

Towards a Backplane (KR) Objective for 400GPL Study Group

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Backplanes Are Used Broadly at 100Gbps/lane and 200Gbps/lane

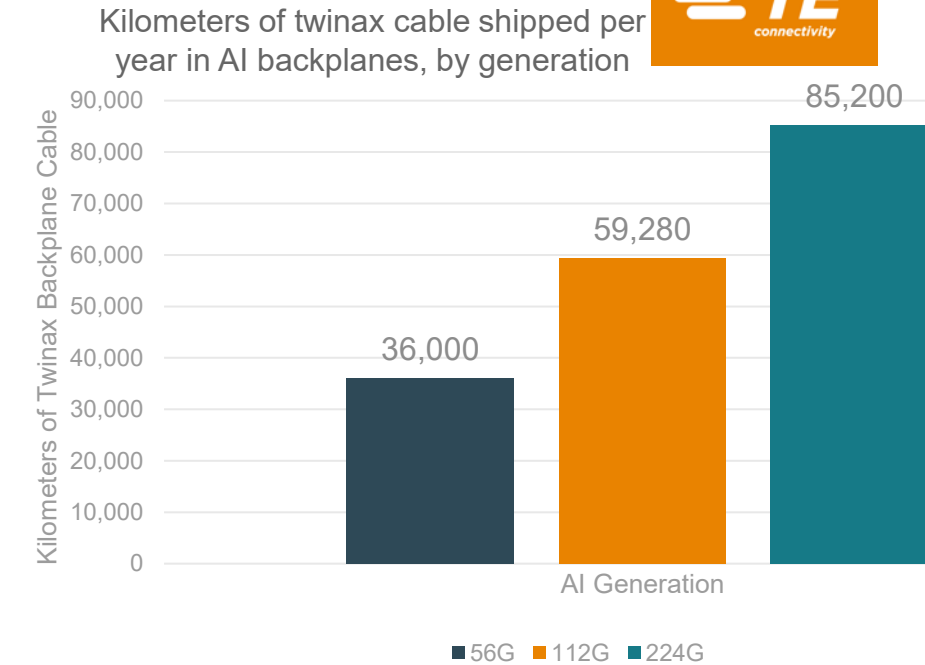
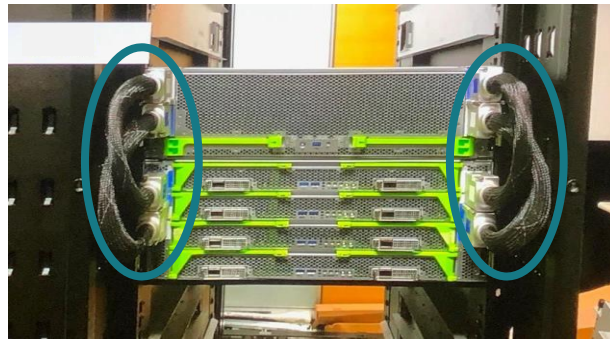
Equipment providers and end users tell us they are depending on them for the 400Gbps/lane generation architectures as well

“The ecosystem” is already working on technology developments

Our proposal is that the 400GPL Study Group should add a Backplane (KR) objective

High Speed Backplane Connectivity

- Current deployments are in the range of >130 Tbps of backplane bandwidth
- Plans to grow > 500 Tbps of backplane bandwidth announced



518Tb/s



Courtesy of Craig Thompson @ Nvidia

400GPL Study Group Have Already Adopted Copper Cable Objectives

https://www.ieee802.org/3/400GPL/public/2605/kochuparambil_400GPL_01c_2605.pdf

https://www.ieee802.org/3/400GPL/public/2605/400GPL_Motions_Straw_Polls_2605.pdf

Summary

- **The length objective assumes front panel to front panel**
- 1M objective has reasonable broad market potential
 - This is based on interconnection details
 - Not every host configuration has to achieve this
- Innovation is already in works to achieve this with passive copper
 - Decision making on the technical details is for task force
 - Ideally, active cables can achieve 2-3M (also needed in the industry)
- Recommend to adopt Copper Cable Objectives

Motion #7: CR

Move to adopt the following objectives:

- Define a single-lane, 400 Gb/s PHY for operation over twin-axial copper cables with lengths up to at least 1 meter.
- Define a two-lane, 800 Gb/s PHY for operation over twin-axial copper cables with lengths up to at least 1 meter.
- Define a four-lane, 1.6 Tb/s PHY for operation over twin-axial copper cables with lengths up to at least 1 meter.

