



S7 Smart-NIC

High Performance Programmable DPU 1/10/25/40/50/100/200GbE Controller

Enables several offloads, programmable compute, encryption, virtualization over a single wire.

Highlights

- Full suite of Storage features
- Full suite of Cloud features
- Full suite of data center networking features
- Full suite of data streaming features
- Full suite of encryption functions
- Integrated Ethernet switch
- Software compatible with T4, T5, T6, and T7

Applications

Datcenter Networking

- Scale out servers and NAS systems
- Consolidate LAN, SAN, and cluster networks (run InfiniBand and FibreChannel applications on Ethernet)
- Enhanced network and server security

Cloud Computing

- Virtualization features to maximize cloud scaling and utilization
- Cloud-ready functional and management features
- Secure Sockets offload
- Full support for overlay products

Networked Storage

- Develop high-performance shared-storage systems providing both file and block level services
- Integrated encryption support
- NVMe Fabrics (iWARP & RoCEv2)
- NVMe/TCP
- Very high data-integrity

High Performance Computing

- Very low latency Ethernet
- High performance RDMA support
- Increase cluster fabric bandwidth

Streaming Applications

- Internet attack protection
- QoS and Traffic Management
- Video streaming

Edge Products

- Micro Servers
- Gateways
- 5G Appliances
- Firewalls

Overview

Chelsio's S7 Smart-NIC is a quad port 1/10/25/50/100Gb or dual port 40/100/200Gb Ethernet Unified Wire DPU ASIC with a PCI Express 5.0 host bus interface, optimized for storage, cloud computing, HPC, virtualization, security, AI, and other datacenter networking applications.



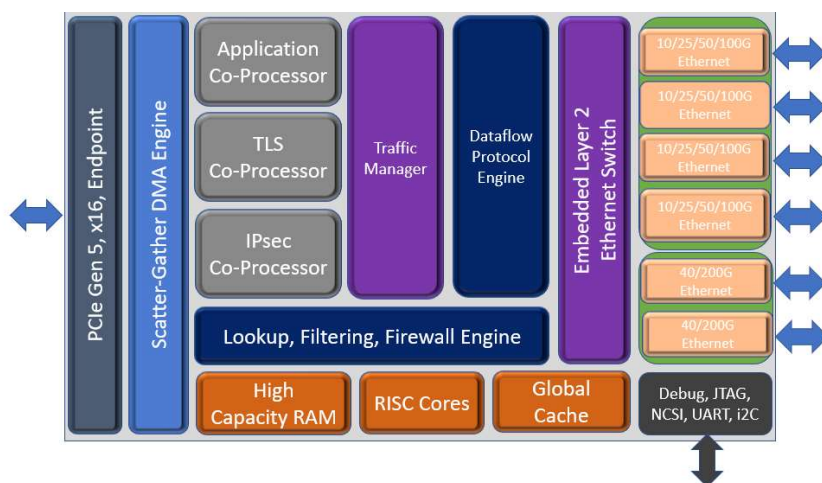
The seventh generation S7 ASIC technology from Chelsio provides the highest performance and efficiency, with dramatically lower host system CPU communications overhead. Thanks to on-board hardware, that offloads TCP/IP, UDP/IP, Unified RDMA (RoCEv2 & iWARP), iSCSI, NVMe-oF, NVMe/TCP, NVGRE, VXLAN, and TLS/IPsec processing from its host system and frees up host CPU cycles for the user applications. As a result, the system benefits from higher bandwidth, lower latency, and reduced power consumption.

S7 runs the predecessor T4, T5, & T6 silicon software without modification to enable leveraging of the user's existing software investment.

S7's architecture is Chelsio's 7th generation technology road-tested across several tier-1 OEMs over the years and has evolved to support all offloads using host memory. As a result, S7 technology can now enable a full featured DPU technology in a small memory-free package to address server and cloud applications at an aggressive price point.

The Memory-free Operation

S7's architecture allows using the host memory for performing various offload functions, removing the need for card memories. The system can benefit from host CPU savings, with no additional cost compared to regular stateless offload NIC, resulting in an extremely lower cost bill of materials. Up to 2048 offload connections can be cached on S7 Smart-NIC concurrently, making it an ideal choice for Client/Initiators. It uses the exact same firmware and software that runs on T7 (with card memory).



