Choose the ideal adapter

Broadcom NetXtreme Ethernet Adapters for HP ProLiant Gen8 Servers
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The HP ProLiant Gen8 family of DL, ML, SL, and BL servers offers a broad range of networking options designed to address the challenging demands of today’s data center.
Introduction

The HP ProLiant Gen8 family of DL, ML, SL, and BL servers offers a broad range of networking options designed to address the challenging demands of today’s data center. The new Gen8 servers support the innovative FlexibleLOM architecture as well as standard optional network interface cards (NICs) and converged network adapters (CNAs) for maximum application workload performance and deployment flexibility.

The HP portfolio of FlexibleNetwork adapters leverages a variety of third-party vendor technology, including the Broadcom NetXtreme Gigabit Ethernet (1GbE) and 10 Gigabit Ethernet (10GbE) technologies, providing best-in-class server-to-fabric networking solutions. This paper offers several validation points that set apart the HP best-in-class Ethernet solutions available on ProLiant Gen8 servers—powered by Broadcom NetXtreme technology.

Comprehensive portfolio of 1GbE and 10GbE adapters

IT administrators of large and small data centers continue to look for ways of improving management and deployment efficiency. This is justifiable because introducing such efficiencies helps reduce costs and extends ever-shrinking IT budgets. By offering a wide range of HP 1Gb and 10Gb adapters powered by Broadcom, HP ProLiant Gen8 servers provide a consistent deployment and management experience throughout the data center. Therefore, regardless of the server form factor or Ethernet connectivity speed, the HP adapters powered by Broadcom offer a solution for your needs. Table 1 details the full breadth of HP adapters using Broadcom’s NetXtreme technology.

For more information about the HP ProLiant Gen8 Ethernet portfolio and features, please see hp.com/go/ProLiantNICs.
### Table 1. HP FlexibleNetwork Adapters powered by Broadcom NetXtreme technology

<table>
<thead>
<tr>
<th><strong>Adapter photo</strong></th>
<th><strong>Adapter description</strong></th>
<th><strong>Product details</strong></th>
</tr>
</thead>
</table>
| ![Adapter photo](image1) | HP Ethernet 1Gb 4-port 331T Adapter | • 1GbE/4 ports  
• Form factor: stand-up card (NIC)  
• Controller: Broadcom BCM5719  
• HP P/N: 647594-B21 |
| ![Adapter photo](image2) | HP Ethernet 1Gb 2-port 332T Adapter | • 1GbE/2 ports  
• Form factor: stand-up card (NIC)  
• Controller: Broadcom BCM5720  
• HP P/N: 615732-B21 |
| ![Adapter photo](image3) | HP 10Gb 2-port SFP+ CN1100R CNA | • 1GbE/2 ports  
• Form factor: stand-up card (NIC)  
• Controller: Broadcom BCM57810S  
• HP P/N: QW990A |
| ![Adapter photo](image4) | HP Ethernet 10Gb 2-port 530T Adapter | • 1GBASE-T/2 ports  
• Form factor: stand-up card (NIC)  
• Controller: Broadcom BCM57810S  
• HP P/N: 656596-B21 |
| ![Adapter photo](image5) | HP Ethernet 1Gb 4-port 331FLR Adapter | • 1GbE/4 ports  
• Form factor: FlexibleLOM Rack  
• Controller: Broadcom BCM5719  
• HP P/N: 629135-B21 |
| ![Adapter photo](image6) | HP FlexFabric 10Gb 2-port 534FLR SFP+ CNA | • 10GbE/2 ports  
• Form factor: FlexibleLOM Rack  
• Controller: Broadcom BCM57810S  
• HP P/N: 700751-B21 |
| ![Adapter photo](image7) | HP FlexFabric 10GBASE-T 2-port 533FLR-T Adapter | • 10GbE/2 ports  
• Form factor: FlexibleLOM for rack  
• Controller: Broadcom BCM57810S  
• HP P/N: 700759-B21 |
| ![Adapter photo](image8) | HP FlexFabric 10Gb 2-port 534FLB CNA | • 10GbE/2 ports  
• Form factor: FlexibleLOM Blade  
• Controller: Broadcom BCM57810S  
• HP P/N: 700741-B21 |
| ![Adapter photo](image9) | HP FlexFabric 10Gb 2-port 534M CNA | • 10GbE/2 ports  
• Form factor: mezzanine adapter  
• Controller: Broadcom BCM57810S  
• HP P/N: 700748-B21 |
Table 2. Advantages of the 10GbE NetXtreme adapters

