ASSIGNMENT#1

Due Date: March 07 (7x100=100 points)

CS 6/75995 ST: Foundations of Peer to Peer Computing

Spring 2008, Department of Computer Science, Kent State University

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For each question you need to explain your answer clearly and logically in much greater detail than in given papers. Merely repeating text from a paper or lecture notes therefore will not be given any grade even if the answer appears correct. Graduate level originality, logic, and intuitive thinking abilities are expected in your answer.

1. **(Gnutella & Clustering Analysis, A#1(a)):** Ripeanu et. al. conjecture "Gnutella nodes cluster in a way that is completely independent from the Internet structure". Explain each step of the construction this conjecture. List all the key assumptions used.

2. (**Bit Torrent, A#1):** List the sixteen possible states based on local and remote choke (un-choke) and interested (not interested) setting of a connection. Draw the *state transition diagram* based on the optimistic choking and un-choking policy. Label links with transition conditions.

3. (**BitTorrent Strategy, A#1):** An over smart BitTorrent client cheats by offering pieces which its peer already possesses- assuming that its peer will not than request those. Explain up to what extent such an evil strategy may or may not help the over smart client.

4. **(Chord Analysis:A#1)** Basic Chord requires log N steps to lookup a query. Even log N messages per lookup may be too many for some applications. It seems Chord can be generalized to make longer stride in each hop. The distance to query can be reduced by a factor 1/(1+d) in each lookup hop for various values of d. Derive the generalized complexity of the following (a) how far each finger should point? (b) How many hops will be required to lookup a query?

5. **(Chord Analysis:A#1):** Show that in Chord as nodes join and leave the system with high probability each such event results in no more than O ($\log^2$ N) messages.

6. **(Chrod Routing:A#1):** Provide an illustrated explanation of the Chord Routing given in Fig-4 in the paper of Stioca et. al. It has three subroutines. Explain each invocation of the three routines in the routing example discussed in the class notes.

7. **(Pastry Node Join,A#1):** To construct its routing table a joining node can take several approaches. At the minimum it can fetch only the appropriate rows from the successive nodes through which a join message travels (SL). To improve the quality of routing it can also fetch the entire state from those successive nodes (WT). To further improve the quality it can fetch states from each entry of the nodes it got in its routing table (WTF). (a) At which routing depth 'level' the quality of routing table shows most improvement- why? (b) Derive the message cost for these three approaches.