Providing Easy Access to Visualization for Biomedical Research

Mathias Kaspar[a], Benjamin Loehnhardt[a], Nick Kepper[b], Dagmar Krefting[c]

[a] *Department of Medical Informatics, University Medical Center, Goettingen, Germany*
[b] *Genome Organization & Function, Bioquant and German Cancer Research Center, Heidelberg, Germany*
[c] *Department of Medical Informatics, Charité University Medical Center, Berlin, Germany*

Abstract and Objective

With the MediGRID a Grid Computing Infrastructure for the German biomedical community was deployed as part of the German Grid Infrastructure D-Grid. Currently this foundation is used to build up an additional countrywide visualization infrastructure for biomedical researchers. Therefore three new visualization clusters were installed in 2009 to extend the MediGRID infrastructure. It is possible to use the clusters in different ways in response to the demands. By using an integrated and already deployed solution, researchers do not need to spend time and money to build up own systems. Further the communication between two or more professionals can be improved by shared visualizations. The sites are now working on standardized ways to utilize this infrastructure to reduce the threshold for naïve research users. The poster describes the architecture and functionality of this infrastructure.

Keywords:

3D-Visualization, Grid computing, Multi center research

Methods

In 2009 the MediGRID [1] was extended with a visualization infrastructure, which can be used by every biomedical researcher related to a cluster site. Three visualization clusters were deployed on sites in Berlin, Goettingen, and Heidelberg. The first two sites are also providing autostereoscopic displays to view data with 3d perception. This high-end graphics hardware within the MediGRID allows implementing innovative use cases in multi center research scenarios. Every Linux-based application can be used.

Results

There are three different ways of using the visualization infrastructure: asynchronous by queuing jobs, synchronous by directly visualizing data, and as a combination of both.

1. Use as compute resource: The clusters can be used as standard computing resources with the value of using the CUDA framework within applications. Therewith special GPU's on the graphics cards can be used for highly parallel calculations, which can be a multiple times faster compared to CPU's depending on the application [2].

2. Use as visualization resource: The cluster nodes can be used like remote desktops as a substitution of an own local high-end visualization computer. A researcher can switch to this solution especially for graphics demanding applications within his workflow. The clusters can be used remotely by transferring video, mouse, and keyboard signals or - alternatively - directly at the cluster location. The first variant is also usable with limited connectivity. The advantage of the second variant is the direct connection, which is very fast and allows stereoscopic imaging.

3. Combined use of compute and visualization resources: Also the sequential combination of both scenarios is possible. Therefore a graphics demanding application is used to present data on a cluster node. For this the applications input and output data is calculated in advance and afterwards, respectively within the MediGRID compute infrastructure or just on the visualization clusters.

Conclusion

Several visualization examples of clinical and research data have been implemented. By providing an easy to use visualization infrastructure, it is possible to access the infrastructure from every lab. Current developments are focusing on the topic of integrating the clusters as visualization resources. Therefore a portlet for the existing MediGRID portal is in development, which shall provide overall information, tools and the possibility to reserve nodes for visualization tasks.

References

[1] F. Dickmann, M. Kaspar, B. Loehnhardt, T.A. Knoch and U. Sax. Perspectives of medigrid. Stud Health Technol Inform, 147, 2009.

[2] S.S. Samant, J.Xia, P.Muyan-Ozcelik, and J.D. Owens. High performance computing for deformable image registration: towards a new paradigm in adaptive radiotherapy. Med Phys, 35(8):3546–53, 2008.

Address for correspondence

Mathias Kaspar, University Medical Center, Dpt. of Med. Informatics, 37099 Goettingen, Germany