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Introduction to Internet GIS

As it is well known, the age of the Internet has arrived. The 19th century was the era of the railway, the 20th century the era of the expressway, and the 21st century the era of the Internet. With the development of Internet techniques comes intense requirements for GIS, it is a certain trend for GIS development to help users browse, query, and analyze spatial data through the Internet.

The Internet GIS is the result of Internet technology applied to GIS. Through the World Wide Web, GIS functions can be expanded and have become a popular tool. The Internet user can browse, query, or analyze spatial data and thematic maps by accessing the Internet at any node. Therefore, GIS will be brought into every family in future.

Internet GIS can be widely used to build WebGIS by scientific research institutes, governments, and enterprises through their respective intranets. Internet GIS is a distributed GIS solution which can be maintained easily.

Internet GIS characteristics

Globalization: Any Internet user can take advantage of various GIS services by simply accessing the Internet GIS server through any World Wide Web node. The user can even update the GIS data through the Internet globally.

Popularization: GIS was held and used only by few experts as a special tool which is difficult to generalize the uses because of the high cost and difficult techniques involved in the past. With the explosive development of the Internet, Internet GIS supplies a better opportunity for more users to use GIS especially with the Internet services becoming more accessible to the public. Moreover, the reduction of the
economic and technological burdens of the end user has further expanded the potential applications range of GIS.

**Expandability:** Internet GIS can be easily and seamlessly integrated with other service information thereby establishing a more flexible GIS application.

**Cross-platform:** Before using Internet GIS, GIS software has not support cross-platform. Even at that time, many companies supply different GIS versions for different operating systems such as Windows, UNIX, Macintosh, etc. However, Internet GIS can be directly run anywhere as a cross-platform once it has been programmed.

SuperMap Software Co., Ltd.

April, 2010
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Appendix 1 List of SuperMap IS .NET Functionality

Functions provided by Map Engine
List of Supported Functions by Map Engines
List of Additionally functions provided by Spatial Analysis Engine
Functionalities provided by Map Editing Engine
Custom Extending Engine
Functions provided by WebControls
Accessory tools of WebControls
SuperMap IS WebService
Others
SuperMap IS .NET is a new generation WebGIS development platform based on .NET technology and SuperMap Objects Component GIS technology. It adopts Internet-based distributed computing technology to meet the needs of integration among regional- and network-crossing, as well as large scale complex network application systems. SuperMap IS .NET consists of user interface presentation components, Web server extensions, GIS application servers, data servers, and remote management. The SuperMap IS .NET Components and Architecture is shown in Figure 1-1.
1.1 Spatial Information Publishing

SuperMap IS .NET mainly provides online and real-time spatial information services, including spatial data browse and query and spatial analysis operations (such as optimal path analysis) based on interactive digital maps and other location-based services.

When the user visits an application provided by a service vendor, the client (browser) sends a HTTP request to the Web server for a response. If the request relates to a GIS service, the Web server will transfer the request to the GIS application server to produce corresponding processed results and return them back to client as an Internet standard image (PNG format or JPEG format) or vector data stream (XML format).

Besides the general WebGIS functionalities, such as interactive digital map operations and queries, SuperMap IS .NET also provides advanced spatial analysis functionalities, such as shortest/optimal path analysis, objective buffer analysis, bus line query, and bus transfer analysis.
1.2 Spatial Information Service Publishing

Establishing Web applications based on SuperMap IS .NET will publish not only spatial information visually but also location-based Web services. SuperMap IS .NET Web services publish GIS functions through the Internet, such as map services, spatial-related query services, and spatial analysis services. Service vendors can directly publish Web services on their respective websites to provide the public with general GIS services, or integrate SuperMap IS .NET Web services with third-party Web services to make full use of spatial data, hardware as well as marketing resources to provide more professional Web services. Service consumers can use these Web services to implement GIS requests and functions without spatial data management. Thus, it decreases the costs of system development and maintenance.

An asyn-architecture system can quickly integrate GIS services with SuperMap IS .NET Web services. For example, a system based on J2EE can easily connect with SuperMap IS .NET and provide the user with spatial-related analysis services.

1.3 Spatial Information Online Editing

With the development of Internet techniques and the deep application of WebGIS, more and more users require editing spatial data online. SuperMap IS .NET provides the functions to edit spatial data concurrently and implement data collection and maintenance remotely.

1.4 GIS Service Remote Management

The service management program of SuperMap IS .NET adopts the general client type——browser. It adopts a standard Web program to manage the GIS application service, modify system parameters dynamically, and adjust system parameters remotely without interruption of GIS services.
1.5 Spatial Meta Data Publishing and Management

SuperMap IS .NET provides map catalogue services by collecting meta information from the WebGIS industry website and building multiple hierarchy catalogues according to industry or region. The map catalogue service implements map-oriented spatial data sharing and integration. Spatial information service providers register their data service descriptions on map catalogue services, which manage meta data on a center database. The user can obtain the information about the provider and check the provided services to feed the needs by querying. Map catalogue services provide a portal system with a powerful search tool in terms of spatial relation or location. Because the service is based on pure Web technology, it is easily integrated with other B/S application systems. It is also a stateless service and the system scope is easily expanded.

1.6 Conforming to the OGC Service Specifications

OGC defines a suite of specifications for spatial data sharing and interoperation for asyn architecture systems. According to the specifications, different systems must conform to the same operation semantics and command parameters to implement message-based system interoperation. WMS is the most important protocol concerning the Web mapping operation specifications and is the common gateway for asyn architecture systems to implement network-crossing map operations. SuperMap IS .NET conforms to the latest WMS specifications, i.e., WMS 1.3. Details of WMS and other specifications can be found on the OGC website (http://www.opengis.org/).

1.7 WebGIS-based Website Application Development Platform

In essence, SuperMap IS .NET not only provides a large scale, complicated network system with powerful GIS services, but it is also a development platform for WebGIS,
which is a main factor that makes SuperMap IS .NET different from other WebGIS systems. SuperMap IS .NET SDK (Software Development Kit) has rich content and provides several development modes:

1. WebControls development mode. The series of WebControls provide visual and dragable components to program, so these components in programming mode can be used to develop desktop programs simply by dragging and dropping. It supports uniform program design and practical interface when running. The running result can be displayed in advance in the design stage.

2. Web service development mode. SuperMapIS .NET Web service provides Internet GIS functionalities and is transferred by HTC components or desktop client.

3. GIS service engine development mode. The default GIS service engine is a .NET component with self-description information, which can be reused by inheriting or aggregating when it cannot fill the special needs of the user. The customized GIS service can be easily integrated into the GIS application server. SuperMap IS .NET will provide other development modes in the subsequent version.
Chapter 2

Installing and publishing

2.1 Microsoft Internet Information Server Installation and Configuration

After installing the required operating system, the Microsoft Internet Information Server (IIS) should be installed because later installation of .NET framework will automatically install other programs to permit IIS support .NET technology. If IIS is installed after .NET Framework, many programs for supporting .NET technology will have to be installed individually.

To verify the IIS installation, try to visit http://Localhost. If it is accessible, the IIS installation is successful.

2.2 NET Framework Installation

After IIS installation, .NET Framework should be installed to support SuperMap IS .NET. If the user wants to develop applications, Microsoft Visual Studio 2008
(recommended) or other tools should be installed.

2.3 SuperMap IS .NET Installation

The user can start SuperMap IS .NET installation program located in \SuperMap IS .NET\Setup.exe on the CD-ROM, operate and install it according to the guide.

2.4 Configuration SuperMap IS .NET

After installation the SuperMap IS .NET, the **License Configuration** dialog box will pop up, and it is as shown in Figure 2-1.

![License Configuration dialog box](image)

Figure 2-1: License Configuration dialog box

Tip: you can also select **Start\Programs\SuperMap\SuperMap License Manager(6.x)** to open the dialog box as shown in Figure 2-1.

Before choosing the license type, you should to confirm the license type of SuperMap IS .NET you have purchased. There are two Editions of SuperMap IS .NET: SuperMap IS .NET Professional Edition and SuperMap IS .NET Enterprise Edition. The licenses of different Editions have different accesses, for the details information
of these licenses please refer to the section 3.1. If you don’t know the license type you purchased, please contact with our salesman.

Please refer to section 3 to learn how to configure SuperMap IS .NET with hardware key and license file.

### 2.5 SuperMap Objects Installation

SuperMap Objects together with SuperMap IS .NET must be installed. Runtime version and development version of SuperMap Objects are both acceptable. The order of installation for SuperMap Objects, SuperMap IS .NET, and DirectX is not fixed and can be changed freely.

### 2.6 DirectX Installation


### 2.7 The installation directory

#### 2.7.1 System directory

1. The system directory

After the installation and configuration with SuperMap IS .NET, it has the installation directory as shown in Figure 2-2.
Bin folder: there are map engine, map server application and map configuration files in this folder. It is the core of the SuperMap IS .NET, and don’t modify this folder yourself.

Data folder: there is the sample data used by the demo in SuperMap IS .NET.

Demo folder: there are five demos supported by SuperMap IS .NET in this folder, it includes AspxDemo, AspxDemoVB, CustomEngine, MobileMap and WinFormClient.

Documents folder: there is the document resources supported by SuperMap IS .NET, it includes GettingStarted with SuperMap IS .NET, SuperMap IS .NET manual and SuperMap IS .NET Developer Manual.

Extras folder: there are the extras tools supported by SuperMap IS .NET in this folder, it includes BusNetworkManager and eWebMap.

Getting Started folder: there is the sample code in this folder corresponding to the GettingStarted with SuperMap IS .NET.

Manager folder: it is used to configure and manage the map service.

Output folder: it is the default address that used for storing the images which generated by SuperMap IS .NET map service.
**SampleCodeLibrary** folder: it provides AjaxScripts sample programs of different functions, such as query, thematic map, spatial analysis, network analysis, data editing, data operation, etc.

**WebSDK** folder: the WebControls for developer.

**Support** folder: the Microsoft Enterprise Instrumentation installation program.

**WebService** folder: the GIS functionalities based on spatial information, such as MapService, QueryService, SpatialAnalysisService, etc.

2. The start menu

After installation, the SuperMap IS .NET has been added into the start menu, its structure is shown in Figure 2-3:

![Figure 2-3: the Start menu](image)

### 2.7.2 The virtual directory

![Figure 2-4: Virtual Directory Created by SuperMap IS .NET](image)

Successful installation of SuperMap IS .NET will create a series of virtual directories
automatically (shown in Figure 2-4). The path of all virtual directories will be in the SuperMap IS .NET installation directory.

After creating the virtual direction, the asp.net version of each item in this direction should be set to 2.0. For example:

- Right-click ISmanager in the directory;
- Select Property in the shortcut menu, a dialog box will be popped-up in the window, and then select ASP.NET in this dialog box.
- Select the version of the ASP.NET is 2.0, as shown in Figure 2-5.

![Figure 2-5: selecting the version of ASP.NET](image)

2.8 FAQ in installation

1. A dialog box will be popped up when installing the SuperMap IS .NET without the .NET Framework in your computer, as shown in Figure 2-6. Click ok to exit the
installation, and then install the .NET Framework 3.5 in your computer. After installing the .NET Framework 3.5, you can run the installation program of SuperMap IS .NET again.

![Image](image1.png)

Figure 2-6: the .NET Framework is needed in system

2. A dialog box will be popped up when installing the SuperMap IS .NET without the Internet Information service (IIS) in your computer, as shown in Figure 2-7. Click ok to exit the installation, and then install the Internet Information service (IIS) in your computer. After installing the Internet Information service (IIS), you can run the installation program of SuperMap IS .NET again.

![Image](image2.png)

Figure 2-7: IIS is needed in system

3. If you install the .NET Framework before IIS, the IIS should to be registered by yourself.

   - Select *Start\Programs\Microsoft .NET Framework SDK v2.0\SDK*
Command}, the SDK Command window will pop up as shown in Figure 2-8:

![SDK Command window](image)

- Types the command of `aspnet_regiis -i` in the window, and then enter.

2.9 Starting service

2.9.1 Start service from the Start menu

After installing the SuperMap IS .NET and the related software, we can start service from the Start menu. Click `Start\Programs\SuperMap\SuperMap IS .NET\SuperMap IS .NET Service Controls\Start Service`.

2.9.2 Start SuperMap IS .NET Manager

Start ISManager

A local user inputs the address of management website such as [http://Localhost/IS/Manager](http://Localhost/IS/Manager) or [http://ServerName/IS/Manager](http://ServerName/IS/Manager) in the address bar of IE browser and can visit the website without user validation. The visitor telneting via intranet or Internet should type his username and password for validation. The homepage of SuperMap IS .NET manager is a navigation page as shown in Figure 2-9.
Start Service

Click Service on the left of the homepage to enter the service page as shown in Figure 2-10. Each service item has a service status column and Stop/Start button. The Stopped or Running information in the status column displays the current running state of the service. To start map service, just click Stop/Start button behind SuperMap IS ServerManager and the service control window will popup as shown in Figure 2-11, then select Start Service and click Submit button.
Figure 2-10: the service page

Figure 2-11: service control page

If an error occurs when starting SuperMap IS .NET Manager as shown in Figure 2-12, we can get the error information that marked in red in the error information window:

```
Line: <configuration xmlns="http://schemas.microsoft.com/.NetConfiguration/v2.0">
```

At the same time, we can get the version information of the .NET Framework in the box as below.
Figure 2-12: error occurs when starting ISManager

From this page, we can find out the reason why this error occurs. The version of .NET Framework SuperMap IS .NET needs is 2.0, but the version has been selected by default is 1.0, so we should to change it to 2.0:

- Right-click My Computer in desktop, and then select Manage in the shortcut menu.
- Select Services and Application\Internet Information Services (IIS) Manager\Web Sites\default web site in the Computer Manage window and then Right-click Manager in the directory.
- Select Properties in the shortcut menu, an Manager Properties dialog box will be popped up.
- Select the ASP.NET option in this dialog box, and select the ASP.NET version to 2.0 as shown in Figure 2-13.
Click `Start\Programs\SuperMap\SuperMap IS .NET\SuperMap IS .NET Samples\WebControl Samples\Browse AjaxDemo`, the SuperMap IS .NET Demo will be displayed shown in Figure 2-14. The source code of this demo can be used in your WebGIS system.
4. If an error occurs when browsing the demo, and the error message is:

   *No connection could be made because the target machine actively refused it.*

   And the Source Error in line 203 is shown in Figure 2-15:

   ```csharp
   string[] b = this.MapControl1.MapNames;  // for debug.
   ```
Figure 2-15: error occurs when browsing demo

From this error message we can find out the reason why this error occurs, it means the map service hasn’t started successfully, maybe the license is invalid or the workspace isn’t exist.

- First, we come to the installation directory of SuperMap IS .NET to open the log file, and the path is *SuperMap IS .NET \BinLog*. The log file whose name is the date will be generated by SuperMap IS .NET everyday, such as 20061219. If the content in the log file is shown as below in Figure 2-16, and the message in the box is:

2009-01-12 16:29:14.828+08:00   [I]  Invalid License. Please contact to SuperMap Software Co., Ltd
Installing and publishing SuperMap IS .NET Manual

Figure 2-16: Messages in SuperMap IS.AppServer.exe.MapServer1.log

Because of the invalid license, the map service is fail to start. Please to configure the related license again (Select Start\Programs\SuperMap> SuperMap License Manager 6 to open the license manager tool), the details information that how to configure the license manager please refer to the section 3.

- If the error message in log file is shown as Figure 2-17, and the message in box is:

2006-12-28 09:32:33.140+08:00  [E]  Fail in opening Workspace '.\Data\SMISSampleData.smw'

2006-12-28 09:32:33.171+08:00  [I]  Failed in starting application server.

2006-12-28 09:32:33.203+08:00  [I]  SuperMap IS is stopped
Please to confirm the spatial data in Data folder exists under the installation directory or not. There will be five data files in this folder by default, they are changchun.sdb, changchun.sdd, world.sdd, world.sdd and SMISSampleData.smw. If some of these files dismissed or the Data folder isn’t exist, the data can be gotten from the installation program.

5. An error occurs when browsing the demo as shown in Figure 2-18. The error message is: Parser Error. And the Source Error displayed in the window is:


From the message in the box of this page, we can find out the reason why this error occurs. The version of .NET Framework SuperMap IS .NET needs is 2.0, but the version has been selected is 1.0 by default, so the version should be changed to 2.0.

- Right-click *My Computer* in desktop, and then select *Manage* in the shortcut menu.
- Select *Services and Application\Internet Information Services (IIS)*
Manager\Web Sites\default web site in the Computer Manage window and then right-click ASPxDemo in the directory.

- Select Properties in the shortcut menu, an ASPxDemo Properties dialog box will be popped up.

- Select the ASP.NET option in this dialog box, and select the ASP.NET version as 2.0 as shown in Figure 2-19.

![ASPxDemo Properties dialog box](image)

Figure 2-19: selecting the version of ASP.NET

6. When starting the demo and the window displayed as shown in Figure 2-20, the map window is blank.
First, open the SuperMap.IS.AppServer.exe.MapServer.log under the SuperMap IS .NET Installation directory\Bin\Log as shown in Figure 2-21. The message in box is: *The layers of map ‘changchun’ is empty, please check whether the opposite datasources can be opened correctly or has been used by other application.*

- To check if the workspace has been used by other application, if the workspace has been used by other application (such as SuperMap Deskpro), please to stop the application and restart the map service, then open the demo again.
If the workspace isn’t used by other application, please open the workspace through SuperMap Deskpro to confirm if the data can be used. The path of this workspace is under the SuperMap IS .NET Installation directory\Data and the name is SMISSampleData.smw. If the map displayed in SuperMap Deskpro is blank, please come to the install directory under the disk to get the data, and then use this data to replace the default one.

When starting the demo and it is displayed as shown in Figure 2-22, the map window is blank with a waiting image.

To confirm if the output folder exists, and the folder is under the SuperMap IS .NET Installation directory by default. If the folder exists and the property isn’t read-only, to confirm if the virtual direction of the folder is correct.

Right-click the icon of My Computer on desktop.

Select Manager in the shortcut menu, a dialog box will be popped up.

Select Services and Applications\Internet Information Service (IIS) Manager\Web Sites\default web site.

Right-click output directory and select properties in the shortcut menu, a dialog box will be popped up.
Select Virtual Directory, and then pitch on the radio button before a directory located on this computer.

Fill in the text box of Local Path with the local directory of the output folder.

7. If there are errors occur when using SuperMap IS .NET to load map or do some other operations, maybe the version of SuperMap Objects is not the expected version by SuperMap IS .NET. Open the SuperMap.IS.AppServer.exe.MapServer.log under the SuperMap IS .NET Installation directory\Bin\Log as shown in Figure 2-23. It will display the version information of the SuperMap Objects in the first line of this file. If the version of SuperMaop Objects is not the expected version of SuperMap IS .NET, please install the SuperMap Objects in the disk which match the SuperMap IS .NET.

Figure 2-23: the log message when the versions are different
3.1 License types of SuperMap IS .NET

To meet the specific needs of different users, SuperMap IS .NET comes in two editions, Enterprise and Standard, that are provided in the same installation package and require different licenses to run. The two editions differ mainly in the functionalities supported. Users can select and take full advantage of the most suited edition according to their individual needs.

