Business Intelligence | Data Center | Cloud | Mobility | Security

Enterprise Computing Solutions – North America

Intel® 10GbE Network Connectivity
What Sellers Need to Know

Five Years Out

arrow.com

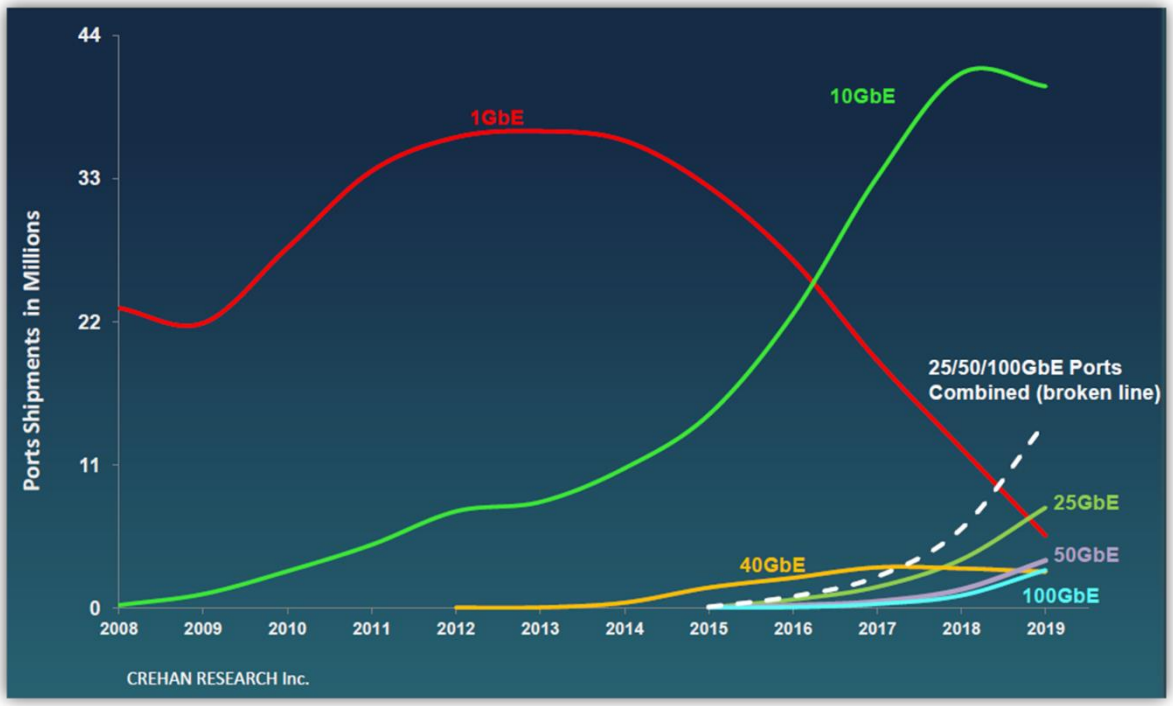
10Gb Ethernet (10GbE) Adoption

10GbE has been around since about 2008. Adoption has been slow for two primary reasons:

1) The network was not the primary bottleneck in system performance

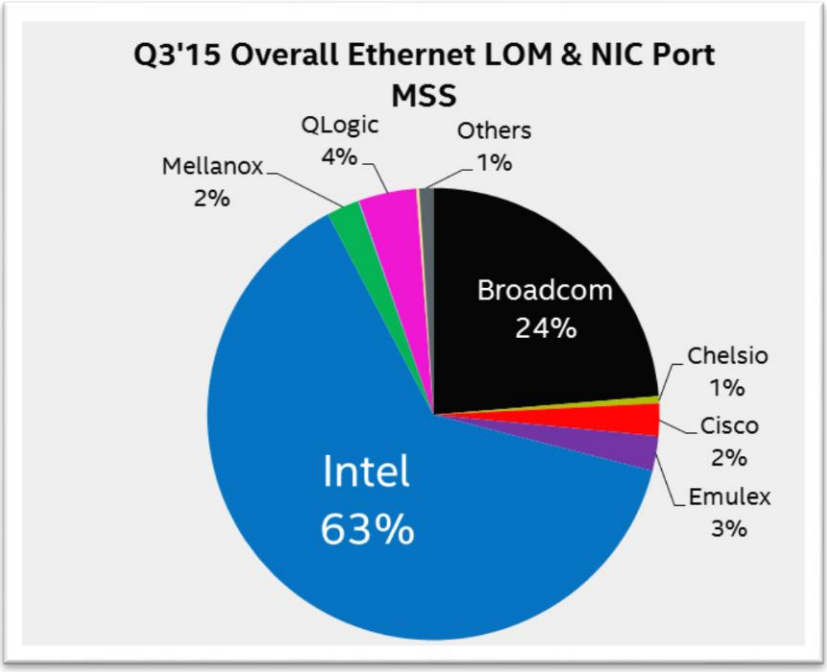
2) The relatively high cost of upgrading network infrastructure for 10GbE

With technology advances in processors, much faster flash storage combined with the increased use of virtualized servers, administrators are now looking to upgrade their network infrastructure. The following chart (credit Crehan Research, LRF 2015) illustrates the dramatic growth in the number of 10GbE ports expected in the next few years along with a corresponding drop in the number of 1GbE ports:



10GbE Competitive Landscape

Who is providing solutions into the 10GbE market? According to Crehan Research, Intel placed a commanding 7,425 ports shipped into the market in 2015 Q3, followed by Broadcom at 2,779 ports, QLogic at 484.7 ports and Emulex at 291 ports. The following chart shows the overall market segment share (MSS) for Ethernet LOM & NIC Ports.



