A Foundation for Next-Gen Cloud Networks: Introducing Industry's First Cloud-Optimized 51.2 Tbps Networking Platform

March 2, 2023

Our focus: data infrastructure

Data center

Every major cloud

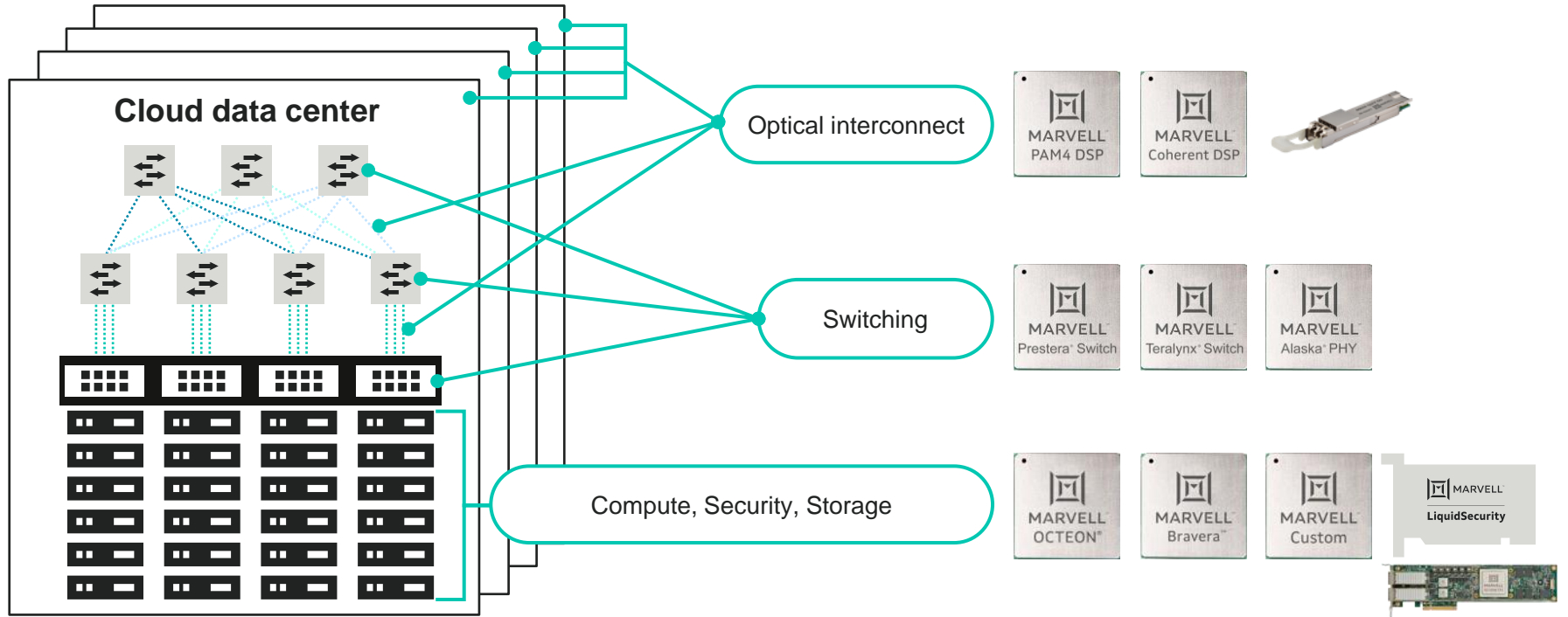**Carrier infrastructure**

5G

4 of 5 top wireless OEMs

Automotive

8 of 10 top auto OEMs

Enterprise networking

17 of 20 top networking OEMs

Cloud-optimized data center portfolio

Cloud data center

Optical interconnect

Switching

Compute, Security, Storage

MARVELL™ PAM4 DSP

MARVELL™ Coherent DSP

MARVELL™ Prestera® Switch

MARVELL™ Teralynx® Switch

