THE DESIGN AND IMPLEMENTATION OF A WCS SERER FOR SERVING MODIS DATA

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1. PURPOSE

MODIS satellite data has a number of advantages that attract the researcher that include, of the medium resolution, products freely available globally and on time; covering a wide range at a high data update frequency, real-time with Direct Broadcast (DB) systems,over 100 DB stations is the U.S and worldwide. MODIS are currently widely applied in the scientific research covering the global or regional in the real-time Earth observation and disaster and environmental monitoring.

In the decades, many MODIS satellite data ground receiving station were built in China, which form a MODIS station network which can obtain the data covering the whole China. However, so far these data have not been very good circulation and use, and at the same time, repeated development of data storage and distribution software also led to waste of resources and money.

As we know, there are a lot of ways to implement data management and sharing, web data services gradually were accepted and adopted by the uses for its powerful ability and easy-to-use, it can provide users with different levels of services that includes remote sensing image retrieval, browsing and accessing, to accomplish online sharing of massive remote sensing data.

In order to realize the sharing of geographic information, OGC organizations put forward a series of specifications to support web data sharing and interoperability. At present, these specifications has been extensive supported and applied. Web Coverage Service (WCS) is one of them to support data service and interoperability of the satellite and aerial images. Through pre-processing and customization, it can provide the data to meet the user's requirements.

On the basis of full analysis of characteristics of MODIS data Wuhan University MODIS satellite data ground receiving station received, complying with OGC WCS specification, A MODIS data WCS server were designed and implemented to support MODIS' publish and distribution to Chinese users, so as to enable Chinese geospatial community to better use MODIS data to carry out scientific and applied research.

2. METHODS

According to OGC WCS specification, three basic interfaces as follow must be defined and implemented in WCS.

(1)GetCapabilities: return service-level metadata, which describes the content of all the services and their request parameters.

(2) DescribeCoverage: return a full description of the requested coverage in WCS server.

(3) GetCoverage: return a geographic coverage with a specified data format.

Logically, the entire WCS system can be divided into three layers: application layer, processing layer and data layer.

The upper layer is application layer, which is responsible for interacting with the users, whose tasks include receiving the user's request, downloading and returning the results that include xml file and image files, uploading image files, display exception information, and so on. The middle layer is processing layer, which is charge of parsing users' request parameters, extracting the specified image data from files or database based on request parameters, and perform user-specified processing that include image mosaic and clipping, project transformation, format conversion, data resampling and subsetting and etc., and storing the data as an image file format specified by request parameters. If the errors occurred, the exception document will be generated. The lowest layer is data layer, which is responsible for the management and delivery of raster data, which are stored in files or database.

3. SYSTEM FUNCTIONS AND THEIR IMPLEMENTATION

Based on the above analysis on the system requirement, the major system functions below were designed and defined, the corresponding implementation strategies were studied. Here is brief description about the them both.

1)User Interaction: including user request parameters parsing, the three standard interfaces definition, post-processing and XML document processing. These function were achieved by the web service programming via C# + ASP.NET. Besides, file's upload use SWFUpload to implement.

2) Image processing: include reading and writing HDF-EOS image data, geometric correction, tailoring, map-join, mosaic, color composite, image segmentation, splice, re-sampling, projection conversion, format conversion, etc.; GDAL Library-based programming is used to complete the underlying read, write and all the processing

operations of MODIS data files. However, NASA's HDF-EOS library is used as a supplement in our implementation, since GDAL can't support perfectly HDF-EOS 2.X version and unable to retrieve MODIS data's geographic reference information.

3) The metadata management and query technology: in the WCS service, the MODIS image metadata such as URI, BBox, and projection so forth are also preserved. Our Strategies are: XML documents to store metadata information, LINQ (Language Integrated Query) technology of NET 3.5 are adopted to finish XML query and retrieve metadata information.

4) Data storage and management: both file storage and data storage are offered. Under normal circumstances, the data was stored in the files on the server. Data are also can be stored into Oracle database according to user's demand. Oracle spatial Georaster component are used to store and manage these image data, and these data can be retrieved via OCI programming. In order to facilitate image retrieval, data is organized by groups according some principles, such as data types plus application domain. In actual applications, an interface is offered to support the user-defined data grouping.

Using the above technical strategies, based on .Net platform, we designed and implemented a MODIS data services WCS server. This server complies with the OGC WCS specification, and utilized the integration of web service, XML, and LINQ technology provided by the .NET platform to implement the expected system functions.

4. SYSTEM'S RELEASE AND RUNNING

The entire system has been completed in December, 2009, currently; the system has been released on Windows IIS, with the final run on Windows 2003 server. The service is normally deployed in the web site of LIESMARS of Wuhan University as a part of LIESMARS geo-spatial sharing and services platform, which are open to provide the MODIS data services for scientific computing and research of the geo-spatial community users.

5. CONCLUSIONS

MODIS image data's large data volume and complex storage format impede the directly circulate and use of MODIS data. With the introduction of WCS these problem will be improved and mitigated. WCS can be transparently deployed in the server-tier to complete various of data processing users is hard to achieve, and return the user the data to meet their requirements. This will not only greatly reduces the complexity of the application of MODIS data, but also greatly enhanced the efficiency of research and application of MODIS data. Therefore, the WCS server of serving MODIS data can contribute the Chinese geo-spatial society to better use of MODIS data and carry out scientific and applied research.

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