**Table 3-1: Supported Functionality in the Two Editions**

<table>
<thead>
<tr>
<th>Module</th>
<th>Function</th>
<th>Standard</th>
<th>Enterprise</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Engine</td>
<td>Spatial database engine</td>
<td>√</td>
<td>√</td>
<td>Support large-scale DBMS, including Oracle\SQL Server\DB2\Kingbase.</td>
</tr>
</tbody>
</table>

SuperMap IS .NET Manual
<table>
<thead>
<tr>
<th>Module</th>
<th>Function</th>
<th>Standard</th>
<th>Enterprise</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web datasource engine</td>
<td></td>
<td>√</td>
<td>√</td>
<td>Support aggregating Web data sources, WMS/WFS services on the GIS service layer.</td>
</tr>
<tr>
<td>Server Manager</td>
<td>Logging</td>
<td>√</td>
<td>√</td>
<td>The three levels of logging contain information about start/stop events as well as errors and warnings.</td>
</tr>
<tr>
<td></td>
<td>Precache</td>
<td>√</td>
<td>√</td>
<td>The GIS server will cache the maps based on the cache configuration file before clients request the maps, thus reducing response times.</td>
</tr>
<tr>
<td></td>
<td>Service management</td>
<td>√</td>
<td>√</td>
<td>Configure and manage GIS services through the Web page, including: creating/deleting/configuring GIS servers; creating/deleting/configuring application services; starting/stopping GIS services/cluster services; managing service logs; setting workspace directories; etc</td>
</tr>
<tr>
<td>Map</td>
<td>Map</td>
<td>√</td>
<td>√</td>
<td>Pan, zoom, full extent, etc.</td>
</tr>
<tr>
<td>Module</td>
<td>Function</td>
<td>Standard</td>
<td>Enterprise</td>
<td>Notes</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------</td>
<td>----------</td>
<td>------------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Service</td>
<td>navigation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Projection on the fly</td>
<td>√</td>
<td>√</td>
<td>Create maps in the specified projection.</td>
</tr>
<tr>
<td></td>
<td>Coordinates transformation</td>
<td>√</td>
<td>√</td>
<td>Transformation of coordinates between geographic and planar coordinates, and between geographic and display coordinates.</td>
</tr>
<tr>
<td></td>
<td>Distance/Area Measurement</td>
<td>√</td>
<td>√</td>
<td>Measure distances and areas.</td>
</tr>
<tr>
<td></td>
<td>Legend</td>
<td>√</td>
<td>√</td>
<td>Get map legend</td>
</tr>
<tr>
<td></td>
<td>Thematic Mapping Dynamically</td>
<td>√</td>
<td>√</td>
<td>Unique Values Map, Ranges Map, Graph Map, Dot Density Map, Graduated Symbols Map, Label Map, User-defined Map, Grid Map.</td>
</tr>
<tr>
<td></td>
<td>Spatial Query</td>
<td>√</td>
<td>√</td>
<td>Query objects based on spatial relationships.</td>
</tr>
<tr>
<td></td>
<td>Attribute Query</td>
<td>√</td>
<td>√</td>
<td>Support querying objects by attribution.</td>
</tr>
<tr>
<td>Module</td>
<td>Function</td>
<td>Standard</td>
<td>Enterprise</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------</td>
<td>----------</td>
<td>------------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Data Service</td>
<td>Dataset/DataSource Information</td>
<td>√</td>
<td>√</td>
<td>Get dataset/datasource information</td>
</tr>
<tr>
<td></td>
<td>Data Exploration</td>
<td>√</td>
<td>√</td>
<td>Explore data and query data by location/attribution.</td>
</tr>
<tr>
<td></td>
<td>Data Editing</td>
<td>√</td>
<td></td>
<td>Provide interfaces for adding/deleting/modifying data, which can be used for developing these data editing functions.</td>
</tr>
<tr>
<td></td>
<td>Client-side Data Editing</td>
<td>√</td>
<td></td>
<td>Support interactively editing data, e.g. adding, modifying, and changing data, on the client side.</td>
</tr>
<tr>
<td></td>
<td>Workspace/Datasource Management</td>
<td>√</td>
<td></td>
<td>View workspace information; view, open, and close datasources; display, add, and remove maps.</td>
</tr>
<tr>
<td>Cluster Service</td>
<td>Cluster Service</td>
<td>√</td>
<td></td>
<td>Support multiple instances (servers) cluster. Cluster service registers multiple GIS services onto the cluster server and provides services to the clients through the same</td>
</tr>
<tr>
<td>Module</td>
<td>Function</td>
<td>Standard</td>
<td>Enterprise</td>
<td>Notes</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------</td>
<td>----------</td>
<td>------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Map Service Publishing</td>
<td>SOAP Service</td>
<td>√</td>
<td>√</td>
<td>SOAP based Web services</td>
</tr>
<tr>
<td></td>
<td>REST Service</td>
<td>√</td>
<td>√</td>
<td>Publishing RESTful services (AjaxHandlers).</td>
</tr>
<tr>
<td></td>
<td>WMS</td>
<td>√</td>
<td>√</td>
<td>Publishing WMS services</td>
</tr>
<tr>
<td></td>
<td>WFS</td>
<td>√</td>
<td>√</td>
<td>Publishing WFS services</td>
</tr>
<tr>
<td></td>
<td>WCS</td>
<td>√</td>
<td>√</td>
<td>Publishing WCS services</td>
</tr>
<tr>
<td></td>
<td>KML</td>
<td>√</td>
<td>√</td>
<td>Publishing KML services</td>
</tr>
<tr>
<td></td>
<td>GeoRSS</td>
<td>√</td>
<td>√</td>
<td>Publishing geographic location services in GeoRSS format</td>
</tr>
<tr>
<td>Development Support</td>
<td>.NET SDK</td>
<td>√</td>
<td>√</td>
<td>The following are included: 1. SuperMap Web controls used for Web application development</td>
</tr>
<tr>
<td>Module</td>
<td>Function</td>
<td>Standard</td>
<td>Enterprise</td>
<td>Notes</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------</td>
<td>----------</td>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>2. SuperMap Services and custom engine interfaces for GIS application development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Other .NET development kit.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JavaScript SDK</td>
<td>√</td>
<td>√</td>
<td></td>
<td>A JavaScript software developer kit for browser development</td>
</tr>
<tr>
<td>Advanced Analyses</td>
<td>Advanced spatial analyses</td>
<td>√</td>
<td></td>
<td>Provide advanced spatial analysis services, including buffer, overlay, and spatial operations. Spatial operations include: Clip, Erase, Identity, Intersect, Union, and Symmetrical Difference.</td>
</tr>
<tr>
<td>Network Analyses (Public Transportation Analyses Included)</td>
<td>√</td>
<td>√</td>
<td></td>
<td>Provide analysis services based on network data. Network analyses include Finding Shortest Path, TSP Analysis, Closest Facilities, and Service Area. Public transportation analyses include Bus Transfer Analysis, and Querying Bus/Subway/Railway</td>
</tr>
</tbody>
</table>
When SuperMap IS .NET server starts, it will read the license information first, following the PRI of Enterprise Edition, Standard Edition to seek for license information, and provide the corresponding service access according to the license type. If the user possesses multiple edition licenses of SuperMap IS .NET at one time, for example, both trial license of Enterprise Edition and formal Edition of Standard Edition, and configures the two licenses in License Manager. In this case, SuperMap IS .NET service will find the Enterprise Edition license first according to the PRI mentioned above, and provide the access for this edition. If the user want to use the Standard Edition license rather than the former Enterprise Edition, the user need to eliminate the former Enterprise Edition in License Manager first.
3.2 License Configuration

The License Configuration tool can configure the licenses for the SuperMap product series. For the Windows operating system, two types of license configurations are available: by license file and by hardware key.

3.2.1 License File

File license is a license given in the file format that you can use to run the software.

Ensure that you have obtained the license from SuperMap Software Co., Ltd. before you start to configure. You could supply your computer name, your company name and user name to the technical support center of SuperMap Software Co., Ltd. to obtain the license file.

1. The License Configuration tool will run automatically after installing SuperMap products. You can also click Start > Programs > SuperMap > SuperMap License Manager 6 > License Manager 6 to run it. In addition, You can also use the file LicenseManager6.exe in [System disk]\Program Files\Common Files\SuperMap\LicenseManager to run this tool
2. Enter your computer name, your company name and user name used for applying the license file and choose the relevant license file with the .lic extension:
3. Click the Verify button to check whether the license is valid; if so, the remark “Valid” will appear in the "State" column, as shown below.

Note that the license is valid only when the computer name, company name and user name are consistent with that you provided to apply for the license.
4. Click the Save button to save the current configuration information in the configuration file SuperMapLic.ini. (For details about the configuration file, see 1.1.3.)
5. Click the Close button to exit the License Configuration tool.

**3.2.2 Hardware Key**

A hardware key is a license provided in the format of encryption key.

There are four kinds of hardware keys available: the stand-alone key, the stand-alone time key, the network key and the network time key.

The stand-alone key has only one license installed on the same computer with the relevant SuperMap product.

The stand-alone time key is similar to the stand-alone key but with a time limit for use.

The network key allows the software to be used by multiple licensed computers. You...
only need to install the network key license on any computer (called license server) within the network and the other computers in the same network are all licensed to use the software. The number of licensed computers is determined by the network key.

The network time key is similar to the network key but with a time limit for use.

The time limit of the time key, usually six years, is controlled by the battery within the key. If the time key expires, you can apply to SuperMap Software Co., Ltd. to extend the time limit. The stand-alone key and the network key do not have any time limit, but note that you can’t change the system time of the licensed computer.

Before using the hardware key you must install the driver. Once you have successfully installed the driver you can plug the hardware key in the parallel port or USB port of the computer. Currently, SuperMap provides hardware keys of two companies: Aladdin and Sentinel.

To use the Aladdin HASP stand-alone key and time key, you are required to install the key driver; to use the HASP network key and network time key, both the key driver and License Server software are required to be installed. Their locations are:

- **Key driver**: SuperMap Installation directory\Support\Aladdin\HASPUserSetup.exe
- **License Server**: SuperMap Installation directory\Support\Aladdin\lmsetup.exe

For the Sentinel hardware keys, you only need to install the key driver, which is located in SuperMap Installation directory\Support\Sentinel\ Sentinel Protection Installer 7.5.0.exe.

After installing the network key on the server, find the item "SentinelKeysServer" by opening the server management tools in Windows Control Panel > Administrative tools > Services". That server is the service program for network keys. Usually, the system will automatically run this service after the installation is completed. If not, please use the toolbar or click the shortcut on the right button to start.
1. It will automatically run the License Configuration tool after installing SuperMap products. You can also click Start > Programs > SuperMap > SuperMap License Manager 6 > License Manager 6 tool to run it. You can also use the file LicenseManager6.exe in \[System disk]\Program Files\Common Files\SuperMap\LicenseManager to run this tool.

![](image)

Figure 3-5 License Configuration tool - Hardware Key

2. Enter the name of the computer which has the hardware key or the IP address and select the version of the product:
3. Click the Query button and check the current license state. You can stop the query by clicking the Stop button. The bottom of the dialog box shows the key type, the user name and the information of the company:
4. Click the Save button to save the current configuration information in the configuration file SuperMapLic.ini. (For details about the configuration file, see 1.1.3.).
Check the boxes before the products that you want to license. Only the configuration information of the checked products will be saved in the configuration file. Products unchecked are not licensed to use.

5. The product licenses you want to configure may be on different servers. In this case, just follow the above steps to configure the product licenses and click Save after each configuration session finishes.

6. Click the Close button to exit the License Configuration tool.

### 3.2.3 Configuration Management

The License Configuration tool will create a configuration file SuperMapLic.ini located in [System disk] \Program Files \Common Files\SuperMap\LicenseManager. The file is accessed automatically each time the SuperMap software is launched, to enable the use of the software. You can manage the file through the Configuration Management tab. Any changes to the configuration will be updated in the file automatically.
1. On the Configuration Management tab, click the Refresh button, and the licensed SuperMap products as well as the License Mode, Expired Date, and other relevant information will be displayed:

![Image of License Configuration tool - Configuration Management]

Figure 3-9 License Configuration tool - Configuration Management

2. You can select any product and click the Delete button to delete the configuration for this product. The configuration file will be updated automatically.
3. Click the Close button to exit the License Configuration tool.

### 3.3 Notice

It is recommended that you exit all windows programs before running the driver setup program.

1. When the setup is finished, the system will prompt you to restart your computer, and it is strongly recommended that you restart your computer.

2. If you fail to install the driver for the hardware key with USB port, you can open Computer Management window in Administrative Tools of Windows Setting: "Control Panel-->Administrative Tools-->Computer Management" and click Device Manager item in the catalog tree on the left, and then right-click the Ports (COM&LPT) item on the right. Click Scan for hardware changes on the shortcut menu to search the hardware key. Reinstall the driver for the hardware key follow the wizard. If the hardware key driver setup is still unsuccessful, please restart the computer and try it again.
3. For the users who use the network keys, you need to install the key’s driver on the server-side and also configure on the client-side.

4. For the users who use the hardware key with parallel port, in order to not damage the computer and hardware key, please shut down the computer and unplug the power supply after setup of the driver. Then plug the key with parallel port into the computer, restart the computer, and start the service.

5. If you fail to install the driver for hardware key of SuperMap IS .NET, please remove the former driver, and restart the computer, then install the driver again following the wizard. If the hardware key driver setup is still unsuccessful, contact our company and ask for help. The telephone number is (0086)-10-82736655 and then transfer to Customer Service Department.

6. If you fail to run the program after configuring on the client-side, you can run the NetStat command to check: 1) Whether the Internet is connected successfully 2) Whether there is another computer occupying the port of the server. If none of the above problems occurs, please contact the Technical Support Department of SuperMap (The telephone number is (0086)-10-82736655; transfer to the Customer Service Department.).

7. There is a slight difference in the setup interface and steps for installation of the network keys on different operating systems.

8. For the users who use the stand-alone key, it is suggested that you finish installing the driver before configuring the stand-alone key; for the users who use the network key, it is suggested that you make sure you have configured on the server-side before you configure on the client-side.
4.1 SuperMap IS .NET Architecture

SuperMap IS .NET is based on the .NET technology as a whole. It adopts an Internet-oriented distributed computing technology which supports region-crossing and network-crossing integration of complex large scale network application systems. SuperMap IS .NET adopts a classical multi-tile software architecture, which not only logically divides the functionalities of modules and relationships, but also physically implements component independence. All components, including client applications, Web server extensions, GIS applications and data servers can be maintained and updated independently.

SuperMap IS .NET implements the extension of system scope and Web server transparently. GIS application and database services can be deployed on one computer server or multiple server groups. All the Web server extension, GIS application server, and database server can have multiple copies to implement the same task cooperatively by concurrent computing, or to implement different tasks and offer
different content services. Figure 4-1 is a diagram of the logical distribution for different layers. The horizontal direction denotes the logic unit of the same layer, while the vertical direction denotes the interactive relationship of components for different layers in the process flow.

● **SuperMap IS .NET Client**

SuperMap IS .NET supports several widely-used client programs, such as IE, Netscape, Mozilla, etc. It also supports accessing to desktop applications, mobile terminal devices, and various network applications. Users can easily connect to the website established by SuperMap IS .NET by multiple methods. Without going into any specific description, the default client (or client program) is HTML or JavaScript script provided by SuperMap IS .NET, which can be operated and displayed on any browser since it is currently the most popular client software technology. SuperMap IS .NET client is based on dynamic script technology, which is a typical zero-client program and helpful to describe the SuperMap IS .NET implementation process.

● **SuperMap IS .NET Web Server Extension**

SuperMap IS .NET uses the HTTP standard port (80 or 8080) to publish GIS services, Which cant avoid adding new GIS services and ensure Web security. Utilizing mature Web server technologies (such as cache, session, etc.) to expand GIS service makes full use of all advantages of both the Web server and background services to provide a powerful GIS function.

Web service technology is introduced to SuperMap IS .NET. The XML file format, a kind of extensible data exchange protocol, makes the interoperation, data exchange, and integration among isomerous architecture systems very convenient. The Web service technology decreases the additional costs for replacing a uniform platform. Furthermore, the service vendor may provide integrated and value-added Internet services based on SuperMap IS .NET Web services.
SuperMap IS .NET GIS Servers

SuperMap IS .NET GIS servers can realize multiple applications on multiple
computers, or treat multiple tasks through a cluster server. The architecture makes full use of hardware resources, which can largely decreases the hardware and software investment for developers and vendors, and increases concurrent accessibility for the multi-users. SuperMap IS .NET GIS server is based on the .NET component technology and supports various different types of GIS engines to run concurrently. The development platform provides many pre-defined GIS service engine components, which can be reused immediately to customize a new GIS engine. It is a good way to provide advanced application engines for different industries in order to increase brand competency of products.

- SuperMap IS .NET Database Access Technology

SuperMap IS .NET adopts SuperMap core spatial database engine technology SDX/SDX 5 to easily implement the integrated storage of spatial and non-spatial data into Oracle, SQL Server, Sybase and other large-size RDBMS. Based on SuperMap IS .NET, an extensive Web GIS application system could be established by making full use of spatial database technology to manage large quantities of data and provide concurrent performance.

4.1.1 SuperMap IS .NET Request Handling Process

HTTP is a kind of “stateless” application transfer protocol. Each request from a client, whether the first or not, is considered new to the Web server. If the user wants to conduct a “state” operation, (i.e., every map operation is based on the last operation, such as the ‘Zoom In Map’ operation should base on the current viewable map bounds), the Web and GIS servers set the session to change the current state parameters continuously to ensure the latest state value during the whole process.

The processing unit of the Web program developed by SuperMap IS .NET is an independent, dynamic Web page (ASPX Web page), which consists of many dynamic Web page elements. Each Web page handling process can be divided into two steps or just maintains the first one if nothing refers to the map operation.

The following is a brief introduction to the SuperMap IS .NET Web page handling process.
4.1.1.1 Dynamic Web Page Process

1. Web client program (browser) sends an http POST request to the Web server together with the additional complex parameters. There is no limitation of 2K bytes for POST mode compare with GET mode. The HTTP Handler Library of Web server transfers the user request and related parameters to Web page Handler Factory according to the extension name of the request file.

2. The Web page handler factory queries the cache of the dynamic program set. If the cached program set object is found, then skip to the fourth step. Otherwise, the Web page handler factory will parse the request page and dynamically create the page object with a tree structure to represent a dynamic Web page (see Figure 4-3).

3. The runtime environment transfers the immediate compiler to create machine code; this type of compiling result (inherited from the Page class) exists in the global ASP.NET cache.

4. The runtime environment calls instance classes to handle HTTP request submitted.
5. The instantiation of page object begins to handle the submitted commands from the client and recursively transfers the sub-object of the sub-component object tree. If there is no Web service cache to use, map control and other Web server extensions will ask for background GIS services (Section 3.1.1.2 explains the handling process). The final Web page instance object will generalize sub-object processing result and create an HTML Web page.

6. The results of html Web page are sent to the client and then a request process is finished.

![Figure 4-3: Tree Structure of SuperMap IS .NET Dynamic Page Object](image)

**4.1.1.2 GIS Services Request Handling Process**

GIS-related service requests always require comparatively complex and time-consuming operations. If there is a similar request, a Web service extension will store the handled results to the cache and make a quick response to the client directly. The use of cache can increase concurrent accessibility. But in many cases, most interactive map operations require the server to create a new map dynamically. The following illustrates SuperMap IS .NET abilities to adapt to the circumstances (see also Figure 4-4).

1. The Web program connects to the GIS application server on the listening state. If there is a cluster service, a most appropriate connection would be allocated to GIS application server automatically. Then the Web program will send the GIS request DTO (Data Transfer Object) to the GIS application server through the connection.
2. The GIS application service parses and confirms the validity of the request. If there is a request cannot be handled, the server will record the log file automatically, then reject the abnormity, and prompt the client of an illegal operation. If the request command is confirmed, the engine manager will correctly take over the control.

3. The GIS application server can allocate many GIS service engines (belongs to the same class or not) for different service operations. The engine manager dispatches a thread by choosing a service engine and setting it to the work thread.

4. The GIS service engine is a stateless management component and also the core component of task handling. The map parameter state of a user operation can be recovered by submitting the parameter of the DTO. As a result, the GIS service engine has the current user state (it can also recover part of the user state to reduce the operation steps).

5. The GIS service engine interacts with the cache manager. If the current operation can use the existing result of the cache manager, it will return the result directly.
Otherwise, in the next operation, the result will be resubmitted to the cache manager for the next cache.

6. The GIS service engine implements transaction operations according to the command. The operation includes creating a dynamic map, conducting spatial queries and spatial analysis, etc. If it is necessary to access an external storage device, Step 7 will be implemented automatically.

7. The GIS service engine uses SDX+ data access technology to access the spatial database.

8. The result of Step 6 is a DTO object that can be transmitted long distance. The handled results of the GIS service engine can be returned to the Web program directly.

**4.1.2 Component-based Structure**

SuperMap IS .NET structure adopts component method. All components run on the server; the HTML/JavaScript running on the client is encapsulated into SuperMap IS WebControls. It is not necessary for the final user to download any plug-in or Java Applet. Both the server program and client program are designed and developed on the component technology and centered on the server for management and configuration. The server component consists of the following parts:
4.1.2.1 GIS Service Component

The GIS service component is an out-of-process (EXE) component, which can run independently to provide GIS application services. SuperMap IS .NET GIS application server can operate many process instances of the same or different service contents by using cluster components. The same service content means the same data; the same GIS service engine components, the same data services and the same function services.

The GIS service component is a kind of rough (grain size) application component. It consists of a GIS engine component, communication component, image component, cluster cooperative component, and user state management component (as shown in Figure 4-5). The GIS service component is the unit of those reusable components.

4.1.2.2 Engine Component
The engine component is the entity for implementing GIS services. It can create new maps according to the requests submitted from the client, execute query according to the input conditions, perform specific analysis, and obtain the handled results. SuperMap IS .NET offers many service engines. Each service engine has self-descriptive meta information to describe which GIS functionalities can be handled. According to the meta information, a service engine can be dynamically set and loaded to the GIS application server. The GIS application server includes one or more engine components that can be integrated physically by using an engine interface (Figure 4-6 illustrates these relationships). The engine interface as the specification between the GIS servers and the server engine describes the function list provided by GIS server.

