

SAS® Decision Services 6.4

Deployment Guide



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SAS® Decision Services 6.4: Deployment Guide

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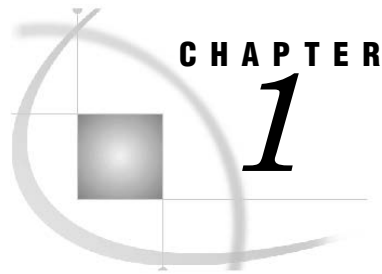
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Overview

The *SAS® Decision Services: Deployment Guide* explains how to install and configure SAS Decision Services. The SAS Decision Manager and SAS Real-Time Decision Manager software offerings use SAS Decision Services. Refer to the SAS Customer Intelligence and SAS Decision Manager documentation for specific information on SAS Real-Time Decision Manager and SAS Decision Manager.

The additional software offerings used by SAS Decision Services are SAS Metadata Server and SAS Integration Technologies. The SAS Intelligence Platform library provides information for these two platform offerings.

See <http://support.sas.com/94administration> for more information about these two software offerings and their components.

What Is Covered in This Document?

This document is for SAS installers who want to deploy SAS Decision Services 6.4. See <http://support.sas.com/documentation/onlinedoc/intellplatform/index.html> for more information on how to install and configure the SAS Intelligence Platform.

Recommended Reading

As of March 2015:

- ⑥ SAS Institute Inc., 2013. *SAS 9.4 Intelligence Platform: Installation and Configuration Guide*. Cary, NC. Available at <http://support.sas.com/documentation/onlinedoc/intellplatform/index.html>
- ⑥ SAS Institute Inc., 2013. *SAS Federation Server 4.1: Administrator's Guide*. Cary, NC.

Assumptions

The installation and configuration of SAS Decision Services supports the following assumptions:

- Ø Each environment (development, test, and production) should use separate SAS Metadata Servers.
- Ø Each separate SAS Metadata Server on the same hardware machine should be configured with different ports and different configuration directories.
- Ø The Oracle service names and ODBC data source names for DB2 and SQL Server should be configured to use the same name on the SAS Server and the SAS Federation Server.
- Ø During the execution of the SAS Deployment Wizard, you must select to configure the SAS Anonymous Web User, if you plan on using SAS BI Web Services to write SAS activities that use SAS procedures.

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Pre-Installation Steps for SAS Deployment Wizard

Complete the pre-installation steps from the *SAS 9.4 Intelligence Platform: Installation and Configuration Guide*,
<http://support.sas.com/documentation/onlinedoc/intellplatform/index.html>.

Pre-Installation Steps for SAS Federation Server for SAS Decision Services

Before running the SAS Deployment Wizard to install and configure SAS Decision Services, there are pre-installation steps that need to be performed. You will need to complete these pre-installation steps prior to deploying SAS Decision Services 6.4.

Create a Folder on your SAS Federation Server to Publish DS2 Packages to SAS

Create a folder for storing SAS data on the machine that will host the SAS Federation Server. Give the SAS Federation Server system user, also known as the Data Management System User (sasdmadm), and the user assigned to start the SAS Federation Server process, the SAS Installer, read and write permissions.

Note: If you are unsure which machine will host the SAS Federation Server, refer to the `details_diagram_for_ie7.mht` file that accompanies your deployment plan. Locate the machine hosting the software to install and configure SAS Federation Server.

Note: If you prefer to use a shared network drive, you need to ensure that the user who starts the SAS Federation Server process, and the SAS Federation Server system user, have access to the shared network drive.

Copy SAS Federation Server and SAS Authentication Server Licenses to a Local Folder

The license files for the SAS Federation Server and the SAS Authentication Server must be copied locally to the machines where you will install these products. A network location cannot be used. You can find the licenses in your SAS Software Depot, in the `sid_files` folder.

Pre-Installation Steps for Database Access for SAS Decision Services

If you select SAS as your database type, you can skip this section of the document and proceed to the next chapter.

Complete these pre-installation steps prior to configuring SAS Decision Services 6.4, if you plan on using a database vendor for customer data tables. Supported databases are Oracle, DB2, Teradata, Greenplum, SQL Server, Netezza, and Postgres.

Step 1: Install the Database Client and Server Software

It is recommended that you configure the SAS Federation Server to use the native database drivers for improved performance.

Therefore, install the required DBMS client software on the SAS Federation Server and the SAS Server. Refer to the installation documentation for the specific database.

For Oracle only. Add an entry into your `tnsnames.ora` file and change the values shown in brackets to suit your environment. SAS uses the `<addressname>` to connect to the database. The SAS Federation Server and the JDBC connection system resources use the `<sid>` to connect to the database. When defining this entry, define the `<addressname>` and the `<sid>` as the same value.

```
<addressname>=
(DESCRIPTION=
  (ADDRESS_LIST=
    (ADDRESS= (PROTOCOL=TCP) (Host=<hostname>)
      (Port=<port>)))
  (CONNECT_DATA=
    (SERVICE_NAME=<sid>)
  ))
```

Step 2: Define Database Users

Define a database user ID with create, alter, and delete table permissions that will be used to access customer data tables. This user ID is also used by the engine and design server as the Java Access user ID for general I/O.

Step 3: Obtain Your Database JDBC Driver Information for Customer Data Access

Prior to starting the SAS Deployment Wizard to configure SAS Decision Services, you need to obtain the JDBC driver name and JAR files for your specific database. Refer to the installation documentation for the specific database.

Step 4: Download JDBC Drivers

As of March 2015:

- 0 DB2 drivers are available at <http://www-01.ibm.com/support/docview.wss?uid=swg21363866>
 - 0 Microsoft SQL Server drivers are available at <http://msdn.microsoft.com/en-us/sqlserver/aa937724>
 - 0 Teradata drivers are available at <http://downloads.teradata.com/download/connectivity/jdbc-driver>
 - 0 Oracle drivers are available at <http://www.oracle.com/technetwork/database/features/jdbc/index-091264.html>
 - 0 Greenplum and PostgreSQL drivers are available at <http://jdbc.postgresql.org/download.html>
 - 0 Netezza drivers are available at <http://www-01.ibm.com/software/data/netezza/>
1. Download the JDBC driver for your specific database version, along with all dependent files including license files.
 2. Copy the database JDBC JAR files, along with the correct license files, where applicable (such as DB2), to the machine where the SAS Decision Services design and engine middle tiers will be installed. Only the JAR files for a single version of the JDBC JARs should reside in this directory.
 3. Record the location for use during the SAS Deployment Wizard installation.

Step 5: Create the ODBC Data Source Name (SQL Server, Netezza, PostgreSQL, and DB2 Only)

If you are using Netezza, PostgreSQL, SQL Server, or DB2, you need to create the ODBC data source names for the SAS Federation Server. Refer to the section “Configuring ODBC Connections” of the *SAS Federation Server 4.1 Administrator’s Guide*.

