ETHERNET. ОБЗОР РЕШЕНИЙ INTEL ДЛЯ CLOUD/TELECOM

Иван Панков, специалист по продукции Intel® Ethernet в России и СНГ
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**INTEL® ETHERNET 500 SERIES**

- **X520 10GbE SFP+**
  - 10GbE CNA

- **X540 10GBase-T**
  - Single Chip 10GBase-T

- **X550 10GBase-T**
  - 2nd Generation
  - Single Chip 10GBase-T

**INTEL® ETHERNET 700 SERIES**

- **X710 (10GbE SFP+)**
  - Cloud and Network Virtualization Overlays
  - (Dual- and Quad-Port)

- **XXV710 (25GbE SFP28)**
  - Cloud and Network Virtualization Overlays

- **XL710 (40GbE QSFP+)**
  - Network Virtualization Overlays Acceleration

- **X710-T4 (10GBase-T)**
  - Quad-Port 10GBase-T

**INTEL® ETHERNET 800 SERIES**

- **X722 (10GbE SFP+)**
  - Network Virtualization Overlays Acceleration
  - Cloud and Network iWARP

- **X710-T2L/T4L (10GBase-T)**
  - Dual- and Quad-Port

**PHY Mezz Cards**

- Lewisburg PCH
- OCP X527-DA4
- OCP X527-DA2
- OCP X547-T2

**Up to 100 GbE per port**

- Queue and Steering Hardware Assists
  - Application Device Queues (ADQ)

- Fully Programmable Pipeline
  - Table definition with DDP profile packages

- Storage
  - RDMA (iWARP* & RoCE*v2)

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*Other names and brands may be claimed as the property of others.*
<table>
<thead>
<tr>
<th><strong>Legal Name</strong></th>
<th>Intel® Ethernet Network Adapter X710-T2L/T4L</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ports</strong></td>
<td>Dual / Quad Port</td>
</tr>
<tr>
<td><strong>Product Codes</strong></td>
<td>X710T2L, X710T2LBLK (Retail Dual)</td>
</tr>
<tr>
<td></td>
<td>X710T4L, X710T4LBLK (Retail Quad)</td>
</tr>
<tr>
<td><strong>Connection Type</strong></td>
<td>RJ45, Twisted-pair copper</td>
</tr>
<tr>
<td><strong>Connection Speed</strong></td>
<td>100Mbps/1Gbps/2.5Gbps/5Gbps/10Gbps</td>
</tr>
<tr>
<td><strong>Cabling type/range</strong></td>
<td>10GBASE-T 100m on CAT6A, 55m on CAT6</td>
</tr>
<tr>
<td></td>
<td>5GBASE-T, 2.5GBASE-T 100m on CAT5e, CAT6 or CAT6A</td>
</tr>
<tr>
<td></td>
<td>100BASE-TX, 1000BASE-T 100m on CAT5e, CAT6 or CAT6A</td>
</tr>
<tr>
<td><strong>Slot Specs</strong></td>
<td>PCI Express* v3.0 x8 (8.0GT/s)</td>
</tr>
<tr>
<td><strong>Controller info</strong></td>
<td>Intel® Ethernet Controller X710-AT2 (Carlsville Dual)</td>
</tr>
<tr>
<td></td>
<td>Intel® Ethernet Controller X710-TM4 (Carlsville Quad)</td>
</tr>
<tr>
<td><strong>Power Consumption</strong></td>
<td>10GbE Dual Port Typical 8.2W Max 9.6W</td>
</tr>
<tr>
<td></td>
<td>10GbE Quad Port Typical 13.6W Max 14.2W</td>
</tr>
<tr>
<td><strong>Virtualization acceleration</strong></td>
<td>Intel® AVF / VXLAN, GENEVE, NVGRE, MPLS, and VXLAN-GPE with NSH Offloads</td>
</tr>
</tbody>
</table>

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# INTEL® ETHERNET ADAPTERS FOR OPEN COMPUTE PROJECT (OCP)

