

Flexible Ethernet (FlexE) Deep Dive

**IETF 98, Chicago, IL, USA
March 26-31, 2017**

FlexE Design Team

What is Flexible Ethernet (FlexE)

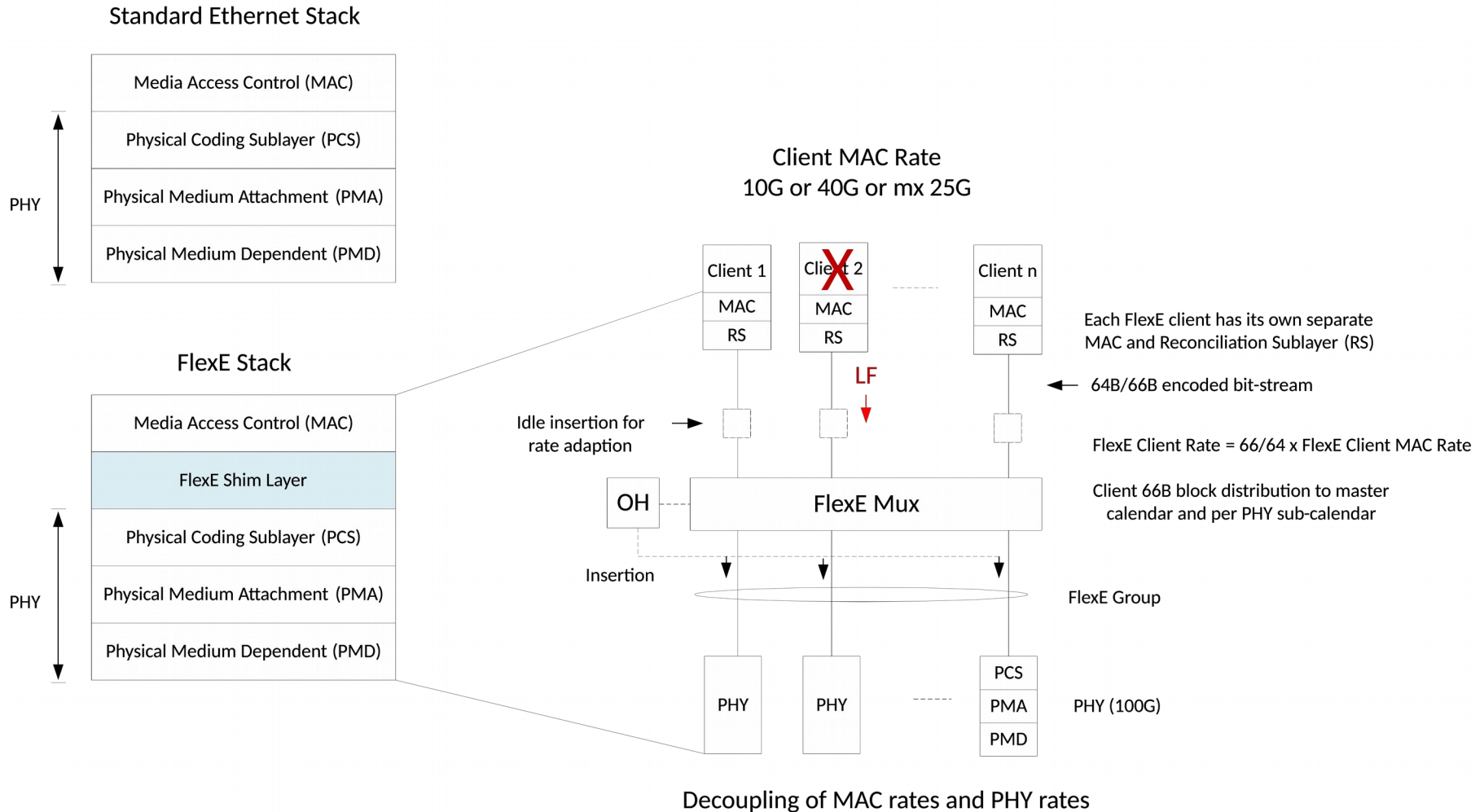
- FlexE refers to a generic mechanism defined in OIF-FLEXE-01.0 implementation agreement for supporting a variety of Ethernet MAC rates e.g.:
 - 200G MAC through bonding of 100GBASE-R PHYs
 - sub-rate of 50G MAC over a 100GBASE-R PHY
- The FlexE group refers to a group of from 1 to 254 bonded 100G Ethernet PHYs
- FlexE utilizes the FlexE group framework to provide the aforementioned flexible MAC rates

