Problems With The Two-colors 25G Wavelength Plan And A Solution

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Background

At July meeting motion 5 was passed.
Motion 5
802.3ca shall adopt an upstream wavelength plan for the first 25G and new 10G (EQ based) channel
with two options,
Option 1: at 1310nm width 20nm; WDM coexistent with 10G
-EPON
Option 2: at 1270nm width 20nm; WDM coexistent with G
-PON reduced wavelength set.
TDM coexistence with legacy PONs is not required

This contribution discusses the problems with the above 25G upstream wavelengths, its impact on service provider networks, impacts on evolution as well as convergence, and provides a solution

Motion 5 didn't address the problems as its claimed

- The intention of motion 5 with options of two 25G upstream wavelengths was to use WDMA coexisting with both 10G EPON and GPON, as stated in the motion
- The motion stated "**TDM coexistence with legacy PONs is not required"**
- It reflects the long debates of TDMA or WDMA coexistence
- On the surface it looks WDMA coexist won - symmetric 25G WDMA coexist with 10G EPON and GPON with 2 wavelengths
- However, if asymmetric 25G EPON is considered, **TDMA coexistence has to be used.**

At least, motion 5 is inconsistent and incomplete. Moreover, it has negative impacts on products and networks in the long run.

TDMA and WDMA Coexistence

- Motion 5 as it is stated doesn't allow asymmetric rates in 25G EPON standard, because it **requires** TDMA coexistence
- It implicitly excludes the low-cost asymmetric 10G/25G EPON from the standard, that is not a good way to resolve the WDMA or TDMA debate
- Both WDMA and TDMA coexistence have been specified in PON standards; and there are pros and cons for both.
- In case of coexistence of two types of PONs, WDMA or TDMA is a matter of choice.
- However, if more than two types PON need to coexist, using both WDMA and TDMA provides another degree of freedom.

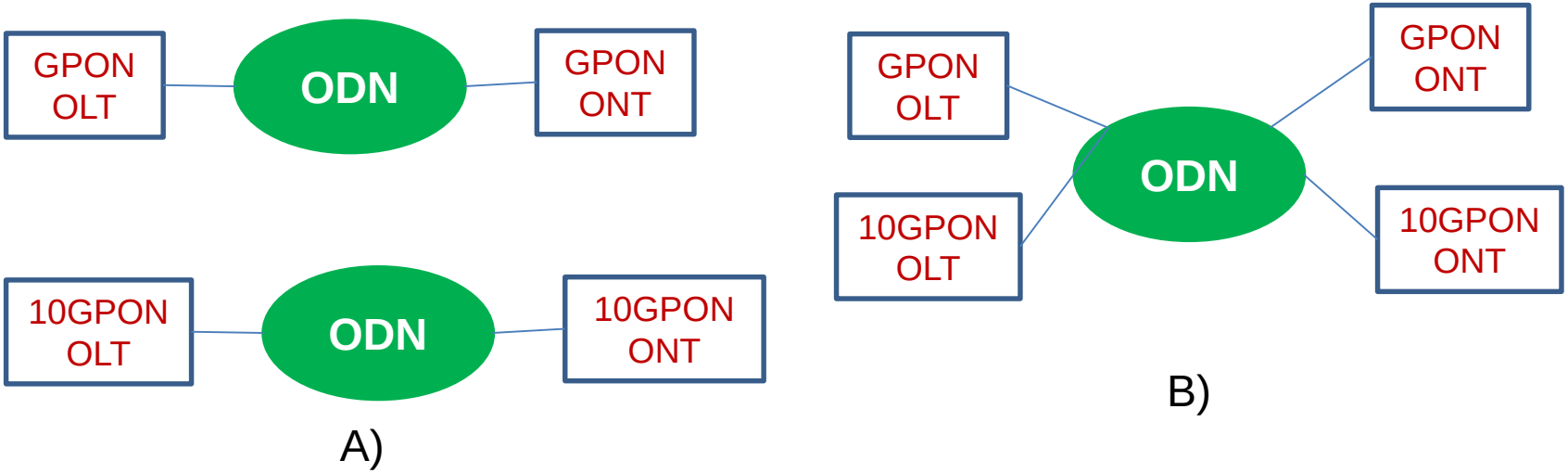
Adding an extra degree of freedom could enable simpler solution for 25G wavelength plan

Drawbacks of the 2-colors Wavelength Options

- The immediate drawback, on the surface, is that it divides markets by creating TWO distinct 25G EPONs with 2 sets of optics/colors
- In the long term, it has negative impacts on
  - Network deployments
  - Network operational cost
  - Network evolution
  - Coexistence with future PONs
  - Possible convergence of PONs
- All these problems could be avoided with a simple solution to be discussed later

