

The UIBK HPC Ecosystem - LEO4 and Visual Interaction Lab 1669

Martin Thaler

University of Innsbruck, IT Services (ZID)

High Performance Computing (HPC) has a long tradition in Innsbruck. Today our local systems [1] are LEO4 (1344 cores, 5TB of RAM, 100Gbit Infiniband network, 2018), LEO3E (900 cores, 4TB of RAM, 56Gbit Infiniband network, 2015) and LEO3 (1944 cores, 4TB of RAM, 40Gbit Infiniband network, 2011). Our current and future LEOs bridge the gap between Tier 3 systems (computational resources of university departments and research groups) and our national Tier 1 systems.

HPC Cluster LEO4: This Cluster is another step in our strategy of renewing LEO cluster systems approximately every three years. LEO4 was designed in an open and extensible way to support our current customers and address special needs of new user groups (e.g. bioinformatics). The features are very similar to those of LEO3e but show significant improvements in various characteristics. We nearly doubled the bandwidth of our Mellanox Infiniband network to 100Gbit while reducing the blocking factor to 1:2.6. The tiered storage system now combines a IBM FS900 flash system (16TB, 419000 I/Os) with two SAS IBM V5030 storage systems (65.5TB, 12000 I/Os each). With those three storage systems we provide significantly higher I/O performance and offer more available disk space (147TB). Files are automatically moved from Flash to SAS and vice versa, depending on their size, age and access frequency. We established the IBM Spectrum Scale (GPFS) monitoring and performance analysis GUI to gain a deeper understanding of the performance metrics of our parallel filesystem.

Soon, the system will be extended by a enterprise grade GPU node (4x GPU NVIDIA Volta 100, 32GB of gpu RAM each, 384GB of host RAM, including NVLink with 300GB/s bandwidth) to evaluate the performance and usability of those systems for our customers.

Visual Interaction Lab 1669: Successful HPC does not merely require computational resources, it also requires infrastructure to present scientific data to colleagues, sponsors and the public. For this purpose, funded by the *Research Area Scientific Computing, University of Innsbruck* [2] and the *Förderkreis 1669, University of Innsbruck* the *Visual Interaction Lab 1669* was established together with our partner *Three10, Munich*. Its centerpiece is a high resolution visualisation wall consisting of 9 Full HD displays with a physical dimension of approximately 3x2 meter and an overall resolution of 5760x3240 pixels. Additionally a virtual reality headset (HTC Vive Pro) is fully integrated with the visualisation wall, such that the view of the VR headset is visible at the same time on the high resolution visualisation wall, also in stereoscopic mode. These technologies combined allow our scientists to visualize their results in various 2D and 3D (stereoscopic) ways to a larger audience.

Operational side: We have installed Lenovo XClarity Management software to simplify and automate updates to BIOS/UEFI, firmware, and service processors. In addition, we are currently planning to install the Mellanox Unified Fabric Manager (UFM) to optimally monitor our Mellanox Infiniband fabric. In combination with the aforementioned Spectrum Scale (GPFS) GUI, we hope to have more opportunities to analyze and eliminate bottlenecks. Another big project is that we plan to migrate from SGE (Son of Grid Engine) to Slurm for our local clusters in 2019.

References

[1] University of Innsbruck - ZID (IT Services) - <https://www.uibk.ac.at/zid/systeme/hpc-systeme>

[2] University of Innsbruck - Research Area Scientific Computing - <https://www.uibk.ac.at/forschung/profilbildung/forschungsschwerpunkt-scientific-computing.html.en>