1. Create the system data source named “DSDataODBC” on the SAS Federation Server and the SAS Server.
2. Create the ODBC data source name as an administrative user and use the native database driver.

Windows

1. From the Microsoft® Windows® Start menu, navigate to **Start ► Control Panel ► Administrative Tools ► Data Sources (ODBC)**.
2. On the **System DSN** tab, click **Add**.
3. Select the driver that corresponds to your database and click **Finish**.
4. Complete the options below based on the database type.

PostgreSQL

1. Data Source: Enter the name **DSDataODBC**.
2. Description: (Optional)
3. Database: Enter database name.
4. Server: Enter the host for the PostgreSQL server database.
5. Port: Enter the port for the PostgreSQL server database.
6. User Name: Enter the user ID.
7. Password: Enter the password.
8. Select **Test**, to test the data source connection.

SQL Server

1. Data Source Name: Enter the name **DSDataODBC**.
2. Description: (Optional)
3. Server: Enter the host for the SQL Server database.
4. With SQL Server Authentication: Enter the user ID and password.
5. You can change default database. (Optional)
6. You can change the log location. (Optional)
7. Select test data source.

DB2

1. Data Source Name: Enter the name **DSDataODBC**.
2. Description: (Optional)
3. Database Alias: Select **ADD**.
Data Source Tab: Enter the user ID and password.
TCP/IP Tab:
 - i. Database Name: Enter the database name.
 - ii. Database Alias: Enter the database alias (schema).
 - iii. Host Name: Enter the database host name.
 - iv. Port: Enter the database port.
4. Test the connection on each DSN and click **Finish**.

UNIX® or Linux®

Interactive ODBC Configuration Tool

Use the interactive ODBC Configuration Tool `dfdbconf` to add new data sources to the ODBC configuration. Use the name **DSDataODBC** as the name for your data source.

1. From the root directory of the SAS Federation Server installation, run `./bin/dfdbconf`
2. Select **A** to add a data source. You can also use `dfdbconf` to delete a data source, if it is no longer needed.
3. Select a template for the new data source by choosing a number from the list of available drivers.

4. You are prompted to set the appropriate parameters for that driver. The new data source is then added to your `odbc.ini` file.

Test Data Source Connections on UNIX for SAS Federation Server

Once you have added all of your data sources, the interactive ODBC Viewer application, `dfdbview`, can be used to test your connection.

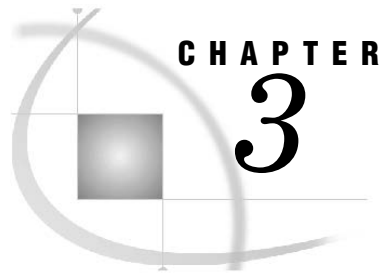
Example `./bin/dfdbview my_odbcdsn`

For non-ODBC connections, use the vendor supplied client configuration utility. You might be prompted for a user name and password. If the connection succeeds, you will see a prompt from which you can enter SQL commands and query the database. If the connection fails, SAS Federation Server displays error messages describing one or more reasons for the failure.

SAS Decision Services Checklist

The table below describes the information that must be obtained prior to running the SAS Deployment Wizard.

Description	Default Value Database Information	Actual Value
Database Type		
Database Host		
Database Port		
Database Name		
Database User ID		
Database Password		
<i>Oracle Only</i>		
Oracle Service Name		
Oracle Default Schema Name		
Oracle Service Name		
Oracle Default Schema Name		
<i>SQL Server Only</i>		
SQL Server ODBC Data Source Name		
<i>Greenplum Only</i>		
Greenplum Database Name		
<i>DB2 Only</i>		
DB2 Database Name		
<i>Teradata Only</i>		
Teradata Database Name		
<i>Netezza Only</i>		
Netezza Database Name		
<i>Database Data Service and Data Source Names</i>		
SAS Federation Server Database Data Service Name	<databasetype>_ds	
SAS Federation Server Database Data Source Name	<databasetype>_dsn	
<i>SAS DataService, Data Source, Catalog and Schema Names</i>		
SAS Federation Server Base Data Service Name	BASE	BASE
SAS Federation Server Base Data Source Name	BASE_dsn	
SAS Federation Server Base Schema Name	baselib	
SAS Federation Server Base Catalog Name	basecat	
SAS Federation Server path to SAS datasets		
JDBC Information		
JDBC Class Name		
Directory containing JDBC .jar files:		



Configuring SAS Deployment Wizard

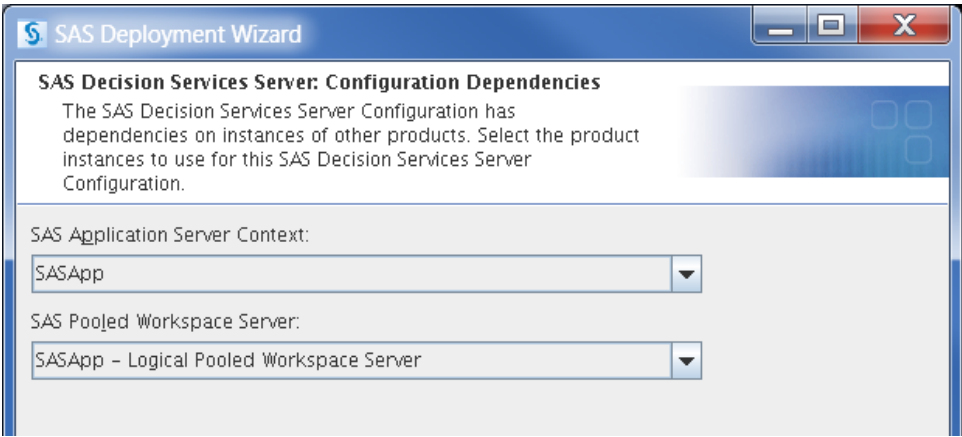
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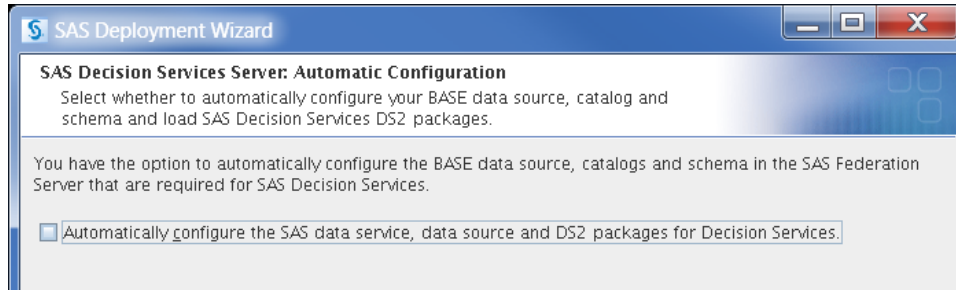
SAS Deployment Wizard Configuration

SAS Decision Services Server Tier

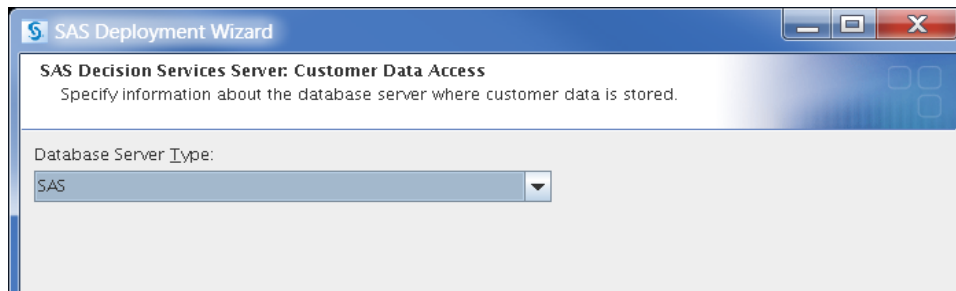
This section describes the dialog boxes that are associated with the configuration of SAS Decision Services 6.4 server configuration.

