

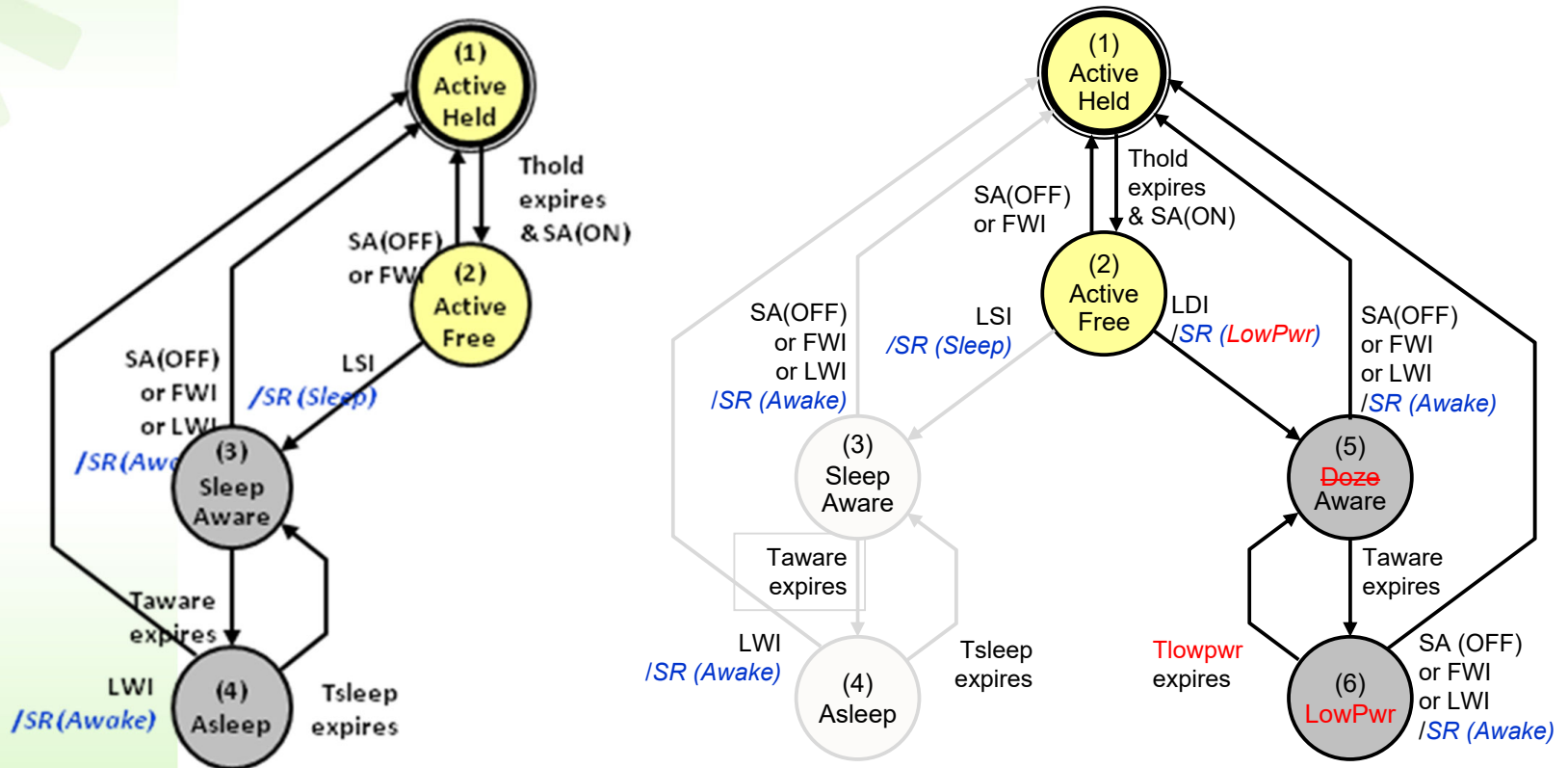


Two proposals in ChengDu and the path forward for ONU power management simplification