Key Findings from Market Pulse Study

Intel and HP® commissioned IDG Research Services to do a study Market Pulse: 10GbE Adoption with InfoWorld and NetworkWorld. This study provides insight into the motivations for moving to 10GbE and benefits organizations have experienced or expect to experience from the upgrade.

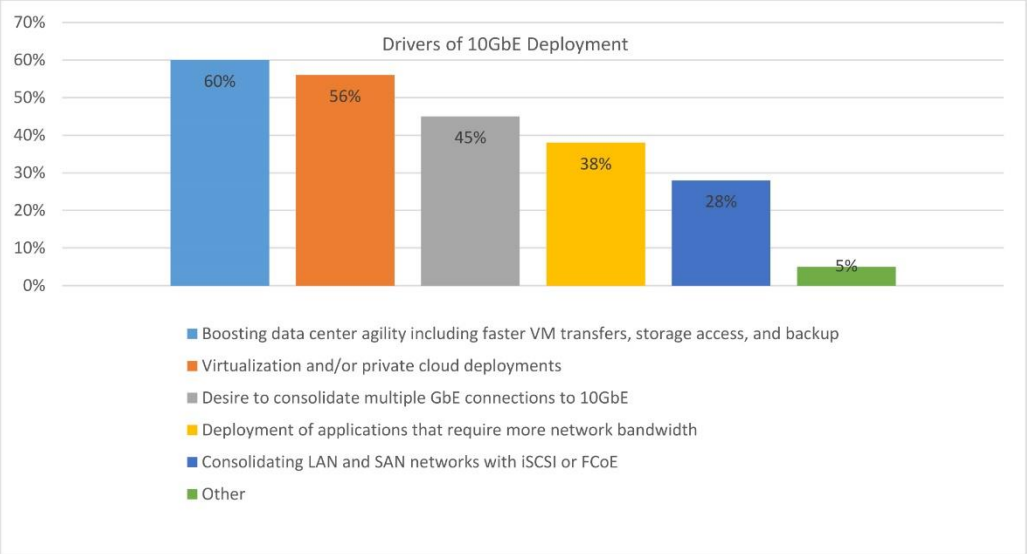
Key findings from the study include:

- The top challenges for data centers and private cloud networks are the inability of bandwidth to keep up with faster servers, the increases in data volume, and Virtual Machine (VM) sprawl. 93% of respondents expect their organizations' bandwidth to grow over the next twelve months by an average of 28%.
- 80% of the respondents have deployed or plan to deploy 10GbE
- Of the respondents who have deployed or plan to deploy 10GbE
    - The biggest drivers for deployment are data center agility and virtualization/private cloud.
    - Large organizations (1,000 or more employees) are significantly more likely to cite consolidation of multiple GbE connections to 10GbE, and deployments of applications that require more bandwidth as drivers for 10GbE deployment.
    - 77% say their organizations are already experiencing increase in application performance

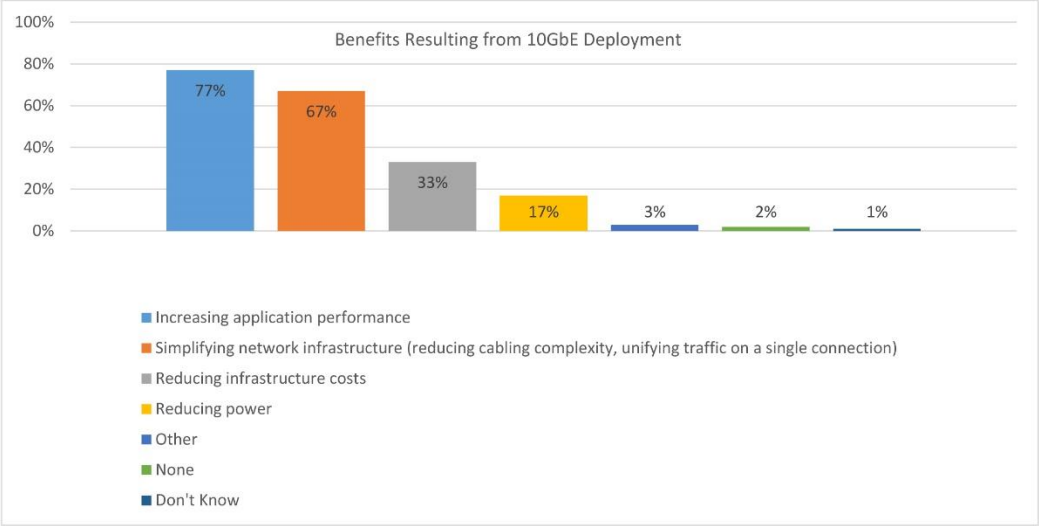
- 67% say their organizations have experienced a more simplified network structure from their 10GbE deployment.

