

EPON Powersaving via Sleep Mode

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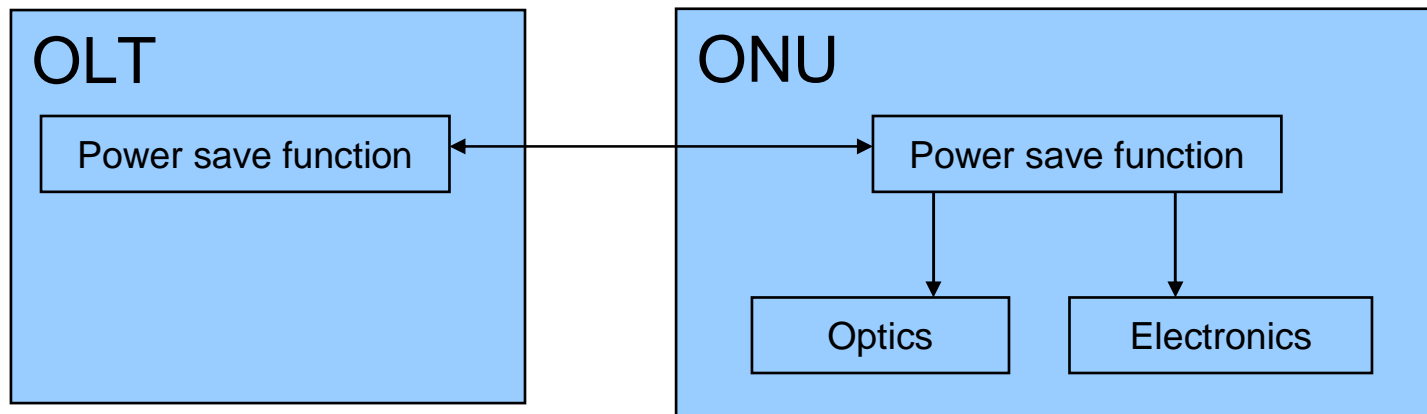
PMC-Sierra

