2017).

For the network architecture where many peers are involved in the connection called a super-peer network, a network interface can be implemented which acts as an overlay. If two or more peers within the network share resources or data with each other, this can be done directly without the intervention and the use of a network interface.

## Design and implementation

When the connection is initiated, a group is first created in which the peers will be able to join. Each of the peers is initialized with a given ID which is unique from the other peers to avoid connection failure. Once an ID is allocated to a peer, the peer can then be able to join a specific group (Layer, 2017).

The group contains an IP and port which is used to create a multicast connection. A peer can be able to join or leave the connection at any time. A given peer cannot be able to join a group if the group is not created and the connection is not initialized.

The connection is initialized using a given IP address at a certain port. The port is bound to the IP address, which then creates an instance of a connection. A peer can also be able to create a group in which other peers can be able to join the same group (Gong, 2017).

A request from a peer can be ignored if it is not understood or invalid. Once the peer joins the network, the peer can be able to post a question to other peers, the question is associated with the peer ID which is unique for all the peers.

**Advantages**

Peer networks are suitable and important in the exchange of information and data between the partners. Overlay peers’ networks are more secure than other forms of networks since the data is only shared and exchanged directly between the involved nodes. The data is not transferred via a server and therefore, the resources and the data cannot be accessed by any other party. This improves the privacy and the security of the data for a given organization.

These types of networks are more secure than client-server based systems.

User datagram protocol (UDP) is mainly implemented to aid in the sharing of resources between the peers (Ponec and Alness, 2017). UDP protocol enables lower latency and is considered to be connectionless since it does not require a connection to be established for any transfer of data or resources. The port numbers are mainly used to understand and distinguish the origin of the requests.

## Conclusion

Sharing of resources and data via a client-server model is prone to abuse and attacks. This can be prevented by the implementation of a peer overlay network which sends the resources directly between the peers connected. This mechanism can be considered as an advantage to other networks since the peers are only associated with a given address and a port (Curcio and Mani, 2015).

The important aspect of any network, especially which involves sharing of data, is the security and the speed of data transfer. Network nodes are able to cooperate and communicate with each other after a successful connection is established between them.

## References

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