David Kwon

Kenny Ta

Assignment 2

1. What is a three-tiered client-server architecture?

This is a type of architecture has a separate server to execute the programs that are part of the processing layer; however, the programs can also be distributed across client and server machines.

1. What is the difference between a vertical distribution and a horizontal distribution?

Vertical distribution is when different components are logically placed in different machines. Horizonal distribution is when a client or server is split into logically equivalent parts but each one is doing its own part of the data set.

1. If a client and a server are placed far apart, we may see network latency dominating overall performance. How can we tackle this problem?

We can make it such that each client is in the form of a peer-to-peer system where multiple clients can be used as access points to simulate the original transactions between a server and a client.

1. Consider a chain of processes P1, P2, . . ., Pn implementing a multitiered client-server architecture. Process Pi is client of process Pi + 1, and Pi will return a reply to Pi − 1 only after receiving a reply from Pi+1. What are the main problems with this organization when taking a look at the request-reply performance at process P1?

The main problem with this organization is that P1 is dependent on submitting a return only from once it receives a reply from Pi+1. The dependency between theses two processes leaves it such that if this was a peer-to-peer system, the client may not receive the same request from a server but rather another client acting as a proxy. This also limits the functionality of the system architecture because there might be a chance the messages will be corrupted such that the process fails completely. The original transmission message cannot recorded as lost or failed and what if the process was not idempotent as well.

1. In a structured overlay network, messages are routed according to the topology of the overlay. What is an important disadvantage of this approach?

An important disadvantage of this approach is the limitation of each individual structure of nodes. If the request is made to the wrong part of the structure, then the other nodes are incapable of fulfilling the request, thus leading to wasted resources. The greatest limitation of a structured overlay network is when a key is searched for, the efficiency of the search for the key might be limited to the choice of where in the structure one chooses to start their search.

6. Consider an unstructured overlay network in which each node randomly chooses c neighbors. If P and Q are both neighbors of R, what is the probability that they are also neighbors of each other?

The probability that the node are neighbors of each other would be 2c/(N-1)

7. Not every node in a peer-to-peer network should become superpeer. What are reasonable requirements that a superpeer should meet?   
Some reasonable requirements for the superpeer would be to always be readily available since many other nodes would rely on it. It must also have the capacity to handle the tasks at hand.

8. Give an example of a self-managing system in which the analysis component is completely distributed or even hidden.   
An example of this would be YouTube.com where sometimes if you do not have the strongest connection to the Wireless network or if you do not have the best data at the location you are at, the site will automatically adjust itself to lower the resolution in order to process the video faster. In here the site automatically prioritizes the faster video so you can still watch the video but at a lower quality bit rate. This is also done automatically because the user does not have to change or edit anything.

9. Consider a BitTorrent system in which each node has an outgoing link with a bandwidth capacity Bout and an incoming link with bandwidth capacity Bin. Some of these nodes (called seeds) voluntarily offer files to be downloaded by others. What is the maximum download capacity of a BitTorrent client if we assume that it can contact at most one seed at a time?

The maximum download capacity of a client is Seeders \* Bout / N + Bout.

10. Modern cars are stuffed with electronic devices. Give some examples of feedback control systems in cars.

A couple of feedback control systems in cars are GPS, automatic braking, their sensors for blind spots, and backup cameras. These feedback control systems oftentimes help users avoid danger while using the vehicle. GPS helps with road assistances and helps users avoid obstacles; automatic braking helps the users stop when the sensors sense a collision. The backup cameras help the users see when they are reversing.