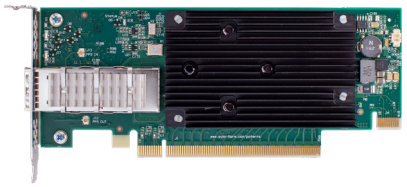
XtremeScale® X2541

The World's Lowest Latency 100G Ethernet Network Adapter
The Industry's 1st 100G Adapter with Hardware Security



The X2541 single-port 10/25/40/50/100GbE Ethernet network adapter is the most powerful member of the X2 family of XtremeScale® products that redefine the price/performance of standard adapters for modern data centers.

Designed from the ground up for virtualized dense server environments Solarflare XtremeScale X2 adapters are the most cost-effective network adapters in the industry for Ethernet connectivity. At the same time, XtremeScale acceleration provides record-breaking low latency and throughput needed for today's modern class of applications. X2 is the most secure standard adapter with integrated hardware firewalls. XtremeScale X2 is the only general-purpose adapter with 2,048 virtual NICs, a programmable packet processing engine for network off-load and real-time packet/flow capture required by your network performance management and analytics platforms.

Summary of Features and Benefits

Acceleration Services Allow Distributed Apps to Scale-Out – The challenge with distributed apps is keeping hardware and system latency low while scaling to thousands of tasks running across thousands of cores. The X2541 harnesses kernel bypass acceleration to deliver superior small packet performance with hardware latency as low as one-half a microsecond. Solarflare kernel bypass technologies include Onload®, Cloud Onload™ and DPDK acceleration services, providing servers the headroom needed to handle more processes in the same amount of time and with fewer servers.

Solarflare's Cloud Onload software dramatically accelerates and scales network-intensive applications such as in-memory databases, software load balancers, and web servers. With Cloud Onload, data centers can support 4X or more users on their cloud network while delivering improved reliability, enhanced quality of service (QoS) and higher return on investment, without modification to existing applications.

NVMe Storage – Solarflare acceleration technology can also be used to build ultra-low latency NVMe all-flash storage fabrics. X2541 adapters configured for NVMe™/ TCP, with kernel bypass acceleration, provide the same (or better) performance as NVMe fabrics based on special-purpose RDMA fabrics.

Precision Time Stamping for Accurate Synchronization – The X2541 supports the precision timing protocol (PTP) fabric service for apps that require synchronized time stamping of packets down to the single-digit nanosecond.

Protect Traffic "Inside" the Data Center with Integrated East-West Security – Solarflare's ServerLock® technology inside every X2541 adapter complements firewall perimeter security. It is now possible to scale security inside your data center by using micro-segmentation to scale packet surveillance, filtering, cloaking and firewalling with every server.

A Platform for Micro-Segmented Fabric Services – For modern data centers, X2541 lays a new foundation for network adapter-based network virtualization needed for their highly distributed applications with thousands of inter-connected web server, machine learning, and big data workloads. X2541 is the first and only standard adapter platform that can establish ultra-scale connectivity to thousands of virtual NICs, while at the same time providing real-time packet and flow information. The combination of ultra-high bandwidth, ultra-low latency, ultra-scale connectivity and packet telemetry, allows X2541 adapters to serve as the industry's first commercial platform for micro-segmented fabric services that scale with each server, virtual machine or container.

The Most Cost Effective Network Adapters in the Industry – Solarflare makes data center-wide deployment of these capabilities cost-effective. Although X2541 adapters provide superior performance and the SmartNIC-like ability to enable network services, a 100GbE X2 from Solarflare offers a cost advantage over comparably configured adapters.

The Solarflare Advantage

- **Scale Higher** – The only standard 100G network adapter with the ability to segment a single NIC into thousands of vNICs.

  Together, ultra-low latency and ultra-scale connectivity power a more efficient data center that scales higher with more workloads per server and/or less servers.

- **Accelerate Applications** – With optional Cloud Onload software technology, the X2451 accelerates nearly all network intensive TCP-based applications

- **Secure Every Server** – The first and only solution allowing IT organizations to deploy a layer of security on every server using a general-purpose adapter.