Find below the results of two of the survey's questions.

"Which of the following did or will drive deployment of 10GbE at your organization (select all that apply)"



"Which of the following benefits has your organization already experienced as a result of 10GbE deployments?"



Focus Segments for Upgrading Network Infrastructure

The primary market for networking infrastructure greater than 1000GbE includes the following broad categories:

1. **Enterprise Data Centers**
    - Customers transitioning from 1Gb to 10Gb to leverage new processor and disk technologies
    - Customers evaluating network overlays such as Virtual eXtensible Local Area Networks (VXLAN), Network Virtualization using Generic Routing Encapsulation (NVGRE), and Stateless Transport Tunneling (STT)
2. **Cloud Service Providers**
    - Deploying 10GbE SFP+ and 10GBBASE-T to provide for the network traffic needed to service cloud workloads
    - Evaluating and investigating 100GbE server ports for network intensive workloads
3. **Communication Service Providers**
    - Deploying 10GbE & 40GbE with DPDK (Data Plane Development Kit)
    - Deploying NFV (network-function virtualization) on standards based servers
    - Developing applications to leverage Intel's new switch technology code named Red Rock Canyon

10GbE Technology Choices

The Intel white paper 10GBASE-T for Broad 10 Gigabit Adoption in the Data Center provides valuable information on the driving forces for the adoption of 10GbE and the alternatives for delivering it to the data center including pros and cons of each method.

The driving forces listed include:

- Provide greater bandwidth for virtualized servers.
- Reduce complexities associated with using 1GbE for virtualized servers
- Increase flexibility by combining data and storage networks on one unified network
- Eliminate networking bottlenecks caused by technological advances such as faster processors and flash storage

There are many interface options available to deploy 10GbE. Which interface is the best is dependent on the situation and budget. Some of the popular 10GbE interface alternatives, along with important notes of each include:

10GBASE-CX4

- Reach limited to 15 meters
- Advantages of low power, low cost, & low latency
- Larger diameter, fairly rigid cables purchased in fixed lengths, making it difficult to use in high density data centers
- Adoption is relatively low

10GBASE-SR (SFP+ Optical fiber)

- Reach limited to 300 meters
- SR stands for short-range
- Enhanced small form-factor pluggable (SFP+) transceiver and optical fiber cabling
- Advantages of low power, low latency

- Optical connections may not be cost-effective for broad deployment
- Fiber electronics can cost as much as four or five times their copper counterparts

10GBASE-SFP+ Direct Attach Copper (DAC)

- Reach limited to seven meters
- Enhanced small form-factor pluggable (SFP+) transceiver and copper cabling
- Lower cost alternative to fiber
- Not backward-compatible with existing GbE switches
- Cables are more expensive than structured copper channels, and cannot be field terminated.

10GBASE-T

- Reach limited to 100 meters
- Backward compatible with existing 1000BASE-T switch infrastructures that are cabled with CAT6 and CAT6A or above cabling.
- Lowest cost media
- Can accommodate either top of rack, middle of row, or end of row network topologies
- Operates in low power mode (aka data center mode) on channels under 30 meters
- Process improvements have resulted in power reduced from 25 Watts/port to under 6 Watt/port
- Adds an incremental 2 µs of latency over 1000BASE-T
- Forecasted with astronomical adoption rate in the next few years based on the combination of lowest cost media and backward compatibility

10GbE Data Center Network Architectures Reference

Network Architecture	Technology	Connectivity
Top of Rack (ToR)	10GBASE-SR (SFP+ Fiber)	Uplinks from ToR switches to aggregation layer switches
	10GBASE-SPF+ DAC	Inter-cabinet connectivity from servers to ToR switches
	10GBASE-CX4	Inter-cabinet connectivity from servers to ToR switches
	10GBASE-T	Inter-cabinet connectivity from servers to ToR switches
Middle of Row (MoR)	10GBASE-SR (SFP+ Fiber)	Inter-cabinet connectivity from servers to MoR switches
	10GBASE-T	Inter-cabinet connectivity from servers to MoR switches
End of Row (EoR)	10GBASE-SR (SFP+ Fiber)	Inter-cabinet connectivity from servers to EoR switches
	10GBASE-T	Inter-cabinet connectivity from servers to EoR switches
Network Backbone	10GBASE-SR (SFP+ Fiber)	Network data center connectivity

40 Gigabit Ethernet (40GbE)

40GbE is a group of networking technology transmitting Ethernet frames at 40 gigabits per second.

