

22C: 196: 001 Peer-to-peer Networks

Spring 2009, Assignment 1

60 points

Assigned February 10, 2009, Due February 17, 2009, in class

Please submit the answers in a typewritten form. Good documentation is essential. Your solution should only reflect your own thoughts, not someone else's ideas. It is ok to consult other papers, but please cite them at the end of the answer.

1. How will you determine if the topology of a unstructured P2P network is power-law graph?
2. Study the SHA-1 function from any source of your choice. Then visit <http://www.movable-type.co.uk/scripts/sha1.html>
It contains a javascript implementation of SHA-1. Use this to look up the keys for (1) a computer with IP address 208.77.188.166 (2) the object University_of_Iowa
3. A Tapestry network of 32000 nodes uses a base of 8. Illustrate the primary routing table a node with key 71324. Then compute the size of this table.
4. A Gnutella network of 1000 nodes stores an object with population 0.01. What is the expected number of hops needed to locate this object by a single random walker if there is no timeout?
5. Consider a Chord network with $N=2^{16}$ nodes, and a keyspace of the same size. What is the smallest routing distance from the node with key 0110 1001 1100 1010 to the node with key 0101 1001 1100 1111? How will this distance change if bidirectional routing is used (i.e each node maintains $2 \cdot \log_2 N$ fingers instead of $\log_2 N$ fingers)?
6. Compare the prefix (or suffix) routing as used by Plaxton, with the routing mechanism used in Chord. In a network with 256 nodes, formulate two examples: in one, prefix routing takes fewer steps than Chord routing, and in the other, Chord-routing takes fewer steps than prefix routing.