# Using ArcSDE™ With Microsoft® SQL Server™ Desktop Engine

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## An ESRI Technical Paper

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# Using ArcSDE With Microsoft SQL Server Desktop Engine

When sending users into the field or for many small organizations, full-sized relational database systems such as Microsoft® SQL Server™ can be a large investment.  Microsoft SQL Server Desktop Engine (MSDE) is an alternative that is certified to work with ESRI® ArcSDE™ for Microsoft SQL Server.  However, MSDE has certain limitations that can only be overcome by upgrading to SQL Server Standard or Enterprise Editions.  This paper discusses the benefits and limitations of using MSDE and provides a step-by-step guide to the installation process of both MSDE and ArcSDE.

**Introduction**      ArcSDE can be installed and run with MSDE.  The key issues for ESRI customers are

- Multiuser access for a small number of users
- Cost
- Support for rasters, long transactions, and versioning

MSDE is a run-time version of SQL Server.  Consequently, the client tools and some of the functionality of the full version are missing.  It does, however, have the smallest installed footprint of any version of SQL Server.  There are other limitations that have been built into the engine that include maximum database size and maximum number of concurrent queries.  MSDE comes as part of Office XP Premium, Visio 2000, and Microsoft Application Center 2000.  It also comes with developer products such as Office XP Developer Edition, Microsoft Developer Network (MSDN), Universal Subscription, SQL Server (Standard, Enterprise, or Developer), and Visual FoxPro®.

ArcSDE is certified to work with MSDE 1.0 (based on SQL Server 7.0) and SQL Server 2000 Desktop Engine.  Prior to beginning installation of MSDE or ArcSDE, attention should be given to the supported platform guides available at http://arconline.esri.com and http://www.microsoft.com/sql.

**MSDE**      Other than the benefits of using a true relational database engine, MSDE also allows the ESRI user access to the benefits of ArcSDE.  Raster and long transactions (versioning) are supported with this configuration.

**MSDE Limitations**      Microsoft has noted the following limitations of MSDE 2000:

**Performance.**  MSDE 2000 is a local data engine that can be shared.  It has a managed concurrency workload governor that limits up to five concurrent batch workloads for optimal performance.  Commands and log entries are available to monitor instances where more than five workloads are executed concurrently, a situation that can cause

slower performance even on well-tuned systems.  As more batch workloads are submitted beyond the five-workload limit, the concurrency governor continues to slow down the system.  These workloads are not dropped or lost; they are still processed, but in an increasingly degraded performance mode.  If your solution must support more than five concurrent workloads, it is highly recommended that you migrate to SQL Server 2000 Standard Edition or SQL Server 2000 Enterprise Edition for optimal performance at this higher level of scalability.

**Maximum database size.**  MSDE 2000 supports up to 2 GB per database.  This limitation is per database, not per server.  A single computer can support multiple MSDE 2000 instances, each with databases of up to 2 GB in capacity.

**Data Transformation Services.**  MSDE 2000 is capable of running Data Transformation Services (DTS) packages.  However, it cannot design DTS packages because it is not equipped with a DTS Designer.

**Remote administration.**  It is possible to administer MSDE 2000 both locally and remotely.  However, MSDE 2000 cannot be remotely administered in a multiserver environment where transactions occur across servers.

**Replication.**  Merge replication is supported as a publisher or subscriber.  However, MSDE 2000 supports snapshot and transactional replication as a subscriber only.

Further limitations of MSDE as a database include the absence of graphical management tools, Books Online (the SQL Server reference guide), and analysis capabilities (OLAP, data mining, and data warehousing).

## MSDE Licensing

Careful consideration should be given to the licensing of the MSDE product.  Information can be found at Microsoft's SQL Server Web site.  Your Microsoft representative should be contacted with any questions about the licensing and use of MSDE.

## Installing MSDE 2000

Full installation instructions are included with MSDE.  Installation of MSDE is by execution of the setup.exe found on the CD.  Options for the setup command can be found by running setup on the command line with the /? switch.  If problems are encountered with the installation, an installation log can be created by using the '/l*v logfile' switch.