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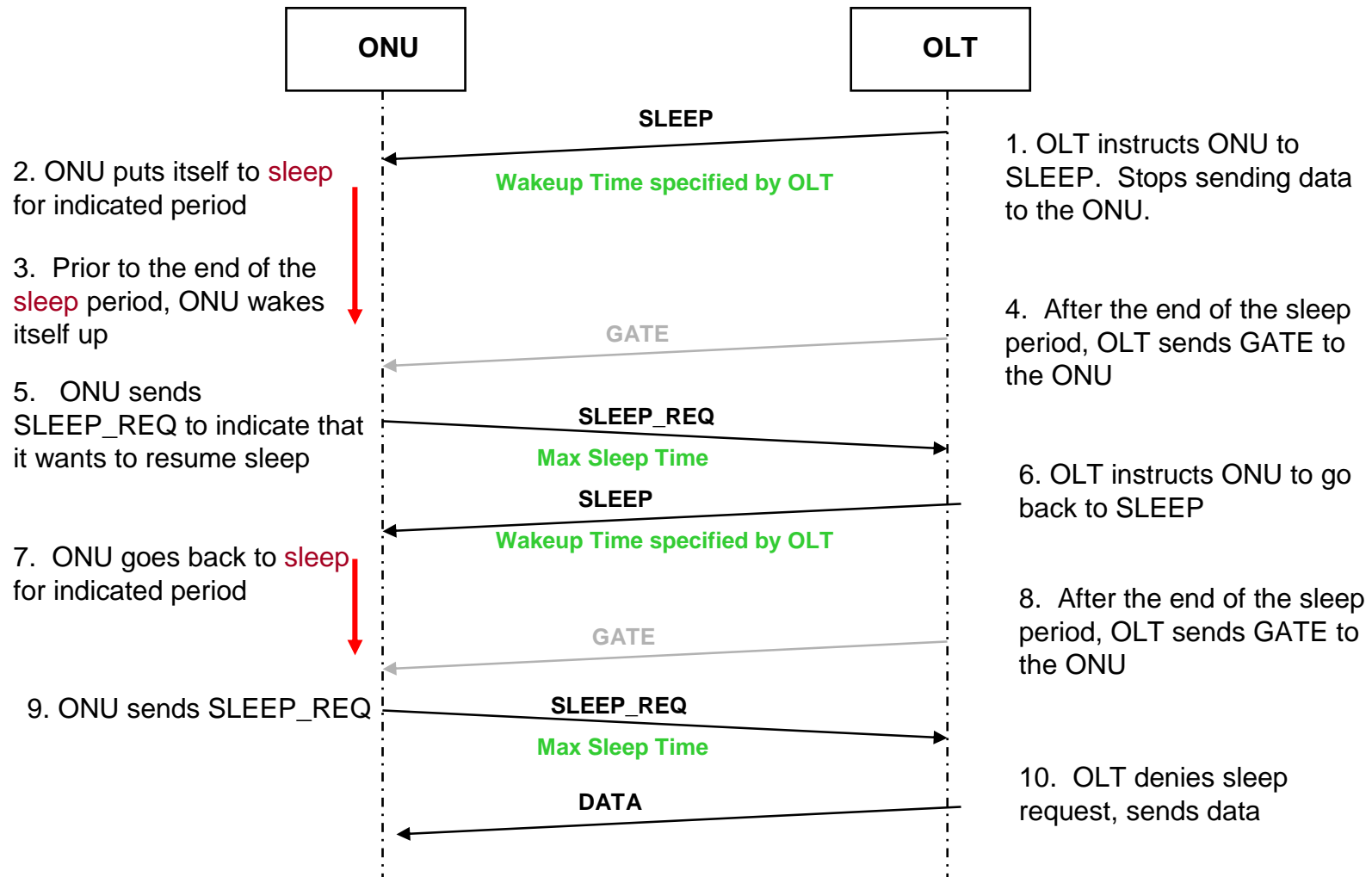
Target and Scope

- Goal is to introduce a flexible powersaving solution for EPON/10GE PON system for long term use
- Proposal for Protocol-Based Power Saving with:
 - ONU going to sleep during idle periods (ie. “sleep mode”)
 - Handshake model
- Not included in this outline:
 - Particulars of handshake protocol (eg. PCS codes, PDUs, etc.)
 - To be addressed later
 - Specific components that will be turned off during sleep
 - Vendor-specific and out-of-scope

