DPLCA Issues in D1.0

Contribution to 802.3da Task Force

Brett McClellan, Eve Huang, Lance Wang
Marvell

March 13, 2024

Introduction

- Simulations of the PLCA and DPCLA state diagrams in D1.0 revealed issues that should be addressed
- Changes are proposed to address the issues

1- WAIT_BEACON Lockup

- Issue: DPLCA Control will lockup in WAIT_BEACON
  - When coordinator_role_allowed=FALSE, see slide 4
  - WAIT_BEACON: local_nodeID <= 255

    -> PLCA Control forced to DISABLE: plca_active<=FALSE

    -> PLCA Status forced to INACTIVE: plca_status<=FAIL

    -> DPLCA Control cycles DISABLED / WAIT_BEACON indefinitely waiting for plca_status=OK
- Proposal:
  - use dplca_en to prevent forcing PLCA Control to DISABLE when local_nodeID = 255
  - use dplca_en to exit DISABLE to RESYNC when local_nodeID ≠ 0
  - see slide 5

148.4.6.5 State diagram

Change Figure 148–3 and Figure 148–4 as shown:

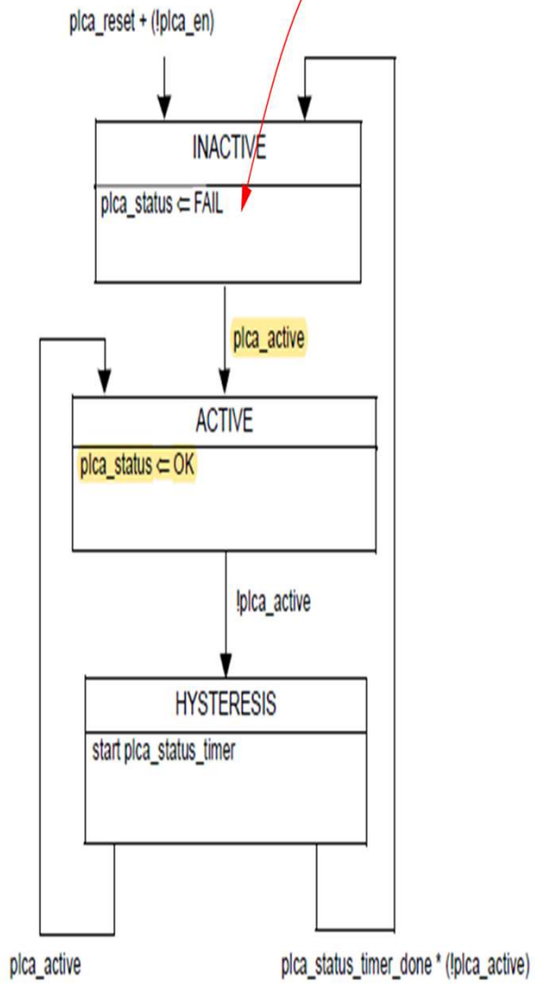
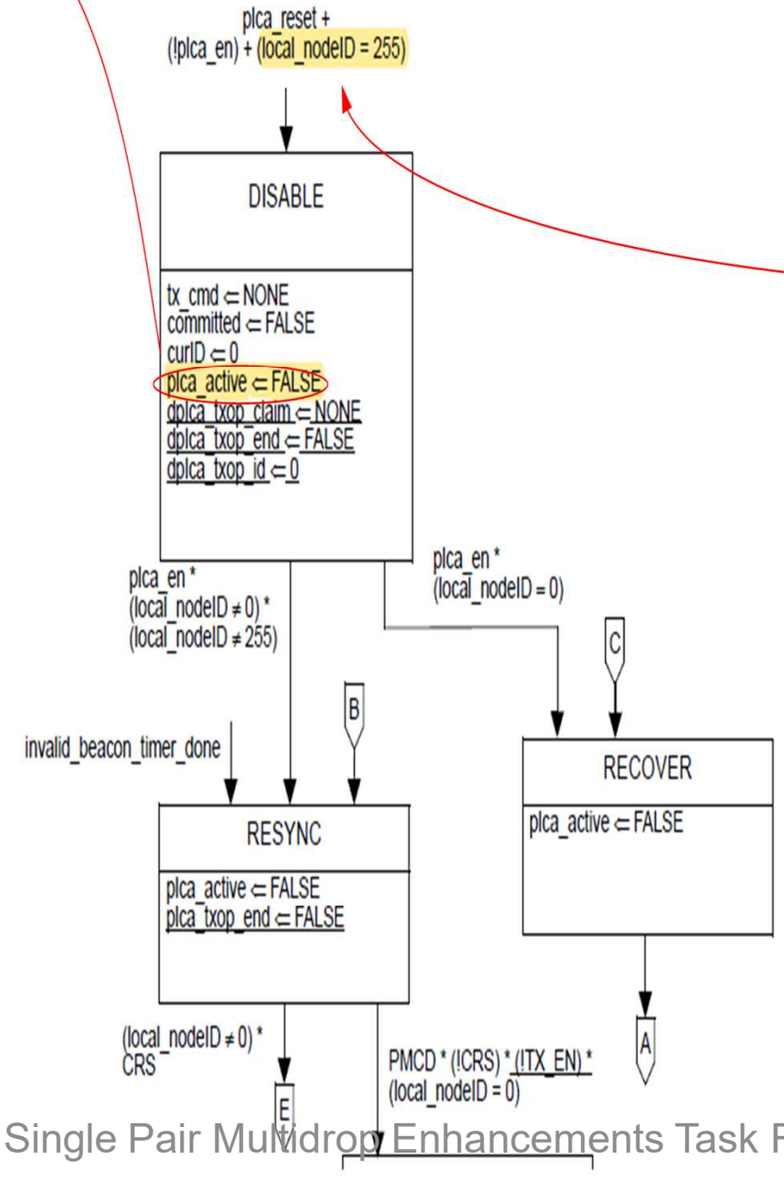
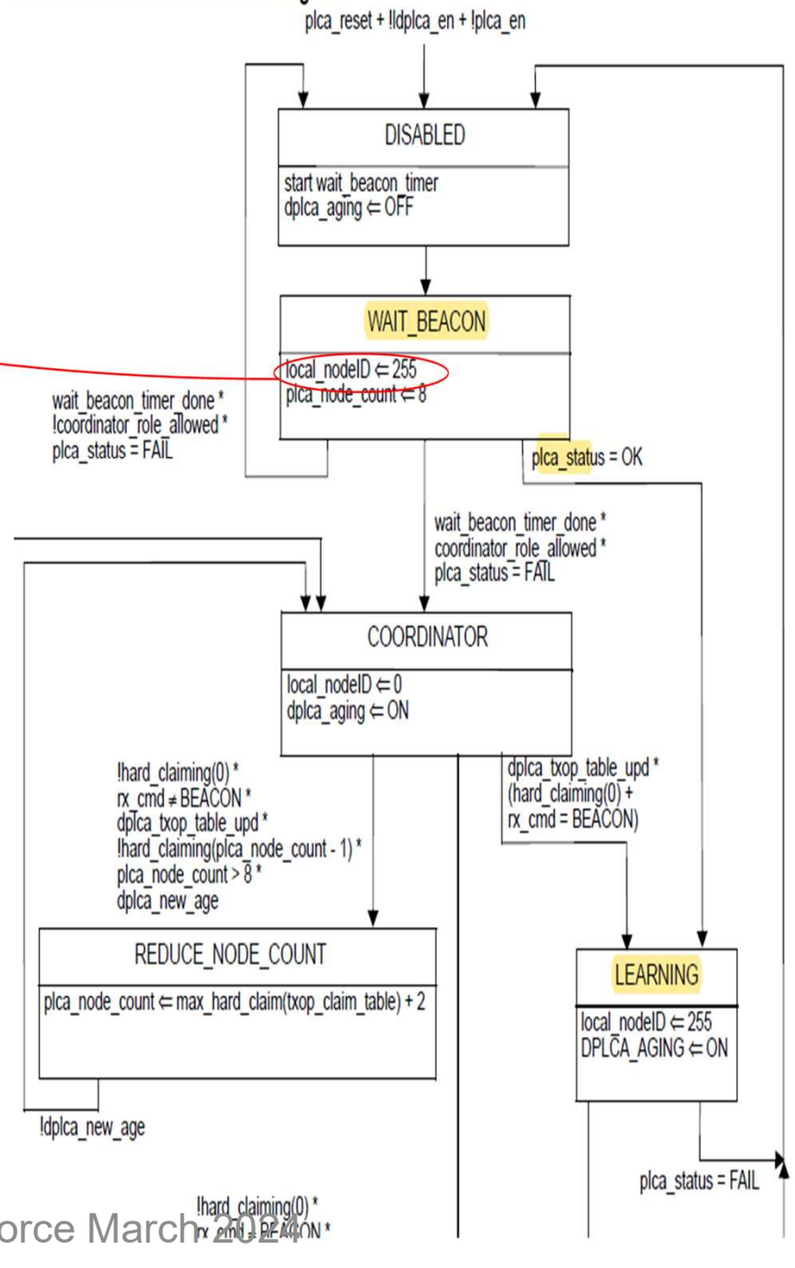


