



New PCIe Retimer Product Line Scales Compute Fabrics for the AI Era

May 2024

Forward-looking statements

Except for statements of historical fact, this presentation contains forward-looking statements (within the meaning of the federal securities laws) including statements related to future revenue, future earnings, and the success of our product releases that involve risks and uncertainties. Words such as “anticipates,” “expects,” “intends,” “plans,” “projects,” “believes,” “seeks,” “estimates,” “can,” “may,” “will,” “would” and similar expressions identify such forward-looking statements. These statements are not guarantees of results and should not be considered as an indication of future activity or future performance. Actual events or results may differ materially from those described in this presentation due to a number of risks and uncertainties.

Forward-looking statements are only predictions and are subject to risks, uncertainties and assumptions that are difficult to predict, including those described in the “Risk Factors” section of our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q and other documents filed by us from time to time with the SEC. Forward-looking statements speak only as of the date they are made. You are cautioned not to put undue reliance on forward-looking statements, and no person assumes any obligation to update or revise any such forward-looking statements, whether as a result of new information, future events or otherwise.

Overview

Company founded

1995

FY24 revenue

\$5.5B

Employees

6,800+

Patents worldwide

10,000+

Global fabless semiconductor supplier



 Nasdaq-100

Industry-leading data infrastructure products



Storage

HDD, SSD and
Fibre Channel controllers



Electro-optics

PAM4 DSPs, linear TIAs, drivers and
coherent DSPs



Processors

4G/5G baseband and
data processor units (DPUs)

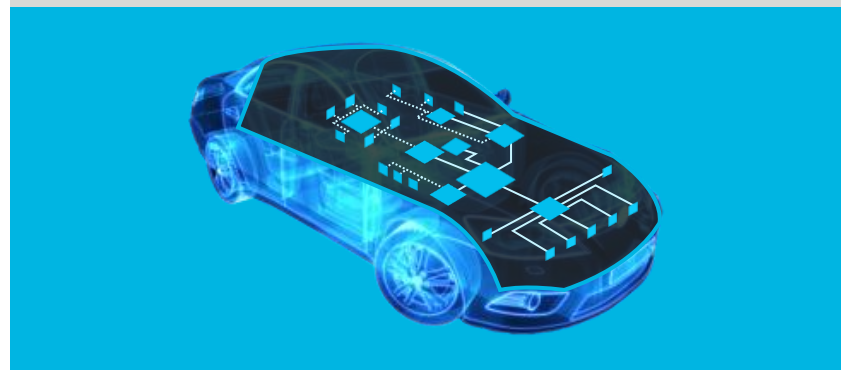
Networking

Ethernet switches and PHYs



Automotive Ethernet

Switches, multi-gig PHYs and bridges



Security

Processors and cloud hardware
security modules (HSM)



Marvell accelerated infrastructure portfolio

Compute

 **Custom compute**

Connectivity

 **Ethernet switch**

 **Interconnect**

Storage

 **Controllers**

AI server connectivity market trends



AI driving bandwidth growth across every connectivity tier

- Data center-to-data center, cluster-to-cluster, server-to-server, and inside servers.



Inside AI server compute fabrics accelerating migration to PCIe Gen 6

- Faster connections needed between AI accelerators, GPUs, CPUs and other server components.



Higher-speed inside server system copper connections need retiming

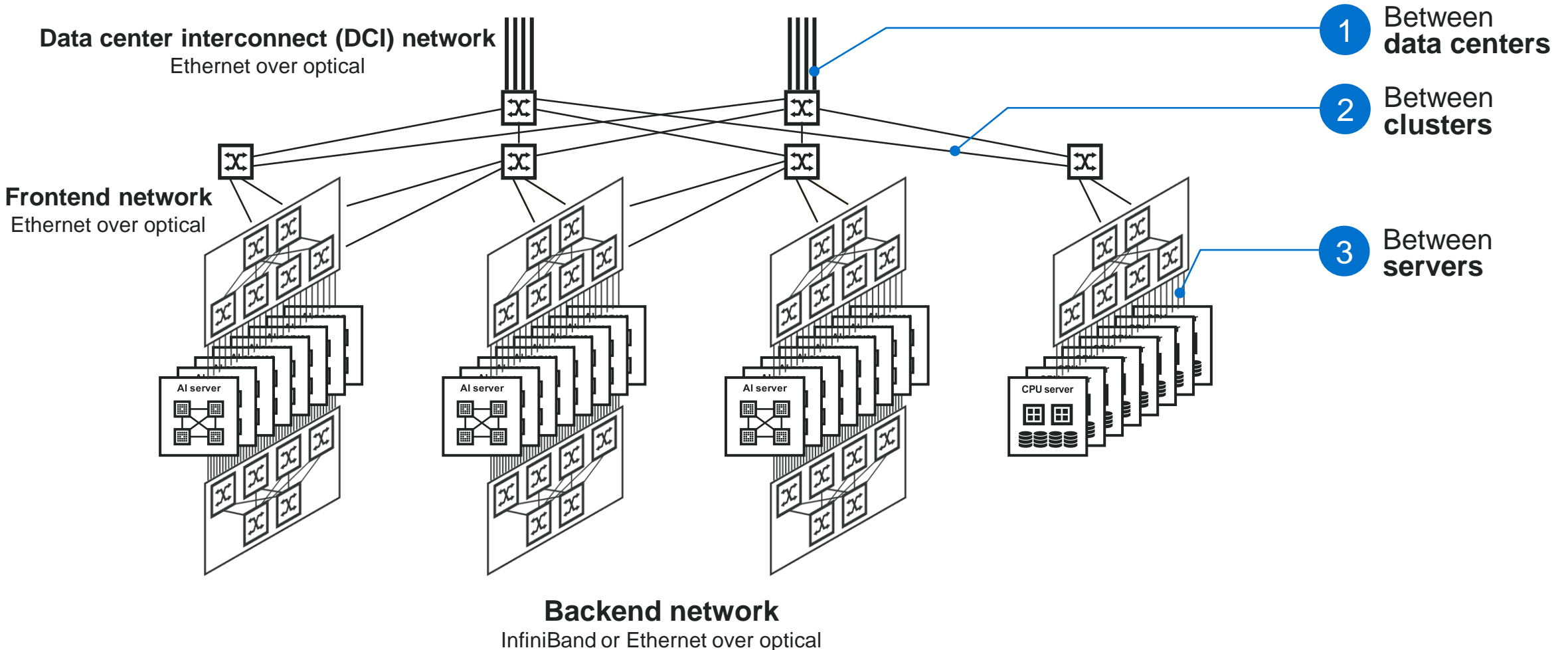
- New category of PCIe retimers emerging to enable required compute fabric connections.