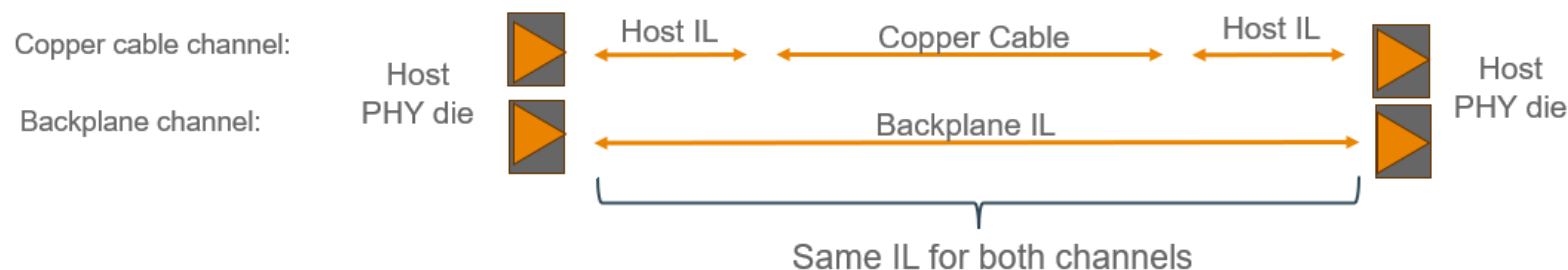
M: M. Nowell

S: N. Tracy

Technical $\geq 75\%$

Results: Passed by Unanimous Consent

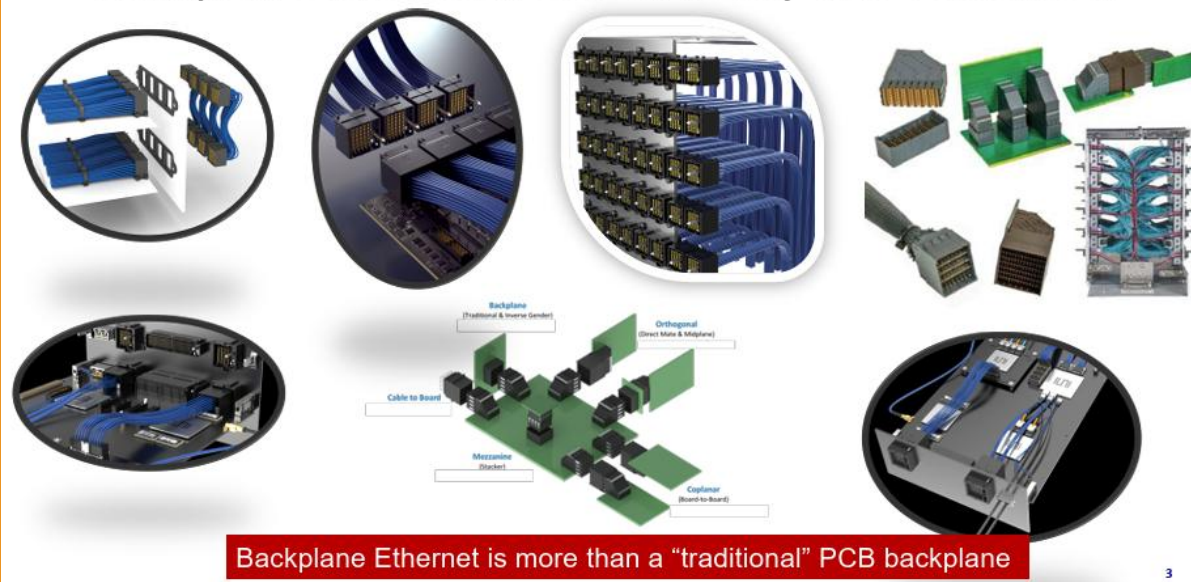
CR and KR channel construction and performance has significant similarities



