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Requirements for efficient mining and processing of massive terrain data in Grid infrastructures

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Requirements by science for computing power and IT resources rise steady. Therefore the efficient use and optimization of currently existing IT resources is necessary. In particular for a range of applications services for processing of massive amounts of terrain data have to be developed and implemented within Grid infrastructures. This is a key goal of our work packages in within the project GDI-Grid (www.gdi-grid.de).

A Spatial Data Infrastructure (SDI) provides access to globally distributed spatial data through standardized web services. SDI consists of interoperable services for managing, discovering, processing and visualizing spatial data which are based on open standards of the Open Geospatial Consortium (OGC). So far SDI only covers static, data-oriented services for management and visualization. There is a lack of dynamic, process-oriented services. However, for manipulating spatial data the “Web Processing Service” (WPS) standard (version 1.0.0) was released in December 2007. The WPS provides an interface offering access to geospatial processing functionality.

Demand by the huge terrain data (especially laser scanning data) and the complex spatial computations, the geoprocessing of terrain data is very storage intensive and can take a considerable amount of time. The generation of Digital Elevation Models (DEM) from massive laser scanning data as soon as modeling spatial processes based on DEM provides huge requirements on IT resources. SDI and Grid-Infrastructures benefit from the ubiquitous availability of the Internet to process vast spatial data on distributed high-performance computers. This reduces the response time and allows an on-the-fly generation of 3D-city- and landscape models. A goal is to increase SDIs

by the supply of cooperatively using, interoperable and Web-based geoprocessing services which apply Grid-computing technologies. Currently we are developing a range of terrain processing services for generalization, geotesselation and spatial partitioning in the GDI-Grid project. Based on distributed databases, requirements are defined to Grid services to generate multiscale 3D models. In particular very computer-bound geometrical preprocessing operations are necessary. A standardized, Grid able interface, which contains both geometrical, and semantic description of the data will be developed. Using these Grid services, terrain and landscape models can be generated and prepared according to the requirements of the application of goals.