Canova Tech

The Art of Silicon Sculpting

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IEEE 802.3cg

PLCA Burst mode

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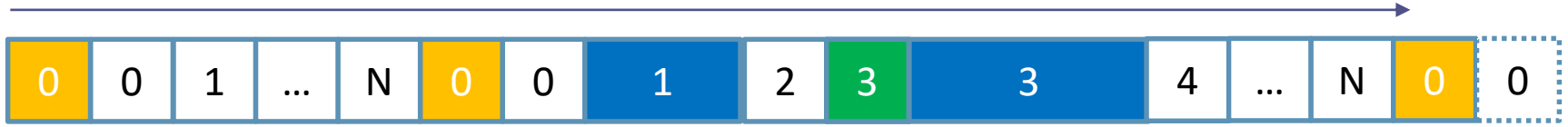
Outline

- PLCA currently provides packet-level access fairness (round-robin) across all nodes on the mixing-segment network.
- In some cases, weighing the share of the media among the nodes is desirable
  - 802.3cg D2.0 comments:
    - #371, #372 (Kirsten Matheus, BMW)
    - #503, #504, #505 (Peter Jones, Cisco)
- This is a new feature request for PLCA: burst mode

Proposed solution

- Nodes can be individually configured for bursting from management entity by setting the max number of packets that can be sent in a single burst (max_bc)
  - max_bc = 0 → no burst, up to one packet per BEACON (default)
  - max_bc = N → up to N additional packets per BEACON
- Bursting nodes can 'keep' their transmit opportunity by filling the IPG with IDLE (i.e. COMMIT from PLCA perspective)
- Problem is, a node cannot know in advance whether the local MAC has more packets to send after a transmission with no (logical) collisions.
  - Only option is to fill the IPG with COMMIT **regardless**, after any transmission.
    - Except when the max_bc limit is met
  - This yields some negative impact on the throughput in case there are nodes awaiting their TO after a logical collision
    - In such case an additional IPG period (96 bits) is wasted at the beginning of the new transmission

Working principle

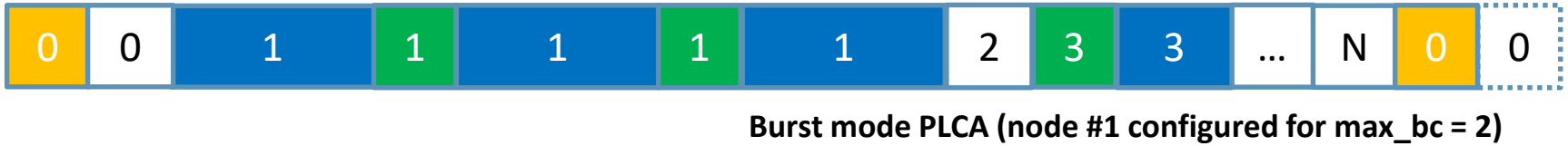


Standard PLCA operation (no bursts)

node #1 sends a burst of 2 packets, and needs to append an empty COMMIT

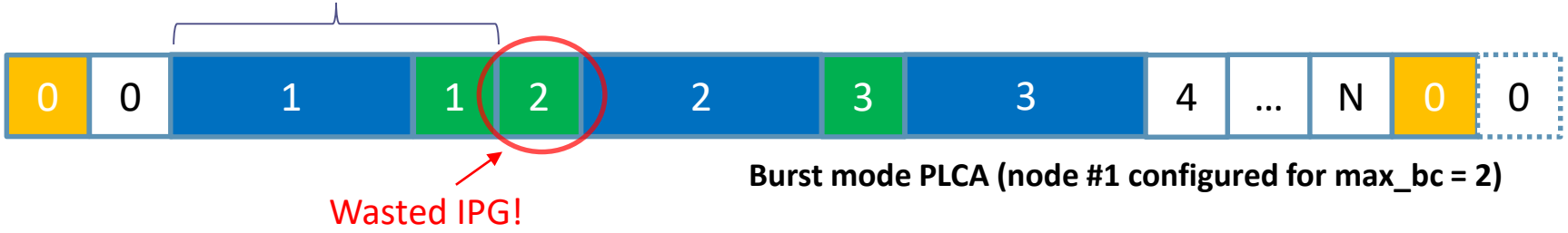
Burst mode PLCA (node #1 configured for max_bc = 2)

node #1 sends a burst of 3 packets (max) and does not append a COMMIT



Burst mode PLCA (node #1 configured for max_bc = 2)