No user interface is provided for the installation, so any parameters for the installation must be specified using the setup.ini file.  You will need to copy the installation directory from the CD in order to make these modifications.  Recommended options are SECURITYMODE (enable SQL Server and Windows authentication), TARGETDIR (specifies a destination for MSDE executables), and DATADIR (specifies location for database files).

For example:

```
[Options]
SECURITYMODE=SQL
TARGETDIR="c:\Program Files\Microsoft SQL Server\ "
DATADIR="c:\Program Files\Microsoft SQL Server\"
```

Other options include INSTANCENAME (specifies a named instance) that should be used if MSDE is being installed on a machine with SQL Server already installed.

Installing MSDE installs OSQL, a command line tool that enables the execution of SQL statements against the MSDE instance databases. To execute, open a command prompt window and execute OSQL, specifying the user name and password you wish to use.

For example:

```
C:\>OSQL -U sa -P -S myserver
1>
```

Note: osql -?  Will return the usage of the command.

MSDE Configuration

Once MSDE is installed, the following steps are highly recommended:

1.  The 'sa' (system administrator database user) is set to NULL by default.  To reduce the possibility of malicious attacks, set the sa user password to something other than NULL or 'sa'.

    For example:

    ```
    1> use master
    2> exec sp_password NULL,'newpassword','sa'
    3> go
    ```

2.  Manage memory use.

    Without management, SQL Server will attempt to use all possible memory resources available on the computer.  Set this option to a number (in megabytes) below the maximum available memory on the computer.

    For example:

    ```
    1> use master
    2> exec sp configure 'show advanced options', '1'
    3> reconfigure with override
    4> go
    1> exec sp configure 'max server memory', '128'
    2> reconfigure with override
    3> go
    ```

3.  Install SQL Server service packs up to the latest supported by ArcSDE.  Service packs are available on CD–ROM from Microsoft.  Follow the instructions in the readme.txt included carefully.  Some installations will require the service pack to be ordered on CD–ROM from Microsoft and then installed from the command line.

    For example:

    ```
    setup /p sqlrun
    ```

Note:  If you modified the setup.ini file when installing MSDE, you must supply the same file when installing the service pack.

4.  Download and install Books Online (BOL) from Microsoft's Web site (http://www.microsoft.com/sql > Technical Resources > Product Documentation) or bookmark the Books Online section of MSDN (http://msdn.microsoft.com/library/ > Enterprise Development > .NET Enterprise Servers > Microsoft SQL Server > Microsoft SQL Server 2000 > SDK Documentation).

**Management Tools for MSDE**

While MSDE does not come with any graphical management tools, if you have a Microsoft SQL Server license the same client tools can be used for MSDE.  Other companies have created tools to manage MSDE instances, and they can be found on the Web.  The SQL Server 2000 Resource Kit includes sample tools (Database Management MMC Plugin, Desktop Configuration Tool) to manage MSDE instances written with SQL DMO.

**ArcSDE**

To the end user, the use of MSDE by the ArcSDE server is transparent.  ArcSDE is certified for use on Microsoft SQL Server Standard, Enterprise, and Desktop Editions.  ArcSDE is licensed on a processor/server basis.  The licensing for ArcSDE is the same no matter what type of supported relational database management system (RDBMS) is used.  ESRI should be contacted with any questions about the licensing and use of ArcSDE.

ArcSDE requires that the Microsoft Data Access Components (MDAC) 2.6 or higher package from Microsoft be installed.  To confirm the installation and version of MDAC installed, use the Microsoft Component Checker tool downloadable from their Web site (http://www.microsoft.com/data).

ArcSDE supports both SQL Server and Windows authentication.  Each user account that will be used must be added to each database they will be given access to.

- Add the domain user to a group on the ArcSDE server.
- Add the domain user to the SQL Server as a new login.
- Grant the new login access to a database.
- Grant the login appropriate permissions within the database.