SuperMap IS .NET engine components include the map engine, spatial analysis engine, and edit engine. The map engine is the basic and core component, which implements general functionalities of interactive digital map operations. The spatial analysis and
edit engines are inherited from the map engine, so they have additional characteristic functionalities besides that of the map engine.

4.1.2.3 GIS Component

The GIS component is the core of the GIS service engine. SuperMap IS .NET uses SuperMap Objects core control and extended control (SuperTopo component and spatial database access component (SDX+)). Other GIS components which conform to the GIS service engine interface specifications can also be used to develop the GIS service engine.

4.1.2.4 Image Component

The component converts the map outputs to usual image file format such as PNG, JPG, etc. The user can develop other outputs tools in multiple file formats, such as VRML, Flash, CGM, etc.

Using the virtual Device Context (DC) of SuperMap IS .NET image component, the drawings on Windows DC can be output to memory DC, and even be output and saved as JPG, PNG, or other formats that WWW browser supports.

Figure 4-7: The Relationship of Image Component and Other Components

4.1.2.5 Cluster Service Component

Server cluster component, a Windows Service process with the name of SuperMap IS Cluster Service, is intended for the management of the server’s task scheduling and
load balancing.

System performance is a key technical specification for website. In Internet GIS website, processing capability of the GIS server is a critical factor within a number of system performance indicators. Due to complexity of GIS data and its large volume, every GIS request consumes a lot of time and resources of the Internet GIS server. If user access is huge, single GIS server cannot bear the requests so that overall system performance will be affected. In order to solve the performance bottle neck, SuperMap IS .NET provides an integrated clustering and scheduling architecture with the cluster component.

The cluster Service of SuperMap IS .NET visualize more than one GIS server by visualization technology, unifying several GIS processing resources into one computing power and offering a unified access interface service for client programs as Figure 1 shown below. GIS server instances can be achieved by clustering on a single physical server and meanwhile more than one physical server can be clustered to provide identical map service, which are managed accordingly by clustering service. Multiple servers computing power can be aggregated to increase load balancing capability by virtual clustering technology. If one server fails or malfunctions, other servers in the cluster can take over its burden so that GIS serviceability and system redundancy can be secured. By increasing the number of servers in the system, more users can be supported on the same performance level or the performance of the users’ application can be improved, increasing system’s overall scalability.
Cluster service monitors every GIS server node’s status in real time from the node joining the cluster to quitting it. GIS server node should report its load status to a cluster service in every pulse cycle, if it fails to report the status to the cluster service, then it will be judged faulty, web side requests will not be transferred to this node until the cluster service detects the report again as Figure 4-9 shown below.
Cluster service measure GIS server load by some performance as follows. By default, cluster service monitors %Process Time and %User Time of the Server’s CPU. Specific GIS tasks will be allocated upon these two timers. If particular performance indicators are needed, modify the configuration file named SuperMapIS.Config. Please see *Service Management-Other Configurations*. 

### 4.1.2.6 Server Management Component

SuperMap IS .NET server management component can manage many GIS application servers at the same time by adopting distributed management technology. The user can connect to any other servers dynamically by using the remote management tool to implement management at the enterprise level.

The server management component is a tool for map application management and configuration, which includes background management services and foreground Web application programs.

The server management component has a user-friendly interface. By using Web pages to breakdown the management tasks, an administrator can easily control GIS services and their system parameters without complex configuration.
The Web portal management application is a typical ASP.NET application program, which responds to management requests, manages services, and transfers management commands to corresponding management services on each physical server. The management service will modify configuration files or control GIS application servers.

![Diagram of Management Component](image)

**Figure 4-10: Sketch of Management Component**

**Characteristics of Service Manager**

- The SuperMap IS .NET distributed management object supports multi-server and remote management, so it can implement single point login and centralized management.

- Single point login and centralized management. SuperMap IS .NET provides a unified entrance for local and remote management servers; both of whose user interfaces are based on the Web-based management module, which covers the differences between local and remote management mode.

- Web-based pure HTML management interface. SuperMap IS .NET has user-friendly interface, with simple and detailed help and tips, which provides the administrator with easy GIS service management and configuration.

- Security system. The windows identity validation and system-based safety mechanism are greatly help to ensure the safety of the application system.
4.1.2.7 Map Catalogue Service Component

Map catalogue service provides spatial meta data publication, management, browsing and querying functionalities and effects like yellow pages directory. It is an excellent tool for spatial data sharing and publication which is also the foundation of website and digital urban construction.

Map catalogue service system provides three kinds of users with three types of functionalities.

1. System Administrator. This is the operator of the portal system, who has the ultimate power to take charge of and run the entire system. The system administrator manages the meta information from map service provider, and checks and validates registration information provided by the map server.

2. General Administrator. This is the GIS service provider entity and also the GIS service manager. If someone wants to publish his own GIS service on a portal system to share spatial or non-spatial information to users (browsers), the GIS service provider should register valid meta information in the map catalogue service portal system. After being validated by the general administrator, he will be responsible for updating all registration information and meta information.

Figure 4-11: The Framework of Map Catalogue Service System

Map catalogue service system provides three kinds of users with three types of functionalities.
3. Registration User (map catalogue customers): The user can be considered one of two groups according to the business strategy of the map catalogue service supplier: the paying user group or the free user group. Map catalogue customers can query their interested map meta information by regions or map themes.

### 4.1.3 Other Auxiliary Tools

Other auxiliary tools include data conversion, processing tools, etc.

### 4.2 Cluster Structure

Cluster service is composed of a clustering server and GIS servers, either logically or physically separated. Users send service requests via Internet, if connection succeeds, cluster service will allocate specific tasks to functionally matched GIS server or assign the tasks according to dynamic load balance. The allocated GIS server will connect with the client side and meanwhile GIS servers send status report to the cluster server.

SuperMap IS .NET Cluster supports following structures:

1. Cluster Server – GIS Server with singular GIS function
As shown above, A GIS server with the same structure i.e., the same service capability is registered to join a cluster. The cluster server virtualizes all registered GIS server as a unified computing resource. The cluster server sets an open address and port to interact with web based incoming GIS requests.

Compared with a GIS server with single service capability, this cluster structure unifies multiple GIS servers with higher concurrent accessibility as well as enhanced system stability. This kind of cluster structure requires rigid stability of the cluster server as once the cluster server fails, the whole GIS service will break down, although it doesn’t demand high performance of the cluster server.

This structure is applicable to limited functions of GIS service with high demand of concurrent access.

2. Cluster Server – GIS Server with various GIS functions
The cluster server allows registration and removal of one or more GIS servers with various service functions. The cluster server assigns tasks by request map name to a certain GIS server, which can handle this task. It’s unnecessary for map service consumers to know the detailed processing procedure, they only need to submit GIS request to cluster servers and get results from the cluster.

This structure has the same defects as the first structure, which demands high stability of the cluster server.

This structure is applicable to a function comprehensive GIS website with complex GIS data. If concurrent access is huge, the first structure can be combined to form a cluster.

3. Cluster server – cluster server
The cluster server in this structure shown above can not only uniformly manage GIS server resources but also make other cluster server registered to this cluster, forming a tree like cluster structure, which realize a hierarchical GIS service deployment geographically or physically. For example, there is a county level cluster server in a county statistics bureau, the municipal statistics bureau requires both municipal and county level GIS service, therefore, the municipal bureau can form a tree like cluster, registering county level cluster to municipal cluster servers, and Published data by municipal cluster servers can integrate both municipal and county level GIS resources.

This structure is applicable to large enterprise level distributed applications, increasing fault tolerance and load balancing capability of the system.

SuperMap IS .NET cluster service supports multiple registrations: one GIS server can be registered to multiple cluster servers as shown above. GIS servers with the name of a1, a2, a3…an can be registered to Cluster Server A and Cluster Server B so that two cluster servers have the same GIS service capability. For GIS service consumers, they can send service requests to multiple cluster servers at the same time.

The advantage of this structure is to offer clustering function with high fault tolerance. When one cluster server fails to function normally, another cluster server can take over its task.

The above structures are the commonly used cluster system configuration. In deployment practice, these structures can be combined to form a network like cluster structure to satisfy high end distributed GIS service requirement.

SPECIAL INSTRUCTION:

All GIS servers are scheduled and assigned with a unique map identifier by the cluster server. Therefore, if a number of GIS servers have service function on data with the same map identifier, these GIS servers should have the same map service, i.e., the same service engine should be loaded to these GIS servers.
Clients send service requests via Internet to a specific cluster server; if connection succeeds, the cluster server will search out GIS servers that meet the requests and assign the task to a certain GIS server on the basis of dynamic load balance; clients will connect the GIS server via the cluster server to get required service and map data.

### 4.3 Data Transfer Object (DTO)

How to transfer messages between different servers effectively is one of the main goals of WebGIS research. Standard message format is one of the signs of the advanced WebGIS software. Effective transfer mode (compared with XML format mode adopted by other software; SuperMap IS .NET uses binary DTO transfer parameters with higher efficiency) is one of the key points in the improvement of service capabilities.

SuperMap IS .NET defines a suite of transfer object libraries. DTO is a simple container of a group of data sets, which needs to be transferred cross-process or across-network. It can transfer complex data between Web service extensions and GIS servers. According to the definition of data transfer object, SuperMap IS .NET DTO encapsulates all submitted parameters of Web services extend to GIS servers and all responses processed by GIS servers.

It is known as “Remote Call” that different processes or computers establish relationships and transfer messages. Many Remote Call frames can Unify the forms of the Remote Call and the Local Call and conceal the complexity and details of the Remote Call but cannot decrease the consumption of the resource consumption.

The Remote Call may cause the delay of the service request. The delay of service can be described by the Lag time, the message transferring time between networks (or processes) mainly determined by network bandwidth. The throughput reflects the data quantity that the host computer receives and sends in a certain period of time. In a modern network which based on the IP routing, the main factor influencing distributed services is network lag effect. That is to say, host throughput has comparatively little effect on services. It has been tested that the time needed to transfer 10 bytes of data may nearly equal that of 1000 bytes of data.
When designing the interface of local objects, the best method is to encapsulate large amounts of information into objects and provide a group of fine granular methods to visit and operate them. Fine granular means that each method is responsible for a single, quite small, and basic functional unit. Using fine granular means that more methods should be used to implement more advanced tasks. When using interfaces within a process, the cost of transferring extra functions can be ignored. However, when transferring these methods across process or across network, the cost of time and resources would become the bottleneck of the system.

The best way to solve the lag time problem in Remote Call is trying to reduce the process-crossing transfer time and increasing data quantity of each Remote Call. Although the client can transfer more data to remote components in a single transfer by adopting long parameter list method, it will be easier to make errors in programming by interface. Long parameter list programming is not a good way for transferring extra function parameters according to the location on the list. It is easy for a developer to transfer the parameters by error order and no compiler will be able to detect the errors. On the other hand, a long parameter list will not contribute to returning more information to a client from the Remote Call.

*Table 4-1: Classification for DTO*

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Request Parameter to Submit</th>
<th>Result Parameter Responded</th>
</tr>
</thead>
<tbody>
<tr>
<td>MapService</td>
<td>MapParam</td>
<td>MapImage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MeasureResult</td>
</tr>
<tr>
<td>QueryService</td>
<td>QueryParam</td>
<td>ResultSet</td>
</tr>
<tr>
<td>RouteParam</td>
<td></td>
<td>AnalystResult</td>
</tr>
<tr>
<td>BufferParam</td>
<td></td>
<td>ResultSet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...</td>
</tr>
</tbody>
</table>
SuperMap IS .NET classifies each DTO in terms of service type provided by GIS application server. The main DTO classes are shown in [_missing reference]. They are all complex long-distance transfer objects. For example, MapParam consists of a series of attributes and member sub-objects. The objects and sub-objects are reflected as either contained or containing.

The interactive DTO between GIS applications and other client programs are illustrated in Figure 4-16. The client transfers the remote methods of the GIS server in order to submit DTO as command parameters and a serialized binary data stream. The GIS server de-serializes the received binary data stream by using a long-distance method and creates the local object during the process. The server processes services using the local method and creates an instance of serialized DTO to return to the client. The client then de-serializes and creates the local process object. It should be noted that the serialize/de-serialize process of DTO has been done through a .NET framework and it is transparent to both server and client. Therefore, application programs can use the DTO just like any other local object. DTO is a type-safe object and its data type can be checked at the compilation stage. Because the strongly typed object has high efficiency during the runtime stage, SuperMap IS .NET server data interaction has higher efficiency than that of other WebGIS software with XML document data transfer mode.

![Diagram](image.png)

Figure 4-16: Illustration of DTO Process
5.1 Basic concepts of SuperMap IS .NET service configuration and management

5.1.1 GIS Service

GIS service is a functional software instance related to geospatial information within network environment, exposing capsulated functions via interface to the outside. GIS Services are divided into GIS data service and GIS functional service. The former is to offer spatial data; the latter is to offer spatial data processing capability. The GIS functional service is to offer web GIS processing service, whose data can be local or network compared with conventional GIS service.

The GIS services Published by SuperMap IS .NET enable Internet browsers or customized applications to get access to GIS resources, including map, metadata as well as other GIS functions without installing any GIS software. The requested results will be sent back to clients in picture or text format.
5.1.2 GIS Service of SuperMap IS .NET

SuperMap IS .NET is composed of three services as follows:

SuperMap IS .NET Service: deployed on GIS service layer, providing GIS functional services by adding various service engines to GIS servers, including base map, network analysis, map edit, coordinate transform as well as user defined functions.

SuperMap WebService: disseminates SuperMap IS .NET service as Web Service specification on WebService layer.

Standard Service: Publishes SuperMap IS .NET service as WMS (Web Mapping Service), WFS (Web Feature Service), WCS (Web Coverage Service), KML and GeoRSS on WebService Layer.

![SuperMap IS .NET Services](image)

Figure 5-1: SuperMap IS .NET Services

5.1.3 Service capability of SuperMap IS .NET

Standard Map Engine: map access, map query, layer control, map browse, spatial and attribute search of the map, get track layer, coordinate transform, map measure, legend output, clear cache, data source, workspace edit.

Map Edit Engine: map data access and edit, e.g., location edit, attribute edit, new or delete an object.

Analysis Engine: overlay analysis, buffer analysis, route analysis, vicinity facility analysis, bus transfer analysis, 3D analysis etc.
Coordinate Transform: batch coordinate transform.

Web Map Service WebService (WMS): Create map by use of geographical data, define map as a visual presentation of geographical data, and return layer grade map image. It publishes geospatial data dynamically in picture or text format.

Web Feature Service (WFS): WFS allows clients to get geospatial data in GML coding format from multiple web feature services. The returned GML codes in feature level can be modified, such as adding or deleting the features.

Keyhole Makeup Language (KML): an XML based text format file for description and storage of geospatial information such as point, line, picture, and polyline etc., shown in Google Earth.

GeoRSS: A geographical extended standard for ATOM and RSS. In web interactive environment, ATOM and RSS can request, aggregate, share and publish Feeds, and attach geospatial data to interactive information to make the geospatial information enabled.

5.1.4 Running mode of SuperMap IS .NET service

There are two running modes for GIS service and data deployment: standalone mode and cluster mode, shown as in Figure 5-2:
5.1.4.1 **Standalone Mode**

Clients directly get access to the GIS server for data and service. This mode is simple and its configuration and management is quite easy, but it requires high computing power and stability of the GIS server, otherwise single GIS server cannot bear the burden during high concurrent access.

Standalone mode is applicable to limited number of user access.

5.1.4.2 **Cluster Mode**

Cluster technology visualize more than one GIS server by visualization technology, unifying several GIS processing resources into one computing power and offering a unified access interface service for client programs. Multiple servers computing power can be aggregated to increase the system’s load balancing capability by virtual clustering technology.

**SuperMap IS .NET Cluster Structure**

Please refer to the description in *Cluster Structure* for the cluster structure. If cluster
mode is adopted, there should be at least one cluster server in this mode, the cluster server can configure one or more GIS servers which contain workspace where GIS data are available for access and service engine where GIS functions are implemented.

![Cluster Structure Diagram](image)

**Figure 5-3: Cluster Structure**

**Introduction to Cluster System Configuration and Management**

**Configuration parameter of GIS server:**

Address and port of cluster server: use this address and port as a communication channel to report its status to the cluster server.

Report time interval: the frequency of GIS server report to cluster server. If the cluster server doesn’t receive a GIS server’s report in this interval, the GIS server is judged malfunction, no further GIS request will be assigned to this server.

**Configuration parameter of cluster server:**

Publishing address and port of the cluster server: access channel for GIS service requester.

Listening address and port of the cluster server: the channel between the GIS server and the cluster server. Set these parameters in Listening tab.
Up reporting: an optional parameter, only enabled when cluster server – cluster server structure is applied. (Please see *Cluster Sturcture in SuperMap IS.NET Architecture*)

### 5.1.5 Administrative tools of SuperMap IS .NET

ISManager is a user friendly SuperMap IS .NET administrative tool. SuperMap IS .NET services can be added via ISManager, configuring each data’s file address, setting publishing mode(standalone or cluster), setting service parameter; monitoring every service of all servers’ OS, monitoring and managing OS processes, logs etc, browsing and downloading SuperMap IS .NET logs.

ISManager can be accessed via local machine, LAN or Internet. After installing SuperMap IS .NET, click **Start > All Programs > SuperMap > SuperMap IS .NET > SuperMap IS .NET Service Control > Manage Map Services**. ISManager appears as follows:

![SuperMap IS .NET Manager](image)

*Figure 5-4: SuperMap IS .NET Manager*

Click Server Information to see the host machine’s configuration profile, where host machine OS version, CPU type, CPU count, CPU speed, IP address etc for user’s
5.1.5.1 Service Management

Similar to OS’s service manager for monitoring all service status of the host machine’s OS, such as ASP .NET State Service, SQLSERVERAGENT, SMTP Services, which can be started or stopped on service management webpage. SuperMap IS .NET service and cluster service are also listed on this page, where webmaster can manage these services.

Click Service to enter service management page as Figure 5-5 shows. Each service has a status bar and control button. Stopped and Running indicate the status of the service.

![Services](image)

Figure 5-5: Services

5.1.5.2 Process management

Process management monitors and manages all processes of the host machine’s OS, including CPU used by each process, CPU time and memory etc. user can end unnecessary process just like use of Windows Task Manager.
5.1.5.3 IS Log Manager

IS Log Manager is similar to event viewer in Windows OS, which can review application, security, system log by type, time, source and task category. It is a fully functional remote event viewer for remote monitor server status.

Please see Log File for detail.

5.2 Before Publishing Services

5.2.1 Prepare for data

Please prepare geospatial data for publishing services.

Data is the core of GIS services. It is very important to design data structure, data type for users’ requirement. Save one or more than one map for the final workspace file.

One GIS server publishes data in one workspace; map is the minimum manageable unit for a GIS server, which means a GIS server can specify which workspace to be published, which map in the workspace and which map is highlighted.

It is recommended that SuperMap Deskpro be used to prepare data.

Step 1: Data Collection.

There are a number of data collection methods, one of which is vectorization of paper map on computer screen as follows:

1) Scan paper map
2) Export image file to SuperMap Deskpro
3) Register and crop
4) Create dataset
5) Manual tracking
6) Modify data structure
7) Input attribute data

8) Data edit and validation

**Step 2: Create Map**

1) Add dataset to map window

2) Style rendering in two ways: set one style to map layer; or make thematic map

3) Integrate scale bar, adjust layer order etc.

4) Save map, save workspace

**5.2.2 Data Optimization**

It is necessary to make some optimization to your data in order to improve the performance of GIS data service.

**5.3 Set System Information**

It mainly refers to specify bitmap output address. Bitmap output by GIS server will be stored in a specified path; the bitmap should be published so that clients can get access to the bitmap. Meanwhile, ISManager sets bitmap output path, virtual directory, access address etc.

Please follow the procedures below:

1. set picture output path

Log on map service manager, click system setting on the left side of the page.
Specify picture output address in picture output path. The path could be relative or absolute. If relative path is chosen, prefix of the full path is `SuperMap IS .NET setup folder\bin`. By default, SuperMap IS .NET sets its picture output to `SuperMap IS .NET setup folder\output`.

**Notes:**
1) Pictures occupy a considerable amount of storage, so users can set picture output path to other disk drive or even another computer. If picture output path is modified, administrator should specify absolute path of the Output virtual directory to this picture output path.

2) If picture output path is set to other disk drives, please make sure the host machine of the GIS server can get access to this picture output path. Usually, the path should be shared in network, and allow access. Use the following format to specify the output address: `\192.168.115.23\output`

2. Set host machine’s name

The host machine is the server that temporarily store pictures whose name is either machine name, IP address or domain name.

