

NT20E2 CAPTURE

Intelligent Real-Time Network Adapters

2-Port 10 G Ethernet PCIe Gen2

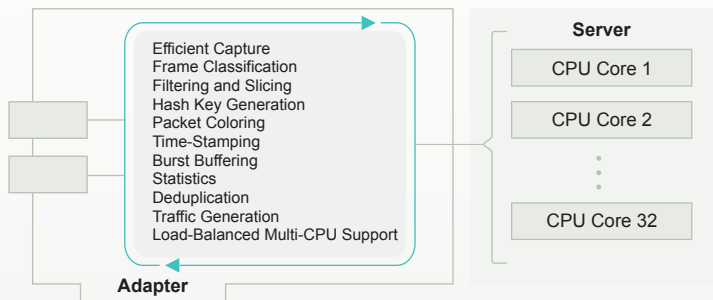
DATA SHEET

Hardware Acceleration

The NT20E2 Capture Adapters provide deep packet inspection (DPI), flow analysis, and protocol processing capabilities that can accelerate network applications and off-load the server CPU by taking care of layer 2 to 4 network traffic analysis. This enables OEM customers to build or upgrade their products to become high-performing full-line-rate 20 Gbps network monitoring/analysis systems by using the NT20E2 Capture Adapter and a standard Linux, FreeBSD, or Windows server.



NT20E2: 2 x 10 Gbps PCIe Gen2



FEATURE HIGHLIGHTS AND APPLICATIONS

Feature Highlights

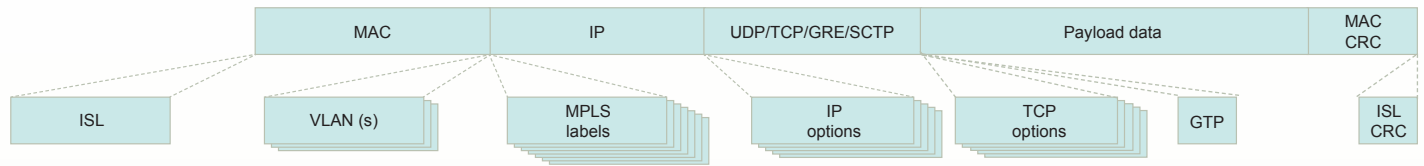
- 2 x 10 Gbps SFP+ connections
- Full-duplex monitoring of IPv4 and IPv6
- Full-line-rate capture and transmission for all frame sizes
- Efficient capture: < 1% host CPU load
- High-precision 10 ns time-stamping
- Advanced hardware time synchronization
- 1.2 sec. of onboard data burst buffering
- 20 Gbps frame processing including protocol decoding, programmable filters, conditional slicing, hash keys, buffering, advanced statistics, deduplication, and multi-CPU support
- Local retransmit at full line rate
- On-the-fly fully reconfigurable setup
- Easy-to-integrate API
- LibPCAP and WinPCAP support
- Linux, FreeBSD, and Windows support

Napatech-Supported Applications

The Napatech Capture Adapters enable our OEM customers to build cost-effective and value-added appliances to meet requirements for many different solutions. Examples of supported applications are:

- Advanced Frame Analysis and Statistics
- Packet Jitter and Latency Analysis
- Flow Analysis of any IP end-to-end traffic
- Traffic Generation
- Capture and Replay
- Data Retention, Logging, and Forensic Analysis
- Lawful Intercept
- Intrusion Detection
- Network QoS Assurance for media streams
- Transaction Performance Analysis
- Load Distribution between servers

FEATURES



The Napatech adapters decode all frames regardless of encapsulations.

Frame Classification

The NT20E2 frame decoder ensures protocol recognition of all major layer 2 to 4 protocols. This is a unique advantage over any other network adapter. It provides offset information for assisting the customer application under all circumstances in a mixed-traffic environment.

Frame classification information is the foundation for the adapter to implement these advanced features:

- Finding protocol headers and payload data at dynamic locations
- Advanced filtering
- 17 different hash keys
- Dynamic selection of hash keys (per frame)
- Dynamic slicing
- Multi-CPU buffer splitting

Packet Descriptors

Received frames are appended with a standard PCAP packet descriptor. This can be augmented with additional information such as CRC error flags. Extended packet descriptors are also available with information, such as:

- Protocol information: IPv4, IPv6, UDP, TCP, GRE, SCTP, and GTP
- Encapsulation information: ISL, VLAN, and MPLS
- Hash key information: hash key value and type
- Offsets to information: Start of IP header, L4&L5 offsets
- Coloring/tagging: Tags defined by filters

Efficient Data Capture

The 2 ports on the NT20E2 adapters enable full-duplex monitoring of a network link (Rx and Tx traffic). The frame merging functionality enables Rx and Tx frames to be merged in reception time order simplifying the application processing.