A networking adapter may support multiple physical layer specifications (PHY) by means of pluggable modules. Depending on the module, these modules have the ability to support multiple Ethernet speeds.

The Quad Small Form-factor Pluggable (QSFP) is a hot-pluggable transceiver allowing 4x10 gigabit data rates. The QSFP specification accommodates 40GEthernet, Fibre Channel, InfiniBand, and SONET/SDH standards. The QFSP+ transceivers are designed to carry 40G Ethernet, Serial Attached SCSI, QDR (40G) and FDR (56G) InfiniBand, and other communications standards.

QSFP and QFSP+ modules increase the port-density by 3x-4x compared to SFP+ modules.

Currently, 40GbE solutions are not backward compatible to 1GbE networking solutions (including routers and switches) when operating as a 40GbE solution.

40GbE include port types comparable to their 10GbE cousins including 40BAE-CR4, 40GBASE-SR4, and 40GBASE-T (this standard is expected to be announced in the spring of 2016)

Intel Complimentary Technology Increases Overall Performance

When upgrading a data center, each component upgraded to newer technology carries an increase in performance and functionality. In addition, when complementary Intel upgrades are selected, Intel provides technology that works across components to provide additional performance and functionality.

Intel Virtualization Technology (Intel VT) provides a portfolio of technologies and features that provide performance and functionality to increase the performance of systems running a virtualized environment by providing a hardware assist to the virtualization software. These technologies work to reduce the virtualization overheads occurring in cache, I/O, and memory in hypervisors for hypervisors, solution developers, and users who have enabled Intel VT. The result is a server's virtual machines (VM) run more cost effectively. The Intel VT portfolio includes:

CPU virtualization features enable abstraction of the full power of the Intel CPU to a VM. Software in the VM can run as if it was running natively on a dedicated CPU. This feature also provides for live migration from one Intel CPU generation to another, as well as nested virtualization.

Memory virtualization features allow abstraction, isolation, and monitoring of memory on a per VM basis. These features facilitate live migration of VMs, add to fault tolerance, and enhance security. Features include direct memory access (DMA) remapping, and extended page tables (EPT), including their extensions: accessed and dirty bits, and fast switching of EPT contexts.

I/O virtualization features facilitate offloading the multi-core packet process to network adapters as well as direct assignment of virtual machines to virtual functions, including disk I/O.

Features include:

Virtual Machine Device Queues (VMDQ) – Improves traffic management within the server by offloading traffic sorting and routing from the hypervisor's virtual switch to the Intel Ethernet Controller. By working with VMware NetQueue or Microsoft Virtual Machine (VM) Queues, VMDQ enables traffic steering and balanced bandwidth allocation across the Intel Ethernet Controller's multiple hardware queues.

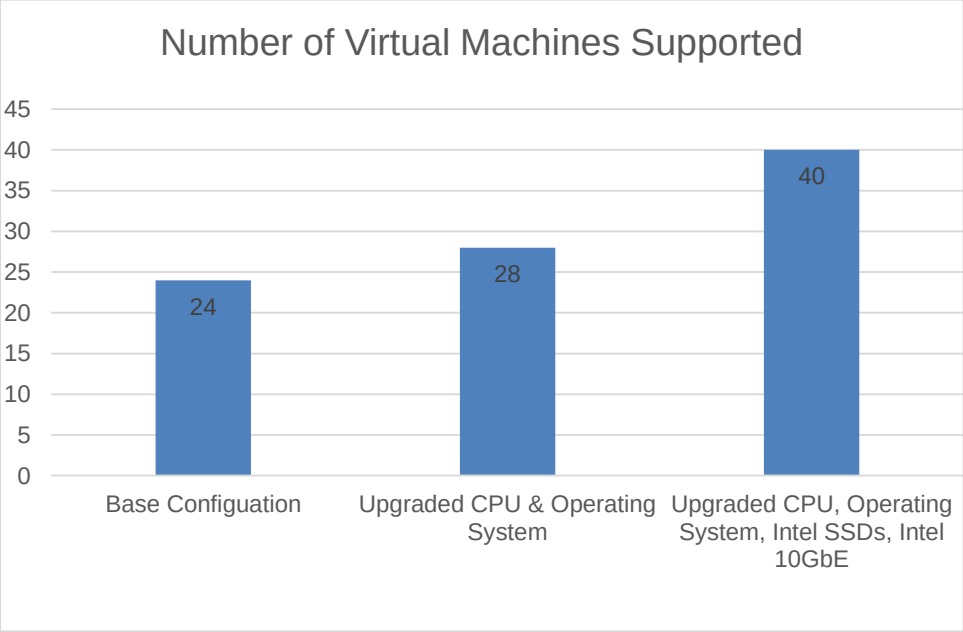
Single Root I/O Virtualization (SR-IVO) – Allows partitioning of a single Intel Ethernet Server Adapter port into multiple virtual functions. Administrators can use these virtual ports to create multiple isolated connections to virtual machines. It can also be used to remove the CPU from the process of moving data to and from a VM. Data is DMA'd directly to and from a VM without the software switch in the VM ever 'touching' it.