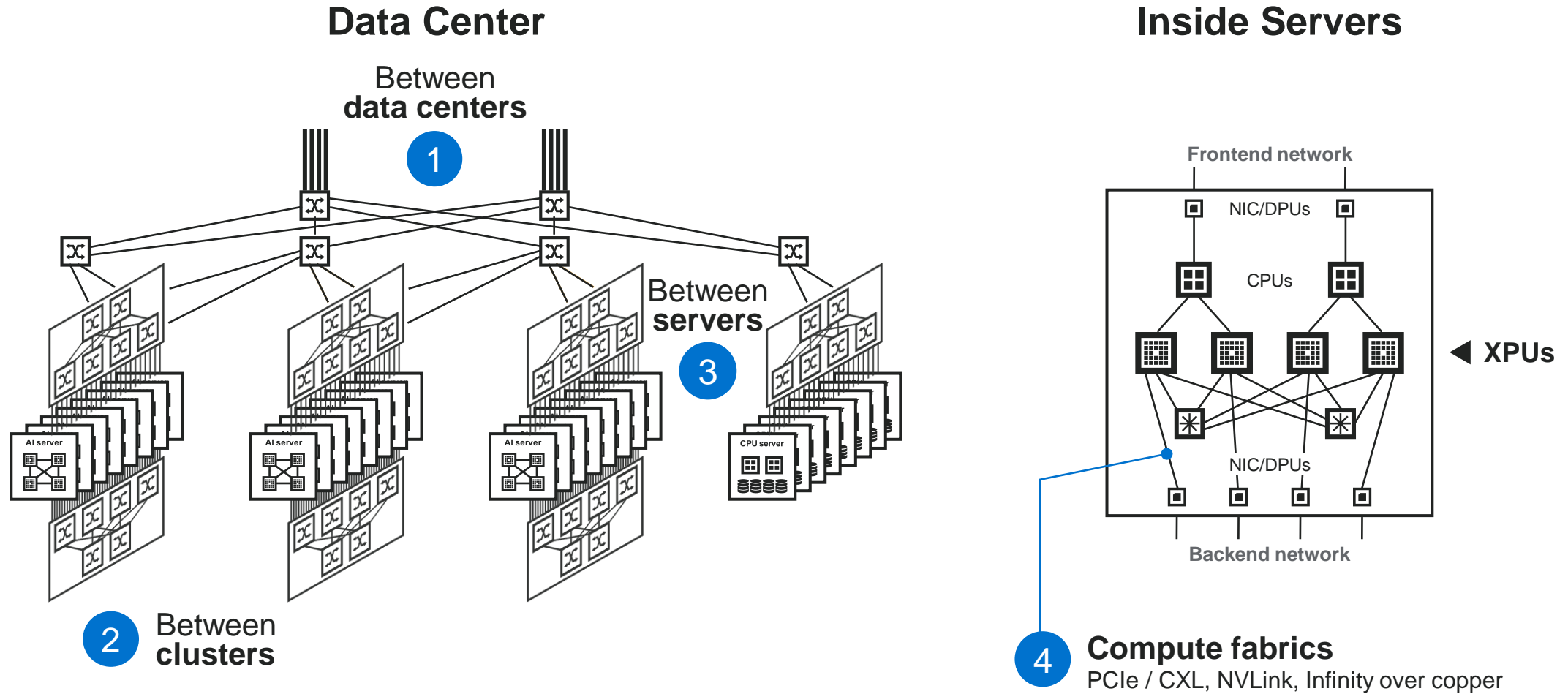
Disaggregated systems emerging to address performance and power

- Growing number of XPU's per single server computing domain require new system architectures.

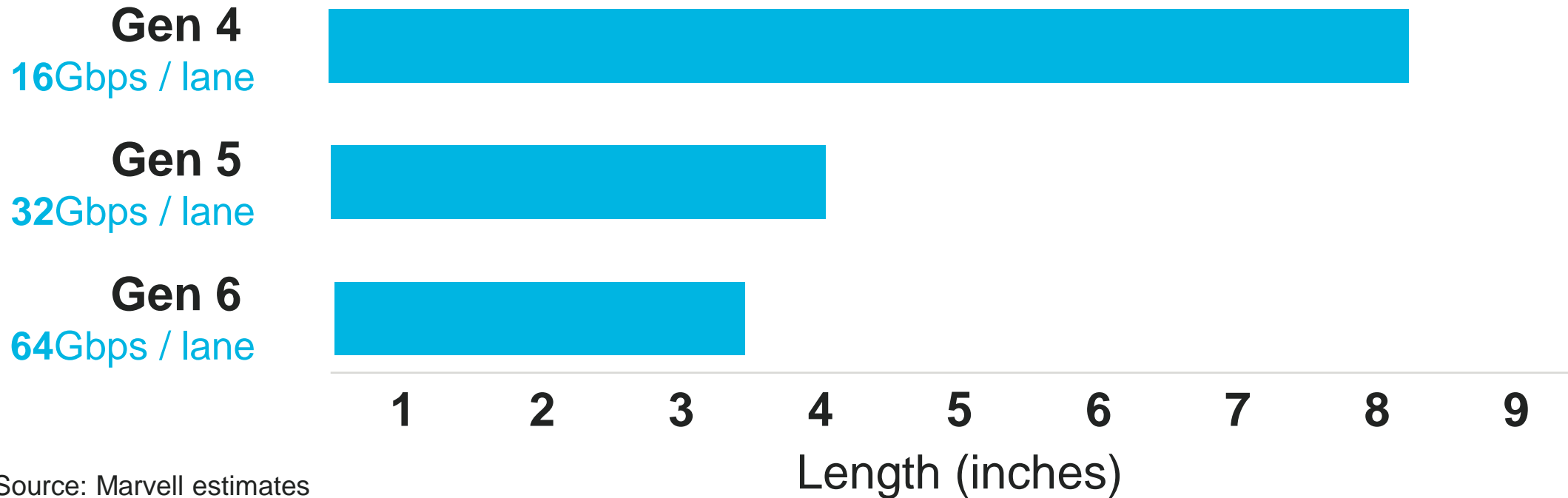
Data center network and connectivity tiers



