



100G EPON Resilience Requirements for Network Transport Applications



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Outline

- Resilience requirements for 100G EPON as network transport solution
- Error propagation in current channel bonding model
- Channel error isolation methods
- 4:1 protection

100G EPON for Network Transport

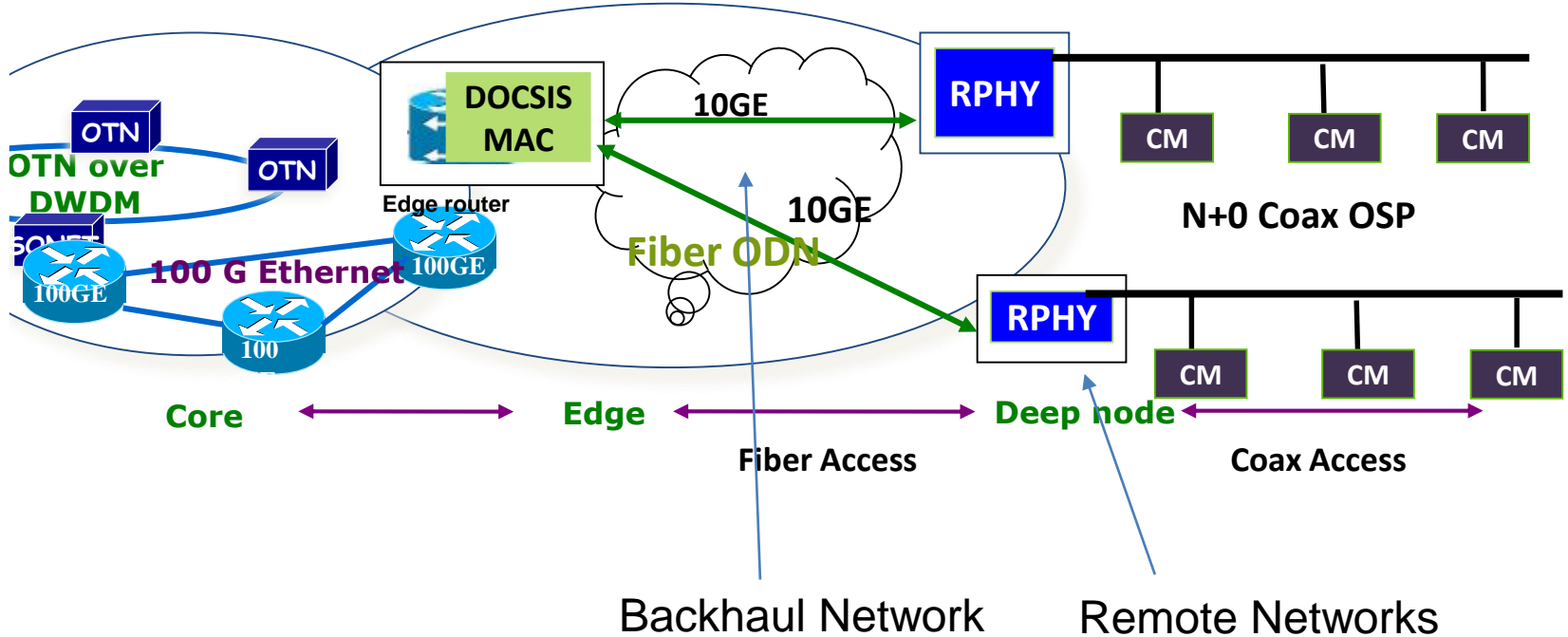
- At 100Gbps MAC rate, the killer application for PON may be in the aggregation and transport sections of network
- PON Mobile backhaul and front-haul applications are already moving towards this direction...
- 100G EPON may be used for small data center interconnections
- RPHY (remote PHY) backhaul may be a killer application of the 100G EPON for MSOs

PON for Network Aggregation and Transport will pose new requirements on resilient that is different from traditional PON applications

100G EPON for RPHY Backhaul

PON RPHY backhaul can be used as an example of network transport application for 100G EPON to illustrate the requirements on resilient

