EE 122: A Note On Joining Operation in Chord

Ion Stoica
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Big Picture

- Assume circular identifier space is $0..2^m$
- To each node we associate a unique id in this identifier space
- Each node is responsible for all identifiers between itself and its predecessor on this circle
Identifier to Node Mapping Example

- Node 8 maps [5,8]
- Node 15 maps [9,15]
- Node 20 maps [16, 20]
- ...
- Node 4 maps [59, 4]
Routing

- Each node maintains its successor
- Route packet (ID, data) to the node responsible for ID using successor pointers

```plaintext
send(34, data)
```
Joining Operation

- Each node A periodically sends a `stabilize()` message to its successor B.
- Upon receiving a `stabilize()` message a node B returns its predecessor B’ to A by sending a `notify()` message.
- Upon receiving `notify()` from B, A updates its successor to B’ if B’ is between A and B; otherwise A doesn’t do anything.
Node with id=50 joins the ring

Node 50 needs to know at least one node already in the system

- Assume known node is 15
Joining Operation

- Node 50 asks node 15 to forward join message.
- When join(50) reaches the destination (i.e., node 58), node 58 (1) updates its predecessor to 50, and (2) returns a notify message to node 50.
- Node 50 updates its successor to 58.
Joining Operation (cont’d)

- Node 44 sends a stabilize message to its successor, node 58
- Node 58 reply with a notify message
- Node 44 updates its successor to 50
Joining Operation (cont’d)

- Node 44 sends a stabilize message to its new successor, node 50.
- Node 50 sets its predecessor to node 44.
This completes the joining operation!
Achieving Robustness

- To improve robustness each node can maintain the k (> 1) immediate successors instead of only one successor.
- In the notify() message, node A can send its k-1 successors to its predecessor B.
- Upon receiving notify() message, B can update its successor list by concatenating the successor list received from A with A itself.