FlexE Client MAC Rates

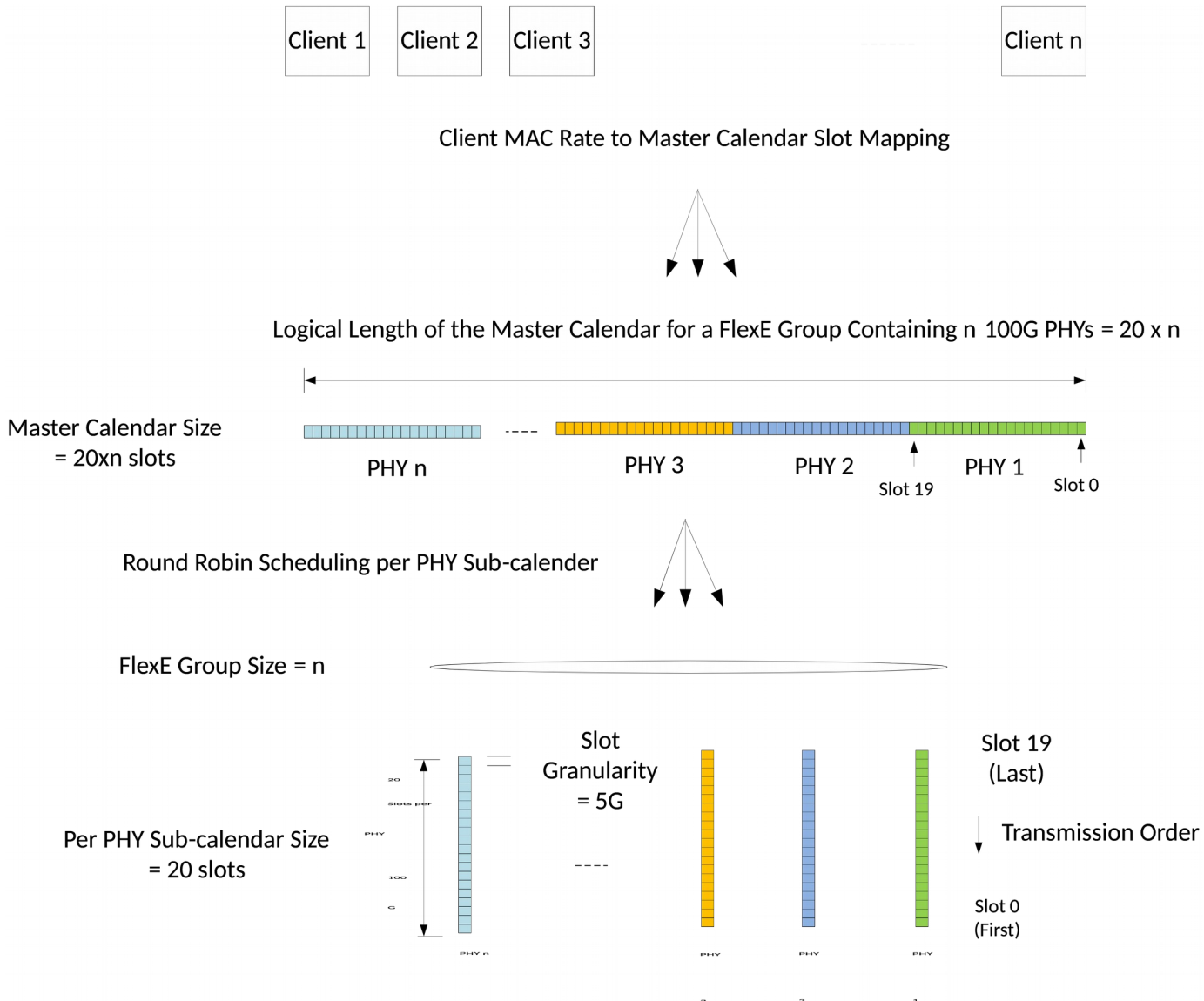
- FlexE Client MAC Rate Support
 - 10G, 40G, m x 25G
- FlexE Client MAC Rates Configurations
 - Super rate of bonded 100G Ethernet PHYs
 - Sub rate of bonded 100G Ethernet PHYs
 - Channelization within bonded 100G Ethernet PHYs
 - Sub rate of a single 100G Ethernet PHY
 - Channelization within a single 100G Ethernet PHY



