Dynamic Resource Dispatch Strategy for WebGIS Cluster Services

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Abstract. In order to meet the requirements of massive data processing and high quality of service, a WebGIS(Web Geographic Information System) cluster system has been developed which has the capability of balancing resources between servers. This cluster system includes three parts: a load balancer, a GIS server cluster, and a database of spatial and geographic information. The strategy of dynamic dispatch and the algorithm of adaptive load balancing service are presented in the paper.

Keywords: cooperative GIS, cluster services, load balancing strategy, concurrent processing.

1 Background

Generally, middlewares such as JAVA RMI[2]□CORBRA[3]□COM[4] are often used to balance the loaders by Web application servers. With the development of Internet and WebGIS application, GIS is used widely nowadays. There are massive number of users that retrieve and analyze the WebGIS spatial data and graphics data at the same time. This raises a very special problem in the cooperative visualization of the WebGIS. With more and more data transportation in WebGIS servers, the bandwidth of network transmission and capability of servers are required more strictly. WebGIS servers must meet the rapid increase of the number of the internet clients and server nodes with high dependability, scalability, and other QoS[5] features. To solve this special problem, an adaptive WebGIS server cluster system is under study about its adaptive load balance and dynamic resource dispatch to meet the requirement of massive data transportation, QoS and net parallel computing.

2 Components of the WebGIS Server Cluster System

In order to transmit requests from the clients to different severs properly, IP load balancing and dynamic feedback mechanisms are utilized in our cluster server system. The hot plug-in servers are used as a solution. The load balancer in the cluster system can shield the impedimentary servers automatically and add new GIS servers into the register. The whole server cluster has a high capability to deal with the dynamic

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loader change. An additional virtual server can be added by the load balancer when necessary. Therefore, the data transmission and information process are completely transparent to the clients. The whole system includes the load balancer, the GIS server cluster and the database servers for spatial information and geography properties.

2.1 The Load Balancer

A balancer ，a monitor and a register make up a load balancer[1]. The load balancer will be in charge of monitoring the load situation of each server dynamically dispatching suitable GIS servers for the request tasks. It maintains a server table, which contains registered address, scale weight and loader of registered GIS server in the dispatcher. Once the balancer receives a request from clients, it will appoint the lightest loaded GIS server to respond to the tasks according to the information and dispatch algorithm in the server table. The monitor has two tasks. One is to keep watching if each GIS server has impediments. If yes, the server will be removed from the server table to prevent dispatching tasks to the wrong GIS servers. The other is to collect the load information periodically, and renew the server table in order to adjust parameters of the dispatch algorithm in time. The register receives the register request from GIS servers, and searches their information in server table. If their information is contained in the table that means the GIS server has been registered in the cluster system successfully. If there is no information, the server will be added into the server table.

It is necessary to have an assistant load balancer to backup the information of the chief load balancer to avoid the whole system failure when the chief load balancer has impediments. The chief load balancer□the assistant load balancer and the GIS server cluster are connected by internet or intranet. The problem in the single joint impediment has been overcome using integrated dispatching. We have added an assistant load balancer to the whole WebGIS cluster system. As a result, the whole cluster system increased greatly its stability and reliability.

2.2 The GIS Server Cluster

The GIS Server Cluster is in charge of dealing with the client requests, sending the results to the clients. Each GIS server contains five modules, including a Receive module, a GIS module, a Sent module, a Load feedback module, and a Register module. The Receive module receives the package requests from the clients, parses them, and sends the parsed result to the GIS module. The GIS module retrieves spatial data, operates the geography property database and packs the result data into a XML data stream. The Sent module delivers the XML data stream on parsed IP address from the Receive module. The Load feedback module records the load condition of its GIS server. It must be informed in order to renew its load parameter while the Receive module sends a resulted XML data stream. It will feedback the parameters to the balancer according the requirement. The Register module is responsible for sending registered request to the load balancer. If it registers successfully, the GIS servers will be initialized, and server table in the load balancer will be updated.