802.3cg Supporting QoS on PLCA: A Problem Statement

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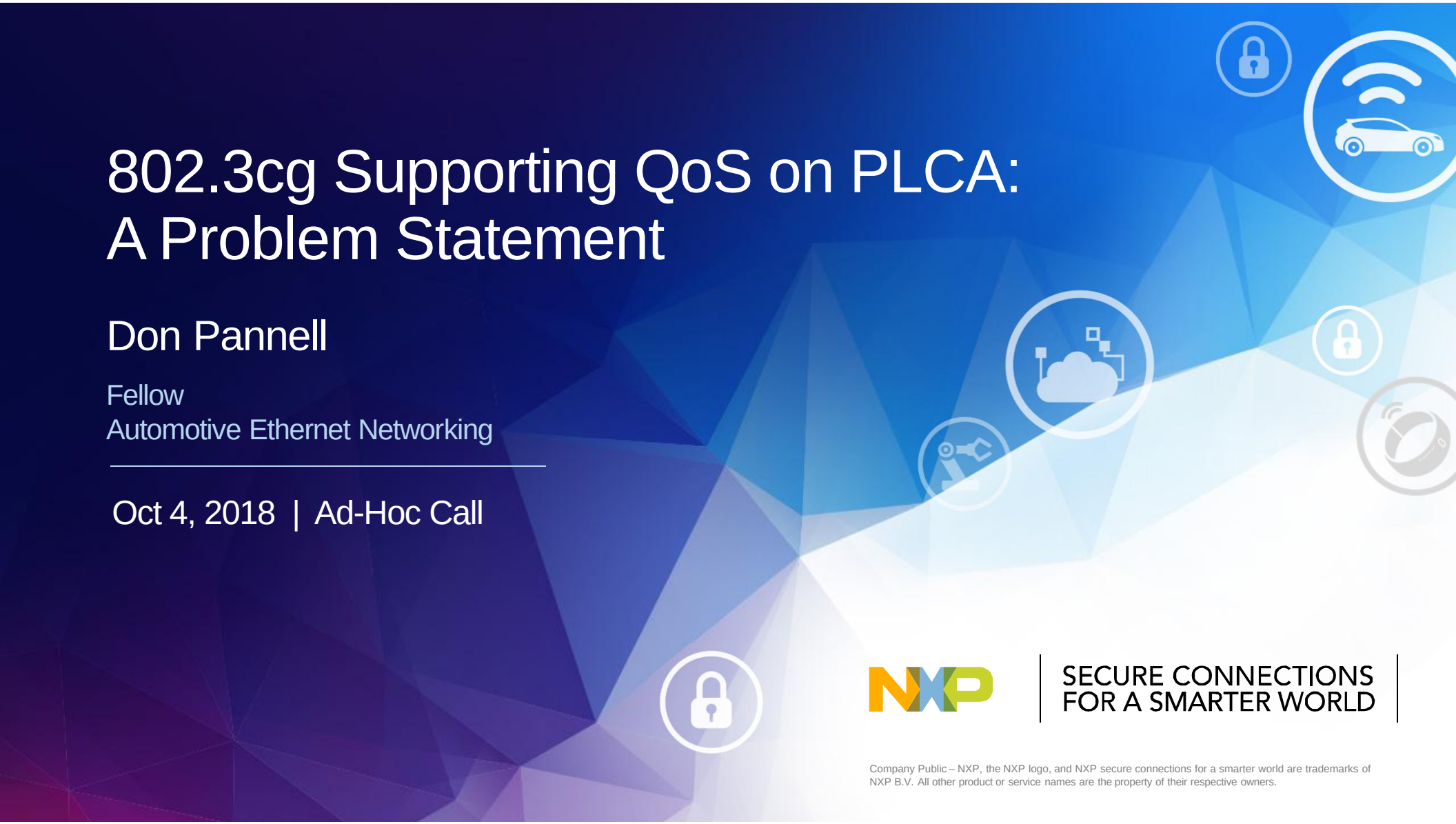
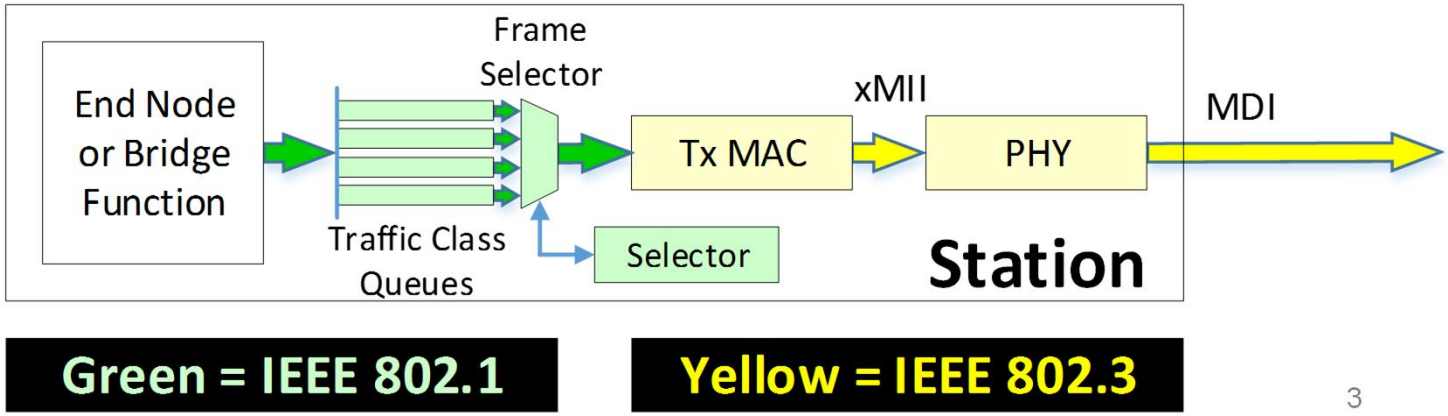


