Geospatial Web Processing Services for Client-Side Computations

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Abstract. Development of the interactive geospatial data manipulation techniques and especially of online geoprocessing techniques are some of the main trends for Web geotechnologies in recent decades. Currently, the key paradigm of Web geoprocessing implementation is a server-side data processing, which is based on Client/Server or Cloud architecture. This approach is used both by open source geospatial software and by enterprise environments.

However, in some cases this approach could not be acceptable. For example, in the case when significant input data volumes are stored on the client side, which leads to high cost of data transmission to the server. In the case of narrow or unreliable network channels, also receiving of the processing results from the server could be problematic. Finally, if user operates data supplemented with any commercial or legislative restrictions, it leads to non-acceptance of the transmitting these data to the third party server as well as to the public cloud.

Obvious way to escape these limitations is to use computational resources of the client side for data processing, and to transmit processing software tools over the network instead of the datasets. This approach keeps benefits of the Software as a Service model and supplements it with the possibilities of more stable distributed system implementation.

The client-side processing allows to realize highly valuable transformation of the Web geoprocessing architecture from centralized Server-Oriented/Cloud paradigm to Grid Computing Architecture (of both types Client/Server or Peer-to-Peer). Keeping in mind that Peer-to-Peer GCA many times confirmed its applicability for the implementation of a global, highly stable computing systems (e.g. file-sharing networks, virtual currency payment systems, etc.), it seems obvious to use a similar approach in

open source geocomputations. The key advantage of this approach is that it allows to eliminate building of server/cloud infrastructure.

Since the existing standards do not support any functionality suitable for transmission of executable code and software components to the client, there is a need of expansion of the existing or development of the new standards.

Primary objective of our study is the development of such geoprocessing Web service schema, which will be compatible with the current OGC WPS standard (main Web-based geoprocessing standard). Additionally, Web service should allow not only server-side processing, but also the client-side, transmitting executable code through the Web. The unity of the executable code should be preserved in this schema. It means that the transmitted code must be identical to the code of server-side process. This code identity should provide identity of the processing results generated on any side (server or client). We propose to determine the services, which support described features as Hybrid Geoprocessing Web Services.

Conceptual solution of the HGWS implementation task can be provided by expanding the WPS standard with additional getProcess method, which allows client to receive an XML file with a description (including downloading URLs) of the software components needed for process execution. This way is similar to the WPS describeProcess method, which allows receiving of the process description.

The PyWPS WPS-server was chosen as the platform for implementation of HGWS concept. Implemented system available at http://195.70.211.131 The processes could be executed by using Web-based graphical user interface or could be accessed directly through the program requests for server-side and client-side processing.

Important idea, which should be underlined in conclusion, is that in our opinion the implementation of client-side geoprocessing techniques can supplement current server-side/cloud approach and make it more flexible.

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