



Environmental Systems Research Institute, Inc., 380 New York St., Redlands, CA 92373-8100 USA • TEL 909-793-2853 • FAX 909-307-3014

Environmental Systems Research Institute, Inc.

ArcSDE 9.0 and SQL Server 2000 MSCS Active/Passive Cluster Configuration

Systems Integration Test Report

Prepared by:

Ray Echevarria and Tony Callender
ESRI Systems Integration Department
Redlands, California

December 5, 2001
Rev 3 January 27, 2005

Copyright © 2005 ESRI
All rights reserved.
Printed in the United States of America.

The information contained in this document is the exclusive property of ESRI. This work is protected under United States copyright law and other international copyright treaties and conventions. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval system, except as expressly permitted in writing by ESRI. All requests should be sent to Attention: Contracts Manager, ESRI, 380 New York Street, Redlands, CA 92373-8100, USA.

The information contained in this document is subject to change without notice.

U.S. GOVERNMENT RESTRICTED/LIMITED RIGHTS

Any software, documentation, and/or data delivered hereunder is subject to the terms of the License Agreement. In no event shall the U.S. Government acquire greater than RESTRICTED/LIMITED RIGHTS. At a minimum, use, duplication, or disclosure by the U.S. Government is subject to restrictions as set forth in FAR §52.227-14 Alternates I, II, and III (JUN 1987); FAR §52.227-19 (JUN 1987) and/or FAR §12.211/12.212 (Commercial Technical Data/Computer Software); and DFARS §252.227-7015 (NOV 1995) (Technical Data) and/or DFARS §227.7202 (Computer Software), as applicable. Contractor/Manufacturer is ESRI, 380 New York Street, Redlands, CA 92373-8100, USA.

@esri.com, 3D Analyst, ADF, AML, ARC/INFO, ArcAtlas, ArcCAD, ArcCatalog, ArcCOGO, ArcData, ArcDoc, ArcEdit, ArcEditor, ArcEurope, ArcExplorer, ArcExpress, ArcFM, ArcGIS, ArcGrid, ArcIMS, ArcInfo Librarian, ArcInfo, ArcInfo—Professional GIS, ArcInfo—The World's GIS, ArcLogistics, ArcMap, ArcNetwork, ArcNews, ArcObjects, ArcOpen, ArcPad, ArcPlot, ArcPress, ArcQuest, ArcReader, ArcScan, ArcScene, ArcSchool, ArcSDE, ArcSdl, ArcStorm, ArcSurvey, ArcTIN, ArcToolbox, ArcTools, ArcUSA, ArcUser, ArcView, ArcVoyager, ArcWatch, ArcWeb, ArcWorld, Atlas GIS, AtlasWare, Avenue, BusinessMAP, Database Integrator, DBI Kit, ESRI, ESRI—Team GIS, ESRI—The GIS People, FormEdit, Geographic Design System, Geography Matters, Geography Network, GIS by ESRI, GIS Day, GIS for Everyone, GISData Server, InsiteMAP, MapBeans, MapCafé, MapObjects, ModelBuilder, MOLE, NetEngine, PC ARC/INFO, PC ARCPLOT, PC ARCSHELL, PC DATA CONVERSION, PC STARTER KIT, PC TABLES, PC ARCCREDIT, PC NETWORK, PC OVERLAY, Rent-a-Tech, RouteMAP, SDE, SML, Spatial Database Engine, StreetEditor, StreetMap, TABLES, the Arc/INFO logo, the ArcAtlas logo, the ArcCAD logo, the ArcCAD WorkBench logo, the ArcCOGO logo, the ArcData logo, the ArcData Online logo, the ArcEdit logo, the ArcEurope logo, the ArcExplorer logo, the ArcExpress logo, the ArcFM logo, the ArcFM Viewer logo, the ArcGIS logo, the ArcGrid logo, the ArcIMS logo, the ArcInfo logo, the ArcLogistics Route logo, the ArcNetwork logo, the ArcPad logo, the ArcPlot logo, the ArcPress for ArcView logo, the ArcPress logo, the ArcScan logo, the ArcScene logo, the ArcSDE CAD Client logo, the ArcSDE logo, the ArcStorm logo, the ArcTIN logo, the ArcTools logo, the ArcUSA logo, the ArcView 3D Analyst logo, the ArcView Business Analyst logo, the ArcView Data Publisher logo, the ArcView GIS logo, the ArcView Image Analysis logo, the ArcView Internet Map Server logo, the ArcView logo, the ArcView Network Analyst logo, the ArcView Spatial Analyst logo, the ArcView StreetMap 2000 logo, the ArcView StreetMap logo, the ArcView Tracking Analyst logo, the ArcWorld logo, the Atlas GIS logo, the Avenue logo, the BusinessMAP logo, the Data Automation Kit logo, the Digital Chart of the World logo, the ESRI Data logo, the ESRI globe logo, the ESRI Press logo, the Geography Network logo, the MapCafé logo, the MapObjects Internet Map Server logo, the MapObjects logo, the MOLE logo, the NetEngine logo, the PC ARC/INFO logo, the Production Line Tool Set logo, the RouteMAP IMS logo, the RouteMAP logo, the SDE logo, The World's Leading Desktop GIS, Water Writes, www.esri.com, www.geographynetwork.com, www.gisday.com, and Your Personal Geographic Information System are trademarks, registered trademarks, or service marks of ESRI in the United States, the European Community, or certain other jurisdictions.