Intel Data Direct I/O Technology enhancements (Intel DDIO) – First introduced in the Intel Xeon processor E5 family and Intel Xeon processor E7 v2 family as a key feature of Intel Integrated I/O. It allows Intel Ethernet Controllers and adapters to talk directly with the processor cache, Intel DDIO makes the processor cache the primary destination and source of I/O rather than main memory. This re-architecture of the flow of I/O data, helping to deliver increased bandwidth, lower latency, and reduced power consumption.

67% more Virtual workloads with Intel Complementary Technology

Intel commissioned Principled Technologies to evaluate the impact of upgrading processor, disk, and networking components both individually and together. In this study, the Principled Technologies labs found that by just upgrading to the CPU to the Intel Xeon processor E5-2699, and operating system to Microsoft Windows Server 2012 R2, resulted in a 16 % increase in the number of VMs the system could support. Additional upgrades from SAS disk drives to Intel SSD DCS3700 drives and 1GbE to 10GbE Intel Ethernet CNA X520 provided a 67% increase in the number of VMs supported.

Find below a chart representing the VM density increases with component upgrades.



The dramatic increase in virtual workloads supported translates into tangible savings for the customer's data center since two new technology servers can replace the workload done by three older technology servers. Less servers required to support operations are easier to manage, and provide saving in both software licensing and power consumption.

Intel 10GbE, 40GbE Networking Solutions

10GbE

Intel Ethernet Converged Network Adapter (CNA) X520 using Intel 82599 Controller

Benefits

Designed as a low cost, low power adapter, provides 10Gb Ethernet Blade, Direct Attach, or Fiber Optic Connectivity. Also provides a high-volume stable architecture with broad operating system support. Available as CNAs, LOM, and custom mezzanine adapters from most OEMs.

Features

- Low cost, low power 10 Gigabit Ethernet (10GbE) performance
- Provides 2 ports with 16 queues per port
- Backward compatible with existing 1000BASE-T networks
- Provides 64 Virtual Station Interfaces
- Intel Ethernet Flow Director – TCP/IP or SCTP/IP protocols only
- Compatible with Intel I/O Technology including VMDq, Next-Generation VMDq (64 queues per port)
- Compatible with IPv6 Offloading, Advanced packet filtering
- VLAN support with VLAN tag insertion, stripping and packet filtering for up to 4096 tags
- Delivers same throughput as ten dual-port one-Gigabit adapters
- Unified networking, delivering LAN, iSCSI and FCoE in one low cost CNA

Target Market

Enterprise networking — Customers needing networking performance, energy efficiency, broad Operating System (OS) and Virtual Machine Monitor (VMM) support, automation (including resource provisioning and monitoring, and workload balancing), converged networking, and emerging standards.

Intel Ethernet CNA X540 using Intel Ethernet Controller X540

Benefits

Brings 10 Gigabit 10BASE-T Ethernet to a broad market with reduced power, performance improvements, and deployment flexibility. Simplifies the transition to 10GbE through Backward Compatibility with existing 1GbE networks. Industry First Dual-Port 10GBASE-T adapter with single-chip solution with integrated MAC + PHY

Features

- Low cost, low power 10 Gigabit Ethernet (10GbE) performance
- Backward compatible with existing 1000BASE-T networks simplifies transition to 10GbE
- Uses standard CAT-6a cabling with RJ45 connections
- Flexible I/O virtualization for port partitioning and quality of service (QoS) of up to 64 virtual ports
- Unified networking, delivering LAN, iSCSI and FCoE in one low cost CNA

Target Market

Enterprise networking — Customers needing 10BASE-T networking performance, energy efficiency, broad Operating System (OS) and Virtual Machine Monitor (VMM) support, automation (including

resource provisioning and monitoring, and workload balancing), converged networking, and emerging standards.

40GbE/10GbE

Intel Ethernet CNA XL710 and Ethernet CNA X710

Benefits

Brings 10 Gigabit Ethernet to the broad market with reduced power, performance improvements, and deployment flexibility. The XL710 can be deployed as Converged Network Adapters (CNA), backplanes, and LAN on Motherboard (LOM).

Features

- Low power single chip design for PCI Express 3.0
- Software configurable Ethernet Port Speed for up to 2x10GbE or up to 2x20GbE
- Interfaces for Converged Network Adapters, backplanes and LAN on Motherboard
- Network virtualization Overlay stateless offloads for Geneve, VXLAN, and NVGRE
- Intelligent load balancing for high performance traffic flows of virtual machines
- Intelligent Offloads accelerate operating system storage initiators to deliver high performance for NAS (NFS, SMB), and SAN (iSCSI)
- Intel Data Plane Development Kit (DPDK) optimized for efficient packet processing to support Network Function Virtualization (NFV)
- Intel Ethernet Flow Director for hardware based application traffic steering
- Intel Data Direct I/O (Intel DDIO) makes the processor cache the primary destination and source of I/O data rather than main memory

Target Market

Enterprise networking — Customers needing networking performance, energy efficiency, broad Operating System (OS) and Virtual Machine Monitor (VMM) support, automation (including resource provisioning and monitoring, and workload balancing), converged networking, and emerging standards. Examples are data centers looking for Data Center Bridging (DCB) and Virtual Bridging (VEB).

