

## ITS 413 – QUIZ 6 ANSWERS

First name: \_\_\_\_\_ Last name: \_\_\_\_\_

ID: \_\_\_\_\_

Total Marks: \_\_\_\_\_

out of 10

### Question 1 [3 marks]

Explain how a super-peer architecture like that used in the Fasttrack P2P network provides advantages offered by both fully-distributed networks (e.g. Gnutella) and centralised networks (e.g. Napster).

#### Answer:

Fasttrack provides the advantage of search efficiency (similar to centralised networks) because some of the index information is stored on super-peers. When peers search for files, the query request is sent to the local super peer. In many cases the super-peer will immediately know of the node storing the resource, hence the query does not have to be sent any further through the network.

Fasttrack provides the advantage of reliability (similar to fully-distributed networks) because if one super-peer fails, all other super-peers (and their peers) can continue using the service. Even the peers attached to the failed super-peer can use the service by connecting to new super-peers.

### Question 2 [2 marks]

- a) If a system using Chord Distributed Hash Tables (DHTs) allows up to 256 nodes, how many unique key values are possible?

#### Answer:

256. Chord uses a hash function to determine the node IDs. If there are 256 nodes, then that means the hash function returns 256 possible values. The same hash function is used to produce the key values: a hash of the file name produces a key.

- b) If a resource maps to a key K in Chord, but no corresponding node K exists, what does Chord do?

#### Answer:

Chord stores the resource on the next node in the ring that does exist.

**Question 3** [3 marks]

In Chord routes are maintained to only a selection of other nodes (e.g. 1, 2, 4, 8, ... positions away). Explain an advantage and disadvantage of instead maintaining routes to nodes 2, 4, 6, 8, ... positions away.

**Answer:**

Advantage of maintaining routes to nodes 2, 4, 6, 8, ...: faster search. If all nodes exist, then each node knows about half of the nodes in the network (and hence can send queries directly to nodes when searching for a K of 2, 4, 6, 8, ...).

Disadvantage of maintaining routes to nodes 2, 4, 6, 8, ...: higher cost of route maintenance. Each node must maintain routes (that is, know of the IP addresses of other nodes) to half of the nodes in the network. Whenever the nodes change (a computer turns off or changes address), the routes need to be updated, which requires messages to be sent, i.e. leading to high message overheads for route maintenance.

**Question 4** [1 mark]

Napster's performance is of order 1 for both latency (time to get search result) and number of messages sent. Whereas Gnutella is of order  $\log(n)$  for latency and order  $n$  for messages sent (where  $n$  is the number of peers). What is a disadvantage of Napster compared to Gnutella?

**Answer:**

Napster is a centralised system and therefore if the server fails, the entire network fails. Napster has a single point of failure.

**Question 5** [1 mark]

A default value of the number of permanent peers ( $C$ ) in Gnutella is 4. What is a disadvantage of increasing this value?

**Answer:**

Increasing  $C$  to a larger number will mean a node will have to maintain routes to more nodes (disadvantage: higher route maintenance) and, depending how TTL is used, more messages will be sent (disadvantage: higher overhead, less efficiency).