Accelerated infrastructure connectivity tiers

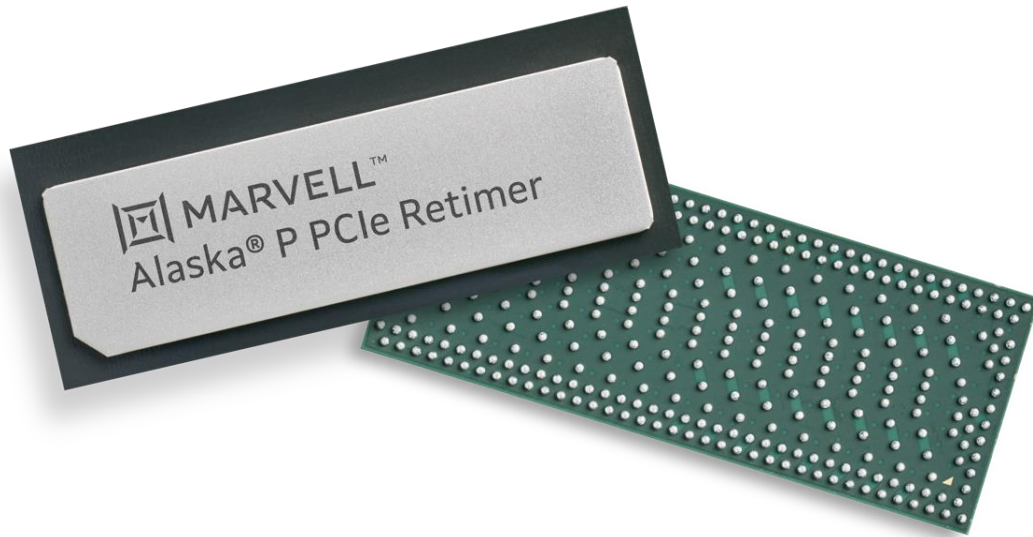


The challenge for inside server component connections



Limits connection distances between AI accelerators, GPUs and CPUs

Alaska[®] P PCIe retimers address the distance gap



- 5nm PAM4-based PCIe Gen 6
- 16-lane and 8-lane products
- **Industry's lowest-power: 10W for 16-lane product**
- Built on industry-leading Marvell in-house PAM4 IP
 - SerDes supporting >40dB insertion loss compensation
 - Field-proven: shipping in multiple Marvell 5nm high-volume products
- Scales inside server compute fabric connections
 - Between AI accelerators, GPUs, CPUs and other server components
 - On motherboards, accelerator baseboards, and in copper and optical cables
- Supports CXL 3.x for emerging disaggregated systems
- Advanced diagnostics and telemetry
- Sampling now