## OCP Mezz 2.0 slot

<table>
<thead>
<tr>
<th>Intel® Ethernet Server Adapters</th>
<th>40GbE QSFP+ for OCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Port</td>
<td>XL710QDA1OCP</td>
</tr>
<tr>
<td>Dual Port</td>
<td>XL710QDA2OCP</td>
</tr>
</tbody>
</table>

## OCP 3.0 Future Adapters

<table>
<thead>
<tr>
<th>Intel® Ethernet Server Adapters</th>
<th>25GbE SFP28 for OCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Port</td>
<td>XXV710DA1OCP</td>
</tr>
<tr>
<td>Dual Port</td>
<td>XXV710DA2OCP1</td>
</tr>
<tr>
<td></td>
<td>XXV710DA2OCP2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intel® Ethernet Server Adapters</th>
<th>10GbE SFP+ for OCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Port</td>
<td>X520DA1OCP</td>
</tr>
<tr>
<td>Dual Port</td>
<td>X520DA2OCP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OCP 3.0 Future Adapters</th>
<th>1/10/25/100 GbE per port</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I350 / X710 / 800 Series based</td>
</tr>
</tbody>
</table>

(preliminary forecast)

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НОВЫЕ ТРЕБОВАНИЯ ДЛЯ ВЫСОКОПРОИЗВОДИТЕЛЬНЫХ СЕТЕЙ

Одновременное использование сети множеством приложений

Поддержание высокопроизводительного доступа к СХД

Поддержка множества сетевых протоколов

Увеличение скорости делает выполнение этих требований более сложной задачей

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РАЗНООБРАЗНЫЕ СЕТЕВЫЕ ЛАНДШАФТЫ – МНОЖЕСТВО СЕТЕВЫХ ПРОТОКОЛОВ

MICROWAVE
MOBILE BACKHAUL
BRAS
WIRELESS CORE
GiLAN
IMS
DSLAM
CDN
IPFE
GTP
QinQ, GRE, MPLS Martini
IPv4, IPv6, TCP, UDP, SCTP, VXLAN, NVGRE, GRE

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**РАЗНООБРАЗНЫЕ СЕТЕВЫЕ ЛАНДШАФТЫ – МНОЖЕСТВО СЕТЕВЫХ ПРОТОКОЛОВ**

Значительное расширение типов протоколов, с которыми способны работать сетевые адаптеры

**Enterprise**
- Network Virtualization over Layer 3 (NVO3)
- Virtual Extensible LAN (VXLAN) [RFC7348]
- Generic Protocol Extension for VXLAN (VXLAN-GPE)
- Network Virtualization using Generic Routing Encapsulation (NVGRE) [RFC7637]
- Generic Network Virtualization Encapsulation (GENEVE)
- Network Service Header (NSH)

**Service Providers**
- C-VLAN Tag (C-Tag)
- Customer VLAN (C-VLAN)
- S-VLAN Tag (S-Tag)
- Service VLAN (S-VLAN)
- Customized Protocols

**Network Edge**
- GPRS Tunneling Protocol (GTP)
- Internet Protocol over Ethernet (IPoE)
- Layer 2 Tunneling Protocol (L2TP)
- Multiprotocol Label Switching (MPLS)
- Multi-Service BNG (MS-BNG)
- Residential Gateway (RG)
- Point to Point Protocol (PPP)
- PPP over Ethernet (PPPoE)
- Control and Provisioning of Wireless Access Points (CAPWAP)

**SECURITY**
- Internet Protocol Security (IPsec)
- Encapsulating Security Payloads (ESP)
- Authentication Headers (AH)
- Security Associations (SA)

**Default Protocol Support + Programmability to Meet Segment Needs**

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DYNAMIC DEVICE PERSONALIZATION (DDP)

RUN-TIME PROGRAMMABILITY
Packet pipeline customization to meet a wide range of customer deployment needs
Available on Intel® Ethernet 700 Series

OPTIMIZE PERFORMANCE
• Lower Latency
• Higher Throughput
• Improved CPU Utilization
Improved Packet Processing Efficiency

