



NVIDIA Spectrum-2 ASIC

400G Ethernet switch silicon

NVIDIA Spectrum™-2 provides an impressive combination of performance, virtualization, and telemetry capabilities in a 6.4Tb/s Ethernet switch silicon with 128 x 50Gb/s PAM4 serializer/deserializer (SerDes). The SerDes can act independently, in pairs, or in groups of four or eight, to operate at speeds between 100Mb/s and 400Gb/s for maximum flexibility. The switch ASIC is optimized for cloud, storage, and machine learning solutions. The Spectrum family of products enjoys a strong software ecosystem that can be leveraged by partners to develop and deploy solutions with a rapid time to market.

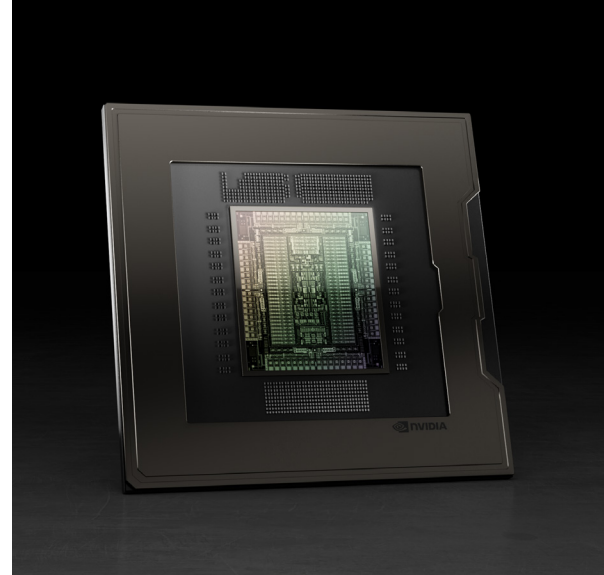
Consistent Performance

Consistent performance and fair bandwidth-sharing are critical for multi-tenant cloud, distributed storage workloads as well as hardware-accelerated data transfers using technologies such as NVIDIA GPUDirect® or NVMe-oF. Spectrum-2 features a 42MB fully shared and monolithic packet buffer that is dynamically shared across all ports. This provides excellent burst absorption and low-latency cut-through performance. The on-chip packet buffer supports high-bandwidth packet reads/writes, enabling consistent and predictable cut-through performance. The monolithic packet buffer architecture simplifies buffer management and traffic scheduling, while enabling fair resource sharing. Additionally, Spectrum-2 supports intelligent congestion management mechanisms, including Explicit Congestion Notification (ECN), which enable robust RoCE-based, hardware-accelerated data transport.

Industry-Leading Visibility With What Just Happened (WJH)

Spectrum-2 provides rich, contextual, and actionable network-based visibility data that seamlessly integrates with open application programming interfaces (APIs) at the software development kit (SDK) layer. Referred to as NVIDIA What Just Happened® (WJH), this feature allows network operators to finally get instant answers to the five W's—When, What, Who, Where, and Why—as soon as an issue arises. WJH can easily be extended and customized to support both third-party and open-source tools. WJH is open and extendable, making it ideal for integration into third-party network monitoring and analysis tools.

Beyond providing hardware-based mechanisms that measure and summarize packet buffer dynamics and over half a million purpose-built flow tracking counters, Spectrum-2 supports traditional hardware-based visibility features, such as sFlow, in-band, and streaming telemetry.



Key Features

Highlights

- > 6.4Tb/s of Ethernet switching and IP routing
- > Integrated 128 x 50Gb/s PAM4 SerDes
- > Flexible port configurations:
 - > Up to 16 x 400GbE ports
 - > Up to 32 x 200GbE ports
 - > Up to 64 x 100GbE ports
 - > Up to 128 x 50/25/10 GbE ports

Consistent Performance

- > Industry-leading, true, cut-through latency
- > Low power consumption
- > 42MB dynamically-shared, flexible, packet buffering
- > Robust RoCE data path for NVMe-oF and GPUDirect® hardware-accelerated data transfers