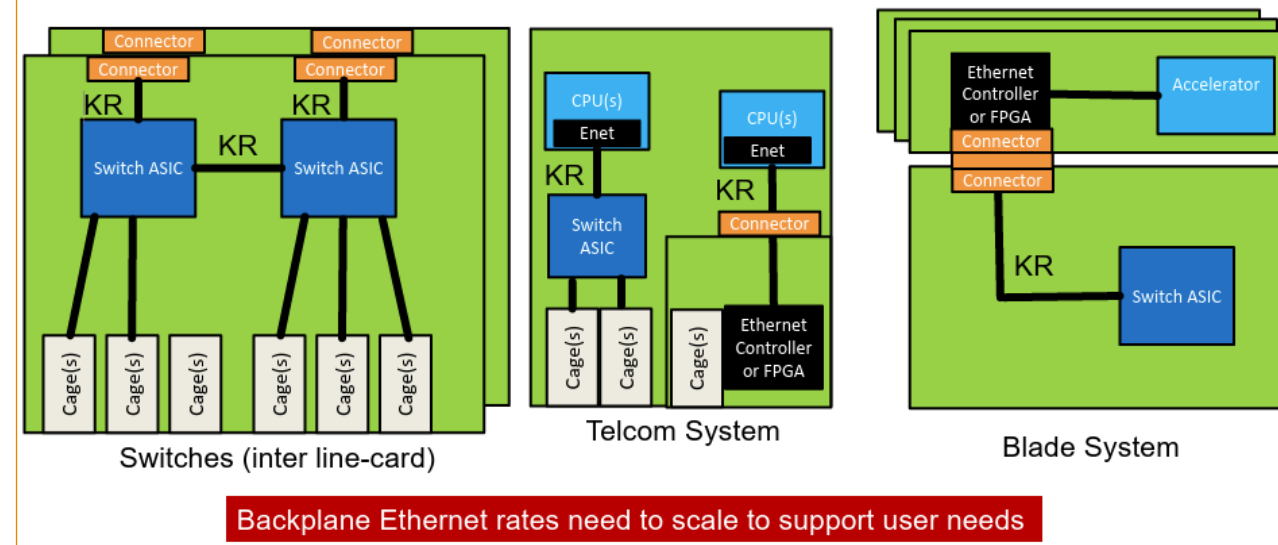
“Backplane” as described in P802.3dj Consensus Building

(https://www.ieee802.org/3/dj/public/23_01/23_0116/lusted_3dj_01a_230116.pdf)

Backplane Interconnects of Today and Tomorrow



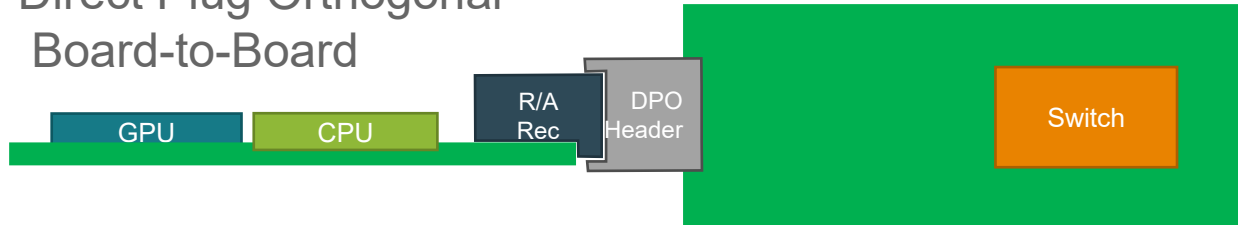
Some Examples of How Backplane PHYs are Used



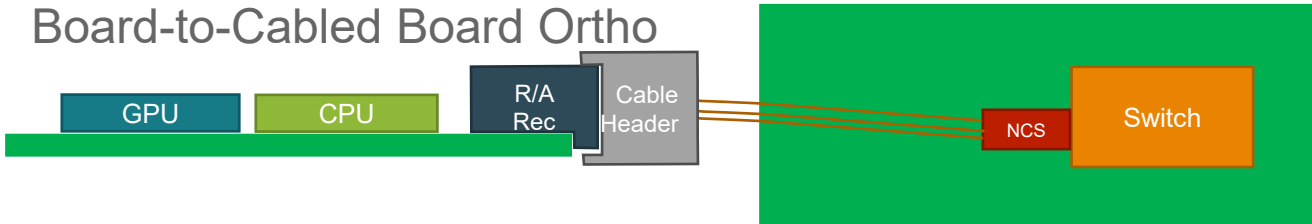
The point was made in 2023: copper backplanes (KR) allow flexible architectures, high performance, and are broadly deployed

What Does “Backplane” Mean to You?