AVAILABLE NOW
See user guide on the Intel® Developer Zone

Intel® Ethernet 700 Series DDP Profiles
Publicly Released: GTPv1, PPPoE
Others: MPLSoGRE/MPLSoUDP, L2TPv3, QUIC, IPv4 Multicast, 4G Fronthaul, eCPRI, VXLAN-GPE, IPsec

Dynamic Device Personalization (DDP) profile enabled
The pipeline parser can look deeper into the packets

Unsupported protocols in the pipeline rely on the host to parse them

parsed fields

Payload

Definition: With PPPoE DDP Profile
70% more upstream processing performance

Broadband Remote Access Server (BRAS) Aggregated Forwarding Test

Without DDP
Upstream (21.42 Mpps) Downstream (25.90 Mpps)

With DDP
Upstream (36.98 Mpps) Downstream (25.18 Mpps)

Destination Address | Source Address
Undefined Protocol | Start of Payload | ? | ?

Payload

DDP Profiles

Publicly Released:
- GTPv1
- PPPoE

Others:
- MPLSoGRE/MPLSoUDP
- L2TPv3
- QUIC
- IPv4 Multicast
- 4G Fronthaul
- eCPRI
- VXLAN-GPE
- IPsec

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Source: Intel internal testing as of November 2017. Features & schedule are subject to change. Calculation: Upstream DDP vs w/o DDP (36.98 - 21.42)/21.42*100% = 72.6%

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**APPLICATION DEVICE QUEUES (ADQ)**

**ADQ Basics**
- Выстраивание очередей трафика в зависимости от приоритета приложения
- Упорядочивание потоков данных приложения в соответствии с сценариями построения очередей ADQ
- Дополнительные возможности управления скоростью исходящего (Tx) трафика

Существенное снижение разброса во времени отклика приложения – улучшение Application Latency Predictability

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APPLICATION DEVICE QUEUES (ADQ) – REDIS* OPEN SOURCE DATABASE

INCREASES APPLICATION PREDICTABILITY

Average Latency Predictability

Round Trip Time Avg - (100B) Intel® Ethernet 800 Series with ADQ "Off" Baseline

Round Trip Time Avg - (100B) Intel® Ethernet 800 Series with ADQ "On"

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Как iWARP*, так и RoCE* v2 потенциально могут предоставлять услуги RDMA при сравнимой стоимости и производительностью.

iWARP построен на TCP/IP и сегодня является законченным решением, готовым к работе, готовым к масштабированию.

RoCEv2 требует использования коммутаторов с поддержкой Data Centre Bridging, с поддержкой таких сервисов как Enhanced Transmission Services и Priority Flow Control.

iWARP представляется более простым и удобным с точки зрения настройки и масштабирования.

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Intel® Ethernet AVF (Adaptive Virtual Function) – единый драйвер виртуальной функции для SR-IOV. При модернизации оборудования сохраняется базовый набор функций.

- 4 Queue Pairs (QP) и associated Configuration Status Registers (CSRs) для Tx/Rx
- i40e descriptors и ring format
- Descriptor write-back completion
- 1 control queue, with i40e descriptors, CSRs и ring format
- 5 MSI-X interrupt vectors и соответствующие i40e CSRs
- 1 Interrupt Throttle Rate (ITR) index
- 1 Virtual Station Interface (VSI) per VF
- 1 Traffic Class (TC), TC0
- RSS with 64 entry indirection table и key, configured through the PF
- 1 unicast MAC address reserved perVF
- 16 MAC address filters для каждого VF
- Stateless offloads - non-tunneled checksums
- Large Send Offload (LSO) / TCP Segmentation Offload (TSO) для буферов до 256K
- Common device ID
- HW mailbox is used для VF to PF communications (including on Windows)

Расширяемый функционал
Основано на Physical Driver сетевого контроллера

Intel® Ethernet 700 series
Further product series

Linux Kernel 4.14 in

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QUAD PORT ADAPTERS FOR FIBER OPTICS – FULL HEIGHT AND LOW PROFILE

X710-DA4 FH

X710-DA4 LP
Гарантийные обязательства

Intel® Ethernet Products
• Ограниченная пожизненная гарантия на выпускаемую продукцию
• 5-летняя гарантия на продукцию, снятую с производства

• Intel® Points