<table>
<thead>
<tr>
<th>Performance criteria</th>
<th>Description</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Maximum throughput           | Line-rate throughput across all ports—up to 37,000 Mb/s | • Support more data streams  
                              |                                                                  | • Reduce content quality degradation                                    |
| Storage protocol processing  | • 2.5M FCoE IOPS  
                              | • 1.5M iSCSI IOPS                                                        | • Hardware offload frees up  
                              |                                                                  | CPU resources                                               |
|                              |                                                                  | • Combines network and storage data on one simplified infrastructure  |
| Processor utilization        | Lowest processor utilization—less than 15%       | • Increase asset utilization  
                              |                                                                  | • Reduce energy costs                                               |
|                              |                                                                  | • Improve business productivity                                        |
| Small packet performance     | Simultaneously send and receive 5.7 million packets per second | • Support more concurrent requests  
                              |                                                                  | • Service more requests/second                                        |
|                              |                                                                  | • Reduce network congestion                                              |

Highest performance for networking applications

With the exception of IT professionals, most people take networks for granted. They are like our freeways and roads—we drive on them without a second thought and take them for granted until they become congested or inaccessible. That is why IT administrators take great care in deploying solutions that provide the highest levels of performance to accommodate the vast growth in data traffic that today’s data centers are experiencing.

Network performance impacts business productivity and profitability. That is why performance is one of the key factors in design and deployment of data center networks.

As a leading provider of high-performance computing solutions, the HP network adapter product offerings leveraging Broadcom NetXtreme technology deliver the world’s fastest 1GbE and 10GbE networking performance for HP Gen8 ProLiant family of DL, ML, SL, and BL servers. Table 2 above, details the performance criteria and its impact within the data center.

Applications that require maximum throughput for cloud computing include streaming video and audio, large data transfers between servers, load-balancing, failover, high-resolution graphics, database, and backup. This is where the HP ProLiant Gen8 Server 10GbE FlexibleNetwork CNAs powered by the Broadcom BCM57810S controller come into play. The BCM57810S has demonstrated greater large block I/O networking performance, delivering line-rate performance up to 37,000 Mb/s. See Chart 1 for details.

Data center operational costs have a significant impact on businesses and IT administrators are consistently tasked to reduce costs and increase asset utilization. Traditionally, data center servers used were dedicated, which meant they were over-provisioned and under-utilized.
HP 10GbE FlexibleNetwork Adapters powered by the Broadcom BCM57810S improve processor utilization (less than 15%) through a combination of hardware and stateless offload features (See Chart 2).

![Chart 1](image1.png)

Source: Demartek Report (June 2012)

Applications that require high small packet performance for cloud computing include inter-node messaging traffic, database with small fields and small packet updates, voice over IP (VoIP), routing applications, financial services trading, game servers, and web servers with small messaging services.
The HP portfolio of 10GbE FlexibleNetwork Adapters using the Broadcom BCM57810S has demonstrated and delivered superior small packet performance of 5.7 million packets per second (See Chart 3).

Chart 3
Frames per second (fps) vs. frame size (bytes)

Multi-threaded packet routing

Frames per second (fps)
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Frame size (bytes)
64 128 256 512

264% higher than Brand X
200% higher than Brand Y at 64 bytes

Source: Demartek Report (June 2012)

Converging application data and storage data onto the same network simplifies the installation and management of the network infrastructure. As shown in Charts 4 and 5 below, Broadcom based CNAs deliver the highest performance for FCoE and iSCSI protocol processing with efficient hardware offload that frees up the server CPU resources for applications processing.

Much of the world’s data transfer begins and ends with an Ethernet connection. IT professionals who are looking for higher capacity and higher performance solutions can rely on the HP ProLiant Gen8 Servers with HP 10GbE FlexibleNetwork CNAs that utilize the Broadcom BCM57810S NetXtreme II controller to deliver the highest levels of performance.