**Notes:** the picture output address should be set as real server’s address or IP address. Localhost is only applicable for local access from the same computer.
3. set picture virtual directory

Picture virtual directory is the address that clients can get access to. SuperMap IS .NET transmits pictures in http protocol, so webmaster is required to set the above picture output path as output directory and name the output directory. By default, an output directory named `output` has been added to IIS list after installation. Webmaster can reset the directory, but please make sure picture output address should correspond to the access address.

4. Save configuration settings

Save configurations after setting all these parameter by click save.

**Notes:** every steps for saving the configuration of GIS server and cluster server in the following paragraphs are as the same as described above. Every setting and modification will not be functional if save is not performed.

### 5.4 Configure and manage GIS server

#### 5.4.1 Create GIS server

Click server node to enter GIS server list page as the Figure below shows.

![Figure 5-7: Server List](image-url)
More than one GIS server can be configured, and GIS server can be added or removed freely as instructed below:

Add GIS Server: Two choices for adding a GIS server. One is to click “add” after input a GIS server name. The other is to copy an existing profile with a new name and choose the server, click “copy” to add a new GIS server. There are “delete”, “edit”, and “copy” options on the list.

Remove GIS server: click “delete” to remove the selected GIS server.

5.4.2 Set GIS server parameters

After adding a new GIS server, click “edit” to set its parameters, which includes server type, channel name, server address, port, dynamic map loading, whether to join cluster and whether to enable cluster report.

Dynamic map loading refers to opening a map dynamically upon client map request by map service. The advantage of dynamic map loading is flexibility: maps with high request frequency will be loaded to process first when loading map service for the first time, maps with low request frequency will be loaded when requested so that computing resources can be better utilized. The dynamic map loading parameters are as follows:

![Server Config](image)

Figure 5-8: Server Config
Automatic map open count: this specifies the maximum count of automatic map open when map service starts. By default, its value is 10.

Automatic map open list: this specifies maps that are loaded first by map service. Map names can be separated by “,”. If map name contains “,”, please use another “,”, i.e., “thematic map of rice, corn and wheat” should be rewritten as “rice,, corn and wheat”. Map name is case sensitive, and is strictly as the same as the map name of the workspace.

The relationship of automatic map open count (n) and automatic map open list (map count of automatic map open list is m, total map count of the workspace is s):

1. m>n, n maps will be opened when GIS service starts, and the opened maps are the first n maps on the list. The rest of maps will not be opened.
2. m<n and m<s, n maps will be opened when GIS service starts, the opened maps include all maps on the automatic map open list and n-m maps on the workspace.
3. n>s, s maps will be opened when GIS service starts.

Server Type: only one server type is available, e.g., MapServer, administrator just inputs “MapServer”.

Channel Name: a parameter for the internal engine of SuperMap IS .NET, a unique identifier is required. Please do not share the same name with other GIS servers’ channel.

Disseminate address and port of GIS server: Default port is 8800, it is suggested that port be set between 1024 and 65535. If a server is equipped with more than one network interface card or the server has more than one IP address, disseminate address should be specified at server address. Address and port are only valid when standalone mode is applied.

Whether to join cluster: When cluster mode is applied, use this option to join the serve to a cluster. GIS server address and port are disabled.
5.4.3 Detailed parameters of GIS sever

5.4.3.1 Default map settings

The default settings include four parameters below:

**Highlight style:** click default map settings node at the GIS server on the left side of the IS Manager panel, set highlight style on point, line, polygon, text and queried area.

Queried area is an area that meets some query criteria, which is highlighted on map. If no special highlight setting is assigned, the default setting will be used. Style corresponds to resource id of the resource library of the workspace.

Size of point/line: set the size of point/line with the unit of 0.1mm. The size is set null or zero mans original size display. Minus size means no symbol display.

**Picture settings:**

Set default picture size and format for picture output.

Picture width/height: size of the picture with the unit of pixel.

Picture quality: set compress ratio. Default is 100, means no compression. The smaller
the value, the smaller the size, but quality becomes worse.

Picture format: default format is PNG. JPG, GIF, BMP, TIFF are also available.

PNG: Portable Network Graphics (PNG) is a bitmapped image format that employs lossless data compression derived from LZ77. PNG supports palette-based (palettes of 24-bit RGB colors), up to 16 bit grayscale or up to 48 bit RGB images as well as 16 bit alpha channel. PNG was designed for transferring images on the Internet, not professional graphics, and so does not support other color spaces (such as CMYK).

GIF: a bitmap image format using the Lempel-Ziv-Welch (LZW) lossless data compression technique to reduce the file size without degrading the visual quality. The format supports up to 8 bits per pixel, allowing a single image to reference a palette of up to 256 distinct colors chosen from the 24-bit RGB color space. It also supports animations and allows a separate palette of 256 colors for each frame. The color limitation makes the GIF format unsuitable for reproducing color photographs and other images with continuous color, but it is well-suited for simpler images such as graphics or logos with solid areas of color.

JPG: a lossy compression format with compression ratio up to 100:1, which supports 8 bits per color (red, green, blue) for a 24-bit total, producing relatively small files. When not too great, the compression does not noticeably detract from the image's quality, but JPEG files suffer generational degradation when repeatedly edited and saved. It is well suited for multi color maps, such as remotely sensed maps. It is not suitable for simple content maps with less color, strong contrast, solid frame or wide pure color zone.

BMP: lossless compression format with high storage size. Color depths range from 1 bit, 4 bit, 8 bit and 24 bit. Web browsers are not supported.

TIFF: tagged image file format, the most popular format in publishing industry. Compression function is optional. Web browsers are not supported.

Public transportation configuration: set bus

Display area: reserved.
5.4.3.2 Bird view settings
It is used to set width and height of bird view. Default setting will be used if no specified setting in GIS request.

![Bird view settings](image)

Figure 5-10: Bird view Settings

5.4.3.3 Map cache settings
It refers to cache during map service processing, including map cache setting and cache setting of map engine. If map cache is set, processed result will be stored at GIS server side, when another GIS service request comes up, map service will directly access the cached data and return it to client side, which secure high efficiency of map service.
Map cache of GIS server is to cache the processed result of GIS request to decrease handshake with map engine, which includes map cache setting option or compatible mode of 5.2.1 version.

**Usage option:** this option has three values: fast cache, enable and disable. Default value is fast cache.

The strategy for fast cache: whether to use fast cache lies on the MapFrequency value. MapFrequency = high, caching is started; otherwise, caching is not started. With fast cache can select caching situation more flexibly. When the system needes control the caching with application program, for example, displaying map just temporarily, need not caching, then can set MapFrequency=low, and select fast cache strategy.

Enable, caching is started no mater what value is set.

Disabl, caching is not started no matter what value is set.

**Compatible Mode:** two values are available. If value is true, cache file structure will
be as the same as that of SuperMap IS .NET 5.2.1. No cache practice on dynamic thematic mapping in caching mechanism of 5.2.1 version, therefore, if dynamic thematic mapping is required, please set value to false. Default value is true.

**Notes:** Cache file produced by Deskpro’s precache tool is compatible with cache mechanism. The compatible mode is set true if Deskpro’s precache tool is used.

**JointImage:** to use the splicing image mode or not. When the value of jointImage is true, map cache is able to use picture splicing mode. The default value is false.

**The size of benchmark picture:** represents the size of benchmark picture, with default value 256. If the current map size is set to be multiple size of the benchmark picture (the number of multiple could be integer or decimal number that is bigger than one), the size of benchmark picture cache could be used to directly generate a map with the size of the current map, rather than re-drawing the whole map, increasing the reusing ratio of cache.

For instance: pre-caching image size is 256*256, the required map size is 512*512, the configuration of image splicing mode is as follows:

Selecting "True" to JointImage; the size of benchmark picture is 256.

Engine cache is cache the processed result to reduce time of GIS component, which includes 1) whether to use map engine cache; 2) maximum percentage of cache against total physical memory; 3) maximum capacity of cache using the physical memory; 4) cache check interval; 5) whether to ignore flow display of the thematic map.

Whether to use map engine cache: four values: true, false, FalseIfOnlyImage, FalseIfHasImage, false. **FalseIfOnlyImage** denotes no cache will be used if there is only image layer on map. **FalseIfHasImage** denotes no cache will be used if image layer is available on map. Default value is **falseIfHasImage**.

Maximum percentage of cache against total physical memory: default value is 0, indicating it is under SuperMap IS .NET management.

Maximum capacity of cache using the physical memory: this parameter will be
adopted if it is not consistent with maximum percentage of cache. 0 is null.

Cache check interval: unit is second, interface is reserved.

Ignore flow display of the thematic map: text on thematic map can be shifted according to map display shift. Due to dynamic change of thematic mapping, this parameter controls caching strategy of flow display. Default value is True, which denotes disable flow display.

5.4.3.4 Map Settings

One GIS server relates to one workspace, the server only disseminates maps within this workspace.

Click map setting node on the left side and set workspace file path.

![Map Settings](image)

Figure 5-12: Map Settings

**Workspace path:** types the workspace path in Figure 5-12-(1) or click **View** to select the path, it can be either absolute path or relative path. The starting line of relative path is SuperMap IS .NET setup directory\bin.
If workspace is a .smw or .sxw file, input path directly with password blank. If workspace is stored in database setting as follows:

SQLSERVER and ORACLE are two databases that can store workspace.

For example:

For SQL SERVER:

Provider = SQLOLEDB; Driver = SQL Server; SERVER = server; Database = test; Caption = WksName;

For Oracle:

Provider = MSDAORA; Driver = Oracle ODBC Driver; SERVER = SUPERMAP; Database = SUPERMAP; Caption = WkspName;

“SERVER” refers to server name, “Database” refers to database name, and “Caption” refers to workspace name.

**Workspace password:**

Workspace password is set below if workspace is database stored.

**SQL SERVER/ORACLE:**

"UID =SA; PWD = SA"

**Verify whether** workspace exists: verify whether workspace specified by workspace path exists.

**Add Map:** set highlight, picture parameter, bus setting on map. Please note map name is case sensitive, and it is consistent with map name. Click **Add**, map name will appear on list.

**Edit Map:** all parameters of newly added map are set blank by default. Click “edit” to enter parameter setting page. Please see “default map setting” for reference.

**Delete Map:** click “delete” to remove map setting.

**Notes:**
1) If default map setting is not up to requirement of highlight, picture parameter, bus transfer of the default map setting, please specify parameters from “Add Map”.

2) Relationship of map setting and default map setting:

![Diagram](image)

Figure 5-13: Relationship of map setting and default map setting

### 5.4.3.5 Map Engine Settings

GIS service function is determined by the map engine it contains. SuperMap IS .NET offers four map engines, including general map engine for map browse, query; analysis engine, for GIS analysis functions such as closest facility analysis, route analysis besides functions offered by map engine; map edit engine, for online spatial data request; coordinate transform engine, for coordinate transformation. Webmaster should configure every map engine by function requirement. Please see *List of SuperMap IS .NET Functionality* for engine type and detailed functionality.

Map engine setting page is used for adding map engine, deleting setting, as shown in Figure 5-14.

Add map engine: input engine’s unique instance. Choose engine type and add it to list. “delete” and “edit” are on the right side of the engine name.
Delete Map engine: click “delete to remove this map engine.

Edit Map Engine: click “edit” to enter map engine edit setting as Figure 5-15 shows.

- Choose engine type
- Add map: input map name and click “add”. The map engine is only responsible for GIS operations by this method.

### 5.4.4 Start/stop GIS service

After setting GIS server parameters, GIS service should be started as follows:

Method 1: click **Start > All Programs > SuperMap > SuperMap IS .NET > SuperMap IS .NET Service Control > Start Map Service**

Method 2: logon to ISManager, click “service” tab to enter service management page. Click “control” button to start GIS service.

Stop GIS service is very similar to start GIS service.

### 5.5 Configuring and Managing Cluster

Cluster services involve the cluster server and the GIS servers controlled by the cluster
server. The following illustrates how to configure the cluster server and the GIS server nodes.

### 5.5.1 Setting cluster parameters for cluster server

You can refer to “SuperMap IS .NET Services Mode—Cluster Mode” for details about the parameters for cluster server configuration.

Follow the steps below to configure the cluster server:

1. Log on to the SuperMap IS .NET Manager page and click **IS Config**. On the left of the page, expand **Default Cluster Settings**, and click **Monitoring Settings**:

   ![Cluster Monitoring Settings](image)

   **Figure 5-16: Cluster Monitoring Settings**

2. The Monitoring Settings page is used to set the monitoring parameters. It is allowed to set multiple communication channels to monitor the GIS servers reporting, by clicking the **New** button to add new channels.

   **Timeout Setting:** set the timeout value in the units of seconds. The timeout value should always be equal to or larger (larger recommended) than the reporting time interval. If the reporting time of any GIS server exceeds the timeout value, it is
thought that the GIS server fails, and the cluster server will not send the client request to that GIS server any more.

Click Edit to set the parameters for each monitoring channel:

Enabled: set whether to enable the monitoring.

Protocol: Select the protocol for the monitoring channel. Currently, four types of protocol are supported: HTTP, which is a secure protocol best suited for the World Wide Web; TCP, which is a safe and suitable protocol for local area networks; UDP, which supports fast-speed and unconnected services although not safe enough; and net.pipe, which applies to communication between stand-alone processes. Note that ports cannot be set for net.pipe.

IpAddress: Set the address for the communication between the cluster server and the GIS servers. GIS servers will set their address and port for reporting based on this IpAddress.

Port: Set the port for the communication between the cluster server and the GIS servers. GIS servers will set their address and port for reporting based on this IpAddress.

Token: Set the token to access the cluster server. Access will be denied if the token a GIS server used to report is not consistent with the one set for the monitoring channel.

3. Client Settings: Click Client Settings on the left and go to the Client Settings page. The address and port used for the cluster server to publish the service are set here.

4. Report Settings: Click Report Settings on the left and go to the Report Settings page. First, set the interval of reporting in the units of seconds. Note that the interval value must be equal to or larger (larger recommended) than the timeout value set in the Monitor Settings page.

Click Edit to set the parameters for each reporting channel:

Enabled: set whether to enable the reporting.

Protocol: Select the protocol for the reporting channel. Currently, four types of
protocol are supported: HTTP, which is a secure protocol best suited for the World Wide Web; TCP, which is a safe and suitable protocol for local area networks; UDP, which supports fast-speed and unconnected services although not safe enough; and net.pipe, which applies to communication between stand-alone processes. Note that ports cannot be set for net.pipe.

**IpAddress:** Set the address for the communication between the high level and low-level cluster servers. The low-level servers will report their state to this address and the port specified.

**Port:** Set the port for the communication between the high level and low-level cluster servers. The low-level servers will report their state to the specified address and port.

**Token:** Set the token to access the high-level cluster server. The token should be the same with the one set in the Monitoring Settings page. Access will be denied if the token the low-lever cluster server used to report is not consistent with the one set for the monitoring channel of the high-level cluster server.

### 5.5.2 Set clustering parameters for GIS servers

You can refer to “SuperMap IS .NET Services Mode—Cluster Mode” for details about the parameters for GIS server configuration.

Follow the steps below to configure the GIS server:

1. **Register/Unregister GIS servers:** Log on to the SuperMap IS .NET Manager page on the GIS server. From the Servers list on the left of the page, click to select the GIS server node you want to add to the cluster. On the Server Config page, select “Yes” from the Join Cluster dropdown list to add the GIS server to the cluster, or select “No” to isolate the GIS server from the cluster.

2. **Cluster Reporting Settings:** Click Cluster Reporting Settings under the GIS server you have added to the cluster to set the reporting parameters for it. Some of the parameters have been set by default for all the GIS servers. You can change the default parameters.
**Whether to Enable Setting:** Check Disable if you want to use the default reporting parameters, or check Enable to set the reporting parameters according to your individual needs. If you check Enable, the following page appears:

![Cluster Reporting Settings for GIS servers](image)

Figure 5-17: Cluster Reporting Settings for GIS servers

**New/Edit:** GIS servers can communicate with different cluster managers through different channels and by different protocols. Click the New button to add a new channel and click edit to set the parameters for any existing channel. Note that after the parameters are set, click Update to save the settings.

Click Edit and set the following parameters:

**Enabled:** Set whether to enable the reporting.

**Protocol:** Select the protocol for the reporting channel. Currently, four types of protocol are supported: HTTP, which is a secure protocol best suited for the World Wide Web; TCP, which is a safe and suitable protocol for local area networks; UDP, which supports fast-speed and unconnected services although not safe enough; and net.pipe, which applies to communication between stand-alone processes. Note that ports cannot be set for net.pipe.

**IpAddress:** Set the address for the communication between the cluster server and the
GIS servers. GIS servers will report their state to this IpAddress.

**Port:** Set the port for the communication between the cluster server and the GIS servers. GIS servers will report their state to this port.

**Token:** Set the token to access the cluster server. Access will be denied if the token a GIS server used to report is not consistent with the one set for the monitoring channel.

### 5.5.3 Start/Stop Cluster Service

After the cluster parameters are set, start the cluster service on the cluster server by following the steps below:

1. **Start Cluster Service**

   Start the cluster service on the cluster server in any of the following two ways:

   **Way 1:** On the cluster server, click 【Start】→【Control Panel】→【Administrative Tools】→【Services】, find “SuperMap IS ClusterService” from the services list, and start the service.

   **Way 2:** Log on to the SuperMap IS .NET Manager on the cluster server. Click Services on the left of the page and go to the Services page. Find “SuperMap IS ClusterService” from the list and click Start to start the service.

2. **Start GIS Service.**

   Start the GIS service on the GIS server in any of the following two ways:

   **Way 1:** Click 【Start】→【Programs】→【SuperMap】→【SuperMap IS .NET】→【SuperMap IS .NET Service Control】→【Start Service】.

   **Way 2:** Log on to the SuperMap IS .NET Manager on the GIS server. Click Services on the left of the page and go to the Services page. Find “SuperMap IS ServerManager” from the list and click Start to start the service.

3. **Stop Cluster Service**

   Stop the cluster service on the cluster server in any of the following two ways:
Way 1: On the cluster server, click 【Start】→【Control Panel】→【Administrative Tools】→【Services】，select “SuperMap IS ClusterService” from the services list, and click Stop.

Way 2: Log on to the SuperMap IS .NET Manager on the cluster server. Click Services on the left of the page and go to the Services page. Find “SuperMap IS ClusterService” from the list and click Stop to Stop the service.

5.6 Configuration File

The IS .NET configuration information is stored in the SuperMapIS.config xml file in the Bin folder under the installation directory. You can view the configuration information by opening this file. So the SuperMap IS .NET service can be managed by editing in the SuperMapIS.config file, besides managing the service through the IS .NET Manager.

The tree structure of the SuperMap IS .config file is shown below:
The following table gives a brief description on the root nodes of the xml file:

<table>
<thead>
<tr>
<th>Root Node</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;managerServer&gt;</td>
<td>Settings for the GIS server manager, including the communication channel name and the port for monitoring</td>
</tr>
</tbody>
</table>
the server nodes. A host computer can have multiple GIS servers which are managed by SuperMap IS ServerManager.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>channelName</td>
<td>The channel name of the GIS server manager, which can be changed to any valid name. The default name is ManagerServiceChannel.</td>
</tr>
<tr>
<td>listenPort</td>
<td>The port for the GIS server manager to monitor the servers.</td>
</tr>
</tbody>
</table>

### 5.6.1 <managerServer>

The path where the images to be output are stored and the address for the user to access the images.

The reporting settings for the GIS servers to report to the cluster server, including the reporting channel, reporting interval, etc.

This node can have multiple sub-nodes `<spatialServer>` with each sub-node representing a GIS server. The parameters for each GIS server are recorded in the nodes under each sub-node. Detailed information about these parameters is given in the following sections.

Management of user custom service application. (Reserved)

Parameters set for the cluster server, including settings for the monitoring channel, timeout, publishing address and port, protocol, etc.