Other companies and products mentioned herein are trademarks or registered trademarks of their respective trademark owners.

Test Objective

The objective is to document a working configuration of ESRI’s Spatial Database Engine (ArcSDE) 9.0 and Microsoft’s SQL Server 2000 Enterprise Edition, in an Active/Passive Microsoft Cluster Server (MSCS) configuration. This is in support of an ArcSDE high-availability configuration, which is required for some GIS environments. This report is not all-inclusive and is intended for technical engineers experienced with ArcSDE, SQL Server 2000, and MSCS clusters.

Test Hardware and Software Configuration

The MSCS test cluster was located in ESRI’s Enterprise Systems Lab (ESL) and consisted of two INLINE Intel-based servers, each running Windows Server 2003 Enterprise Edition. Each cluster node was configured with dual Gigabit network interface cards (NIC). One NIC was dedicated to client network communications while the other was dedicated to real-time cluster monitoring (i.e., heartbeat). The SQL Group virtual IP address and virtual server name, which are used by client application connections, are “moved” via the MSCS software from one cluster node to the other during a failover event. Four public IP addresses are required for an Active/Passive MSCS/SQL Server cluster configuration; two for the physical nodes, one for the Cluster Group name, and one for the SQL Group virtual server. Also, two private IP addresses are required for private network communications between the two nodes. Table 1 below contains the ESL cluster configuration.

**Table 1
Cluster Server Configuration**

Configuration Item	Configuration
Manufacturer	INLINE
Operating System & Version	Windows Server 2003 Enterprise Edition
Number of CPUs & Type	2 x 3.2GHz Intel Xeon
Memory (GB)	2
Node Names	ESLINLINE1 & ESLINLINE2
Network Access	Dual Gigabit NICs One set for Public network and one set for Private network
Shared Quorum Disk (Q:)	INLINE TF480 direct attached fiber channel disk array with LUN on two 146 GB 10K RPM SCSI drives (RAID-1)
Shared Data Disk (E:)	INLINE TF480 direct attached fiber channel disk array with LUN on two 146 GB 10K RPM SCSI drives (RAID-1)
Software	ArcSDE 9.0 SQL Server 2000, Enterprise Edition, SP3

MSCS Cluster Installation and Configuration

The first part of the overall installation process is to install and configure the cluster software. For this test report the [single quorum device cluster model](#) was implemented. The cluster installation was performed using the following on-line Microsoft documentation.

