

Distributed Computing 2020

Theory Assignment 1

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1. // Let there be n processes

// For process i

Let $v[1..n]$, $LS[1..n]$ and $LU[1..n]$ be new arrays.

// $v[]$ represents the vector timestamp

// $LS[]$ represents the Last Sent timestamp

// $LU[]$ represents the Last Update timestamp

Initialize the new arrays to zero.

On Event e_i^j (payload):

$LU[i] = ++v[i]$ // basic step for all events

if e_i^j is sending to P_j :

$LS[j] = v[i]$

new_payload = [] // message to be sent

for $k = 1$ to n :

if $LS[j] < LU[k]$:

new_payload.append((k, v[k]))

send(new_payload) // send message to process P_j

else if e_i^j is receiving from P_j :

$LU[j] = v[i]$

for k, val in payload:

$v[k] = \max(v[k], val)$

2. Let Process 2(0, 1, 0) send a message[(2,1)] to Process 1.

Let Process 3(0, 0, 1) send a message[(3,1)] to Process 1.

Now, if the messages are not sent in FIFO - Process 1 will have the first event as $(1, 0, 1)$ when **actually it should have been** $(1, 1, 0)$. Due to this, when compared with a process with vector timestamp $(3, 0, 1)$ this shows that there is a causal relationship but the actual answer is the events are concurrent.