node #1 does not burst but still needs to append an empty COMMIT

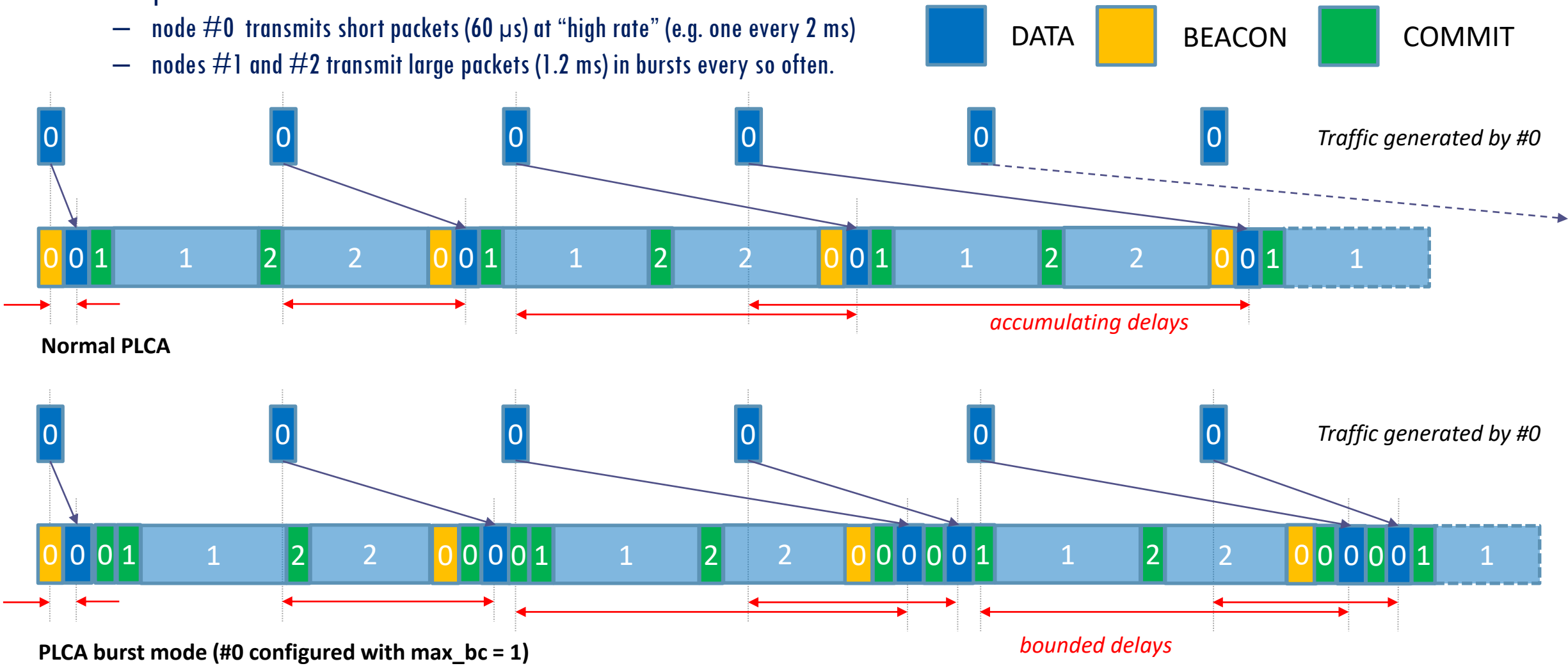


Burst mode PLCA (node #1 configured for max_bc = 2)

Bursting node keeps its TO by filling IPG with IDLE (COMMIT)

Example

- PLCA burst mode could provide a simple solution for situations where communication is inherently heterogeneous among the nodes
- Example with 3 nodes where:
  - node #0 transmits short packets (60 µs) at "high rate" (e.g. one every 2 ms)
  - nodes #1 and #2 transmit large packets (1.2 ms) in bursts every so often.



