

Visualization at the Exascale: Making it all Work with VTK-m

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Abstract: VTK-m is the software library that makes it possible to perform scientific visualization on Exascale machines. Exascale machines use GPUs as accelerator processors provide the highest computational throughput available today, which necessitates an algorithmic design that often deviates from algorithms on a classical computer. In addition to providing scientific visualization algorithms for GPUs and other accelerator processors, VTK-m provides a framework that simplifies the implementation of new algorithms and provides a porting layer to work across multiple processor types. This paper captures the main challenges encountered to make visualization available at the Exascale. We document the surprises and obstacles of moving from pre-Exascale platforms to the final Exascale designs and the performance on those systems. We also report on the integration of VTK-m with other Exascale software technologies. Finally, we show how VTK-m helps scientific discovery for applications like fusion and particle acceleration that leverage the Exascale machine.