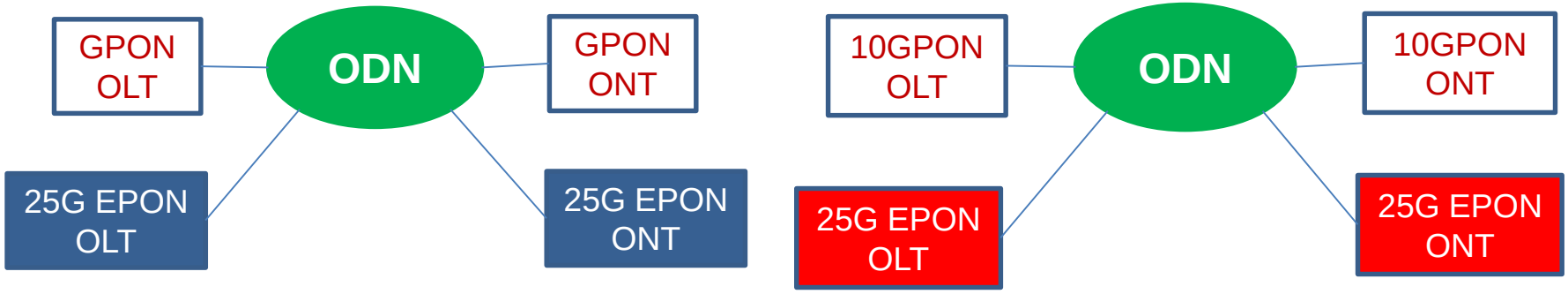
25G EPON Coexist Scenarios

- GPON bandwidth is under constraints in offering Gigabit services
- Upgrade to 10G PON is imminent or happening
- At the time for 25G EPON deployment, 10G PON may already be widely deployed, some coexist with GPON.
  - This gives two coexistence scenarios for 25G EPON:
    - A). GPON and 10G PON are on different ODNs
    - B) GPON and 10G PON coexist on same ODN;

