

NT4E IN-LINE

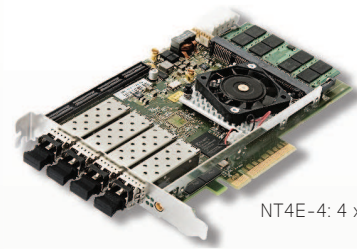
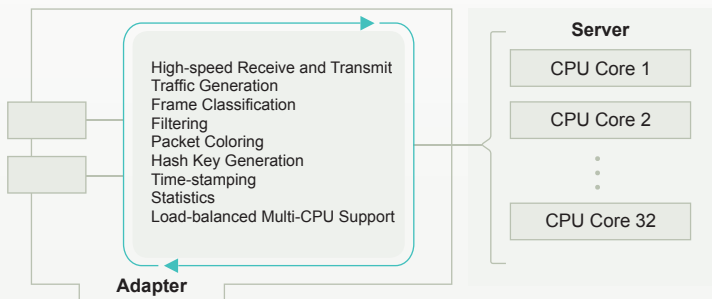
Intelligent Real-time Network Adapters

4-port 10 M / 100 M / 1 G Ethernet PCIe

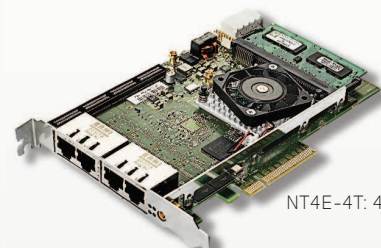
DATA SHEET

4 Gbps In-line Application Acceleration

The NT4E In-line Adapters provide full line-rate processing, analysis and retransmission of 4 Gbps data with zero packet loss, no matter the packet size. Advanced features, such as layer 2 to 4 traffic analysis, filtering, OS bypass and balanced multi-CPU traffic processing ensure that all relevant traffic is quickly transferred to the appropriate application without impacting CPU performance. The NT4E In-line Adapters are thus ideal for 4 Gbps applications that require hardware acceleration with maximum throughput and minimal CPU load. A comprehensive software suite is provided to allow quick and easy integration of the NT4E In-line Adapter supporting Linux, FreeBSD or Windows operating systems.



NT4E-4: 4 x 1 Gbps PCIe



NT4E-4T: 4 x 1 Gbps PCIe

FEATURE HIGHLIGHTS AND APPLICATIONS

Feature Highlights

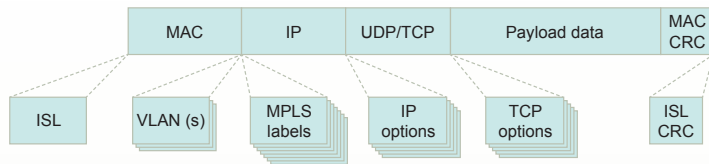
- 4 x 1 Gbps SFP and/or RJ45 connections
- High-speed in-line processing for all frame sizes
- Low host CPU load
- Low latency
- High-precision 10 ns time-stamping
- Advanced hardware time synchronization
- 4 Gbps frame processing including protocol decoding, programmable filters, hash keys, buffering, advanced statistics and multi-CPU support
- 10 ns control of IFG for transmitted frames
- On-the-fly fully reconfigurable setup
- Easy-to-integrate API
- LibPCAP support
- Linux, FreeBSD and Windows support

Napatech-supported Applications

The Napatech In-line Network 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:

- Firewalls
- Intrusion Prevention System (IPS)
- Unified Threat Management (UTM)
- Anti-spam Filtering
- Traffic Generation and Replay
- Traffic Shaping
- Policy Control

FEATURES



The Napatech adapters decode all frames regardless of encapsulations.

Layer 4 Protocols TCP, UDP and ICMP
Layer 3 Protocols IPv4, IPv6, IPX and ARP
Layer 2 Protocols Ethernet II, LLC, SNAP and RAW

Protocols supported by the NT4E frame decoder.

Frame Classification

The NT4E 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
- 2-tuple and 5-tuple hash key generation (sorted/unordered)
- Multi-CPU buffer splitting
- Per frame transmission TX parameter setting

The frame classification information can be provided to the customer application to accelerate the frame processing.

Packet Descriptors

Captured 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 etc.
- Encapsulation information: ISL, VLAN and MPLS
- Hash key information: 2- or 5-tuple hash keys
- Offsets to information: Start of IP header, UDP/TCP header and UDP/TCP payload
- Coloring/tagging: Tags defined by filters

Efficient In-line Processing

The NT4E In-line Adapter provides a zero copy RX - TX interface where frames to be transmitted/discarded can be selected via a single bit in the packet descriptor. This enables implementation of basic in-line functionality using less than 10% of the CPU for 4 Gbps network traffic at any frame size. The adapter supports retransmission of frames without modifying the Ethernet CRC. A frame received with a bad Ethernet CRC can be retransmitted with the same bad

Ethernet CRC and the same IFG as received, enabling the in-line device to be 100% transparent. The advanced filter logic can be used to pre-fill the TX descriptor fields, e.g. frames received on port 0 will be retransmitted on port 1.