- [Planning and Preparing for cluster installation](#)
- [Checklist: Planning and creating a server cluster](#)
- [Checklist: Validating your clustering system](#)

Following the completion of the MSCS installation, two cluster groups existed. The first group was the Cluster Group and it contained the default cluster resources (see Table 2). Though this group is required for the cluster, it is not used for the SQL Server and ArcSDE configuration. The second group was for the shared E: disk. To support the SQL Server and ArcSDE cluster resources, a new group was created, named "SQL Group," and the E: disk was moved into it. The empty default disk groups were then removed. Table 3 contains the SQL Group prior to the SQL Server and ArcSDE installation.

Table 2
Cluster Group Resources

Resource Name	Notes
Quorum Disk (Q:)	Quorum disk used to manage cluster between nodes
Cluster Name	Default virtual server name. Not used for SQL connections
Cluster IP Address	Default virtual server IP address. Not used for SQL connections

Table 3
SQL Group Resources

Resource Name	Notes
Data and Log Disk (E:)	Shared disk used to store database data and log files

SQL Server Cluster Installation and Configuration

The clustered SQL Server installation was performed on the SQL Group using the following on-line Microsoft documentation.

- SQL Server 2000 Failover Clustering
<http://www.microsoft.com/sql/techinfo/administration/2000/failovercluster.asp>
- Installation Order for SQL Server 2000 Enterprise Edition on Microsoft Cluster Server
<http://support.microsoft.com/support/kb/articles/Q243/2/18.ASP>

Following the SQL Server cluster installation, the SQL Group was automatically populated with the necessary SQL Server resources. The complete SQL Group contained the resources listed in Table 4.

Table 4
Modified SQL Group Resources

Resource Name	Notes
Data Disk (E:)	Shared disk used to store database data and log files
SQL IP Address	SQL virtual server IP address
SQL Network Name	SQL virtual server name (i.e., the "datasource")
SQL Server	SQL Server instance
SQL Server Agent	SQL Server Agent instance
SQL Server Fulltext	Microsoft Search Service Instance

ArcSDE Cluster Installation and Configuration

To perform an ArcSDE clustered installation the software should be installed on the system disk of each node. The ArcSDE data and log files can be installed on the SQL Server shared disk.

The following steps identify the ArcSDE installation and configuration procedure. The ArcSDE commands assume the default ArcSDE instance name of "esri_sde". If a different instance name is used, be sure to include the "-i <instance>" parameter to reflect the configured instance name.

Primary Node ArcSDE Installation Steps

1. Ensure that the SQL Group is on the primary node and install ArcSDE using standard installation procedures. For the Post Installation Setup two configurations must be performed:
 - For the SQL Server Instance name specify the SQL Server virtual server name. This should be the name that was identified during the SQL Server installation.
 - Choose the shared SQL Server disk for the data and log files. For this test we specified the E: drive.
2. After the post installation is completed, you will then need to delete and re-create the ArcSDE service. The default ArcSDE service will not work properly in a clustered environment. This is because by default, the service contains an RDBMS dependency. In a cluster environment, the cluster software manages the services and their dependencies and therefore it is necessary to delete the default ArcSDE service by issuing the following ArcSDE command. Prior to issuing the command, stop the ArcSDE service if running.

```
sdeservice -o delete -i <service>
```

3. Manually recreate the ArcSDE service without the database dependency. Be sure to use the SQL Server virtual server name for the 'SQLSERVERINSTANCE' parameter and the "-n" argument at end of syntax, which creates the service without a dependency.

```
sdeservice -o create -d <SQLSERVER,VIRTUAL SERVER NAME> -i <instance> -p <sde_Password> -n
```

4. Then you will need to register the database with the service

```
sdeservice -o register -r ADMIN_DATABASE -v <database_name> -d SQLSERVER -p <SDE_Password> -l <instance>
```

5. Prior to continuing with the secondary node installation, ensure that the ArcSDE service starts on the primary node. Once that has been verified, stop the ArcSDE service. You must stop the ArcSDE service on the primary node to allow the SQL Group to be moved to the secondary node, which is the first step of the secondary node installation process.