Cloud networking — Cloud customers needing computing infrastructure and software are sold as services, and where cloud service providers drive unique requirements, the XL710 has these strengths: networking performance, energy efficiency, automation (including resource provisioning and monitoring, and workload balancing), sophisticated packet header parsing, and quality open source drivers. In the case where computing infrastructure is sold as a service, the XL710 features important in Enterprise networking and HPC can also be important to the cloud.

Intel 10GbE Comparison

	Intel Ethernet Controller XL710 and X710	Intel Ethernet Controller X540	Intel Ethernet Controller X520
Networking Specification			
Ports	1x40GbE or 4x10GbE	Single/Dual	Single/Dual
Data Rate Per Port	40GbE/10GbE/1GbE	10GbE/1GbE	10GbE/1GbE
System Interface	PCIe v3.0 (8.0GT/s)	PCIe v2.1 (5.0 GT/s)	PCIe v2.0 (5.0GT/s)
Controller	FTXL710	Intel X540	Intel 82599ES
Interfaces including: SFI, KR, KR4, XAUI, KX, KX4, SGMII	Yes	No	No
Intel Ethernet Flow Director	Up to 64 different packet types (L2/IPV4/IPv6/TCP/UDP/SCTP	Tx/Rx IP, SCTP, TCP, UDP, IPv4, IPv6	TCP/IP or SCTP/IP Only
Connectivity	XL710 Adapters with Single or Dual QSFP+ cages: • 40GBASE-SR4 fiber-optic transceivers • 40GBASE-LR4 fiber-optic transceivers • QFSP+ CR4 Copper Direct Attach physical media	RJ45 Copper: • 10GBASE-T • 1000BASE-T • 100BASE-T	XL520 Adapters with SFP+: • 10GBASE-SR fiber-optic transceivers, • 10GBASE-LR fiber-optic transceivers • SFP+ Copper Direct Attach
Advanced Technologies			
iWarp/RDMA	Yes	Yes	No
IEEE 1588	Yes	No	No
Intel Ethernet Power Management	Yes	No	No
Intel Data Direct I/O Technology	Yes	Yes	Yes
Intelligent Offloads	Yes	Yes	Yes
Storage over Ethernet	iSCSI, NFS	iSCSI, NFS, FCoE	iSCSI, NFS, FCoE
Intel Virtualization Technology for Connectivity			
Host Virtualization	384 Virtual Station Interfaces	64 Virtual Station Interfaces	64 Virtual Station Interfaces
On-chip QoS and Traffic Management	Yes	Yes	Yes
Flexible Port Partitioning	Yes	Yes	Yes
Virtual Machine Device Queues (VMDq)	Yes	Yes	Yes
PCI-SIG SR-IVO Capable	Yes	Yes	Yes

HP Network Adapter Reference

Blade Adapters

HP Part #	615729-B21	665246-B21	655639-B21	727053-B21	727052-B21
HP Description	HP NC366M Quad Port Gigabit BL-c Adapter	HP 560M Dual Port 10 Gigabit BL-c Adapter	HP 560FLB Dual Port 10 Gigabit FlexLOM for BladeSystems	HP M600M Dual Port 20 Gigabit Mezzanine Adapter	HP 660FLB Dual Port 20 Gigabit FlexLOM for BladeSystems
HP Platform	Gen 7, 8, 9	Gen 7, 8, 9	Gen 8, 9	Gen 9	Gen 9
Availability as of 12/15	Yes	Yes	Yes	Q1 2016	Coming Soon
Speed	1GbE	10GbE/1GbE	10GbE/1GbE	20GbE	20GbE
Ports, Media	Quad Port, KX	Dual Port, KR	Dual Port, KR	Dual Port, KR	Dual Port, KR
Form Factor	Mezzanine Card	Mezzanine Card	Flex-LOM Blade	Mezzanine Card	Flex-LOM Blade
Controller	Intel Ethernet Controller I350	Intel Ethernet Controller X520	Intel Ethernet Controller X520	Intel Ethernet Controller XL710	Intel Ethernet Controller XL710