MARVELL™ Alaska® PHY

MARVELL™ OCTEON®

MARVELL™ Bravera™

MARVELL™ Custom

MARVELL™ LiquidSecurity

Addresses unique needs of the largest data center operators

Key market dynamics

1	New AI applications

2	Network bottlenecks

3	Bandwidth growth

New AI drives more bandwidth

More AI

OpenAI — ChatGPT

Google — Bard

Microsoft — Bing AI
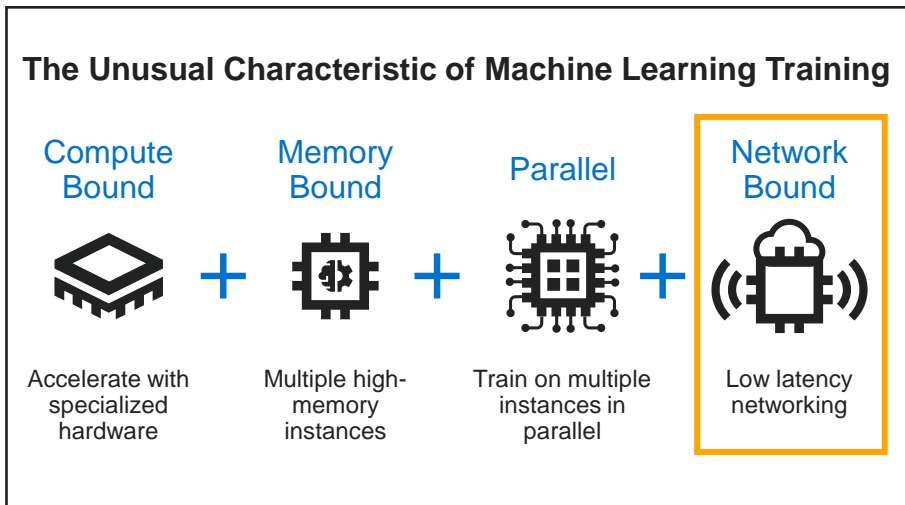
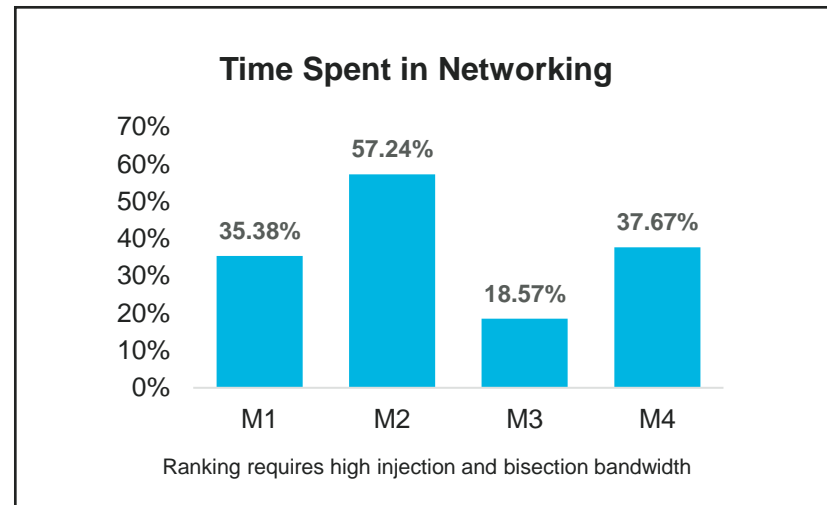Baidu 百度 — Ernie Bot

More bandwidth

More optics

More switches
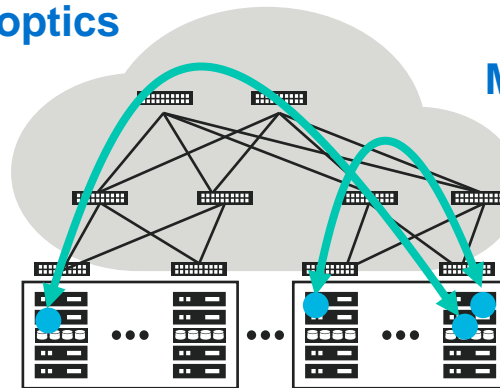
Cloud operators need networking to do more

