P802.3cs Architectural Options

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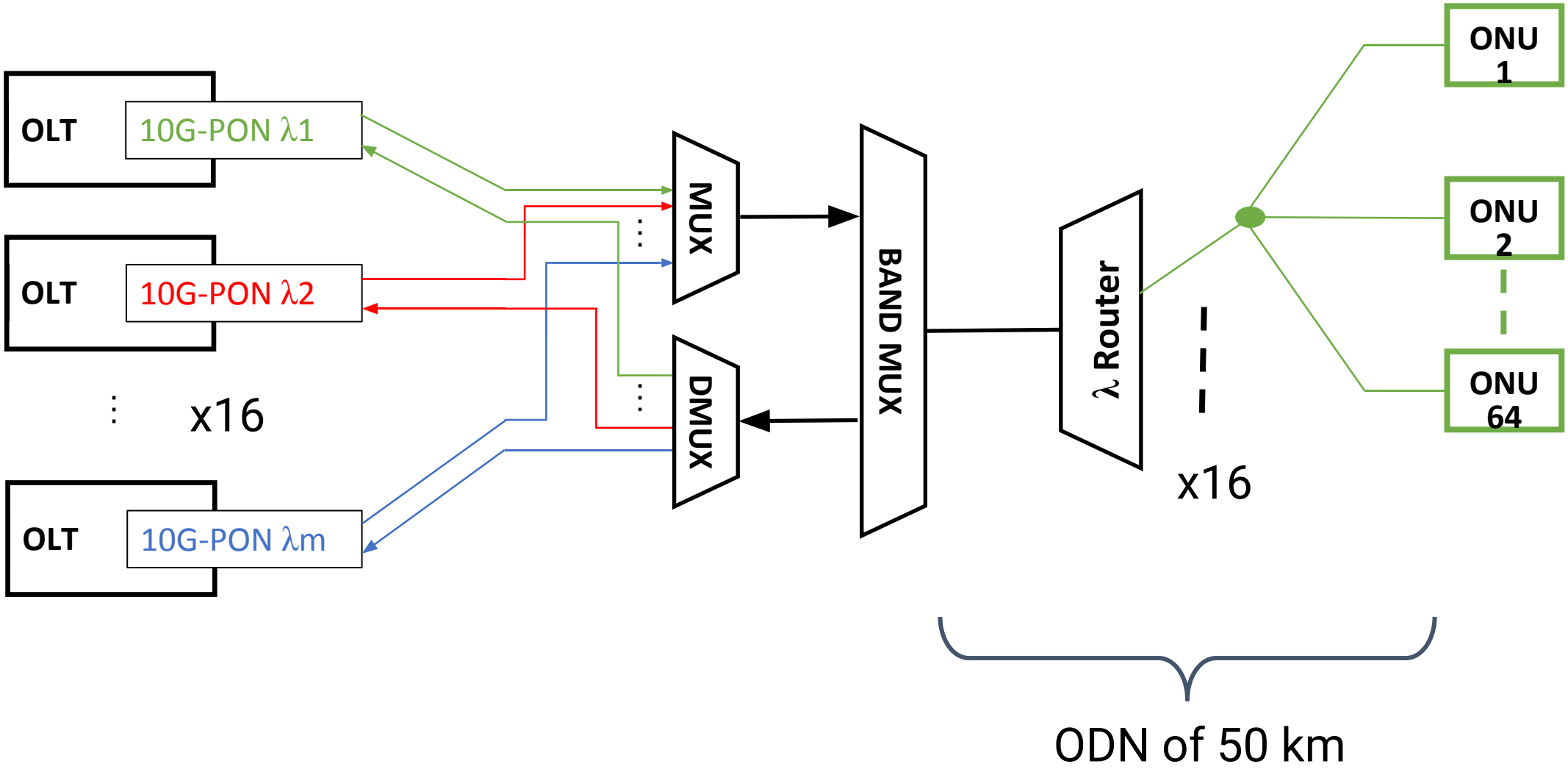
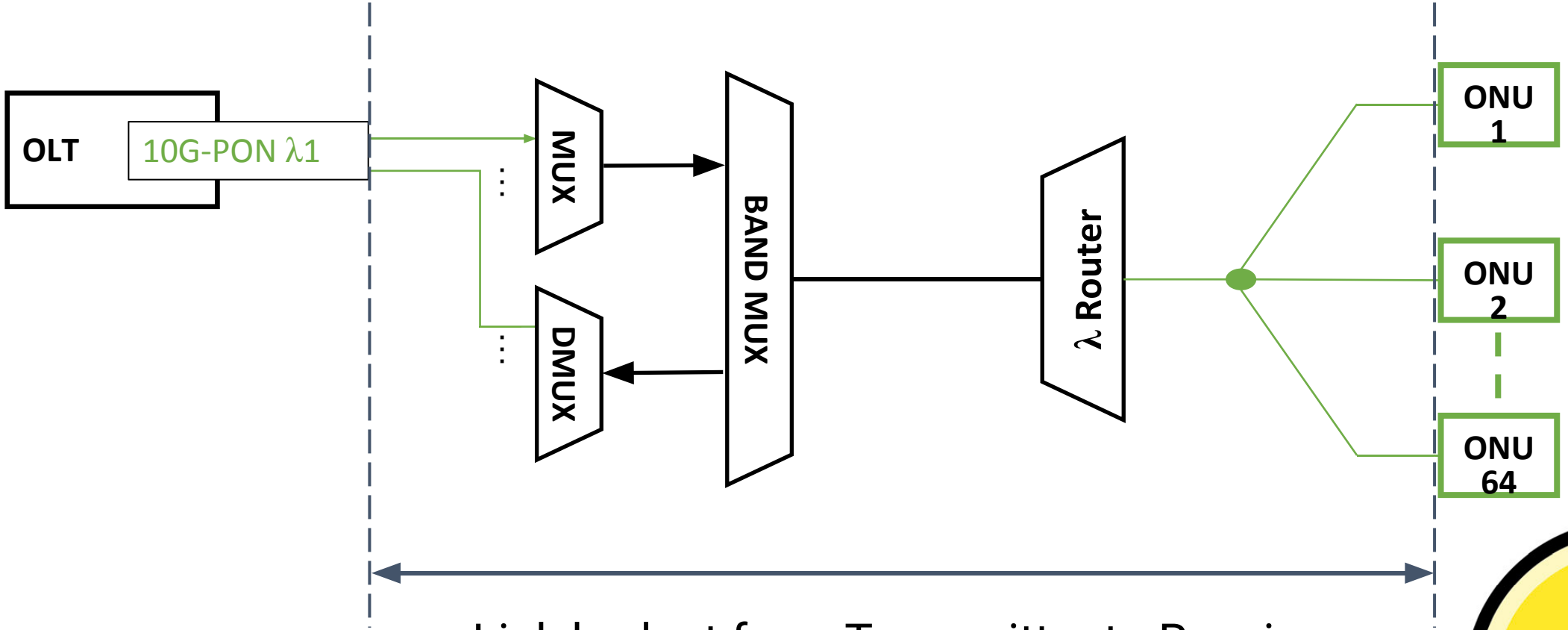
Google Fiber