FlexE Mux Functions



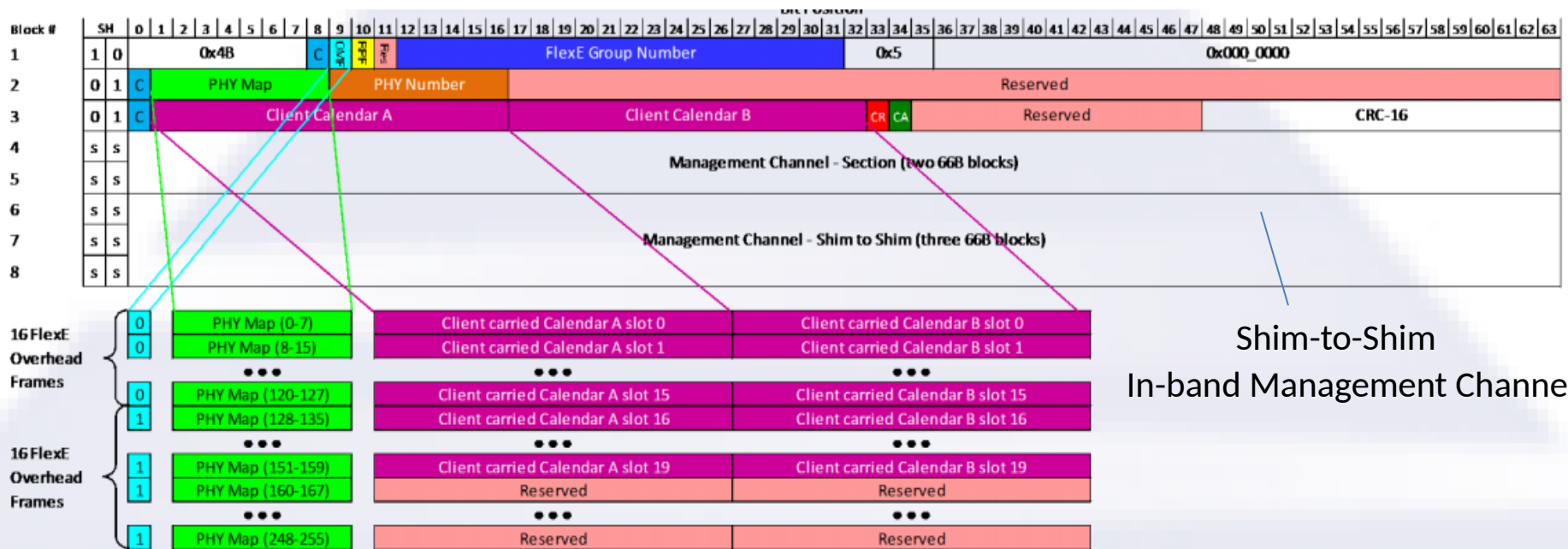
FlexE Calendar Scheduler



FlexE Overhead Frame and Multiframe



The FlexE mux to the FlexE demux info exceeds the 24 bits available in a single ordered set block per PHY. Therefore, it is spread across 8 FlexE blocks on each PHY, each separated by 20×1023 FlexE data blocks.