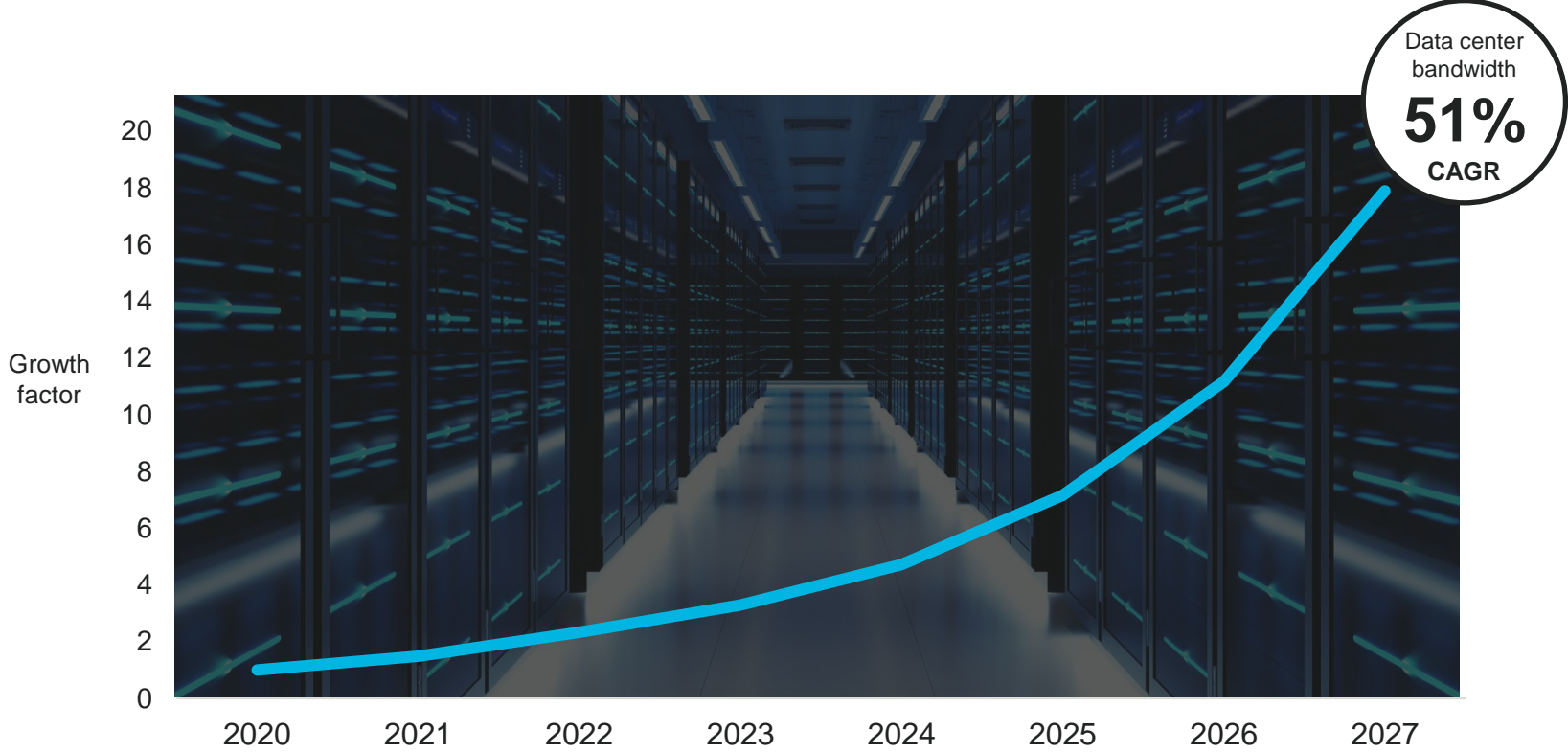# Low latency critical for demanding applications