Slicing

Three slicing methods are supported:

- Fixed slicing: Truncation of frames to a maximum size
- Dynamic slicing: Truncation of frames to a dynamic size relative to a specified protocol, e.g. IP payload + 16 bytes
- Conditional slicing: Fixed or dynamic slicing with properties based on frame decoding

Buffering

Onboard memory enables 1.2 sec. of data burst buffering even on a fully loaded 2 x 10 Gbps network.

Filtering

64 advanced programmable filters are available with an exceptional flexibility in the way they are specified, combined, and controlled. They are configured by means of the easy-to-use Napatech Programming Language. The customer application can change the filters on the fly without data loss.

The programmable filter logic is built on top of the advanced protocol decoding capabilities. This ensures that the application always gets the packets matching the requested protocol, even under very diverse conditions. Using a single filter, the adapter can capture, for instance, all TCP/IP packets with a specific source IP address, even when these packets are ISL-, VLAN-, or MPLS-encapsulated and/or contain IP/TCP options.

In all, a single filter will give the correct output under 7744 different traffic conditions. NT20E2 has 64 such programmable filter blocks, which can be combined in various ways.

Multi-CPU Support

Multi-CPU buffer splitting enables the NT20E2 adapters to place captured frames in 1 – 32 host buffers. The customer can configure the size of the host buffers from 1 MB to 128 GB; and how data is placed in the host buffers, based on results from the filter logic (IP address range and protocols), port numbers and/or generated hash key values (flows).

The advanced multi-CPU buffer splitting functionality and the option for distributing traffic to 1 – 32 CPU cores significantly improves the CPU cache performance, by always delivering the same flows and frame types to the same CPUs.

Coloring/Tagging

Filtered frames can be tagged with a "color" ID identifying the filter that forwarded the frame. This tag can be used to optimize applications performing different processing for different frame types.

FEATURES

Time-Stamping and Synchronization

High-precision time-stamping with 10 ns resolution is applied to all frames received by the adapter. The adapter time-stamping can be synchronized to that of another adapter or to external sources:

- Synchronization via the Napatech Time Synchronization Unit, such as to a GPS signal via Trimble Acutime Gold GPS antenna
- Adapter-to-adapter HW time synchronization either internally, externally or using daisy-chaining of adapters
- OS time synchronization with dynamic drift adjustment
- Free-running time synchronization
- Synchronization relative to any external PPS time source
- Synchronization to UTC time from:
 - CDMA time reference when connected to EndRun Præcis Cf CDMA receiver
 - IEEE1588/PTP time reference when connected to Oregano SYN1588 PCIe NIC

The adapter supports insertion of a high-precision 64-bit time stamp in frames being transmitted. The time stamp is inserted at a user-defined offset.

The NT20E2 Capture Adapters support six different 64-bit time-stamping formats:

- Native free-running format with 10 ns resolution
- 2 Windows formats with 10 ns or 100 ns resolution
- Native UNIX format with 10 ns resolution
- 2 PCAP formats with 1 ns or 1000 ns resolution

Traffic Generation and Replay

The NT20E2 Capture Adapter can also be used for high-speed transmit, for example traffic generation or replaying captured data. The transmit functionality enables transmit of 10 Gbps line speed for any frame size from 64 bytes to 10,000 bytes. Transmit of frame sizes from 17 bytes to 63 bytes are also supported at high speed. The IFG can be controlled with high precision on a per-frame basis using one of three time stamp formats.

CRC Verification and Generation

Ethernet, IP, UDP, and TCP CRCs are verified for received frames and can be generated for transmitted frames.

Statistics

The adapter hardware generates an extensive amount of statistics counters, which are available independently on whether the traffic is forwarded to the host or not. This enables customer applications to retrieve a comprehensive network traffic analysis at virtually zero CPU load.

Two types of statistics counters are available:

- Large sets: RMON1 (RFC2819) counters with extension of Jumbo frame counters are available for both captured and discarded frames on a per-port basis.
- Normal sets: Frame and byte counters for good and bad frames are available per filter and per host buffer.

Counter sets are always delivered as a consistent snapshot time-stamped by a 64-bit high-precision clock.

Deduplication

When network traffic is analyzed, large amounts of duplicate frames are sometimes received. NT20E2 has hardware functionality that can recognize and remove duplicate frames. This saves a substantial amount of server CPU cycles. The deduplication functionality can be configured to detect and remove 98% of duplicate frames in typical situations.

Software

The adapter drivers support Linux, FreeBSD, and Windows.

The API is identical for all Napatech adapters. The adapters also support LibPCAP and WinPCAP.

NTPL (Napatech Programming Language) provides an intuitive interface for programming the advanced features of the NT20E2 adapters. Napatech also provides a command line tool that enables fast prototyping of the adapter programming.

A large set of useful SDK tools are included in source code. These tools can be used for debugging and prototyping but also as examples of how the adapters are used.