**Table 1**
**ArcSDE Users Rule Matrix**

| User | SDE Database | Other Databases |
|------|--------------|-----------------|
| SDE User | Create table, create view, create procedure, create function (SQL Server 2000) | Must be added as a user |
| Other User | Create table at least for first login, create procedure if will own data | Add as a user if accessing data, create table, create procedure if will own data |

Installing ArcSDE    ArcSDE can be installed on the same server on which MSDE is installed (recommended) or on another server in the network. Once the software is installed on the server, the postinstallation ArcSDE configuration must be completed manually.

Note: The installation requires system administrator privileges.

The installation procedure includes the following steps:

- **Determine the location of the license manager.** Each Windows license manager requires a Sentinel hardware key. If you only have one hardware key, you will install the license manager on one machine on your network and all installations will use that license manager for ArcSDE applications. If a license manager is already installed on your network, you can use it to administer ArcSDE. ArcSDE licenses can be served from either a Windows® or a UNIX® license manager. For more information on sharing licenses across platforms, see the license manager reference guide, LicenseManagerGuide.htm, located in the Documentation folder on the ArcSDE CD. If a license manager exists on your network for ArcSDE, skip to Step 3 below.

- **Install the license manager.** If the license manager will be installed on a dedicated machine without ArcSDE software applications installed on it, the license manager installation should occur first. The license manager installation is available from the ArcSDE CD. If you have an existing network license manager for ESRI software products, you will need to update it to the latest license manager. You will do this by completing the license manager install on that machine.

Rebooting is typically required at this stage to start the License Manager software.

- **Start the setup program.** Insert the ArcSDE CD into the CD–ROM drive, browse to the setup.exe in the intel_nt folder, and follow the installation instructions. This step will automatically begin if you installed the license manager.

ArcSDE Configuration    Once ArcSDE for Microsoft SQL Server is installed, you must set up your SDE® database and ArcSDE service.

- **Setting up the SDE user environment.** The SDE user and database must exist before the rest of the postinstallation setup will succeed. Security at your site may dictate that you skip this part of the setup and allow your Microsoft SQL Server DBA to create the SDE user and database.

**Create the SDE database.**

You must change the file name parameters to actual locations on your disk. Change size, maxsize, and filegrowth options as necessary. Where size is the initial size of the database on disk, maxsize is the maximum size to which the database will grow, and

filegrowth denotes how much space will be added to the database each time SQL Server needs more room.  Sizes are in megabytes.

For example:

```
C:\> osql -Usa -Ppassword -Smyserver
1> use master
2> go
1> CREATE DATABASE sde on
2> ( name='sde',
3>   filename='c:\program files\Microsoft SQL Server\MSSQL\data\sde.mdf',
4>   size=300,
5>   maxsize=400,
6>   filegrowth=100 )
7> LOG ON
8> ( name='sdelog',
9>   filename=' c:\program files\Microsoft SQL
Server\MSSQL\data\sdelog.ldf',
10>   size=200mb,
11>   maxsize=300mb,
12>   filegrowth=100mb)
13> go
1> exec sp dboption sde,'trunc. log on chkpt.',true
2> go
```

**Create an 'sde' login and add it as a user to the 'sde' database.**

Create the login with sp_addlogin <loginName><password><default database>.  Then you must switch to the sde database and add the login as a user to the sde database with sp_adduser <loginname>.

For example:

```
1> use master
2> go
1> exec sp_addlogin 'sde', 'sde.password', 'sde'
2> go
1> use sde
2> go
1> exec sp adduser sde
2> go
```

**While still in the sde database, assign appropriate permissions to the sde user.**

For example:

```
1> grant create table to sde
2> go
1> grant create procedure to sde
2> go
1> grant create view to sde
2> go
(for SQL SERVER 2000 SYSTEMS ONLY)
1> use sde
2> go
1> grant create function to sde
2> go
```