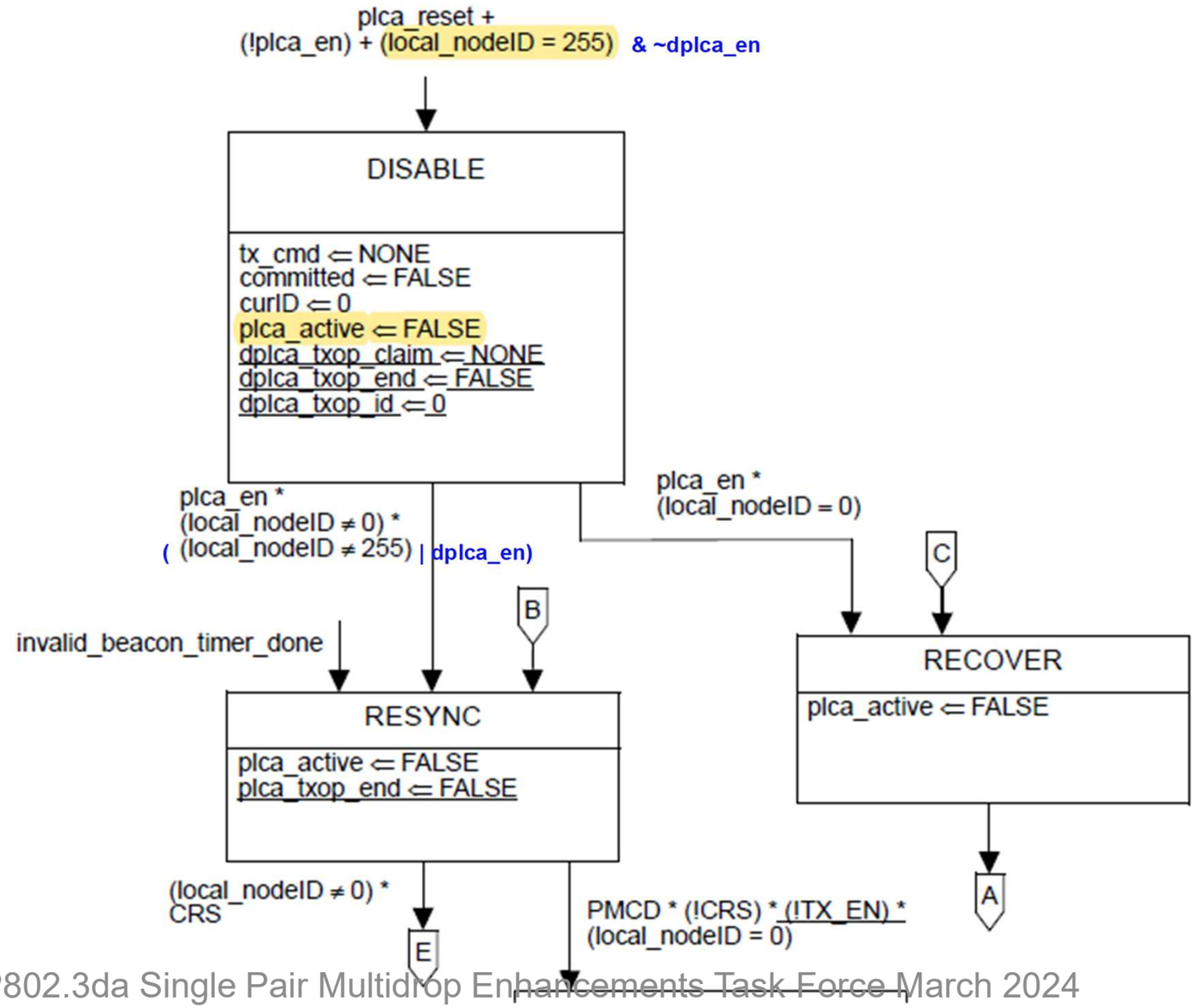
Figure 148–7—PLCA Status state diagram



48.4.7.5 D-PLCA Control state diagram



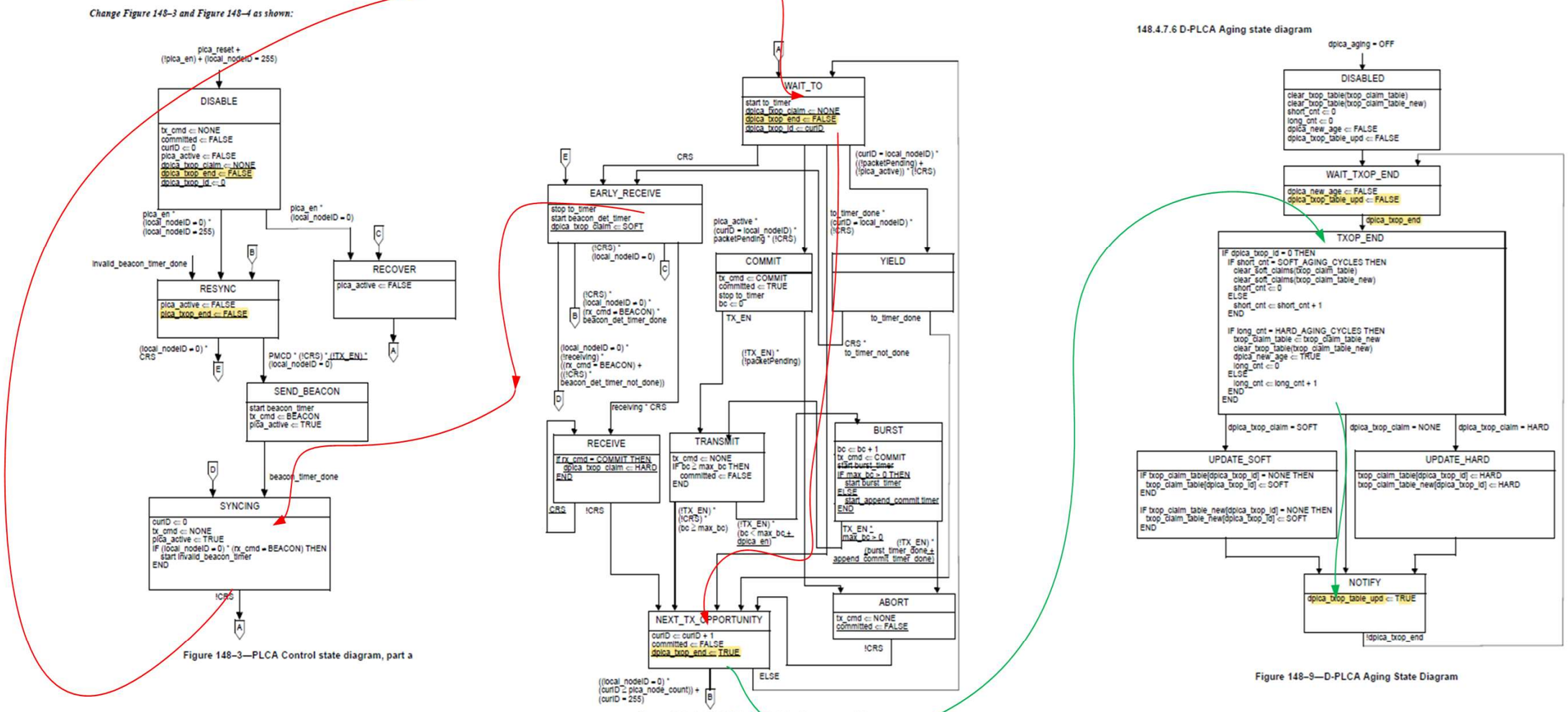
Change Figure 148–3 and Figure 148–4 as shown:



2- COORDINATOR to LEARNING transition

- Intent: transition from COORDINATOR to LEARNING upon BEACON detection from another node – see slide 9 state diagram
  - beruto_3da_01_031021.pdf slide 17
- Issue: BEACON doesn't trigger a transition
  - for condition: dplca_txop_table_upd *(hard_claiming(0) +rx_cmd = BEACON)
    - variables dplca_txop_table_upd, rx_cmd = BEACON aren't true simultaneously
    - sequence on slide 7, timing diagram on slide 8
- Proposal: modify D-PLCA Control as shown in slide 9
  - Allow transition to LEARNING upon BEACON detection

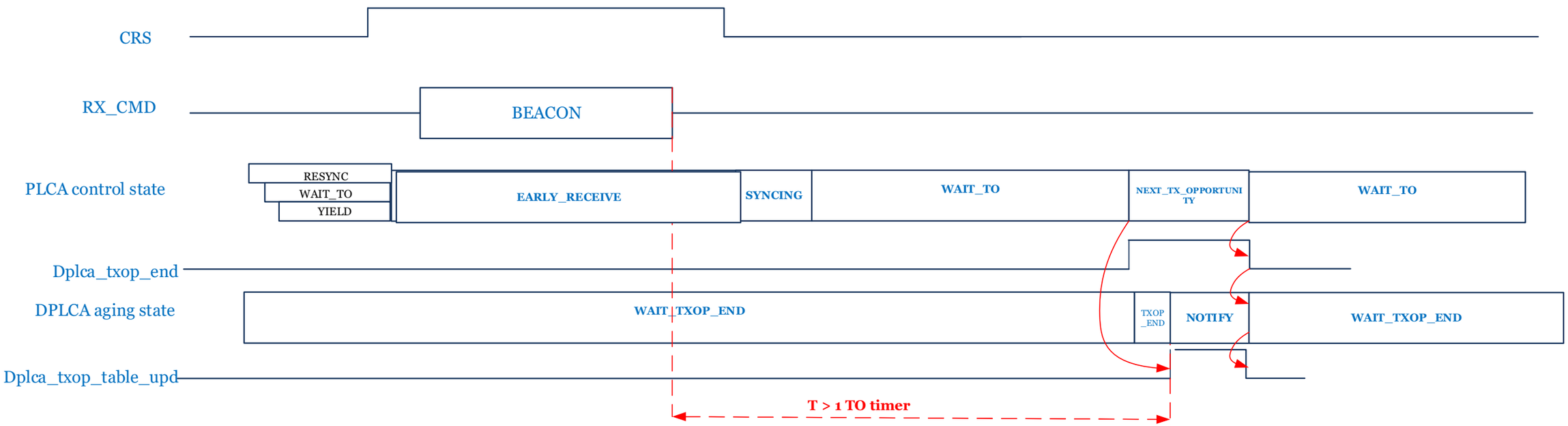
2- COORDINATOR to LEARNING transition



Interaction between PLCA Control and D-PLCA Aging when rx_cmd=BEACON

2- COORDINATOR to LEARNING transition

Timing relation between rx_cmd = BEACON and dplca_txop_table_udp



2- COORDINATOR to LEARNING transition

- Change the condition to occur when rx_cmd = BEACON without condition of dplca_txop_table_udp
- [dplca_txop_table_upd *hard_claiming(0)] + rx_cmd = BEACON

