

Using and building clusters

Cluster means to register one or more SuperMap iServer services into cluster server to provide a single view of service for customers. When requests arrive at cluster server, the cluster server will uniformly dispatch which iServer to handle what requests by using cluster technology, while users don't need to know this process. Using cluster can highly improve the concurrency and performance of iServer.

In iServer, the Distributed Map Tiling module is a typical application of cluster technology.

There are two ways to configure cluster, one is through iServer WebManager as shown in this section, the other is through configuration file, see: [Managing clusters through configuration file](#).

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Cluster overview

The cluster system includes the following contents:

- ClusterServer: As ID1 in figure 3-1, i.e., ClusterServer, which is the provider of the cluster service, is responsible for monitoring and coordinating members, provides GIS services

by **Use local cluster service** in **Use cluster**, and checks and controls the participation of the member by **Configure cluster**;

- Members: As ID2 in figure 3-2, executes the task assigned by the ClusterServer and then reports the execution information to the ClusterServer by **Join cluster**;
- GIS server: If the GIS server, directly accessed by the client, is the ClusterServer, then the setting method is same with that of the ClusterServer; if it is an independent server like the GIS application in the figure 3-2, then the settings can be performed by Use other cluster service in **Use cluster**.

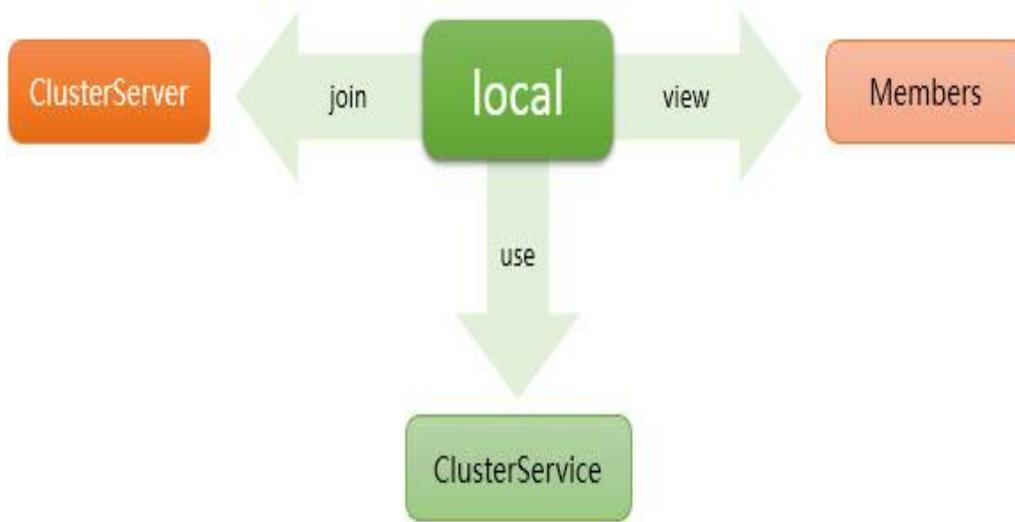


Fig.1 Cluster Overview

For a specific machine:

- GIS server can use other cluster service;
- ClusterServer can configure cluster and check members.
- Members can join cluster and send report to ClusterServer.

After a member join in the cluster, it will send a report to ClusterServer every 2 seconds; after ClusterServer receives the report, then it will consider this member is an available child node and the child node will be put into the "cluster members list". When the client or GIS server sends a request to ClusterServer (parent node), the parent node will assign tasks to its members based on the load balancing principle, as shown in the figure below. The member makes response to the request and then return the response result to ClusterServer; then the ClusterServer will return the response result to the client which just sends the request, or the GIS server. For example, when the client browses the map, the received map slices may come from distinct cluster members, not just from the cluster server which the client requests. For the following situations, the cluster server will determine the cluster member is timeout, and will not assign tasks to the member or send the assigned task to the other node.

- If the cluster member doesn't report to the cluster server more than two seconds, i.e., the connection is timeout, then the cluster server will think this member is invalid.
- If the response time of the cluster member is more than two minutes, i.e., the response is timeout, then the cluster server will think that the member is response timeout, and will send the request to the other node for processing.

In which, both the connection timeout settings and the response timeout settings can be set via the configuration file, see Managing the cluster with the configuration file.