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Two power management proposals side by side

ONU State machines



A transition from Low Power to ActiveHeld on external stimulus

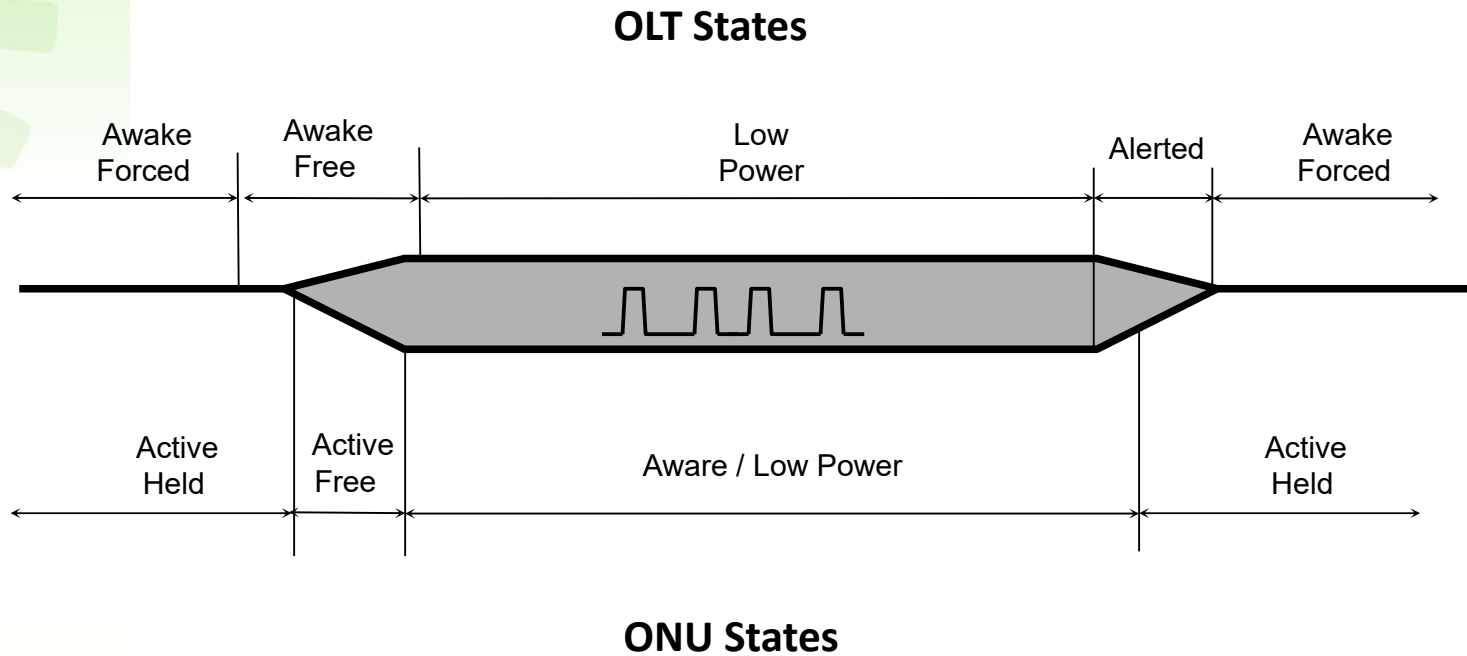




Common idea

- Simplify ONU power management by eliminating the duplicate branch of the state machines
- Define three power levels within a single power management mode
 - Rx On/ Tx On
 - Rx On/ Tx Off
 - Rx Off/ Tx Off
- Allow ONU to optimize its power consumption within the constraints specified by the OLT

G.987.3: OLT and ONU State correspondence



- No signaling within the Power Saving phase
- OLT unable to distinguish ONU's Aware and Low Power states



What the OLT does and does not care about...