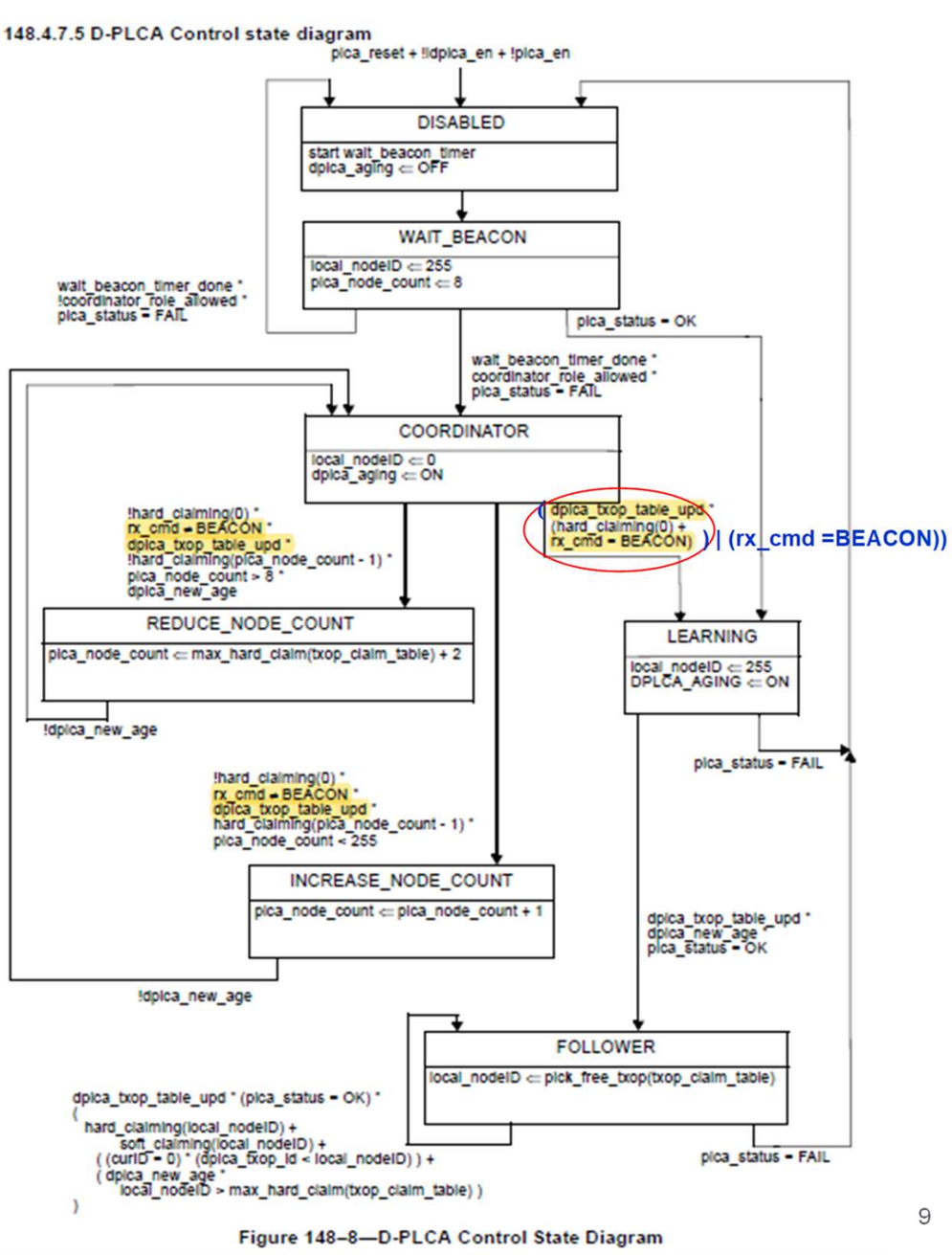
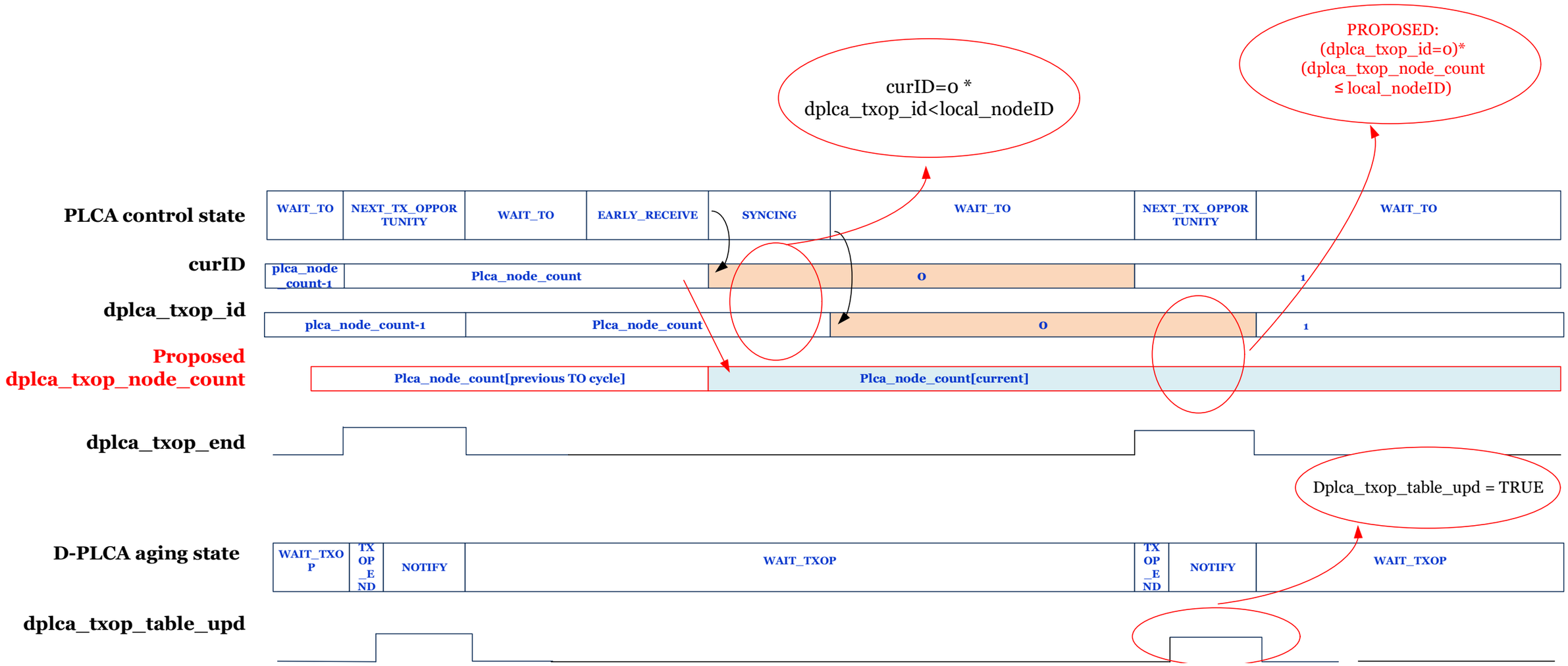


Figure 148–8—D-PLCA Control State Diagram

3- FOLLOWER to FOLLOWER transition

- Intent: pick a new local_nodeID if ID is greater than plca_node_count
- Issue: condition doesn't trigger a new pick
  - for condition: dplca_txop_table_upd * (plca_status = OK) *(...+((curID = 0) * (dplca_txop_id < local_nodeID) +…)
    - (curID = 0) * (dplca_txop_id < local_nodeID) isn't aligned to dplca_txop_table_upd
    - timing diagram on slide 11
- Proposal: modify PLCA control and DPLCA control as shown in slide 12
  - In SYNCING latch the value of dplca_txop_id for use in FOLLOWER
    - to new variable dplca_txop_node_count in PLCA Control and D-PLCA Control
  - In FOLLOWER to FOLLOWER transition
    - replace (curID = 0) * (dplca_txop_id < local_nodeID)
    - with (dplca_txop_id = 0)*(dplca_txop_node_count ≤ local_nodeID)