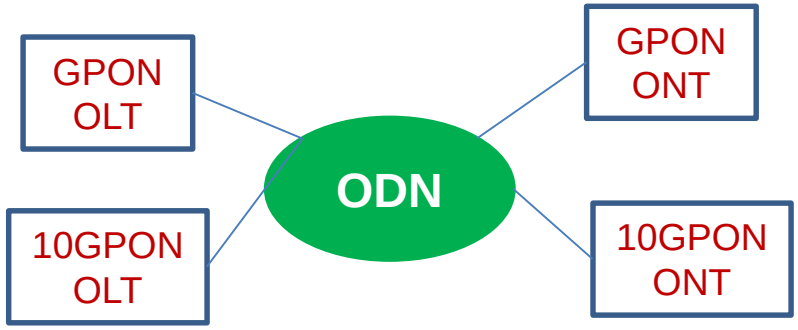


Scenario B has higher probabilities…

Impacts On Network Deployments



A) Blue 25G(1270nm) coexist with GPON; Red 25G(1310nm) coexist with 10G PON

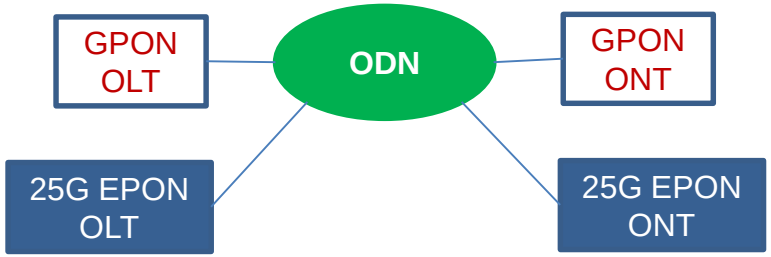


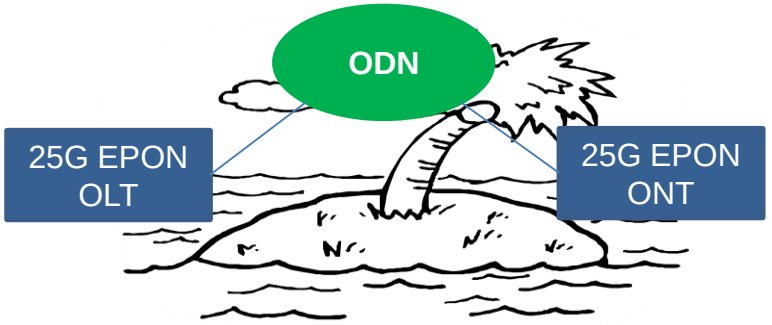
B) Coexist with 25G is not possible

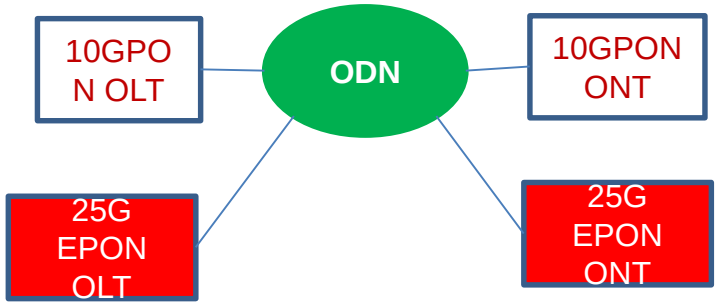
- **GPON has to be removed from ODN for adding 25G EPON**
- **Or, to avoid the migration problem, don't put GPON and 10G PON on same ODN today**
- **Or, not to deploy 25G EPON**

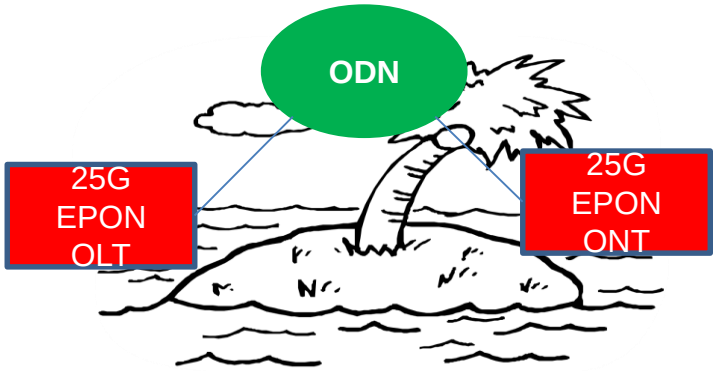
Neither "blue" nor "red" 25G EPON works for the most common deployment scenario

Impacts Network Evolution and OPEX







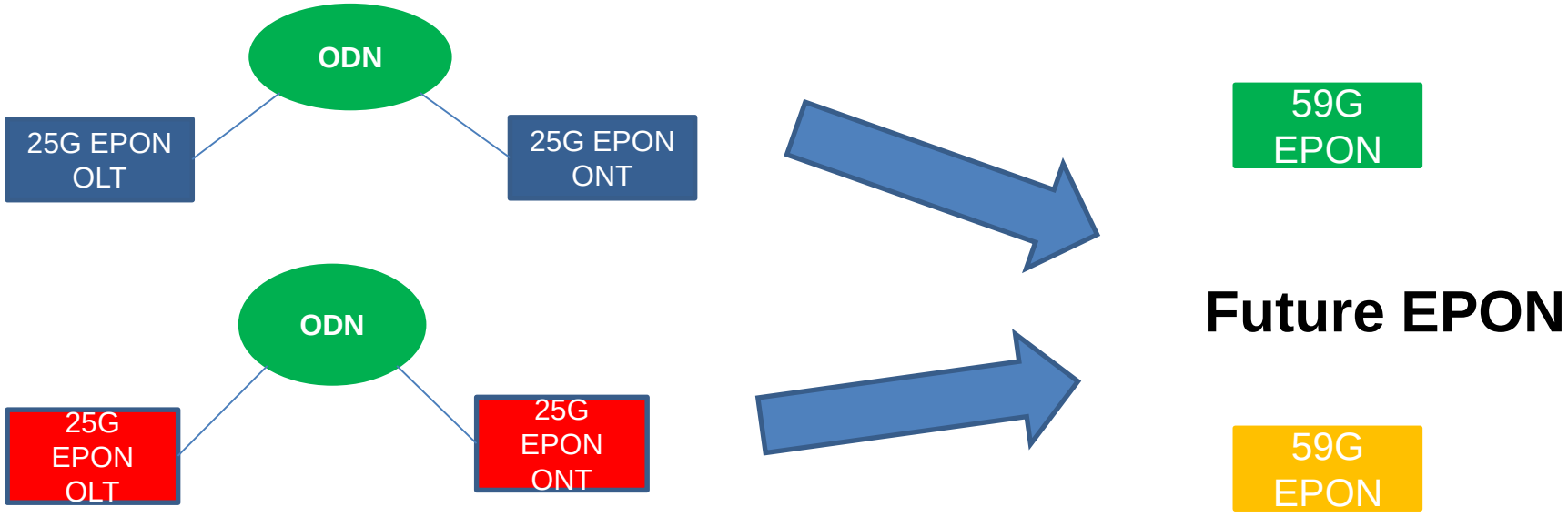


Beginning of evolution: Coexist with 10G PON and GPON with blue and red 25G

End of evolution: Isolated blue and red 25G EPON islands

Operators have to manage isolated blue and red 25G EPON in the network for the lifespan – high OPEX

Impacts on the Next Generations



Blue and red 25G EPON islands

Two colored 50G?