Secondary Node ArcSDE Installation Steps

1. Use the Cluster Administrator to move the SQL Group to the secondary node. Wait for this to complete before continuing.
2. Repeat steps 1 – 4 on the second node.
3. Prior to continuing the ArcSDE service in the cluster, ensure that the ArcSDE service starts on the secondary node. Once that has been verified, stop the ArcSDE service.

The MSCS and SQL Server 2000 installation creates all required SQL Server clustered Instance resources. However, following the ArcSDE installation, it is necessary to manually add the ArcSDE service as a resource to the SQL Group. This is done via the Cluster Administrator by choosing to add a new resource. Table 5 lists the required parameter settings when adding the ArcSDE resource to the SQL Group. It is important to note that improper configuration of the dependencies can result in cluster failover performance degradation, or even cluster failure.

**Table 5
ArcSDE Cluster Resource Parameters**

Resource Parameter	Setting
Name	ArcSDE Service
Description	ArcSDE Service
Resource Type	Generic Service
Possible Owners	ESLINLINE1 & ESLINLINE2
Dependencies	SQL Service Agent
Service Name	esri_sde
All Other Settings	Defaults*

By default, the ArcSDE service name is set to “ArcSDE Service(*instance name*)”. However, the service name to use when configuring the new resource is actually what is contained only within the parenthesis, which in this case is the default instance name of esri_sde. Attempting to use the entire name during the resource configuration will result in a cluster resource configuration error. Once the ArcSDE resource has been successfully added to the SQL Group, bring the resource online via the Cluster Administrator. This will start the ArcSDE service on the node that currently controls the SQL Group.

* If an ArcSDE client application such as ArcIMS is going to be running on the cluster, it will be necessary to “check” the “Use Network Name for Computer Name” box located on the parameters tab of the “ArcSDE Service” resource properties. If this box is unchecked, ArcSDE applications running on the cluster may not be able to connect to ArcSDE when both services are running on the same node (following a failover event, for example). This behavior is described in the following Microsoft TechNet article:

<http://support.microsoft.com/default.aspx?scid=kb;EN-US;q198893>

Cluster Testing and Validation

Clients connecting to SQL Server should use the SQL Server virtual server name, or ESLSQL in this case. ArcSDE connection requests will be routed to the cluster node that currently controls the SQL Group. In the event of failover, the SQL Server virtual server name and associated group resources will “move” from the failed node to the surviving node. During failover, the client application will lose its connection to the ArcSDE server and it will be necessary to reconnect to the ArcSDE cluster once failover has completed.

Cluster testing was performed using ArcMap 9.0 to validate the configuration. Cluster failover was successfully executed in both directions. That is, from the primary node to the secondary node, and from the secondary node to the primary node. Upon a cluster node failure, the Cluster Administrator detected the failure and moved the Cluster Group and SQL Group to the surviving node. The client application, ArcCatalog, was then able to reconnect to the surviving node via the SQL Server virtual server name. The failover time, which is the time required for the client to reconnect and begin processing data, was 12 seconds. This is in the context of a read-only environment and therefore does not include any database rollback time that may exist in an editing environment during a failover.

Conclusions

Testing verified that ArcSDE 9.0 and Microsoft SQL Server 2000, Enterprise Edition could be successfully integrated and utilized in a MSCS configuration.

Configuration Support

It is important to realize that for enterprise configurations such as the one described in this paper, ESRI Support will typically be limited to supporting only the ESRI software components (ArcIMS, ArcSDE, etc.). ESRI Support strives to provide the best assistance possible, but problems or questions regarding third-party applications and components may require you to contact the support services provided by the respective vendor.

ESRI offers ongoing, dedicated assistance with the design and/or implementation of an enterprise configuration through our Professional Services Department. Professional Services staff has real-world experience with enterprise configurations, as well as expert knowledge of ESRI resources. To learn more about what ESRI Professional Services can offer your organization, please see the contact information posted at <http://www.esri.com/consulting/contact.html>.