Chart 4
FCoE performance

IOPS - RndRead - FCoE

IOPS
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Block size
512B 1K 2K 4K 8K 16K 32K 64K

250% higher than Brand Y
814% higher than Brand X at 512 bytes
Energy Efficient Ethernet (EEE) reduces energy consumption

When data centers were originally designed, energy was not a big consideration. However, over the past decade, our data-hungry world has brought energy to the forefront of data center design. As data centers became larger and larger, energy consumption began to consume a larger portion of an organization’s operating expenses (OPEX). Some data centers have reached the point where sourcing energy is the challenge—not enough power can be delivered to fully operate the computing and cooling resources within the data center. As a result, energy efficiency has become a factor in selecting the computing and networking building blocks needed for the data center. In addition, energy efficiency is not relegated to large power-hungry building blocks of the data center. IT administrators have come to expect some level of energy efficiency from every component used in the data center.

To further drive energy conservation within the data center, the EEE standard was developed to help IT administrators reduce the energy consumption of Ethernet-attached devices within their networks. Examples of such devices would include Ethernet adapters and Ethernet switches. A key feature of the EEE standard is called Low Power Idle (LPI). As the name implies, when the Ethernet device is in an idle state (no data transmission activity), non-essential components of the Ethernet interface are placed in a low power state (sleep mode). A wake-up signal sent by the link partner allows the sleeping Ethernet device time to prepare for receipt of an incoming Ethernet data frame. EEE makes network energy conservation seamless and effective.

![Chart 5]

**iSCSI performance**

100% higher than Brand Y
1500% higher than Brand X at 512 bytes

- Brand X
- Brand Y
- Broadcom

<table>
<thead>
<tr>
<th>Block size</th>
<th>IOPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>512B</td>
<td></td>
</tr>
<tr>
<td>1K</td>
<td></td>
</tr>
<tr>
<td>2K</td>
<td></td>
</tr>
<tr>
<td>4K</td>
<td></td>
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<tr>
<td>8K</td>
<td></td>
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<tr>
<td>16K</td>
<td></td>
</tr>
<tr>
<td>32K</td>
<td></td>
</tr>
<tr>
<td>64K</td>
<td></td>
</tr>
</tbody>
</table>

**Chart 5**

iSCSI performance

**Brand X**

100% higher than Brand Y
1500% higher than Brand X at 512 bytes

**Brand Y**

512B 1K 2K 4K 8K 16K 32K 64K

**Broadcom**

100% higher than Brand Y
1500% higher than Brand X at 512 bytes
With the HP Ethernet portfolio based on the Broadcom EEE-enabled 1GbE and 10GbE adapters, power consumption during idle state is reduced by up to 42%. Table 3 quantifies the potential power savings of HP FlexibleNetwork Adapters that utilize the Broadcom EEE-enabled Ethernet controllers.

**Table 3. Realized power savings**

<table>
<thead>
<tr>
<th>NIC ports IDLE without EEE (W)</th>
<th>NIC ports IDLE with EEE (W)</th>
<th>NIC ports Power savings with EEE (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP 331FLR Quad-Port 1GbE</td>
<td>4.12</td>
<td>2.41</td>
</tr>
<tr>
<td>HP 331T Quad-Port 1GbE</td>
<td>2.41</td>
<td>1.71</td>
</tr>
<tr>
<td>HP 530T Dual-Port 10GbE</td>
<td>12.8</td>
<td>9.4</td>
</tr>
<tr>
<td>HP 533FLR-T Dual-Port 10GbE</td>
<td>12.8</td>
<td>9.4</td>
</tr>
<tr>
<td>NIC ports IDLE with EEE (W)</td>
<td>2.41</td>
<td>1.71</td>
</tr>
<tr>
<td>NIC ports Power savings with EEE (W)</td>
<td>3.4</td>
<td>27%</td>
</tr>
</tbody>
</table>

* Includes the physical layer device (PHY), BCM5719 processor, and other components on the adapter.


**IEEE 1588 Precision Time Protocol (PTP)**

The old adage, “Time is money” can best describe IEEE 1588. For some organization environments such as financial institutions and brokerage firms, the accuracy with which they can time-stamp network traffic data determines the number of zeros they can add to their profits—the greater the accuracy, the greater the profits. As network computing becomes more complex and the world more interconnected, the need for greater granularity of time synchronization has increased. Precision Time Protocol standard was developed to address this need.