SECURE CONNECTIONS FOR A SMARTER WORLD

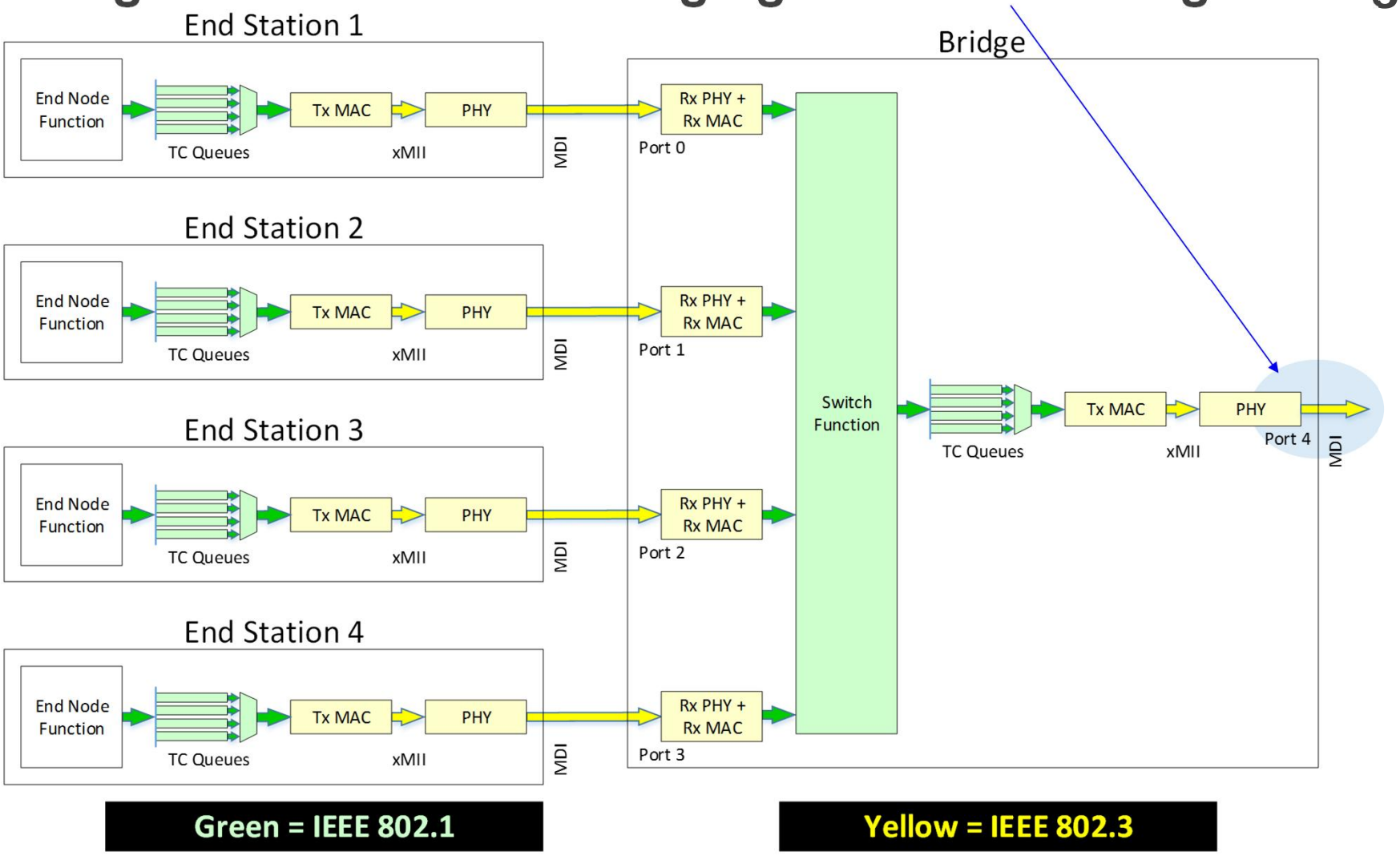
802.1 TSN Group’s view of QoS & How Today’s Shared Media Looks

