

THE DESIGN OF THE LBS PLATFORM WITH THE IDEA OF “GRID” AND “GRID SERVICES”

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ABSTRACT

In this paper, the author try to demonstrate the importance of idea of the grid and grid services in the constructing of the LBS platform in the context of the digital city and a deeper study is conducted on the location based services based on the USIG and OGSA platform. Using the idea of Grid and grid services to construct the LBS in the context of “digital city” is a good usage of grid services. USIG (urban spatial information grid)is the fundament of digital city and can play an important role in constructing the location based services. LBS is a typical grid services and can be constructed by the OGSA (Open Grid Services Architecture).

KEY WORDS: Grid services LBS USIG digital city OGSA

1. INTRODUCTION

The term " the Grid " was coined in the mid-1990s to denote a proposed distributed computing infrastructure for advanced science and engineering (Atkinson, M. P. et al. 2002).“Grid” computing has emerged as an important new field, distinguished from conventional distributed computing by its focus on large-scale resource sharing, innovative applications. Grid services are the based on the idea of “GRID” computing and related to the concept of “web services”. The ideal of the grid and grid services is very useful and may be a revolution for the construction of the framework of the LBS (Location based services), which has made a rapid development in recent years. The SIG(spatial information grid),which is proposed on the idea of the grid and is far form the spatial information database and spatial information warehouse ,is the fundaments in constructing the digital city platform and the LBS in the context of the digital city. The idea of the grid is similar to the idea of the digital city to some extent, but the digital city means more than the spatial information grid .the idea of the grid and grid related technology is important to the construction of the digital city and it means application—LBS (location based services)

We can built the application of the LBS in the context of the digital city on the USIG(urban spatial information grid) which is the evolution of the USII(urban spatial information infrastructure) and the platform of the grid services (such as the OGSA platform) play on revolutionary role in the construction of the platform of the LBS. Currently, the design of the LBS platform is based on the conventional

distributed computing and some researcher try to use “web services” to construct this platform. Use the idea of Grid and grid services to construct the LBS in the context of “digital city” is not only a good application of “GRID” and “grid services”, but also of great importance to the development of the Digital City.

In this paper, the author try to demonstrate the importance of idea of the grid and grid services in the constructing of the LBS platform and a prototype one is constructed on the grid services platform--OGSA platform in the context of the digital city. The whole paper can be divided into 4 parts .First is the introduction, a preliminary review of the LBS and digital city is put forward in this part and followed by the review of the GRID and grid services in second part .then the: OGSA “is introduced and its potential effect on the construction of the LBS platform are discussed in the following parts. In the last part, some conclusions are drawn and the future work is lay out.

2. digital city and LBS

“LBS” is the abbreviation of location-based services .many organizations and projects have given the definition of the LBS from the perspective of their industry domain. Following are some definitions of the LBS from the main organizations.

Location-based services are services that empower (single or collections of) devices (and users or enterprises with devices) to acquire and take advantage of their location or mobility, or to acquire and take advantage of the location or mobility of other devices or objects with devices. (OGC2000).

Location-based services use subscriber’s geo-location to offer him appropriate answers to his current needs, depending on his geographical situation and usage environment.(Emily2000)

Location Based Services (LBS) are services that exploit knowledge about where an information device user is located (LBA2002)

A location service, in the broadest sense, is any service or application that extends spatial information processing, or GIS capabilities, to end users via the Internet and/or wireless network.(ESRI2000)

No one knows when and where the term LBS is first used, but there are many projects of LBS is implemented in European countries since the first location-based services are available in 1996 which carried by Italian mobile.

One of the main drivers for the development of ubiquitous positioning technology that can support a wide range of location-based services is the U.S. Federal Communications Commission (FCC) requirement for emergency service response to mobile E911 calls, As far as Europe is concerned, "Early in 2000, it seemed likely that the European Commission would follow America's lead in mandating mobile network operators to automatically locate subscribers via their wireless device" (Hoyde, 2001).

