CSC2231 – Internet Systems and Services

Paper Review – Pastry
Name: **Alex Wun**
Date: **Nov. 6th, 05**

The authors of this paper propose a P2P lookup protocol based on the numerical "distance" between two node IDs. Requests to hash a key are routed towards nodes whose IDs are "closer" to the key than the current node's ID. A node ID is closer to the key if it shares a longer common prefix or is arithmetically closer (when there is no better prefix closeness). Matching prefixes must be at least *b* bits longer for another node's ID to be considered closer than the current node's ID, where *b* is a tunable parameter.

Since this is also a deterministic protocol, it shares many of the same benefits as Chord (mentioned in my other review). In comparison to Chord, Pastry seems to require more state at each node even in the ideal case. However, Pastry has tunable parameters that can be used to adjust the expected number hops per query and routing table size. Also, Pastry attempts to incorporate locality awareness into its selection of neighbouring nodes. This however depends on application designers to supply a "distance" metric for which the triangle inequality holds. Otherwise, Pastry's locality scheme breaks down.

Since Pastry is also deterministic, it suffers from the same problems as Chord in the face of failures and incorrect state information. Their solution is to maintain a Leaf set and Neighbourhood set of nodes to be used in preserving integrity of the network state. Even so, the protocol depends on a probabilistic "stubborn" retry mechanism to work around failed nodes. Additionally, their approach to dealing with network partitions is essentially a periodic broadcast mechanism used to discover nodes. Similar to Chord, once failures are introduced, schemes that much less elegant than the fundamental protocol are used as workarounds.

I found their discussion of developing pub/sub over Pastry interesting as they chose to create a unique topicID for pub/sub routing purposes. This is very closely related to the approach I am investigating to enable the routing of encrypted content in pub/sub networks. It seems that from reading these two papers, the primary concern for deterministic P2P schemes is maintaining sufficiently consistent states for the protocol to work.