S7 Block Diagram

Features

S74 S72		S74 S72		S74 S72	
Host Interface		Storage		High Performance RDMA	
PCI Express Gen5 x16	✓ ✓	iSCSI initiator and target mode stack	✓ ✓	Native RoCEv2 support	✓ ✓
End Point (EP) operation	✓ ✓	T10 DIF/DIX support for iSCSI	✓ ✓	Native iWARP support	✓ ✓
MSI-X, MSI, legacy pin interrupts	✓ ✓	NVMe-oF Offload (iWARP)	✓ ✓	All to All support	✓ ✓
Wire Interface		NVMe-oF Offload (RoCEv2)	✓ ✓	TCP & UDP Offload	
25G NRZ or 56/112 PAM4	✓ ✓	NVMe/TCP Offload	✓ ✓	Full TCP stack including IPv4 & IPv6	✓ ✓
2x1/10/25/40/50/100G	✓	iSER	✓ ✓	Extensive RFC compliance, fully featured	✓ ✓
4x1/10/25/50/100G or 2x40/100/200G	✓	Data-at-rest encryption	✓ ✓	VLAN support up to 4096 VLAN IDs	✓ ✓
IEEE 802.3cd (50/100/200GbE)	✓	Security		Load balancing and failover capabilities	✓ ✓
IEEE 802.3bs 200GbE	✓	AES 128/256 and SHA1/SHA2 offload	✓ ✓	UDP Sockets API	✓ ✓
IEEE 802.3by 25GbE	✓ ✓	TLS and IPsec co-processor mode	✓ ✓	Low user-to-user latency	✓ ✓
IEEE 802.3bm 40GbE/100GbE	✓ ✓	TLS and IPsec inline mode	✓ ✓	Multicast replication on ingress or egress	✓ ✓
IEEE 802.3ba (40/100GbE)	✓ ✓	QUIC co-processor mode	✓	Patented Seamless Failover	✓ ✓
IEEE 802.3bj (100 GbE over copper/backplane)	✓ ✓	QUIC inline mode	✓	Proxy Switching	✓ ✓
IEEE 802.3az Energy Efficient Ethernet	✓ ✓	Inline IPsec & TLS for all Offload Traffic	✓ ✓	High capacity offload without card memory	✓ ✓
IEEE 802.3ap Backplane Ethernet	✓ ✓	Secure firmware update	✓ ✓	Data Center Features	
IEEE 802.3ae (10 GbE)	✓ ✓	Hardware Root of Trust support	✓ ✓	Internet Attack Protection	✓ ✓
IEEE 802.3z (1GbE)	✓ ✓	Cloud & Virtualization		PFC, DCB, CEE	✓ ✓
IEEE 802.1p Priority	✓ ✓	Inband Telemetry	✓ ✓	Time stamping support	✓ ✓
IEEE 802.1Q VLAN Tagging	✓ ✓	NVGRE, VXLAN and GENEVE support	✓ ✓	Flow mirroring, sampling and statistics	✓ ✓
IEEE 802.1Qbg EVB/VEPA	✓ ✓	PCI-SIG SR-IOV, 256 VF, 8 PF	✓ ✓	GPUDirect	✓ ✓
IEEE 802.1BR Bridge Port Extension	✓ ✓	264 port virtual switch	✓ ✓	GPUDirect Storage (GDS)	✓ ✓
IEEE 802.1Qau Congestion Notification	✓ ✓	EVB, VEPA, Flex10, VNTag	✓ ✓	Management and Other Interfaces	
IEEE 802.1Qbb PFC	✓ ✓	512 MAC addresses	✓ ✓	UART	✓ ✓
IEEE 802.1Qaz (ETS)	✓ ✓	NAT Offload	✓ ✓	NC-SI	✓ ✓
IEEE 802.3x Flow Control	✓ ✓	Stateless Offloads		SPI Flash	✓ ✓
IEEE 802.3ad Load-balancing and Failover	✓ ✓	TCP/UDP checksum offload for IPv4 & IPv6	✓ ✓	I2C, MDIO, GPIO, JTAG	✓ ✓
Ethernet II and 802.3 encapsulated frames	✓ ✓	TSO, LSO, and GSO for IPv4 & IPv6	✓ ✓	PLDM, MCTP (SMBus or PCIe), RBT	✓ ✓
Multiple MAC addresses per interface	✓ ✓	VLAN filtering, insertion & extraction	✓ ✓	SGMII for 1Gb BMC interconnect	✓ ✓
Jumbo Frames up to 9.6 Kbytes	✓ ✓	Packet filtering and attack protection	✓ ✓	JTAG IEEE 1149.1 and IEEE 1149.6	✓ ✓
ITU-T G.8262, Sync-E	✓ ✓	Nanosecond granularity 64b timestamping	✓ ✓	SyncE	✓ ✓
IEEE 802.1AS Timing and Synchronization	✓ ✓	Ethernet Routing (packet header rewrite)	✓ ✓	Boot Facilities	
IEEE 1588 PTP	✓ ✓	Packet Tracing and Packet Sniffing	✓ ✓	iSCSI, PXE, UEFI	✓ ✓
Streaming		Adaptive interrupt coalescing	✓ ✓	Secure Boot	✓ ✓
Integrated Traffic Management	✓ ✓	Receive side scaling (RSS)	✓ ✓		
Advanced QoS support	✓ ✓	Embedded Processors			
Hierarchical QoS	✓ ✓	400Gb DPU Core	✓ ✓		

Ordering Information

	S72ASIC	S74ASIC
Card Memory	No	
Conn. Capacity	Up to 500k	
Cached conns.	2k	
200Gb Typ Power*	8W	14W
200Gb WC Power*	15W	19W
Package Size (0.8mm pitch)	21mm	21mm

* Configuration dependent

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Physical & Environmental

- Fully RoHS Compliant
- Operating Temp: -40° to 55° C or -40° to 131° F
- Operating Humidity: 5 to 95%