LightPulse LPe16000-Series 16GFC Qualifying Questions

Qualifying Questions	Background info/ why 16GFC is better than previous generations of Fibre Channel	Why Emulex is the best 16GFC HBA
1. **Do you have a Fibre Channel SAN?**		
2. **Are you experiencing any I/O bottlenecks in your existing SAN environment?**		
3. **What brand and speed are your current HBAs?**		
4. **Do you have a new server initiative (refresh) planned?**	New Intel® Xeon® E5-2600 and Intel® Xeon® E5-4600 processors ("Romley") with PCI Express (PCIe) 3.0 are now shipping. These new servers provide not only higher numbers of cores and performance improvements in processor power but also provide significant increases in I/O throughput. PCIe 3.0 doubles the maximum possible I/O rates and processors with PCIe 3.0 can support approximately double the number of PCIe lanes available to each processor. As a result, the total I/O bandwidth available in one of these new servers is approximately quadruple that of the previous generation of servers.	If you are deploying a new system, you should choose the latest HBA design to match the performance of new high performance, PCIe 3.0 servers.

Emulex 16GFC HBAs feature a PCIe3.0 bus; the faster bus has more lanes (eight) to support the performance requirements of new Intel platforms.

LPe16000-series also boasts industry leading 1.2 million IOPS, enabling Emulex HBAs to keep pace with the significant I/O demands of new Intel servers.

LPe16000 is the 16GFC adapter chosen by more |

		OEMs than any other (with 86percent market share).
		LPe16000 is the most reliable 16GFC HBA on the market with more than 10 million hours MTBF. LPe160000 utilizes passive heat sinks and does not use fans, which cause significantly higher failure rates. In fact, competitors' 16GFC HBAs with fans fail eleven times more frequently!
5. Are you planning to upgrade OS or Database applications?	16GFC delivers faster IO Response Times and six times more IOPS than 8GFC, enabling increased transactions per second. Higher performing 16GFC HBAs provide database applications with peak workload headroom when needed.	LPe16000 reduces response times by 50 percent in 8GFC environments and 75 percent in 16GFC environments to speed up database transactions. Best in class performance with more than 1.2 million IOPS on a single port to handle increased database transactions (four times more at 4K block size transactions, three times more at 8K block sizes). Completes SQL Server database workload 25 percent faster than 8GFC adapters and allows for doubling of throughput when needed in peak-workload conditions. Information stored in Databases is often the lifeblood of the organization. T10 PI technology offers additional protection to keep data assets safe. For example, one major United States bank experienced a silent data corruption event and it took four days to restore the data. During those four days the database was down, the bank was unable to fund home loans which resulted in significant financial impact. Exclusive BlockGuard Data Integrity (Emulex T10 PI support) safeguards data assets from silent data corruption like the example mentioned above. LPe16000 features a second generation T10 PI design (where other HBAs are yet to support first generation

| | | gen), and it is the only HBA with high performance T10 PI offload. Offload eliminates the 30 percent performance penalty of firmware-based T10 PI implementations.

Four times more logins and open exchanges than other 16GFC HBAs to support more users:

LPe16000 enables more active users per database (because we have more logins) which can reduce the number of software licenses that need to be purchased:

- For instance, with Oracle you pay more for an Enterprise Edition than for the Standard edition. The Standard edition, though, is limited to servers with a maximum of four sockets. If you can support more users with the Standard Edition then you don't have to upgrade to the more expensive Enterprise Edition.

- From another aspect, it comes down to the complexity of supporting an Oracle database. Information referenced below came from this study: http://alinean.com/PDFs/Alinean-MicrosoftAndOracleTCAStudy.pdf

- "*Study participants reported that on average a Database Administrator (DBA) could manage over 30 Microsoft SQL Server databases, while Oracle Database implementations required <u>one</u> DBA per 10 databases.* " |
|---|---|---|

Measure	Oracle
Average number of databases per company	87
Average number of users per database	716
Databases supported per DBA	9.9
Annual Total Cost per database (based on $101,042 total annual salary cost per DBA)	$10,206
Annual Total Cost per database user (based on 5,567 average number of users supported by each DBA)	$18.15

- We can see that the average DBA can only support ten Oracle databases. So, if more users can be supported per database it will result in less cost. With more logins per board, we can support more users per database. Or, by preventing the upgrade to a more expensive license for an Oracle database by supporting more users on the Standard Edition license, the customer can save money.

6. Do you need to increase the number of Virtual Machines per server you support?	16GFC Increases VM Density. An ESG Survey shows 60 percent of datacenters will deploy 251 or more virtual machines (VMs) in their data centers by the end of 2013, compared to 38 percent in 2011. And 65 percent will consolidate 11 or more VMs per host server by the end of 2013 compared to 31 percent in 2011. More Mission Critical Applications are being moved to	LPe16000 supports 2X the VMs vs. 8GFC for greater VM density. (This is because 16GFC can handle twice the workload vs. 8GFC). Industry leading 1.2 million IOPS supports the increased IOPS demands of more VMs. 8192 exchanges (up to 4x more than other 16GFC HBAs) enables LPe16000 to support more VMs per server • More VMs per server equals more users per server, equals more users per HBA. More

	virtualized environments, which makes VM density increasingly important.	users equals more required logins and exchanges. Our card supports many more logins and open exchanges then the competition, or our previous generation 8GFC card.

