The bridge to possible

Cisco Nexus High Resolution Timestamp Capture NIC

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Dual port high precision capture and low latency NIC

Industry leading capture solution

The Cisco Nexus® High Resolution Timestamp Capture NIC is a 10Gbps, 0.25 nanosecond resolution, network capture card.

Supports full line-rate capture with High Resolution Timestamps (HPT). High speed capture can be performed to both standard PCAPs (with nanosecond resolution) and enhanced PCAPs (with picosecond resolution) using our free open source Exact Capture software[1]. Timestamps are also delivered directly through intuitive C and Python based APIs. Measurements using the adapter have a standard deviation of just 0.2ns.

Scalable and programmable

Programmable flow steering and load balancing delivers packets to the right cores.

For demanding capture applications, load balancing automatically distributes flows across a collection of receive queues to make the most of CPU parallelism. For those who need more control, flow steering directs traffic to specified threads or cores based on programmable rules. Each Cisco Nexus HPT port supports up to 128 programmable flow steering rules that direct traffic to 32 user accessible buffers.

Industry standard synchronization

Both Pulse-Per-Second (PPS) synchronization and generation functions are supported.

The Cisco Nexus HPT Pulse-Per-Second (PPS) input can be used to synchronize the HPT clock with a PPS source such as a Grand Master and/or GPS receiver to within 1ns, allowing users to meaningfully compare captured timestamps across multiple servers and/or geographic locations. The Cisco Nexus HPT can also generate PPS output to master other devices in a rack and hardware assists Precision Time Protocol (PTP IEEE1588) packets for 2ns time synchronisation across machines.

Ultra low-latency performance

The Cisco Nexus HPT is also an ultra low latency network interface card.

Designed from the ground up to minimize latency, the Cisco Nexus HPT delivers record-breaking performance numbers. On an Intel Ivy Bridge test system, median latency from application to network to application is 780 nanoseconds for small packets, which is significantly better than competing network cards on the same hardware. Half round trip TCP latencies are as low as 930 nanoseconds for small payloads.

Easy to use

The Cisco Nexus HPT includes a transparent TCP/UDP acceleration and direct, low-level access library, and a standard Linux driver

The Nexus HPT transparent socket acceleration library allows applications to benefit from the low latency of kernel bypass, in most cases without modifications to the applications. For the most latency sensitive applications, a library called 'libexanic' allows direct low-level access to the Nexus NIC hardware and includes simple functions for sending and receiving Ethernet frames.

Figure 1.
Cisco Nexus High Resolution Timestamp Capture NIC

Performance

Typical latency, raw frames[2]:

- 64 bytes: 780 ns
- 256 bytes: 1 µs

Typical latency, raw frames with preloaded TX buffer[2]:

- 64 bytes: 710 ns
- 256 bytes: 930 ns

Typical latency, UDP[3]:

- 14 bytes: 880 ns
- 256 bytes: 1.2 µs

Typical Latency, TCP[3]:

- 14 bytes: 930 ns
- 256 bytes: 1.2 µs

Timestamping

Timestamp resolution:

- 0.25ns, σ=0.2ns

Timestamp availability:

- All received frames
- Most recent transmitted frame

Time synchronization:

- Host, hardware assisted PTP, optional PPS

PPS input/output:

- 3.3V CMOS, selectable 50ohm termination
- High-precision oscillator

General

Form factor:

- Low-profile PCI Express Card
- 150x68mm (5.91x2.67in)

Environmental:

- Operating temperature: 0 °C to 55 °C
- Storage temperature: -40 °C to 70 °C
- Operating Relative Humidity: 5% to 90% (non-condensing)
- Storage Relative Humidity: 5% to 95% (non-condensing)

Ports:

- 2x SFP+
- SMA for PPS in/out

Data rates:

- 10GbE, 1GbE, 100M Fast Ethernet

Supported media:

- Fiber (10GBASE-SR, 10GBASE-LR, 1000BASE-SX), SFP+ Direct Attach

Host interface:

- PCIe x8 Gen 3 @ 8.0 GT/s per lane

Operating systems:

- Linux x86_64 (all distributions)

Other features

Capture:

- Line rate capture to disk

Flow steering:

- 128 IP rules per port
- 64 MAC rules per port

[1] Exact Capture available at https://github.com/exablaze-oss/exact-capture

[2] Latencies are median latencies for raw frames from wire-userspace-wire via the libexanic library, on a 3.5Ghz Intel Ivy Bridge processor.

[3] Latencies are median half round trip time latencies for the sockperf benchmark using the exasock socket acceleration library. More information about benchmarking methodology is available on request.

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