■ Missed allocations

- Thanks to signaling exchange at phase transition, OLT knows when the ONU is in power saving phase
- Once in the Power Saving phase, the OLT does not count and does not react to missed allocations

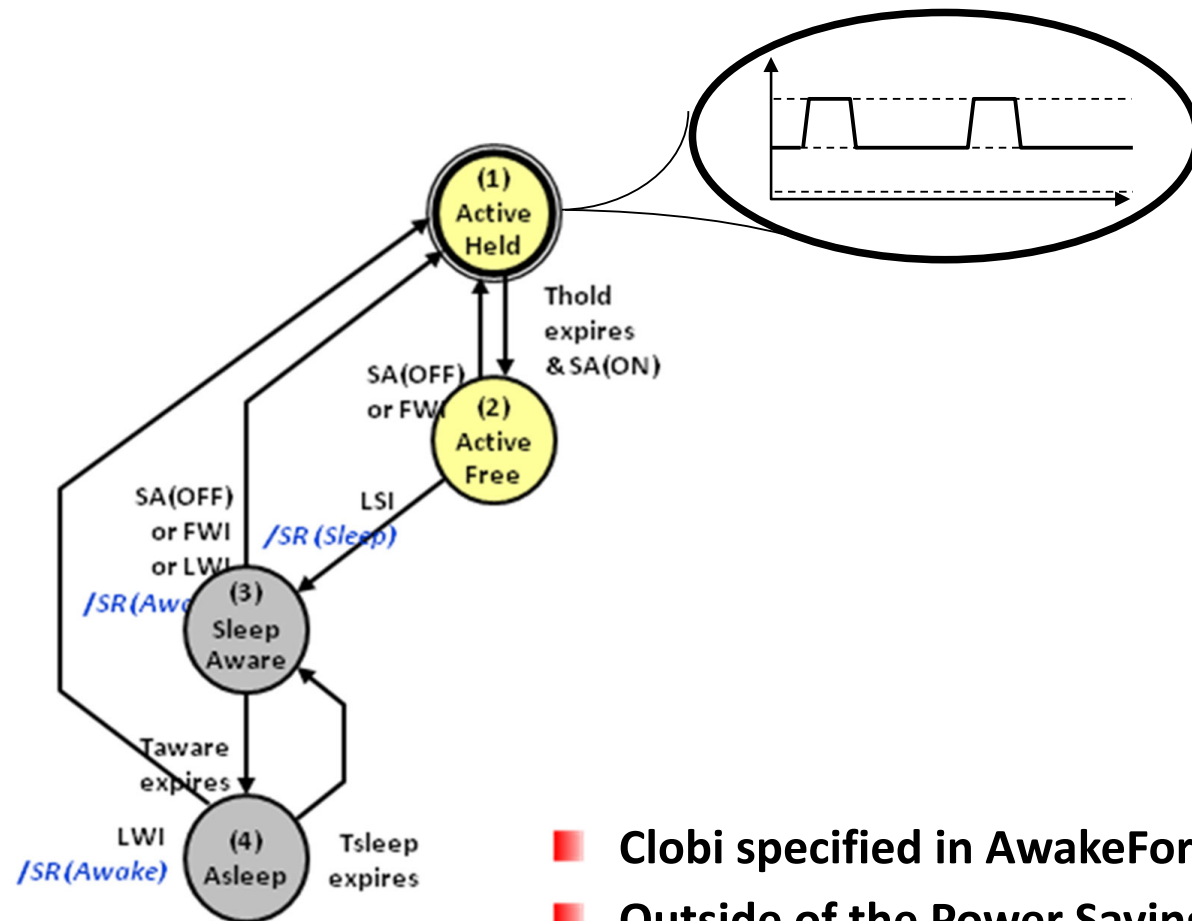
■ How fast the ONU can start transmitting

- Downstream allocations are provided regularly in power saving phase (each frame)
- Once OLT decides to wake up the ONU, how long does it take to hear from the ONU: the Talerted timer

■ How often should the OLT hear from the ONU to ensure it is still alive and well