Enables high-speed connections between components inside servers

Industry-leading 5nm PAM4 SerDes

High-
performance
equalizer

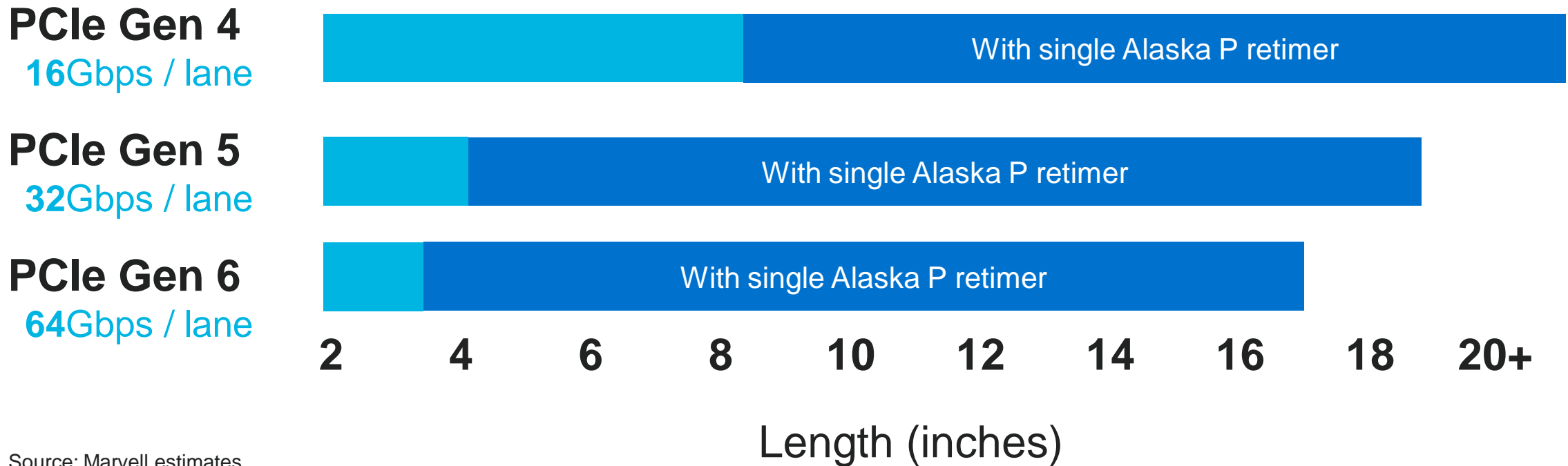
>40dB
insertion
loss

Low-power

Field-proven

Multiple Marvell 5nm products shipping in high volume

Extends PCIe Gen 6 connection distances by >5x

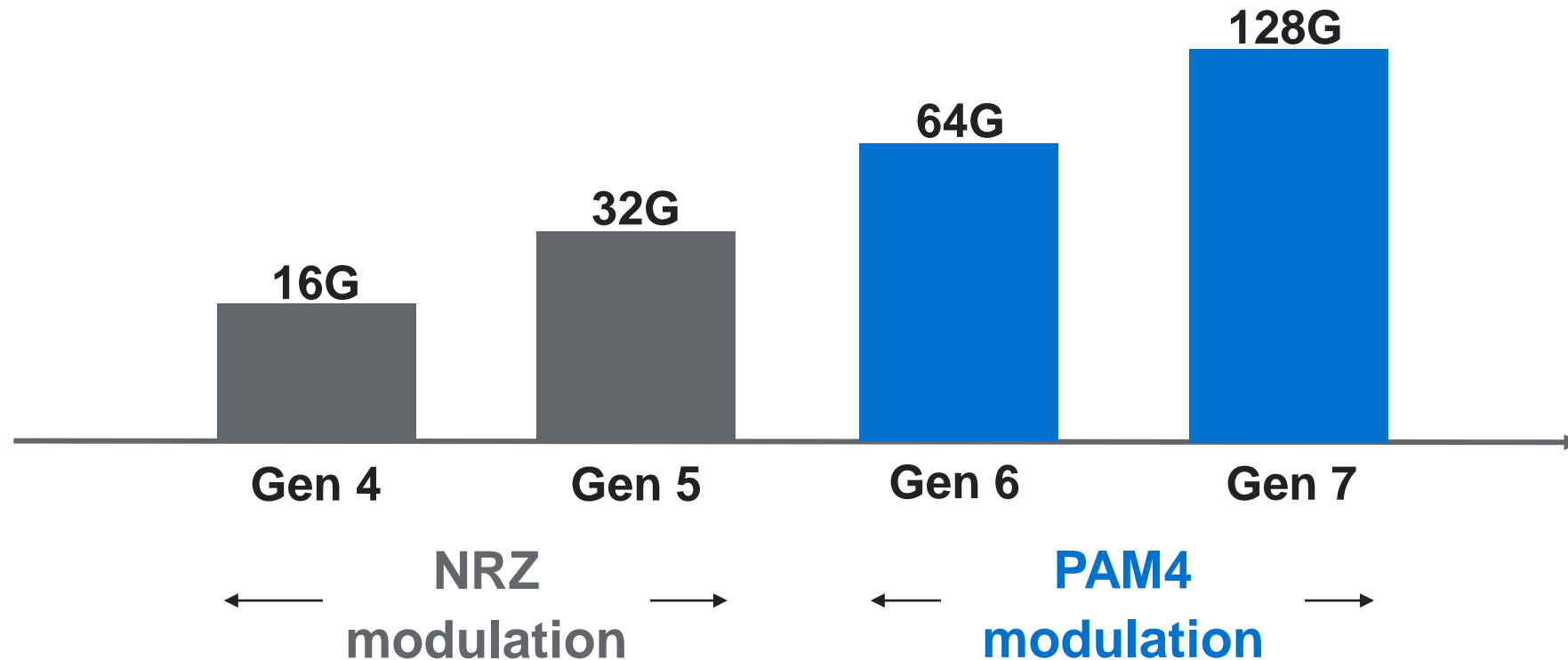


Source: Marvell estimates

Note: Assumes standard PCB material
Assumes AIC losses of 8.5dB for PCIe 6, 9.5dB for PCIe 5 and 8dB for PCIe Gen 4 per CEM.

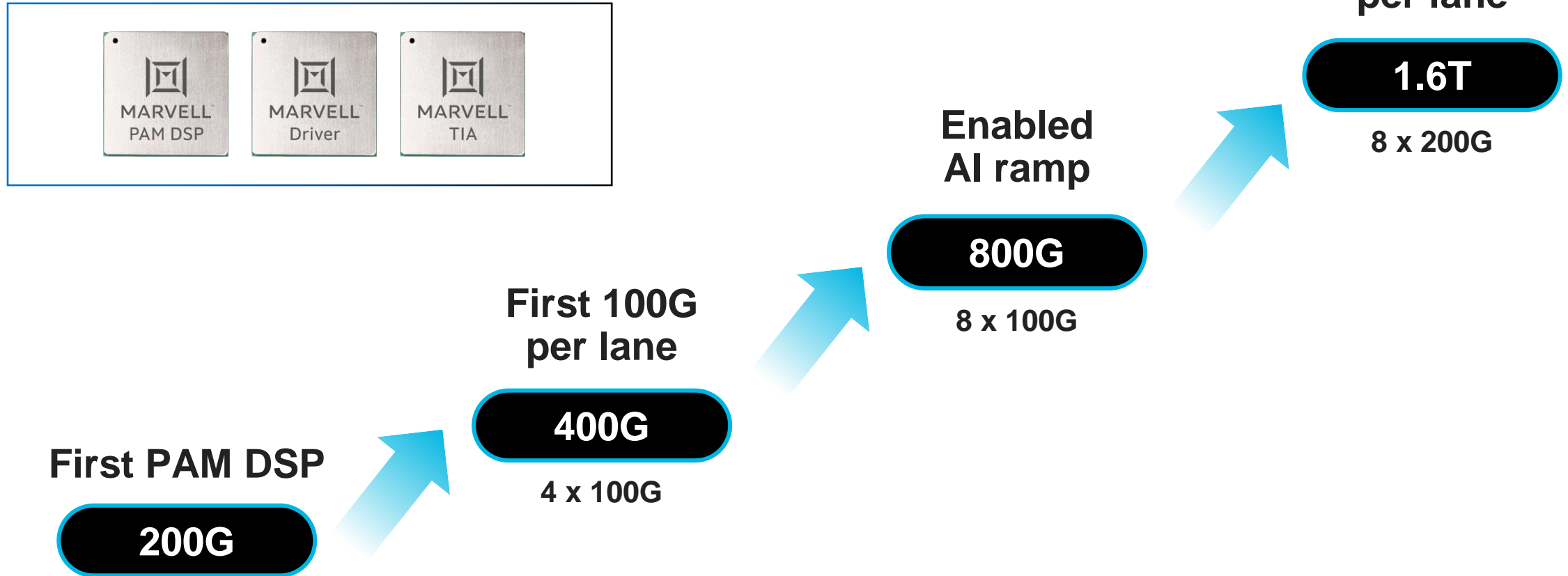
Foundational for AI and general-purpose server compute fabrics