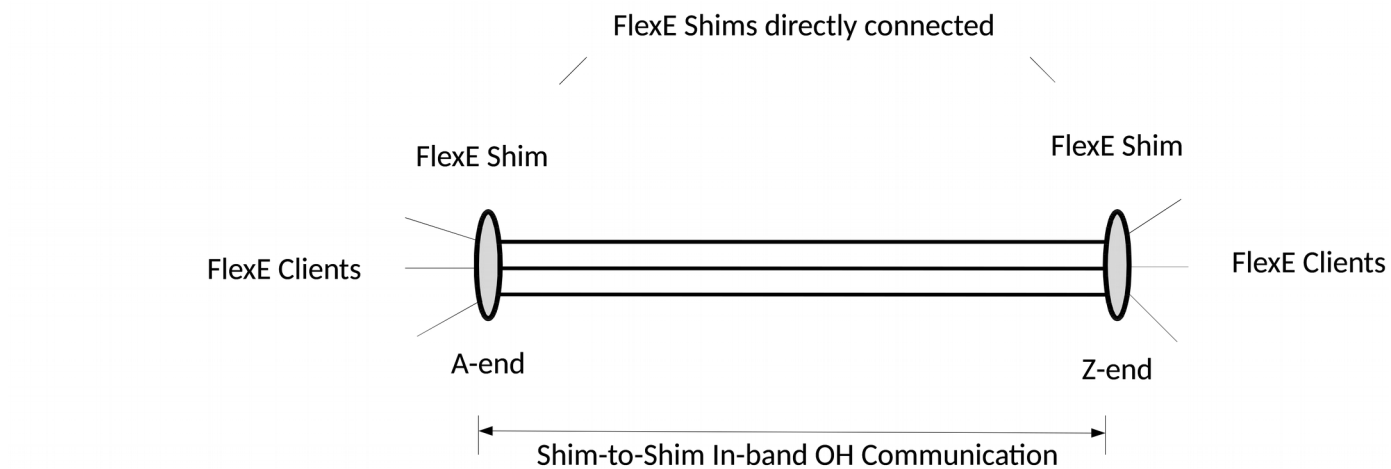


Shim-to-Shim
In-band Management Channel

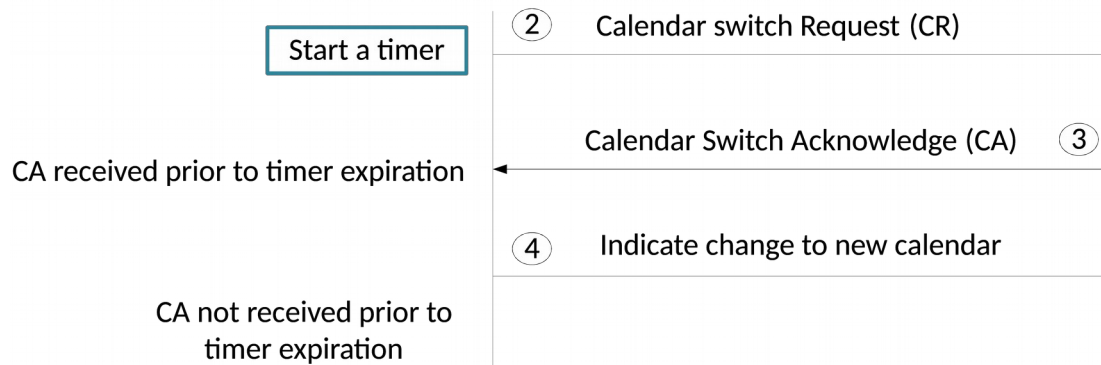
C = Calendar configuration in use (see 7.3.2)
 OMF = Overhead Multiframe Indicator (see 7.3.1)
 C = Calendar configuration in use (see 7.3.2)
 RPF = Remote PHY Fault (see 7.3.8)
 CR = Calendar Switch Request (see 7.3.4)
 CA = Calendar Switch Acknowledge (see 7.3.4)
 s s = Valid sync header bits (01 or 10)

PHY Map = Control of which PHYs are members of this group (see 7.3.3)
 PHY Number = Identity of this PHY within the group (see 7.3.3)
 FlexE Group Number - See 7.3.6
 Client (being programmed) - See 7.3.4
 Reserved - See 7.3.7
 Management Channels - See 7.3.5
 CRC-16 - See 7.3.8