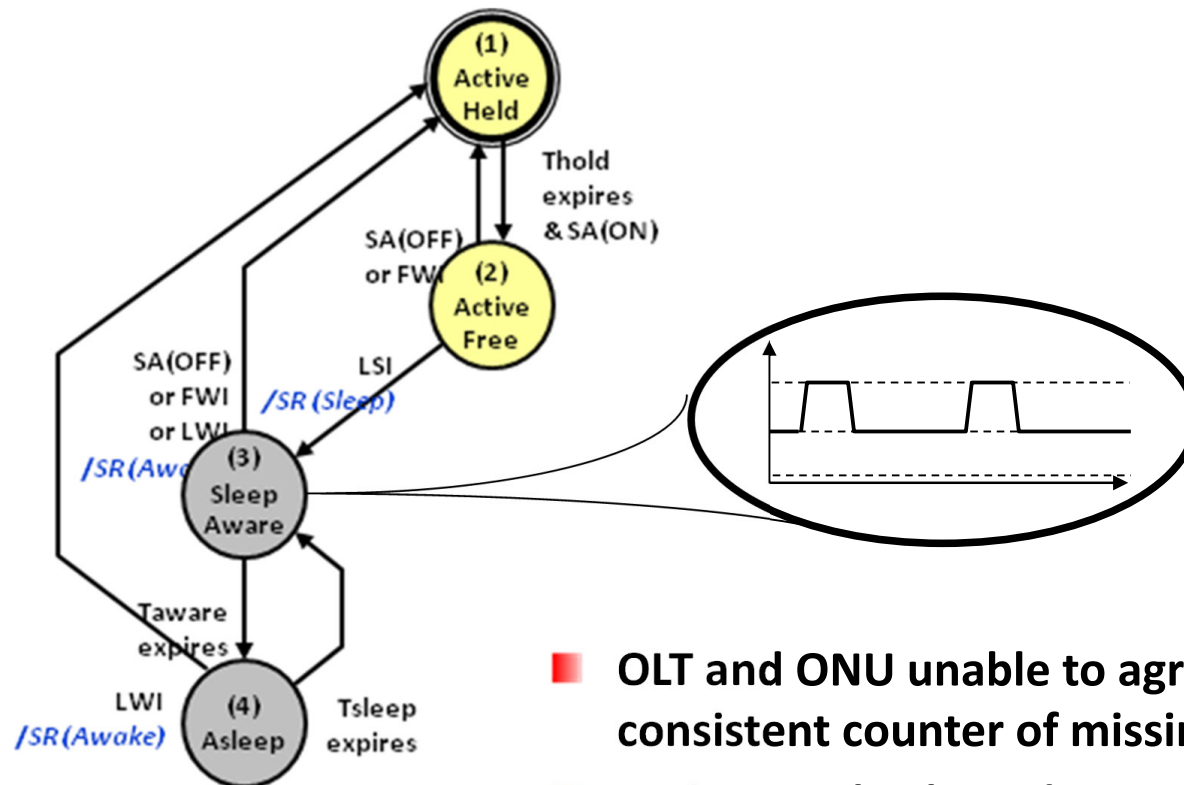
- Once in the Power Saving phase, the OLT would like to hear from the ONU every once in a while without explicitly waking the ONU up: the Teri timer