Remote PHY in a Nutshell



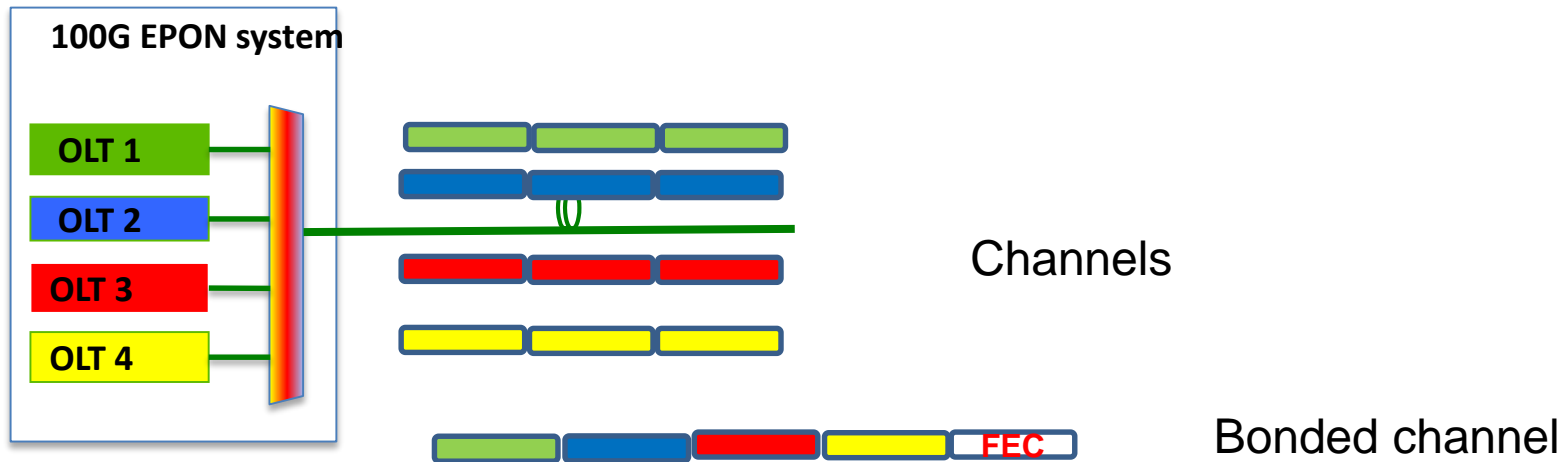
Backhaul network is under high traffic loads

Resilience requirements

- Backhaul networks are normally under high traffic loads and in some case, such as mobile fronthaul, need to handle CBR like traffic
- 100G EPON for remote network transport needs to provide high resilient to meet with bandwidth stability requirements in case of errors and failure

Can channel bounded 100G EPON meet these requirements ?

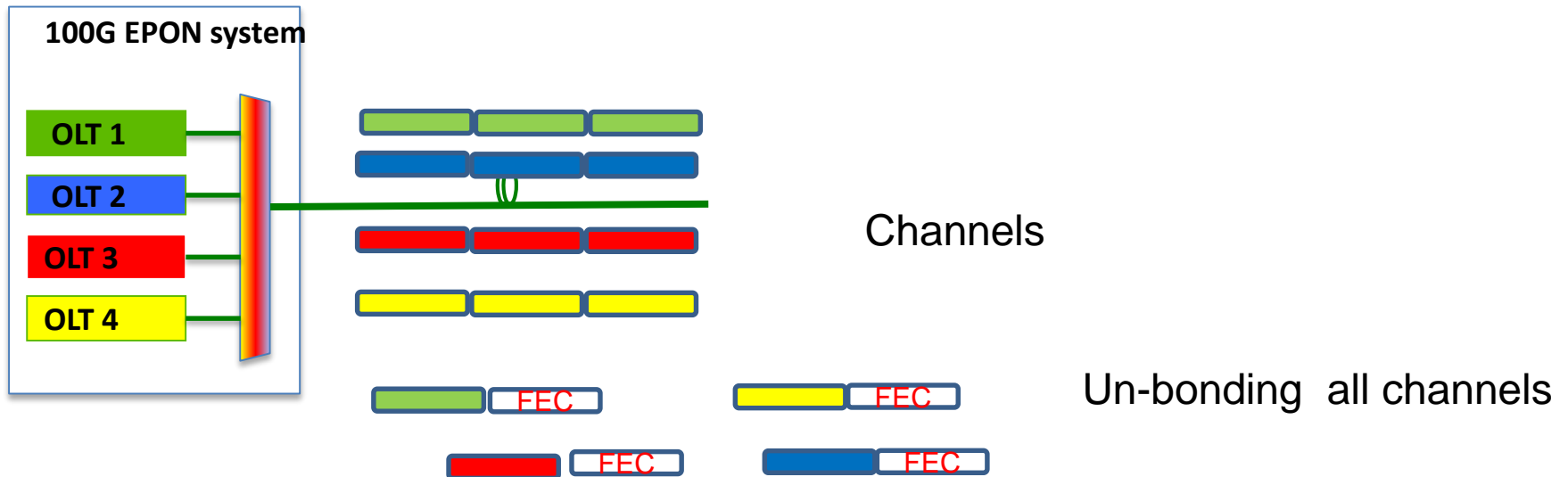
Error propagation in current channel bonding model



- A common FEC protects data blocks from 4 channels
- If one channel has uncorrectable error, all the data from other 3 good channels will be discarded – error propagation
- If the channel error is transient, it may be ok,
- **But what if one channel has persistent errors ?**
- **The system capacity will be seriously impacted**

