Proposal for Downstream MPRS

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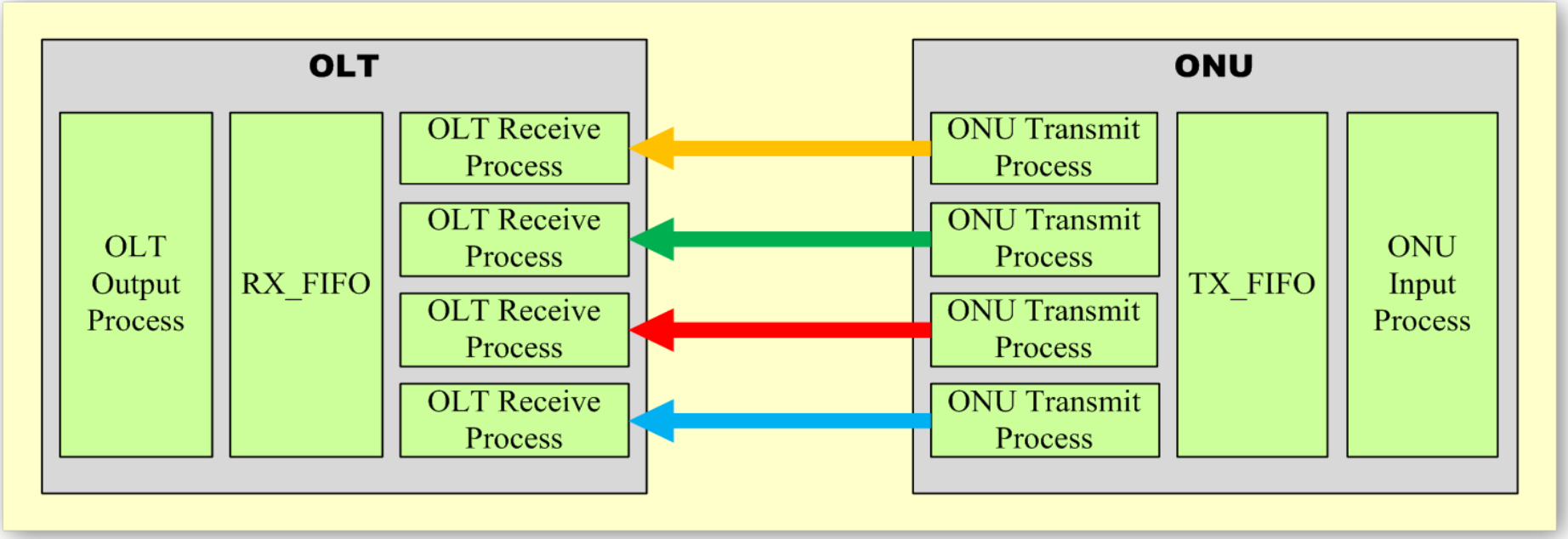
Multi-Point Reconciliation Sublayer

- Upstream MPRS was reviewed over several meeting cycles
- Was accepted in San Antonio
  - ONU state diagrams (see motion #4)
    - Input Process
    - Transmit Process
  - OLT state diagrams (see motion #5)
    - Receive Process
    - Output Process



Key MPRS Advantages

#1: MPRS provides a transparent bit transport mechanism.

- MPRS takes bits from a transmitting MAC and delivers them in the same order and without modification or interpretation to the receiving MAC.
- MPRS doesn't care if MAC sends any data or just idles.
- MPRS doesn't care in what format the data arrives from the MAC.
- MPRS does not care how large the frames are or how the frames are aligned to 25GMII lanes (/S/ can be at octet 0 or octet 4).

Key MPRS Advantages

#2: No unwanted inter-layer dependencies

- MPRS is self-contained.
  - Completely encapsulates and hides forming the envelopes, envelope alignment, and skew recovery
- MPRS eliminates the need for the MPCP to be in the data path.
  - In 10G_EPON, the MPCP is in the data path to check if next data frame fits in the grant
- MPRS eliminates the need for the MPCP to emulate the PHY.
  - In 10G-EPON, the MPCP emulates PHY to predict when the channel becomes available and when the parity is inserted

Key MPRS Advantages

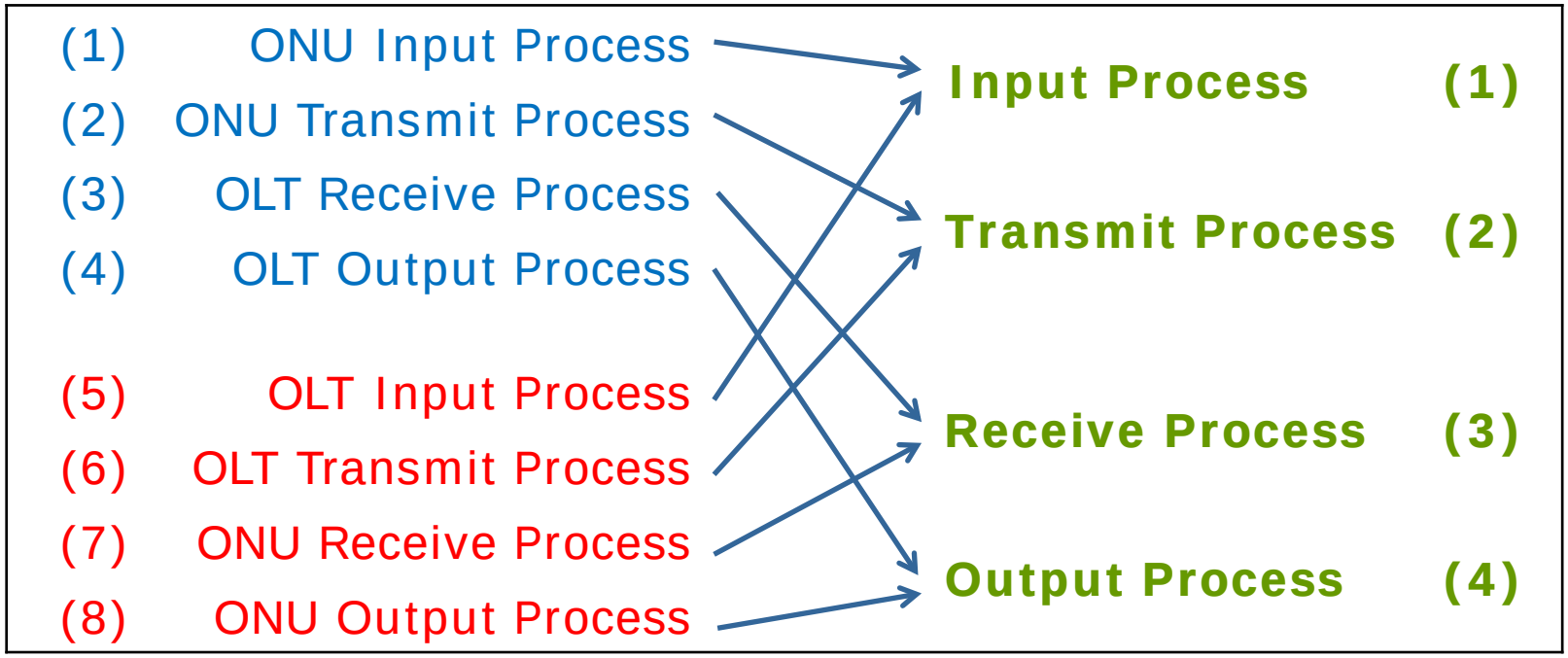
#3: MPRS is direction-agnostic

- At the last meeting, the MPRS state diagrams were accepted for the upstream direction.
- There is nothing in these state diagrams that makes them upstream-only.

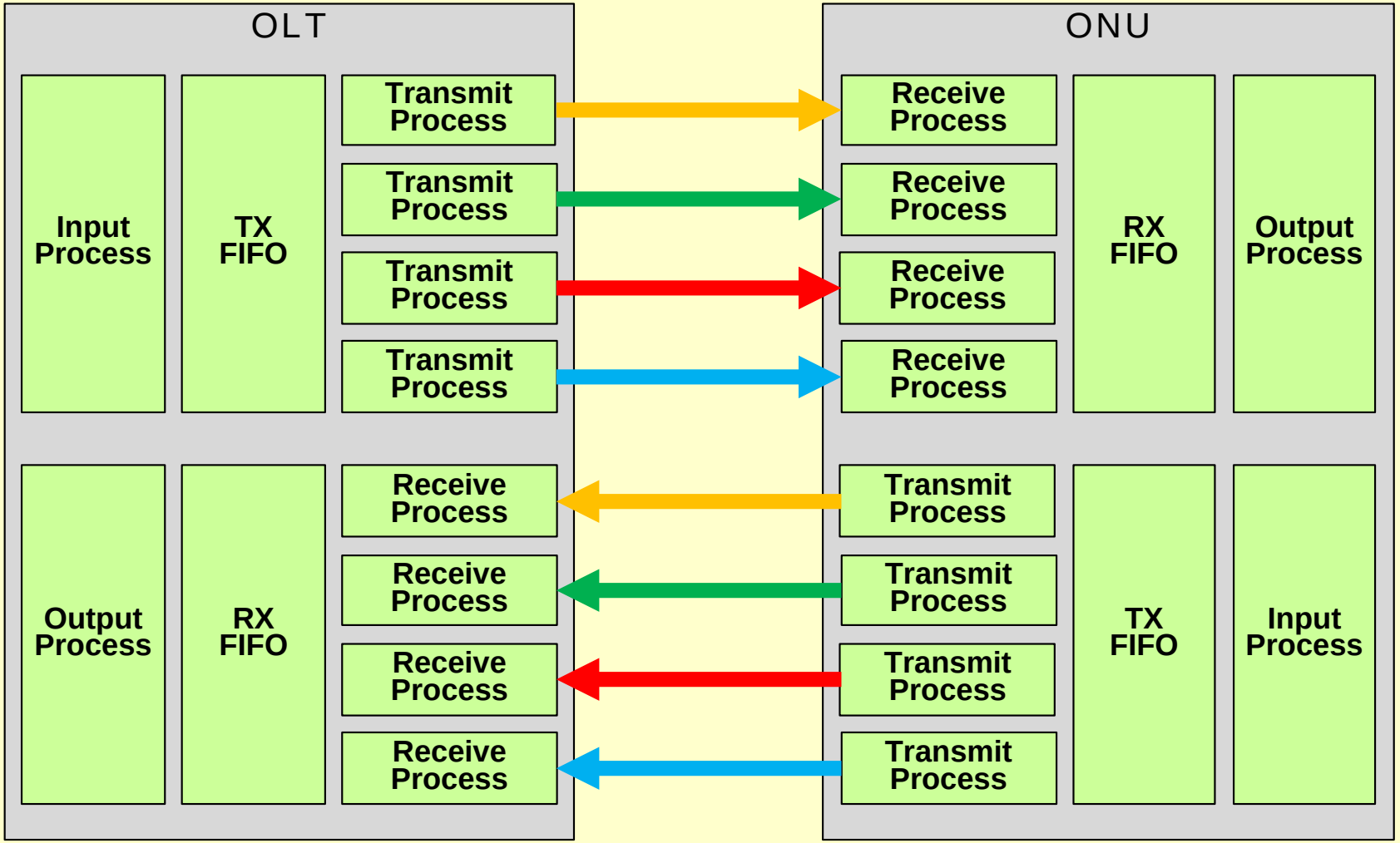
Downstream MPRS Proposal

- **Use the same state diagrams as defined for the upstream for the downstream direction**

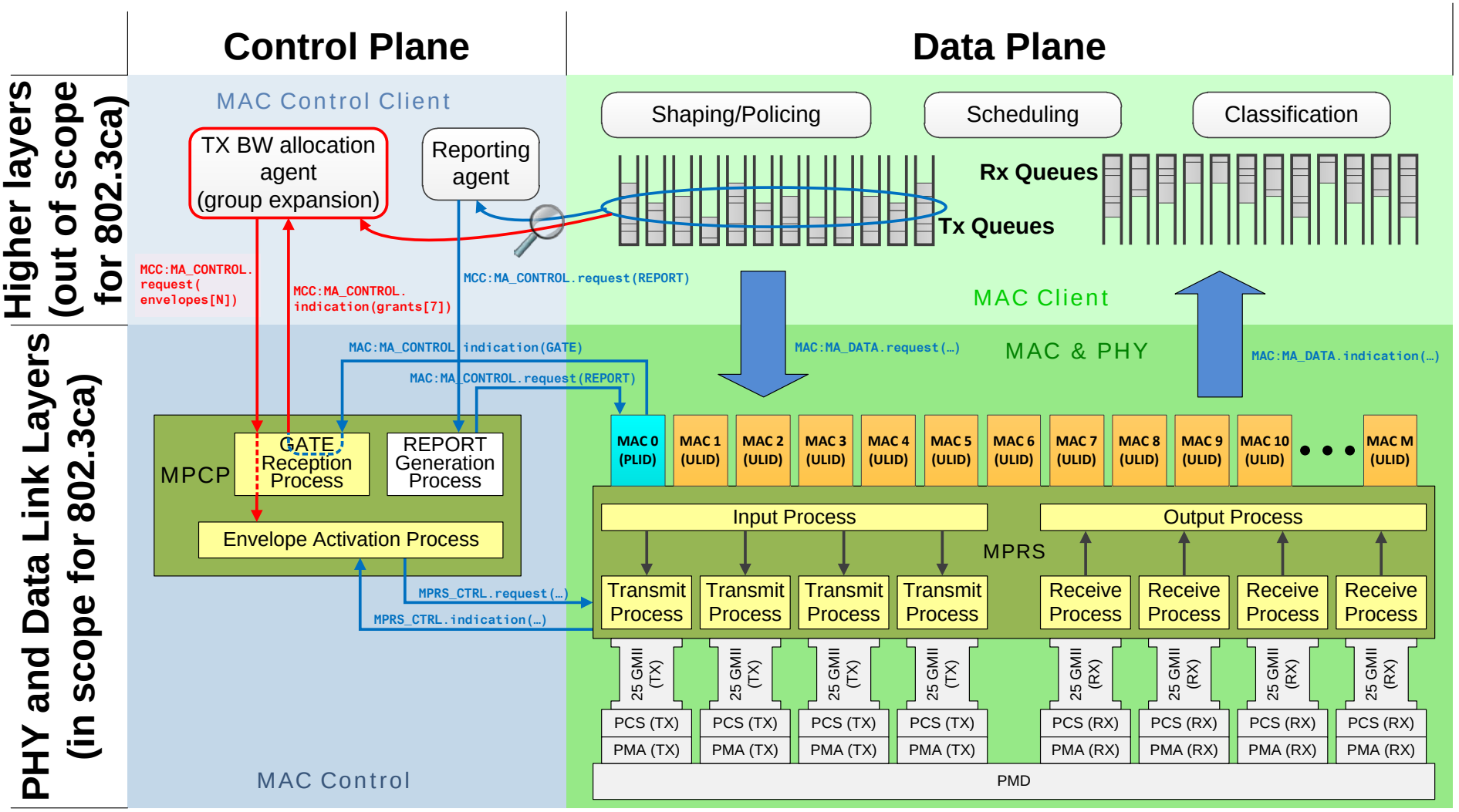
- Instead of defining 8 processes, we only need to define 4 (which we have done already)



MPRS is Symmetric

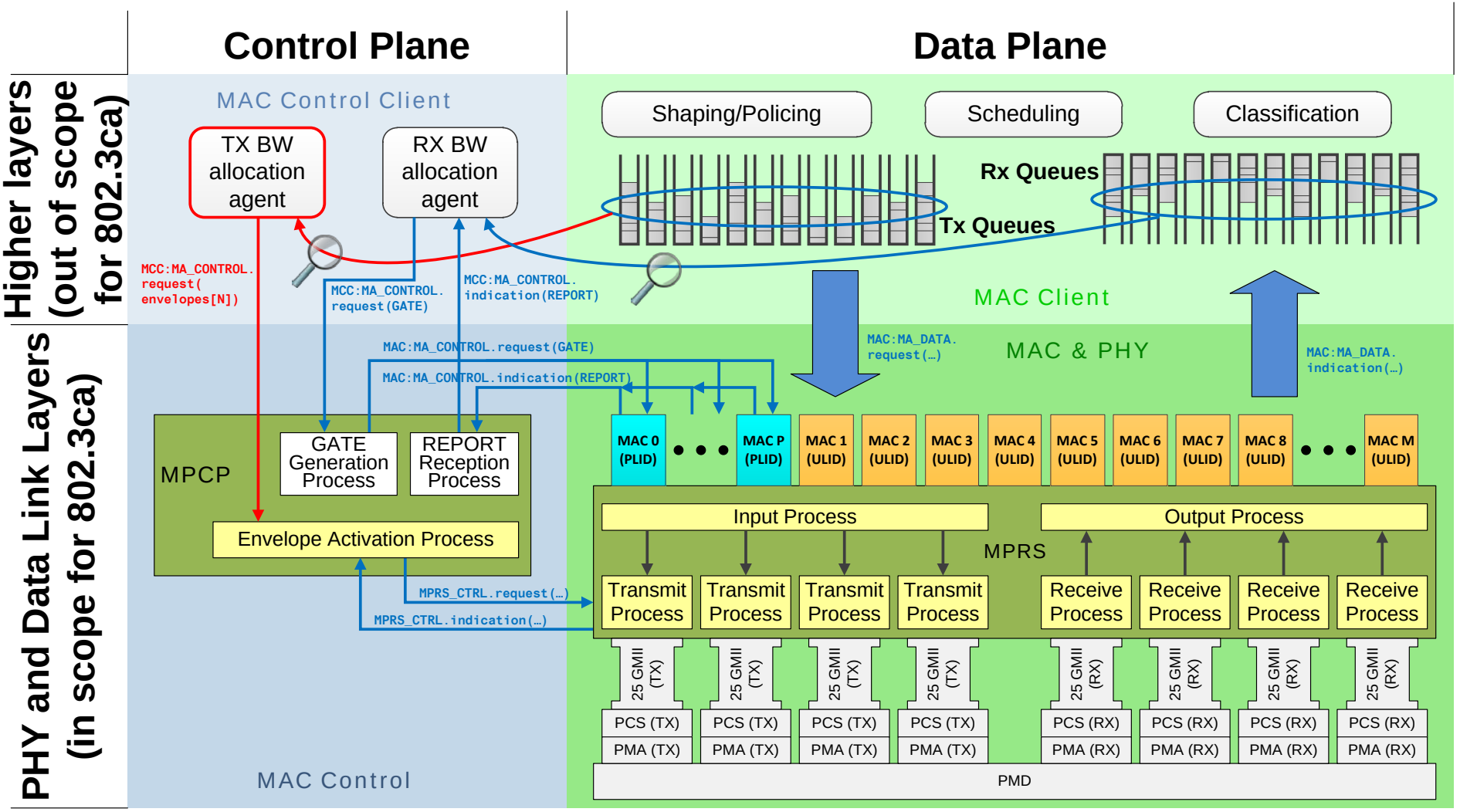


ONU Functional Map



- Yellow boxes are done

OLT Functional Map



- Yellow boxes are done – same as in ONU

Upstream vs. Downstream

- The difference between the upstream and downstream directions is only in how the envelopes are scheduled. The envelope-scheduling decision is confined to the **MAC Control Client** (specifically, the **TX BW allocation agent**)

- Input and output of TX BW Allocation Agent:

	ONU	OLT
Input	❑ Channel availability per LLID (received in the GATE message) ❑ In case of group granting (GLID): ▪ Preconfigured weights/QoS parameters ▪ Queue state of different LLIDs	❑ Channel availability per LLID (known via NMS) ❑ Preconfigured weights/QoS parameters ❑ Queue state of different LLIDs (same as in the case of group granting at the ONU)
Output	❑ Set of envelope descriptors for individual LLIDs	❑ Set of envelope descriptors for individual LLIDs

OLT's MAC Control Client

- MAC Control Client at the OLT has all the information necessary to schedule downstream envelopes.
  - QoS associated with each LLID
  - Queue state of each LLID
  - Number of channels/wavelengths available to each ONU (may change dynamically)
- If many queues have a single frame waiting in them, the MAC Control Client will issue envelopes that match individual frame size, thus sending one frame per envelope.
- If queues grow larger, the MAC Control Client may schedule larger envelopes that include multiple frames, or it may still decide to send one frame per envelope.
- In all cases, since the MAC Control Client also has the visibility into the data queues, it can always schedule envelopes matching the frame boundaries, so that the ONUs do not need to have the reassembly buffers.

Conclusion

- **MPRS is done!**
  - Upstream MPRS state diagrams are already defined
  - Upstream MPRS state diagrams are also applicable to the downstream
    - Nothing needs to be added
    - Nothing can be removed
- **Future MPRS refinements**
  - If we need any, apply to both upstream and downstream
  - Any increase in complexity should be carefully weighted against the expected benefits
- **MAC Control Client is outside the scope of 802.3.**
  - Do we need to standardize the MAC Control Client anywhere else?

Layer Diagrams and Interfaces

(Contribution to .3ca draft)

Layering Diagram

- 100G-EPON layering diagram
- Compare to 10G-EPON

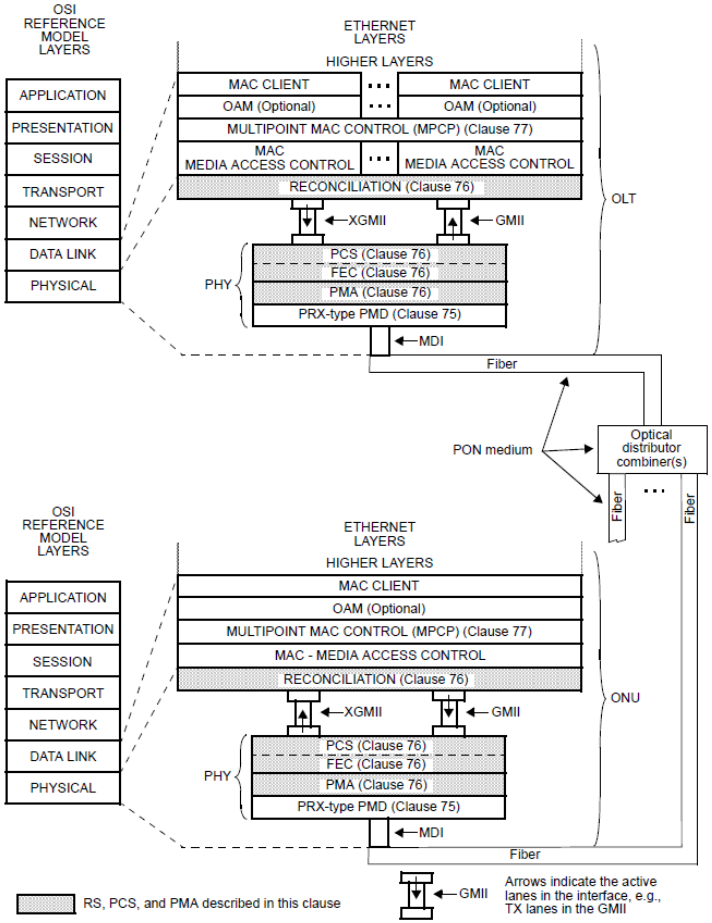
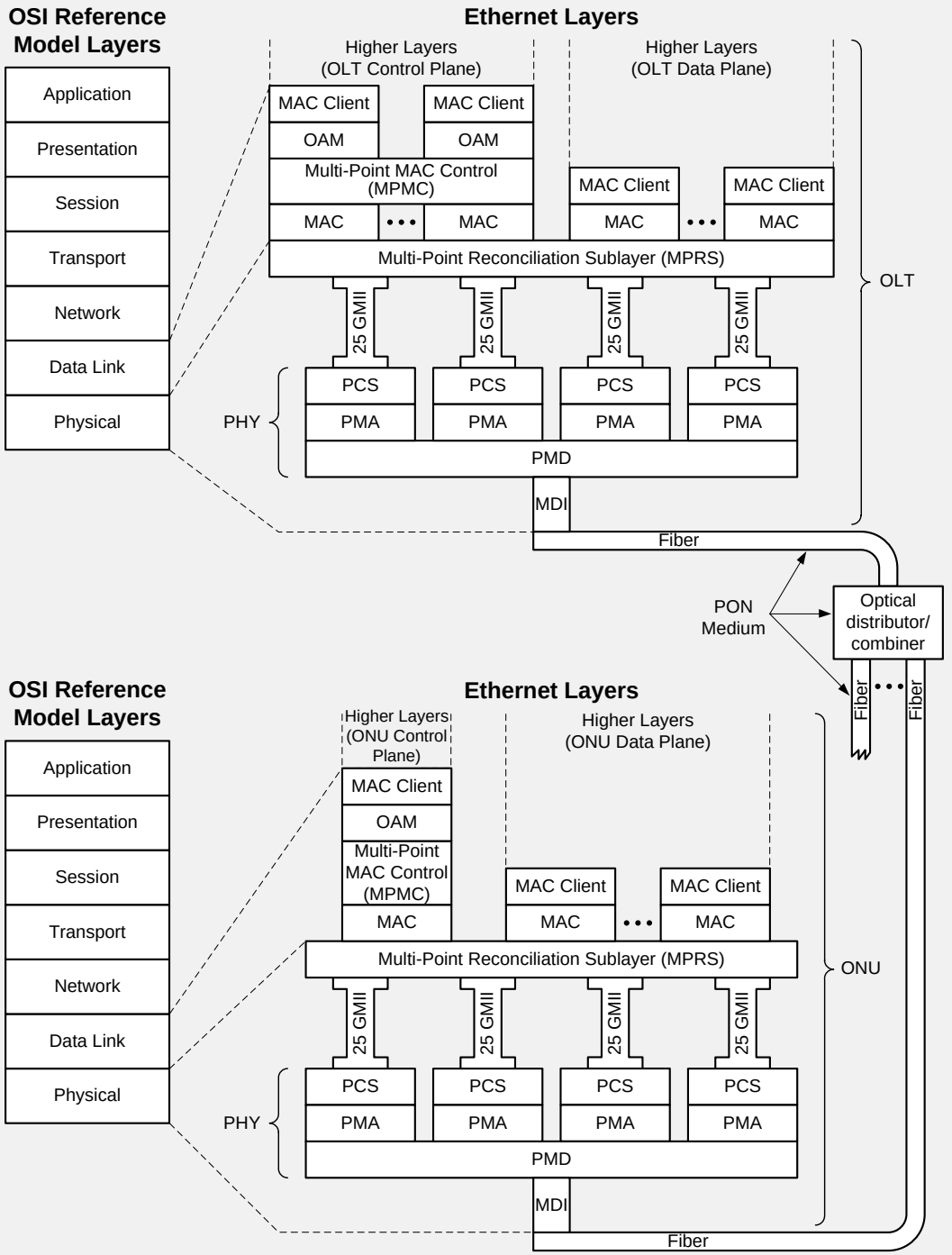


Figure 76–2—Relationship of 10/1G-EPON P2MP RS, PCS, and PMA to the ISO/IEC OSI reference model and the IEEE 802.3 Ethernet model



MPRS Interfaces

- Compare to 10Gb/s P2P RS

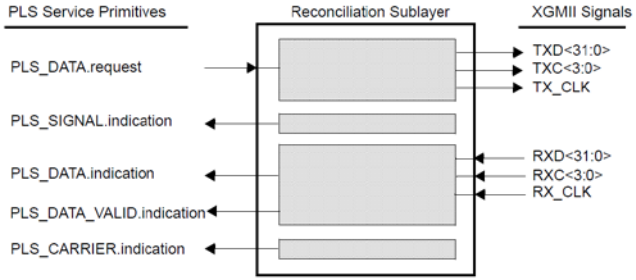


Figure 46–2—Reconciliation Sublayer (RS) inputs and outputs

- Compare to 10/1G-EPON RS

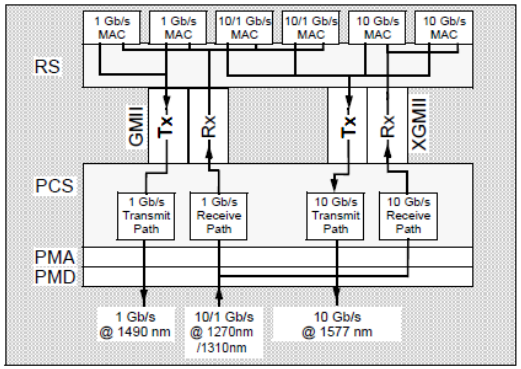


Figure 76–4—PCS and Reconciliation Sublayer for dual rate mode at OLT

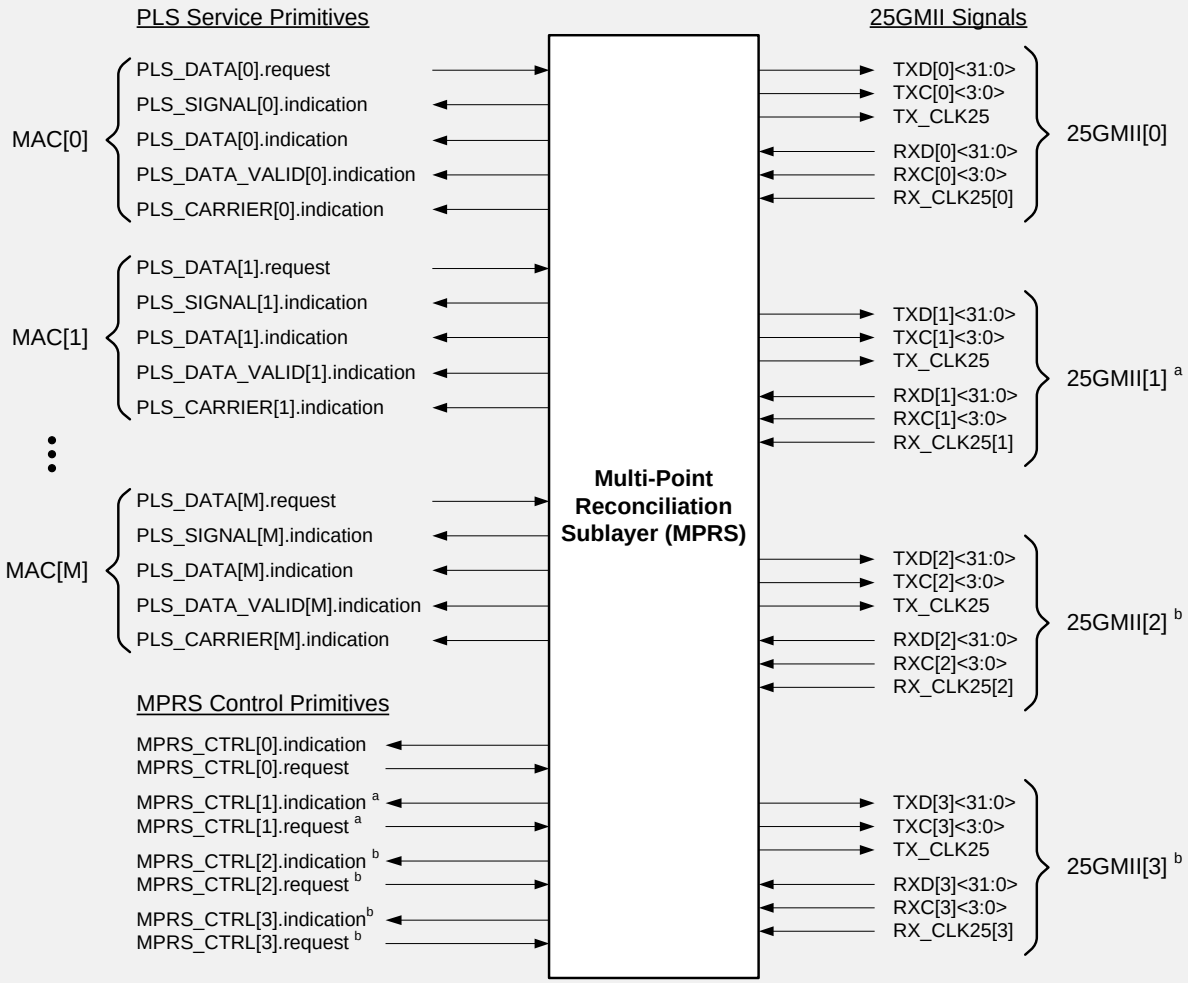


Figure 202-xx: Multi-Point Reconciliation Sublayer (MPRS) inputs and outputs

Thank You