AWS keynote at re:Invent 2022

The Unusual Characteristic of Machine Learning Training

Compute
Bound

Memory
Bound

Parallel

Network
Bound

Accelerate with
specialized
hardware

Multiple high-
memory
instances

Train on multiple
instances in
parallel

Low latency
networking

Meta keynote at OCP Summit 2022

Time Spent in Networking

35.38%	M1
57.24%	M2
18.57%	M3
37.67%	M4

Ranking requires high injection and bisection bandwidth

Mx = ML training models

Network bottlenecks limit performance, hurt revenue

Data center bandwidth growth accelerating

Data center bandwidth
51%
CAGR

Growth factor

20
18
16
14
12
10
8
6
4
2
0

2020   2021   2022   2023   2024   2025   2026   2027

Source: Marvell estimates based on industry analyst forecasts

A foundation for next-gen data center networks

1.6 Tbps PAM4 DSP

200G per lambda

51.2 Tbps Ethernet switch

Ultra-low latency, programmable

Cloud-optimized platform enables cloud networks to scale

# Nova: Industry's first 1.6T PAM4 DSP

Sampling now

- **8 x 200G / wavelength (λ)**
- 30% lower cost/bit*
- 30% lower power/bit*
- Half module count
- 2x more reliable optics**
- Multi-vendor

*As compared to optical modules based on Marvell's previous PAM4 DSP generation

**Expected reliability improvement compared to the previous Marvell PAM4 DSP generation.

Doubles data center bandwidth for new AI/ML applications

Why PAM4 DSP?

2x → 200G
2x → 400G
2x → 800G
2x → 1.6T
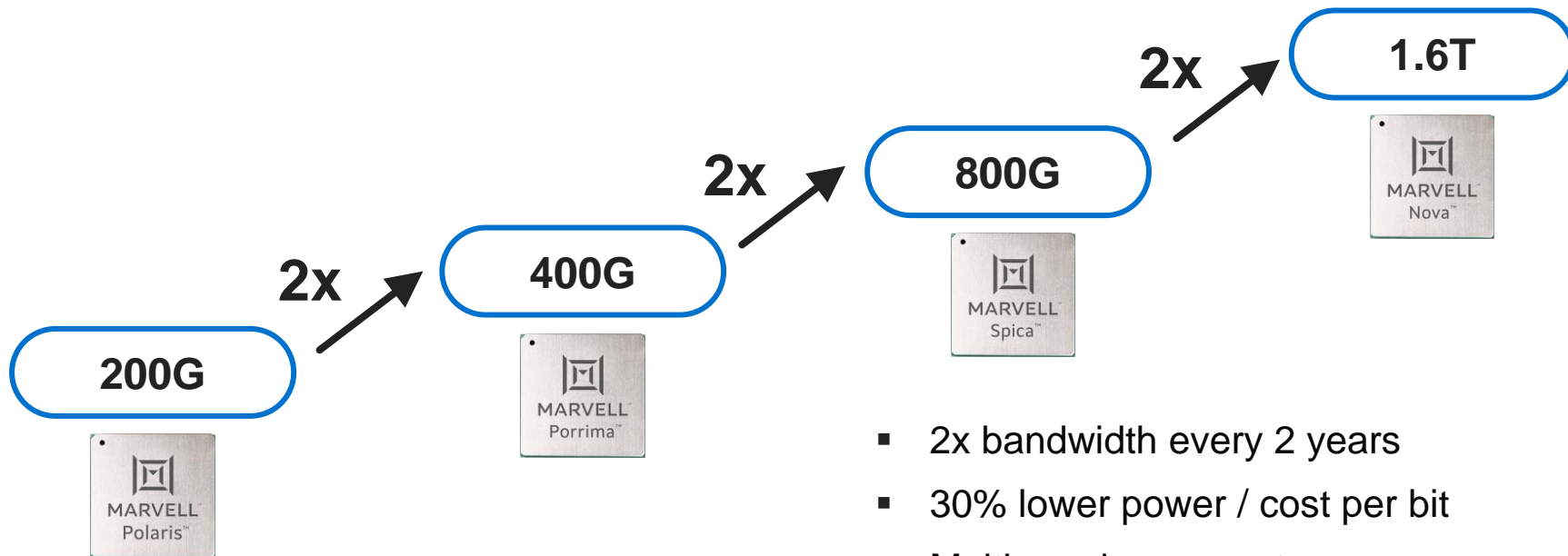
- 2x bandwidth every 2 years
- 30% lower power / cost per bit
- Multi-vendor ecosystem
- High volume, high reliability
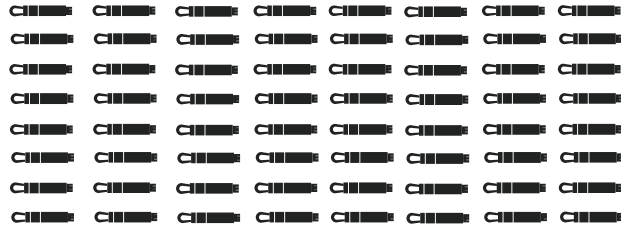- Backward/forward compatibility