Note: If more than one application server context or pooled workspace server has been defined for your environment, you will be prompted to select the application server context or pooled workspace server to use for SAS Decision Services. Choose the application server context that you selected for your stored process server and the corresponding pooled workspace server.

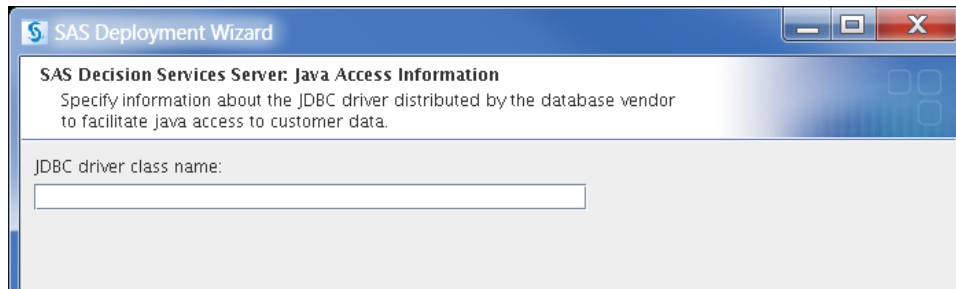




This dialog box allows you to select whether you want to configure the SAS Federation Server automatically. The SAS Authentication Server and SAS Federation Server must be started prior to selecting this option.



This dialog box is used to specify the type of database server that will be used to store the user, audit log, and customer data. The DS2 packages are stored in SAS data sets.



This dialog box is used to specify the name for the JDBC driver class that allows access to customer data stored in SAS datasets. It is displayed if SAS is selected as the database type.

SAS Decision Services Server: Customer Data Access Database Information
Specify a user who has access to create, update and delete tables in your database.

Database Server Host:
hostname.domain.com

Database Server Port:
<database server port>

Database User:
<database server user id>

Database User Password:.

Confirm Database User Password:

This dialog box allows you to specify the database information. Specify the database user who has permission to create, alter, and delete tables in the database where customer data will be accessed. It is not displayed if you select SAS as a database type.

SAS Decision Services Server: DB2 Database Name
Specify the database instance name in your DB2 database.

Database Name:

This dialog box allows you to specify the database instance name. There is an eight character limit.

SAS Decision Services Server: Oracle Information
Specify the schema and service name of your Oracle database.

TNS Address Name:
ORA11G

Service Name:
ORA11G

Schema Name:
<default schema name>

This dialog box allows you to specify the value of the path that is defined in the tnsnames.ora file. This file is located in *<Oracle Install Dir>\product\11.1.0\client_1\NETWORK\ADMIN\tnsnames.ora*.

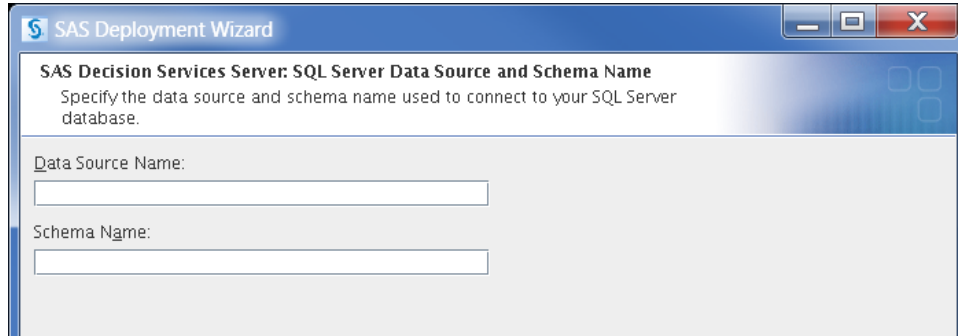
```
ORA11G =
  (DESCRIPTION =
```

```

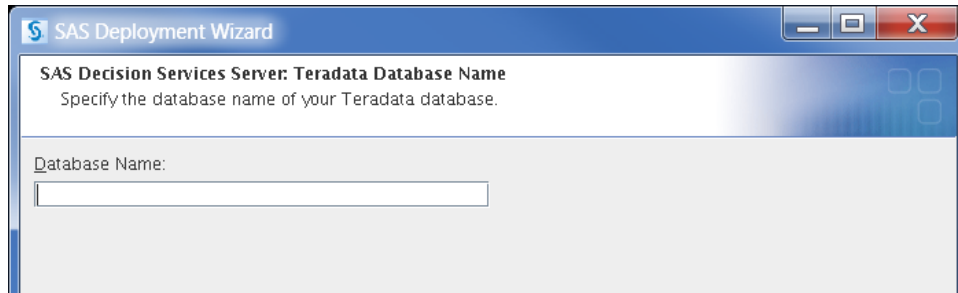
      (ADDRESS_LIST =
        (ADDRESS = (PROTOCOL = TCP)(HOST = hostname.domain.com)(PORT =
1521)) )
      (CONNECT_DATA =
        (SERVICE_NAME = ora11g) ) )

```

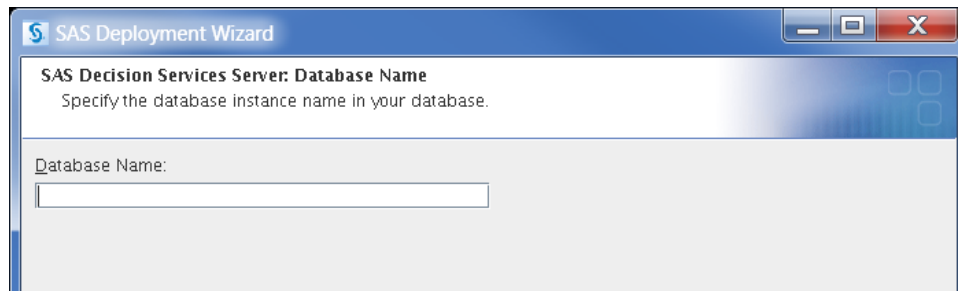
The ORA11G and ora11g that are bolded above should have the same name. The schema referenced here is the name of the default schema for the Oracle database user where the customer data is accessed.