The TSN Transmit Architecture

- The 802.1 Transmit View:
  - Stations have 1 or more transmit Traffic Class Queues
  - In TSN, these Queues are used to separate the various traffic types in order to support the differentiated services that each traffic type needs
  - The Selector knows what Queues have frames to transmit & the “Queue’s configured traffic type”, and based on this, selects the next frame to transmit
    - Various Selector algorithms are supported in 802.1 to support the various traffic types
  - Normally this next frame is released to the Tx MAC right away



Extending this to 4 Stations merging to 1 Link – Using a Bridge



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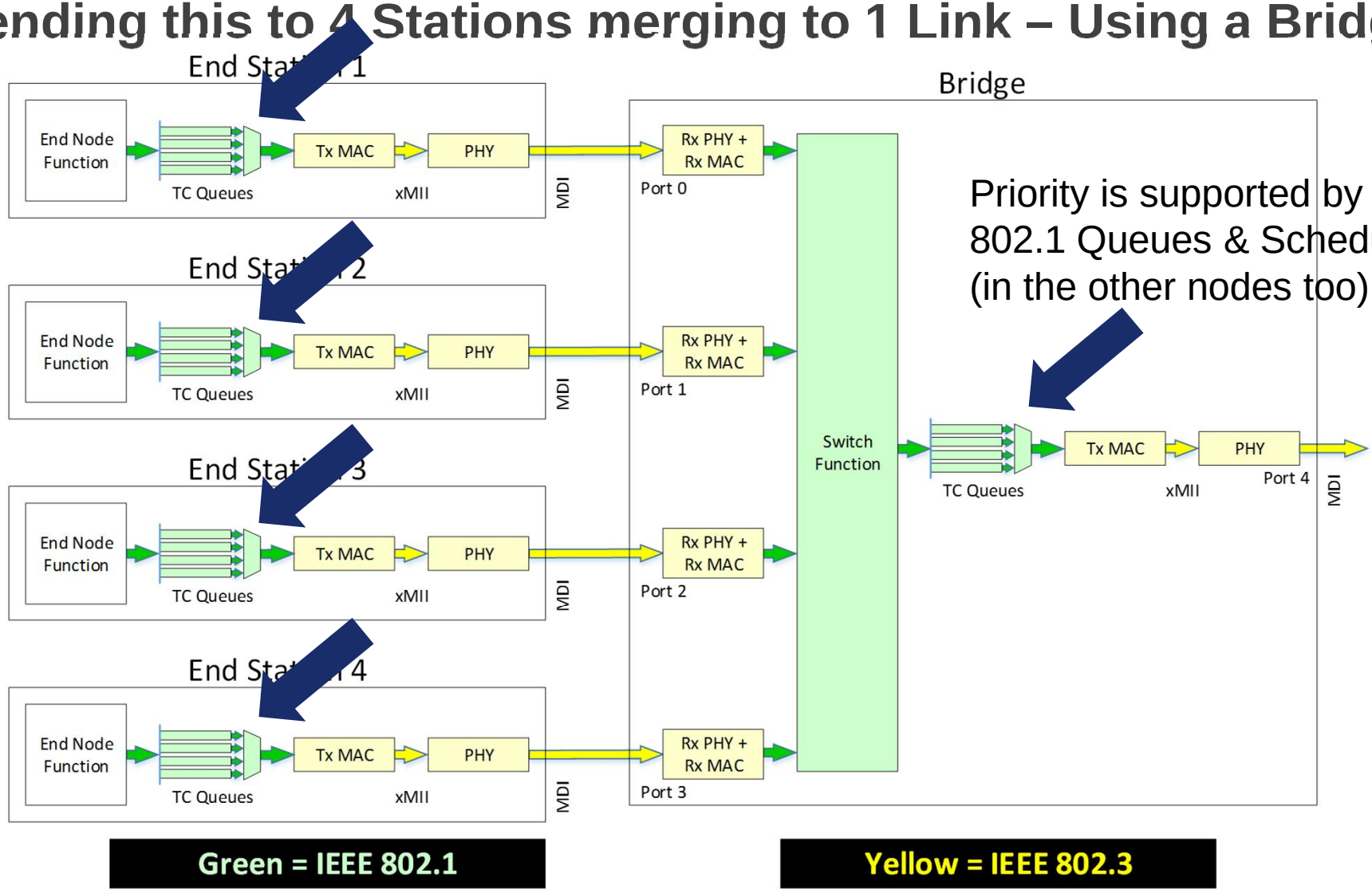
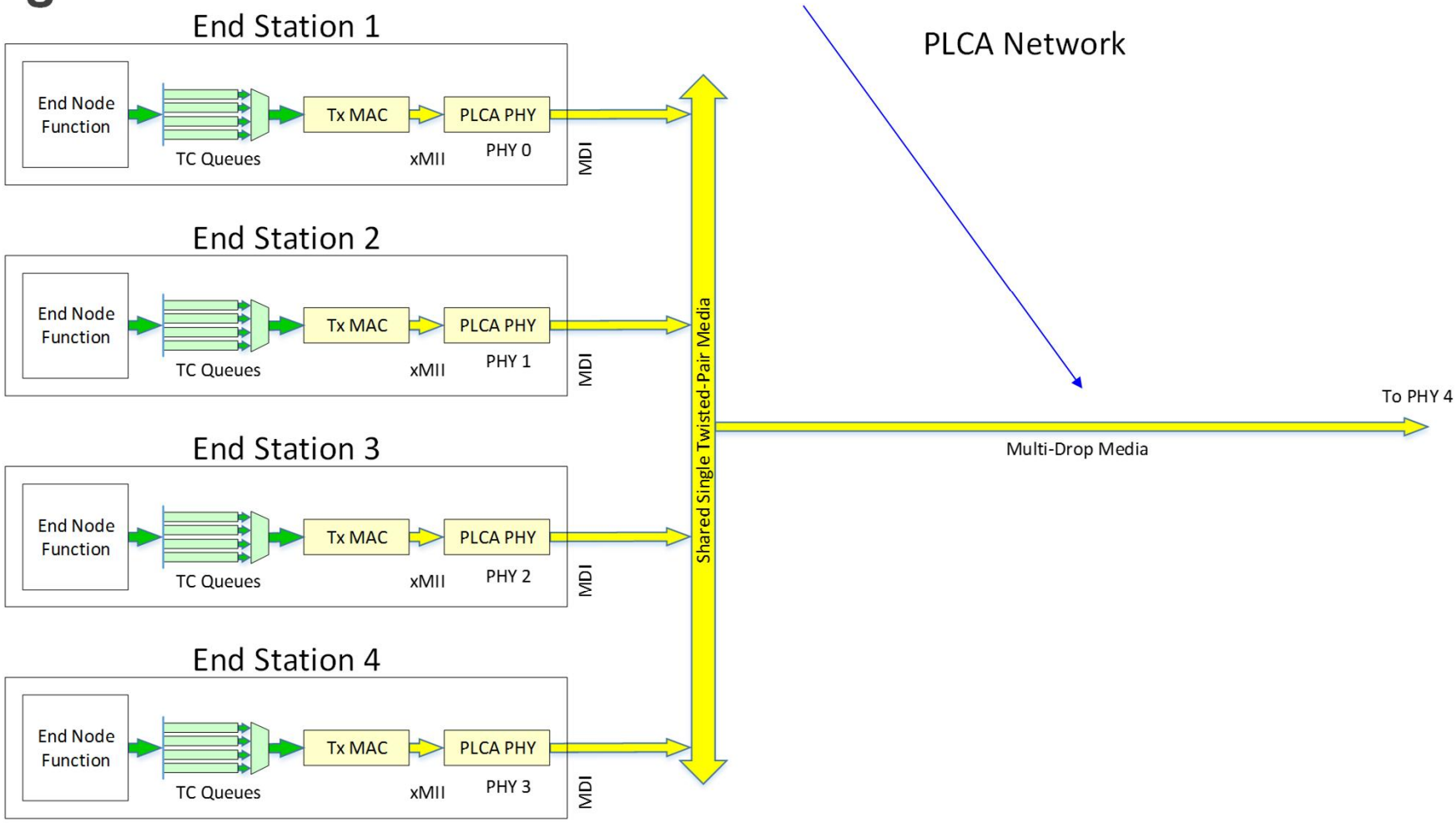