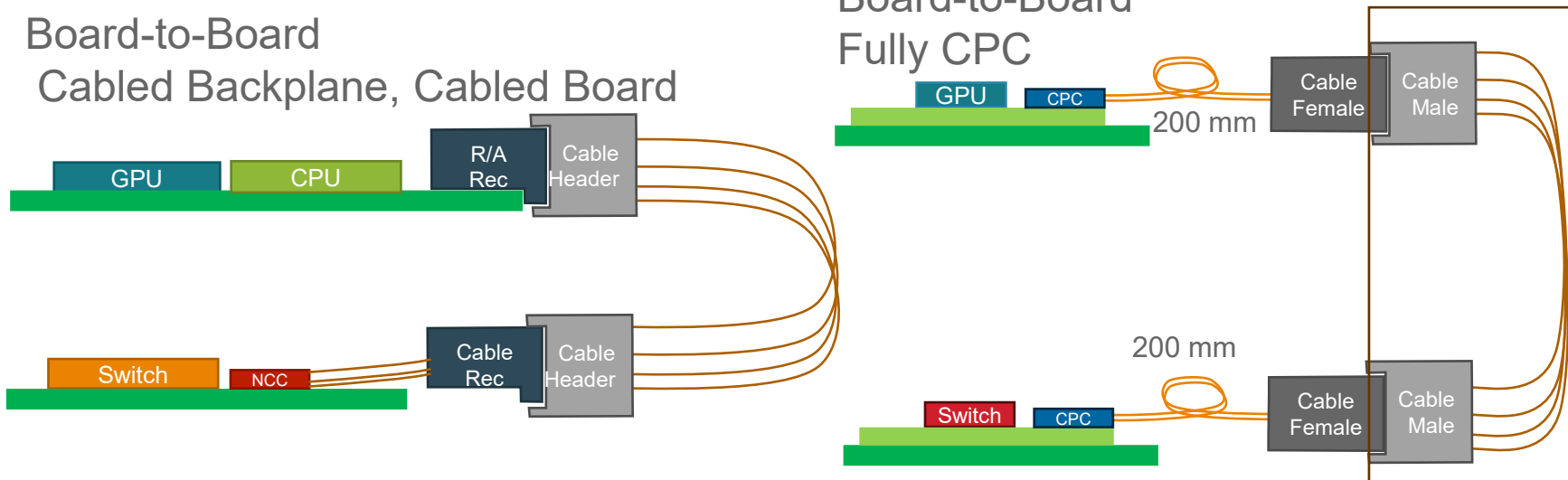
Direct Plug Orthogonal
Board-to-Board



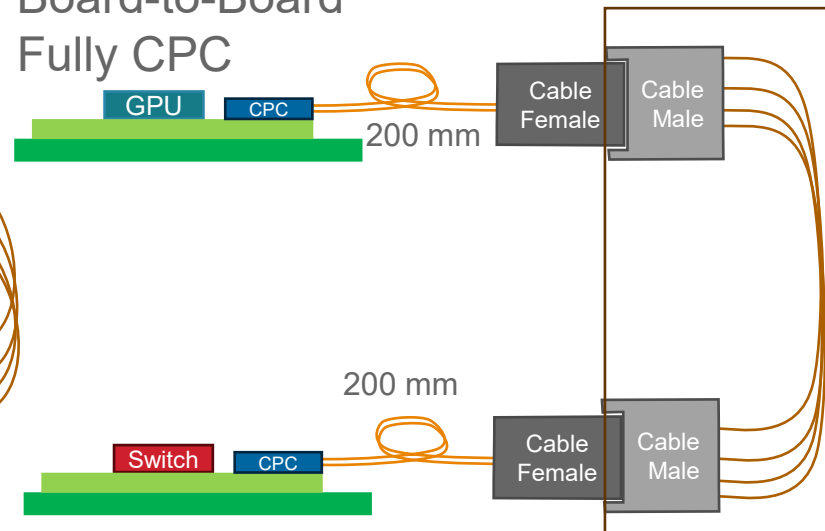
Direct Plug Orthogonal
Board-to-Cabled Board Ortho