The LBS architecture basically comprises the components. The first component is the mobile positioning system. This can be network-based (AOA, TOA, TDOA), or handset-based (E-OTD, GPS), or A-GPS. The second component is the mobile telephony network,. The third component is the location-based service application

itself.(emily2000)

Following is the classification of the LBS from the usage(emily2000)

Assistance services

Location-based push services

Location based pull services

In-vehicle guidance

Pedestrian guidance

Community services and games

Assets Tracking

3. LBS and digital city

Digital city is the understanding of the city in the information age. Many researchers have envisioned digital city from the perspective of their own research fields .the digital city we defined here is the one which is come from the idea of “digital city “and is one node of the digital earth .

LBS is the basic application of the digital cities. The physical city is spatial-temporal world and the Location is central to how people organize and relate to their world and is the most valuable in city lives. We often want to know about the location of people, objects, and phenomena. Location based services can servers as the digital city information systems reflect the physical urban life. So it is necessary to organize the information in the digital city platform by location just like we organize the affairs in urban lives.

We summarize the relationship of the digital cities and LBS as following:

- (1) the digital city platform is the fundament of the location based services
- (2) LBS is the most fundamental application and services in digital cities in our lives
- (3) Ubiquitous LBS in urban lives is the aim of the digital cities
- (4) LBS is the bond of the digital cities and physical city from the perspective of urban usage
- (5) LBS is the killer application of digital cities

4. grid ,Spatial information grid and LBS

In the past few years, “Grid” computing has emerged as an important new field, distinguished from conventional distributed computing by its focus on large-scale resource sharing, innovative applications, and, in some cases, high-performance orientation. (Ian Foster 2001) The term “the Grid” was coined in the mid1990s to denote a proposed distributed computing infrastructure for advanced science and engineering (Foster, I. 1999) Grid technologies support the sharing and coordinated use of diverse resources in dynamic VOs—that is, the creation, from geographically and organizationally distributed components, of virtual computing systems that are sufficiently integrated to deliver desired QoS (Foster, I.2001) Considerable progress has been made on the construction of such an infrastructure. In the next few years, the Grid will provide the fundamental infrastructure not only for e-Science but also for e-Business, e-Government, e-Science and e-Life. The Grid will serve as an enabling technology for a broad set of applications in science, business, entertainment, health and other areas.(fran berman 2002).

The concept of the “SIG” (spatial information grid) which was put forward based on the grid computing, is the fundamental plan and useful tool to construct the “digital city”. SIG is a intelligent information platform which is built based on the current spatial information infrastructure and spatial information network protocol specification and from which the user can obtain the common spatial information services conveniently. The procession of the spatial information in this platform is distributing collaborated and intelligent in this platform and user can visit all spatial information use the common protocol and do not need to goggle the information he needed from million website from internet. The aim of the SIG is to realize the SOD(service on demand) of Spatial information and services. The essential of the SIG can be treated as the spatial information services infrastructure which lies on the layer of the grid application.

Digital city, which is the most important part of the digital earth, is the node of the digital earth and can be envisioned as the node of the global spatial information grid from this point of view.but the digital city has more geography meaning and application meaning than the SIG and grid computing .we deem that the digital city can be seen as a interesting application of SIG and grid computing and has the more broad meaning than them. The essential of application services of digital city is urban spatial information (USIG) and the upper application and DDS layers which based on it.

Currently, digital city application service platform we will design will based on the urban spatial grid(USIG)and its offer the urban location based services(ULBS).

The framework of the digital cities can be divided into following three parts (1) urban data grid (2) urban spatial information grid (3) urban spatial services grid .

LBS is one kind of urban spatial services .The figure1 is the LBS platform based on the USIG and USDG. From the figure, we can see that the lbs platform is based on the USDG(urban spatial data grid)and USIG(urban spatial information grid) and is a special grid services from the perspective of the GRID.