Calendar Configuration Example Scenario 1

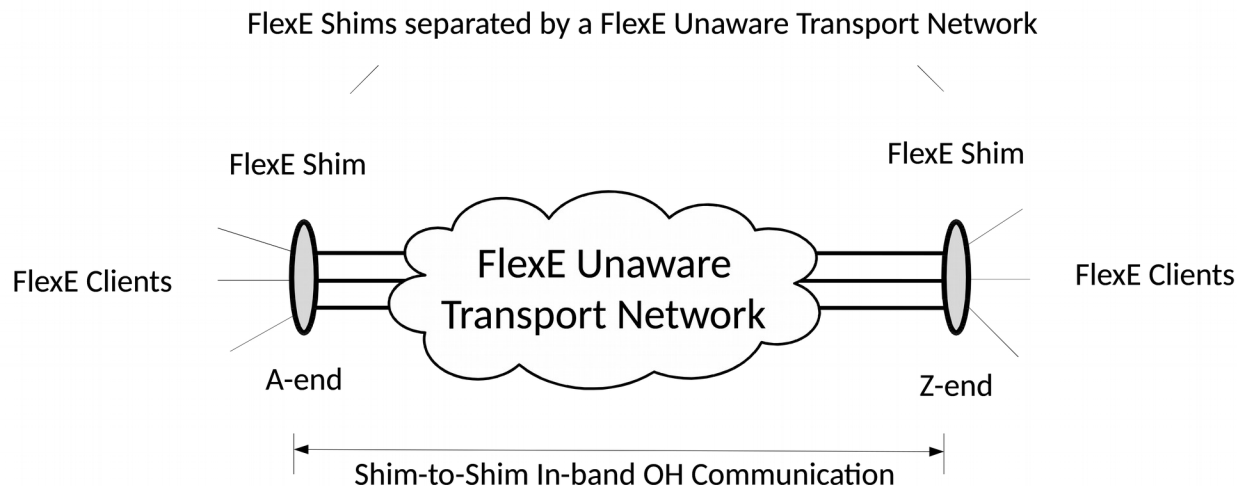


- ① Program the new client slot assignment into the calendar currently not in use

