

Rapid Raster Projection Transformation and Web Service

Using High-performance Computing Technology

Qingfeng Guan, Michael P. Finn, E. Lynn Usery, and David M. Mattli

Center of Excellence for Geospatial Information Science

U.S. Geological Survey

1400 Independence Road

Rolla, MO 65401

Abstract.

The National Map under development at the U.S. Geological Survey (USGS) aims to provide users a large quantity of geospatial data and enable them to pre-process and download the data in any commonly used projection. To accomplish this task in a timely fashion, a rapid raster projection transformation system called *pRasterProject* was developed using high-performance parallel computing technology. In particular, the algorithm of *MapImage*, a software package developed by the USGS for raster projection transformation (Finn and others, 2008), was parallelized using an open-source general-purpose parallel Raster Processing Programming Library, *pRPL*. The output grid is decomposed into equal-area sub-grids, and the information of the output sub-grids is used to appropriately decompose the input grid (often into unequal-area sub-grids). A master-worker-based dynamic load-balancing technique is deployed. A task-farm is formed on the master processor that dynamically assigns output sub-grids and distributes the corresponding input sub-grids to workers in response to requests. The worker processors request and receive tasks, apply the transformation algorithm on the local sub-grids, and send them back to the master for output.

To fit *pRasterProject* into *The National Map* architecture, a web service also was developed to provide a web-based interface for users to select the area of interest, choose the desired projection, pre-view the transformation result, and download the data.

Experiments showed that *pRasterProject* significantly reduced the computing time, and yielded fairly high speed-up and efficiency. *pRPL* also can be used for other kinds of computationally intensive processing that involve massive raster datasets and complex algorithms.