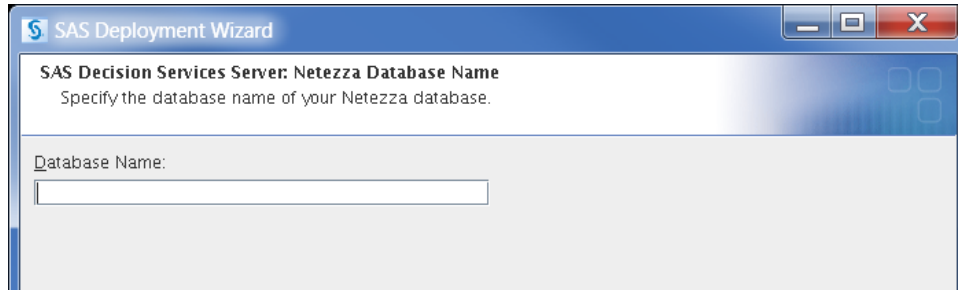
This dialog box allows you to specify the SQL Server data source and schema name.



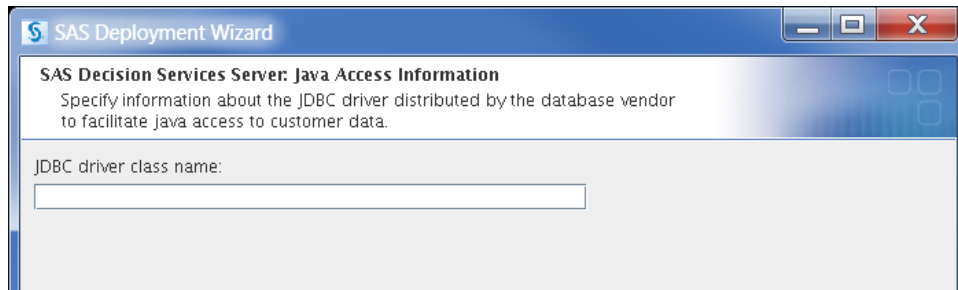
This dialog box allows you to specify the name of your Teradata database.



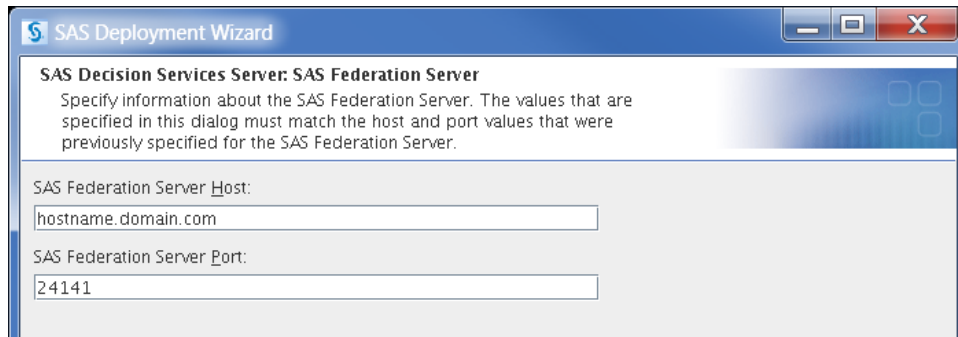
This dialog box allows you to specify the name of your Greenplum or PostgreSQL database.



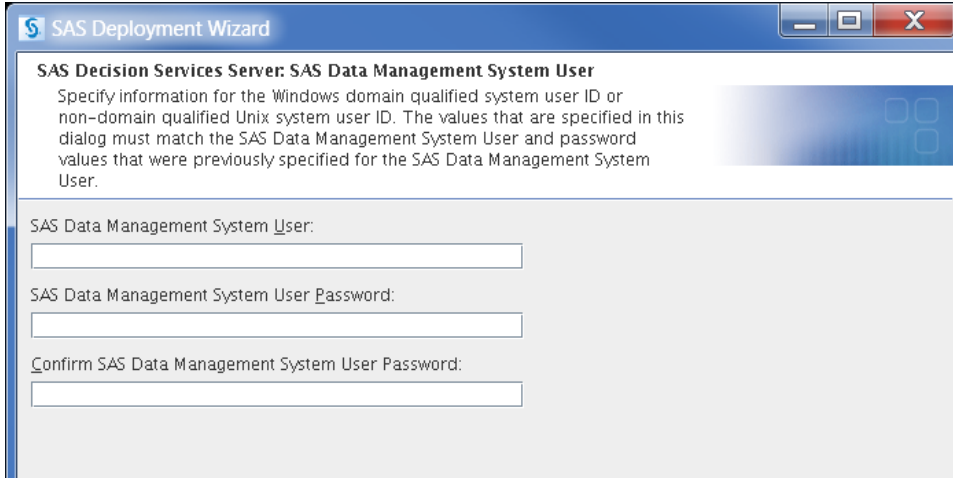
This dialog box allows you to specify the name of your Netezza database.



This dialog box allows you to specify the JDBC driver name for connecting to your database.



This dialog box allows you to specify the host and port information for the SAS Federation Server.



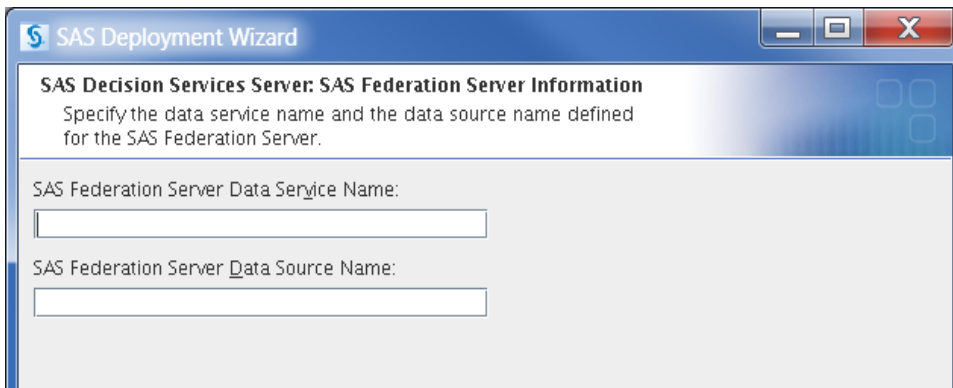
SAS Decision Services Server: SAS Data Management System User
Specify information for the Windows domain qualified system user ID or non-domain qualified Unix system user ID. The values that are specified in this dialog must match the SAS Data Management System User and password values that were previously specified for the SAS Data Management System User.

SAS Data Management System User:

SAS Data Management System User Password:

Confirm SAS Data Management System User Password:

This dialog box allows you to specify the Data Management system user ID that will be used to connect to the SAS Federation Server from the SAS Decision Services engine and design server. This is the user that you specified in the SAS Data Management System User dialog.

