#ASLI ENGINEERING

FloodMax Algorithm for Leader Election

SWIPE

BY

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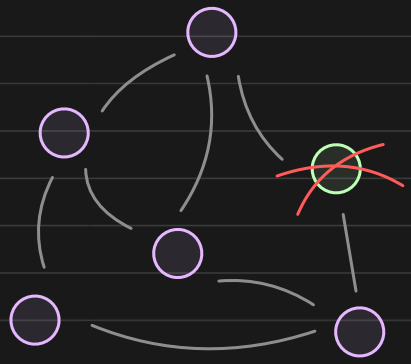
FloodMax algorithm for leader Election

leader Election is an automated way of System Recovery. When the leader node is down, the leader Election algorithm is triggered which elects the new leader thus restoring the system



Diameter of a network

Diameter of a network is the maximum distance between two nodes in the network

$$\max(d(i,j) \; \forall \; i,j)$$

The FloodMax Algorithm

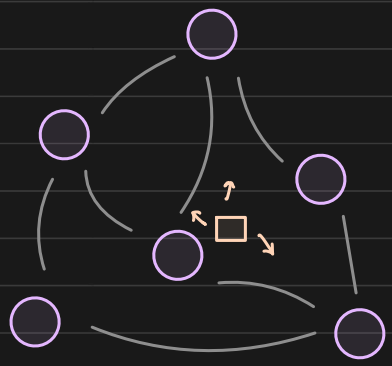
FloodMax algorithm works with a network that is arbitrarily connected

↓

Ring topology not enforced

Every node is given a comparable UID that may be randomly allotted, and every node knows the diameter of the network.

The algorithm



FloodMax selects the node with max UID to be the new leader and the core idea is Flooding the network with the max UID.

Election happens across multiple rounds

↳ number of rounds = diameter of network

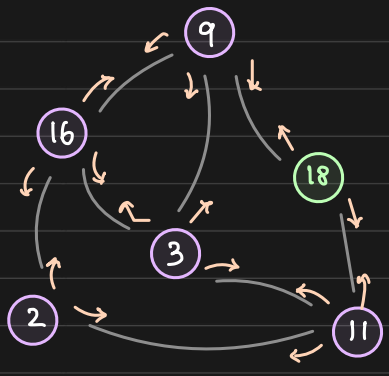
In each round,

every node keeps track of max UID seen so far (including its own)

and it broadcasts the max to all the nodes connected to it

Thus every round, every node will receive the max its neighbours have seen.

and after 'diameter' number of rounds we would be sure the message from node with max UID would have reached everyone.



Thus, after 'diameter' round, each node knows

if self.uid == max_seen → leader

if self.uid != max seen → non-leader

Every node hence knows if it is the leader or not

Complexity Analysis

It takes O(diameter) number of rounds to elect the leader.

The number of messages exchanged is O(diameter x |E|)

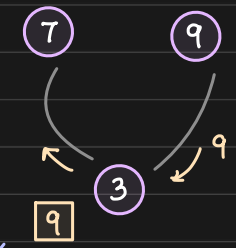
|E| = number of directed edges in the network

Reducing communication complexity

To decrease the number of messages exchanged during election, nodes can send the max UID only when it changes.

This would significantly reduce the messages exchanged across the network

Another approach to reduce the communication messages is to NOT send the max UID in the direction of the neighbour from which it was received



Send max UID 9 in all direction except in the direction of node 9