For more information, please refer to Cluster System Communication Mechanism.

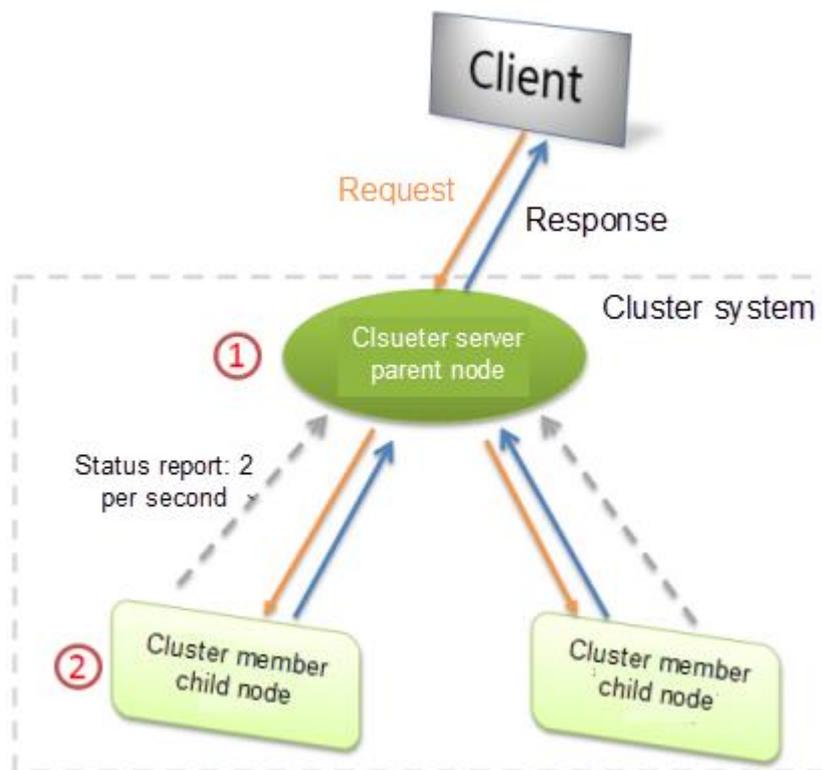


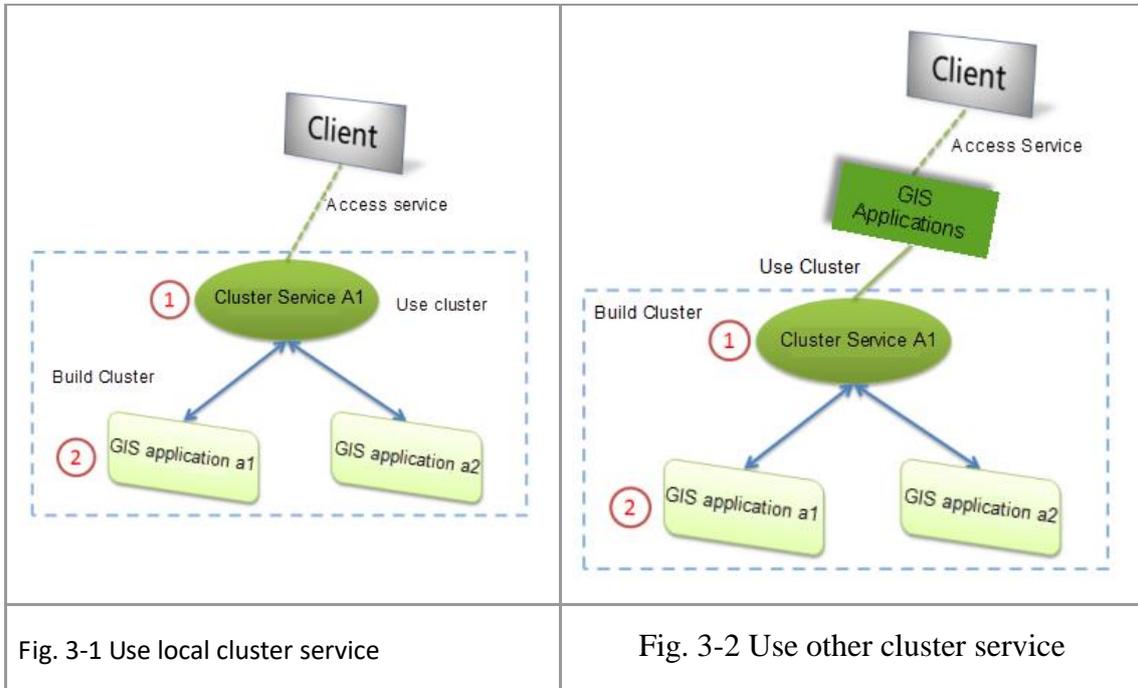
Fig. 2 Cluster communication mechanism

Use cluster

The GIS server is the service-side which directly provides services to the client. Using cluster can improve the performance and load to provide client services directly to customers end GIS services can improve performance by using clustering and load volumes of the GIS services. The cluster system will use the local GIS server as an outlet to provide high-performance services to the client.

GIS server has two ways of using cluster:

- Use local cluster service, as shown in figure 3-1, i.e., the parent node (ClusterServer) as the GIS server to provide services, and the client can directly access the parent node.
- Use other cluster service, as shown in figure 3-2, i.e., the GIS server doesn't belong to the cluster service, which receives the request from the client and then sends the request to the parent node.



The operation method that GIS server uses the cluster is:

Visit the Use Cluster page: <http://gisserver:8090/issuer/manager/clusterusage>, check the "Enable the cluster" check box, select "Use local cluster service" or "Use other cluster service" as shown in figure 3-1 and 3-2. If you select "Use other cluster service", then you need to add "Cluster service URL" and "Token".