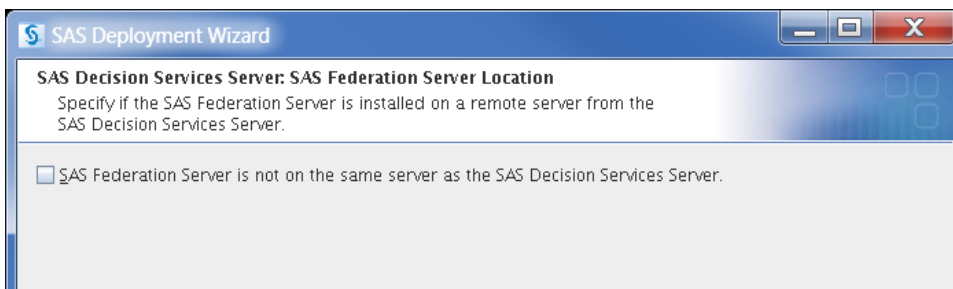


SAS Decision Services Server: SAS Federation Server Information
Specify the data service name and the data source name defined for the SAS Federation Server.

SAS Federation Server Data Service Name:

SAS Federation Server Data Source Name:

This dialog box allows you to specify a unique data service name and a unique data source name for your database that will be created on the SAS Federation Server machine.



SAS Decision Services Server: SAS Federation Server Location
Specify if the SAS Federation Server is installed on a remote server from the SAS Decision Services Server.

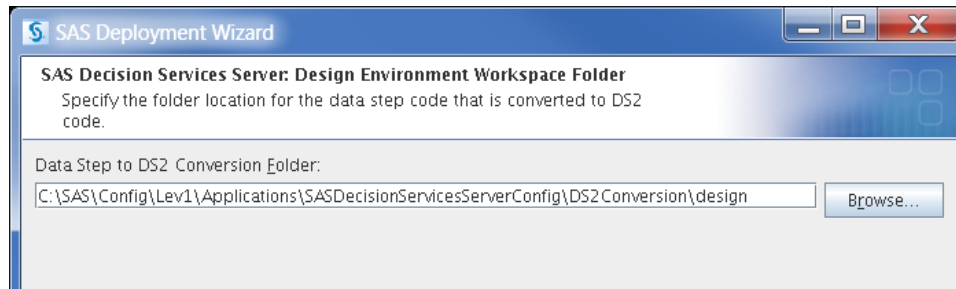
☐ SAS Federation Server is not on the same server as the SAS Decision Services Server.

This dialog box allows you to specify if the SAS Federation Server is not on the same server as the SAS Decision Services Server.



This dialog box allows you to specify a unique data source name, schema, catalog name, and path for the Base data service. The Base data service will be used to access SAS data that is accessible from the SAS Federation Server machine.

Specify the federated data source name. The federated data source name will be used to reference multiple data sources.



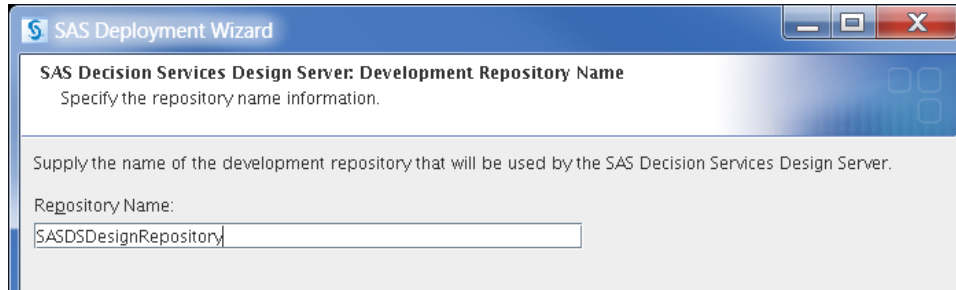
This dialog box allows you to specify the name of the working folder where DATA step code is translated to DS2 code for the design environment.

Configuring the Middle Tier with Multiple Steps

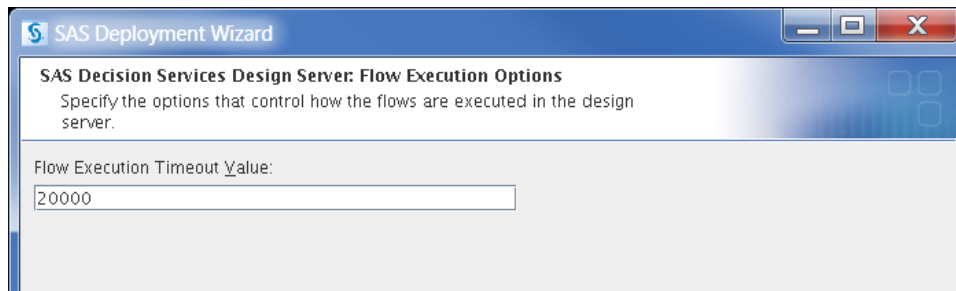
In a multi-tier configuration, a dialog box is displayed requesting that the user stop the SASServer1 web application server before the second execution of the SAS Deployment Wizard.

SAS Decision Services Design Middle Tier

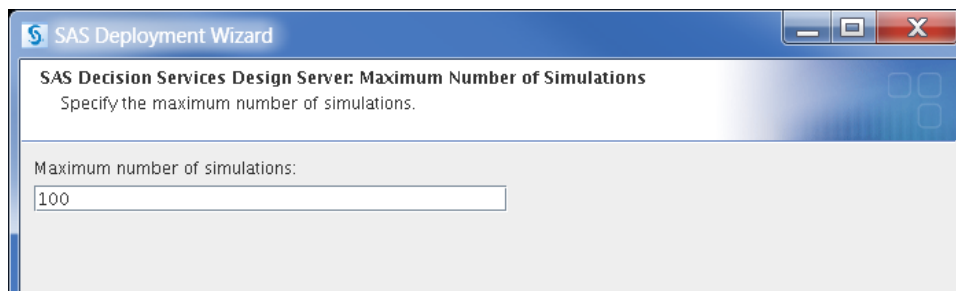
This section describes the dialog boxes that are associated with the configuration of the SAS Decision Services 6.4 design server.



This dialog box allows you specify the name of the repository configured for the SAS Decision Services design middle tier.

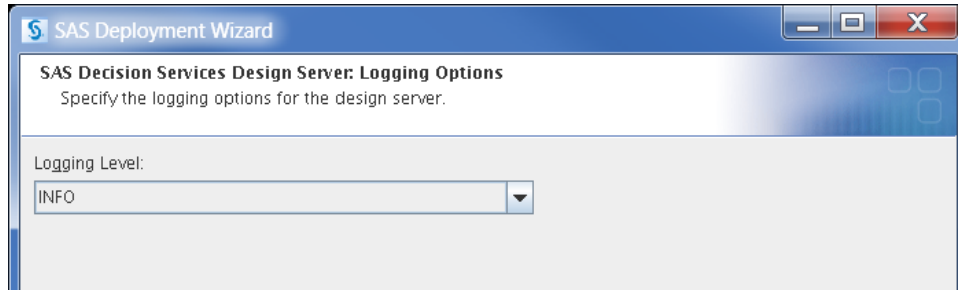


This dialog box allows you to specify options for how flows are executed in the SAS Decision Services design server.