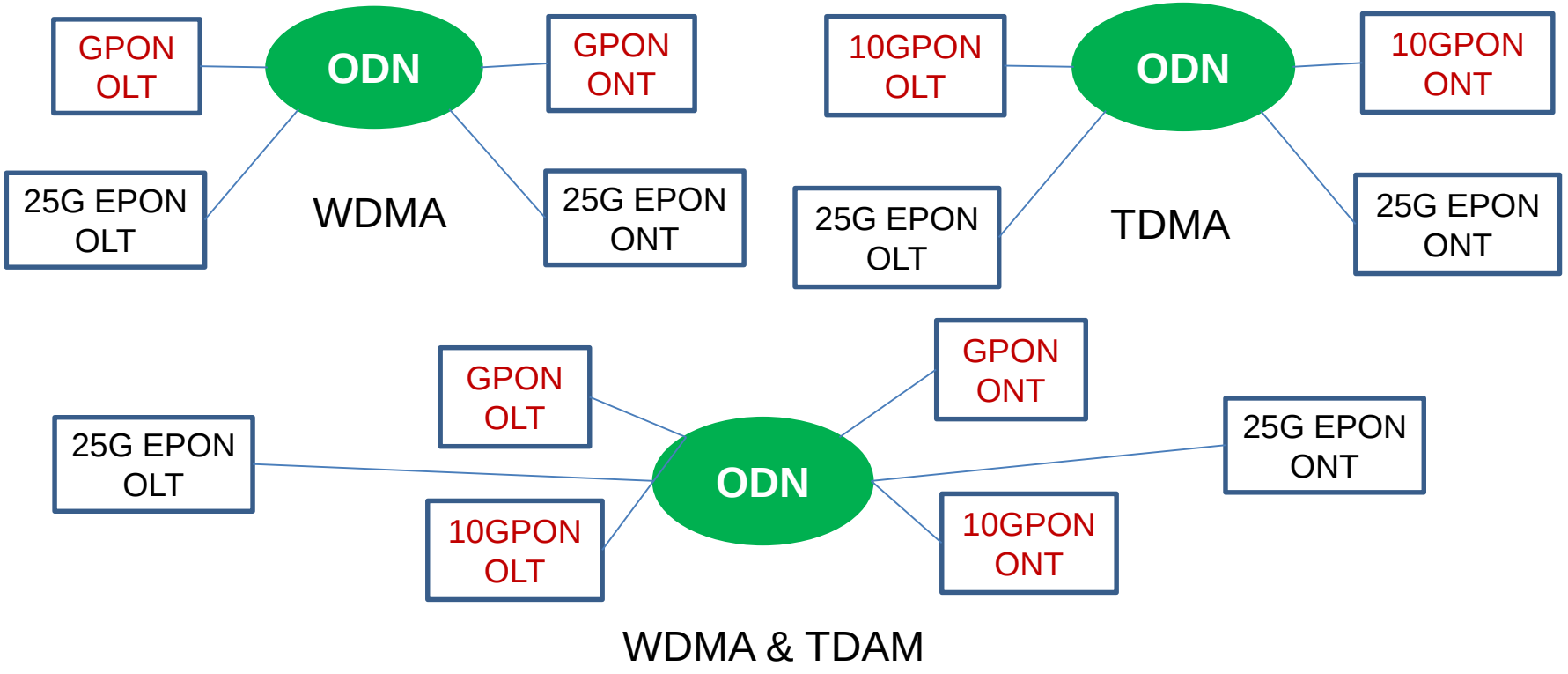
- The NG PON has to coexist with both blue and red 25G
- It will make PON convergence more difficult

Using another degree of freedom

- The two colors 25G upstream wavelength proposal doesn't solve the problems it claimed
- Instead, it creates more problems, such as
  - Dividing the market
  - Creates isolated two-color 25G EPON islands, increase OPEX during the lifespan of 25G
- Forcing WDMA coexistence for 3 types of PONs is not a good solution
- The problem can be solved by using both WDMA and TDMA
- TDMA coexistence may make silicon or software more complicated, and lose some efficiency, but the impacts are much less than creating long-term OPEX and evolutionary problems

A Simple Solution – Using Both TDAM and WDMA Freedoms

- One 25G upstream wavelength at 1270nm with 20nm width
- 25G WDMA coexists with GPON
- 25G TDMA coexists with 10G PON



Conclusions

- **The two-colored 25G wavelength plan does not solve the all coexistence problems as it is intended to**
- **More importantly, it creates long term operational and evolutionary problems**
- **Single 25G upstream wavelength at 1270nm with 20nm width, TDMA coexisting with 10G PON and WDMA coexisting with GPON, provides an optimized solution**

Thanks

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