Only when you select "Use Cluster", the GIS server can give response to the request from the client so as to improve the performance of the GIS service.

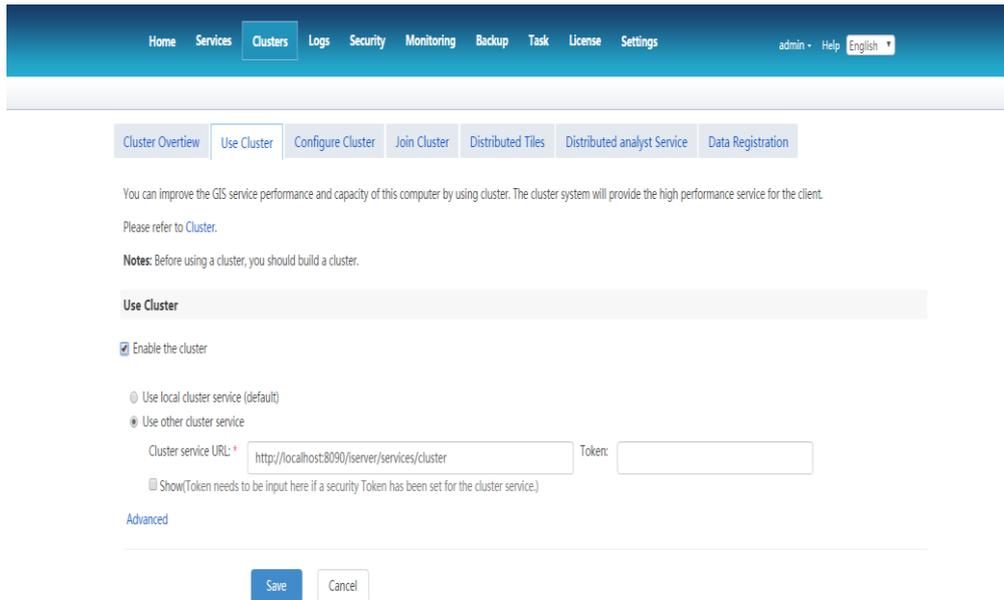


Fig. 4 User Cluster

About the implementation of the cluster filter, please refer to implementing the cluster filter.

Configure cluster

Multiple GIS servers can improve their capability by building the cluster. By default, the GIS server of SuperMap iServer enables the cluster service function, which can accept the child node at any time. As shown in figure 3-1, the "ID 2" directly joins in the cluster service of "ID 1", then a simple cluster was built up. Note that the "ID 1" supports multiple GIS servers to join the it and it can join the other cluster (then the multilayer cluster was established).application_cluster.png

Security control

The cluster parent node as ID1, i.e., ClusterServer, is mainly used to monitor and coordinate the child nodes, which can control the security for the whole cluster system, check the members and decide whether the members can join in the cluster. The parent node can enable service security to control its members.