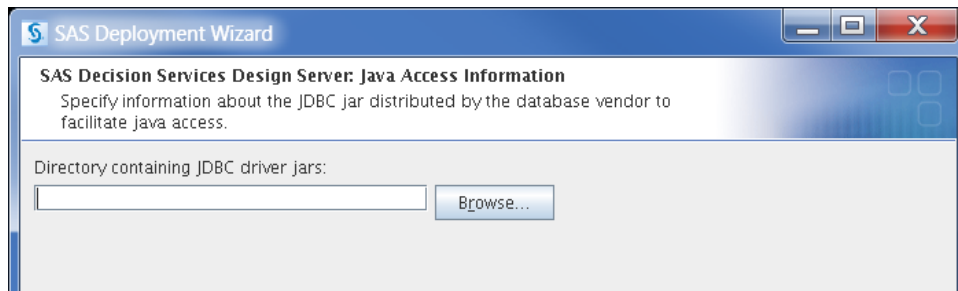


The dialog box allows you to specify the maximum number of simulation results that the design server will hold in memory.

Note: Running more simulations causes older results to be dropped from in-memory storage. The number includes results for simulations currently running, as well as those run previously.



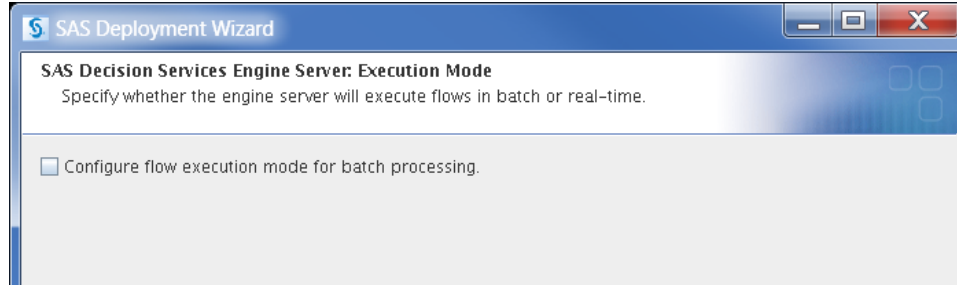
This dialog box allows you to specify the initial logging level for the SAS Decision Services design middle-tier server.



This dialog box allows you to specify the path to where your JDBC database driver JAR file is located. The path should only contain the JAR file and its dependencies. This dialog box is only displayed if you select a database other than SAS.

SAS Decision Services Engine Server Middle Tier

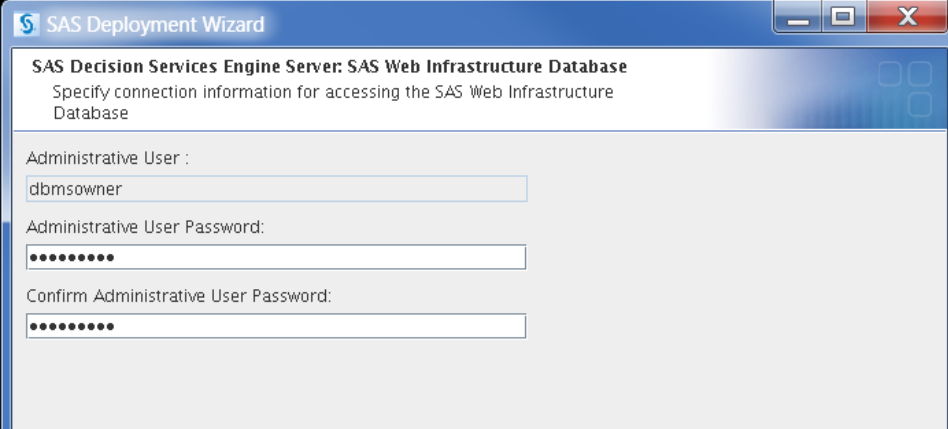
This section describes the dialog boxes that are associated with the configuration of the SAS Decision Services 6.4 engine server.



This dialog box allows you to specify if the flows will be executed in batch mode or real-time. If this check box is not selected, then the default execution mode is real-time.



This dialog box allows you to specify information about the SAS Decision Services application database stored in the SAS Web Infrastructure Platform Data Server. This database contains the user, and monitor tables that are used internally by SAS Decision Services.



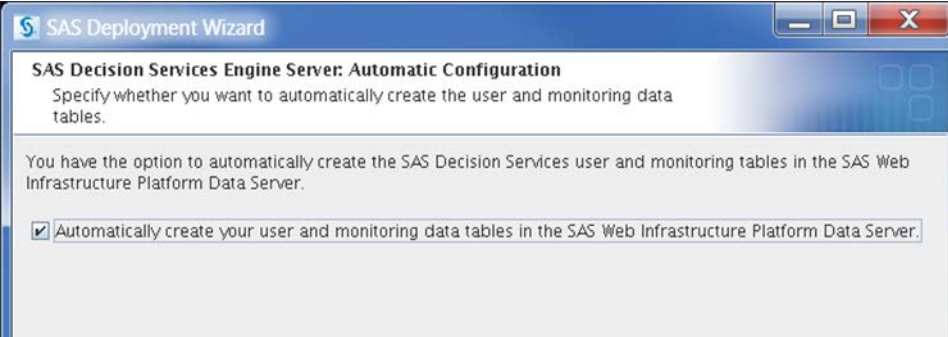
SAS Decision Services Engine Server: SAS Web Infrastructure Database
Specify connection information for accessing the SAS Web Infrastructure Database

Administrative User :
dbmsowner

Administrative User Password:
.....

Confirm Administrative User Password:
.....

This dialog box is used to specify the administrative user to connect to the SAS Web Infrastructure Platform Data Server.

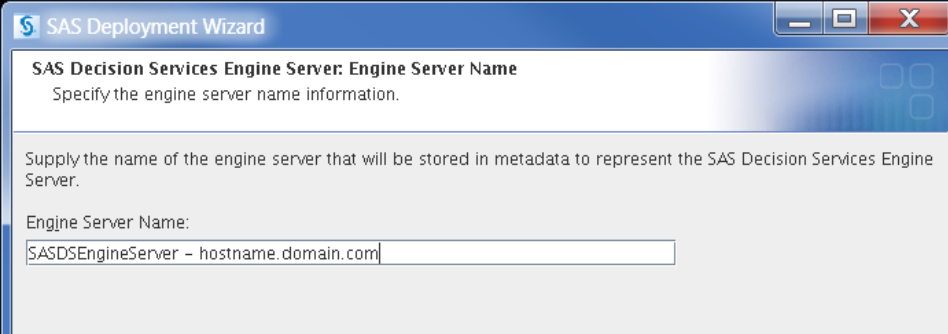


SAS Decision Services Engine Server: Automatic Configuration
Specify whether you want to automatically create the user and monitoring data tables.