P802.3cs Super-PON requirements

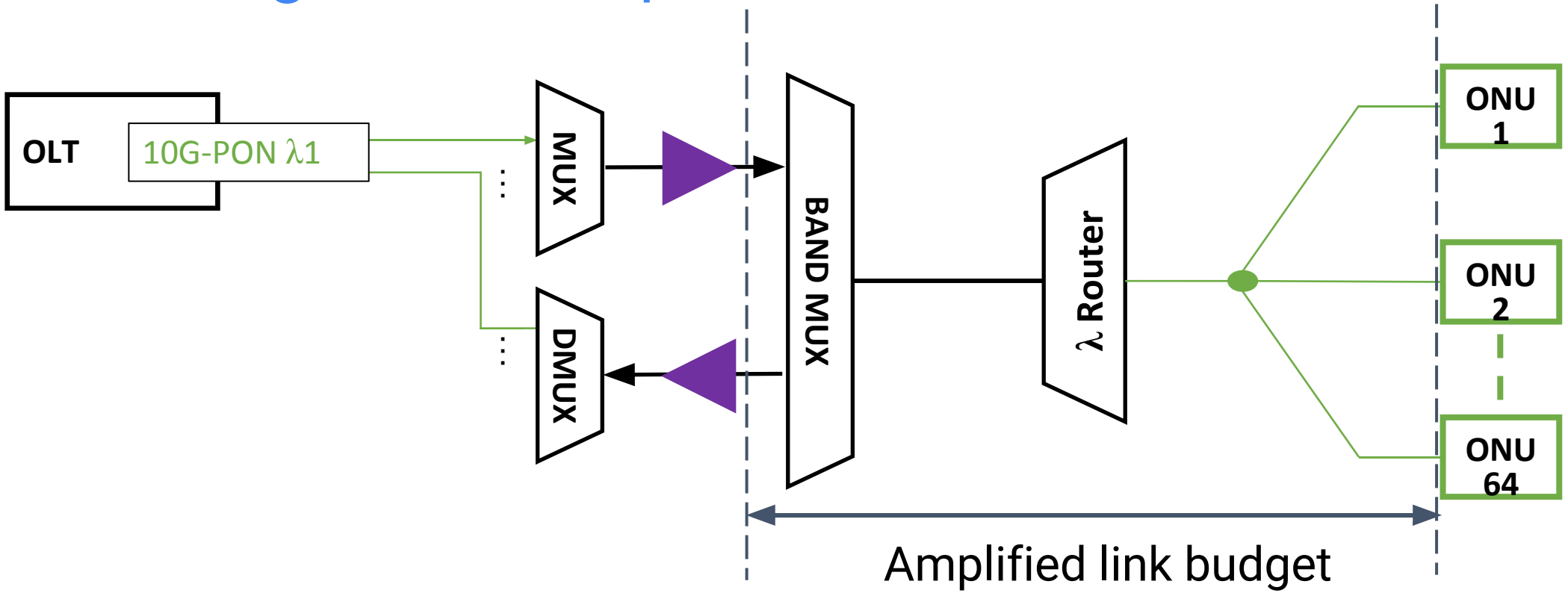


Link budget with no amplifiers



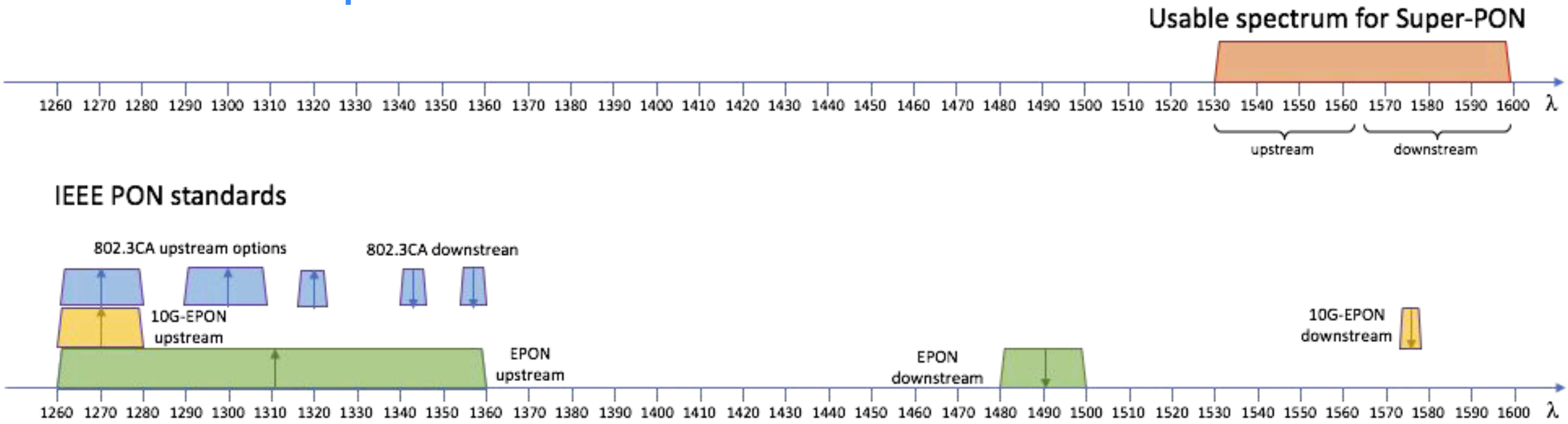
- Link budget from Transmitter to Receiver
- Requires high-power lasers and sensitive receivers at both ends