Automated tasks, e.g. clearing temp files regularly.
The port should not conflict with other ports already used.

| **ipAddress** | The IP address of the GIS server manager. By default, the IP address is not specified, which means that the address of the GIS server manager is that of the host. Note that if the host has more than one IP address, an IP address must be specified here as the GIS server manager address. |
| **serviceObject** | The service object name, which can be any valid name. The default name is ManagerService. |

### 5.6.2 <defaultReportSetting>

<table>
<thead>
<tr>
<th><strong>Sub-node</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>reportChannels</td>
<td>A GIS server can have multiple reporting channels and the information of each channel is recorded in the communicationChannel sub-node. The following is an example of setting four reporting channels.</td>
</tr>
</tbody>
</table>

```
<reportChannels>

  <communicationChannel enabled="true" protocol="net.udp" ipAddress="224.0.0.3" port="12000" token="" />

  <communicationChannel enabled="false" protocol="net.tcp" ipAddress="localhost" port="12001" token="" />

</reportChannels>
```

**Notes:** The communicationChannel node has five properties:

- enabled: whether to enable the channel;
- protocol: the protocol for communicating, which could be net.udp, net.tcp, http, net.pipe;
| **ipAddress**: | the IP address of the cluster server; |
| **port**: | the port number of the cluster server; |
| **token**: | the token for reporting |

| **reportInterval** | The reporting interval, in the units of seconds. |
| **performanceCounters** | The performance counter for GIS servers reporting to the cluster server, which is used by the cluster server to balance the loads between different GIS servers. The format of the performance counter is: |

```xml
<performanceCounters sampleInterval="200" maxSamples="5">
  <counter alias="cpu" category="Processor" name="% Processor Time" instance="_Total" loadWeight="0.3" />
  <counter alias="cpu_user" category="Processor" name="% User Time" instance="_Total" loadWeight="0.5" />
</performanceCounters>
```

**Notes:** The sampleInterval property defines the interval at which the performance of the GIS server is sampled, in the units of milliseconds. The maxSamples property defines the maximum number of samples. The properties for each performance indicator, including alias, category (memory, processor, CPU, network use ratio, and user-defined), name, instance, and loadWeight, are defined in `<counter>`. The property “instance” could be null, which means there is only one instance counter. The property loadWeight determines the weight of the performance counter. Different performance counters are given different weights based on importance, to make the system run efficiently.
5.6.3 `<spatialServers>`

`<spatialServers>` has multiple sub-nodes `<spatialServer>` with each sub-node representing a GIS server:

<table>
<thead>
<tr>
<th>GIS Parameter</th>
<th>Server Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;autoOpenMaps&gt;</code></td>
<td>The map list opened when the GIS server starts.</td>
</tr>
</tbody>
</table>
| `<autoRestart>` | Settings for the auto restart function:  
  ```xml
  <autoRestart enabled="true" interval="7.00:00:00.00" baseTime="23:59:59" />
  ```  
  **Note:**  
  Enabled controls whether to enable auto restarting. interval, in the format “d.hh:mm:ss.ff”, defines the interval at which the GIS server restarts. The interval cannot be less than 30 minutes. Note that if the interval isn’t specified or is specified incorrectly, then the default value, 24 hours, will be used.  
  BaseTime is the first time the server will restart, in the form Hours: Minutes: Seconds". If baseTime isn’t specified or is specified incorrectly, then, by default, the server will restart in one specified interval after it is started. |
| `<reportSetting>` | Settings for the GIS server reporting to the cluster server. |
| `<defaultMapSetting>` | The default map parameters including the display extent, the highlight style(for points, lines, and regions), etc. |
| `<overviewSetting>` | Overview settings. |
| `<mapCacheSetting>` | Map cache settings, e.g. whether to use cache, cache mode, etc. The format is:  
|                 |     <mapCacheSetting useCache="quickCache" compatibleMode="true" />
|                 | **Notes:**
|                 | useCache controls whether to use cache or the type of cache: true, quickCache, false.
|                 | compatibleMode controls whether to run in the mode compatible with 5.2.1.
| `<workspace>`   | Data in the workspace.
| `<engineCacheSetting>` | Cache settings, including the cache type, the cache size and the size ratio between the cache and physical memory, the interval at which the cache is checked, and whether to ignore thematic map dynamic labeling.
| `<engines>`     | The name of the engine used by the GIS server, the name of the file for the programs set.

### 5.6.4 `<clusterServer>`

<table>
<thead>
<tr>
<th>Sub-node</th>
<th>Description</th>
</tr>
</thead>
</table>
| monitorSetting | The settings for monitoring the GIS servers. The format is:  
|                |     <monitorSetting>
|                |                 <!-- protocol supported, and other required parameters -->
|                |     <monitorChannels>
|                |                   <communicationChannel enabled="true" protocol="net.udp" ipAddress="224.0.0.3" port="12000" token="" />

SuperMap IS .NET Manual
5.7 Other Configurations

Most of the parameters for the cluster server and GIS servers can be configured and managed through IS .NET Manager, although some other parameters, as discussed below, must be managed in the configuration file.

5.7.1 Cluster Performance

By default, Processor Time and User Time are considered as two performance indicators of the GIS server by the cluster server when balancing the loads between the GIS servers. It is allowed to define other performance indicators in the SuperMapIS.config file in the following way:

Open the SuperMapIS.config file and find the <performanceCounters> node which is in this format:

```
<performanceCounters sampleInterval="200" maxSamples="5">
  <counter alias="cpu" category="Processor" name="% Processor Time" instance="_Total" loadWeight="0.3" />
  <counter alias="cpu_user" category="Processor" name="% User Time" instance="_Total" loadWeight="0.5" />
</performanceCounters>
```
</performanceCounters>

Notes:

SampleInterval, defines the interval at which the performance of the GIS server is sampled, in the units of milliseconds.

MaxSamples, defines the maximum number of samples. The properties for each performance indicator, including alias, category (memory, processor, CPU, network use ratio, and user-defined), name, instance, and loadWeight, are defined in <counter>. The property “instance” could be null, which means there is only one instance counter. The property loadWeight determines the weight of the performance counter. Different performance counters are given different weights based on importance, to make the system run efficiently.

5.7.2 Auto Restart GIS Server

SuperMap IS .NET supports auto restarting any GIS server regularly:

Open the SuperMapIS.config file and find <autoRestart> which is in the following format:

```xml
<autoRestart enabled="true" interval="7.00:00:00.00" baseTime="23:59:59" />
```

enabled, controls whether to enable auto restarting.

interval, in the format “dd.hh:mm:ss.ff”, defines the interval at which the GIS server restarts. The interval cannot be less than 30 minutes. Note that if the interval isn’t specified or is specified incorrectly, then the default value, 24 hours, will be used.

baseTime, is the first time the server will restart, in the form "Hours:Minutes:Seconds". If baseTime isn’t specified or is specified incorrectly, then, by default, the server will restart in one specified interval after it is started.

5.8 Log

Logs can be used to record the running information of the system after service starts,
and SuperMap IS .NET provides a powerful log management function. If error occurs when the system is running, you can find the reasons why error occurs by viewing the log file, in order to fix the problem.

After starting service, SuperMap IS .NET will create a Log folder automatically in the Bin folder under the installation directory, and arrange the log files by modified time. There are three log files provided: application server log (SuperMap.IS.AppServer.exe.MapServer.log), automatic task log (SuperMap.IS.AutoTask.exe.log) and service manager log (SuperMap.IS.ServerManager.exe.log). By viewing the log files, you can know the running state of the current system and detailed information about each event.

Log information has several levels, and it can be set and viewed in IS Manager. Click 【Start】】 All Programs 】 SuperMap 】 SuperMap IS .NET 】 SuperMap Service Control 】 Manage Map Services to open the IS Manager page and click IS Logs on the left:

![IS Logs](image)

Figure 5-19: IS Logs

By default, the page displays the whole information of application log at the current date, and sorts them by time. The information provided includes normal information,
exception information, warning and error information. In the Filter combo box, select to view Exceptions or Warnings or All. In the Sort by time box, you can select the method for sorting log information. In the Date combo box, you can set to display log information of certain date, such as 20090227. You can select to display which type of log file in the Type box.

IS Manager also supports downloading logs. Click "Download Today's Logs" to download all the logs of the selected date.
Developing a GIS Website

6.1 Development Process

6.1.1 Development Environment

- Windows XP (with SP2 or later version) / Windows Server 2003 (with SP2 or later version) / Windows Vista / Windows Server 2008 operating system
- IIS Web server
- Visual studio 2008 (recommended) or other tools used to implement .NET development
- Browser compatible with JavaScript1.2 version, such as Internet Explorer 5.0 or later version
- SuperMap Objects runtime version when using the default engine to publish GIS service; SuperMap Objects development version when customizing GIS engine
6.1.2 Technology Background

Internet-based GIS service is the integration of Internet and GIS technologies. Therefore, it is necessary for a developer to understand, and/or have experience with the following technologies:

- .NET development technology and Web application development
- Component-based programming
- Programming of HTML, DHTML and JavaScript
- HTTP protocol foundation
- C++, VB or other development language (Optional)
- SuperMap technology or other GIS software technology
- Map edit and operations
- SuperMap IS .NET structure and development method or other GIS software

6.1.3 Preliminary Work and Data Handling

6.1.3.1 Preliminary Work for Data Handling

To develop an Internet-based GIS service system, maps and related data are needed in addition to the necessary hardware and software. In essence, many tasks related to GIS service system development focus on map and related data digitization and preparation. Therefore, preparation of original map data, data processor, and the proper hardware and software infrastructure is required.

6.1.3.2 Preparation for Map and Workspace

SuperMap workspace organizes data of different formats and different sources.
Different maps created in different representational ways can be saved in a workspace file. The workspace is the basic configuration unit of SuperMap IS .NET service engine. So, the required data should be prepared in advance and saved as a workspace file through SuperMap Deskpro. Then the corresponding parameters should be set to configure a map application using SuperMap IS .NET manager.

### 6.1.3.3 Data Preparation Steps

SuperMap Deskpro can be used to digitalize a paper-based map, convert the existing data, edit and clean them, make a thematic map, etc. The basic steps for data preparation are as follows:

- Establishing a workspace
- Building a symbol library and line style library
- Importing the existing dataset
- Scanning a base map
- Creating a new dataset
- Digitalizing

### 6.1.4 Flowchart of Development

![Flowchart](image)

Figure 6-1: The Flowchart For Developing a Website for Spatial Information Services
6.1.5 Designing Runtime Mode

After the preliminary work has been completed and prior to the system development, it is necessary to consider the runtime mode to reduce later modifications as explained in the following steps:

6.1.5.1 Request Investigation

Detailed and clear user requirements for functionality and performance index are the foundation for a good system structure design. Only perfectly understanding the user’s needs can the system be developed well, thereby avoiding constant adjustments, reducing redundant functionalities, saving system resources, and decreasing the total cost.

6.1.5.2 Resource Investigation

Being familiar with available resources will provide good understanding of the attainable functionalities and technology parameters. Building a system with available resources can avoid blind and unnecessary plans. Otherwise, a system will not be built successfully and the objectives will not be realized. Therefore, system objectives and tasks should be designed based on user requirements and resource investigation, and the designer should take all possibilities and requirements into consideration.

6.1.5.3 Architecture Design

The system architecture and total objectives are designed according to the requirements and resource conditions, for instance, whether systems need to be clustered, what modes of GIS application server need to be adopted, what functionalities a system needs to provide, and what performance index should be reached for the possible number of concurrent users, and so on.

6.1.6 Workflow of System Development

After finishing all prerequisite tasks, the specific development will be started. It can be divided into following stages:
6.1.7 Optimizing and Debugging

After operating for a period of time, a system needs to be optimized and debugged to the best state in accordance with the real situation.

6.2 SuperMap IS .NET WebControls

SuperMap IS .NET provides WebGIS platform with controls and class libraries. Compared with script language, the controls and class libraries provide the properties, methods, and events to develop WebGIS systems easier.

SuperMap IS .NET provides a SDK development kit, including four class libraries as shown in Table 6-1.

Table 6-1: Class Library List

<table>
<thead>
<tr>
<th>Name of Class library</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SuperMap.IS.WebControls.dll</td>
<td>WebGIS control running on the server, the main interface of second development</td>
</tr>
</tbody>
</table>
SuperMap.IS.Utility.dll  Utility Tool Library
SuperMap.IS.ServiceInterface.dll  Remote Service Object Interface
SuperMap.IS.WebLib.dll  Web Development Program Library

WebControl includes seventeen controls, which implement different functionalities, respectively.

*Table 6-2: WebControl List*

<table>
<thead>
<tr>
<th>Name of Control</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="MapControl" /></td>
<td>Displaying a map; query; spatial analysis; optimal and shortest path analysis; bus transfer, etc.</td>
</tr>
<tr>
<td><img src="image" alt="ViewEntireToolControl" /></td>
<td>Displaying the entire map</td>
</tr>
<tr>
<td><img src="image" alt="ZoomInToolControl" /></td>
<td>Zooming in the map to any scale</td>
</tr>
<tr>
<td><img src="image" alt="ZoomOutToolControl" /></td>
<td>Zooming out the map to any scale</td>
</tr>
<tr>
<td><img src="image" alt="QuickZoomInToolControl" /></td>
<td>Double zooming in map</td>
</tr>
<tr>
<td><img src="image" alt="QuickZoomOutToolControl" /></td>
<td>Double zooming out map</td>
</tr>
<tr>
<td><img src="image" alt="PanToolControl" /></td>
<td>Panning the map</td>
</tr>
<tr>
<td><img src="image" alt="OverviewControl" /></td>
<td>Eagle eye function (needs to cooperate with MapControl)</td>
</tr>
<tr>
<td><img src="image" alt="LayerControl" /></td>
<td>Layer control for setting the state of layer, such as visible or selectable, etc.</td>
</tr>
<tr>
<td><img src="image" alt="LegendControl" /></td>
<td>Displaying legend and edit</td>
</tr>
</tbody>
</table>
6.3 Quick Start Guide for Using SuperMap IS .NET WebControls

The following steps will provide a guide for using SuperMap IS .NET webcontrols in order to establish a WebGIS website with basic functions, such as browsing a map, querying location by attribute, querying attribute by location, etc.

6.3.1 Preparing map for publishing

A map is needed before configuring and starting the service. SuperMap Deskpro, SuperMap Express or other applications developed by SuperMap Objects can be used to create a map. You can refer to relevant documents and help files of SuperMap Deskpro on how to create a map.

6.3.2 Configuring and Starting SuperMap IS .NET Application Server

SuperMap IS .NET service should be configured and started after the installation. The
Developing a GIS Website

The demo program mostly uses the default configuration parameters of SuperMap IS .NET. The user only need to modify the Map setting parameters by clicking the branch of tree structure on the left side of the interface. On the right side of the interface, the user can modify the Path of SuperMap Workspace item as ...
[SuperMap IS .NET installation directory]\Data\SMISSampleData.smw, Click Save button and the application server configuration will be completed.

6.3.3 Building a New Website Project

Microsoft Visual Studio 2005 supports multi development languages. Each language can be used to create an ASP.NET Web Application project. Start Visual Studio 2005, click File> New> Web Site, a New Web Site dialog box will pop up, as showed in Figure 6-2. Select ASP.NET Web Site from the above Templates box and set the Location to be HTTP, and the website address to be http://localhost/SMISSStepByStep, and set the Language to be Visual C# at the bottom. Click OK to complete creating a new web site, and the SMISSStepByStep website will be automatically created.

![Figure 6-2: Create a New Project](image)

SuperMap IS .NET Manual
6.3.4 Loading SuperMap IS WebControls

After creating the new web site, a `default.aspx` window will be displayed. Click the `General` tab on the `Toolbox` window to add SuperMap IS `WebControls`, Usually any tab can be chosen to add SuperMap IS `WebControls` to, but for the convenience of management and use, we choose a blank Tab. Right-click the `General` tab and click `Choose Items...` on the shortcut menu (Figure 6-3), the `Choose Toolbox Items` dialog will pop up.

Click the `Browse` button to browse for `SuperMap.IS.WebControls.dll`, which can be found on the `[SuperMap IS .NET installation]\ SDK` folder (Figure 6-4). Then click `OK` to complete adding the SuperMap IS Webcontrols.

If the WebControls are added successfully, SuperMap IS WebControls will appear in the `ToolBox` window (Figure 6-5).
6.3.5 Creating the Homepage

Most functions of SuperMap IS .NET are encapsulated as Visual Studio.NET WebControls, which improves the speed of program-developing. You can use SuperMap IS WebControls to implement webGIS function in a Web GIS application which is very similar to using SuperMap objects to build a GIS project. You can implement Web GIS functions conveniently by using properties, methods and events defined by SuperMap IS WebControl. The following step is to create an application homepage for the SMISStepByStep website and load a set of basic SuperMap IS WebControls to it.

1. Create an Application Homepage

A web page named Default.aspx was created as the application homepage when you create a new web site. Right-click Default.aspx in the solution explorer window and click Set As Start Page on the shortcut menu as shown in Figure 6-6, then double-click Default.aspx to open this window.
2. There are two ways to load controls onto the web page, one is to click Control icon in the Toolbox window and drag it to the web page and drop it; another way is to double-click the control icon to load the control automatically onto the page and you can change its size and position manually. By using any of the two ways mentioned above, we load MapControl first and set its Width and Height in the properties window. As showed in Figure 6-7 and Figure 6-8 below, MapControl has been loaded into the homepage. If the SuperMap IS service has already been started, the MapControl can display a map published by SuperMap IS service while designing. The procedure is as follows: right-click the MapControl in the homepage and click Load Map, type IP address and Port of Map Server in the pop-up MapControl Editor dialog, then the maps published by the Map Server will appear in the dropdown map list. Select one of the maps you want to load to the homepage, and press Preview button, and then the map will be displayed below. Click OK and the map will be displayed in the MapControl in the homepage.
3. **Runtime Test**

Now we can run and test the web GIS site locally, though we haven’t write any code for the web site. Select the Start Debugging in the Debug menu or click on the toolbar or press F5 key. The running result is shown in Figure 6-9, from which we can see the map is displayed in the web page. The following step is to implement map browse functionality such as zooming and panning in the project.
6.3.6 Implementing the Basic Functionality of Map Browse

The basic map browse functionalities include panning, zooming in, zooming out and viewing entirely.

1. Load Controls

The following SuperMap IS WebControls can implement the basic map browse function:

- **Fixed Zoom In**: QuickZoomInToolControl
- **Fixed Zoom Out**: QuickZoomOutToolControl
- **Zoom In**: ZoomInToolControl
• **Zoom Out**: ZoomOutToolControl
• **Pan**: PanToolControl
• **Full Extent**: ViewEntireToolControl

We have already described how to load the SuperMap IS WebControls onto the webpage in step 6. All the above controls can be loaded onto the webpage in the same way, and their functions can be implemented without attaching any code.

2. **Runtime Test**

Click the Run button to test the basic map browse functionalities. The running result is shown in Figure 6-10 and the buttons below the map in turn (from left to right) are Full Extent, Zoom In, Zoom Out, Fixed Zoom In, Fixed Zoom Out and Pan. Click any of the buttons to operate over the map and test the functions of the buttons.
6.3.7 Querying Features by SQL

Query features by SQL is one of the basic GIS functions. There are two main query manners: one is finding and selecting features with a Structured Query Language (SQL) expression of attribute fields and another is querying the related attribute information for identified features. In this step, we will introduce the former one----finding the features related to the attribute information. This is a fuzzy query. It can find all features in an appointed layer related to the typed one or multiple key words (World_countries@world layer is set as the QueryLayer). The query result will be displayed on the webpage and the queried geometries will be highlighted on the map.

1. Load Controls

You need to load the following controls (Figure 6-11) onto the webpage to implement the query function.

![Figure 6-11: Query Features by SQL](image)

- Add a TextBox to the web page and set its ID to txtQuery in the Properties window for inputting.
• Add a Button to the web page and set its ID to btnQuery for submitting the query statement.

• Add a DataGrid and set its ID to dgResult for displaying the query results.

2. Attach Code

First of all, add the following code to Default.aspx:

```csharp
using SuperMap.IS.Utility;
using SuperMap.IS.WebControls;
```

Secondly, add the following code to `Click` event of `btnQuery` button:

```csharp
private void btnQuery_Click(object sender, System.EventArgs e)
{
    QueryParam param = new QueryParam(); // <line1>
    param.IsAllLayer = false; // <line2>
    QueryLayer queryLayer = new QueryLayer(); // <line3>
    queryLayer.ReturnFields = new string[2]; // <line4>
    queryLayer.ReturnFields[0] = "SMID"; // <line5>
    queryLayer.Name = "World_countries@world"; // <line7>
    queryLayer.WhereClause = "Country like '+" + this.txtQuery.Text + "'"; // <line8>
    param.Layers = new QueryLayer[1]; // <line9>
    param.Layers[0] = queryLayer; // <line10>
    param.HasGeometry = true; // <line11>
    param.Highlight.HighlightResult = true; // <line12>
    ResultSet Rs = MapControl1.QueryBySQL(param); // <line13>
    DataSet ds = Rs.ToDataSet(); // <line14>
    dgResult.DataSource = ds; // <line15>
    dgResult.DataBind(); // <line16>
}
```
Define a QueryParam object named queryParam from which you can set query layer, query condition, and specified return field values.

Set whether to query all layers or not. If its value is false, you should set the query condition to every query layer separately.

Create a new instance of QueryLayer class.

Set fields to return.

Set the query layer’s name and query condition.

Set query spatial data: True means returning spatial data; False means do not return. If you want to highlight the query result, its value must be true.