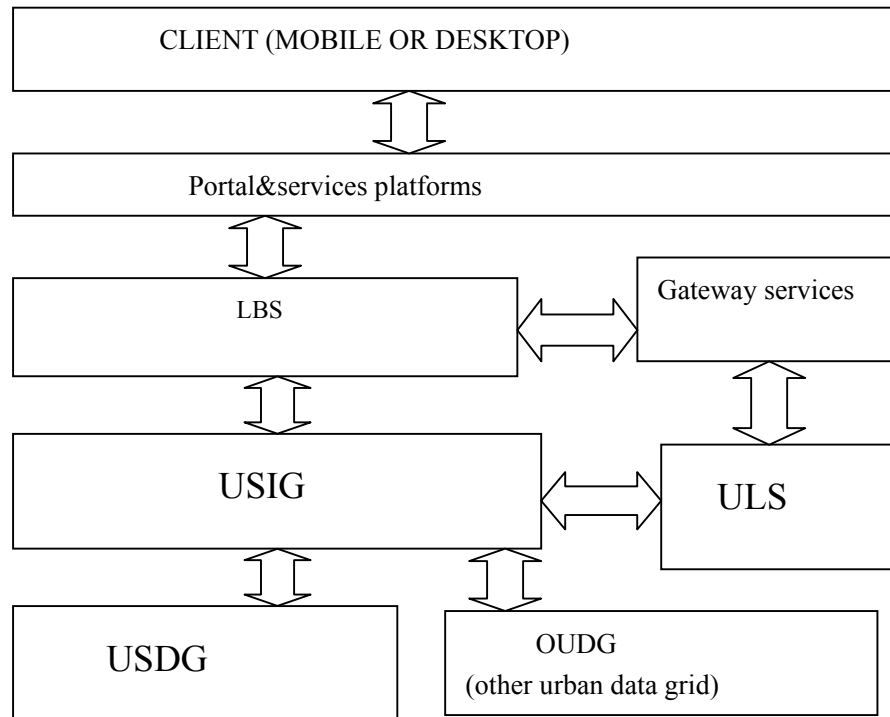


Figure1 The framework of the location-base services with the idea of grid and digital city

5. OGSA and its potential role in the construction of LBS

Based on the idea of the grid, the grid services and data grid are proposed to meet the different demand. The Open Grid Services Architecture (OGSA) has been proposed as an enabling infrastructure for systems and applications that require the integration and management of services within distributed, heterogeneous, dynamic “virtual organizations”(Foster, I.,2002)Building on Web services and Grid technologies, OGSA proposes to define a core Grid service semantics and, on top of this, an integrated set of service definitions that address critical application and system management concerns. (I. Foster,2003)

In general , Grid environments tend to be heterogeneous and distributed.(I. Foster,2003)

- Platforms. The platforms themselves are heterogeneous, including a variety of operating systems (Unixes, Windows, and presumably embedded systems), hosting environments (J2EE, .NET, others), and devices (computers, instruments, sensors, storage systems, databases, networks, etc.).
- Mechanisms. Grid software can need to interoperate with a variety of distinct implementation mechanisms for core functions such as security.
- Administrative environments. Geographically distributed environments often feature varied usage, management, and administration policies (including policies

applied by legislation) that need to be honored and managed.

The computing environment of location based service in context of digital Cities is heterogeneous and distributed environment and meet above four standards, so the location based services is an grid services to some extent and we can use the OGSA to construct the LBS in the context of the digital cities. The digital city application services platform can be an OGSA application confine to a city to external resource sharing and services by different urban management organization (virtual or physical) resource sharing and service In the urban context to achieve various end-to –end qualities of services when running on top of the different urban application platform.

Location based services, a representative digital city application services, which is a special grid services and can be construct on the OGSA in the context of the digital cities. Almost all of the pull location based services and some push location based services such as location based games, location based emergency response system need the interaction and it is very important to guarantee response times for these contents. A number of service providers and sections must be integrated into the location based services to make this work and support the emergency response system, the detailed discussion can be found in the paper in progress. The location based services itself is an heterogeneous and distributed integrated platforms, So it is necessary to use the OGSA to construct the location based services.

6 Conclusions and further works

In this paper, we just try to use the idea of grid and grid services in the construction of LBS(location based services) in the context of digital cities .some conclusion are drawn as following :

- (1) Grid and grid services is of great importance to LBS and digital cities.
- (2) USIG (urban spatial information GRID) is the basis of LBS.
- (3) It is necessary to construct the LBS using the OGSA

Using the idea of grid and grid services to construct the Location based services is a new idea .we just put forward a crude idea and solution and related research is just on the burgeon, below are some of them.

- (1) detailed design of the USIG(urban spatial grid)on the current grid technology to support the digital cities.
- (2) detailed user cases analysis of the LBS in the context of OGSA
- (3) detail design of the LBS based on the spatial information grid and OGSA
- (4) a representative usage f the LBS in the context of “digital haierbin” based on the OGSA.

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