Link budget with amplifiers



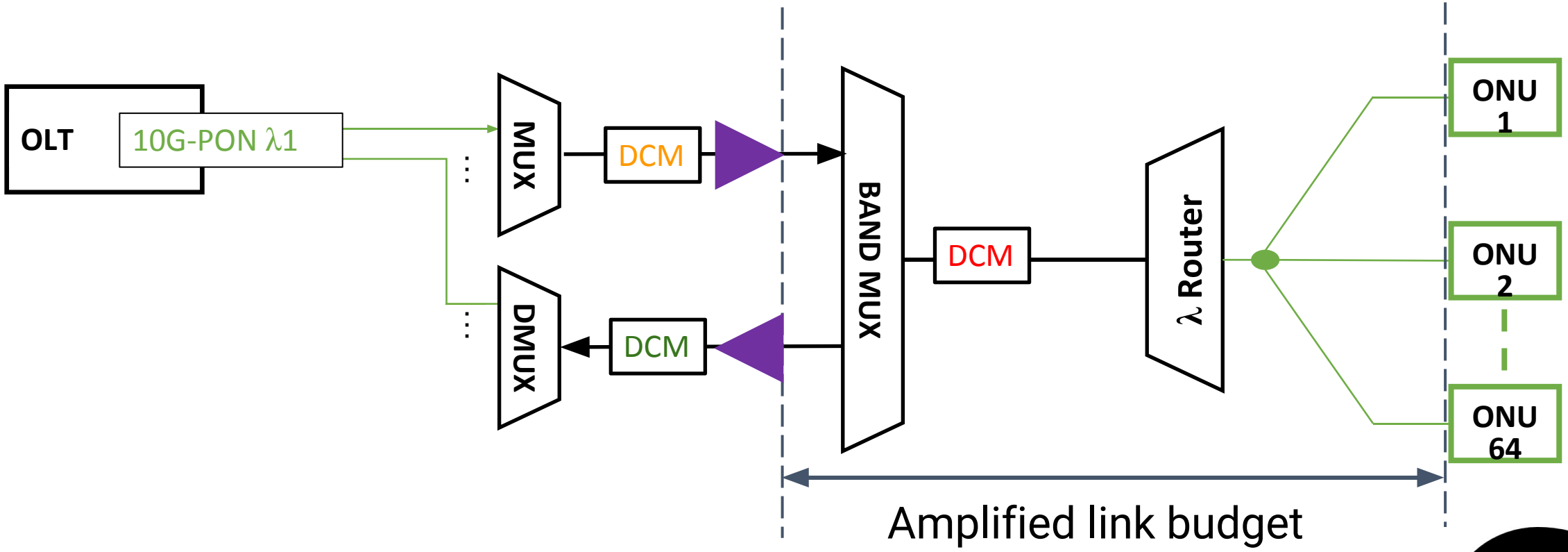
- Using amplifiers allows the link budget to *mostly* ignore the CO mux/demux
- Amplifier gain relaxes Tx and Rx on both ONUs and OLTs
- EDFAs are most mature and lowest noise optical amplifiers and can be shared by all ONUs and OLTs
- EDFAs bound the Super-PON wavelengths to C/L-bands