Change the 4 End Stations to 1 Link to Now Use PLCA



Green = IEEE 802.1

Yellow = IEEE 802.3

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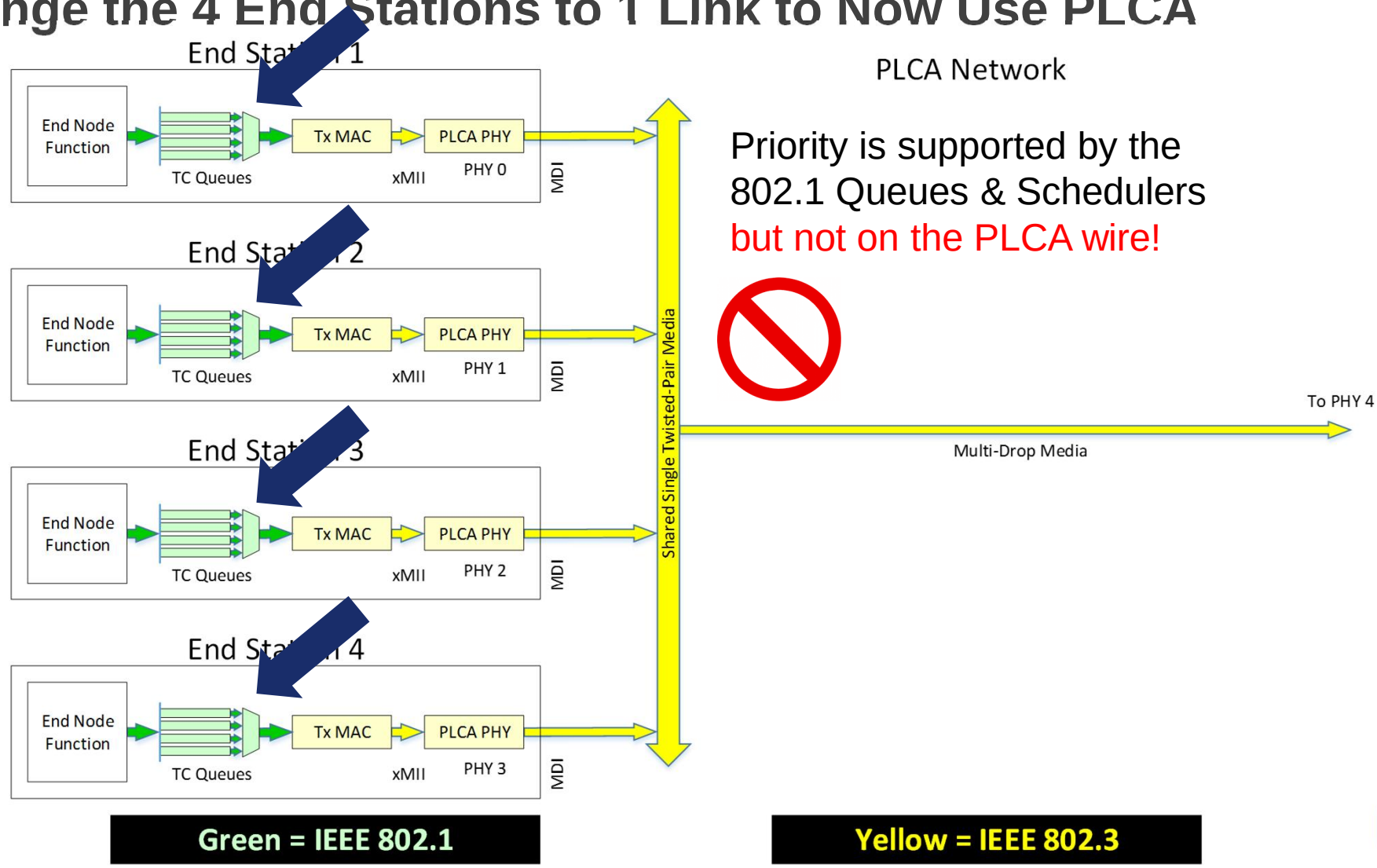