- **NVMe/TCP** – The X2541 is qualified on multiple third-party software stacks supporting the NVMe/TCP standard.

Specifications

Acceleration
- DPDK Poll Mode Driver - Packet (Cloud, Telco)
- Cloud Onload - (Cloud, Enterprise)
- Onload* - TCP/UDP (Fintech)
- TCP Direct* - TCP/UDP (Fintech)
- MSI-X Support
- Interrupt Coalescing

Security
- ServerLock™ Local Hardware Filtering - Monitor, report, analyze, filter and enforce policies
- Tamper resistant adapter – Digitally signed firmware and secured private keys

Time Synchronization and Hardware Timestamping
- Hardware timestamping for all packets, sent and received including PTP*
- On-board Stratum 3 compliant oscillator
- Solarflare Software PTP Daemon delivers enhanced stability and clock synchronization accuracy and can be used to synchronize the adapter clock to external time source.

Stateless Offloads
- TCP/UDP Checksum Offload (CSO)
- TCP Segmentation Offload (TSO)
- Generic Segment Offload (GSO)
- Large Send Offload (LSO)
- Large Receive Offload (LRO)
- Receive Side Scaling (RSS)
- Receive Segment Coalescing (RSC)

Manageability and Remote Boot
- PXE and UEFI
- Solarflare Secure Boot
- Tamper resistant Secure Firmware Upgrade
- NC-SI over MCTP SMBus
- PLDM over MCTP SMBus
- MCTP PCIe VDM

Management and Utilities
- Ethtool Support
- vCenter Plug-in
- Solarflare Boot Manager

Adapter Hardware
- PCIe Gen 3.1 x16
- 100G QSFP28 direct attach copper, optical transceiver or AOC

Hardware Certifications
- FCC, UL, CE
- RoHS - Complies with EU directive 2011/65/EU

Traffic Engineering
- XtremePacket™ Engine for dedicated parsing, filtering, and flow steering
- TCP/UDP/IP, MAC, VLAN, RSS filtering
- Accelerated Receive Flow Steering (ARFS)
- Transmit Packet Steering

Storage
- NVMe/TCP Plug-in for low latency, high performance storage networking on standard Ethernet fabric

Virtualization
- Linux Multiqueue
- VMware NetQueue
- Microsoft Hyper-V Virtual Machine Queue (VMQ)
- SR-IOV: 16 physical functions, 240 virtual functions;
- 2048 Guest OS protected vNICs
- Full hardware switch fabric in silicon capable of steering any flow based on Layer 2 to Layer 4 protocols, between physical and virtual interfaces
- VXLAN, NVGRE, and GENEVE tunneling offloads; adaptable to custom overlays
- VLAN and VLAN Q-in-Q Insertion/Stripping

Ethernet Standards
- IEEE 802.3-2012 Ethernet Base Standard, including 802.3bx
- IEEE 802.3ad, 802.1AX Link Aggregation
- IEEE 802.1Q, 802.1P VLAN Tags and Priority
- IEEE 1588-2008 PTPv2
- Jumbo Frame support (9000 bytes)

OS Support
- Red Hat RHEL, SUSE SLES, Debian, Ubuntu
- Windows Server
- VMware ESXi
- For complete list of supported OS versions visit: http://support.solarflare.com

Physical Dimensions
- L: 16.75 cm (6.6 in)
- W: 6.9 cm (2.7 in)
- End bracket height: PCI Express standard, 12.0 cm (4.725 in)
- PCI Express low-profile: 7.92 cm (3.12 in)

Environmental Requirements

Temperature:
- Operating: 0°C to 55°C (32°F to 131°F)
- Storage: –40°C to 65°C (–40°F to 149°F)

Humidity:
- Operating: 10% to 80%
- Storage: 5% to 90%

Ordering Information

X2541	100G network adapter. *Features can be acquired through a separate license
X2541-PLUS	100G network adapter. Includes all *features

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Note: Feature availability is dependent on software release support. Please contact Solarflare support for details.