SmartNIC

General computing network solution of Agilio SmartNIC.

It provides high performance and scalability for computing and service node applications in service providers and enterprise cloud networks.

This solution enables enterprises of different sizes to greatly improve the efficiency of their data center infrastructure while retaining standard cloud configurations and automation tools.
**PRODUCT FEATURES**

- **01** Silicon is flexible, programmable and highly scalable
- **02** Mature complete software and hardware product line
- **03** High performance, low cost and low power consumption
- **04** Fully programmable control for new network feature rollouts

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**Comprehensive and Proven SmartNIC Platform**

Corrine provides all kinds of software solutions and mature NIC products from silicon to board.

**THE CARD FEATURES**

- **01** VLAN/QinQ isolation, QoS speed limit
- **02** SR-IOV (VEB/VEPA)
- **03** TSO/LSO/CHCKSUM offload
- **04** Host RSS, RSS/VLAN, RX Hash
- **05** Linux / DPDK standard driver (PF and VF)
- **06** PXE startup
- **07** Software upgradable
- **08** Integrated IPSec VPN, kTLS encryption, decryption and offload

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**Data Plane Programming Tools for Custom Feature Adds**

- P4, C, eBPF/XDP-based Programming Layer
- Virtual Switching and Routing
- VLAN, MPLS, MPLS over GRE
- ACLs and Security Groups
- vProbes, In-band Telemetry
- DDoS & Load Balance
- SSL, IPsec VPN, NGFW, UTM
- Congestion & Tail Latency Reduction

**Virtualization Layer and SDN (with standard offload)**

- CoreNIC Upstreamed Linux Device Drivers
- Stateless Offloads, SR-IOV, DPDK, "Express Virtio (KIO)", vDPA
- Agilio SmartNIC Family
  - 10-100Gb/s, with 2-24GB DDR, up to 8 ARM Cores
  - with 36-120 cores, up to 960 processing threads

**NFP Silicon Family**

- with 36-120 cores, up to 960 processing threads

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**Basic NIC Features**

- Offload NIC Features
- Programmable NIC Features
SmartNIC Open vSwitch Offload (TC / RTE_FLOW)

OVS offload

- **Hardware offload supporting OVS-TC interface**
- **Complete OpenFlow 1.3 and Group table offloads**
- **VXLAN, NVGRE, GENEVE tunnel**
- **Up to 500k tunnels**
- **Offload supporting Conntrack connection tracking based on TC interface**
- **Per-flow metering and QoS**
- **SR-IOV, DPDK, zero-copy, packet-direct and stateless offloads**
- **Up to 500k tunnels**

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**SmartNIC OVS offload**

- **Software all Upstream to the community**
- **XVIO Virtual machine live migration in cloud environment**
- **Hardware streaming is up to 35K/S, providing high concurrent new-built.**

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**CentOS**

**Red Hat**

**Ubuntu**

**优麒麟**

**Windows Server**

**openEuler**

**VMware ESXi**

**Fedora**
Support vDPA Makes Live Migration of Virtual Machines Possible

Industry initiative: Express Virtio (XVIO)

SR-IOV technology is widely used, but it cannot solve the problem of live migration. Corigine develops XVIO by combining DPDK technology and Virtio features, solving the problem of cloud machine live migration.

The Lead in Adapting vRouter Acceleration (Tungsten Fabric)

The first to offload Contrail vRouter

- Transparent offload vRouter data plane load to SmartNIC acceleration (VPN/ECMP/Security/Firewall)
- Combine XVIO acceleration technology to improve Contrail performance and realize live migration.
- Tunnel acceleration: MPLS over GRE, MPLS over UDP, VXLAN
IPSec/SSL Acceleration of Network Security

Advanced encryption/decryption hardware

- SmartNIC offload IKE information to hardware
- Support IPSec/SSL message encryption/decryption
- Support plentiful mainstream encryption algorithms: AES, 3DES, ARC-4, 3GPP, SHA-1, SHA-2, MD5, HMAC, etc.
- Up to 80Gb/s encryption processing capacity
- Flexible and programmable

Host (Server)
User mode
Kernel
SmartNIC
IKE daemon (e.g., StrongSWAN)
Cfg on disk
Key
SAs + Keys
ESP stack
SAs + Keys
Host (Server)
User mode
Kernel
SmartNIC
Routes
SAs + Keys
Eth/IP hdr
ESP/encap/decap + crypto
SAs + Keys
Eth/IP hdr
Payload
Networking stack
App
Eth/IP hdr
Payload
Eth/IP hdr
Payload (encrypted)

HIGH-TECH SILICON
LEADING ENCRYPTION DECRYPTION HARDWARE
SmartNIC’s Advanced Programming Supports NFV and Customized Situations
Advanced eBPF programming offload

- Both x86 and NFP JITs upstreamed - first in industry to offload eBPF!
- Container platform, support network attack and defense, load balancing
- Provide NIC JIT translation to maximize performance.