PAM4 modulation is critical for higher PCIe speeds



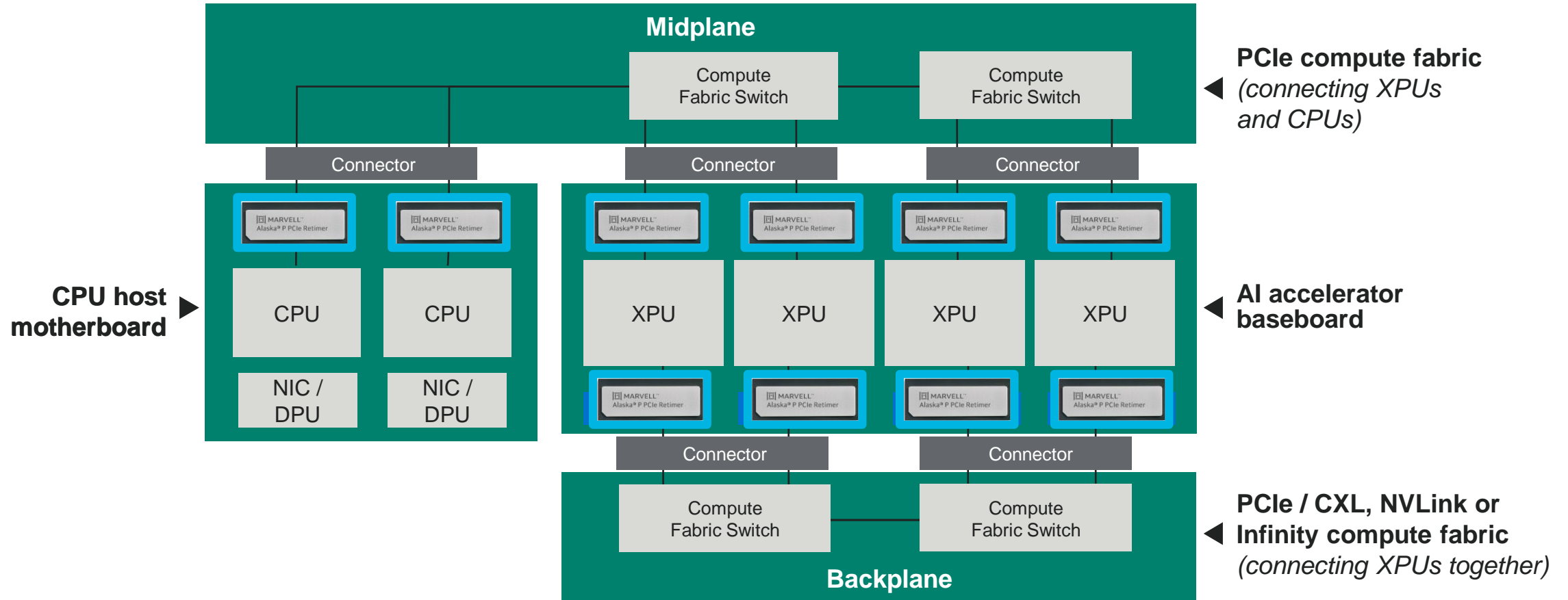
Follows Ethernet technology transition from NRZ to PAM4 modulation

Marvell leveraging PAM4 leadership into PCIe



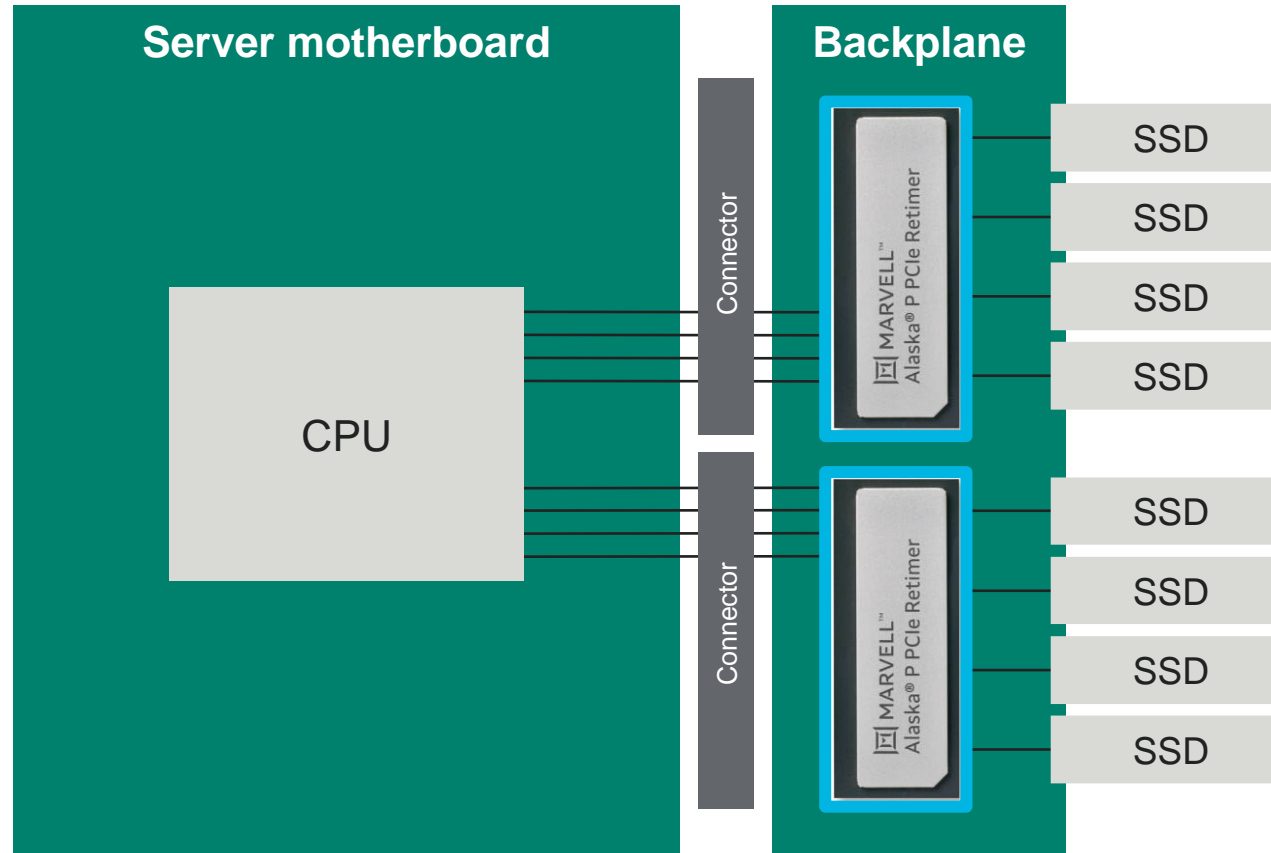
Marvell PAM4 technology deployed in all the leading cloud data centers