Advanced Network Virtualization

- > Single-pass VXLAN bridging and routing
- > Centralized VXLAN routing
- > Comprehensive overlay and tunneling support: VXLAN-GPE, NVGRE, Geneve, NSH, and MPLS/IPv6 based segment routing

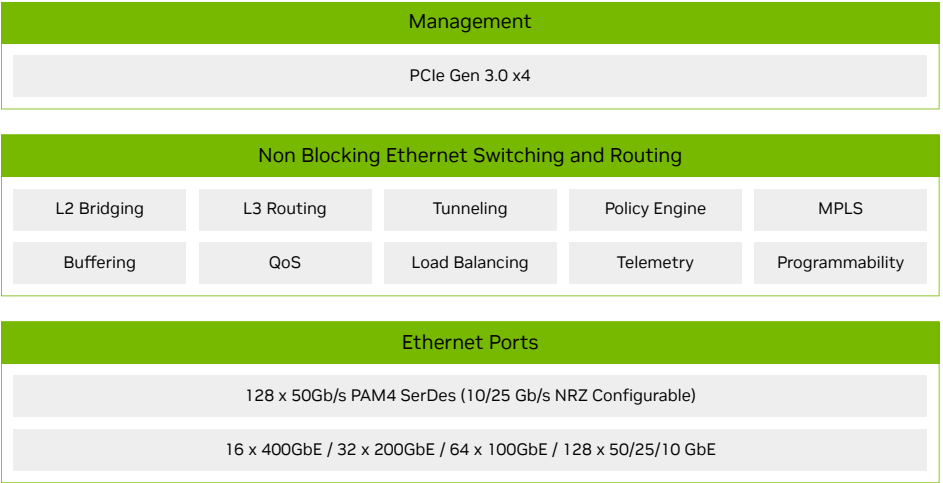
Open and Actionable Telemetry

- > Reduced mean time to recovery / innocence
- > Actionable and contextual telemetry with What Just Happened (WJH)
- > Hardware-based buffer histograms
- > Streaming telemetry
- > In-band network telemetry

Choice of Software

NVIDIA offers a rich set of software development tools and open APIs that enable users and partners to develop fully-functional switching solutions on top of Spectrum-2 at low cost, with short time to market. Users have the flexibility to choose the model best suited to their needs, including NVIDIA Spectrum-2 SDK, OCP SAI (Switch Abstraction Interface), or Linux® Switch driver, which enables native Linux operating systems and applications on top of Spectrum-2.

High-Level System Block Overview



Ordering Information

OPN / SKU	Description
MT53132A0-NCCR-V	NVIDIA Spectrum-2, 128x50Gb/s PAM4, 32-Port 200GbE Switch IC

Cloud-Scale

- > Half a million flexible forwarding entries shared across IPv4/IPv6 routes, MAC, MPLS, etc.
- > Half a million flow-tracking counters
- > 100X more ACLs
- > 10X better VXLAN VTEP and tunnel scale

Compatibility

Ethernet

- > 16 x 400GbE ports, 32 x 200GbE ports, 64 x 100GbE ports, or 128 x 1/10/25/50 GbE ports
- > DCB (PFC, ETS, DCBX)

CPU Interoperability

- > PowerPC, Intel® x86, AMD x86, and MIPS

Host Interface

- > PCIe Gen 3.0; four lanes of 8GT/s, 5GT/s, or 2.5GT/s

Interoperability

- > Full interoperability with standard Ethernet NICs and switches

SerDes

- > 128 x 50Gb/s PAM4 (802.3bs, 802.3cd)
- > 10Gb/s (802.3ba, 802.3ae) and 25GbE (802.3bj, 802.3bm) NRZ operational modes

Connectivity

- > Drives active/passive copper cables, fiber optics, PCB, or backplanes

I/O Specifications

- > SPI flash interface
- > I²C, SMBus, MDIO
- > IEEE 1149.1 boundary-scan JTAG
- > IEEE 1588 1-step and 2-step

Package

- > 57.5mm x 57.5mm HFCBGA

Ready to Get Started?

To learn more, contact an NVIDIA sales representative.

Refer to the driver and firmware release notes for feature availability at: docs.nvidia.com/networking

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