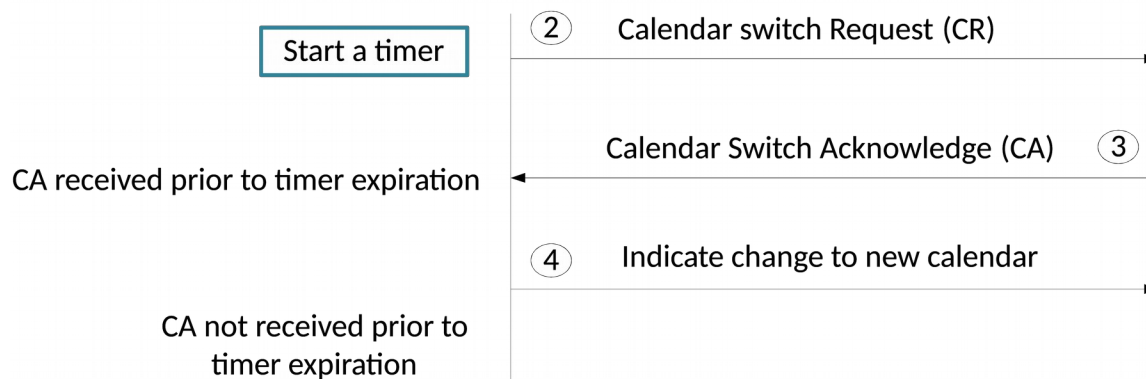


- ⑤ Raise an alarm or proceed with switch based on locally configured policy

Calendar Configuration Example Scenario 2

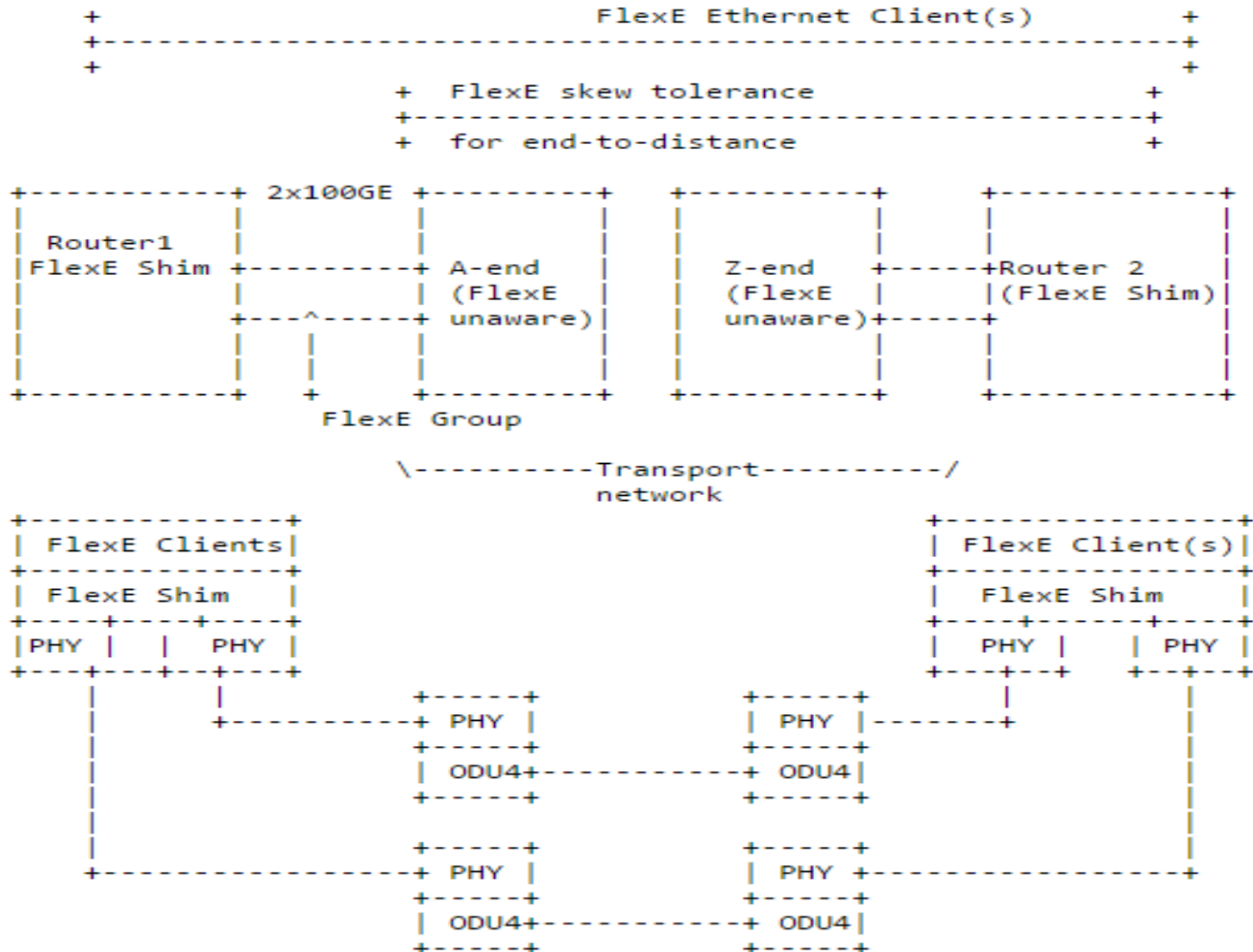


- ① Program the new client slot assignment into the calendar currently not in use