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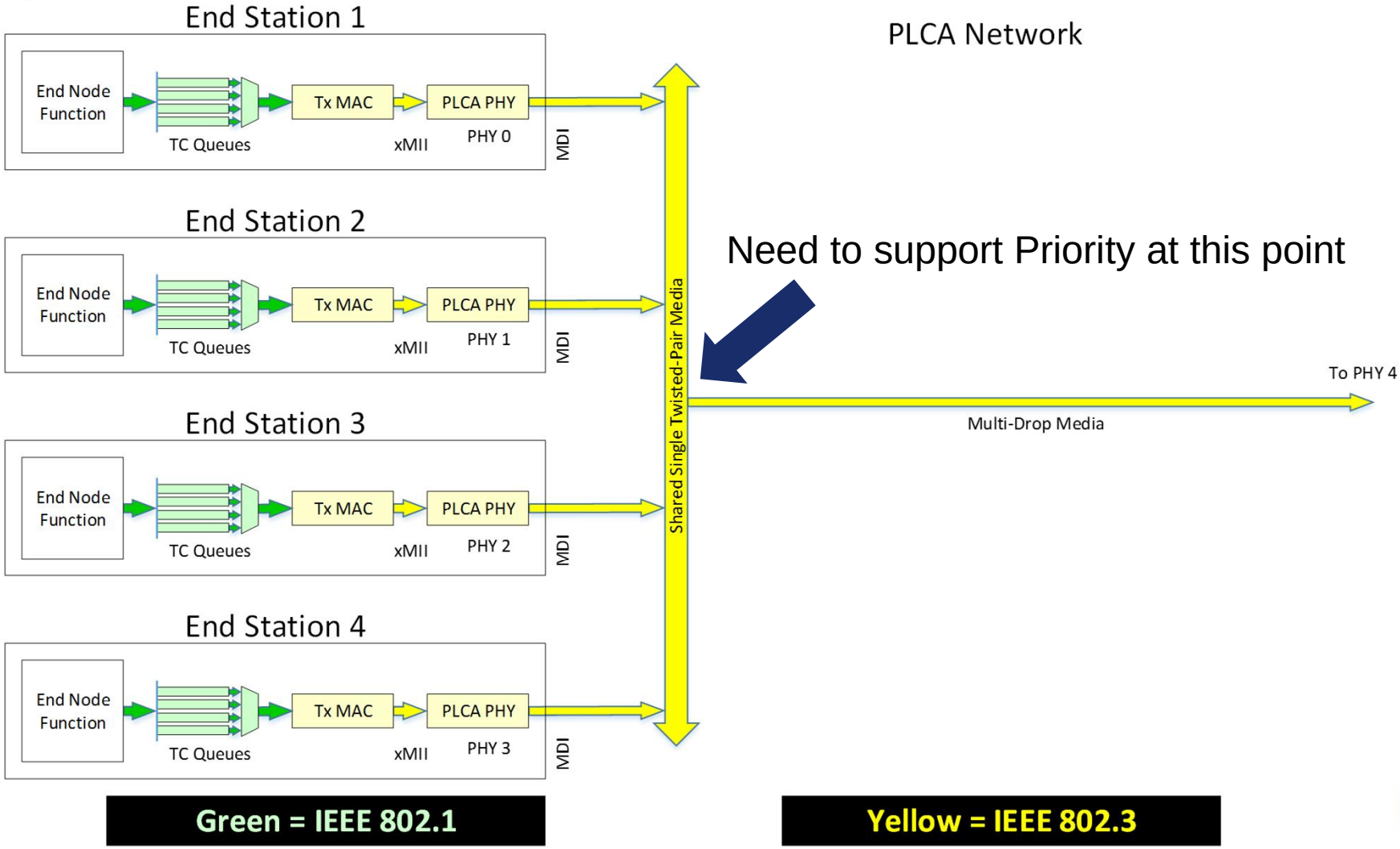
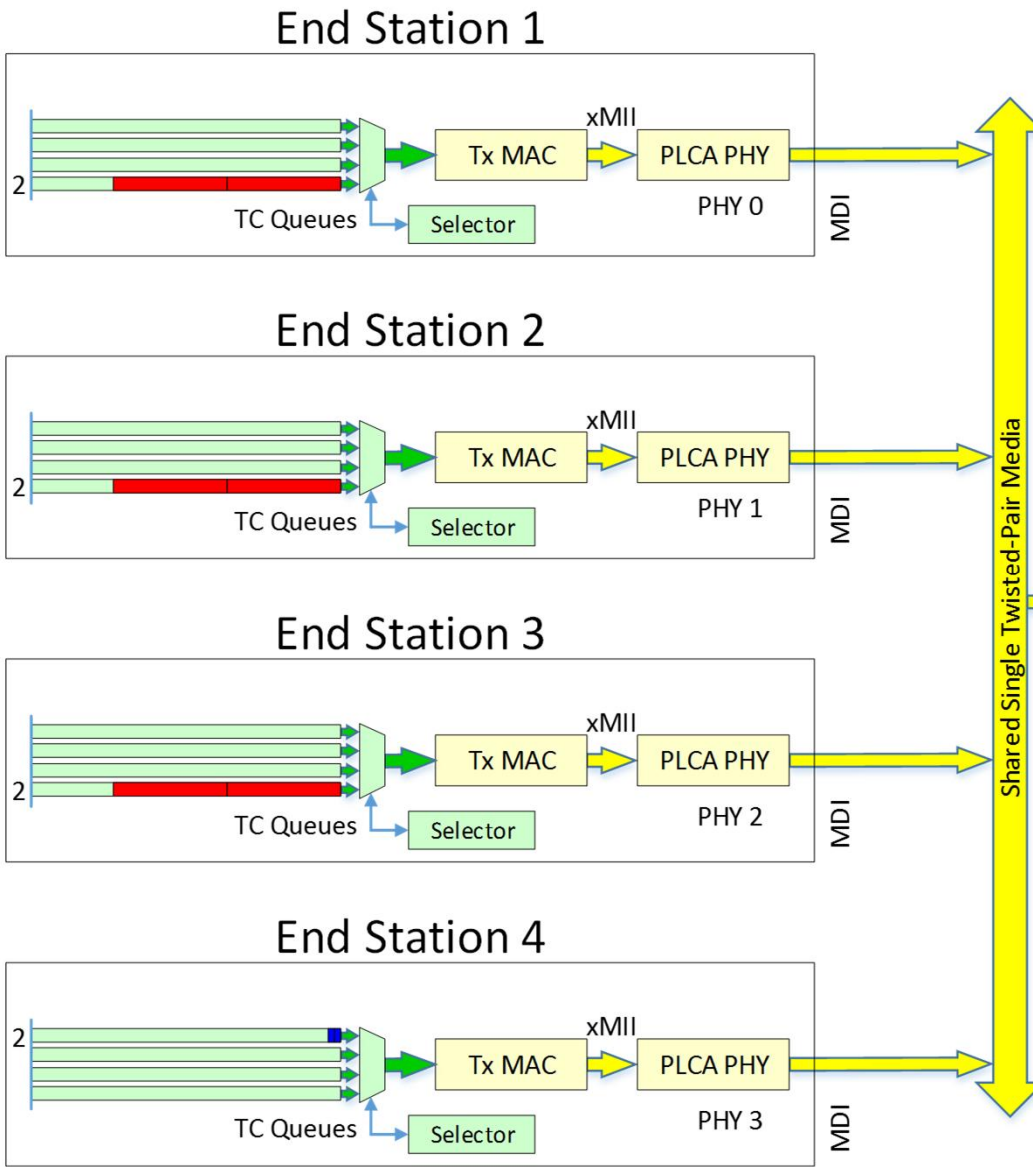