If the parent node enables the service security:

1. Non-local child node whose IP is different from that of the parent node can join in the cluster only after being permitted by the parent node.

- If the parent node sets Token, then non-local child node must input the correct Token to join in the cluster.

Visit <http://clusterserver:8090/iserver/manager/clusterMembers>, click "Enable" to set the security Token, and then click the "Allow" button to permit that the member joins in the cluster or click the "Inhibit" button to inhibit that the member joins in the cluster system.

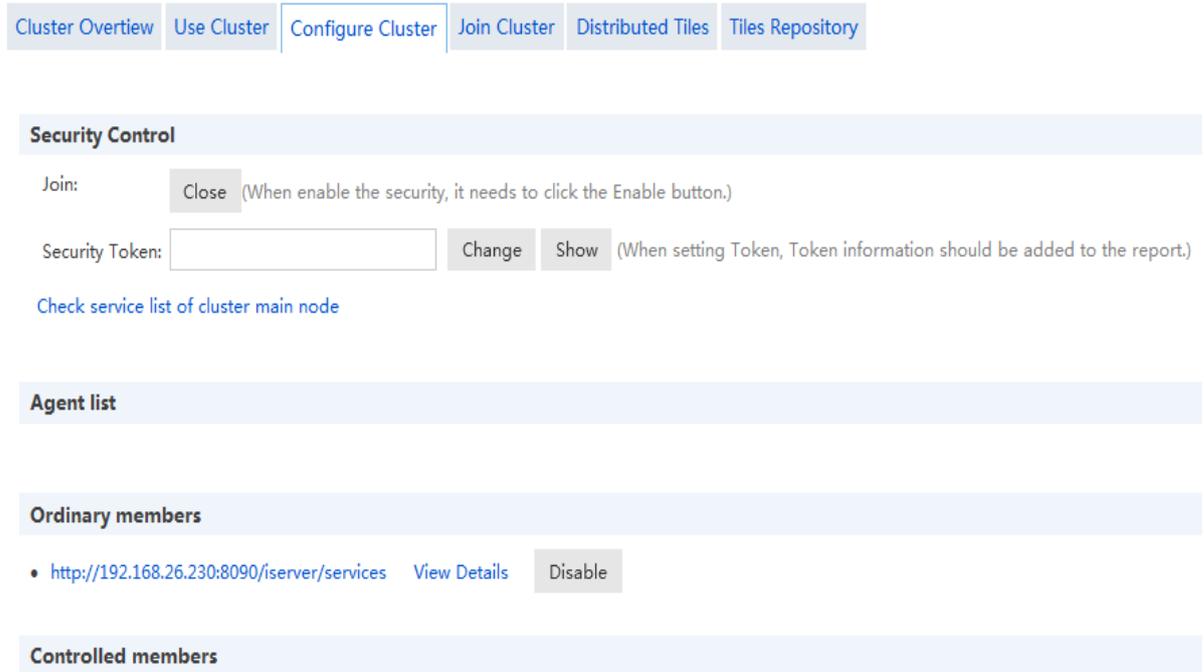


Fig.5 Configure cluster

Instance list of cluster service

Click "Check service list of cluster main node" on the "Configure Cluster" page to get the service instance list in the current cluster system and each service instance can be provided by which child nodes.

Cluster members list

You can check the cluster members list on the "Configure Cluster" page, including "Ordinary members" and "Controlled members" referring to the Controlled Cluster.

For ordinary members, click "Check services" to check the service instances provided by the current child nodes. If the security control is enabled, then you need to click "Allow" to permit the child node joins in the cluster.

Cluser forward configuration

To improve the cluser system's forwarding efficiency, iServer adopts asynchronous way to handle requests by default. If you need to further enhance the efficiency by customized configuration, you should modify <clusterRequestClientSetting> of <clustering> in the iserver-system.xml of master node manually.

For the detailed information, see: Configuration of cluster forward parameter in Managing clusters through configuration file .

Join cluster

The server as shown by ID2 is the cluster child node, which can join the cluster by:

Visit <http://clusterchild:8090/iserver/manager/clusterReporter>, click "Add reporter", input "Cluster address" and "Security token", check the "Enable reporter" check box, and then click "OK" to finish registering the GIS server into the parent node. For single-machine multi-process cluster, registering the child node into the parent node is free from any security restrictions.