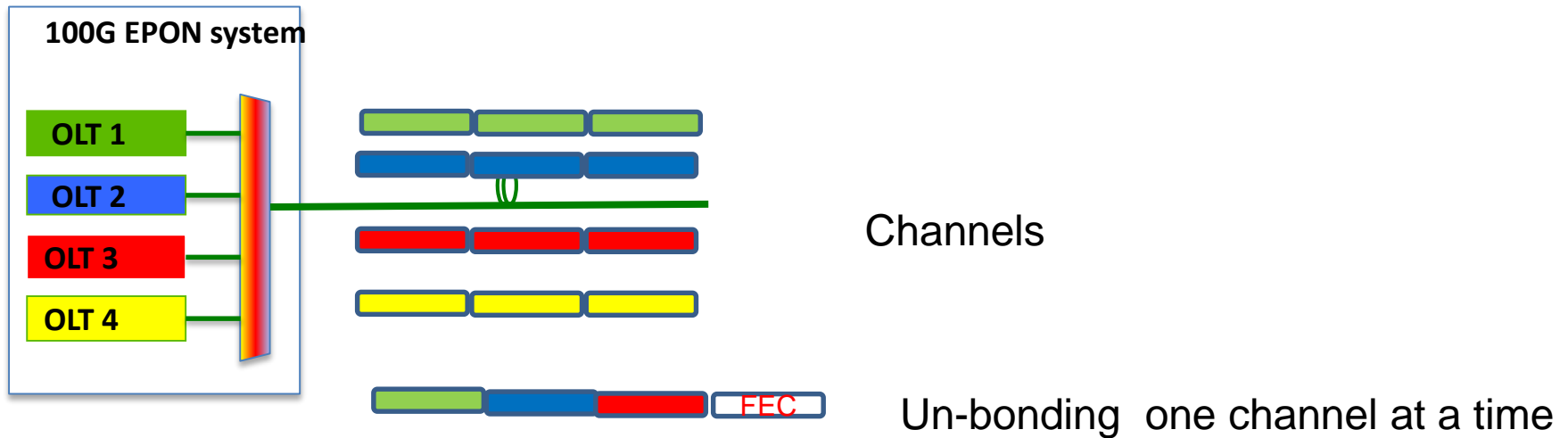
Error isolations – temporally un-bonding all channels

Unless a channel shows LOS, some efforts are needed to debug.



- Temporally un-bond all channels
- Equivalent to channelized FEC
- Will isolate the problematic channel

Error isolations – un-bonding one channel at a time at a time



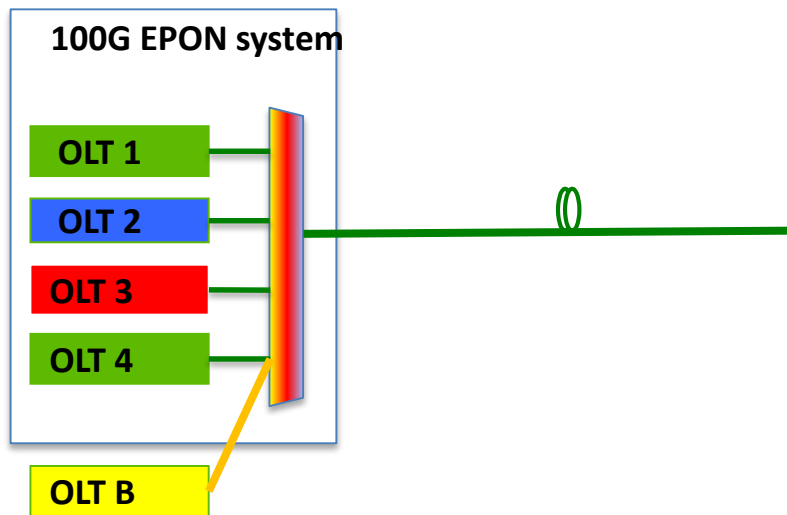
- Un-bonding one channel at a time,...
- Until find the problematic channel

What to do after finding the defected channel?

- Remove the defect channel from bonding group
- The system can restore working condition under reduced capacity
- The 100G EPON may now working at 75G capacity for hours and/or days until the defect components been replaced

This may not be accepted for PON as network transport. What else can we do?

4:1 Protection



- A backup channel can be added to provide 4:1 protection
- The defect channel can be replaced by protection channel immediately

- The system experiences no capacity hit
- A 5th wavelength pair is needed

The 4:1 low cost protection is important for 100G EPON as network transport and as a converged 100G PON solution

Conclusions

- Provide resilience, such as 4:1 protection, is important for 100G EPON as network transport and as a converged 100G PON solution
- A 5th wavelength pair is needed to provide the low cost 4:1 protection



Thanks

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