

NT20E2 IN-LINE

# Intelligent Real-Time Network Adapters 2-Port 10 G Ethernet PCIe Gen2

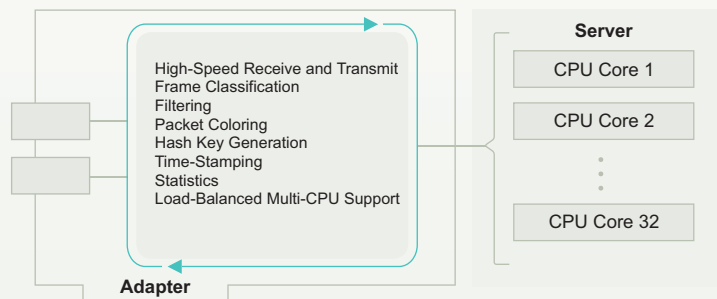
DATA SHEET

## 10 Gbps In-Line Application Acceleration

The NT20E2 In-line Adapter provides full line-rate processing, analysis and retransmission of 10 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 NT20E2 In-line Adapter is thus ideal for 10 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 NT20E2 In-line Adapter supporting Linux, FreeBSD or Windows operating systems.



NT20E2: 2 x 10 Gbps PCIe Gen2



## FEATURE HIGHLIGHTS AND APPLICATIONS

### Feature Highlights

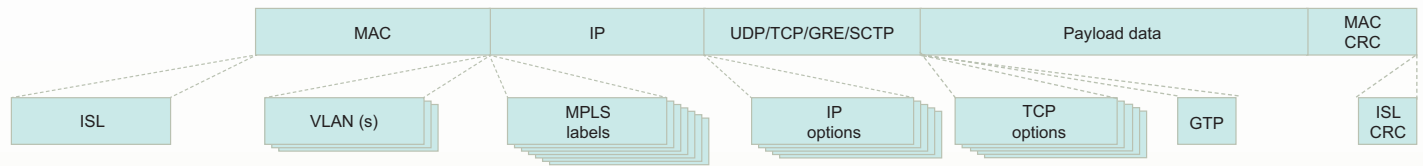
- 2 x 10 Gbps SFP+ connections
- High-speed in-line processing for all frame sizes
- Low host CPU load
- Low latency
- High-precision 10 ns time-stamping
- Advanced hardware time synchronization
- 20 Gbps frame processing including protocol decoding, programmable filters, hash keys, buffering, advanced statistics, 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:

- Intrusion Prevention System (IPS)
- Unified Threat Management (UTM)
- Traffic Shaping
- Policy Enforcement

## 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
- Multi-CPU buffer splitting
- Per frame transmission TX parameter setting

### 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, UDP/TCP header and UDP/TCP payload
- Coloring/tagging: Tags defined by filters

### Efficient In-Line Processing

The NT20E2 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 5% of the CPU for 10 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.

### CRC Verification and Generation

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

### 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 select, 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 NT20E2 In-line Adapter has 64 such programmable filter blocks, which can be combined in various ways.

### Local Retransmit

Local retransmit redirects network traffic on the adapter itself without transferring it to the host. Local retransmit can be applied to all or parts of the incoming traffic using filters to retransmit packets of a specific protocol or a specific IP address etc. This can be used, for instance, to implement “white list” functionality in IPS applications.

## 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 NT20E2 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 accepted 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.

### NTPL Example

```
Capture[Priority=0; SetDescriptorTxIgnore=TRUE]
    = (Layer3Protocol == IPV4)
Capture[Priority=1; SetDescriptorCrcOverride=FALSE;
    SetDescriptorTxNow=FALSE; SetDescriptorTxChannel=1]
    = (channel == 0)
Capture[Priority=1; SetDescriptorCrcOverride=FALSE;
    SetDescriptorTxNow=FALSE; SetDescriptorTxChannel=0]
    = (channel == 1)
```

### 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

### Multi-CPU Support

Multi-CPU buffer splitting enables the NT20E2 adapters to place accepted 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.

### Software

The 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 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.

This NTPL example shows how to set up the adapter so that no IPv4 frames are retransmitted (lines 1 – 2).

All frames other than IPv4 frames from port 0 are retransmitted on port 1 (lines 3 – 5); and all frames other than IPv4 frames from port 1 are retransmitted on port 0 (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 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:
  - < 5% of the CPU is used for data transfer
  - 0% of the CPU is used for any onboard processing
- Time formats: Native 10 ns, NDIS 10 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 support
- SDK tools included in source code for debugging and prototyping and as examples of how the adapters are used

## 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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