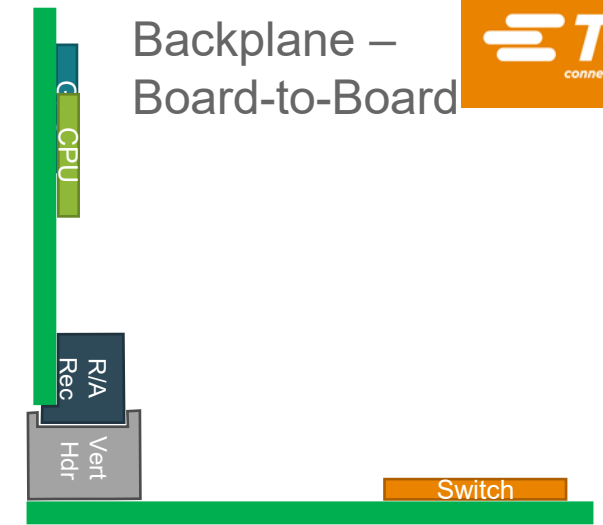
Board-to-Board
Cabled Backplane, Cabled Board



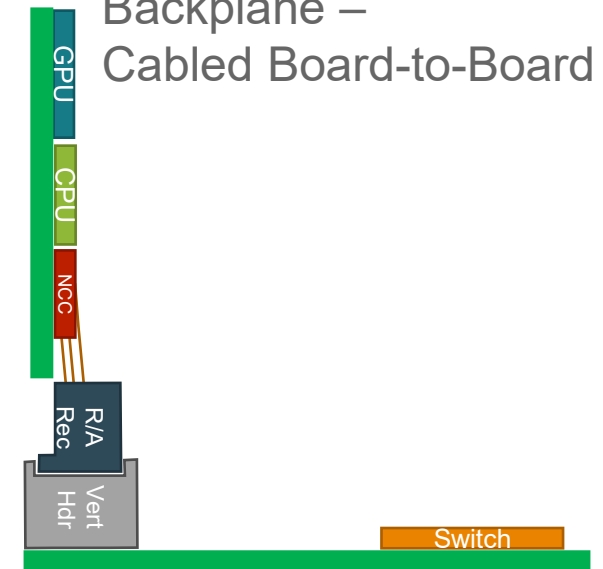
Board-to-Board
Fully CPC