Set whether highlight the geometric objects on the map or not.

Perform query function by using MapControl.QueryBySql and save the result in resultSet.

Bind the result to the DataGrid to display.

Notes: You can add the code below to Page_load event, if you do not want to preserve the highlight on the map when perform another query.

```csharp
private void Page_Load(object sender, EventArgs e)
{
    // Put user code to initialize the page here
    MapControl1.ClearHighLight(); // clear highlight
}
```

3. Runtime Test

Run the project following the related parts in step 6. Type Canada in the textbox and click Query. It will return all the records which contain Canada in NAME field of
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world_countries@World layer and the values of SMID and NAME of the records will be displayed in the DataGrid. The related geometries are highlighted on the map as shown in Figure 6-12.

![Figure 6-12: Querying a specific area](image)

### 6.3.8 Identifying Attributes by Features

Identify attributes of features is another way of spatial information query. SuperMap IS .NET provides several ways to query the features' information such as identifying features inside rectangles, polygons, circles or by pointing at them on the map.

In the beginning, you need to set the query layer and its parameters such as which specified fields information to return. Secondly, you need to set the query style, in point, rectangle, circle or polygon. Thirdly, display the results on the user interface.

The following steps will describe how to implement these functions.

1. **Attach Code to the Buttons**

Add four *HTML* buttons to the right hand side of the map to set four different queries respectively. Set the *Value* of the four buttons as *PointSelect, RectSelect, CircleSelect*.
and PolygonSelect which mean select the feature by point to them, drag a rectangle, a circle or a polygon as shown in Figure 6-13.

![Figure 6-13: Adding Query Buttons](image)

2. Attach Code to the Buttons

Click the HTML tab at the bottom of the webpage to switch the webpage to HTML style. Set the onclick properties of the above four buttons as follows respectively.

- PointSelect: onclick="SMISActionStart('MapControl1','POINTQUERY');"
- RectSelect: onclick="SMISActionStart('MapControl1','RECTQUERY');"
- CircleSelect: onclick="SMISActionStart('MapControl1','CIRCLEQUERY');"
- PolygonSelect: onclick="SMISActionStart('MapControl1','POLYGONQUERY');"

3. Attach Code to Display the Result

First, set the map layer for querying and related parameters which need to set before query. MapControl provides a special event which will be triggered before query, that is

```csharp
MapControl1_Querying (object sender, SuperMap.IS.WebControl.EventArgs.QueryParamArgs e)`, therefore, the
```

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The process of setting query parameters should be performed in this event. The code is as follows:

```csharp
private void MapControl1_Querying(object sender, SuperMap.IS.WebControls.EventArguments.QueryingEventArgs e) {
    e.Params.HasGeometry = true; // <line1>
    e.Params.Highlight.HighlightResult = true; // <line2>
    e.Params.IsAllLayer = false; // <line3>
    e.Params.Layers = new QueryLayer[1]; // <line4>
    e.Params.Layers[0] = new QueryLayer(); // <line5>
    e.Params.Layers[0].Name = "world_countries@World"; // <line6>
    e.Params.Layers[0].ReturnFields = new string[2]; // <line7>
    e.Params.Layers[0].ReturnFields[0] = "SMID"; // <line8>
}
```

- **<Line1>**: Set whether returns spatial data or not, `TRUE` means return and `FALSE` means not return.
- **<Line2>**: Set whether highlight geometric objects on the map or not.
- **<Line3>**: Set whether query all the layers or not.
- **<Line4>**: Create a new instance of `QueryLayer` class.
- **<Line6>**: Set layers to be query.
- **<Line8>**: Set the field value to return.
- **<Line9>**: Set the field value to return.

Secondly, display the query result by using `QueryCompleted` event of the MapControl. In order to obtain the result in the client side, we need to bind the returned results to the `DataGrid` in the `MapControl1_QueryCompleted` event.

```csharp
private void MapControl1_QueryCompleted(object sender, SuperMap.IS.WebControls.EventArguments.QueryCompletedEventArgs e) {
    // Display the query results
    // Bind the returned results to the DataGrid
}
```
{ 
    ResultSet rs = new ResultSet();
    rs.Recordsets = e.Recordsets;
    rs.TotalCount = e.TotalCount;
    DataSet ds = rs.ToDataSet();
    dgResult.DataSource = ds;
    dgResult.DataBind();
}

4. Runtime Test

Run the project in the way as described in step 6 and zoom in the map as shown in Figure 6-14. Click **RectSelect** button and Position the cursor at one corner of the area from which the selection will be made on the map and press the mouse button. Keep the mouse button depressed and drag the cursor away from the starting point. Release the mouse button when the rectangle reaches the desired size. All of the objects whose centroid is within are highlighted. The query results will be shown in the **dgResult** control on the lower-right corner of the webpage (Figure 6-14). You can use the **CircleSelect** and **PolygonSelect** button the similar way to **RectSelect** to test their query functions.
6.4 SuperMap IS .NET Controls

SuperMap IS .NET provides WebGIS platform with controls and class libraries. Compared with script language, the controls and class libraries provide the properties, methods, and events to develop WebGIS systems easier.

SuperMap IS .NET provides a SDK development kit, including four class libraries as shown in Table 6-3.

Table 6-3: Class Library List

<table>
<thead>
<tr>
<th>Name of Class library</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SuperMap.IS.WebControls.dll</td>
<td>WebGIS control running on the server, the main interface of second development</td>
</tr>
<tr>
<td>SuperMap.IS.Utility.dll</td>
<td>Utility Tool Library</td>
</tr>
<tr>
<td>SuperMap.IS.ServiceInterface.dll</td>
<td>Remote Service Object Interface</td>
</tr>
<tr>
<td>SuperMap.IS.WebLib.dll</td>
<td>Web Development Program Library</td>
</tr>
</tbody>
</table>

WebControl includes seventeen controls, which implement different functionalities, respectively.

Table 6-4: WebControl List

<table>
<thead>
<tr>
<th>Name of Control</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>MapControl</td>
<td>Displaying a map; query; spatial analysis; optimal and shortest path analysis; bus transfer, etc.</td>
</tr>
<tr>
<td>Icon</td>
<td>Function</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>ViewEntireToolControl</td>
<td>Displaying the entire map</td>
</tr>
<tr>
<td>ZoomInToolControl</td>
<td>Zooming in the map to any scale</td>
</tr>
<tr>
<td>ZoomOutToolControl</td>
<td>Zooming out the map to any scale</td>
</tr>
<tr>
<td>QuickZoomInToolControl</td>
<td>Double zooming in map</td>
</tr>
<tr>
<td>QuickZoomOutToolControl</td>
<td>Double zooming out map</td>
</tr>
<tr>
<td>PanToolControl</td>
<td>Panning the map</td>
</tr>
<tr>
<td>OverviewControl</td>
<td>Eagle eye function (needs to cooperate with MapControl)</td>
</tr>
<tr>
<td>LayerControl</td>
<td>Layer control for setting the state of layer, such as visible or selectable, etc.</td>
</tr>
<tr>
<td>LegendControl</td>
<td>Displaying legend and edit</td>
</tr>
<tr>
<td>AreaToolControl</td>
<td>Measuring area</td>
</tr>
<tr>
<td>DistanceToolControl</td>
<td>Measuring distance</td>
</tr>
<tr>
<td>ViewNextToolControl</td>
<td>Displaying the next view</td>
</tr>
<tr>
<td>ViewPreviousToolControl</td>
<td>Displaying the previous view</td>
</tr>
<tr>
<td>MapPrintControl</td>
<td>Outputting map and printing</td>
</tr>
<tr>
<td>PrintToolControl</td>
<td>Printing map (needs to be used with MapPrintControl)</td>
</tr>
<tr>
<td>ToolbarControl</td>
<td>Toolbar for basic functionalities (User can drag any of controls on it and place them by need.)</td>
</tr>
</tbody>
</table>
7.1 Overview of SuperMap IS .NET Demo

SuperMap IS .NET provides various development ways for users to build a Web GIS site, such as developing based on SuperMap WebControls, developing using TCPMap, developing by calling WebServices on windows client-side, and the advanced user can also develop GIS service engine. For each way of development there is a development Demo with various functions that provides reference and support for users to build their Web GIS site quickly. The development Demo projects can be accessed in `<SuperMap IS .NET Installation Directory>\Demo` directory. WebControls development demo is in `ASPXDEMO` folder, and TCPMap development demo in the `WinFormClient` folder. The `CustomEngine` folder stores custom engine development demo and the `MobileMap` folder stores the development demo for embedded PC client-side. In each demo, there is a project including the source code.

The ASPXDEMO site built by the Demo template project will be created automatically when installing SuperMap IS .NET. After the setup of SuperMap IS .NET you can access ASPXDEMO demo project by visiting `http://Localhost/AspxDemo` if the SuperMap IS .NET Service has been started.
The data used in Demos includes the map of Changchun city and world map, and the data is installed to `<SuperMap IS .NET Installation Directory>\Data` directory, while the changchun folder stores the map of Changchun city, and the World folder stores the world map.

The following contents are the introduction to the functions implemented by each Demo and the behaviors of each function.

## 7.2 AspxDemo

### 7.2.1 Overview of AspxDemo

AspxDemo is a SuperMap IS .NET Demo that developed based on SuperMap WebControls. It is one of the main demos that attached to SuperMap IS .NET software products, and has both C#.NET version which developed using C#.NET language and VB.NET version which developed using VB.NET language and you can consult either of them according to your habit and preference. Most of the functionalities that provided by SuperMap IS .NET can be implemented in the AspxDemo demo, including querying, path analysis, bus route analysis etc. The interface of the demo is brief and pleasant, which can be used as the reference or development template based on SuperMap WebControls to develop your own Web GIS site.

### 7.2.2 Introduction to the Functionalities of AspxDemo

AspxDemo implements most of the functionalities provided by SuperMap IS .NET, and it is a powerful reference tools for users to perform second development based on SuperMap Web Controls. The main functionalities of AspxDemo are as follows:

- Zooming In, zooming out, panning, zooming to full extent;
- Map switching;
- Clearing highlight.
- Layers controlling;
- Overview
- Path analysis
- Printing maps
- Fuzzy query
- Querying by point and querying by bound
- Measuring distance and area
- Bus route analysis
- Map editing
- Custom labeling
- The closest facilities analysis
- Legend

When performing second development based on SuperMap Web Controls, the users need not to attach any code to implement the preceding 7 functionalities, and only need to attach little code to implement the functionalities of measuring distance and area, and map querying. The main interface of AspxDemo is shown in Figure 7-1.

The main interface can be divided into three sections: the toolbar operation section (as shown in Figure 7-1-(1)(3)), map displaying section (as shown in Figure 7-1-(2)), and the functionality operation section (as shown in Figure 7-1-(3)).
7.2.3 The toolbar operation section

The function and operation of each button on the toolbar is depicted as follows:

- Full Extent: Click to zoom to the full extent of the map;
- Zoom In: Click to zoom in the map by constant increment, here zooms to two times of the actual size.
- Zoom Out: Click to zoom out the map by constant increments, here zooms to ½ time of the actual size.
- Zoom In by Rectangle: Click to zoom in to the area of a rectangle you draw;
- Zoom Out by Rectangle: Click to zoom out from the area of a rectangle you draw;
- Pan: Click and drag the display window to move the map to the part you want to display;
● Precious View: Click to zoom to the last extent. This tool is unavailable until you have changed extents;

● Next View: Click to zoom forward from a previous extent. This tool is unavailable until you have clicked the Previous Extent button.

● Measure Distance: Click and draw a polyline whose length you want to measure. Double-click to end the polyline and the distance information will be displayed;

● Measure Area: Click and draw a polygon whose area you want to measure. Double-click to end the polygon, and the area information will be displayed;

● Point Select: Click this button and then click the object on the map. In this way, the object is selectable, and the attribute information of this object will be displayed in result list box;

● Rectangle Select: Click and draw a rectangle on the map. In this way, the objects within the rectangle are selectable, and the attribute information of the objects will be displayed in result list box;

● Polygon Select: Click and draw a polygon on the map. In this way, the objects within the polygon are selectable, and the attribute information of the objects will be displayed in result list box;

● Circle Select: Click and draw a circle on the map. In this way, the objects within the circle can be selectable, and then the attribute information of the objects will be displayed in result list box;

● Print Map: Click and the Print Preview Window will pop up. You can print the map in current map window or save it as a file.

● Path Analysis: Click on the map to set a series of nodes. Double-click to end and the shortest path passing these nodes is highlighted.
- **Display Custom Label**: Click and the custom label points will be displayed on the map. Custom label points are various HTML elements on the map, which support hyper text link and multimedia link. The label points zoom and move with the map.

- **Clear Custom Label**: Click to clear the displayed custom label points on the map;

- **Switch Map**: Click to display the map name dropdown list box. Chooses one of the map names, and the corresponding map will be displayed in current map window.

- **Clear Highlight**: Click to clear the highlights on the map that generated by path analysis or other operations, and the map will be displayed under normal status.

- **Add Mark Point**: Click any place on the map window, then a flickering picture will be marked at the place you click.

- **Delete Mark Point**: Click and the added flickering marks in the map window will be deleted.

- **Add Geometry Objects**: Click and the current map layers will be listed in the functionality operation section, and the drawing buttons will be displayed below. Select the layer name you want to edit in the layer list, and click one of the geometry drawing (point, line or region) buttons to draw the geometry on the map window. For example, if you want to add a point object, you can select the point layer first, and click the Add Point button, then draw the point at the relevant position in the map window.

- **Update Geometry Objects**: Click and the current map layers will be listed in the functionality operation section. Click the dropdown arrow to select the layer you want to edit in the layer list, and click the geometry object you want to modify on the map window, and then the geometry object will be highlighted representing being selected. At the meanwhile, the three
drawing buttons: the Add Point button, the Add Line button and the Add Region button will appear in the functionality operation section respectively. Select the corresponding button according to the object type you want to update, and then redraw the shape of the geometry object at the desired place on the map. For example, if you want to update a certain point object in a point layer, you can first select the point layer in the layer list, then click a point object in current map window, here, the point object will be highlighted, and click the Add Point button in functionality operation section. Finally, draw the point object at the desired place on the map.

- Move Geometry Objects: Click and the current map layers will be listed in the functionality operation section. Click the dropdown list to select the layer you want to edit in the layer list, and click the geometry object you want to move on the map window, and then drag the object to the desired position.

- Delete Geometry Object: Click and the current map layers will be listed in the functionality operation section. Click the dropdown list to select the layer you want to edit in the layer list, and click the geometry object you want to delete on the map window to highlight the geometry object, and then the Delete Object button will appear in functionality operation section. Click the Delete Object button, the highlighted object will be deleted.

- Display Legend: Click and a new web page will be opened to display the legend of all the layers of the map in current map window.

- Closest Facility Analysis: Click and select the facility layer in the dropdown list appeared next to the button. Click on the map to generate a key point, then the closest facilities apart from the key point will be queried; as a result, the key point, the queried facility points and the route between the key point and the queried facility points will be highlighted on the map.
7.2.4 The Functionality Operation section

The Functionality Operation section includes the operations of the following four functions:

- **The Overview operation**

The overview window located in the upper-right corner of the interface, and the top part of the Functionality Operation section, as shown in Figure 7-2. The overview window displays the map with full extent. There are two usages of the overview function: one is that people can be aware of the location and domain of the displayed map in current map window relative to the whole map, and the district in the red rectangle box in the overview window is the area that displayed in current map window. Another one is when moving the red rectangle box in the overview window, the map displayed in current map window will change correspondingly and quickly, and when clicking anywhere in the overview window, the current map window will navigate to the related area quickly.

![Figure 7-2: The overview window](image)

- **The Fuzzy Query operation**
Click the **Map Operation** tab on the right side of the functionality operation section to switch to the map query window. In the map query window, there is a query input box and a **Query** button, below which is the query result list box.

The fuzzy query function is provided in the map query window. Type one or more key words in the input box, and click the **Query** button to query the place names or organizations related to the typed key words. For example, when you typing “government” in the input box, several names related to “government” are listed in the query result list box, as shown in Figure 7-3. Click an item in the query result list box to navigate the item in the map window.

- **The Layer Control operation**

On the right of the Functionality Operation section, there are three tabs arranged vertically. You can perform different operations and implement different functions in different tab. Click the **Layer Control** button to highlight the tab. Meanwhile, the **Layer Control** operation window will appear in the lower half part of the Functionality Operation section. In the **Layer Control** operation window, you can set each layer on current map to be whether visible and queryable.
The Layer Control operation window is a layer list box with a scroll bar, as shown in Figure 7-4. The first row of the layer list box is the list head, i.e. name of each column: Layer name, Visible,Queryable respectively, so the first column lists the layer names of all the layers; The second row lists check boxes to set whether the related layer can be visible; And the third row lists check boxes to set whether the related layer can be queried.

At the bottom of the Layer Control operation window, there are two buttons and two check boxes. The two buttons are: the Submit button and the Reset button, and the two check boxes are in the Visible column and in theQueryable column respectively. The Submit button is used to submit the settings to the layers, and the Reset button is used to reset all the layers to the settings before submitting. The check box in the Visible column is used to set all the check boxes in the Visible column to be checked or unchecked. Similarly, the check box in theQueryable column is used to set all the check boxes in theQueryable column to be checked or unchecked.

The Bus Analysis operation

Click the Bus Analysis tab on the right of the Functionality Operation section to switch to the Bus Analysis window in the Functionality Operation section, as shown
in Figure 7-5. There are three operations or functions to be implemented in the *Bus Analysis* window, which are Bus Stop Fuzzy Query, Bus Route Fuzzy Query and Bus Transfer Query.

**Bus Stop Fuzzy Query:** The operation of Bus Stop Fuzzy Query is similar to that of the above fuzzy query function, but the Bus Stop Fuzzy Query function queries in the bus stop field. Type one or more key words to query the bus stops related to the typed key words. For example, when typing “qingnian” in the Bus Stop Name text box, the query results appear in a box as a catalog tree as shown in Figure 7-6. The root nodes of the tree are the bus stop names which include the word “qingnian”, and click one of them to navigate to the related bus stop in current map window. Click the plus next to the bus stop name to expand the item, and the items contained in this item are the names of the bus route passing this bus stop. Click one of the bus route names to highlight the related bus route on the map.

**Bus Route Fuzzy Query:** The operation of Bus Route Fuzzy Query is similar to that of Bus Stop Fuzzy Query, but the results of the Bus Route Fuzzy Query are the bus route names. Type one or more key words to query the bus route names which including the key words. For example, when typing “3” in the *Bus Route Name* text box, the query results appear in a box as a catalog tree as shown in Figure 7-7. The root nodes of the tree are the bus route names which include the word “3”, and click one of them to navigate to highlight the related route in current map window. Click the plus next to the bus route name to expand the item, and the items contained in this item are the names of all the bus stops that along this bus route. Click one of the bus stop names to navigate to the related bus stop on the map.
Figure 7-7: Result of Bus Route Fuzzy Query

**Bus Transfer Query**: The Bus Transfer Query function allows you to enter such parameters as the start stop name, the end stop name of the bus route and the transfer times to obtain a bus-taking scheme from the start stop to the end stop. The start stop query and the end stop query all support fuzzy query, which means you can first type the key words of the start stop and the end stop, and find the accurate names of the start and end stop to perform further bus transfer query.

### 7.3 AjaxDemo—AjaxControls Development Demo

#### 7.3.1 Introduction to AjaxDemo

AjaxDemo is an Ajax-based service GIS site. It is developed in AjaxScripts by the visual controls of AjaxControls of SuperMap IS.NET.

AjaxDemo has realized most functions of SuperMap IS .NET, including map browsing, layer control, map measuring, querying, path analysis, on-line editing, navigation, etc. It can be used as the development template or reference resource for developing the Ajax-based service GIS site.

#### 7.3.2 Introduction to AjaxDemo Functions

AjaxDemo has realized most functions of SuperMap IS .NET. It provides users the reference and support for development. The main functions of AjaxDemo are shown as below:

- Zoom In, Zoom Out, Pan, View Enire;
- Select by Point, Select by Line, Select by Rectangle, Select by Polygon, Select by Circle;
- Layer Control;
• Legend;
• Map Overview;
• Compass;
• Magnifier;
• Switch map;
• SQL Query;
• Measure Distance/Area;
• Find Shortest Path;
• Find Transfer solution;
• On-line Map Editing;
• Dynamic Navigation;
• Navigate

The main interface of AjaxDemo is divided into three parts (Figure 6-8): toolbar area (Figure 7-8-①), function area (Figure 7-8-②) and map display area (Figure 7-8-③).
7.3.3 Toolbar Area

- View Entire: Click the View Entire button to display the entire map in map window.
- Pan: Click the Pan button to move the map in map window.
- Zoom In: Click the Zoom In button. Click on the map and drag a rectangle around the area that you want to zoom in.
- Zoom Out: Click the Zoom Out button. Click on the map and drag a rectangle around the area that you want to zoom out.
- Select by Point: Click the Select by Point button, click the optional object to show its attribute information.
- Select by Line: Click the Select by Line button, draw a line on the map and show the attribute information of objects that pass this line.
—Select by Rectangle: Click the Select by Rectangle button, drag a rectangle on the map and show the attribute information of the optional objects in this rectangle on the query results list.

—Select by Polygon: Click the Select by Polygon button, drag raw a polygon on the map and show the attribute information of the optional objects in this polygon on the query results list.

—Query by Circle: Click the Query by Circle button, draw a circle on the map and show the attribute information of the optional objects in this circle on the query results list.

—Measure Distance: Click the Measure Distance button. Click to choose the starting point on the map, move the mouse, choose the middle point or ending point, then double click to end the measuring and show the result.

—Measure Area: Click the Measure Area button. Choose the starting point on the map, move the mouse, choose the middle point or ending point, then double-click to end the measuring and show the area of the selected polygon.

—Find Shortest Path: Click the Find Shortest Path button. Get two or more than two points on the map and double-click. The shortest path which passes the starting point, pass point and ending point is highlighted. The nodes and the edges that pass the shortest path are shown.

—Clear Highlight: Click the Clear Highlight button to clear the highlighted objects on the map, and then the map will recover its normal displaying state.

—Add Feature: Choose the editing layer of the map, click the Add Feature button and the map window is in the add geometry objects state. Click to start the editing and double-click to end the editing.

—Update Feature: Choose the editing layer of the map, click the Update Feature button. Click to choose geometry object on the map, then update objects in the update attribute list on the left of the page.
Move Feature: Choose the editing layer of the map, click the Move Feature button. Click to choose geometry objects on the map, then drag them to the target location.

Delete Feature: Choose the editing layer of the map, click the Delete Feature button. Click to choose geometry objects on the map then delete the geometry objects according to the prompt.

Start Dynamic Navigation: Click the Start Dynamic Navigation button, then AjaxDemo starts to demonstrate the dynamic navigation function.

Pause Dynamic Navigation: Click the Pause Dynamic Navigation button, then AjaxDemo pauses the dynamic navigation function.

Stop Dynamic Navigation: Click the Stop Dynamic Navigation button, then AjaxDemo stops the dynamic navigation function.

Draw Point: Click the Draw Point button, click on the map, type the relevant information in the pop-up menu. Users can also modify or delete the points.

Draw Line: Click the Draw Line button, click on the map to start the drawing, double-click to end the drawing. Type the relevant information in the pop-up menu. Users can also modify or delete the lines.

Draw Polygon: Click the Draw Polygon button, click on the map to start the drawing, double-click to end the drawing. Type the relevant information in the pop-up menu. Users can also modify or delete the polygons.

Clear Graphics: Click the Clear Graphics button, then AjaxDemo will clear all the graphics on the map.

7.3.4 Function Area

Function area includes the parts as below:
Legend: It is used to display the legend of the current map (Figure 7-9);

Query by Graphic: It is used to display the query result (Figure 7-10);

Measure Distance/Area: Displays the result of distance and area measuring;

Find Shortest Path: Displays the number of nodes and edges of the starting point-pass point-ending point shortest path after the path analysis;

Layer control: It is used to control whether the current layer or thematic map is visible or queryable, display the legend information, support the shortcut menu and other extended functions.

Find Transfer Solution: Input the from-stop and to-stop. Click the Find Transfer Solution, then the bus route that passes the two stops will be returned. The query result will be highlighted on the map (Figure 7-11);

Compass: Click the Compass and rotate it. The map window will change the view accordingly. The compass has the navigation function (Figure 7-12);

Overview Map: You can determine the location and range of the current view in the entire map. Click Overview Map to change the display view of the current view;
• Update Features: It is used to operate and update the feature;

• Navigate: Input the scale and the coordinates of the center point. Users can navigate the center of the current view window manually (Figure 7-13);

• SQL Query: Execute the SQL Query by setting the queried layers, the query conditions and the number of the returned results. Return the query result (Figure 7-14).

Figure 7-11 Find Transfer Solution

Figure 7-12 Compass

Figure 7-13 Navigate
7.3.5 Map display area

Map display area has these functions (Figure 7-15):

- **Switch map** (Figure 7-16-①): Click the Switch Map dropdown arrow and choose the map to be displayed;
- **Magnifier** (Figure 7-17-③): Magnifier can zoom part of the interested area. Users can change the zoom rate. Hide and park function are supported;
- **Choose a layer to be edited** (Figure 7-18-④): Click the Choose a layer to be edited dropdown arrow and choose the layer to be edited when editing map online;
- **Slide bar** (Figure 7-19-⑤): Slide bar can be used to quickly set the desired zoom level.
7.4 WinFormClient—Remote map class library development demo

7.4.1 Overview of WinFormClient

WinFormClient is a sample which uses the desktop as the Web client. WinFormClient is developed by TcpMap of the SuperMap.IS.Weblib.dll that is provided by SuperMap IS .NET. It uses TcpMap to realize the basic functions such as map getting, map browse and map query. SuperMap.IS.Weblib.dll provides developers another powerful development mode besides the Controls.

7.4.2 How to use WinFormClient

Open the WebLibInWinForm project in the SuperMap IS .NET installation directory\Demo\WinFormClient and run the project. You can also directly run the WebLibInWinForm.exe in the SuperMap IS .NET installation directory\Demo\WinFormClient\bin\Release. (Start the SuperMap IS .NET map service before running this application).
Click the Open button on the user interface (Figure 7-20-①). Input the address and port of the SuperMap IS .NET server (Figure 7-20-②), the MapName of the browsed map (Figure 7-20-③) and some parameters of map images (Figure 7-20-④). Click the OK button and the interface is shown as Figure 7-20.

Users can use the browse buttons in the toolbar to execute the corresponding operations, such as View Entire, Zoom In, Zoom Out, Pan, Zoom In By Rectangle, Zoom Out By Rectangle, etc. The following introductions can help you know well the functions which are in common use.

**Layer Control**

The layer control function is used to display or query map by controlling the layers. Detailed operations are shown in Figure 7-22. Click the **Layer Control** button (Figure 7-22-①). Choose a visible or queryable layer in the pop-up layer control menu (Figure 7-22-②). Click the OK button, then the server will display the map according to the chosen layer. Click **Reset** if you want to resume the default layer settings (Figure 7-22-③).
Custom View

Custom View is used to display the map according to the precise center point coordinates and the map scale. Detailed operations are shown in Figure 7-23. Click the **Custom View** button (Figure 7-23-①). Choose By Center and Scale or ViewBounds in the pop-up custom parameters dialog (Figure 7-23-②). Input the parameters of the center point and scale or the parameters of the viewbounds (Figure 7-23-③). Click the OK button, then the GIS server can generate the target map according to the inputted center point and scale.
Query functions include Query By Point, Query By Rectangle, Query By Polygon, Buffer Query and SQL Query (Figure 7-24). Query By Point is used to find map objects by mouse clicking. Detailed operations are shown in Figure 7-24. Click the button on the right of Query. Choose Query By Point in the pop-up submenu (Figure 7-24-①). Move the mouse on the map and click the object that you want to query. Here, according to the default tolerance settings of Query By Point, the GIS server highlights the geometry objects that are gotten by the query. The results of Query By Point are shown in the table format (Figure 7-24-②). If you do not want to query according to the default tolerance settings, please click Point Tolerance (Figure 7-24-③). Input the tolerance and click the OK button.
Analyst functions include Grid Analyst, Network Analyst and Bus Analyst. The Grid Analyst provided by SuperMap IS .NET can execute multiple surface analyses of DEM data, such as Isoclines, Slope, Aspect, Surface Area, etc; it can execute map algebra operation of grid data and various statistic analyses, such as Neighborhood Statistics; it provides overall hydrology analysis functions including Fill Sinks, Flow Direction, Flow Accumulation, etc; it also executes Resample, Overlay functions.

Network analyst includes route analysis and the Network analysis parameters settings. The precondition for Network Analysis is that the Network layer should exist.

Bus Analyst means the bus transfer analysis and bus query provided by the map server with the SMISBusNetwork component on the primary base. Namely, get the starting and ending points and find several routes by fuzzy query. Detailed operations are shown in Figure 7-25. Open all the Network layer maps when open the project. (In this sample the map is changchun). Click the button on the right. There are three parts on the pop-up Bus Analyst window. They are Bus Analyst, Route Query and Stop Query. Choose the Bus Analyst. Input the starting point, ending point, transfer times...
and solution count and select the Maximum Transfer (Figure 7-25-②). The server will execute the fuzzy query according to the given parameters, and then return several routes which pass the starting and ending points (Figure 7-25-③). The server will also return several new starting and ending points after the fuzzy query (Figure 7-25-④). Select the Start and End and click the Query button to get the required transfer scheme.

Figure 7-25 Bus Analyst
7.5 MobileMap-LBS mobile web development demo

7.5.1 Overview of MobileMap

MobileMap application is the LBS (Location Based Service) web application built on Windows Pocket PC platform. Users can access the spatial data published by SuperMap IS .NET map server via mobile PC, and perform operations such as map query. The MobilMap demo is a comprehensive LBS web application development template for the user to consult.

7.5.2 Configuration and running of MobileMap

1. Setting the virtual directory

Add a new virtual directory named MobilMap in IIS sever, specify its path as \<SuperMap IS .NET Installation Directory>\DEMO\MobileMap directory, and then start SuperMap IS .NET server.

2. Validating the availability of MobilMap web site

Launch Internet Explorer Browser, and type Http://[IP address of mobilemap server]/MobileMap/mobilemap.aspx. If the page can’t be displayed, please check your connection settings; if the page is available which denote that the web site is published successfully, you can go on to the next step.

3. Running Visual Studio 2005 to start Pocket PC emluator

Run Visual Studio 2005 and in the interface of Visual Studio 2005 click Connect to Device on the Tools menu. Select Pocket PC 2003 SE Emulator in the pop-up Connect to Device dialog box and then click OK as shown in Figure 7-26.
Figure 7-26: Starting Pocket PC emulator

Figure 7-27: Prompt for installing driver

**Note:** If the prompt box as shown in Figure 7-27 pop up when starting Pocket PC emulator prompting you to install VPC driver, please do so.

Follow the above steps, and a Pocket PC emulator will be started as shown in Figure 7-28.
4. Configuring Pocket PC network adapter

In the Pocket PC 2003 interface, click configure… on the File menu, and in the Emulator Properties dialog box click the Network tab. Check the Enable NE2000 PCMCIA network adapter and bind to: option on the Network tab as shown in, and click OK.

5. Configuring network IP

In the Pocket PC 2003 interface, click Start, and then click Settings in the dropdown menu as shown in Figure 7-31-(1) to come into a Settings page.

Click the Connections tab at the bottom of the Settings page, and double-click Network Cards on the Connections tab (Figure 7-31-(1)(2)) to display Configure Network Adapters page.
Click the **My network card connects to:** dropdown arrow and click Work. In the Tap an adapter to modify settings: list, click **NE2000 Compatible Ethernet Driver** to enter the NE2000 Compatible Ethernet Driver page as shown in Figure 7-32. Select **Use specific IP address** and set IP address and Subnet mask. Note that the first three numbers of the IP address should be the same as that of the server IP. After finishing these settings, click in the upper-right corner of the screen.

6. **Setting the Connections information of Pocket PC**

In the Pocket PC 2003 interface, click **Start**, and then click **Settings** in the dropdown menu as shown in Figure 7-30-(1) to come into a Settings page.
Click the **Connections** tab at the bottom of the Settings page, and double-click **Connections** on the **Connections** tab (Figure 7-31-(1)(3)) to display the **Connections** page (Figure 7-34-(1)). Click the **Advanced** tab at the bottom of the Connections page, and click the **Select Networks** button on the **Advanced** tab (Figure 7-34-(2)) to enter the **Network Management** page. Click **My Work Network** in the dropdown list as shown in Figure 7-35-(1), and then click ![ok](image) in the upper-right corner of the screen.

7. Browsing map information of MobileMap web site

In the Pocket PC 2003 interface, click **Start**, and then click **Internet Explorer** in the dropdown menu to come into the Internet Explorer browser page, as shown in Figure 7-36. Enter **Http://[SuperMap IS .NET server IP]/MobileMap/MobileMap.Aspx** in the Address bar, and click button ![ launches](image) to browse MobileMap application.
7.5.3 Introduction to the functionality of MobileMap

There are two main functions in MobileMap application, respectively interested site querying and map editing.

1. Querying interested facility

The querying interested facility function searches facilities near the specified site which also meet the search requirement. For example, to search the universities around Yonkers, you can type Yonkers in the Interested Site text box, and type University in the Interested Facility text box, then click the Search button as shown in Figure 7-36. The matched results will be displayed in a new page as shown in Figure 7-37.

Each result returned has a hyperlink, click the hypertext to navigate to the facility on the map as shown in Figure 7-38. Users can perform the following operations on the map display page:
+) Zooming in the map by constant increments;

(−) Zooming out the map by constant increments;

**Left Right Up Down**: Moving the map leftward, rightward, upward and downward;

1 2 3 4 5: Zooming in the map by different multiples, which performed on the map with full extent.

---

2. **Editing map**

The editing map function allows users to add new interested point denoting a facility and the related information of the facility.

For example, to add a new point object near *Jinlin university foreign branch* as shown in Figure 7-38, first, position the cursor at the place of the new point and click to enter a new page, as shown in Figure 7-39. Then enter the name of the new facility (ending the Name field of the attribute with the value for the point) in *Interested facility name* text box, and click the **Add the new facility information** hypertext. The map will be displayed on the screen with the new facility point on it, as shown in Figure 7-40.
7.6 Digital Watermark function demo

The digital watermark is a new technology of copyright protection in an open network environment. It imbeds the copyright information, such as figures, the serial number, characters, picture marks etc. into the multimedia data in order to indicate ownership of a copyright and identify a buyer or offer additional information of the multimedia data. In brief, digital watermark is a technology to imbed a section of information in multimedia data. The information imbedded is called digital watermark.

The digital watermark function provided by SuperMap IS .NET is to print the watermark with specified size and position on the map. By default, after starting SuperMap IS .NET map server, the map displayed in the browser may have a watermark of *Hi, SuperMap IS Watermark* stamped on it.

The digital watermark function can be implemented easily, which can be done mainly by configuring the *plug_ins.xml* file and this file is located in *[SuperMap IS .NET Installation Directory]/bin* directory.

**Note:** The *plug_ins.xml* file should be placed in the *bin* folder.
7.6.1 Display the watermark

1. Turning on/off watermark display function

Open `plug_ins.xml`, and there is a line of code like this:

   `<section name="watermark" enabled="false">`

This sentence indicates whether to display watermark on the map. If the enabled property is false, indicates not to display watermark; Otherwise, the watermark will be displayed on the map.

2. Choosing display types of watermark

There are two ways to display the watermark. The first is to display a specified picture as the watermark on the map; the second is to display text or information with a specified style on the map.

If you want to display an existing picture with a watermark on the map, you can do as follows:

Open `plug_ins.xml`, and there is a line of code like this:

   `<entry name="filePath">.\watermark.bmp</entry>`

Type the path of the watermark picture (absolute path or relative path) between `<entry name="filePath">` and `</entry>`. (Note: The relative path here refers to the path relative to `[SuperMap IS .NET Installation Directory\bin directory]`).

If you want to use text or other information as a watermark, you can do as follows:

Open `plug_ins.xml`, and there is a line of code like this:

   `<entry name="altText">Hi,SuperMap IS Watermark</entry>`

Type the text information like “Hi, SuperMap IS Watermark” between `<entry name="altText">` and `</entry>`, and do not insert the path of any picture between `<entry name="filePath">` and `</entry>`. When SuperMap IS .NET map server starts, the text between `<entry name="alt Text">` and `</entry>` will be displayed on the map as the watermark on the condition that no watermark picture location has been found.
The position of a picture watermark or text information watermark will be defined by the below code in plug_ins.xml file:

<entry name="posX">20</entry>
<entry name="posY">100</entry>
<entry name="sizeWidth">200</entry>
<entry name="sizeHeight">150</entry>
<entry name="transparentColor">16711935</entry>

Where, the \textit{posX} and \textit{posY} denote the coordinates of the upper-left corner pixel of the watermark; while \textit{sizeHeight} and \textit{sizeWidth} denote the height and width of the watermark respectively. The \textit{transparentColor} parameter denotes the transparence of a picture watermark.
SuperMap IS .NET offers abundant GIS functions to WebGIS user. It also offers many development modes and demonstration procedures to suit different kinds of demands of the users. Otherwise, SuperMap IS .NET has also provided some extra tools specially, user can use these extra tools to Modeling transportation network data, to integrate the GIS data between the local data and remoting data, to improve the efficiency of preprocessing cache. These tools can be accessed in [SuperMap IS .NET Installation Directory]/Extras directory.

8.1 SuperExplorer - Integrating local GIS data and web data

8.1.1 SuperExplorer overview

SuperExplorer is a windows application of SuperMap IS .NET based on WebService. In this project, overlay of a map obtained via WebService and a local map can be performed, and it is an instance that realizes the cross-platform share of map data.
8.1.2 Introducing the functionalities of SuperExplorer

SuperExplorer is a windows application, and it is very convenient to implement the functionalities provided by SuperMap Objects. The aim of this demo is to show how to call WebService through windows application; So there are just some basic GIS functions in this demo, which include how to obtain map from internet using WebService, overlay this map with local map, and perform query.

The following are the main functions that can be implemented in SuperExplorer:

- **Open workspace**

  Click *Open Workspace* on the *File* menu, and choose a workspace file on local disk in the *Open Workspace* dialog box,. When the workspace is opened successfully, the data source name will appear in *Local Data* window with a plus near it. Double-click the data source name or click the plus to display the datasets included in this data source, then double-click a dataset to display it in the right map display window. Similarly, double-click a map on the *Maps* tab to display the map.

  **Note:** The coordinate system of the data source in workspace to be opened must be the same as the map data source provided by WebService. That is to say that the coordinate system of local data should be the same as the data accessed from internet in order to perform overlay of the two kinds of data.

- **Add web data**

  On the *File* menu click *Add Web Data*, and type WebService address in the *Add Web Data* dialog box, such as [http://localhost/WebService_v50/](http://localhost/WebService_v50/). After being added successfully, the names of web data will appear in Layer Control window as layer names with an “(N)” followed to denote its source, whereas the local layer may be tagged with an “(L)” followed. The web map layer can’t be displayed alone, and it should be displayed with a dataset or a map of a local data source. Check the check box in front of a layer name to show the layer, otherwise, it will be hidden.

  The Add Web Data is implemented mainly by the *AddNetLayer()* function, and main
code of this functions are annotated in the demo.

```csharp
/// <summary>
/// Add web layer
/// </summary>
private void AddNetLayer()
{
    ....
}
```

- **Delete web data**

Select the web data in the **Layer Control** window, and click **Delete Web Data** on the **File** menu to delete the web data.

- **Map browse**

The map browse functionality includes zooming in, zooming out, zooming free, panning, and zooming to the full extent of map. These functions can be found on the **Map Operation** menu, and you can also use the shortcut buttons on the tool bar to perform these operations.

- **Query**

The query functionality includes querying by point-select, querying by rectangle-select, querying by polygon-select and querying by circle-select. These functions can be found on the **Map Operation** menu, and you can also use the shortcut buttons on the tool bar to perform these operations.

The corresponding setting and operations of querying can be implemented in the MouseDownEvent event of the SuperMap map display control, and the query is performed over both local data and web data simultaneously. Only the query result of web data will be displayed if it is not null, otherwise, the query result of local data will be displayed.
Main code in the \texttt{asSuperMap\_MouseDownEvent} event is annotated detailedly in the demo. For further details on the implementation of the above functions, please refer to the source code and annotation of SuperExplorer demo.

\begin{verbatim}
///<summary>
/// the MouseDown event
///</summary>
///<param name="sender"></param>
///<param name="e"></param>
private void asSuperMap_MouseDownEvent(object sender, AxsuperMapLib._DSuperMapEvents_MouseDownEvent e)
{
    ......
}
\end{verbatim}

\section*{8.2 BusNetWorkManager-Modeling transportation network data}

SuperMap IS .NET provides the public traffic inquiring & interchange analysis function. If you want to realize this function, you must get the full and accurate transportation network data at first, such as the public stops data and the public transportation route data. Secondly make the public traffic inquiring & interchange model with the transportation network data. It is the basic guarantee that the public traffic inquiring & interchange analysis can work.

