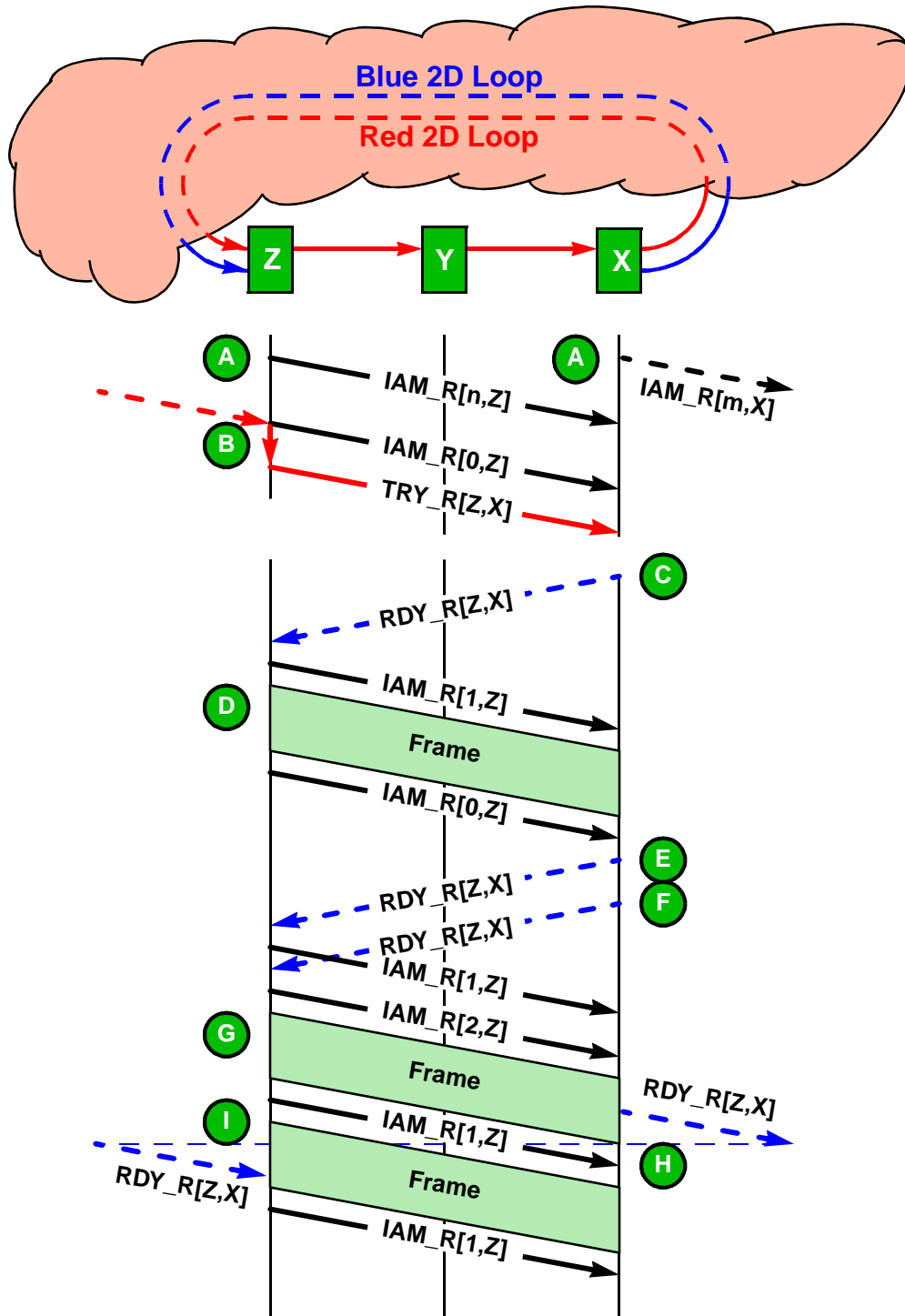# FC−AL−3

2D Loop
Link Level Flow Control

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FC–AL–3 – Link Level Flow Control
2D Loop Operation Scenario #1

Normal Link Level Flow Control on a 2D Loop

FC−AL−3 − Link Level Flow Control
2D Loop Operation Scenario #1

- **A** – The L_Ports 'Z' and 'X' on the red loop sends IAM_R[n,x] Primitive Signals as Fill Words
    - n = L_Port's current Transmitter Credit
    - x = L_Port's address (AL_PA)
  - ❏ The Observing L_Port 'Y' uses IDLE Primitive Signals as Fill Words

- **B** – L_Port 'Z' resets its Transmitter Credit when it receives a TRY_R[Z,X] Primitive Signal
    - X = 'New' Downstream neighbour for L_Port 'Z'
  - ❏ The TRY_R[Z,X] Primitive Signal is preceded by 12 IAM_R[0,X] Primitive Signals before it is forwarded on the Red Loop

- **C** – L_Port 'X' inserts a RDY_R[Z,X] Primitive Signal to transfer a single credit to L_Port 'Z'
  - ❏ This RDY_R[Z,X] Primitive Signal is routed along the shortest path from L_Port 'X' to L_Port 'Z'
  - ❏ L_Port 'Z' adjusts its IAM_R[1,Z] Fill Word reflecting the reception of the RDY_R[Z,X] Primitive Signal

- **D** – L_Port 'Z' transmits a Frame on the 'split' link between L_Port 'Z' and L_Port 'X'
  - ❏ Transmission of the Frame (SOF delimiter) consumes one credit
    - The loss of one credit is reflected in the modified IAM_R[0,Z] Fill Word used by L_Port 'Z'

FC−AL−3 − Link Level Flow Control
2D Loop Operation Scenario #1

- **E** – L_Port 'Z' transmits a RDY_R[Z,X] Primitive Signal to transfer credit to L_Port 'Z', reflected in the adjusted IAM_R[1,Z] Fill Word used by L_Port 'Z'

- **F** – L_Port 'Z' transmits a RDY_R[Z,X] Primitive Signal to transfer credit to L_Port 'Z', reflected in the adjusted IAM_R[2,Z] Fill Word used by L_Port 'Z'

- **G** – L_Port 'Z' transmits a Frame, consuming one credit, reflected in the adjusted IAM_R[1,Z] Fill Word used by L_Port 'Z'

- **H** – L_Port 'Z' transmits a RDY_R[Z,X] Primitive Signal to transfer credit to L_Port 'Z'

  ❑ The coincident transmission of a Frame while receiving a RDY_R[Z,X] Primitive Signal is reflected in the unchanged IAM_R[1,Z] Fill Word used by L_Port 'Z'

- **I** – L_Port 'Z' transmits a Frame, reflected in the adjusted IAM_R[1,Z] Fill Word used by L_Port 'Z'

  ❑ The coincident transmission of a Frame while receiving a RDY_R[Z,X] Primitive Signal is reflected in the unchanged IAM_R[1,Z] Fill Word used by L_Port 'Z'

FC−AL−3 − Link Level Flow Control
Rules − Summary

☯ An L_Port resets its Transmitter Credit when

❑ It receives a TRY_x[Z,X] Primitive Signal of the correct colour, but only if Z = 'the L_Port's AL_PA' and X = 'a new downstream neighbouring L_Port'

↳ The colour is correct if a TRY_R[Z,X] Primitive Signal is received for a L_Port on the red loop

↳ The colour is correct if a TRY_B[Z,X] Primitive Signal is received for a L_Port on the blue loop

❑ It receives a RDY_x[Z,X] Primitive Signal of the correct colour if Z = 'the L_Port's AL_PA' and X = 'an unexpected L_Port'

↳ The colour is correct if a RDY_R[Z,X] Primitive Signal is received for a L_Port on the red loop

↳ The colour is correct if a RDY_B[Z,X] Primitive Signal is received for a L_Port on the blue loop

☯ Transmission of a Class 2 or 3 Frame (SOF delimiter) shall consume one Transmitter Credit

❑ Only L_Port's in the 2D state shall transmit Frame under Transmitter Credit flow control rules

