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Visualization tool and its integration in a gateway

Eva Pajorova and Ladislav Hluchy
Institute of Informatics, Slovak Academy of Sciences, Bratislava, Slovakia (utrrepaj@savba.sk, 02/5477 1004)

Through user-friendly web interfaces as is e-Science gateway integrated into the same environment researchers and scientists can securely and transparently access to computational and data sources, services, tools, sensors, etc. Science gateway is a computational web portal, that includes a community-developed set of tools, applications, and data customized to meet the needs of a targeted community. It can hide the complexity of accessing heterogeneous Grid computing resources from scientists and enable them to run scientific simulations, data analysis and *visualization* through their web browsers. Scientific gateways are able to provide a community-centric view, workflow/dataflow services and a strong support in accessing to the cyber infrastructure including grid and cloud based resources. In each of Science contexts, scientific gateways play a key role since they allow scientists to transparently access to distributed data repositories (across several domains and institutions), metadata sources, carry out search & discovery activities, as well as *visualization* and analysis ones, etc. We are dealing with position the *visualization* as a one of main components the scientific gateway. The scientific web portal - gateway cumulate all types of *visualization*.

There are some reasons for that scientist in different disciplines using visual representations of datasets:

- for a Visual control of the execution process
- for know-how discovery and for presentations the research academic results
- for formal publication of research results
- for a directly visual education form

Simulation and execution with a large date spend usually long execution time. Good solution for execution looks on Grid and actually on Cloud computing. In both infrastructures get *visualization* the main position as a way to control execution process. Visual control has in all infrastructure very useful position. For example the modal parametric studies applications are for example Earth Science or Astronomical simulations. The simulation was realized as a sequence of parameter studies, where each sub-simulation was submitted to the grid as a separate parameter study. The job management was rather time consuming due to the analysis of failed jobs and to their re-submission.

Visualization is including as a visual control process. The visualization tool (VT) developed in our institute is designed as a plug in module. Client asking for visualization is as a “visualization client”. Output data on the storage element are the inputs data for visualization jobs. Visualization workers are to modify data to the visualize formats, but also to prepare the typical visualization scenes. Client can render such scenes on the browser, can make the visual control and modify executions. The VT is composed of several modules, which are responsible for creating scenes and converting data to the visualize format. The VT is designed as a plug-in module. The components generating rendering scenes are easy to exchange, according to the requirements of the given application. In case of our gridified application the output data of the simulation located on the SE can be directly used as the input for the Visualization tool. The final product of the VT includes a set of files containing data in the VRML (Virtual Reality Modeling Language) format. By using the on-line Visualization tool the client can stop the execution process, he can to change input parameters and start the execution process ones more. Such architecture in grid environment can be used for all applications from different sciences spheres which have character as a parametric study.

Actually the research community needs not only traditional batch computations of huge bunches of data but also the ability to perform complex data processing and this requires capabilities like on-line access to databases, interactivity, fine real-time job control, sophisticated *visualization* and data management tools (also in real-time), remote control and monitoring. The user can completely control the job during execution and change the input parameters, while the execution is still running. Both tools, the tool for submission designed before and continued sequential visualization tool - provided complete solution of the specific main problem in Grid environment.