The Performance Impact

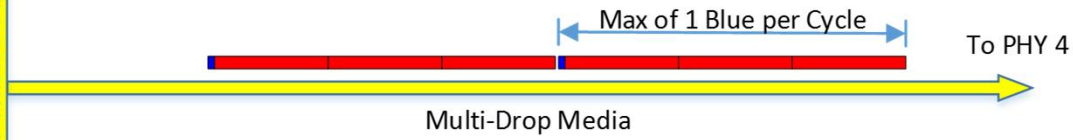


PLCA Network

Frame ordering without Priorities

PLCA gives each station a transmit opportunity per cycle PHY 0 goes first, then PHY 1, etc.

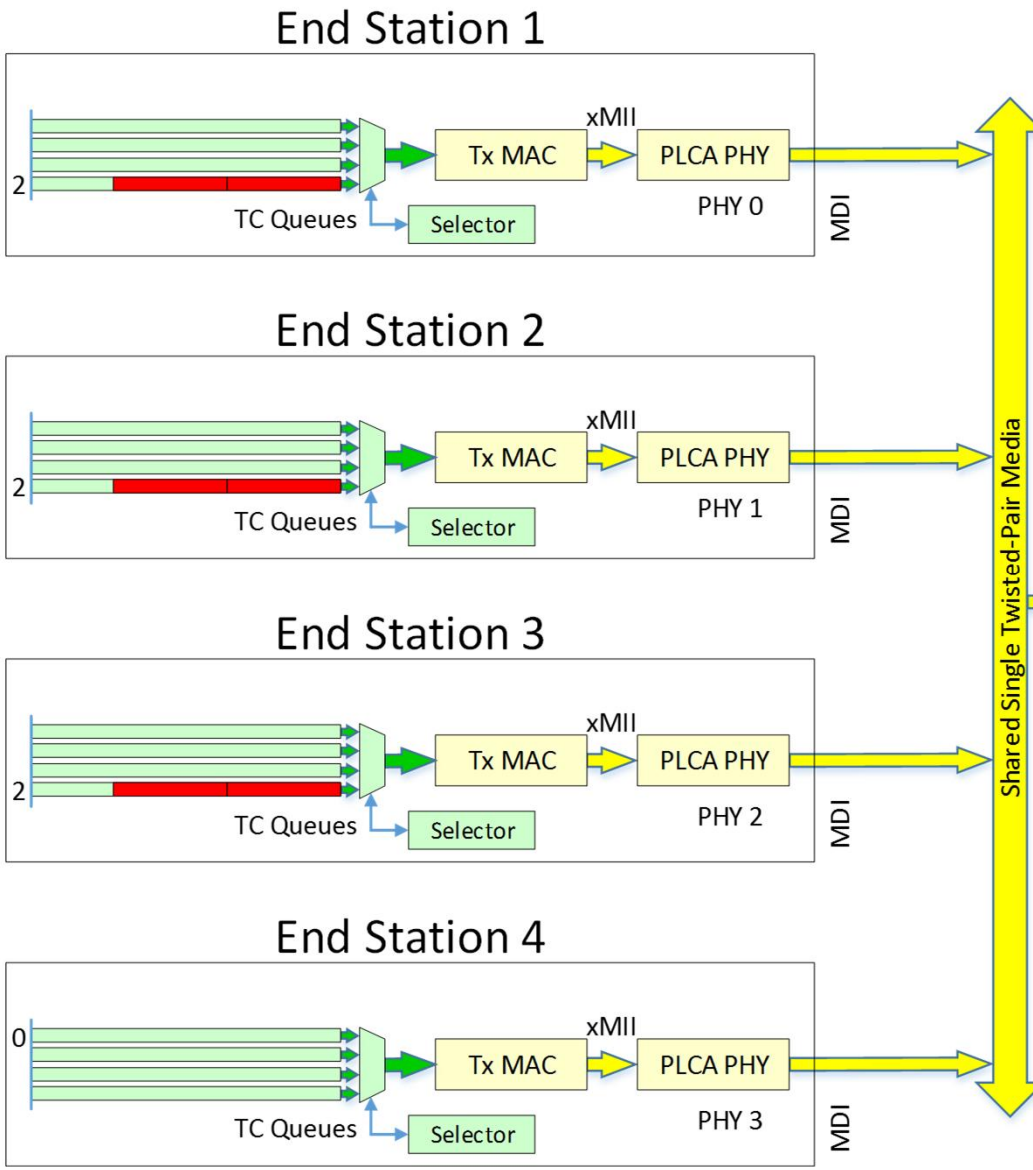
Given the situation where 3 stations have Red max size low priority frames to transmit & 1 station has Blue min size high priority TSN frames to transmit, the resulting transmission order is shown below.



The Problem

Without priorities, Station 4 can transmit only 1 Blue frame per PLCA Cycle, where a cycle's duration is controlled by the frame sizes being transmitted by all the Stations. This limits the usable bandwidth available to high priority Blue frames.

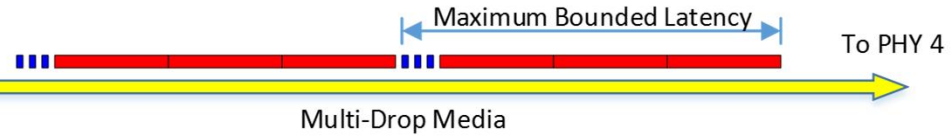
There is no mechanism in PLCA for the high priority Blue frames to burst or 'Catch-up' when their transmission rate is greater than 1 frame per worst case cycle time (as shown).



PLCA Network

Frame ordering with Priorities

This setup adds Priority Awareness to the PLCA PHYs. In this example Station 4 starts with 0 frames, but accumulates 3 high priority Blue frames while the other station's low priority Red frames are transmitting.



The Solution

After adding Priority Awareness to PLCA, the 802.1 Qav 'Catch-up' mechanism can work. Now when Station 4 accumulates multiple high priority Blue frames, they can be burst out! If 4 or more Blue frames accumulated – they would burst out in the same way, dynamically allocating more bandwidth to the higher priority frames as needed.

Questions?