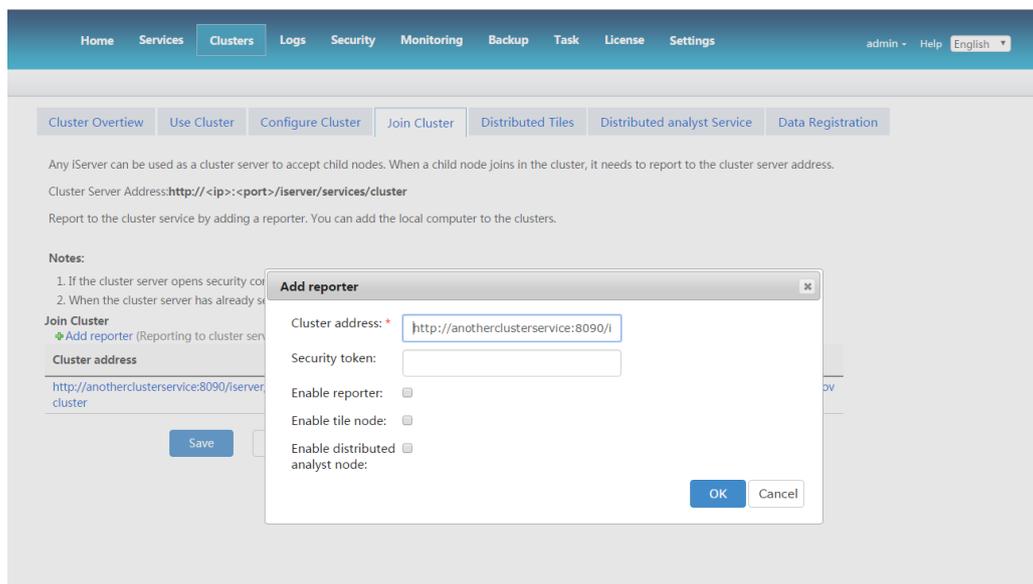


Fig. 6. Join a cluster

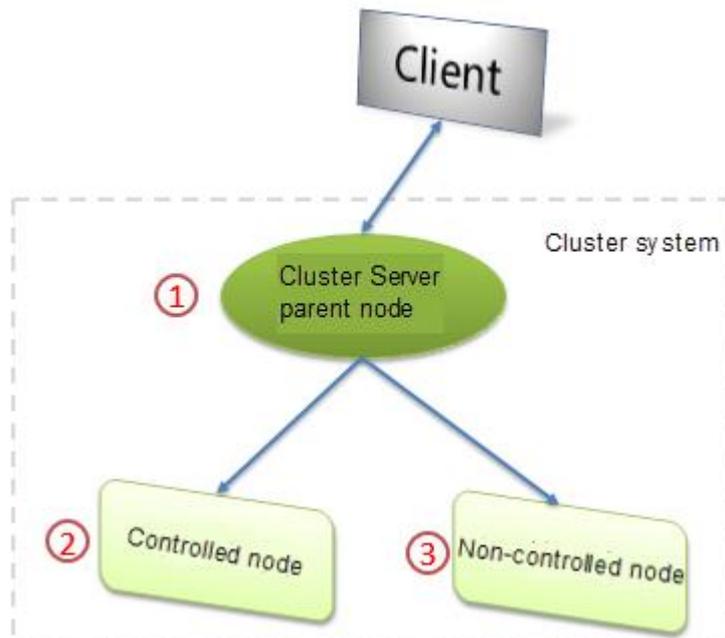
Reporter is used to report the GIS service provided by the cluster child node as shown by ID2 to the cluster server as shown by ID1. The "cluster service address" is the reporter address of the cluster parent node, for example, the cluster service address of clusterservice1 is <http://clusterservice1:8090/iserver/services/cluster>, i.e., the

reporter address of clusterservice1, which supports adding multiple reporters, then the local GIS service can be used by multiple cluster servers.

Controlled cluster

SuperMap iServer supports child nodes to join the cluster in a controlled manner, which is applicable to the case of the free child node. The child node does not need to provide services but can receive the control of the parent node. Once the child node opens the controlled cluster, it is subject to the full control of the parent node, and its own existing service instances and iServer WebManager are disabled while the service instances and data of the parent node will be synchronized to the child node. In which, the service instance corresponding to the service component cluster and the spatial processing will be filtered to the child node.

