

Bidirectional Loss Budgets

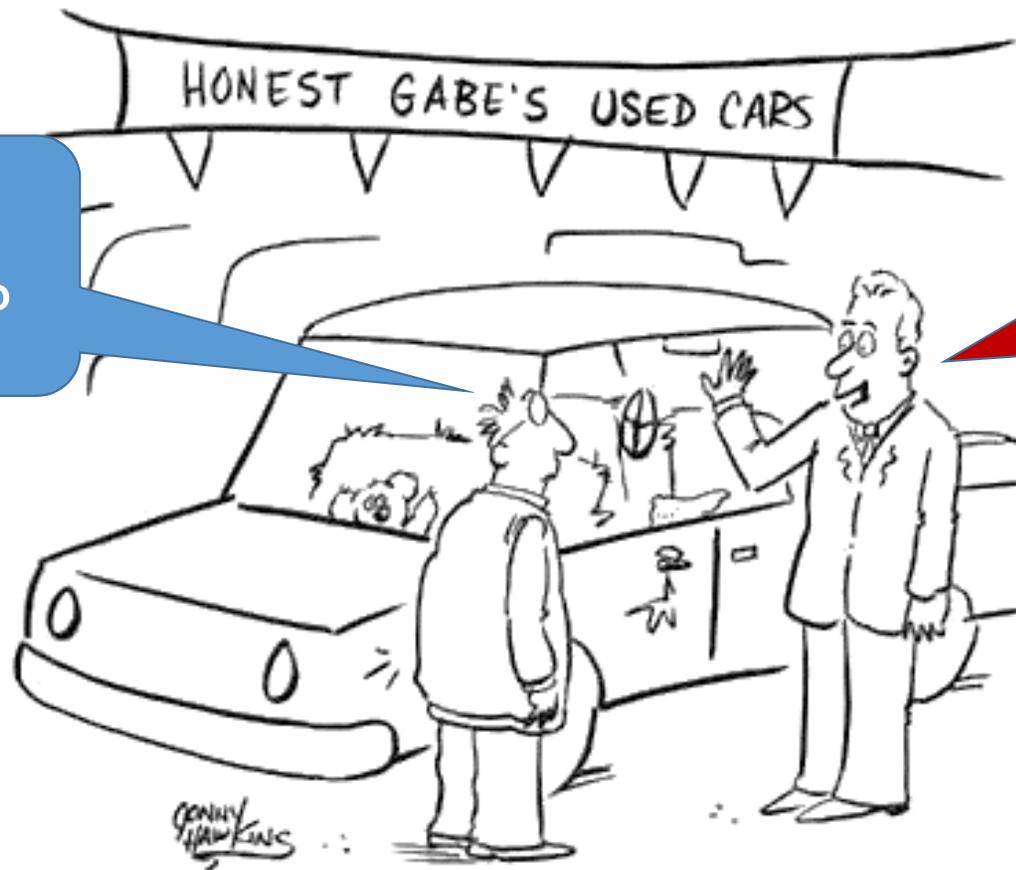
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10, 25, and 50G Bidirectional Access Optics

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Budgeting...

How much does it cost?



How much do you have to spend?

How much link loss?

- Link composed of X km of fiber and Y connectors
- The typical value for fielded fiber loss is 0.47 dB/km, since the bidirectional links will likely use the 1270nm CWDM band
- Estimating the number of connectors depends on deployment scenario, but the following is typical for an access link
 - Patch panel at CO, XC in the field, drop access point, drop termination
 - 6 connectors @ 0.5dB = 3dB
- 10km link = 7.7 dB
- 20km link = 12.4 dB
- 40km link = 21.8 dB

How much power budget do we have?

- A good starting point is the LR4 and ER4 budgets
- Those include a 4:1 mux and 1:4 demux in the modules, while Bidirectional modules will only require a 2:1 mux and a 1:2 demux
 - This means ~1.5 dB of less loss in Bidi versus LR4/ER4 optics (on both sides)
- 40GBase-LR4 budget
 - 10km and 6.7 dB of loss
 - This is 1dB short of the access loss estimation
- 40GBase-ER4 budget
 - 30~40km and 16-18 dB of loss
 - This is calculated assuming the 40km link will be engineered, so losses will be controlled
 - This is 3.8dB short of the access loss estimation

Conclusions

- Link losses calculated for LR4 and ER4 optics are similar to those estimated for bidirectional access links
 - LR4/ER4 have more mux/demux loss
 - Access links have more connectors
 - Fortunately, these almost cancel
- This means that the same lasers and detectors from LR4/ER4 modules can be reused in bidirectional links
 - Obviously a good thing for volume and cost