SmartNIC’s Advanced Programming Supports NFV and Customized Situations
C / P4 Development Environment

- The industry’s first NIC platform supporting mixed programming of P4 and C
- Customized data plane based on P4
- Complete development, compilation and debugging tools

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**IDE with Debugger**

- P4 Runtime gRPC or Thrift
- Debug at C or P4 level

**Compile / Link**

- P4Runtime Compile / Link
- Plugin C app.firmware
- Native code for SmartNIC

**Runtime control app / agent**

- Dataplane Program: Parse - Match - Act
- Custom dataplane extensions in C
- Custom dataplane features in C

**SmartNIC’s Advanced Programming Supports NFV and Customized Situations**

- Industry-wide open developer community
- Open-nfp.org
- 70+ projects

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**Network**

- 10G to 100G Network
- SR-IOV, netdev:VF v0.0
- SR-IOV, DPDK:VF v0.1
- VNF or VM or App

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**Infrastructure or App Code**

- E.g. in C
- E.g. in C

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**User Space**

- Compiler
- eBPF Bytecode

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**Kernel**

- x86 ASMD
- x86 BPF JIT

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**x86 ASMD**

- JIT translation to maximize performance.

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**x86 BPF JIT**

- JIT translation to maximize performance.

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**NFP ASMD**

- JIT translation to maximize performance.

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**Falls back to GPCPU for Public Cloud**

- JIT translation to maximize performance.

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**Uses SmartNIC where available**

- JIT translation to maximize performance.

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**SmartNIC’s Advanced Programming Supports NFV and Customized Situations**

- Both x86 and NFP JITs upstreamed - first in industry to offload eBPF!
- Container platform, support network attack and defense, load balancing
- Provide NIC JIT translation to maximize performance.

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**ADVANCED PROGRAMMING**
## SmartNIC Roadmap

### PRODUCT SERIES

<table>
<thead>
<tr>
<th>Generally Available</th>
<th>2022</th>
<th>2023-2024</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agilio OCP 1x25/50GbE</strong></td>
<td>- OCPv2 Mezzanine</td>
<td>- OCPv3 Mezzanine</td>
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<tr>
<td></td>
<td>- 4xPCIe Gen3x4</td>
<td>- PCIe Gen5x8</td>
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<tr>
<td></td>
<td>- NFP-4000</td>
<td>- NFP-7000</td>
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<tr>
<td></td>
<td>- NCSI</td>
<td>- Crypto</td>
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<tr>
<td></td>
<td>- 15-17W</td>
<td>- 4-16GB DRAM</td>
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<tr>
<td><strong>Agilio OCP 1x50GbE/Crypto/DDR</strong></td>
<td>- OCP v2 Mezzanine</td>
<td>- Crypto</td>
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<tr>
<td></td>
<td>- 4xPCIe Gen3x4</td>
<td>- Bare Metal</td>
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<tr>
<td></td>
<td>- NFP-4000</td>
<td>- 4-16GB DRAM</td>
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<tr>
<td></td>
<td>- Crypto/kTLS</td>
<td>- RoCE/NVMe-oF</td>
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<tr>
<td></td>
<td>- 2GB DRAM</td>
<td>- NCSI/MCTP</td>
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<tr>
<td></td>
<td>- (optional on daughter card)</td>
<td>- 30-35W</td>
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<td></td>
<td>- 17-20W</td>
<td>- 35-50W</td>
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<tr>
<td><strong>Agilio FX 2x10GbE</strong></td>
<td>- Low Profile PCIe</td>
<td>- PCIe Gen5x8</td>
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<td>- 1xPCIe Gen3x8</td>
<td>- NFP-7000</td>
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<tr>
<td></td>
<td>- NFP-4000</td>
<td>- 8-16 ARM64</td>
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<tr>
<td></td>
<td>- Quad core ARM1GHz, with 2GB DRAM Crypto</td>
<td>- Crypto, Bare Metal</td>
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<td>- 2GB DRAM</td>
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<td>- 25-30W</td>
<td>- RoCE/NVMe-oF</td>
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<td><strong>Agilio FX 2x25GbE</strong></td>
<td>- PCIe Gen3x8</td>
<td>- Telecom/SM3/SM4</td>
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<td>- NFP-4000</td>
<td>- NVMe /TCP/RoCEv2</td>
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<td>- 4-8 cores ARM64, 4-16GB DRAM Crypto, Bare Metal</td>
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<td>- Crypto, Bare Metal</td>
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</table>
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