Algorithm – Sequentially Consistent Register

Algorithm 1 LT (or SC-ABD)

Implements:

\((N, N)\)-SequentiallyConsistentRegister, instance \(\text{nnscr}\).

Uses:

BestEffortBroadcast, instance \(\text{beb}\).
PerfectPointToPointLinks, instance \(\text{pp2p}\).

1: upon event \(\langle \text{Init} \rangle\) do
2: \(lt := 0\)
3: \(tsv := (0, \perp)\)
4: \(rid := 0\)
5: \(\text{responses} := \emptyset\)
6: \(\text{readval} := \perp\)
7: \(\text{reading} := \text{FALSE}\)
8: upon event \(\langle \text{nnscr, Read} \rangle\) do
9: \(lt := lt + 1\)
10: \(rid := rid + 1\)
11: \(\text{reading} := \text{TRUE}\)
12: trigger \(\langle \text{beb, Broadcast} \mid [\text{QUERY}, lt, rid] \rangle\)
13: upon event \(\langle \text{beb, Deliver} \mid p, [\text{QUERY}, lt', rid'] \rangle\) do
14: \(lt := \max(lt, lt') + 1\)
15: trigger \(\langle \text{pp2p, Send} \mid p, [\text{RESPONSE, lt, rid'}, tsv] \rangle\)

*Adapted from https://arxiv.org/abs/1608.02442
16: upon event (pp2p, Deliver | p, [RESPONSE, lt', rid', tsv']) do
17:   if rid = rid' then
18:     lt := max(lt, lt') + 1
19:     responses := responses ∪ {(tsv', p)}
20:   if |responses| > \(N \over 2\) then  
21:     (tsv, _) := max(responses)
22:     (_, readval) := tsvm
23:     responses := \emptyset
24:     acks := \emptyset
25:     rid := rid + 1
26:     trigger (beb, Broadcast | [UPDATE, lt, rid, tsv'])
27: upon event (nnscr, Write | v) do
28:   lt := lit + 1
29:   tsv := ((lt, self), v)
30:   rid := rid + 1
31:   reading := FALSE
32:   trigger (beb, Broadcast | [UPDATE, lt, rid, tsv])
33: upon event (beb, Deliver | p, [UPDATE, lt', rid', tsv']) do
34:   lt := max(lt, lt') + 1
35:   tsv := max(tsv, tsv')
36:   trigger (pp2p, Send | p, [ACK, lt, rid'])
37: upon event (pp2p, Deliver | p, [ACK, lt', rid']) do
38:   if rid = rid' then
39:     lt := max(lt, lt') + 1
40:     acks := acks ∪ {p}
41:   if |acks| > \(N \over 2\) then
42:     acks := \emptyset
43:     rid := rid + 1
44:   if reading then
45:     trigger (nnscr, ReadResponse | readval)
46:   else
47:     trigger (nnscr, WriteResponse | readval)