#ASLI ENGINEERING

TimeSlice Algorithm for Leader Election

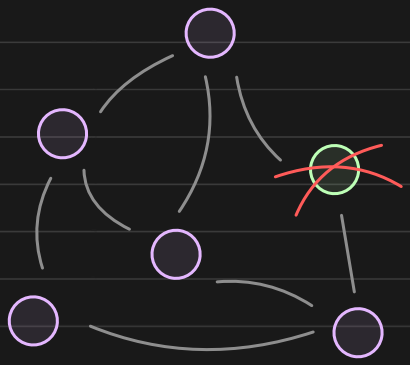
SWIPE

BY

ARPIT BHAYANI

TimeSlice algorithm for leader Election

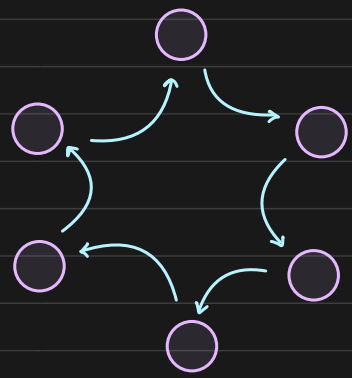
leader Election is an automated way of System Recovery, when the leader node is down, the leader Election algorithm is triggered which elects the new leader thus restoring the system



The TimeSlice Algorithm

and synchronous

It is an unbounded, impractical, yet interesting leader election algorithm. It assumes that each node in the network is



- placed on a unidirectional ring
- has been assigned a positive integer as ID
- knows its neighbour in clockwise direction
- aware about the total nodes n in the network

The algorithm is very slow and it elects the node with the minimum UID as the new leader.

The number of messages passed are $O(n)$ and time to elect new leader is $O(n \times u_{min})$

The algorithm

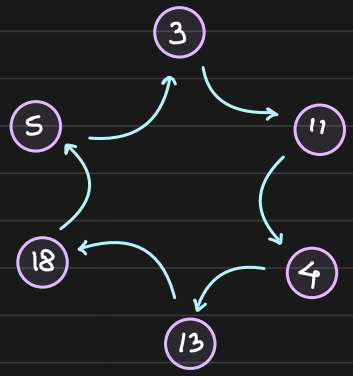
Election happens in phases 1, 2, 3, ...

Each phase consist of n rounds

- Phase 1, round 1
- Phase 1, round 2
- Phase 1, round 3
- ⋮
- Phase 1, round n

} n rounds

- Phase 2, round 1
- ⋮



In phase i, the nodes forward the message/token with UID i

Until then, every one is silent

Say, in topology we have nodes with IDs 3, 4, 5, 11, 13, 18

In phase 1, because no node has uid 1
for all $n = 6$ rounds nothing happens

In phase 2, because no node has uid 2
for all $n = 6$ rounds nothing happens

Hence, the first 12 rounds happened with no messages exchanged or leader elected

We enter phase 3...

Now that we are in phase 3, the node with UID 3 will react

Since no messages were sent in first $2 \times 6 = 12$ $(2n)$ rounds,

Node with UID 3 realizes it is the new leader

Hence it creates an announcement message

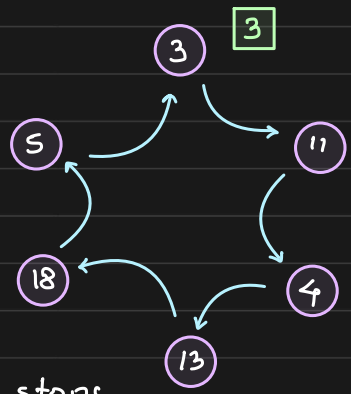
and sends it to its neighbour

For next $n-1$ round of the 3rd phase

the message will be passed on along the

ring and every one will know

3 is the new leader.



Once everyone is aware, the election process stops

Complexity analysis

Number of messages exchanged = $O(n)$ ← as we send message only after the leader is elected

But, the time complexity is $O(n \times U_{min})$

Given that messages are not even sent until

we start the phase $i = U_{min}$, we are just

waiting. Hence the time complexity is unbounded

on the minimum UID value in the network.