



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.

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, 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).

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

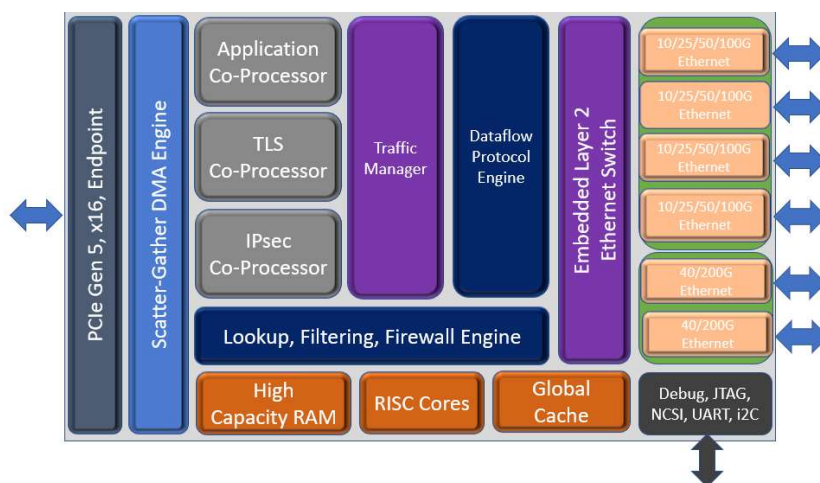
- Very low latency Ethernet
- High performance RDMA support
- Increase cluster fabric bandwidth

Streaming Applications

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

Edge Products

- Micro Servers
- Gateways
- 5G Appliances
- Firewalls



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

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

Physical & Environmental

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

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