LPe16000 has in-box drivers for VMware vSphere 5.1 and is fully supported and tested by VMware. See the performance study here (insert link). QLogic and Brocade do not have in-box drivers.

Time-saving management with VCenter Plug-in provides single pane-of-glass administration of HBAs in VMware environments. |
| 7. **Are you considering adding Solid State Disks (SSDs) or Flash caching to your architecture?** | SSD storage arrays, either all flash-based or as a front-end tier 0 cache for traditional disk based arrays (in a tiered storage architecture), deliver superior performance with10X-40X higher IOPS performance and improved latency, are demanding superior FC I/O performance to keep up with the blistering pace. 16GFC HBAs meet this challenge by delivering higher IOPS and latency (response times) needed. | Emulex LPe16000-series delivers industry-leading 1.2 million IOPS to keep pace with the IO demands of SSDs, ensuring the HBA does not become the bottleneck.

The LPe16000's lightning fast response time is 50 percent less than 8GFC adapters, even when deployed with an 8GFC infrastructure. When used in a 16GFC infrastructure, response time is cut by 75 percent.

Emulex has partnered with Fusion-io to deliver the best I/O connectivity (LPe16000) for IO demanding Fusion-io devices. By selecting Fusion-io and Emulex, you are choosing a best-of-breed solution.

Emulex is partnered with EMC VFCache to provide the best I/O connectivity to EMC's VFCache in-server PCIe Flash Solid State Storage solution. |

8. **Have you experienced data corruption, and if so, how long did it take to recover? Were you able to recover 100 percent of your data?**	T10 Protection Information (T10 PI) is an advanced data integrity feature that enables end-to-end data integrity checking. Previously, there was no way to detect silent data corruption until it was too late, resulting in costly downtime and even complete data loss. Example: One major United States bank experienced a silent data corruption event and it took four days to restore the data. During the four days the database was down, the bank was unable to fund home loans which resulted in significant financial impact.	Oracle and Emulex pioneered the development of T10 PI and with EMC arrays, an end-to-end T10 PI solution is now available. LPe16000 series is a second generation T10 PI implementation, whereas other HBAs have yet to support it. If they do, they support it in firmware at best. LPe16000 has high-performance offload, which eliminates the 30 percent performance penalty that firmware-based T10 PI implementations experience.
9. **Do you have a private cloud deployed?**	16GFC provides maximum system performance for high-speed storage environments such as the cloud. 16GFC provides better QoS- Faster IO Response Times and IOPS enables increased transactions per second.	LPe16000 supports larger cloud deployments through increased VM support (more vPorts). Emulex enables easy administration of HBAs over the cloud with OneCommand Manager's robust, scalable, and remote management capabilities. Reliability is vital in cloud deployments. Emulex has unsurpassed reliability with more than 10 million hours MTBF. It is the most reliable HBA ever built by Emulex and the most reliable 16GFC HBA on the market. By utilizing passive heat sinks, Emulex does not use fans which causes significantly higher failure rates. Competitors' 16GFC HBAs with fans fail eleven times more frequently!
10. **Do you need to accelerate backup and recovery or reduce your backup window?**	16GFC enables shorter backup and recovery windows. When large blocks of data need to be transferred between arrays and sites, a faster link can accomplish the same job in less time. The growth of SSDs in external arrays demand lower latency that 16GFC can provide.	LPe16000 delivers twice the throughput (1600MB/s) vs. 8GFC to speed-up backup and recovery, and shorten backup windows. LPe16000 reduces latency (response times) by 50 percent in 8GFC environments, and by 75 percent in 16GFC environments, which is key for SSD arrays.

| 11. Are you looking to reduce CAPEX/OPEX? | Because 16GFC HBAs can do twice the workload of 8GFC, the same workload could be handled by half the number of cards.

If an entire SAN was switched to 16GFC, a substantial reduction in the number of cables, ISL links and HBAs would be achieved. That would result in greatly reduced complexity and power savings. | LPe16000 features industry-leading 1.2 million IOPS enabling more workload per card resulting in fewer cards that need to be purchased.

Higher IOPS performance enables more users per software license in Oracle database environments, reducing the number of licenses that need to be purchased (see row four above).

GreenState power efficiency delivers four times better IOPS performance/watt than 8GFC HBAs.

• Enables more work to be done with less power

OneCommand Manager delivers twice the management tools and takes half the time to deploy and manage versus other manufacturers' HBAs, which significantly reduces the manpower needed to deploy and maintain HBAs annually. |