PCIe retimers becoming essential for AI servers



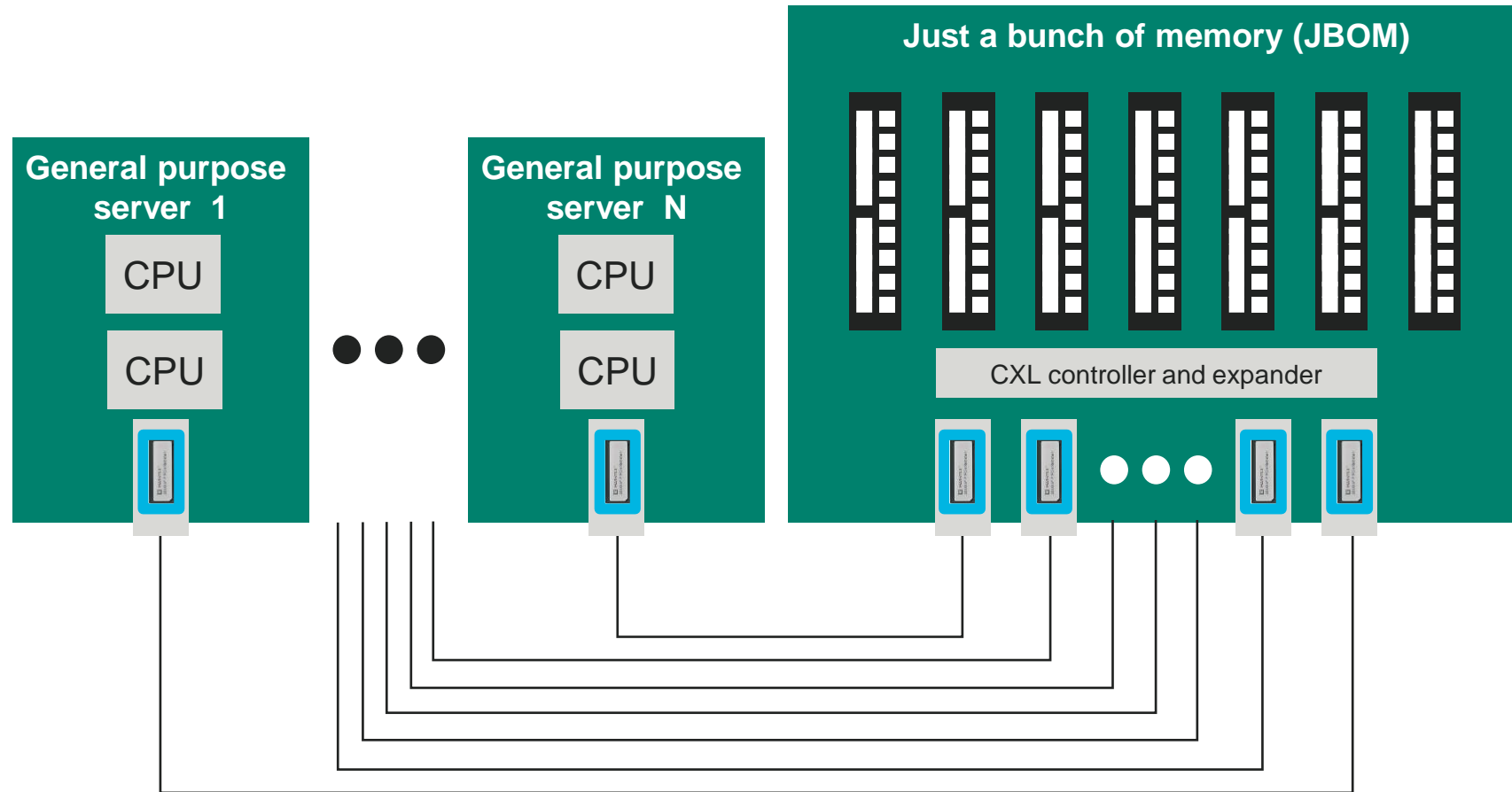
Multiple retimers per AI server, >1 retimer per XPU

Use case: NVMe server storage



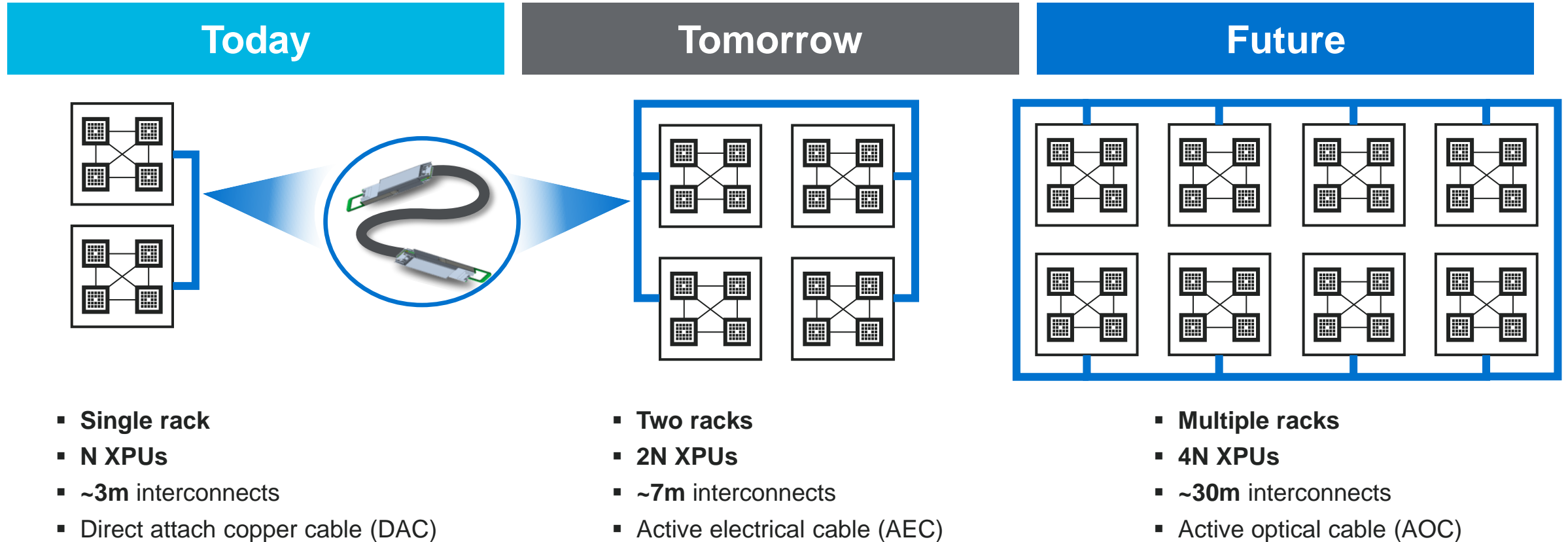
PCI retimers enabling PCIe Gen 6 NVMe SSDs