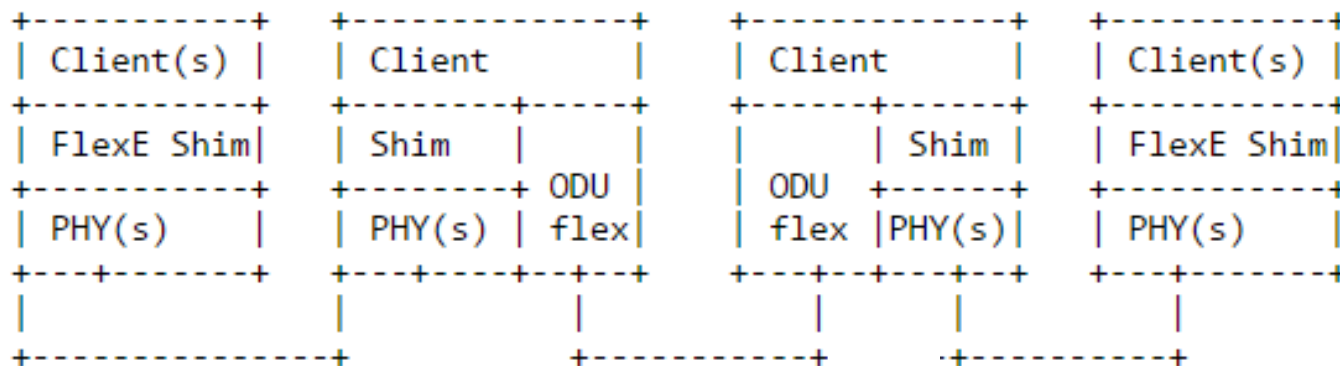
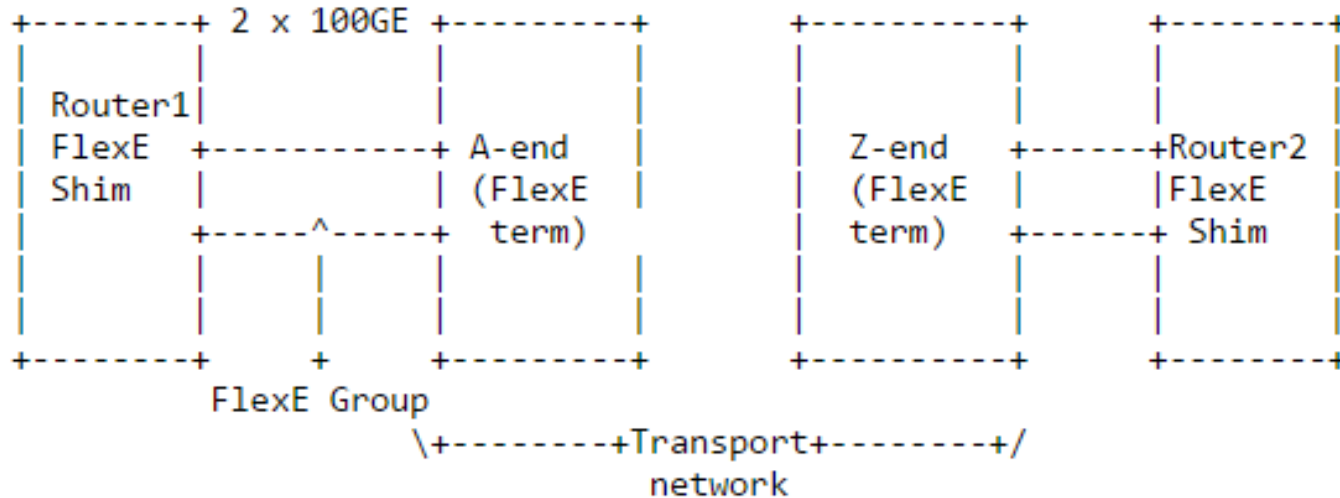


- ⑤ Raise an alarm or proceed with switch based on locally configured policy

FlexE unaware transport



FlexE termination



FlexE Requirements Summary

- Support usecases including FlexE unaware, FlexE aware, and FlexE Termination transport
- Support a flexible mechanism for configuring a FlexE group (e.g., signaling protocol or a SDN controller/management system)
- Support adding/removing a FlexE client to a FlexE group without affecting traffic on other clients
- Support resizing of FlexE client BW through coordination of calendar updates within a single FlexE group