# ENET ACE-NIC40

Carrier-Grade SmartNIC for Network Function Acceleration

ACE-NIC40 is an acceleration SmartNIC, operated on top of COTS servers. ACE-NIC accelerates network function performance, dramatically reducing end-to-end latency associated with NFV platforms.

The ACE-NIC40 incorporates Ethernity's ENET Flow Processor system-on-chip (SoC) platform, which utilizes a patented unique flow-based processing engine to process data units of variable size. ENET SoC firmware has been integrated into a single FPGA on the NIC to include the functionality of various network components, including NIC and SR-IOV support, as well as network processing, such as classification, virtual router and switch, load balancing, performance monitoring, OAM, 100ms buffering, header compression, IPSec encryption, and IP fragmentation.

Product Highlights

- Accelerates VNF application performance by 50 times
- Drastically improves overlay network processing and RSS function flexibility
- Performance monitoring of 256K flows with 10 counters each to reduce CPU processing
- Easy programmability
- OpenStack Plug & Play
- vSwitch plug-in for data path offload
- Large on-board DDR3 to support up to 100ms buffering and search and filtering of millions of flows
- Option for adding customized logic into the FPGA
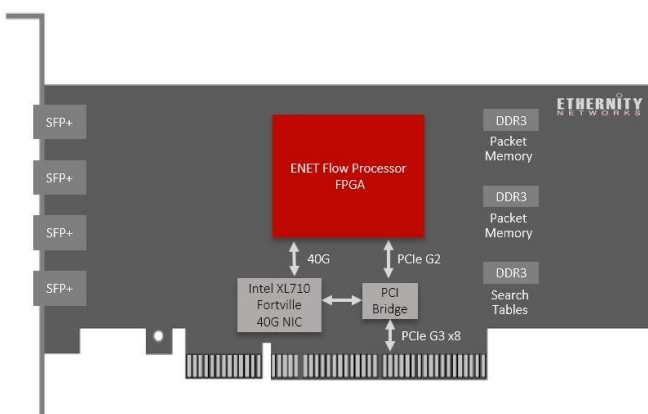
The ACE-NIC40 Ethernet PCI Express adapter comprises a standard Intel MAC controller, FPGA equipped with Ethernity's customized flow processor hardware acceleration engine, and DDR3 on-board memory.

Applications include vSwitch offloading (OVS offload), SD-WAN and vCPE, vEPC (full data plane for vSGW and vPGW), vRouter, vBRAS/vBNG, vPE Router, Edge data appliances and vFW, network overlay/underlay offloading, data center gateways (DC-GW), monitoring, and SLA.

ACE-NIC40: Solving NFV Performance Challenges

Requirement	NFV Challenge	ENET ACE-NIC40 Solution
Performance	The vSwitch and vRouter are not able to perform well enough to support distributed applications on multiple VMs effectively.	Implement Virtual Switch/Router in the SmartNIC, resulting in significantly improved performance
Performance Monitoring	Collect, maintain, and analyze millions of counters. Provide accurate time stamping of events	The card includes multiple counters for 256K flows and supports 1588 accurate timestamps per packet.
Load Balancing	Load balancing is necessary to distribute the workload over multiple VNFs/cores. Stateful load balancing is a significant task to handle.	The card implements stateful load balancing at VM granularity and can be implemented together with IP fragmentation.
Fault Management	Determining faults, monitoring the health of network services, and connectivity management are basic requirements.	Support for OAM and BFD to monitor L2 and L3 connectivity and trigger fast failover to backup links of the virtual path
Security	Backhaul security issues require encryption of backhauled traffic, and therefore require dedicated hardware.	The ENET ACE-NIC40 includes flow-based IPSec tunneling at 10G and supports 1K tunnels.
Tunneling Gateway	Tunnel encapsulation offload	ENET maintains the per-flow encapsulation state and can offload almost any type of tunnel encapsulation, as well as performing encapsulation of any header type to a frame.

Specifications

SR-IOV
- 8 PFs (physical functions)
- 128 VFs (virtual functions)

Ethernet
- Jumbo frame support
- IP packet fragmentation

Stateless offloads
- TSO / LSO
- Enhanced RSS

Network Functions offloads
- L2/L3 Forwarding, NAT/NAPT
- Segment Routing with MPLS label editing
- VxLAN, NVGRE
- GTP for Mobile backhaul solutions
- PPPoE termination for BRAS application
- L2TP and L2TPv3 tunnels

Security offloads
- IPSec @ 10Gbps tunneling with/without overlay: AES-128/256 GCM, CBC and SHA-256 for Authentication
- Firewall and DDoS engine

Environmental requirements
- Operating temperature: 0° to 55°C (32° to 131°F)
- Storage temperature: -40° to 70°C (-40° to 158°F)
- Relative humidity: 5% to 95% non-condensing

OS
- CentOS
- Ubuntu

Boot
- UEFI boot support
- PXI

Compliance
- IEEE Std 802.3ae 10G Ethernet
- IEEE 802.3ad Link Aggregation & Failover
- IEEE 802.1Q.1p VLAN Tags & Priority
- IEEE 802.1Qbb PFC
- MEF10 Compliance
- IETF unicast and multicast routing

MEF, BBF and Carrier features
- TR-101, TR-156
- MEF Policer 2r3c and WRED
- H-QoS supporting WFQ and SP
- OAM and BFD, with 3.3ms CFM
- High precision packet stamping

SW KIT
- ENET Driver, HAL
- ENET CLI with Application Guide
- ENET DPDK HW Acceleration
- REST example
- OpenFlow 1.3 example

Customization
The Flow Processor can be customized with additional functions required by VNF or NFVi acceleration.

Physical Specifications

Standard Interface	4 x 10G SFP+ PCI-Express Base Specification Revision X8 / Gen 3.0 (8GT/s)
Board Size	Standard height: 241.3 x 111.15mm (9.5" x 4.376")
Controller	Intel XL710AM1
On-board Memory Packet Buffer	DDR3: 2GByte on HP (packet data), 1.5 GB on HR. (search, counter, and user application)

Minimum Server Requirements

CPU	At least 2.0-2.5 GHz @ 1CPU @ 8 cores
Memory	At least 16Gb (4G x 4 DIMM)
PCIe	Gen3 x8/x16
OS	At least CentOS 6.3 / Ubuntu 14.04 / Fedora 16

Ordering Options

Part Number	ENA1044 with 4 x 10G interfaces ENA1044S with 10G IPSec tunnel offload (by special order only)