NTPL Example

```
HashMode[ Pri=0; L4Port=GTPv1-U,GTPv1v2-C ] = HashGTPv1v2Sorted
HashMode[ Pri=0; L4Type=UDP,TCP,SCTP ]      = Hash5TupleSorted
HashMode[ Pri=1; L3Type=IPv4 ]              = Hash2TupleSorted
Capture[ Pri=0; Feed=(0..3) ] = mL5Prot (GTPv1-U,GTPv1v2-C)
Capture[ Pri=1; Feed=(4..7) ] = mL4Prot (UDP,TCP,SCTP)
Capture[ Pri=2; Feed=8 ]      = mL3Prot (IPv4)
Capture[ Pri=3; Feed=9 ]      = All
Deduplication[ DynOffset     = Layer2HeaderSize ] = All
```

This NTPL example shows how to set up the adapter to sorted GTPv1 hash keys for GTP-U and GTP-C frames, sorted 5-tuple hash keys for UDP, TCP, and SCTP frames, and sorted 2-tuple hash keys for all other IPv4 frames. Then it shows how to set up the adapter to capture GTP-U and GTP-C frames and distribute them to 4 host buffers (0..3), capture UDP, TCP, and SCTP frames and distribute them to 4 other host buffers (4..7), capture all other IPv4 frames and deliver them to another host buffer (8), and last capture the remaining frames to a separate host buffer (9). Finally the adapter is set up to remove duplicate frames if the layer 2 parts of the frames are identical (MAC addresses and encapsulations are excluded from the compare). All of the functionality included in the example is performed at line speed by the adapter hardware at zero server CPU load.

SPECIFICATIONS

General Features

- Full-line-rate processing for all frames from 64 bytes to 10,000 bytes
- IEEE standard: IEEE 802.3 10 Gbit/s Ethernet
- Physical interface: 2 SFP+ ports
- Supported SFP+ modules: Multi-mode SR (850 nm), single-mode LR (1310 nm), multimode LRM (1310 nm), single-mode ER (1550 nm), or Direct Attached Copper (Twinax)
- Data rate: 2 x 10 Gbit/s
- PCIe performance: 25 Gbit/s
- CPU utilization:
 - < 1% of the CPU is used for any data transfer
 - 0% of the CPU is used for any onboard processing
- Time formats: PCAP-ns/-μs, native, NDIS 10 ns/100 ns, UNIX 10 ns

Host Interface

- Bus type: 8-lane 5 GHz PCIe Gen2
- Data transfer modes:
 - Bus master DMA
 - Memory write or memory read transactions
- Support for 32-bit/64-bit addressing and host DMA addressing

Statistics

- RMON1 counters plus Jumbo frame counters per port
- Frame and byte counters per filter and per host buffer
- Counter sets always delivered as a consistent time-stamped snapshot

Adapter Hardware

- Flash: Supports two boot images
- 1 GB onboard DDR3 RAM
- Physical dimensions: ½-length low-profile PCIe

Environment

- Power consumption: 25 Watts including SFP+ SR modules
- Operating temperature: 0 – 45 °C, 32 – 113 °F
- Operating humidity: 20 – 80%
- Hardware compliance: RoHS, UL, CE, FCC, CSA, VCCI, C-TICK
- MTBF: 175,847 hours according to RIAC-HDBK-217Plus

Software

- Linux kernel 2.6: 32-bit/64-bit
- FreeBSD 6.x and 7.x: 32-bit/64-bit
- Windows Server 2003/2008, XP and Windows 7: 32-bit/64-bit
- API supporting user level applications
- LibPCAP and WinPCAP support
- SDK tools included in source code for debugging and prototyping and as examples of how the adapters are used

ABOUT NPULSE TECHNOLOGIES AND PCAP EXPRESS

nPulse Technologies, LLC is a leading provider of enterprise-class network assurance solutions. Combining open-source-based software technologies with hardware-accelerated performance on multi-core x86-based platforms, nPulse's Packet Capture Express (PCAPX) tools offer easy access to advanced packet capture functions using familiar open software and hardware architectures.

PCAP Express Adapters accelerate monitoring applications to wire-speed, transforming a standard x86 multi-core server into a flexible, high-performance platform processing millions of packets per second per core.

PCAP Express Workbench integrates PCAPX features and performance into a server appliance with pre-packaged applications and

additional tools for line-rate record-to-disk. The custom Workbench libpcap extension seamlessly enables multiple instances of a pcap-enabled application to execute in parallel across up to 32 cores, drastically scaling the throughput of network monitoring, analysis, and cyber security to 10Gbps without code modifications.

PCAP Express solutions are based on Napatech OEM adapter technology. As a value added reseller nPulse markets, sells, and supports Napatech-based solutions to developers, system integrators, and end-users under the Packet Capture Express product line.

For U.S. Federal Government customers, PCAP Express products and services are also available under GSA contract. Contact us directly for details at gsa@npulsetech.com.



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