- **Setting up the repository.** This is a crucial step in the postinstallation setup. If you modified dbtune.sde, dbinit.sde, or a giomgr.defs file and want to use one or all of those, ensure they have been copied into the ArcSDE installation directory. The ArcSDE system tables, geodatabase system tables, stored procedures, and locators are all created when setting up the repository. If this step does not run successfully, your ArcSDE service will not start. This step is performed with the sdesetupmssql.exe command.

```
sdesetupmssql -o install  [-H <sde directory>]
              [-u <DB Admin user>] [-p <DB Admin password>]
              [-s datasource] [-N] [-q]
e.g.:
c:\> sdesetupmssql –o install –H "c:\program files\arcgis\arcsde\sqlexe" –
u sde –p xxx –s SERVER\instance
```

- **Creating the ArcSDE service.** Once the license manager is defined, the ArcSDE service can be created. Choose an ArcSDE instance name and tcp port number that is not already being used. You can use the sdeservice command at the DOS prompt to manually create or modify the ArcSDE service. The command reference can be found in the ArcSDE Developer Help (%SDEHOME%\documentation\ArcSDE Developer Help).

```
sdeservice -o create  -p <DB Admin password>
           -l <license server name> [-q] [-H <sde directory>]
          [-d <ORACLE,SID | ORACLE8I,SID | SQLSERVER |
           DB2,DB2INSTANCE | INFORMIX>] [-i <service>]
          [-u <service_user>] [-P <service_user_password>]

e.g.:
c:\> sdeservice –o create –p xxx –l piopio –H "c:\program
files\arcgis\arcsde\sqlexe" -d SQLSERVER –I esri_sde –u DOMAIN\sde –P sde
```

- **Editing the service files.** After everything else is complete, it is time to edit the service files to ensure the operating system understands where to find the ArcSDE service.

  <ArcSDE installation directory>\etc\services.sde
  <System Drive >:\winnt\system32\drivers\etc\services

  Add a line resembling the following, using the same service name and port chosen in 'Creating the ArcSDE service':

```
esri_sde        5151/tcp# My ArcSDE
```

- **Start the ArcSDE service.** The installation is now complete and the service can be started. Start the service using either the command line tools or the Services Panel in Windows (Start > Settings > Control Panel. Administrative Tools. Services).

```
C:\> sdemon -o start -s myserver -i esri_sde -p sde.password
ArcSDE Instance esri_sde started Wed May 29 10:33:22 2002
```

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**Figure 1**
**Windows Services Panel Showing the Started ArcSDE Service**
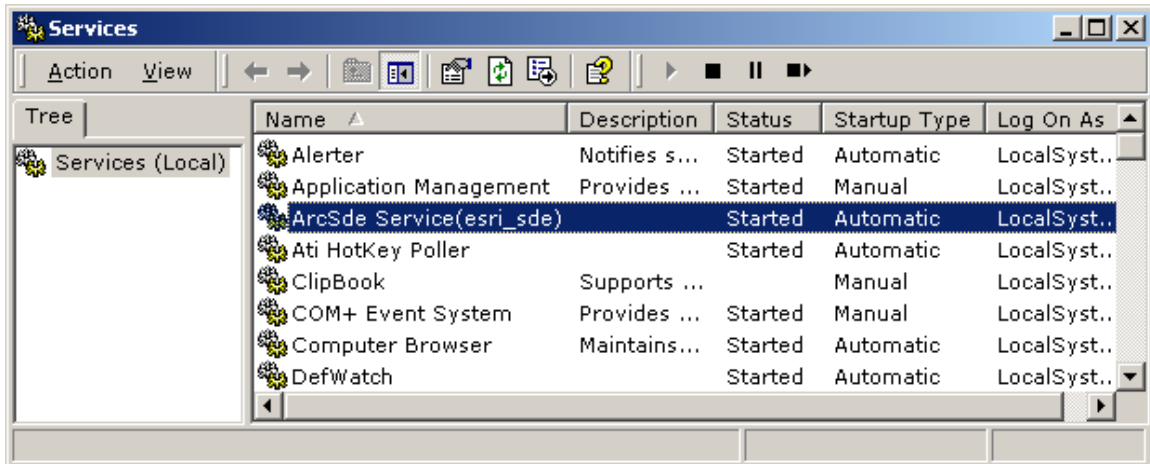


Connecting to ArcSDE

An ArcSDE database is accessed in the same manner, regardless of the underlying database. Information required when creating Database Connections will include server name, database, ArcSDE instance tcp port number or service name, user name, and password for the underlying database.

