COP5615 Project Report (Bonus)

Pastry Protocol

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Run Syntax:

Run : dotnet fsi --langversion:preview proj3Bonus.fsx <numofNodes> <numofRequests> <numOfFailingNodes>

Example : dotnet fsi --langversion:preview proj3.fsx 100 40 10

What's Working:

Pastry is a type of self organizing overlay routing protocol. Each participating node maintains a routing table and helps route messages to their destination. Pastry is implemented as an overlay network where each node is assigned an unique identifier. The assigned identifiers (nodeid) are 128 bits long and have a range from 0 to 2^{128}-1. For the purpose of routing, these nodeids are considered as sequences of digits in base 2^b where b = 4. The nodeids are randomly generated when a node joins the network and are arranged in circular modulo fashion. The nodeids are distributed uniformly across the nodeid range and are organized based on numerical closeness of nodeids. Every node in the implementation has a routing table, leafset and a neighborhood set. Routing table consists of $\log_{16}N$ where N is the number of nodes in the network. Leafset consists of the nodes numerically closest to the node, half of which are greater and the rest smaller than the node. The neighborhood set maintains redundancy by holding data that tracks nodes that are close in terms of network locality. When a message arrives, a node checks its key and then looks at its leafset to locate the node closest to the key, it forwards the message directly to the particular node. If it cannot find a node closest to the key, it checks its routing table and does a prefix match and forwards it to the matched node.This process is continued until the node closest to the key is located. Therefore, the routing of the message takes at most $\log_{16}N$ steps for any given message in the id space.

Handling Failure:

Given a failure model, the nodes indicated are made inactive. The leafsets of nodes that contain nodes that are inactive are updated. The routing table entries of nodes that contain inactive nodes are updated to the value of the closest node to that of the inactive node. While routing of a message isn't guaranteed, routing is made resilient to failures in the network using the network locality of Pastry.

Results:

Number of Nodes	Number of Requests	Num of failing nodes	Average Number of Hops
50	10	3	1.925532
100	30	10	2.306667
200	50	30	2.625059
500	10	2	3.117671
700	10	3	3.319369
1000	20	3	3.548044

Plot: