

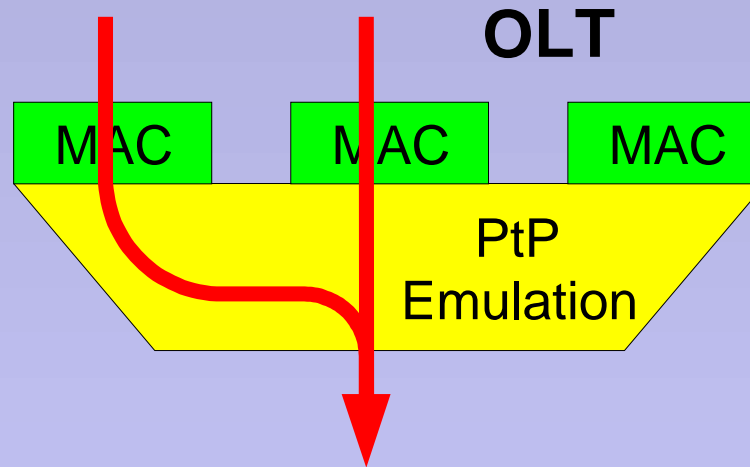
MPCP Layering Considerations

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Emulation in RS Layer



- ❑ Emulation layer must be able to multiplex data frames for downstream transmission
- ❑ Concurrent frames from multiple MAC ports
- ❑ Overall bandwidth may exceed line bandwidth

Issues with Emulation in RS Layer

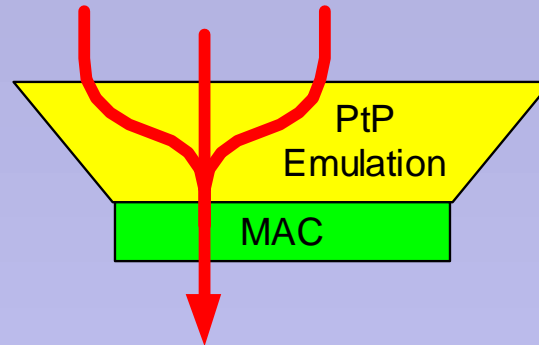
□ Multiplexing requires:

- Buffering \Rightarrow delay is not constant
 - May affect MPCP synchronization
 - Buffers may overflow
 - Backpressure is required
- Intelligent discarding \Rightarrow
 - RS layer must be SLA-aware to drop frame based on user's bandwidth usage (**layer violation**)
 - RS layer must look inside L2 header to drop lower-priority frame (**layer violation**)

□ Error Counters are in MAC \Rightarrow

- Frame Discarding below MAC impacts BER
- BER becomes load-dependant (higher load = drop more frames)

Emulation in MAC-Ctrl Layer



- Solves the problems with buffering and L2 lookup (OK to do above MAC)

- Can intelligently discard frames

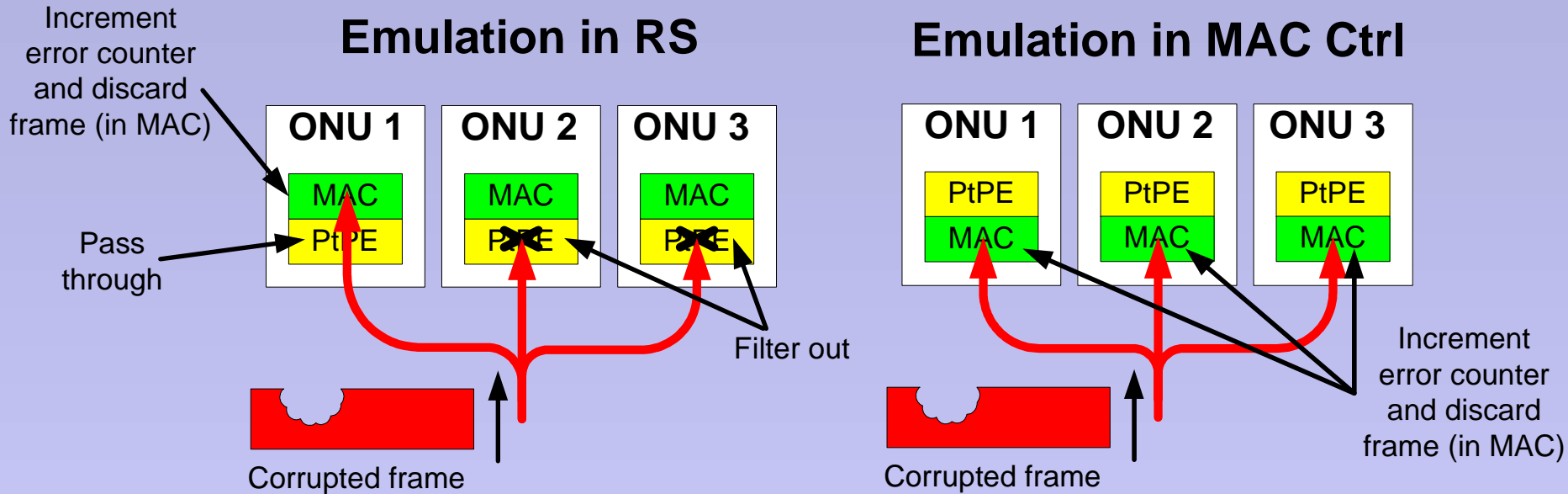
But ...

