"Digital Region" in the Context of the "Grid Computing"

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ABSTRACT This paper is to construct a "digital local, regional, region" information framework based on the technology of "SIG" and its significance and application to the regional sustainable development evaluation system. First, the concept of the "grid computing" and "SIG" is interpreted and discussed, then the relationship between the "grid computing" and "digital region" is analyzed, and the framework of the "digital region" is put forward. Finally, the significance and application of "grid computing" to the "region sustainable development evaluation system" are discussed.

KEY WORDS grid computing; SIG (spatial information grid); digital region

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Introduction

"Grid" computing has emerged as an important new filed, distinguished from conventional distributed computing by its focus on large-scale resource sharing, innovative applications, and in some cases, high-performance orientation. The concept of the "SIG" (spatial information grid) which is based on the grid computing and is the infrastructure and useful tool to construct the "digital region".

The regional sustainable development evaluation system is the foundation of the regional sustainable development, which is too complex to establish an evaluation index in the conventional way. So, it is urgent to call for an advanced method and technology for tackling this problem. The concept of "digital region", which is based on that of "digital earth", means using computer and networks to manage the information of the region, to model the regional development and to support the regional decisions. Constructing the "digital region" by using the "grid" idea and "grid"-related technology will offer a common information share and interoperation platform and can play an important role in the study of the system of the regional sustainable development evaluation system.

1 Grid computing

There are two definitions for grid: the narrow grid and the broad one. The former is defined by Ian Foster in July 2002. The restricted grid must contain three qualifications: ① using the resources cooperating with each other in non-centralized control environment, ② using the standard, open and common portal and interface, ③ offering non-normal services. The latter is called GGG (great global grid), it includes the computing grid, data grid, information grid, knowledge grid, and the network computing model such as p2p, etc. The traditional internet realizes the interconnect of the hardware. The web technology realizes the interconnect of the homepages and the grid tries to realize the interconnection of all the resources in the internet.

There are mainly four kinds of application domains in terms of Ian Foster and Globus group;
distributing, supercomputing, distributing instrument system, date intensive computing and long distance immerse.

2 SIG (spatial information grid)

Literally, spatial information grid is a kind of grid which offers a common agent based spatial information application services for the users using the spatial information infrastructure and spatial information network portal standards. Spatial information can be disposed in distributed environment intelligently and the user can have a single access to the logical portal. All kind of the spatial information resources can be managed and used unitedly by SIG.

The study of the framework of the spatial information grid involves the expression and release of the spatial information bottom layer of the spatial information database and function of the spatial data in middleware (related to the storage, interface and communication of the spatial data in this layer), and shows the users how the logical structure is delaminated, implemented and integrated.

Just as mentioned above, the concept of the “grid” coined after the power grid.

The aim of SIG is to make the users of spatial information use the uniform spatial information easily regardless of its storage location. In a word, SIG offers a universal spatial information services for the end users regardless of the detail computing installations and geographical location of the storage and computing of spatial information. Fig. 1 gives the crude framework of the spatial information grid.

![Framework of SIG](image)

3 Relationship between the digital region and the grid computing

The concept of “digital region” is an evolved one and is the concept of managing information resources, establishing the related application and offering relative services by use of network and computer technologies. It is affected and evolved by computer and network technologies.

We can use the idea and grid computing technology to construct a “digital region”. The “digital region” can be treated as the representative application of “grid” and “grid computing” which are just tools to implement the “digital region” and can not be treated as the whole of constructing “digital region”.

“Grid computing” is the key technology and network platform in constructing the “digital region”. Some aims of the “grid computing”, such as the information sharing, SOD (services on demand), can meet the need of the “digital grid”. We can say that the “digital region” supported by the “grid” and “grid computing” is a group of grids which support the spatial attribute. Its ultimate aim is to support the region sustainable development decision.

GGC (global grid computing) can be seen as a part of the “digital earth” to some extent. “Digital region” is an important part of the digital earth nerve network which is made up of at least two parts of the nerve cell and related linkage.

4 Digital region based on the grid computing

The framework of the “digital region” is constructed by the grid computing technology and grid idea, which is illustrated in Fig. 2.

5 Digital region and regional sustainable development evaluation system

The regional sustainable development is the key to the regional development problem. A re-
A case study is produced and perfected gradually, and a united index system is established also gradually with the development of the region in practice and experience. Constructing the “digital region” plays an important role in establishing the regional sustainable development evaluation index system.

Firstly, we can have a united access to the regional sustainable development information from the platform established on the grid computing.

Secondly, we can monitor the region on the “digital region” platform and offer the real and useful data for the establishment of the regional sustainable development evaluation index system.

Thirdly, we can construct the regional dynamic model for the regional development and set up the simulation system of the region.

The framework of “digital region” supporting the regional decision and regional sustainable development index system is illustrated in Fig. 3.

6 Conclusions

In this paper, we try to use the ideas of “grid” and “grid computing” to construct a “digital region”. We have drawn a conclusion that grid and grid computing is very useful to construct the “digital region” and can help to establish the regional sustainable development index system. Next we plan to product following work:

1 perfecting the framework of SIG and study the way to establish it with current grid technology;

2 perfecting the framework of the “digital region” and “regional sustainable development index system”.

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