Traffic Generation

The NT4E In-line Adapter can also be used for high-speed transmit, e.g. for implementation of traffic generation or replay of captured data. The transmit functionality enables transmit of 4 Gbps line speed for any frame size from 64 bytes to 10000 bytes. The IFG can be controlled with high precision on a per-frame basis using one of three time stamp formats.

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. The NT4E In-line Adapter has 64 such programmable filter blocks, which can be combined in various ways.

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 (TSU) e.g. to a GPS signal
- Adapter-to-adapter HW time synchronization either internally, externally or using daisy-chaining of adapters with or without the use of a TSU
- OS time synchronization with dynamic drift adjustment
- Free-running time synchronization

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 NT4E In-line Adapters support 3 different 64-bit time-stamping formats:

- Native free-running format with 10 ns resolution
- Native NDIS format with 10 ns resolution
- Native UNIX format with 10 ns resolution

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.

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.

Multi-CPU Support

Multi-CPU buffer splitting enables the NT4E 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 are 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.

Software

The network adapter drivers support Linux, FreeBSD and Windows.

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

NTPL (Napatech Programming Language) provides a simple and intuitive interface for programming the advanced features of the NT4E 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. Application examples illustrating how to capture data to memory or disk, and how to generate netflow data, are also included.

NTPL Example

```
Capture[Priority=0; SetDescriptorTxIgnore=TRUE]
    = (Layer3Protocol == ARP)

Capture[Priority=1; SetDescriptorCrcOverride=FALSE;
    SetDescriptorTxNow=FALSE; SetDescriptorTxChannel=1]
    = (channel == 0)

Capture[Priority=1; SetDescriptorCrcOverride=FALSE;
    SetDescriptorTxNow=FALSE; SetDescriptorTxChannel=0]
    = (channel == 1)
```

This NTPL example shows how to set up the adapter so that no ARP frames are retransmitted (lines 1 - 2).

All frames other than ARP frames from port 0 are retransmitted on port 1 (lines 3 - 5); and all frames other than ARP frames from port 0 are retransmitted on port 1 (lines 6 - 8).

All of the retransmitted frames are retransmitted with the same IFG as received (lines 4 and 7). All of the retransmitted frames are retransmitted with the same Ethernet CRC as received (lines 3 and 6).

SPECIFICATIONS

General Features

- Full-line-rate processing for all frames from 64 bytes to 10.000 bytes
- IEEE standard: IEEE 802.3 10 Mbit/s / 100 Mbit/s / 1 Gbit/s Ethernet
- Physical interfaces:
NT4E-4: 4 SFP ports
NT4E-4T: 4 RJ45 ports
- Supported SFP modules: Multimode SR (850 nm), single-mode LR (1310 nm), 1000BASE-T or 10/100/1000BASE-T
- Data rate: 4 x 1 Gbit/s
- PCIe performance: 12.5 Gbit/s
- CPU utilization:
Low CPU utilization for data transfer
0% of the CPU is used for any on-board processing
- Time formats: Native 10 ns, NDIS 10 ns, UNIX 10 ns

Software

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

Host Interface

- Bus type: 8-lane 2.5 Gbit/s PCIe Gen1
- 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
- Memory options: Standard SO-DIMM 200-pin 1 GB, 2 GB or 4 GB DDR2 RAM modules
- Physical dimensions: ½-length full-height PCIe

Environment

- Power consumption: 25 Watts including SFP SR or RJ45 modules
- Operating temperature: 0 - 45 °C, 32 - 113 °F
- Operating humidity: 20 - 80%
- Hardware compliance: RoHS, UL, CE, FCC, CSA, VCCI, C-TICK
- MTBF: 266329 hours according to RIAC-HDBK-217Plus

COMPANY PROFILE

Napatech develops and markets the world's most advanced programmable network adapters for network traffic analysis and application off-loading. Napatech is the leading OEM supplier of Ethernet network acceleration adapter hardware. Napatech is fully focused on providing the most cost-effective hardware acceleration solutions for Gigabit Ethernet connectivity, increasing our customers' ability to keep their competitive advantage, while maintaining the flexibility and cost position of standard server equipment and operating systems.

Napatech provides unmatched value-add to our OEM customers by offering a very flexible feature set and a highly scalable range of network adapters. With easy-to-use APIs, Napatech adapters enable effective integration of Network Monitoring, Network Security, Network Control and Assurance, and Network Traffic Generation appliances. Napatech has a strong international focus supporting OEM customers worldwide with headquarters and development located in Denmark, and sales and customer support located in the USA.

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