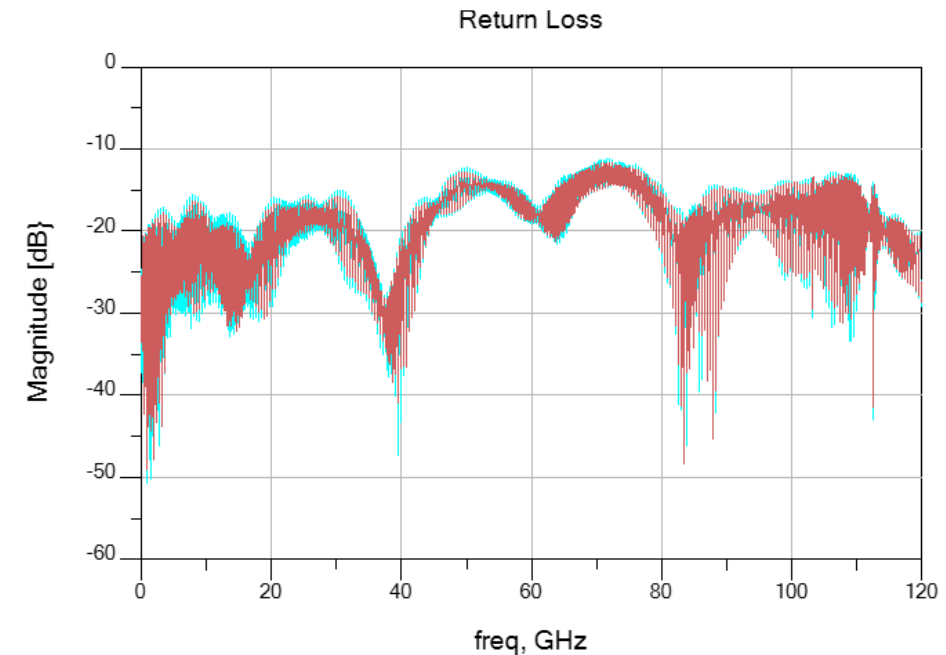
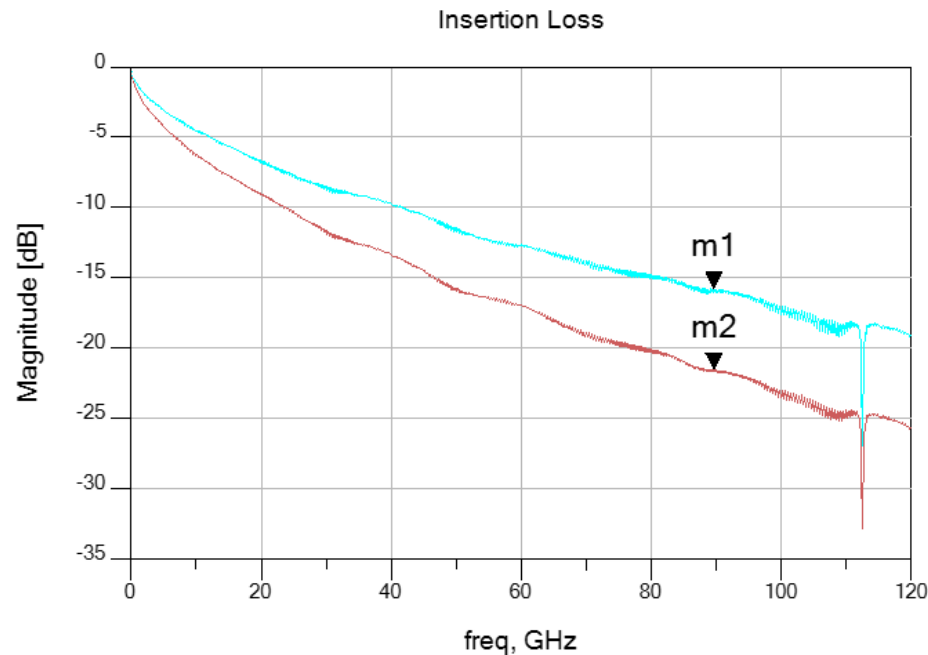
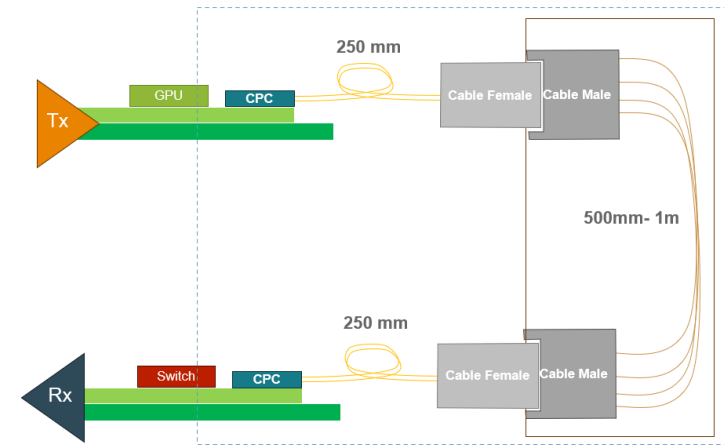
Backplane –
Board-to-Board