Rack FlexLOM Adapters

HP Part #	665240-B21	665243-B21	716599-B21	700699-B21	727054-B21
HP Description	HP 366FLR Quad Port Gigabit Adapter	HP 560 FLR Dual Port Adapter SFP+ for Racks	HP P560 FLR Single Port Adapter SFP+ for Racks	HP 561FLR-T Dual Port Adapter 10GBASE-T	HP 562 FLR Dual Port Adapter SFP+ for Racks
HP Platform	Gen 8, 9	Gen 8, 9	Gen 8, 9	Gen 8, 9	Gen 9
Availability as of 12/15	Yes	Yes	Yes	Coming Soon	Yes
Speed	1GbE	10GbE	10GbE/1GbE	10GbE	10GbE/1GbE
Ports, Media	Quad Port, 1000BASE-T	Dual Port, SFP+	Single Port, SFP+	Dual Port, 10BASE-T	Dual Port, SFP+
Form Factor	Flex-LOM R&T	Flex-LOM R&T	Flex-LOM R&T	Flex-LOM R&T	Flex-LOM R&T
Controller	Intel Ethernet Controller I350	Intel Ethernet Controller X520	Intel Ethernet Controller X520	Intel Ethernet Controller X540	Intel Ethernet Controller X710

Rack PCIe Adapters

HP Part #	716591-B21	665249-B21	652497-B21	I350T4V2	727055-B21
HP Description	HP 561-T2 Dual Port Adapter 10GBASE-T	HP 560SFP+ Dual Port Adapter SFP+	HP 361T Dual Port Gigabit Server Adapter	HP 366T Quad Port Gigabit Server Adapter	HP 562 Dual Port Adapter SFP+
HP Platform	Gen 8, 9	Gen 7, 8, 9	Gen 7, 8, 9	Gen 7, 8, 9	Gen 9
Availability as of 12/15	Yes	Yes	Yes	Yes	Coming Soon
Speed	10GbE/1GbE	10GbE	1GbE	1GbE	10GbE
Ports, Media	Dual Port, 10BASE-T	Dual Port, SFP+	Dual Port, 1000BASE-T	Quad Port, 1000BASE-T	Dual Port, SFP+
Form Factor	Server Adapter	Server Adapter	Server Adapter	Server Adapter	PCIe Server Adapter
Controller	Intel Ethernet Controller X540	Intel Ethernet Controller X520	Intel Ethernet Controller I350	Intel Ethernet Controller I350	Intel Ethernet Controller X710

Lenovo Network Adapter Reference

Copper Rack and Tower Adapters

Lenovo Part #	SN30G46430	Dual: 0B94241 Quad 00JY854	00JY855	00JY856	Dual: SN30G99689 Quad: SN30G99691
Lenovo Description	Intel Ethernet Server Adapter I210-T1	Intel Ethernet Server Adapter I350-T2/T4	Intel Ethernet Converge Network Adapter X520-DA2 SFP+	Intel Ethernet Server CNA X540-T2	Intel Ethernet Converged Network Adapter XL710-DA2/DA4
Lenovo Platform	M3/M4/M5	M3/M4/M5	M3/M4/M5	M3/M4/M5	M3/M4/M5
Availability as of 12/15	Yes	Yes	Yes	Yes	Coming Soon
Speed	1GbE	1GbE	10GbE	10GbE	10GbE
Ports, Media	Single Port, 1000BASE-T	Dual Port, Quad Port, 1000BASE-T	Dual Port, SFP+	Dual Port, 10GBASE-T	Dual Port, Quad Port, SFP+
Form Factor	Standard Server Adapter	Standard Server Adapter	Standard Server Adapter	Standard Server Adapter	Standard Server Adapter
Controller	Intel Ethernet Controller I210AT	Intel Ethernet Controller I350	Intel Ethernet Controller X520	Intel Ethernet Controller X540	Intel Ethernet Controller XL710

Embedded Adapters/Flex-LOMs

Lenovo Part #	Single: SN30G99685 Dual: SN30G99687	00JY857	Quad: SN30H04306	11015441	11015442
Lenovo Description	Intel Ethernet Converged Network Adapter XL710-QDA1/QDA2	Intel ETH 10GSFP+ DP EMBD CNA X520-2	Intel Ethernet X710-DA4 mLOM	Lenovo Think Server X520-2 Any Fabric	Lenovo ThinkServer I350-T4 AnyFabric
Lenovo Platform	M3/M4/M5	M4	TBD	TBD	TBD
Availability as of 12/15	Coming Soon	Yes	Coming Soon	Yes	Yes
Speed	40GbE/10GbE	10GbE	10GbE	10GbE	1GbE
Ports, Media	Single Port, Dual Port, QSFP+	Dual Port, SFP+	Quad Port, SFP+	Dual Port, SFP+	Quad Port, 1000BASE-T
Form Factor	Standard Server Adapter	Embedded Adapter	Flex-LOM	Flex-LOM	Flex-LOM
Controller	Intel Ethernet Controller XL710	Intel Ethernet Controller X520	Intel Ethernet Controller XL710	Intel Ethernet Controller X520	Intel Ethernet Controller I350