- **MAC needs to be modified to pass PHY-ID through** (MAC-address-based filtering does not work)

- Pause support is not possible

- Also link management functions don't work (see next slide)

Issues with Emulation in MAC-Ctrl



Frame is filtered below MAC

Frame is filtered above MAC

Corrupted frame increments error counter in **only one** MAC at the receiving end of virtual PtP link

Corrupted frame increments error counter in **every** ONU's MAC

Invalidates link management

Neither Approach Works

	Layering	Link Management
Emulation in RS layer	Violation	OK
Emulation in MAC Ctrl Layer	OK	Violation

What is the solution? Split functionality into two layers

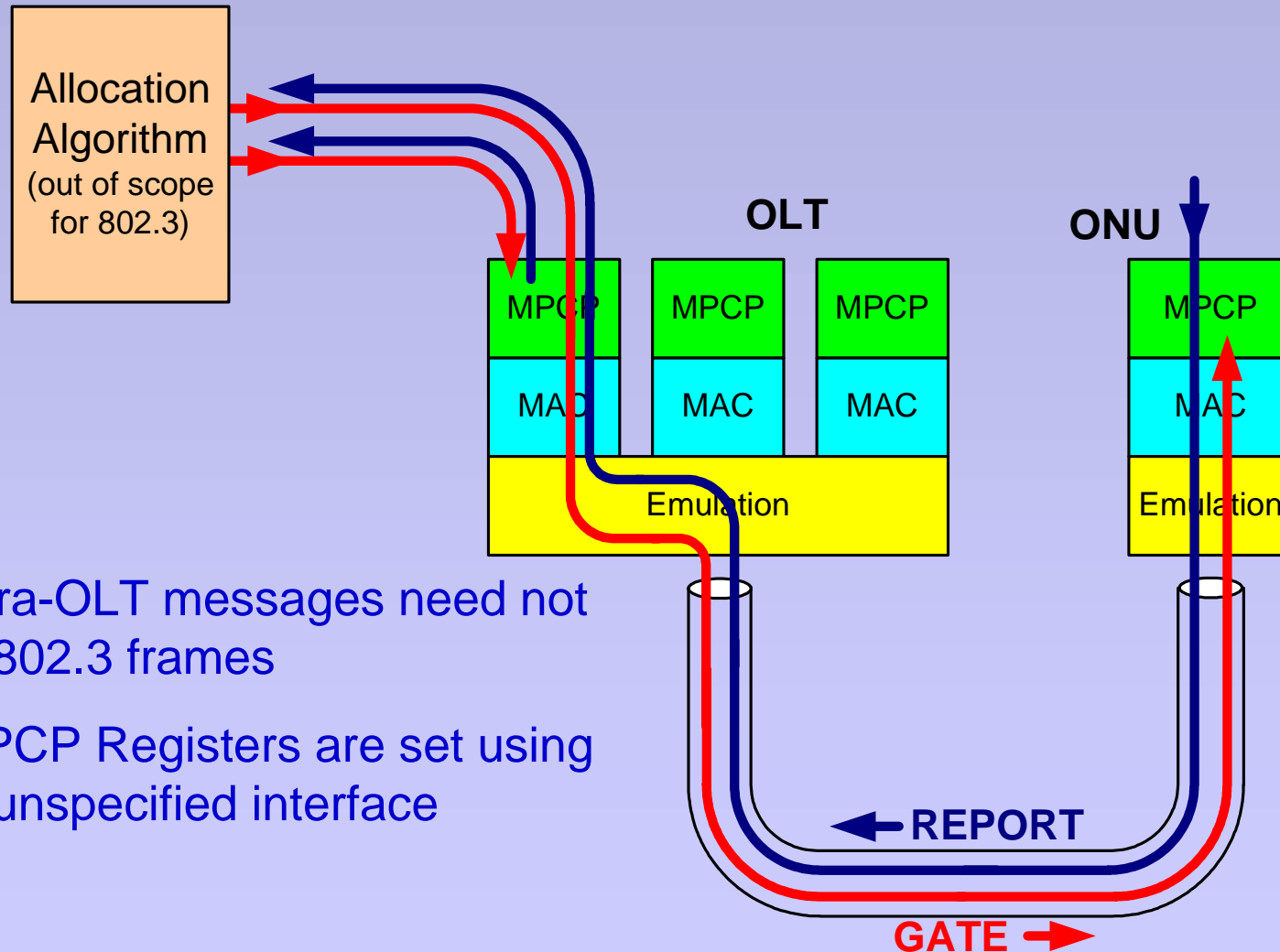
Solution

- ❑ **Keep filtering (emulation) below MAC**
- ❑ **Reduce below-MAC multiplexing to simple OR function**
- ❑ **Guarantee that there is no concurrent frames in emulation layer**

How?

- ❑ **Currently MPCP controls access to the medium from tail end**
- ❑ **Extend MPCP to control access to the medium from the head end**

MPCP Control Message Flow



- Intra-OLT messages need not be 802.3 frames
- MPCP Registers are set using an unspecified interface

Conclusion

1. **Downstream multiplexing performed by gating (serializing) downstream transmissions from different ports**
2. **Same mechanisms used in OLT and ONU**
3. **Currently MPCP allows BE bandwidth control for upstream only. User paying for 10 Mbps may get almost 1 Gbps downstream**
4. **Gating OLT's transmission will allow bandwidth control for downstream**
5. **Gating OLT's transmission allows very simple emulation layer in RS**