Changes to State Diagrams

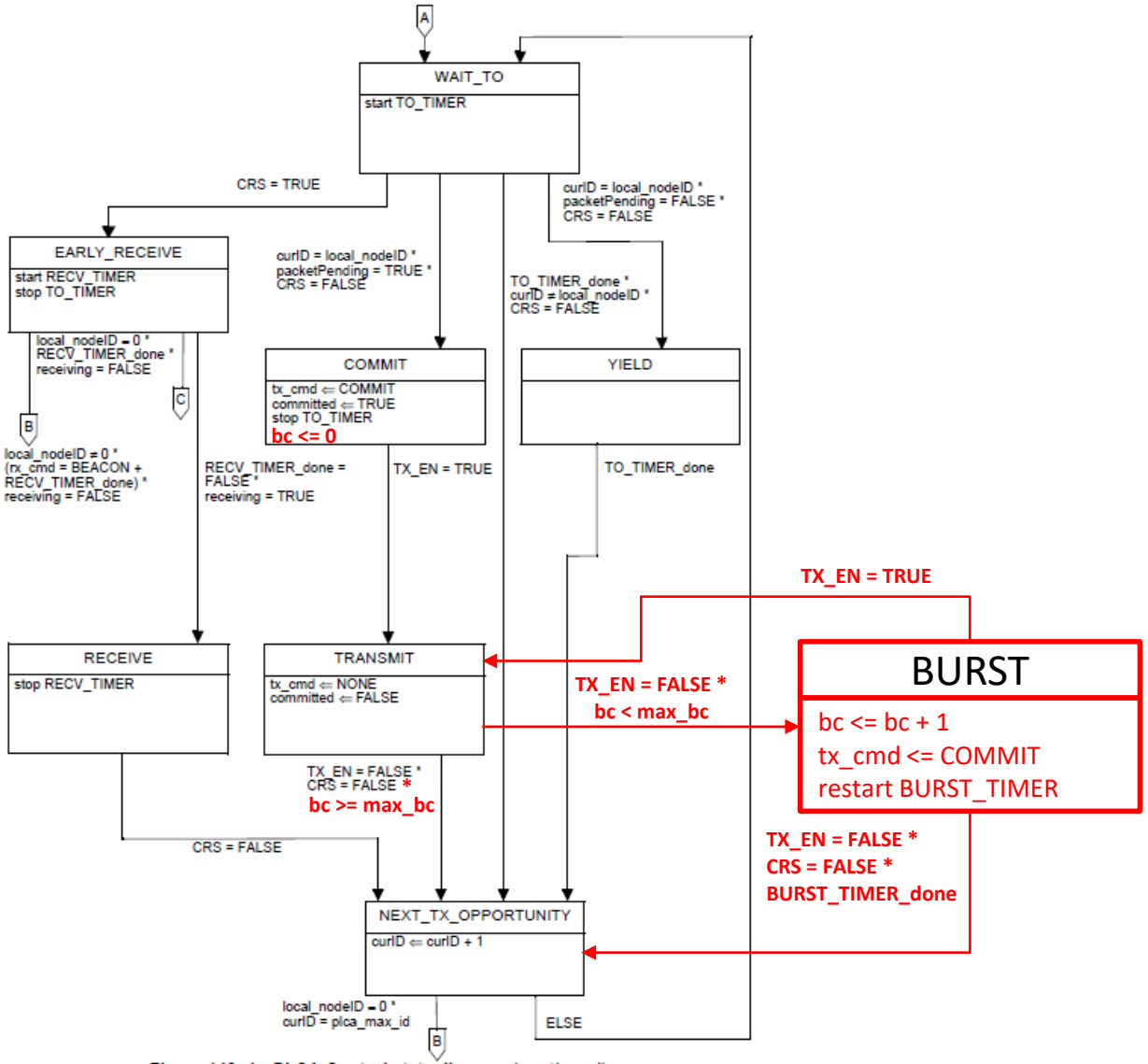


Figure 148–4—PLCA Control state diagram *(continued)*

- bc = counts the number of packets currently sent in a burst after the first transmission
  Value: integer from 0 to 255
- max_bc = maximum number of packet the node is allowed to transmit in a single burst after the first transmission. Set by management via MDIO register TBD.
  Value: integer from 0 to 255
- BURST_TIMER counts the time to wait for the MAC to send a new packet before yielding the transmit opportunity. This timer can be set via MDIO register TBD. For PLCA Burst mode to work properly this timer needs to be greater than one IPG period.

Caveats / Notes

- BURST_TIMER have to be set large enough to allow the local MAC to transmit a new packet
  - Assuming the MAC is capable of transmitting packets back-to-back, BURST_TIMER have to be at least 96 bits (one IPG at 10Mb/s operation) + some margin
  - BURST_TIMER needs not be configured equal across all nodes
  - Increasing BURST_TIMER relaxes time requirements on the MAC at the expense of throughput.
- Throughput is not significantly affected by burst mode
  - Worst case scenario is when the BUS is at max load, every node send the smallest allowed packet (72 bytes) and all are allowed to burst.
    - In this case the throughput penalty is one IPG per node.
      - That is, $1 - (72 * 8 + 96) / (72 * 8 + 96 * 2) = 12.5\ \%$

THANK YOU!