ML2 Adapters

Lenovo Part #	11015440	00JY941	System X: 00D1994	System X: 00D1998	11015440
Lenovo Description	Lenovo ThinkServer X540-T2 AnyFabric	4x10 (FVL) Coyote Flat DA2	Intel X540 ML2 Dual Port 10GbaseT Adapter for Lenovo System x	I350-T4 ML2 Quad Port GbE Adapter for Lenovo System x	Lenovo ThinkServer X540-T2 AnyFabric
Lenovo Platform	TBD	M5	M5	M5	TBD
Availability as of 12/15	Yes	Yes	Yes	Yes	Yes
Speed	10GbE	10GbE	10GbE	1GbE	10GbE
Ports, Media	Dual Port, 10GBASE-T	Quad Port, SFP+	Dual Port, 10GBASE-T	Quad Port, 1000BASE-T	Dual Port, 10GBASE-T
Form Factor	Flex-LOM	ML2 Adapter	ML2 Adapter	ML2 Adapter	Flex-LOM
Controller	Intel Ethernet Controller I350	Intel Ethernet Controller I350	Intel Ethernet Controller I350	Intel Ethernet Controller I350	Intel Ethernet Controller I350

Resources

Technology

- The Time is Now for 10 Gigabit Intel Ethernet (Video)
- Accelerating Ethernet with iWARP Technology (Video)
- Intel VMDq Explanation (Video)
- Intel SR-IOV Explanation (Video)
- Intel Ethernet Flow Director Sketch Animation (Video)
- Virtualizing the Network to Enable a Software Defined Infrastructure with Solution Architect Brian Johnson and Windows Server Architect Jim Pinkerton, Microsoft
- List of Intel Virtualization Technology (Intel VT) Supported Products
- Intel Next Generation Switch and Ethernet Technology – Red Rock Canyon (Video)

Guides/Datasheets

- Intel Ethernet Converged Network Adapter Product Selector Guide
- HP Ethernet solutions featuring Intel Ethernet Technology Data Sheet
- Intel Ethernet XL710 Converged Network Adapter Product Brief
- Intel Ethernet X540 Converged Network Adapter Product Brief
- Intel Ethernet X520 Converged Network Adapter Product Brief
- Intel Ethernet Controller XL710 Datasheet
- Intel Ethernet Controller XL540 Datasheet
- Intel Ethernet Controller 82599 Datasheet

Product Information

- Network Heresy Blog on Intel Ethernet Controller XL710 support for Generic Network Virtualization Encapsulation (Geneve)
- Intel Ethernet Controller XL710 Family Chitchat with Solutions Architect Brian Johnson (Podcast)
- Intel Xeon® Processor E5-2600 v3 Family and Intel Ethernet Controller XL710 for the Data Center – Overview Animation (Video)
- Intel Xeon® Processor E5 v3 Family, and Intel (r) Ethernet Controller XL710 Data Center Performance Animation (Video)
- Fortville Launch Video – Intel Directors to C-level Audience (Video)
- Intel Ethernet Controller XL710 Family Under The Hood with Product Manager Matt Eszenyi (Video)
- Intel Ethernet 10 Gigabit Converged Network Adapter Deployment Guide for ESX and ISCSI

White Papers

Intel: Now is the time to Upgrade to 10 Gigabit Ethernet This white paper outlines the four key technology and market force driving adoption of 10 gigabit Ethernet.

Intel: Intel Virtualization Technology for Connectivity Technology This technical brief describes Intel Virtualization Technology for Connectivity (Intel VT-c) and how it is used in Intel's networking products

Intel Data Direct I/O Technology Overview This technical brief describes Intel Data Direct I/O Technology (Intel DDIO) and how it is used in Intel's networking products

Reducing Data Center Power Consumption with DMA Coalescing – Intel Ethernet Server Adapters are the only networking hardware in the industry to offer an innovative technology that batches together Direct Memory Access (DMA) interrupts to be sent to the system for efficient processing. This capability optimizes system resource utilization, allowing the system to return to a lower power state more quickly and can reduce platform power by as much as 8 to 12 watts.

Optimizing Quality of Service for VMware VSphere* 4 Networking with Ethernet 10 Gigabit Server Adapters Provides a discussion focusing on quality of service (QoS) to provide an overview of the changes in networking capabilities first introduced in vSphere 4.1.

Intel and VMware: Enabling Open FCoE in VMware vSphere 5 – This technology brief discusses the benefits of unified networking along with approaches to enabling it.

Are You Five Years Out?

Most people live in the present. The world of now. But a handful of us work in a unique world that doesn't quite exist yet—the world of Five Years Out.

Five Years Out is the tangible future. And the people who live and work there know that new technologies, new materials, new ideas and new electronics will make life not only different, but better. Not just cheaper, but smarter. Not just easier, but more inspired.

Five Years Out is an exciting place to be. So exciting that, once you've been there, it's hard to get excited about the present. Because we know what's coming is going to be so much better.

Five Years Out is a community of builders, designers, engineers and imaginers who navigate the path between possibility and practicality. Creating the future of everything from cars to coffeemakers.

Are you one of them? Then you're probably working with us.

In Person

Call to talk or set up a face-to-face meeting with one of our knowledgeable representatives.
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