General NVMe FAQ

1. What is NVMe?
   NVMe, more formally NVM Express, is an interface specification optimized for PCI Express based solid state drives. The interface is defined in a scalable fashion such that it can support the needs of Enterprise and Client in a flexible way.

2. Is NVMe an industry standard?
   NVM Express has been developed by an industry consortium, the NVM Express Workgroup. Version 1.0 of the interface specification was released on March 1, 2011. Over 80 companies participated in the definition of the interface.

3. What is the legal framework of the NVM Express organization?
   The legal framework is structured as a Special Interest Group (SIG). To join a company executes a Contributor/Adopter agreement. There are 11 member companies who have board seats and provide overall governance. The governing board is called the NVM Express Promoters Group. There are seven permanent seats and six seats filled by annual elections. Contributor companies are all free to participate in regularly scheduled working sessions that develop the interface. All Contributors have equal input into the development of the specification.

4. Who are the companies that form the NVM Express Promoters Group?
   The Promoters Group is composed of 13 companies, Cisco, Dell, EMC, IDT, Intel, Marvell, Micron, NetApp, Oracle, Samsung, SanDisk, SandForce (now LSI) and STEC. Two elected seats are currently unfilled.

5. Who are the permanent board members?
   Cisco, Dell, EMC, IDT, Intel, NetApp, and Oracle hold the seven permanent board seats.

6. How is the specification developed? Can anyone contribute?
   The specification is developed by the NVM Express Working Group. Any company may join the Workgroup by signing the agreement. The agreement can be found on the nvmexpress.org website. All members have equal input into the development and evolution of the specification.

7. Is there a fee for joining? Are there annual dues?
   There is no fee for joining and there are no dues.

8. Is there a specification currently available? If so where can I get a copy?
   Version 1.0 of the specification that was over two years in development was released on March 1, 2011. The specification is now at 1.0c and can be found on the nvmexpress.org

website. The 1.0c revision incorporates errata that the membership has identified as valuable to the definition of the interface.

9. Why is the NVMe specification not under the aegis of a pre-existing standards body such as INCITS?
PCIe SSD products are a brand new technology. The members of the NVM Express Workgroup believe that the rapid technical development of this innovative new technology requires a standards body that can be as fast moving and nimble as the technology itself. The NVM Express Workgroup is an industry consortium that has already proven itself capable of providing the appropriate level of organizational structure while also providing the flexibility and nimbleness needed to keep pace with the rapid development of the devices.

10. Are there other existing industry consortia that follow the NVM Express Workgroup model?
Yes. There are many. The one you may be most familiar with is the PCI SIG. Many other standards, including ones that are developed and maintained by formal standards groups such as T10, reference the PCI interface specification developed and maintained by the PCI SIG.

11. Who are the members of the NVM Express Workgroup?
The Workgroup is composed of over 80 companies. A list of the companies who have agreed to make their names public can be found on the nvmexpress.org website.

12. Are any other PCIe SSD interface specifications currently available?
No. Currently the NVMe specification is the only interface specification that is optimized for PCIe SSDs and that has been released and is publicly available.

13. Are any other interface specifications under development?
There are projects within T10 to develop a set of standards that will overlap and co-exist with NVMe. It is composed of several separate project proposals, SOP and PQI. The effort in T10 started in March of 2011, and focuses on retaining the legacy SCSI infrastructure investment. The SOP and PQI projects are currently going through a lengthy development cycle before being sent to the governing body, INCITS, for approval as a specification.

14. I thought SCSI Express was a PCIe SSD specification. Is that not the case?
That is not the case. SCSI Express is the name of a marketing project within the SCSI Trade Association. It is not a standards specification.

15. Why develop a whole new interface? SCSI has been around for decades.
As SSD performance continues to increase the existing SCSI interface is likely to prove too heavy and slow, becoming a performance bottleneck. Non-volatile memory technology is also advancing rapidly towards a model that will allow more memory like

access semantics. A legacy block storage interface such as SCSI may limit the evolution of these device types. A brand new interface, designed with an eye to the future while maintaining backward compatibility, was needed. NVM Express is an optimized interface that scales for future Non Volatile Memory solutions yet allows new products implementing the NVMe interface to function fully within the legacy OS IO stack.

16. When will NVM Express products ship?
    We anticipate products shipping in 2012.

17. What performance can I expect with NVM Express?
    We expect industry leading performance and have measured over 1M IOPs with prototypes from various vendors.

18. How does NVM Express compare to SCSI Express or SCSI over PCIe (SOP)?
    It is premature to compare the technologies, as SOP is still under development in T10. NVMe is expected to provide performance benefits due to its streamlined and focused approach towards the future where memory-like semantics may be used. As explained in another question in this FAQ SCSI Express is a term for a marketing project within the SCSI Trade Association (STA). It is not the name of an interface specification. Therefore it is not possible to compare SCSI Express to NVMe or any other interface specification.

19. How does NVM Express compare to SATA Express?
    SATA Express, driven by SATA-IO, defines a host connector that accepts a SATA hard drive, SATA SSD, or PCIe SSD. The PCIe SSD may support either the AHCI software interface or NVM Express. As NVM Express software support spreads in the industry, it is expected that client SSDs will adopt this interface for latency, parallelism, and other benefits that it provides.

20. Does NVMe offer any security features?
    The NVMe command set supports security container commands analogous to the security container commands found in the SCSI and ATA/ACS command sets, allowing NVMe-based SSDs to support industry standard security solutions such as the Opal SSC and Enterprise SSC specifications published by the Trusted Computing Group (TCG). Additionally, the NVMe Workgroup collaborated with the TCG Storage Workgroup to add support for the NVMe interface into the TCG Storage Interface Interactions Specification (see http://www.trustedcomputinggroup.org/resources/storage_work_group_storage_interface_interactions_specification