What D72 seems to propose



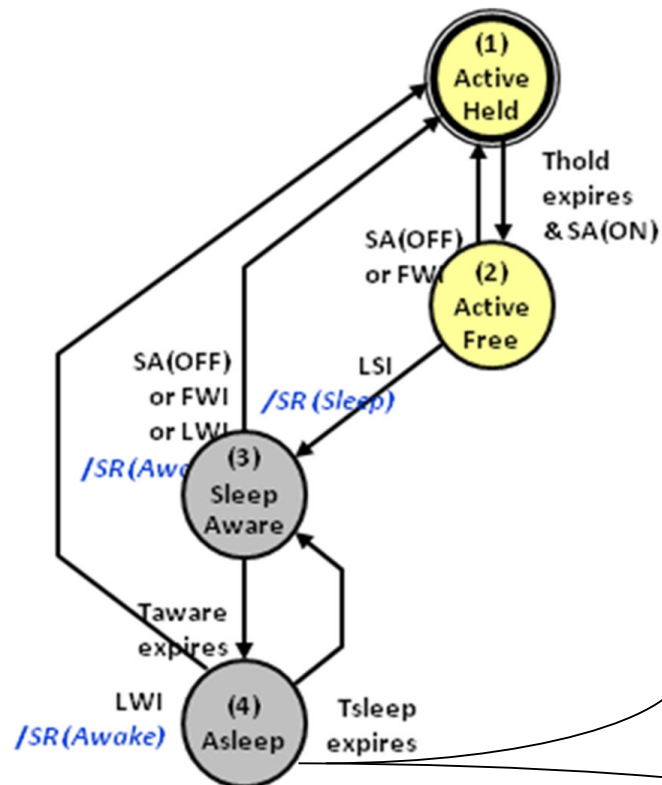
- Clobi specified in AwakeForced only!
- Outside of the Power Saving phase

What D72 likely meant to propose

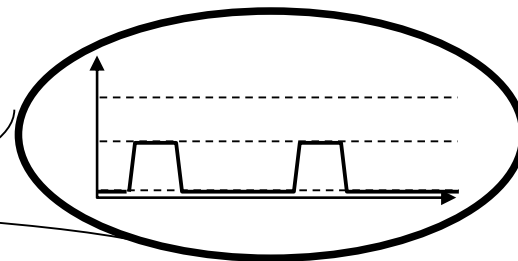


- OLT and ONU unable to agree on consistent counter of missing bursts
- Major non-backward-compatible protocol change in the Aware state