Timing relationship of curID, dplca_txop_id and dplca_txop_table_udp



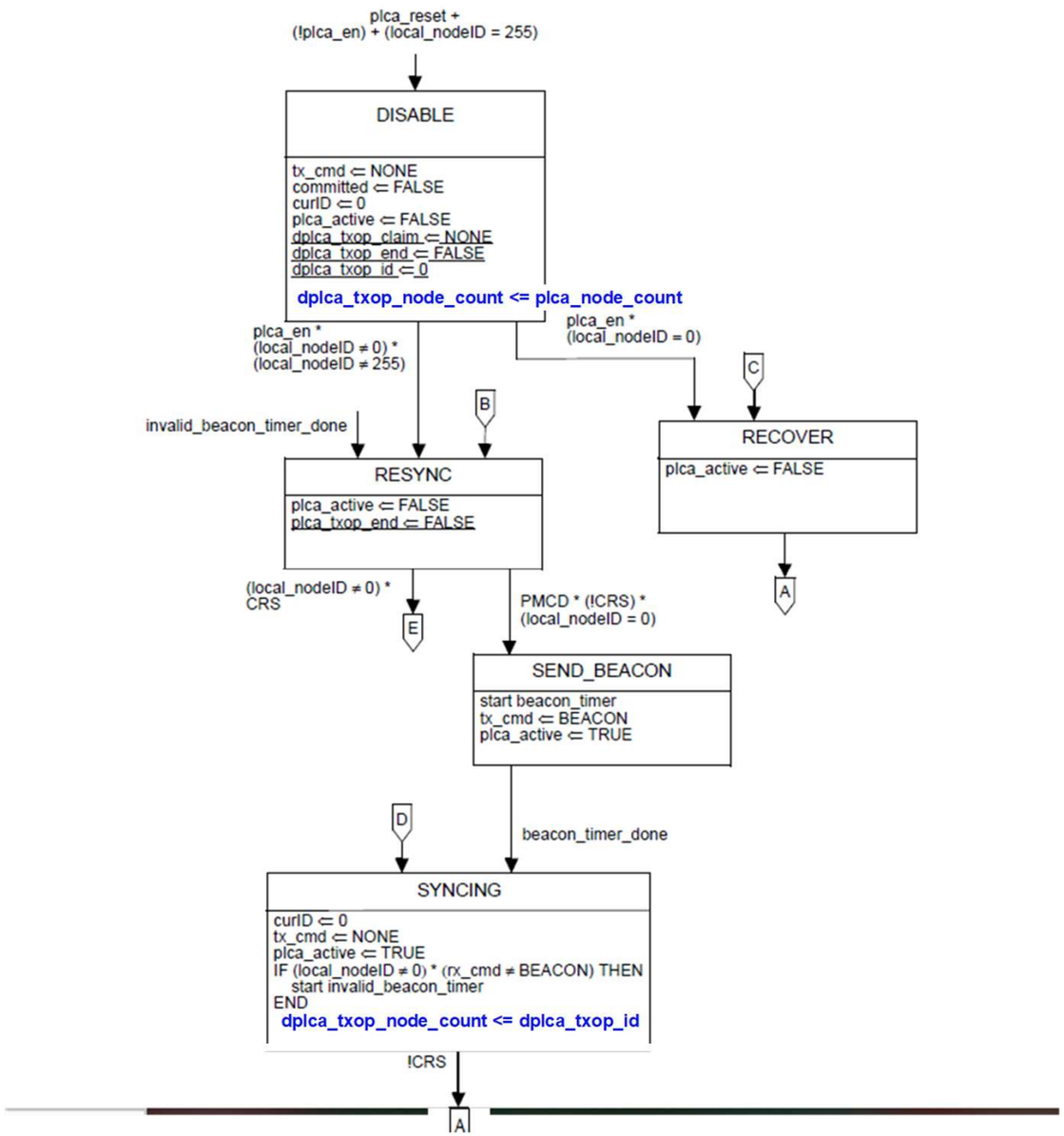


Figure 148–3—PLCA Control state diagram, part a

148.4.7.5 D-PLCA Control state diagram

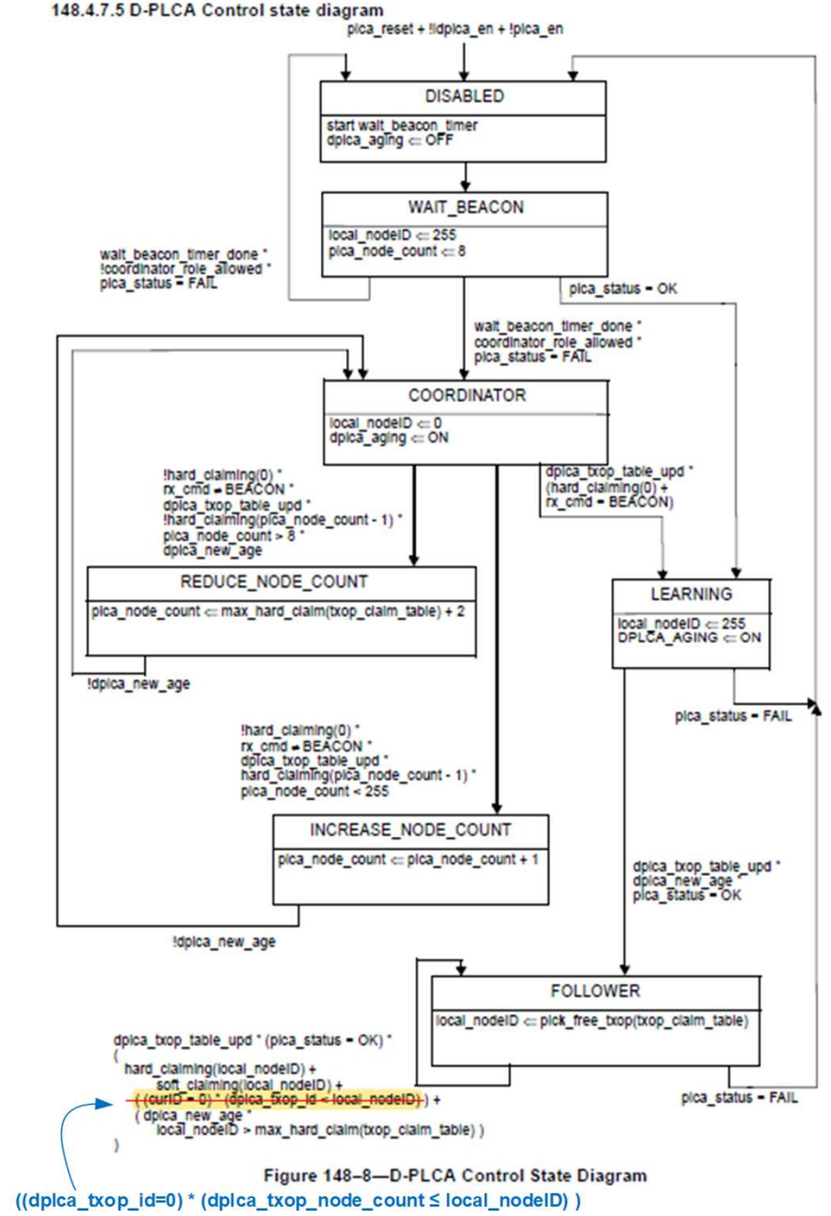


Figure 148–8—D-PLCA Control State Diagram

4- Coordinator Lockup

- Issue: Coordinator lockup can happen when two nodes send the BEACON at the same time
  - PLCA is not able to register activity from other nodes while transmitting BEACON
- Proposal: needs further study

5- Follower Lockup

- Issue: Follower lockup happens when two nodes with the same local_nodeID continue to send packets at the same time
  - PLCA is not able to register activity from other nodes while transmitting packets
    - can’t record a soft or hard claim while transmitting
- Proposal: modify DPLCA Control as shown in slide 15
  - Apply SOFT claim on collision during transmission in COMMIT or TRANSMIT
  - Add a return transition to COMMIT with condition:
    - COL & ~TX_EN & packetPending
  - Add a return transition to TRANSMIT with condition:
    - COL & (TX_EN | CRS)