The child node as the cluster member in the controlled mode, is only be used to process the request forwarded by the parent node.



As shown in the figure above, both the controlled child node (ID2) and non-controlled child node (ID3) can exist simultaneously in a cluster system. The configuration method that the child node joins the cluster in the controlled way is as follows:

- Open the system configuration file of the child node (ID2)([SuperMap iServer installation directory]\webapps\iserver\WEB-INF\iserver-system.xml), enable and modify <controllable>, then restart the child node service. For more information, please see Managing the cluster with the configuration file. For example:

<controllable>

```
<address>http://clusterservice:8090/iserver/services/cluster</address>
<enabled>true</enabled>
<token>-71 90 -24 -17 -115 80 -56 -17</token>
</controllable>
```

- If the parent node (ID1) opens security control, the non-local child node needs to click "Permit" on the configuration cluster page of the child node. If the parent node doesn't open the security control, then it doesn't need any operations.

After the child node opens the controlled cluster, the parent node will automatically synchronize services and data to the child node, so the parent node can forward the request of the client to the child node for processing.

Considerations on building clusters

1. If the GIS server included in the cluster doesn't use SuperMap Object Java in SuperMap iServer product package, use the independent SuperMap iObject Java. When using the map service to output the image, the image dislocation will appear. To solve this problem, you should perform the following setting: open the file SuperMap iObjects Java 6RBinSupermap.xml, and set CustomMapRatioEnable as true (<CustomMapRatioEnable>true</CustomMapRatioEnable>).

2. SuperMap iServer is deployed in the Servlet container in the form of Servlet. If the SuperMap iServer, which is a child node of the cluster, is moved to another Servlet container with a different port, you need to manually change the port under <host> node in the service.xml file to a new one. In addition, you can access any GIS service on the child node to automatically set a new port.

3. The ZIP product package of SuperMap iServer in the windows platform, for example, when configure the cluster in the two packages, it is need to ensure that the Tomcats in different product packages use different ports. The method of modifying the Tomcat port in the ZIP is to modify the related ports in the %SuperMap iServer_HOME%/conf/server.xml, such as <Server port="8016".....>, <Connector port="8091"..... redirectPort="8454">.

Configure stand-alone cluster

The configuration of single cluster has the following two methods:

Configure stand-alone cluster with multiple iServer product packages

The ZIP product package of SuperMap iServer in the windows platform, for example, when configure the cluster in the two packages, it is need to ensure that the Tomcats in different product packages use different ports. The method of modifying the Tomcat port in the ZIP is to modify the related ports in the %SuperMap iServer_HOME%/conf/server.xml, such as <Server port="8016">, <Connector port="8091"redirectPort="8454">.

If ensure that the ports of multiple product packages is different, you can separately startup services. Then use the Configure cluster page to build up a cluster system.

This method can be used in the configuration of single cluster in other middleware.

Configure stand-alone cluster with single iServer product package

In Tomcat, SuperMap iServer supports the starting the specified configuration directory. Therefore, if you set the different configuration file, you can configure the single cluster by using the single iServer product package.

The specific methods are as follows:

1. Prepare the configuration file

- The configuration directory of SuperMap iServer contains all the configuration information in the SuperMap iServer. In the un-war package, the default configuration directory locates in the %SuperMap iServer_HOME%/webapps/iserver/WEB-INF (not includes lib). In the war package, the default configuration directory locates in the %iserver service directory %/WEB-INF (not includes lib). For example, copy the WEB-INF configuration directory in product package directly (not includes lib), and rename, and save as "D:\WEB-INF1".

- The server.xml, %SuperMap iServer_HOME%/conf/server.xml of Tomcat contains the port setting that starts iServer service. Different configuration file should be modified to different ports. For example, copy the server.xml file in the product package directly, and modify the port and save as server1.xml.

2. Start a service

In Tomcat, you can simultaneously custom the server.xml in Tomcat and the configure file in SuperMap iServer by using the following order in windows:

Start the service:

```
set JAVA_OPTS=%JAVA_OPTS% -Diserver.config="D:/WEB-INF1"  
startup.bat -config="D:/server1.xml"
```

Stop the service:

```
shutdown.bat -config="D:/server1.xml"
```