Backplane –
Cabled Board-to-Board



An Initial Look At A Backplane Channel



Freq = 89.6 GHz

m1 - 500mm based backplane channel

$\text{dB}(\text{sdd21_cpc_250mm_conn_500mm_conn_250mm_cpc}) = -15.757$

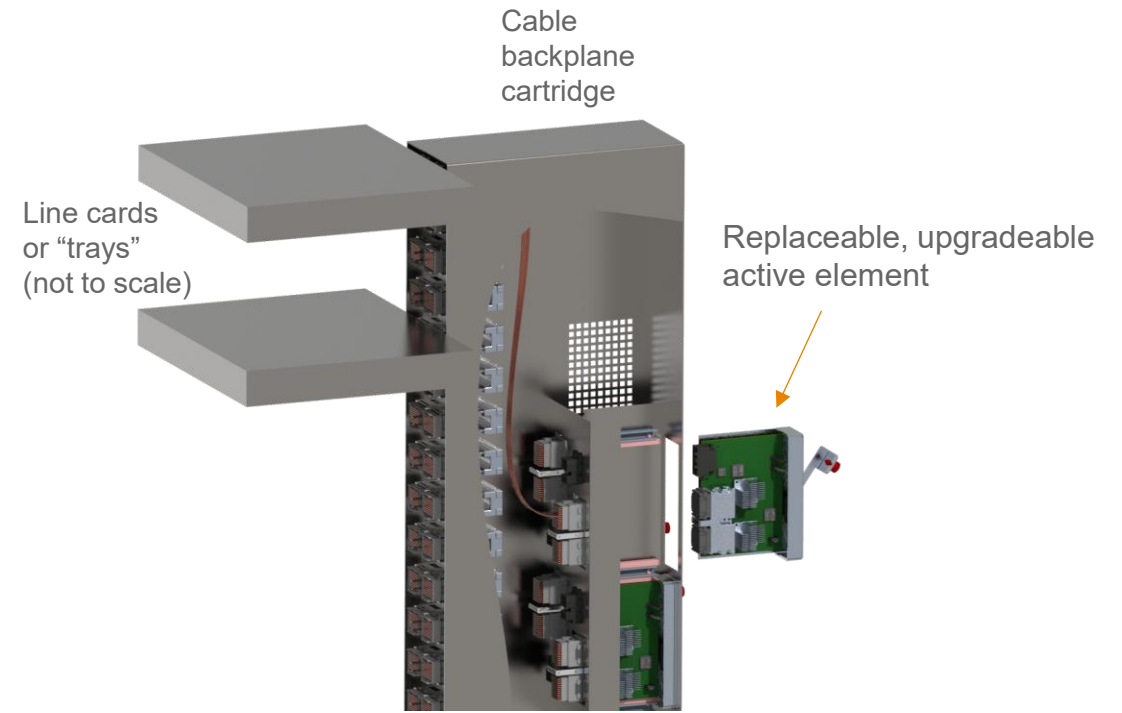
m2 - 1000mm based backplane channel

$\text{dB}(\text{sdd21_cpc_250mm_conn_1000mm_conn_250mm_cpc}) = -21.487$

Critical Work for the Study Group and Working Group

In the future, determine:

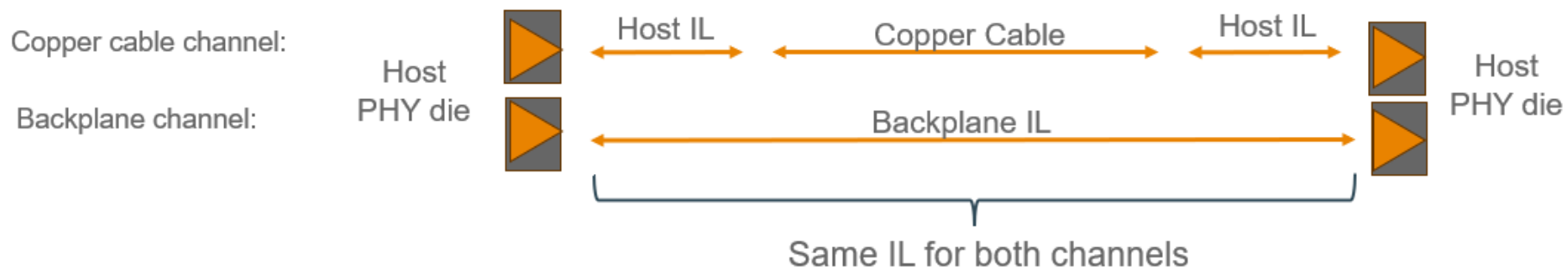
- Modulation?
- Equalization?
- Active or Passive Backplane?
- Architectural loss partitioning?



Active backplane conceptual view

Conclusion

- Propose to consider adding a KR objective that is similar in scope to the adopted CR objective
- Maybe something like:
 - “Define a single-lane, 400 Gb/s PHY for operation over electrical backplanes with insertion loss up to at least the insertion loss of a die-to-die channel supporting a 1 meter twin-axial copper cable
 - Define a two-lane, 800 Gb/s PHY for operation over electrical backplanes with insertion loss up to at least the insertion loss of a die-to-die channel supporting a 1 meter twin-axial copper cable
 - Define a four-lane, 1.6 Tb/s PHY for operation over electrical backplanes with insertion loss up to at least the insertion loss of a die-to-die channel supporting a 1 meter twin-axial copper cable”
- There are many ways this could be done, but we believe this leverages the existing copper cable objectives we have adopted, while still acknowledging the work that needs to be done by the eventual working group to bring more specifics



Thank You