Channel plan



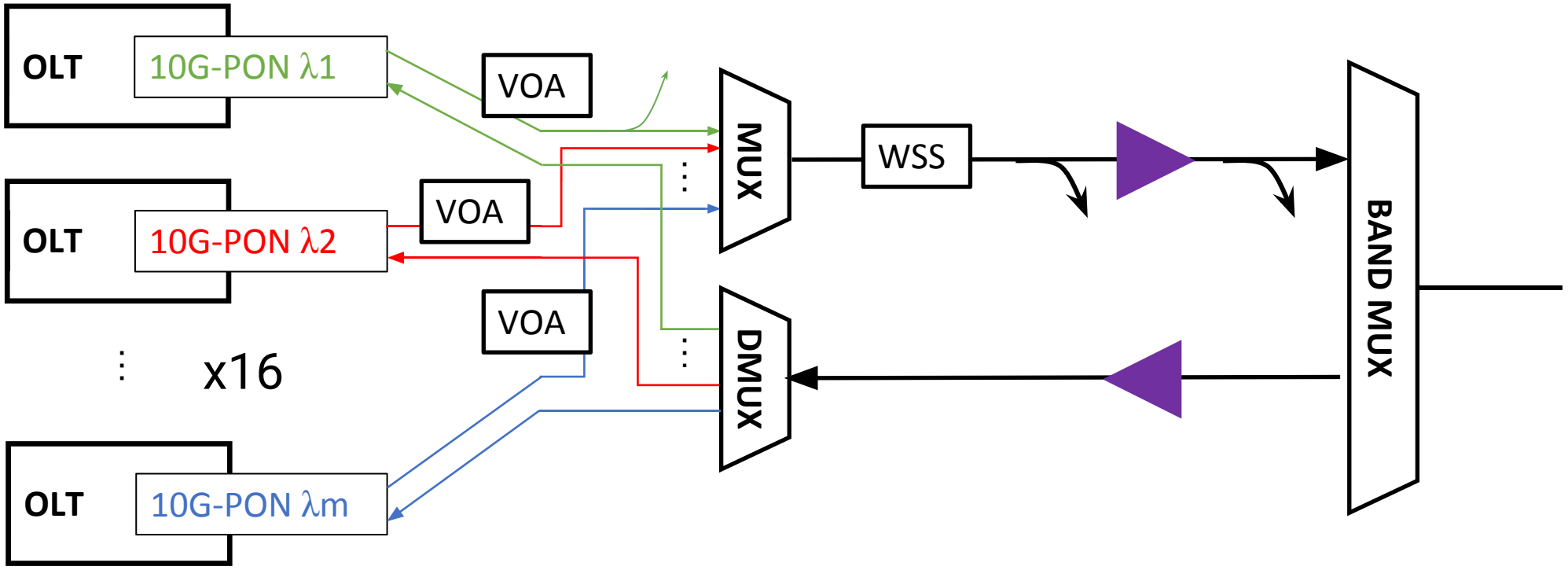
- Propose to use C-band for upstream because of the better availability of lasers
- Use L-band for downstream signals
- Need sufficient separation between upstream and downstream for bidi element inside the ONU -> **should not use the entire band**
- Need to leave a gap to enable WDM coexistence with 10G-EPON

Do we need DCMs?



- DCMs can be used to mitigate for chromatic dispersion penalties
- DCMs have loss -> Increase required link budget on link side of amplifiers
- They enable higher chirp transmitters, maybe even DMLs over 50 km

De we need per channel equalization?



- Per channel power equalization will minimize channel imbalance
- This will reduce the required amplifier output power by the imbalance
- What is the most cost effective solution?
- Does this have a positive cost trade-off?

Conclusions from napkin maths

- Amplification will be needed for both upstream and downstream
  - EDFAs are the most mature amplifier and most suited for WDM systems
  - Bounds the wavelength bands to C- and L-bands
- Use C-band for upstream maximizes component availability for ONUs
- Chromatic Dispersion Compensation Modules are likely to be needed, at least for the upstream direction
- Per-channel power equalization for the downstream may be needed

Thank you