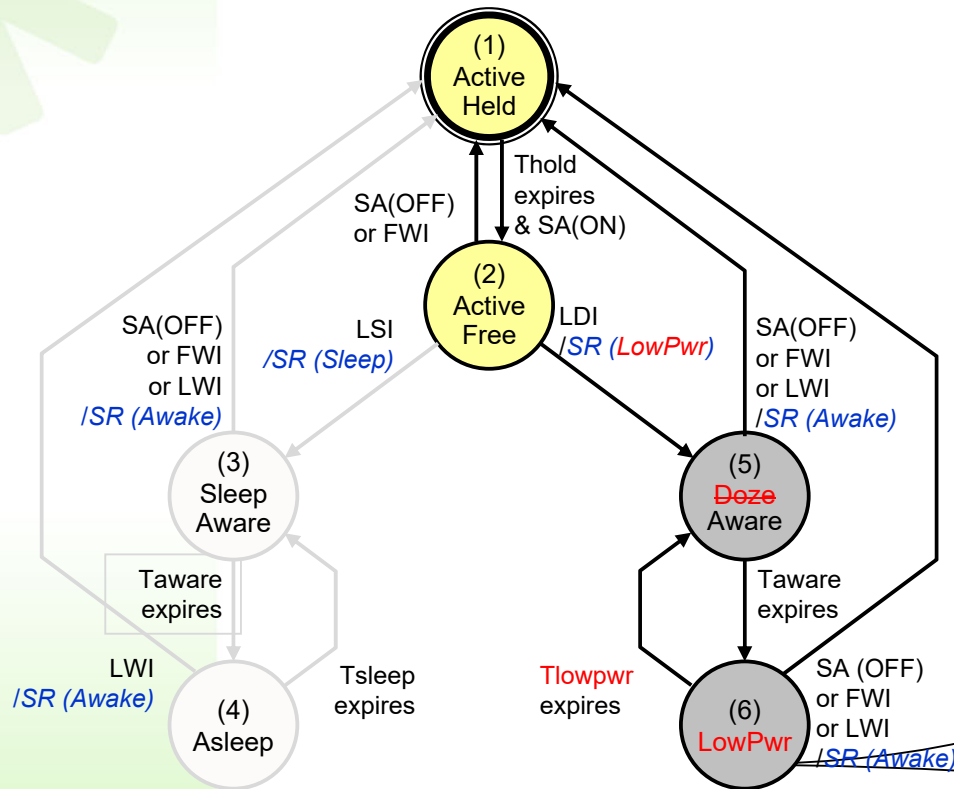
What D72 might have proposed



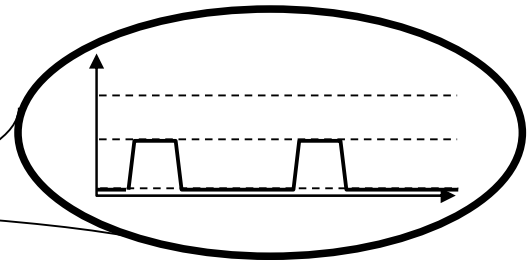
- Transitions timer-driven as in original G.987.3
- A change to the internal state semantics, but not to the protocol
- Need a transition out of Low Power state on external stimulus (missing in the Sleep branch)!



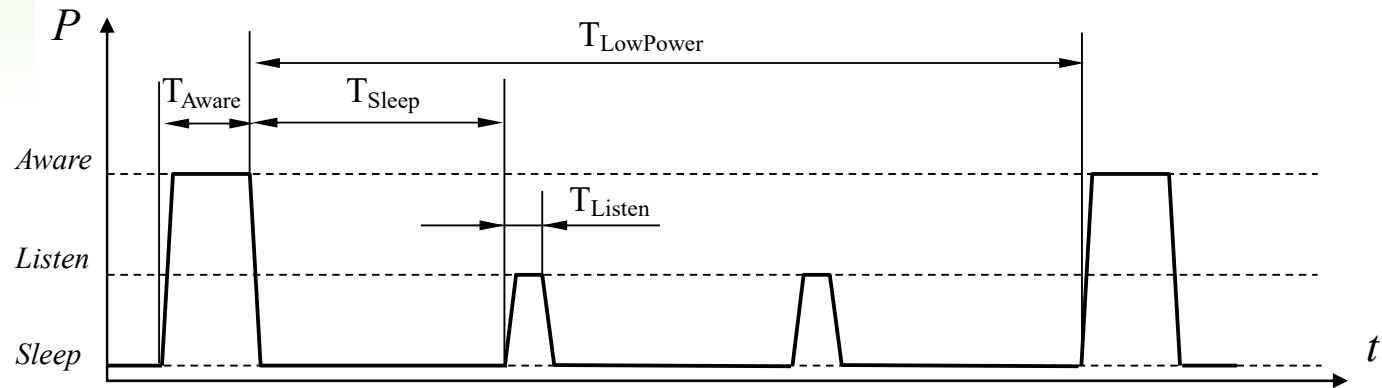
What should be done



- Reusing mandatory branch of G.987.3!
- A change to the internal state semantics , not to the protocol
- A transition out of Low Power state is present!
- Since only one branch is left, does not matter whether it is called Sleep or Doze: it is Unified mode!



Unified mode, or Three-parameter low power



Parameters

- T_{aware} – duration of bidirectional handshake
- T_{sleep} – How long does it take to wake-up the ONU, once the OLT decides to do so (related to T_{alerted})
- T_{lowpower} – How often should the OLT hear from the ONU to ensure it is still alive and well (related to T_{eri})
- T_{listen} – 1 PHY frame, literally.

Conclusions

- It does NOT matter which half of the state machine is deprecated and how the states are called
 - As long as the critical transitions are present and backward compatibility is maintained
- In the current G.987.3, Doze mode is mandatory, Cyclic Sleep is optional
- The former Doze branch provides the necessary transition from LowPower to the ActiveHeld on external wakeup stimulus
- For the specification details, see D75 in Chengdu