Direct Connections

Direct connect or two-tier type connections are used when it is desirable for the processing of requests to be distributed from the server to the client machine. This is an example of load balancing where it is not desirable for the server to be put under continuous load.

The service name used from the client is sde:sqlserver:<sql server instance>. It can be used in any client application that supports direct connections to the server (ArcGIS™, ArcIMS®, and the ArcSDE command line tools).

Direct Connections are read-only unless an ArcSDE server feature license is available in the license manager.

Conclusion

It is possible to use MSDE available from Microsoft with ArcSDE for Microsoft SQL Server. To determine if this is possible, careful consideration must be given to the license agreements provided with both the MSDE and ArcSDE products. MSDE does provide full ArcSDE functionality with a small footprint for organizations wanting multiuser access for less than five users or for users needing a database solution that maintains the full schema of their enterprise database while maintaining a smaller number of features with good performance.

Resources

■ *ArcSDE 8.2 for Microsoft SQL Server Install Guide,* ESRI 2002

■ *ArcSDE Configuration and Tuning Guide for SQL Server,* ESRI, 2001

■ *Microsoft SQL Server 2000 Resource Kit,* Microsoft Press, 2001

- *SQL Server 2000—Product Guide,* 2001, Microsoft
  http://www.microsoft.com/sql/evaluation/overview/SQLGuide.doc

- *SQL Server 2000 Desktop Engine (MSDE 2000),* November 28, 2001, Microsoft
  http://www.microsoft.com/sql/techinfo/development/2000/MSDE2000.asp

**Web Sites**

- Microsoft SQL Server Web site
  http://www.microsoft.com/sql

- ESRI ArcSDE Web site
  http://www.esri.com/arcsde

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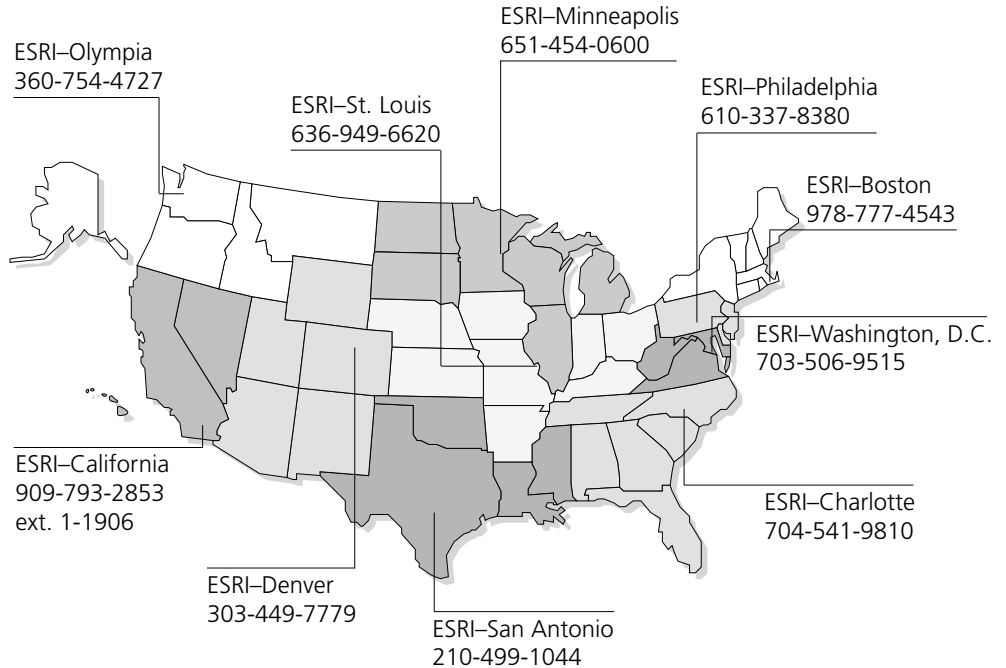
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