5- Follower Lockup

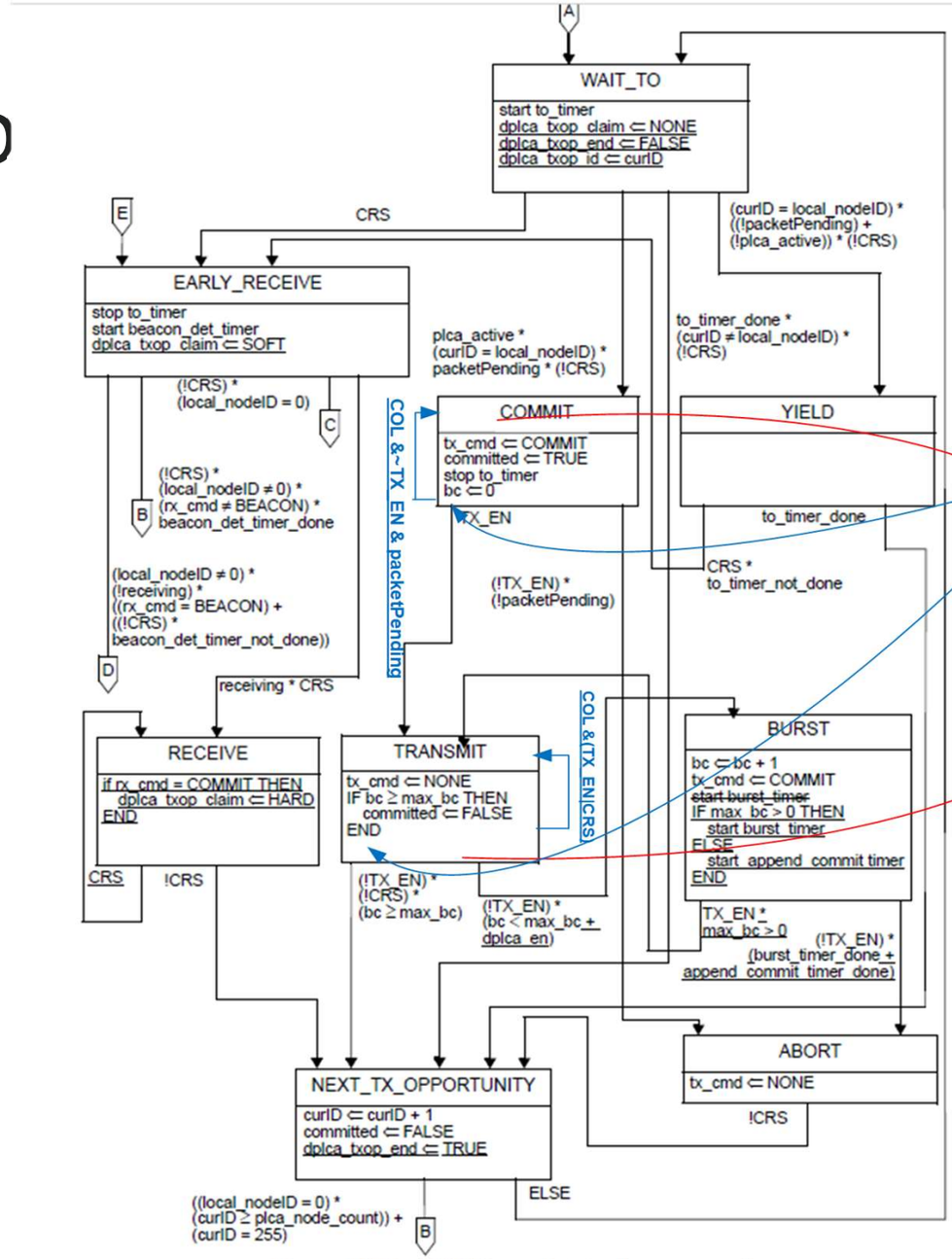
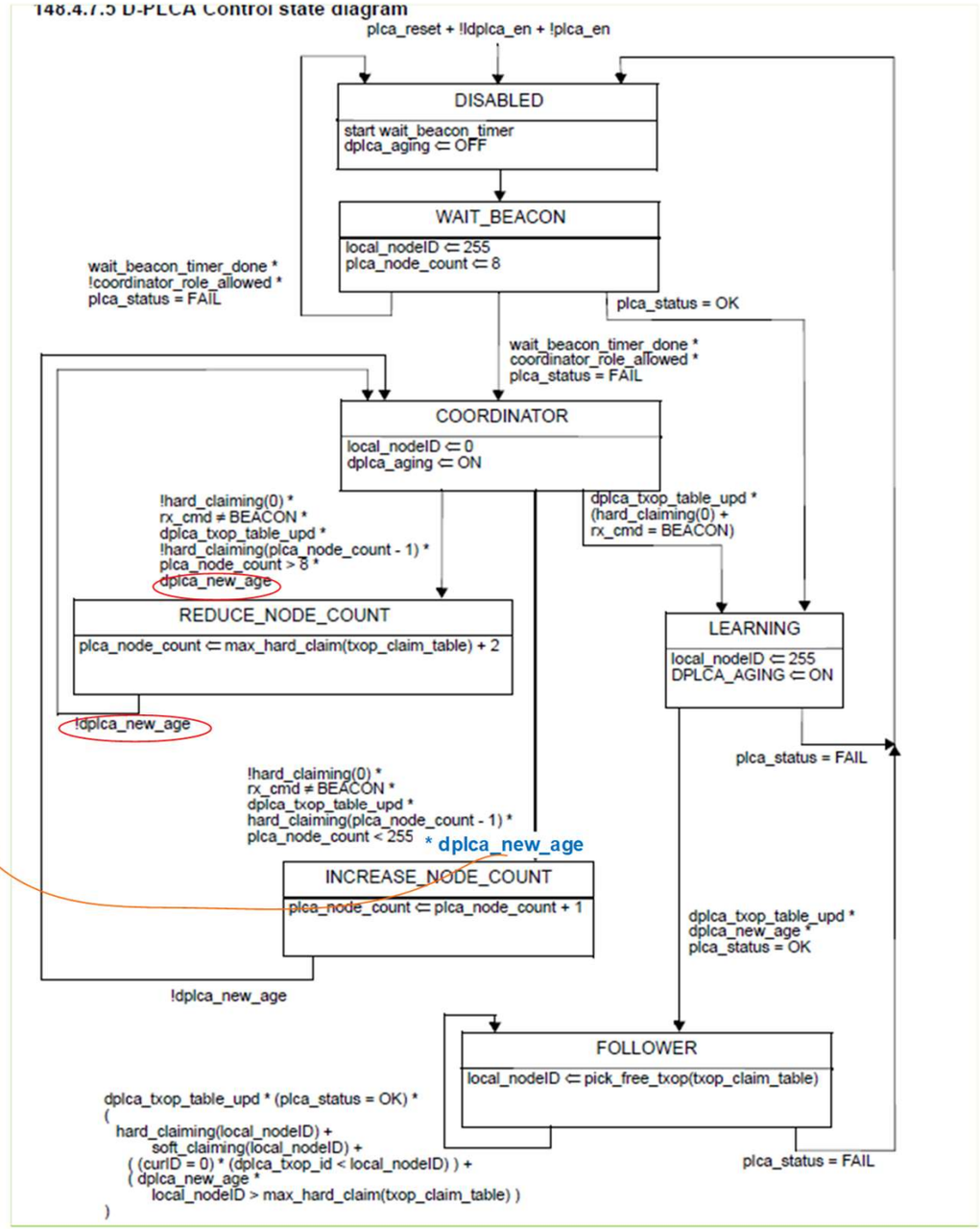


Figure 148–4—PLCA Control state diagram, part b

6-COORDINATOR to INCREASE_NODE_COUNT

- Issue: COORDINATOR to INCREASE_NODE_COUNT transition appears to be missing condition of dplca_new_age used on alternate paths
- Proposal: add condition
  * dplca_new_age



7- curID definition

- Issue: curID is missing definition for DPLCA in 148.4.7.2

- Proposal:

148.4.7.2 Variables

curID

See 148.4.4.2.

Essential technology, done right™