↳ An L_Port in the Joining state shall follow Transmitter Credit rules, once it starts to send IAM Fill Words, having inherited its upstream neighbouring L_Port's Transmitter Credit
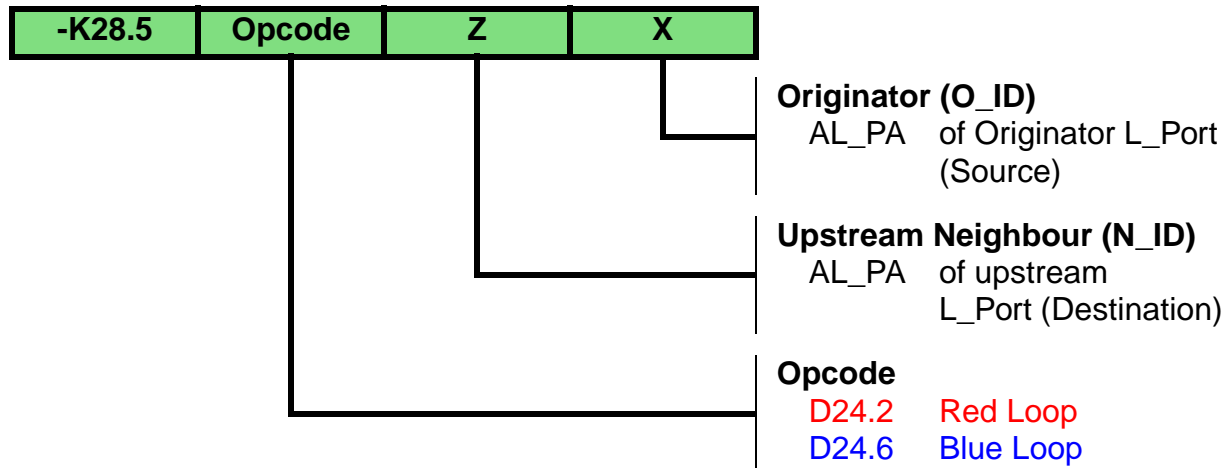
FC−AL−3 − Link Level Flow Control
Rules – Summary

- ☯ Reception of a RDY_x[Z,X] Primitive Signal of the correct colour shall increase the L_Ports Transmitter Credit if Z = 'the L_Port's AL_PA' and X = 'the downstream neighbouring L_Port's AL_PA'

  - ↳ Transmitter Credit shall be limited to a maximum value of 3

    - ✳ RDY_x[Z,X] Primitive Signals received in excess shall be discarded, without affecting the value of the L_Port's Transmitter Credit

    - ✳ An L_Port's current Transmitter Credit is displayed in every IAM Fill Word sent by the L_Port

    - ✳ L_Port's are expected to limit Transmitter Credit to a value of 1

  - ↳ The colour is correct if a RDY_R[Z,X] Primitive Signal is received for a L_Port on the red loop

  - ↳ The colour is correct if a RDY_B[Z,X] Primitive Signal is received for a L_Port on the blue loop

- ☯ Transmission of a RDY_x[Z,X] Primitive Signal shall, for dual ported entities, be made on the port closest to the destination ('Z')

- ☯ Dual ported entities shall accept RDY_x[Z,X] Primitive Signal received on either port

- ☯ Transmission (forwarding) of Primitive Signals takes precedent (priority) over Frame transmission, so any RDY_x[Z,X] Primitive Signal not reflected in the IAM Fill Word is considered lost after 20 ms and shall be re-inserted by the originating L_Port ('X')

  - ❑ 20 ms > 126*(LinkLatency$_{max}$ + FrameLatency$_{max}$)

FC−AL−3 − Link Level Flow Control
New Primitive Signals

☯ Ready (RDY) Primitive Signal

-K28.5	Opcode	Z	X

Originator (O_ID)
   AL_PA of Originator L_Port
             (Source)

Upstream Neighbour (N_ID)
   AL_PA of upstream
             L_Port (Destination)

Opcode
   D24.2   Red Loop
   D24.6   Blue Loop

❑ Passes Link level credit (BB_Credit) from a receiver (X) to a transmitter (Z)
(Routed from source to destination)

  ↳ An L_Port 'X' inserts a RDY_x[Z,X] when it is able to receive a full size Frame from its upstream neighbouring L_Port 'Z'

    ❋ Z = L_Port receiving credit, the destination of the RDY_x[Z,X] Primitive Signal

    ❋ X = L_Port issuing credit, the source of the RDY_x[Z,X] Primitive Signal

    ❋ RDY_R[Z,X] shall be used to transfer credit on the red loop

    ❋ RDY_B[Z,X] shall be used to transfer credit on the blue loop