Support for Precision Time Protocol (PTP) provides a more granular level of time synchronization between the constituents of an Ethernet network for greater accuracy in data packet delivery. The recently developed IEEE 1588 PTP now promises to revolutionize time synchronization by improving accuracy and reducing cost. While certain other precise synchronize protocols require significant investment in hardware and cabling, PTP makes highly precise timekeeping possible using the most widely deployed medium for network connectivity—Ethernet. By synchronizing multiple clocks over networks such as Ethernet, IEEE 1588 provides high precision synchronization over long distances with standard cabling.
Long-standing industry leadership

Networks provide the communication backbone for which the data center is designed. It is for this reason IT administrators seek solutions that deliver not only the highest level of performance, but more importantly, provide a robust and reliable networking infrastructure. Performance is of little value when the network is not stable. With over 13 generations of Ethernet controller design and development experience, Broadcom’s NetXtreme Ethernet technology is rock-solid and market-proven. It enables the HP portfolio of Ethernet adapters to provide not only the highest level of performance, efficiency, and scalability, but also the highest level of reliability and interoperability. These factors combine to deliver:

a. Seamless integration with the HP management framework
   - The HP portfolio of FlexibleNetwork adapters using Broadcom’s NetXtreme technology can be managed using the HP ProLiant Insight Control management framework.
   - Monitor and manage infrastructure with one simple, integrated interface.

b. Seamless Integration and ease of management with HP Flex-10 technology
   - HP solutions using NetXtreme technology hold the majority share of 10GbE Flex-10 ports deployed in data centers.
   - Support extends back to the first release of Flex-10 on HP BladeSystem G5.

100% Broadcom IP for controllers and PHY

There is always a greater level of comfort knowing that the key components of an architecture are designed by a single, trusted partner. Broadcom is one such partner. The Ethernet controller and PHY are the key hardware components of Ethernet server-to-fabric connectivity solutions. While most IT and network administrators associate Broadcom with high-performance 1Gb and 10Gb Ethernet controllers, it is important to also note that Broadcom is a leading designer and supplier of 1GbE and 10GbE PHYs. The PHY plays a key role in Ethernet server-to-fabric connectivity solutions, and although it may receive less of a spotlight relative to an Ethernet controller; it plays a key role in how well an Ethernet solution performs.

In summary, the HP portfolio of FlexibleNetwork adapters powered by Broadcom Ethernet controllers and PHYs combine to deliver the highest levels of performance, reliability, and interoperability within the data center. With nearly 10,000 U.S. and foreign patents awarded, Broadcom leads the industry in innovation, development, and deployment of data communications technologies.
Conclusion

HP FlexibleNetwork Adapters and CNAs powered by Broadcom NetXtreme technology provide 1GbE and 10GbE network connectivity for the HP ProLiant Gen8 server family. These solutions are available in mezzanine, standard NIC, and innovative HP FlexibleLOM form factors. They deliver maximum performance for demanding workload environments and superior flexibility for management and deployment.

The HP portfolio of adapters extends Ethernet’s proven value set and economics to IT managers deploying HP ProLiant Gen8 servers.

• Comprehensive portfolio of 1Gb and 10Gb standup adapter, FlexibleLOM, and mezzanine adapter for HP ProLiant Gen8 servers
• Leveraging Broadcom’s long-standing industry leadership in Ethernet technology
• Highest performance for networking and storage applications with lowest processor utilization
• Energy Efficient Ethernet (EEE) to reduce energy consumption
• IEEE 1588 to provide high-precision synchronization with standard Ethernet cabling
• In-house 100% Broadcom IP ownership for Ethernet controller and PHY enables greater performance, reliability, and interoperability
• A seamless migration from 1GbE to higher performance 10GbE server-to-fabric connectivity
• The lowest total cost of ownership (infrastructure/operational/human capital)

Highest performance networking solutions

For more information on how HP offers the most powerful portfolio of network adapters employing Broadcom NetXtreme technology, please visit hp.com/go/ProLiantNICs, or visit Broadcom at go.broadcom.com/HPGen8.