Use case: disaggregated memory with CXL



PCIe retimers enabling server CXL memory expansion

Use case: disaggregated single server system

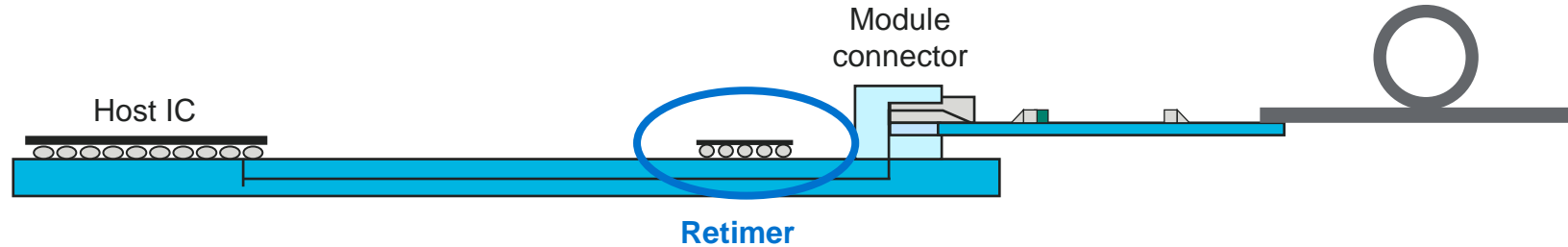


Single server computing domain = scale-up of XPU units (ie compute fabric connecting XPU units together to be a single server)

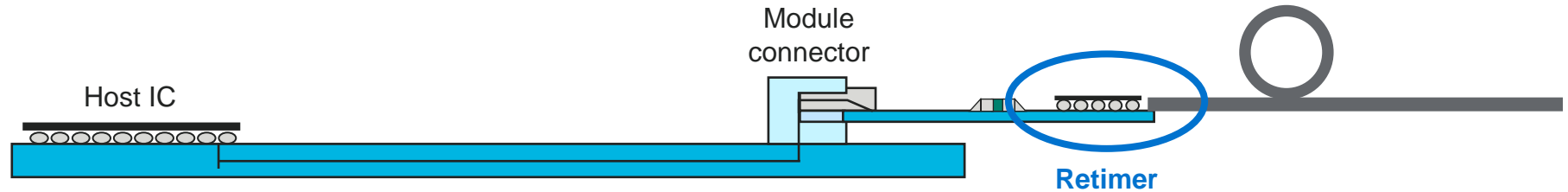
PCIe cables enable higher number of XPU units per single server computing domain

PCIe retimers enable multiple interconnects

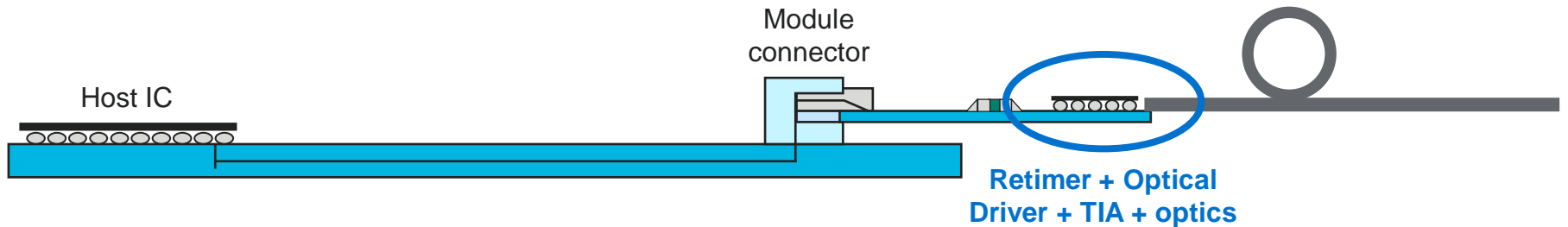
**Direct Attach
Copper Cable
(DAC)**



**Active Electrical
Cable (AEC)**

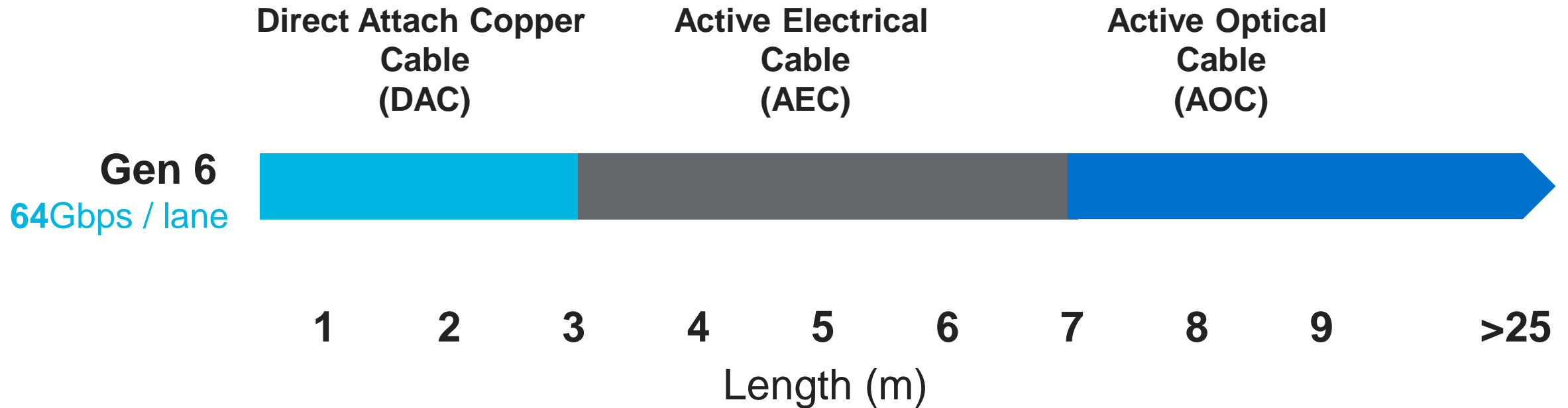


**Active Optical
Cable (AOC)**



Address emerging inside-the-rack and multi-rack PCIe use cases

Distances via PCIe interconnect cable type



Source: Marvell estimates

Note: Estimates using Marvell Alaska P PCIe retimer on both ends of cable.