So, the required data should be created through \texttt{SuperMap Deskpro} or \texttt{SuperMap Express}. And modeling the public traffic inquiring & interchange model can use \texttt{BusNetWorkManager} tool offered by SuperMap IS .NET to perform.

It is necessary to continue checking data especially to those missed or redundant stops of certain route line passing by. It can be done through the function of traffic inquiring in the tool \texttt{BusNetwokManager.exe}. To error route lines after data checking please use
SuperMap Deskpro or SuperMap Express to edit and correct.

After construct the public traffic inquiring & interchange model, need to carry on the verification of exactness to the public transit model that is structured, this link can be carried on in BusNetworkManager tool too.

8.3 eWebMap - visit platforms provided for embedded products

SuperMap IS .NET Not only support the visit of the common browser but also support the visit of the terminal device, such as eSuperMap. At the same time, in order to let eSuperMap conveniently accesses the GIS Service which offered by SuperMap IS .NET, SuperMap IS .NET has made the standard interface visited with eSuperMap together. on the basis of these standard interface, SuperMap IS .NET have offered a visit platform named eWebMap. So the embedded software, for example eSuperMap View can access the GIS data on the network.

8.3.1 Configuring WebMap

eWebMap procedure lies in [SuperMap IS .NET Installation Directory]\Extras \eWebMap directory. After configuring eWebMap, users of SuperMap embedded software can obtain the GIS data through the network. Now the introduction the step of configuring eWebMap:

1. Creating a virtual directory for eWebMap

Install SuperMap IS .NET on your computer, and open Internet information service manager on your computer. Right-click Default web site and click new-> virtual directory on the shortcut menu as shown in Figure 8-1. Then a Virtual Directory Creation Wizard diglog will pop up. This wizard helps you to create a new virtual directory.
2. Configuring the GIS application server of SuperMap IS .NET

After creating the virtual directory of eWebMap, you can configure the GIS application server for providing the GIS data to eSuperMap.

Click **Start menus → all programs → SuperMap → SuperMap IS .NET → SuperMap IS .NET service control → Manage map service**, the map service manager will pop up, as Figure 8-2 shows.
Click **IS Config** on the left of the homepage to open the page in which the service parameters of SuperMap IS .NET can be configured. See also chapter 4 to learn the parameters meaning and operating in detail.

3. Starting the GIS application server

After setting the GIS application server, the administrator can start it to provide GIS service for the web site. There are three ways to start the GIS application service.

**Method 1: Local operation**

Click Start→program→SuperMap→SuperMap IS .NET→SuperMap IS .NET Service control, select Start map service.

**Method 2: Local operation**

Open Services manager, search the service named SuperMap IS ServerManager and start it.

**Method 3: Remote operation**

The administrator can start service directly, the procedure is as follows: First return to
the homepage of the map service manager, then click service to enter Service Manager page, and find the SuperMap IS Server Manager item. If the prompt information is stopped, it means the service is stop running, and if you want to start the service, click Control button to open service management window, as shown in Figure 8-3 and Figure 8-4, select Start Service option and click the submit button, the service will be started.

![Figure 8-3: Start IS service](image)

![Figure 8-4: Start service](image)

### 8.3.2 Connecting eWebMap

After eWebMap is published, the uses of SuperMap embedded softwares can use eSuperMap software to obtain the GIS data offered by SuperMap IS .NET. Here as an example, introduce how to use eSuperMap View to Create a IS connecting dataset to connect the eWebMap.

Open eSuperMap Viewer, and create a dataset type of IS connecting. Now begin to
obtain the remoting GIS data offered by SuperMap IS .NET.

1. In the workspace manager window of eSuperMap View, right-click this IS connecting dataset item. Select IS connection item on the shortcut menu. Configuring remote attribute dialog pops up at this moment.

2. Input the web site of eWebMap into the URL input field. The format of the eWebMap address is http://[IS server IP]/eWebMap, then click connect button.

3. If it is successful to connect the eWebMap, it will automatically list the map names obtained from SuperMap IS .NET in the Map List of IS service. Otherwise, pop up a dialog shows failure to connecting IS.

4. Select a map item in the Map List of IS service, then the bound of this map selected will be written in Bound of remote data.

5. Finally, click OK button to close this dialog.

6. Double click this IS Connecting dataset on the workspace manager window, the map obtained from SuperMap IS .NET will display in the map window.

### 8.4 PreCacheManager — Preprocessed Cache Manager

The PreCacheManager caches the images on the server-side, when a request is sent to the server side, the server will return the corresponding map image to the client and display it on the client-side rather than process once again. This reduces the latency time and the respondent has been speeded up.

#### 8.4.1 Using PreCacheManager

##### 8.4.1.1 Run the PreCacheManager

Firstly, Click Start → Programs → SuperMap → SuperMap IS .NET → SuperMap IS .NET Extras → PreCacheManager tool, and the following interface will be displayed as shown in Figure 8-5.
Figure 8-5: interface of PreCacheManager

### 8.4.1.2 Map Server
- **Name** -- The name or IP address of computer which you deploy map server on.
- **Port** -- The port number of the map server.
- **Map Name** -- The list of maps contained in the workspace provided by the map service. By default, it is the first map in the list.
- **Valid** -- Click this button, and it will validate the link with server and obtain the name of the map published by the server.
- **OK** -- Click this button to get the specified map.

### 8.4.1.3 Configuration
- **Image Width** --- The width of the image to be cached. The unit is pixel. When caching a AjaxMap, it should be of the same value with height.
- **Image Height** --- The height of the image to be cached. The unit is pixel. When caching a AjaxMap, it should be of the same value with width.
- **Image Format** --- The format to cache images. So far, the PNG, GIF, JPG and BMP formats are supported, and when caching AjaxMap, the GIF format is used by
default; when caching MapControl, the default format is PNG.

- **1/ Map Scale**---The reciprocal of map scale. You can enter reciprocals of multiple map scales, and they are separated by commas, for example, 8000, 800. If a number of reciprocals of multiple map scales are input, after clicking Cache Overview, the maps with these map scales will be displayed at the bottom of this window.

8.4.1.4 **Extent**
Left, Bottom, Right, Top ----By default, it is the view extent of current map.

8.4.1.5 **Operation**
- View the situation of server cache---When checked, the numbers of images in the cache will be shown.
- View dynamic effect---When checked, you can see the effect of caching images dynamically.
- Cache Overview---- Click this button to view current situation of the cache.

8.4.2 **Preprocessed cache operation**

8.4.2.1 **Import map**
Clicks Validate, all map names will be displayed in the drop-down list box, you can select one map then click OK, the map will be displayed in the left top of the window as shown in Figure 8-6.
8.4.2.2 View the status of server cache

There is a toolbar on the top of the map image, through these tools you can zoom in the map, zoom out the map and pan the map. You can also modify the extent through entering the map bounds.

1. Clicks Cache View without selecting View the status of server cache and View dynamic effect, the image information will be displayed on the bottom of the window as shown in Figure 8-7.

Cache Information:
Map name--The name of the map which will be cached.

Scale--The scale of the map you input.

Total count--When the map will be cached, it is divided into several little images.

Processed images count--Some images have been cached in the server before, it displays the number of these images.

Unprocessed images count--If you want to cache a part of the map, and this area intersects with another area, some images have been cached.

The cache ratio--Number of the images which have been cached/ The total number of the images.

Processed image cached/s--The count of the images cached per second.

Test--Click this button to test how much time this operation cost.

Start--Click this button to preprocess cache.

Stop--Click this button to stop the preprocess cache operation.

2. Clicks Cache View with View the situation of server cache selected. If the map has been preprocessed cache before, the number of the images that have been cached and the number of the images that have not cached will displayed in the right bottom of the window as shown in Figure 8-8.

3. Clicks Cache View with View dynamic effect selected. The number of images that will be created and other related information will displayed on the right bottom of the window, at the same time you can view the dynamic effect.

8.4.2.3 Create preprocessed cache
After viewing the cache overview, you can click Start to Preprocess Cache to create preprocessed cache.

Tip: If you select view the situation of server cache when starting to preprocess cache, it will create the images that have not saved in the server; but if you starting to
preprocess cache without selecting view the situation of server cache, it will create all images.

8.4.3 Save and import to XML file

8.4.3.1 Save the cache as XML file

After preprocessing cache with the map, you can save the status of the all information with this map as a XML file, to import this XML file you can open the map with the information.

1. Choosing File\Save Configuration as shown in Figure 8-9.

![Figure 8-9: save the cache into a file](image1)

2. Select the path and type the name of the XML file on the open dialog box, then click Save as shown in Figure 8-10.

![Figure 8-10: set the name of the file](image2)

8.4.3.2 Import XML file

Select File\Import Configuration, and then open the XML file on the open dialog box.

**Tip:** If there aren't any operations being done in preprocessed cache interface for a relative long time, it will report an exception when user operates it again. Now, you can click the Valid and then click OK button of map server to restore the operation.
Appendix 1

List of SuperMap IS .NET Functionality

Functions provided by Map Engine

SuperMap IS .NET provides several map engines, including basic map engine, spatial analysis engine, map editing engine and custom extending engine. The first three map engines can deal with most requests of GIS functionality, such as basic GIS information browsing, querying, spatial analysis, and map editing etc.. And for the special applications, custom engine are designed by SuperMap IS .NET in order to help these users to develop programs which can implement certain specific functions. The table below lists the GIS functions supported by these map engines:

List of Supported Functions by Map Engines

<table>
<thead>
<tr>
<th>ID</th>
<th>Functions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Obtaining default map</td>
<td>Obtain default map with its original status (central point and display extent remains no change).</td>
</tr>
<tr>
<td>2</td>
<td>Obtaining overview map</td>
<td>Obtain an overview map according to the name, display range and size of the map.</td>
</tr>
<tr>
<td>3</td>
<td>Displaying map with full extent</td>
<td>Display a map with the range of a specified layer, or with the full extent of the map if the range is not specified.</td>
</tr>
<tr>
<td>4</td>
<td>Zooming</td>
<td>Zoom a map according to the specified central</td>
</tr>
<tr>
<td>1</td>
<td>Point and zoom scale</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Panning</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Obtaining a map with</td>
<td></td>
</tr>
<tr>
<td></td>
<td>specified extent</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Obtaining a map with</td>
<td></td>
</tr>
<tr>
<td></td>
<td>specified central point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and map scale</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Obtaining coordinates</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Measuring distance and area</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Converting coordinates</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Querying by SQL</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Querying by Find</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Querying objects within</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a certain range apart</td>
<td></td>
</tr>
<tr>
<td></td>
<td>from a specified point</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Querying geometries which</td>
<td></td>
</tr>
<tr>
<td></td>
<td>have certain</td>
<td></td>
</tr>
</tbody>
</table>

| 1  | Pan a map according to the    |
|    | specified offset of the       |
|    | coordinates.                 |
| 6  | Display the map according to  |
|    | a specified extent           |
| 7  | Display a map according to    |
|    | specified central point       |
|    | and map scale.               |
| 8  | The conversion between map    |
|    | coordinates and geographic   |
|    | coordinates.                 |
| 9  | Measure distance and area     |
| 10 | Obtain map legend            |
| 11 | Query the specified layer by  |
|    | SQL expressions, and          |
|    | also specify whether to       |
|    | highlight the result of       |
|    | querying.                    |
| 12 | Query the attribute fields    |
|    | (not specify a field, but     |
|    | match case in query words),   |
|    | and also specify whether to   |
|    | highlight the result of       |
|    | querying.                    |
| 13 | Specify layer, query field,   |
|    | SQL conditions, and           |
|    | also specify whether to       |
|    | highlight the results of      |
|    | querying.                    |
| 14 | Specify layer, query field,   |
|    | SQL conditions, and           |
|    | also specify whether to       |
|    | highlight the results of      |

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<table>
<thead>
<tr>
<th></th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Querying the nearest objects within given tolerance apart from a specified point</td>
</tr>
<tr>
<td></td>
<td>Specify layer, query field, SQL conditions, and also specify whether to highlight the results of querying.</td>
</tr>
<tr>
<td>16</td>
<td>Obtaining the coordinate and attribute information of an object according to the ID of the object</td>
</tr>
<tr>
<td></td>
<td>Obtain the coordinates and attribute information according to the layer and ID of the object</td>
</tr>
<tr>
<td>17</td>
<td>Dynamic thematic map</td>
</tr>
<tr>
<td></td>
<td>Create ranges map, graph map, label map, dot density map, graduate symbol map and so on by modifying map parameters.</td>
</tr>
<tr>
<td>18</td>
<td>Layer control</td>
</tr>
<tr>
<td></td>
<td>Perform layer control by modifying map parameters</td>
</tr>
<tr>
<td>19</td>
<td>Controling the display scale range of the map</td>
</tr>
<tr>
<td></td>
<td>Control the maximum and minimum display scale by modifying map parameters.</td>
</tr>
<tr>
<td>20</td>
<td>Filtering the objects to display (DisplayFilter)</td>
</tr>
<tr>
<td></td>
<td>Filter the objects to display by modifying map parameters (SQL filter)</td>
</tr>
<tr>
<td>21</td>
<td>Browsing the results of query paginally</td>
</tr>
<tr>
<td>22</td>
<td>Switching maps</td>
</tr>
<tr>
<td></td>
<td>Switch among maps by modifying the MapName parameter.</td>
</tr>
</tbody>
</table>
# List of Additionally functions provided by Spatial Analysis Engine

<table>
<thead>
<tr>
<th>ID</th>
<th>Functions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Optimum path analysis</td>
<td>Perform optimum path analysis according to coordinate arrays or nodes’ ID arrays, and you can specify whether to highlight the analysis results.</td>
</tr>
<tr>
<td>2</td>
<td>Buffer query analysis</td>
<td>Perform buffer query according to geometry objects on the map or custom geometry objects, and you can specify whether to highlight analysis results.</td>
</tr>
<tr>
<td>3</td>
<td>Nearest facilities analysis</td>
<td>Query the nearest facility objects apart from the selected point on a specified facility layer.</td>
</tr>
<tr>
<td>4</td>
<td>Bus query analysis</td>
<td>Query stops fuzzily according to the specified stop name. Query the bus route aggregate fuzzily according to the specified route name. Query the routes passing a specified stop. Query the stops that specified bus routes pass. Query the bus transfer solution according to the names of start stops and end stops. Highlight the bus stop, bus route and solution.</td>
</tr>
</tbody>
</table>
**Functionalities provided by Map Editing Engine**

<table>
<thead>
<tr>
<th>ID</th>
<th>Functions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adding point, line and region geometry</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Modifying and update point, line and region geometry</td>
<td>Including move geometry objects.</td>
</tr>
<tr>
<td>3</td>
<td>Deleting point, line and region geometry</td>
<td></td>
</tr>
</tbody>
</table>

**Custom Extending Engine**

The custom extending engine provides the function of map downloading by default, and is the demo that developed using custom extending engine. If you need to develop engine with other functions, you can develop other GIS functions based on either of basic map engine, spatial analysis engine, map editing engine.

**Functions provided by WebControls**

<table>
<thead>
<tr>
<th>ID</th>
<th>Functions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Obtaining default map</td>
<td>Obtain default map according to the original map status (central point and display extent).</td>
</tr>
<tr>
<td>2</td>
<td>Displaying with full Extent</td>
<td>Obtain overview map according to the map name, display extent and map size.</td>
</tr>
<tr>
<td>3</td>
<td>Zooming in and zoom out</td>
<td>Zoom according to the central point and zoom.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4</td>
<td>Panning</td>
<td>Pan the map according to the specified coordinate offsets.</td>
</tr>
<tr>
<td>5</td>
<td>Obtaining the map with specified extent</td>
<td>Display the map with the specified extent.</td>
</tr>
<tr>
<td>6</td>
<td>Obtaining the map with specified central point and map scale</td>
<td>Display the map according to the specified central point and map scale.</td>
</tr>
<tr>
<td>7</td>
<td>Coordinate conversion</td>
<td>The conversion between map coordinates and geographic coordinates.</td>
</tr>
<tr>
<td>8</td>
<td>Measuring distance and area</td>
<td>Measure distance and area formed by a series of points</td>
</tr>
<tr>
<td>9</td>
<td>Obtaining map legend</td>
<td>Obtain map legend of a specified layer or a thematic map</td>
</tr>
<tr>
<td>10</td>
<td>Querying by SQL</td>
<td>Query the specified layer by SQL expressions, and also specify whether to highlight the result of querying.</td>
</tr>
<tr>
<td>11</td>
<td>Querying by Find</td>
<td>Query the attribute fields (not specify a field, but match case in query words), and also can specify whether to highlight the result of querying.</td>
</tr>
<tr>
<td>12</td>
<td>Querying objects within a certain range apart from a specified point</td>
<td>Specify layer, query field, SQL conditions, and also specify whether to highlight the results of querying.</td>
</tr>
<tr>
<td>13</td>
<td>Querying geometries which have certain spatial</td>
<td>Specify layer, query field, SQL conditions, and also specify whether to highlight the results of</td>
</tr>
</tbody>
</table>

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relationships with a specified polygon.

14 Querying the nearest objects within given tolerance apart from a specified point. Specify layer, query field, SQL conditions, and also specify whether to highlight the results of querying.

15 Obtaining the coordinate and attribute information of the object according to its ID. Obtain the coordinates and attribute information according to the layer and ID of the specified object.

16 History review (previous view and next view). Review the historical map operations, and the maximum quantity of review can be specified.

17 Editing map. Add, modify (including move) and delete point, line and region geometry objects.

18 Optimum path analysis. Perform optimum path analysis according to the coordinate arrays or nodes’ ID arrays, and you can specify whether to highlight the analysis results.

19 Buffer query analysis. Perform buffer query according to geometry objects on the map or custom geometry objects, and you can specify whether to highlight analysis results.

20 Nearest facilities analysis. Query the nearest facility objects apart from the selected point on a specified facility layer.

21 Bus query analysis. Query stops fuzzily according to the specified stop name.
<table>
<thead>
<tr>
<th>Number</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Query the bus route aggregate fuzzily according to the specified route name.</td>
</tr>
<tr>
<td>19</td>
<td>Query the routes passing a specified stop.</td>
</tr>
<tr>
<td>20</td>
<td>Query the stops that the specified bus routes pass.</td>
</tr>
<tr>
<td>21</td>
<td>Query the bus transfer solution according to the names of start stops and end stops.</td>
</tr>
<tr>
<td>22</td>
<td>Highlight the bus stop, bus route and solution.</td>
</tr>
<tr>
<td>23</td>
<td>User-defined layer</td>
</tr>
<tr>
<td></td>
<td>Display and dynamically label the user-defined layer, and also support to connect it to the file, Web address and multimedia targets</td>
</tr>
<tr>
<td>24</td>
<td>Controlling the display scale range of the map</td>
</tr>
<tr>
<td></td>
<td>Control the maximum and minimum display scale by modifying map parameters.</td>
</tr>
<tr>
<td>25</td>
<td>Filtering the objects to display</td>
</tr>
<tr>
<td></td>
<td>Filter the objects to display by modifying the properties of map controls (SQL filter)</td>
</tr>
<tr>
<td>26</td>
<td>Setting whether to return map images</td>
</tr>
<tr>
<td></td>
<td>When it is no need to return the map image, you can lighten the load of the map server by setting this parameter.</td>
</tr>
<tr>
<td>27</td>
<td>Switching among maps</td>
</tr>
<tr>
<td></td>
<td>Switch among maps by modifying the MapName parameter.</td>
</tr>
<tr>
<td>28</td>
<td>Custom Action</td>
</tr>
<tr>
<td></td>
<td>Extend mouse operations of MapControl and dynamically bind the supported events by using custom Action</td>
</tr>
</tbody>
</table>
### Accessorial tools of WebControls

<table>
<thead>
<tr>
<th>ID</th>
<th>Control name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Overview control</td>
<td>Support overview function, in addition, dynamic overview can be implemented by setting parameters.</td>
</tr>
<tr>
<td>2</td>
<td>The layer control</td>
<td>Support the layer control is visible and queryable</td>
</tr>
<tr>
<td>3</td>
<td>The legend control</td>
<td>Support map legend</td>
</tr>
<tr>
<td>4</td>
<td>The map print control</td>
<td>Provide the function of map print</td>
</tr>
</tbody>
</table>

### SuperMap IS WebService

Three types of WebService are provided by SuperMap IS .NET, which aiming at different GIS functions respectively.

- MapService—Basic GIS function service
- AnalystService—GIS spatial analysis service
- EditService—GIS spatial information edit service

### Others

Besides the GIS functionalities at different levels listed above, SuperMap IS .NET provides a series of accessorial functions:

- Remote manage of map service (IS Manager) – Provides uniform remote management form to manage and configure map servers to users.

- WMS (Web Map Service) – The up to date WMS criterion V 1.3 is supported by SuperMap IS .NET.
• IC&C technology – Perform cache processes at different service levels to establish high-powered Web GIS publication system.