Distributed Network: Assignment #three

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Problem 1

compare Gnuteller and Freenet, and tell how many advantages Freenet has over Gnuteller.
Solution
compare Gnuteller and Freenet, i can find that both of them are decentralized and out-of-network initial connected and peer-based query system.
and there are also some differences between Gnuteller and Freenet in routing algorithm, file search, file sharing, security and file transferring.

- routing algorithm of Gnuteller is flood-based, and Freenetis dynamic decision-based routing. flooding routing is bandwidth-consumed. Freenet considered previous performance of peer(transfer time, response time) and success rate for similar keys. so Freenet is superior to Gnuteller.
- Freenet uses hashes to identify files, so the search is difficult when the hash is unknown. Gnuteller uses flood based searching and ultrapeers with index of leaf nodes, which makes keyword search possible, but also makes traffic overhead larger.
- Freenet allows file storage which means file can be read when sharing so that data is replicated and popular data stays in the network. while Gnuteller only allows file reading when sharing so that file disappears when provider goes offline and for popular files this strategy is very troublesome. so in file sharing, Freenet is superior to Gnuteller.
- Freenet is encrypted and anonymous while Gnuteller and open. so Freenet is much more secure than Gnuteller.
- Freenet transfers data within the network so traffic is always kept encrypted and peers remain anonymous but often slow. Gnuteller connected with each other peers directly, but IP-address is revealed to peers.

Problem 2

Prove that any lookup request can be finished within O(logN) hops where N is the maximum number of nodes in Chord.

Proof. suppose node n wishes to find the successor of key k. and p is the predecessor of k. the problem is simplified to find a upper bound for the number of steps from n and p. node n will examine its finger table and route the closet predecessor of k that it has. then call the node f. if f is the i^{th} entry in n's finger table, then both f and p are at distances between 2^{i-1} and 2^i from n along the identifier circle. Hence, the distance between f and p along this circle is at most 2^{i-1}. thus the distance from f to p is less than the distinct from n to f: we can get the conclusion that the new distance is at most the half of the initial distance.
and after t steps, the distance remaining to p is at most $\frac{n}{2^t}$, and $\frac{n}{2^t} \geq 1$. then $t \leq \log N$ □

Problem 3

As shown as below, why are there some blank entries at the bottom lines of routing table? What is use of leaf set in routing process?
solution
if no node is known with a suitable nodeID, then the routing table entry is left empty. the uniform distribution of nodeIds ensures an even population of the nodeId space; then on average, only $\log_{2^b} N$ rows are populated in the routing table.

Problem 3 continued on next page. . .

the leaf set is used during the message routing, if given a message, the node first checks to see if the key falls within the range of nodeIds covered by it's leaf set. If so, the message is forwarded directly to the destination node, namely the node in the leaf set whose nodeId is closest to the key. if the key is not covered by the leaf set, then routing table is used and the message is forwarded to a node that shares a common prefix with the key by at least one more digit. it serves as a fall back for routing table.

Problem 4

Read A scalable content-addressable network in ACM SIGCOMM 2001 and answer the following question. assume space size is (8×8),node n1:(1,2)is the first node that joins and therefore covers the entire space. n2:(2,2) is the second node that joins. how will the entire space will be divided after n2 joins?

solution

joining node locates a bootstrap node using the CAN DNS entry, and node in zone containing random point P splits the zone and allocate 'half ' to joining node. so the entire space will be divided into 5 pieces.