Enabling NVMe-based Storage Class Memories for an HPC Interconnexion Network

Computation and communications are equally fast with current technology. The main challenge however remains in scaling up the performance across thousands of nodes. With the multitude of hardware and software interfaces, it is hard to bring high performance computing and networking at high abstraction levels without the cost of an increasing complexity. Atos/Bull is a major actor in the Exascale computing race through its in-house high performance interconnect BXI [1].

New hardware designs and architectures are proposed to overcome the challenge. The use of specialized hardware and accelerators becomes a potential direction in supercomputers and data-centers. Thus, turning to heterogeneous architectures based on Field-Programming Gate-Array (FPGA), GPUs, and many-core processors. Such approaches are encouraged through new technologies aiming to improve their efficiency. The emergence of new storage class memories such as the recently announced Intel Optane Non-Volatile Memory. To address the needs of these new memories, the NVMe [2] (for Non-Volatile Memory Express) has been around for past year to prepare software and related hardware for non-volatile storage.

In this context, we propose an internship to study the usage of such storage class coupled with a high-performance network, as defined in the NVMe over Fabric extension [3].

The future intern student will have to produce a Proof-of-Concept running on the BXI network interconnect. For performance reasons, the prototype will rely on advanced network interface features such as offloaded operations and remote memory access. The work will cover a full development cycle through design, development, test and performance evaluation. An existing application (proved to run on InfiniBand) is provided to validate the Proof-of-Concept on a real use-case.

Curiosity and creativity are key points to succeed in this internship. The selected student will work in an environment similar to open source projects and communities. The ideal profile should have knowledge in C programming and basic experience with version control software such as Git, although, anyone is encouraged to apply. The internship is held in the RD division of Atos/Bull in Echirolles.

References

[1] *Bull eXascale Interconnect for HPC Systems*. URL: https://atos.net/wp-content/uploads/2017/10/W-BXI-en1-web-1.pdf.

[2] *NVM Express*. URL: https://nvmexpress.org/.

[3] *NVM Express over Fabrics*. URL: http://nvmexpress.org/wp-content/uploads/NVMe_Over_Fabrics.pdf.

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