Towards an Easy-to-Use Visualization Environment on the Fugaku

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1 INTRODUCTION

We have worked on a large data visualization and analysis environment for the Fugaku taking into consideration some lessons learned from the K computer [1]. Regarding the K computer, it is worth noting that the auxiliary post-processing system was a GPU-less system, and the *Mesa 3D* graphics library, necessary for running traditional OpenGL-based graphics applications, was not initially provided for the compute nodes (SPARC64 VIIIfx CPU). It is also worth mentioning the non-existent direct connection to the pre/post-processing servers as well as the compute nodes despite the considerable interest in using client/server-based distributed visualization such as the *PBVR Remote Visualization System* developed by the Japan Atomic Energy Agency, and *HIVE* developed at RIKEN. This poster will describe the visualization environment developed on the Fugaku (Fig. 1), and some initial impressions regarding the software deployment tool (Spack) and services (Fugaku VPN and Fugaku Open OnDemand) that were utilized for improving and ameliorating this visualization environment.

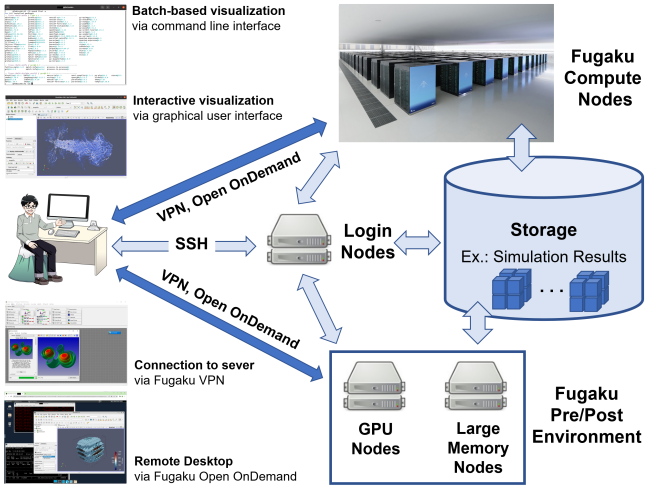

Figure 1: Visualization environment on the Fugaku.

2 FUGAKU VISUALIZATION ENVIRONMENT

The pre- and post-processing environment with GPU and the Arm-based ecosystem can probably be considered two of the main differences compared to the K computer. We can say that the adoption of the Spack package manager for the building and installation of open-source software has greatly helped the deployment of visualization-oriented applications and libraries for different types of users. Since the operational period of the K computer, we have observed three main groups of post-processing users, which we roughly categorized as *Users*, *Customizers*, and *Developers*. Normally users expect the visualization tasks to be as simple as possible and usually have pre-defined applications and procedures to follow. Customizers are skilled people that can make necessary modifications to the available software on their own, and developers are people that can prepare their own necessary tools. Although there are still Spack packages that cannot be built on the Fugaku [2], the successfully built visualization-related open-source packages, such as the ParaView and Mesa 3D, requested by the Fugaku users were all installed on the system side (Spack public instance). Customizers and developers can also use their own local instance (Spack private instance) for building customized versions and packages that are not provided on the main public instance.

As shown in Fig. 1, users can execute traditional batch-based visualization, via CLI (Command Line Interface), on both compute nodes and pre/post environment. In addition, interactive visualization on GUI (Graphical User Interface)-based applications can also be executed on the pre/post environment via SSH port forwarding. This functionality can also be applied to execute client/server-based distributed visualization. To further facilitate this kind of usage, we took advantage of the Fugaku VPN service to get rid of the necessity for setting the SSH port forwarding and facilitating the use of client/server-based visualization. This VPN service also facilitates the connection to the license servers running on the Fugaku front-end servers for running commercial visualization applications such as AVS/Express. GNOME desktop-based remote visualization is also provided on the pre/post environment via VNC (Virtual Network Computing) and can benefit from the Fugaku VPN service. Although it is still in the beta test mode, with the introduction of Fugaku Open OnDemand service, users are currently able to access an even easy-to-use remote desktop (Xfce) environment for carrying out visualization and analysis tasks on the Fugaku.

3 CONLUSIONS

We have been continuously working to further ameliorate the visualization environment on the Fugaku by focusing on state-of-the-art tools, services, and functionalities. We are aware that each of the HPC sites may have different targets and goals, managed based on different operational policies and regulations, but we wish these practical experiences can serve as a point of reference to others.

ACKNOWLEDGMENTS

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REFERENCES

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