Next-gen 1.6T disrupts data interconnects

100G/λ 800G

2RU

64 modules

200G/λ 1.6T

1RU

32 modules

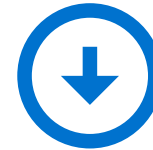**200G/λ enables 1RU design, improving bandwidth density**
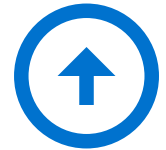
Next-gen 1.6T disrupts data interconnects

100G/λ 800G

2RU

200G/λ 1.6T

1RU

30% lower cost/bit*

30% lower power/bit*

50% fewer modules

2x more reliable optics**

Nova essential for cloud-optimized 51.2T-based networks

*As compared to optical modules based on Marvell's previous PAM4 DSP generation

**Expected reliability improvement compared to the previous Marvell PAM4 DSP generation.

Teralynx 10: ultra-low latency 51.2T switch

Sampling: 2Q23

- **Ultra-low latency**
- Advanced telemetry
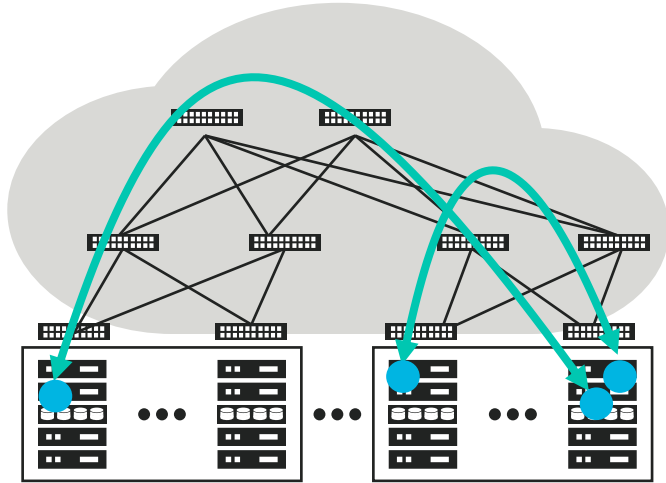- Permutable flex-forwarding
- 80% power savings