You have the option to automatically create the SAS Decision Services user and monitoring tables in the SAS Web Infrastructure Platform Data Server.

☒ Automatically create your user and monitoring data tables in the SAS Web Infrastructure Platform Data Server.

This dialog box allows you to automatically create the user, and monitoring data tables in the SAS Decision Services database located on the SAS Web Infrastructure Platform Data Server.

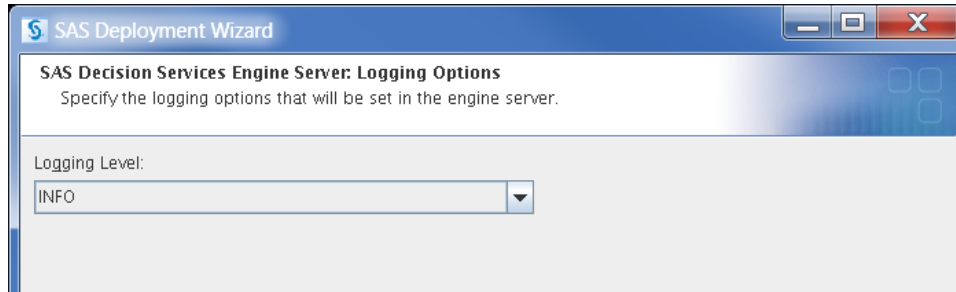


SAS Decision Services Engine Server: Engine Server Name
Specify the engine server name information.

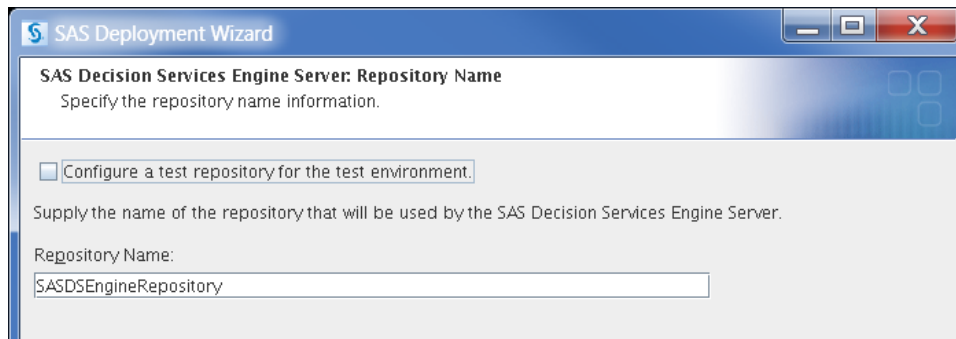
Supply the name of the engine server that will be stored in metadata to represent the SAS Decision Services Engine Server.

Engine Server Name:
SASDSEngineServer - hostname.domain.com

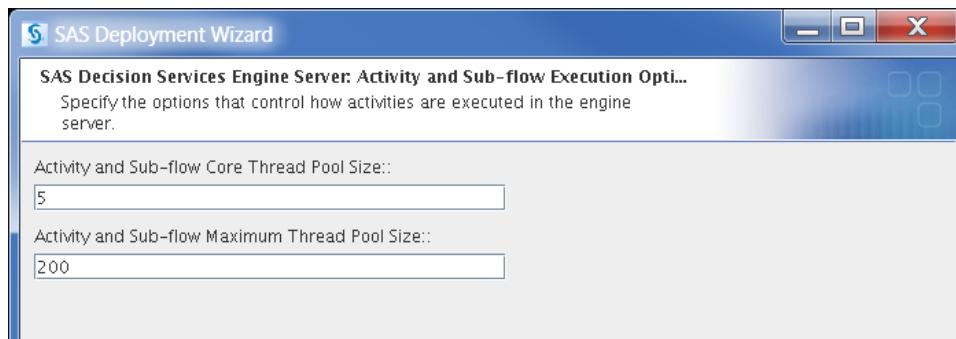
This dialog box is used to specify the name of the engine server that is created under Server Manager.



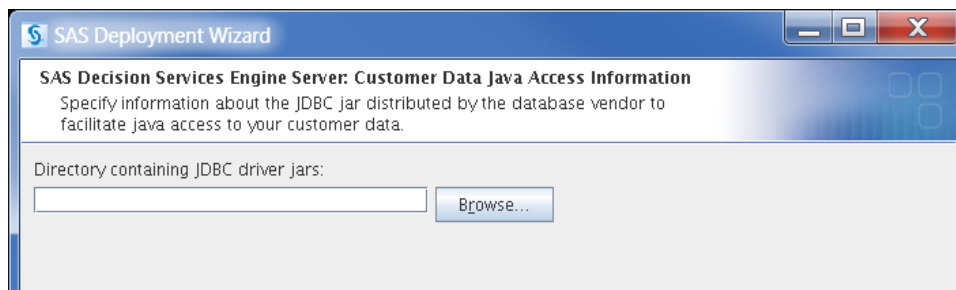
This dialog box allows you to specify the initial logging level for the SAS Decision Services engine server.



This dialog box allows you to specify the name of the repository configured for the SAS Decision Services engine server.



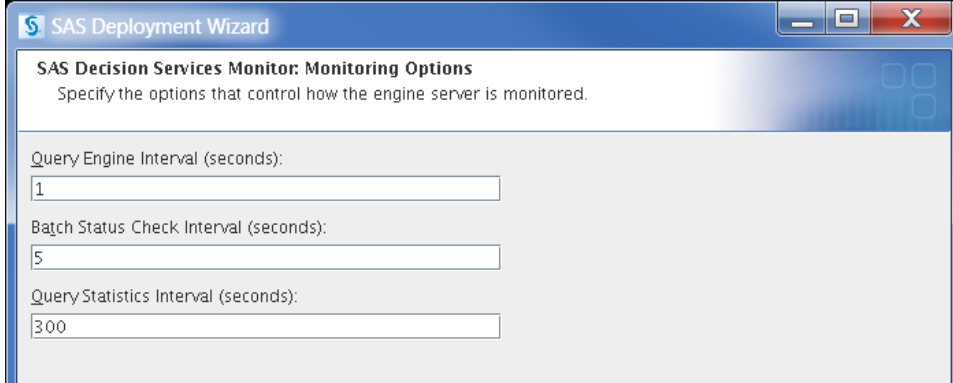
This dialog box allows you to specify activity and sub-flow execution options.



This dialog box allows you to specify the path to where your JDBC database driver JAR file is located. The path should only contain the JAR file and its dependencies. This dialog box is only displayed if you select a database other than SAS.