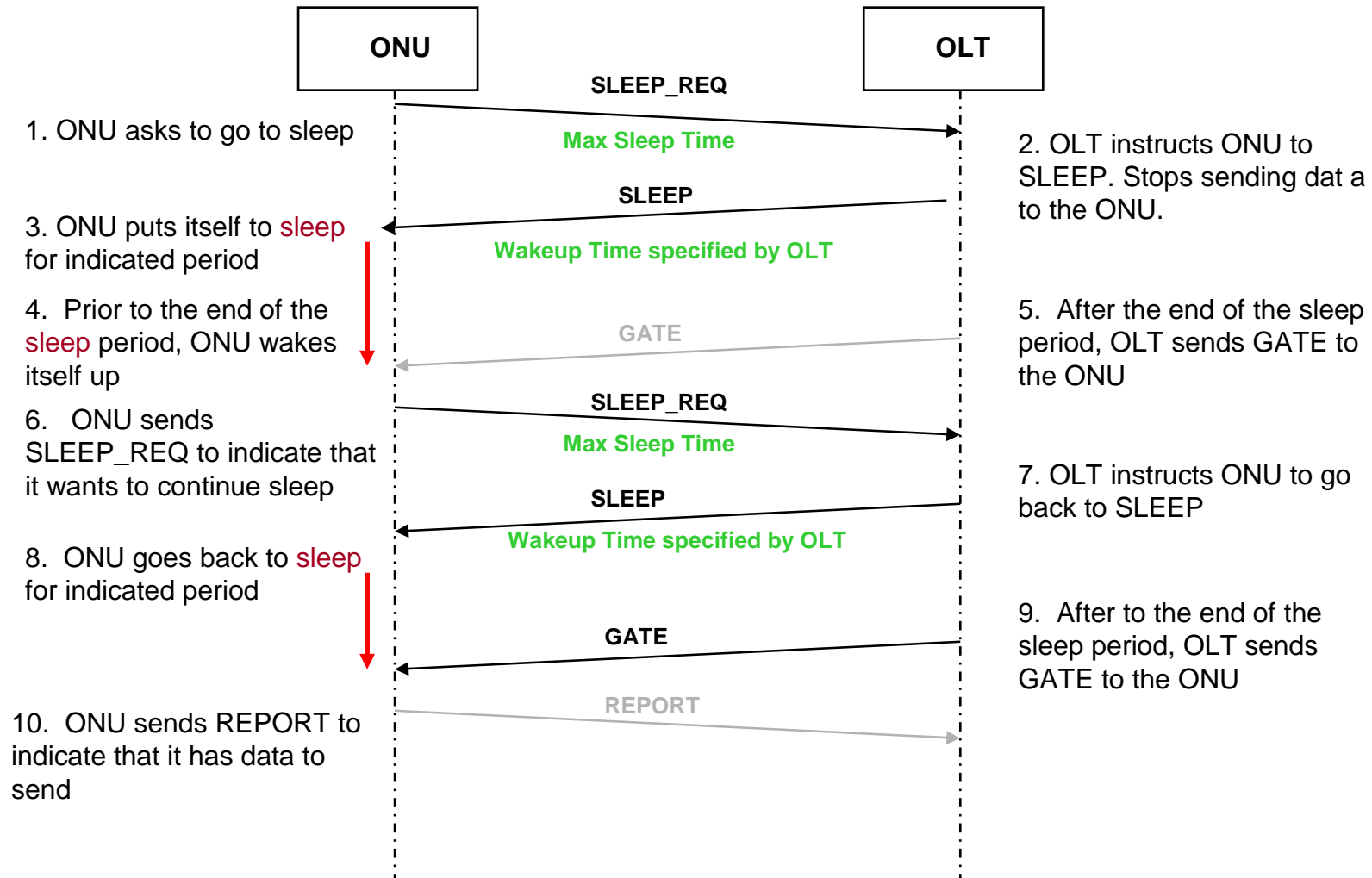
- For the purposes of these slides, assume the following model:



Control Message Flow (OLT-initiated and terminated)