Scales the cloud and addresses network bottlenecks

# Ultra-low latency switch architecture

1.7x advantage

*Based on RFC 2544 FIFO latency with Teralynx 7 for 400G port

Optimized for AI/ML and data center fabrics

- Ultra-low latency
  Reduces job completion time

- Congestion-aware routing
  Minimizes congestion

- Advanced telemetry
  Auto-tunes network in real-time

- Permutable flex-forwarding
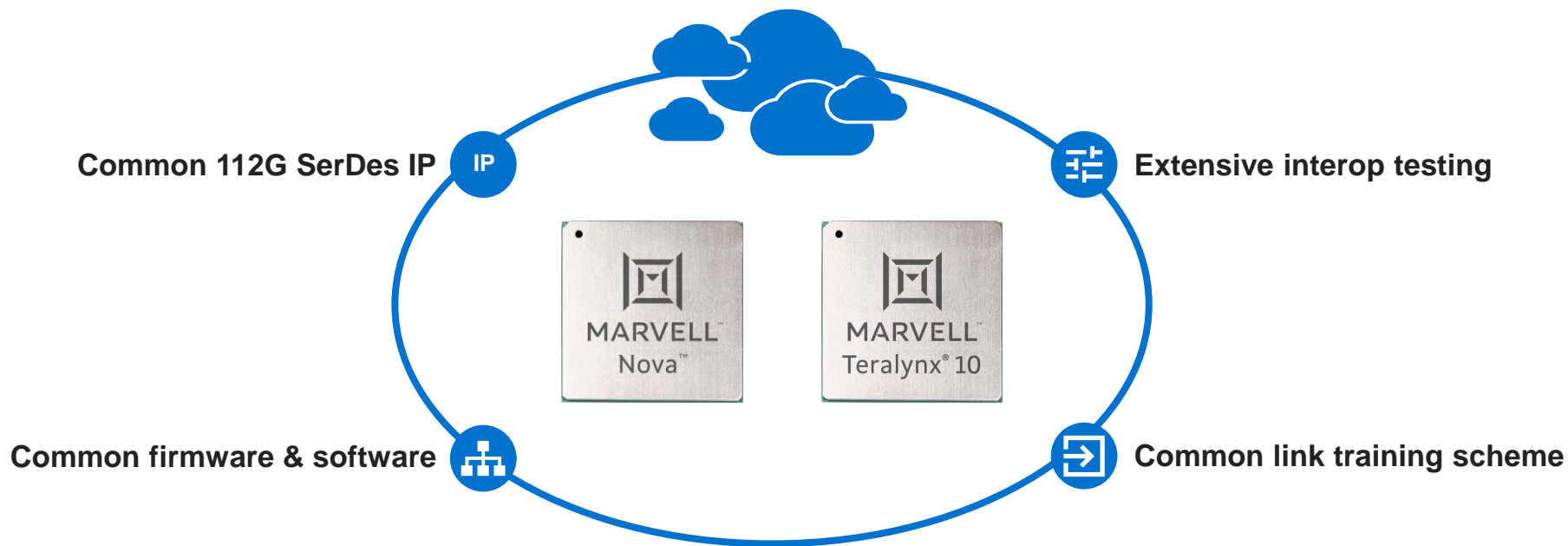 Programs packet-forwarding as networks evolve

Industry-leading 112G SerDes
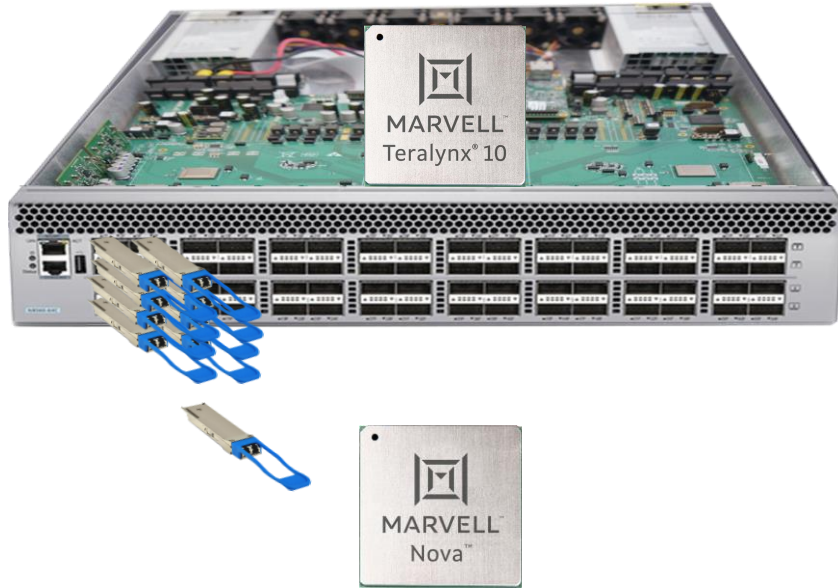
Best-in-class long reach

▪ Lowest bit error rate (BER)

▪ Flexible data rate

▪ Optimized designs without retimers

▪ Eliminates need for flyover cables

Enables lowest cost and power system design

The benefits of an all-Marvell solution…

Common 112G SerDes IP

Extensive interop testing

Common firmware & software

Common link training scheme

…predictable deployment and faster time-to-market

Key takeaways

1	Industry's first cloud-optimized 51.2T networking platform
2	Nova, industry's first 200G/λ 1.6T PAM4 DSP
3	Teralynx 10, ultra-low latency 51.2T switch
4	Enables AI/ML and data center network scaling, lowers power/cost per bit
5	Accelerates time to market

*In a programmable switch