Marvell leveraging Ethernet PAM4 interconnect business models for PCIe

Marvell Alaska P to fuel all PCIe interconnect types

DAC
(up to 3 meters)



AEC
(up to ~7 meters)

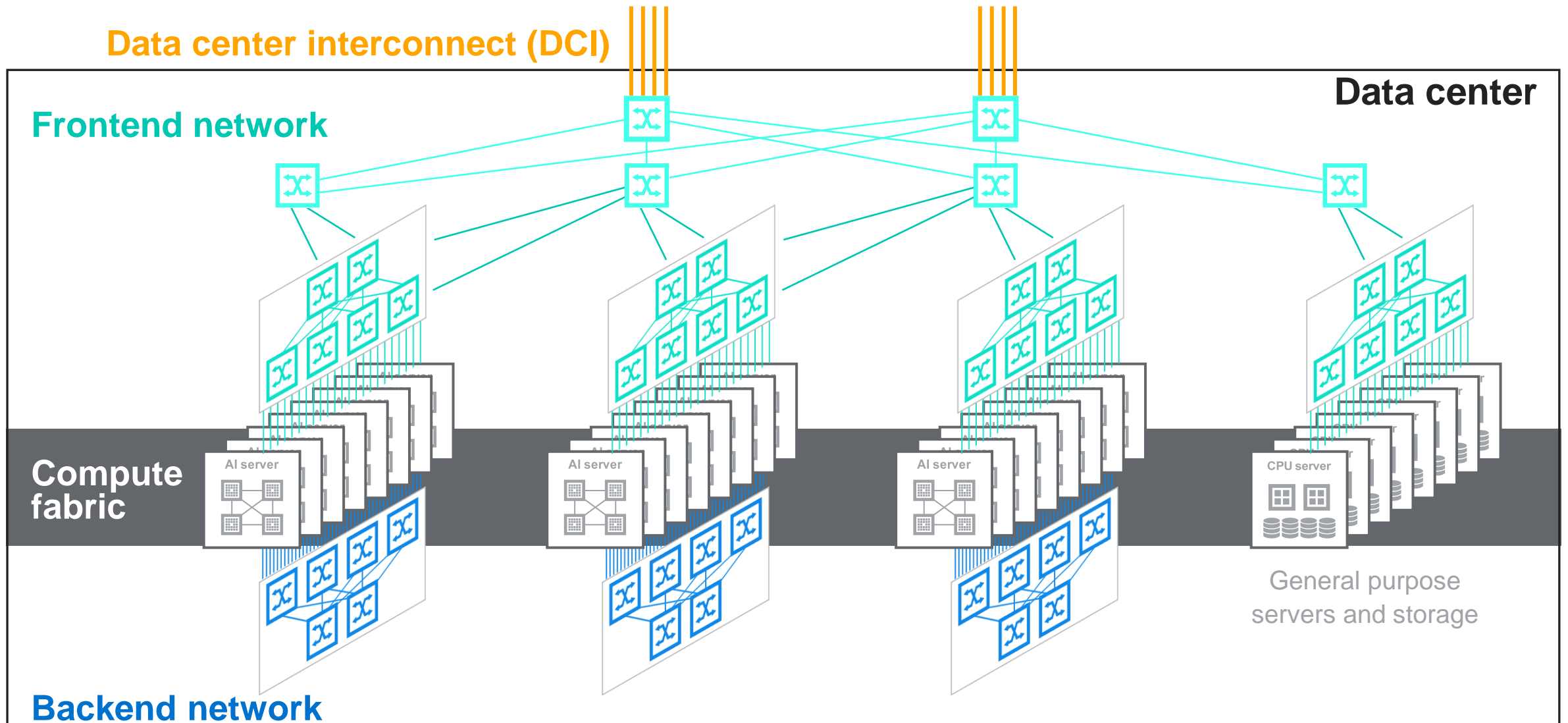


AOC
(up to ~30 meters)



Collaborating with our industry-leading cable and module customers

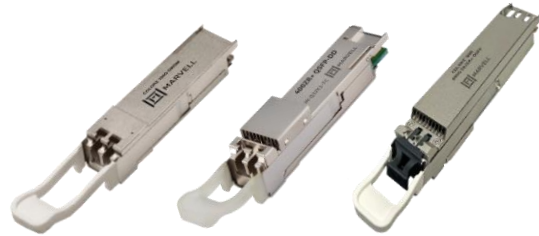
Expanding connectivity leadership into compute fabrics



Comprehensive data center connectivity portfolio

Between data centers

Data center interconnect (DCI) networks



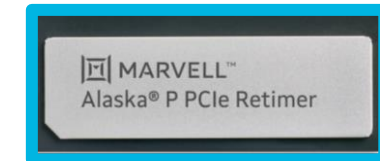
Inside data centers

Frontend and backend networks



Inside servers

Compute fabrics



New PCIe retimer product line expands portfolio to compute fabrics

Key takeaways

1

AI driving bandwidth growth across every data center connectivity network and tier.

2

Inside AI server connections between XPU, GPU and CPU migrating to PCIe Gen 6.

3

New category of PAM4 PCIe retimers required to enable scaling of AI server compute fabrics.

4

Marvell expands connectivity portfolio with new Alaska P PCIe / CXL retimer product line.

5

Marvell leveraging PAM4 leadership to deliver industry's lowest power PCIe Gen 6 retimers.



Thank You



Essential technology, done right™