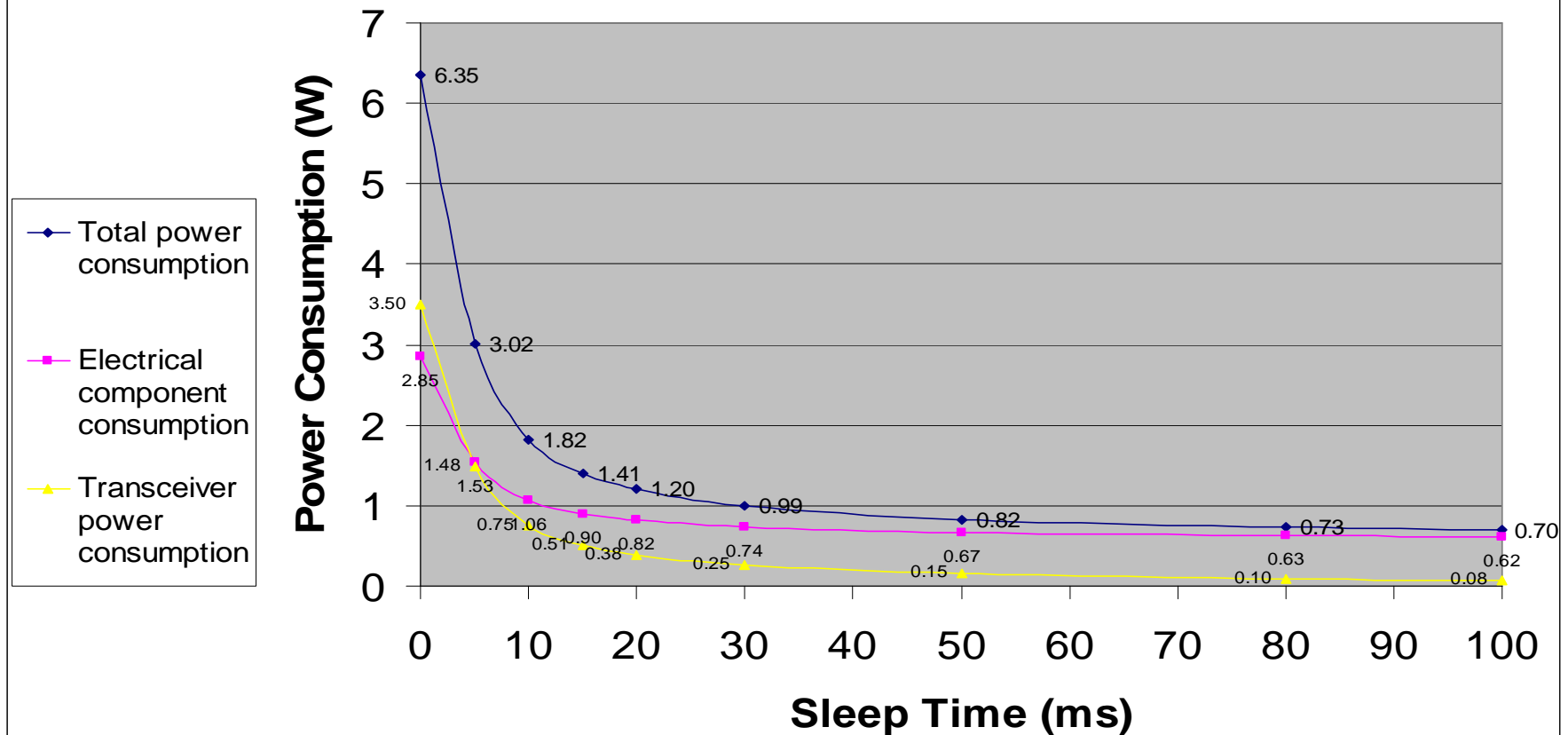
Control Message Flow (ONU-initiated and terminated)



Assumptions for 10G power estimates

1. Assumptions for Standby power consumption of components:
 - TRx consumes 3.5W while awake, 0W while sleeping
 - SoC consumes 2W while awake and .4W while sleeping
 - .15W constant for onhook SLIC
 - DDR consumes .7 while active, .02 in sleep (self-refresh)
 - UNI port is assumed to be inactive
 - With no sleep: $\text{PowerConsumed} = 3.5 + 2 + .15 + .7 = 6.35\text{W}$
 - In interval between wakeups: $\text{PowerConsumed} = 0 + .4 + .15 + .02 = 0.57\text{W}$
2. Assumptions for Wakeup Time following sleep:
 - **Conservative assumption:** 5ms to power up and synchronize, .5ms to send data from ONU to OLT
 - **Aggressive assumption:** is 2ms to power up and synchronize, .2ms to send data from ONU to OLT

10G Sleep mode (Aggressive wakeup assumptions)



1. *Sleep mode* enables a steep dropoff in ONU power consumption
 - around 25-30 ms seems to be best tradeoff between sleep period and power savings
 - Can do early wakeup in case of customer-side offhook event
2. ONU Power consumption will drop off in a similar manner even under different assumptions about component consumption
3. Next Steps:
 - Details on maintaining service quality
 - Working out the handshake protocol