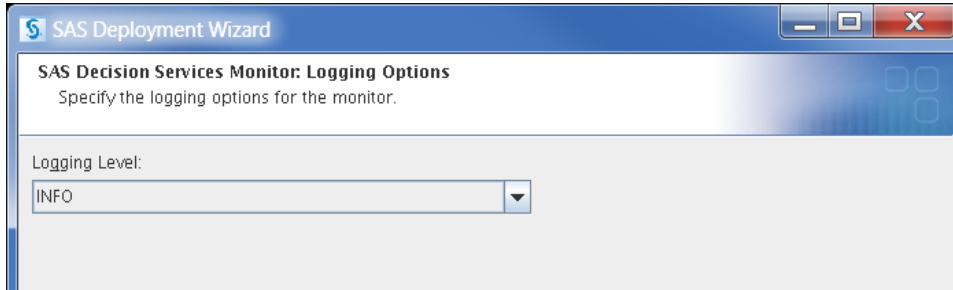
SAS Decision Services Monitor Middle Tier

This section describes the dialog boxes that are associated with the configuration of SAS Decision Services 6.4 Monitor.



The screenshot shows a dialog box titled "SAS Deployment Wizard" with a sub-header "SAS Decision Services Monitor: Monitoring Options". Below the sub-header is the instruction "Specify the options that control how the engine server is monitored." There are three input fields: "Query Engine Interval (seconds):" with the value "1", "Batch Status Check Interval (seconds):" with the value "5", and "Query Statistics Interval (seconds):" with the value "300".

This dialog box allows you to specify the intervals for when the monitor will be querying the engine for flow execution statistics.



The screenshot shows a dialog box titled "SAS Deployment Wizard" with a sub-header "SAS Decision Services Monitor: Logging Options". Below the sub-header is the instruction "Specify the logging options for the monitor." There is a dropdown menu labeled "Logging Level:" with the value "INFO" selected.

This dialog box allows you to specify the initial logging levels for SAS Decision Services Monitor.

Configuring SAS Federation Server for SAS Decision Services

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Configuring SAS Federation Server for SAS Decision Services

These instructions are referred to from the Instructions.html of the SAS Decision Services server configuration. You should complete these in the order identified in the Instructions.html. They are to be completed when you have selected a customer data access storage other than SAS. These instructions allow you to create the database login that is assigned to the Data Management system user ID. You will need to log into SAS Data Management Studio as the Data Management system user ID that was assigned during the configuration of the SAS Federation Server.

Note: The SAS Deployment Wizard references the Data Management system user. This is the single user that is defined as the SAS Federation Server system user.

Create a SAS Authentication Server Definition

To create a SAS Authentication Server definition, perform the following steps:

- 1 Open SAS Data Management Studio on the client tier machine.
- 2 If necessary, log in as **<Data Management system user>**.
- 3 Double-click the **Administration** menu bar.
- 4 Right-click **SAS Authentication Servers**, and select **New Authentication Server Connection**.
- 5 Enter the name for the SAS Authentication Server definition.
- 6 Enter the description (optional).
- 7 Enter the server **<Hostname of SAS Authentication Server>**.
- 8 Enter the port **<Port of SAS Authentication Server>**.
- 9 Select **Test Connection**.
- 10 Log in as the **<Data Management system user>**. On Windows, use the fully qualified domain and user ID.
- 11 Click **OK**.

Create the SAS Authentication Server Domains

To create the SAS Authentication Server domains, perform the following steps:

- 1 Double-click the **Administration** menu bar.
- 2 Click the **+** to expand the SAS Authentication Server menu.
- 3 Double-click your SAS Authentication Server definition.
- 4 Enter the user ID for the *<Data Management system user>*. On Windows use the fully qualified domain and user ID.
- 5 Enter the password.
- 6 Click **Log On**.
- 7 Right-click **All Domains**.
- 8 Select **New Domain**.
- 9 Enter the login domain for the *<Data Management system user>*.
Note: In a UNIX deployment, it is possible that the UNIXUSER will already be defined in SAS Data Management Studio. In a Windows deployment, use the domain defined for the user in the Windows operating system.
- 10 Enter a description (optional).
- 11 Enter a user-name format.
 - ⊖ For Windows, select the radio button down-level login name.
 - ⊖ For UNIX, select the radio button user-name only.
- 12 Select **OK**.
Note: If SAS was selected as the Customer Data Access Database, skip steps 13-19.
- 13 Right-click **All Domains**.
- 14 Select **New Domain**.
- 15 Enter a domain name for the *<Customer Data Access database_user>* (such as Oracle, Netezza, Greenplum, Teradata, SQL Server, or DB2).
- 16 Enter a description (optional).
- 17 Enter a username format for the database user. Select the radio button based on the database server platform.
 - ⊖ For Windows users, select the radio button down-level login name.
 - ⊖ For UNIX users, select the radio button user name only.
- 18 Select **OK**.
- 19 Repeat steps 13-18 to add additional domains as needed.

Create the SAS Authentication Server Users

To create users in the SAS Authentication Server, perform the following steps:

- 1 Double-click the **Users** menu bar.
- 2 Right-click **All Users**.
- 3 Select **New User**.
- 4 For the name, enter the user ID for the *<Data Management system user>*.

Note: This user is specified in the SAS Decision Services server dialog box as the SAS Data Management system user (for example, the user who installed the SAS Federation Server software).

- 5 Enter a description. (optional)
- 6 Enter login information:
 - ø For Windows, enter the non-domain qualified user ID and select the host domain from the domain list.
 - ø For UNIX, enter the user ID and select the host domain from the domain list.
- 7 Select **OK**.

Create a Customer Data Access Database User Login (if applicable)

In the SAS Decision Services server tier, if you selected for the customer data access tables to be accessed from a database other than SAS, then you will need to create a database user login for your Data Management system user.

To create new Customer Data Access database user logins for the Data Management system user, perform the following steps:

- 1 Click the red **x** of the SAS Authentication Server definition to disconnect.
- 2 Double-click your SAS Authentication Server definition.
- 3 Enter the **<Data Management system user ID>**.
- 4 Enter the password.
- 5 Select **Log On**.
- 6 Double-click the **Users** menu bar.
- 7 Double-click **All Users** to expand the menu item.
- 8 Locate and highlight the **<Data Management system user ID>**.
- 9 Select **New login**.
- 10 Add the Customer Data Access database user username, domain, and password to the **<Data Management system user ID>**.

Configuring SAS Federation Server for SAS Mode Versus ANSI Mode for SAS Decision Services

By default, the SAS Federation Server executes in ANSI mode, and not SAS mode. An environment variable has been added to enable the SAS Federation Server 4.1 to either run in SAS mode or in ANSI mode. However, if a DS2 package has been published specifying “ds2_options sas” within the PROC DS2 code, the “ds2_options sas” setting takes precedence over the environment variable setting. If a DS2 package is published without “ds2_options sas”, the SAS Federation Server uses the environment variable to determine whether to run in SAS mode or ANSI mode. When the SAS Federation Server runs in SAS mode, JAVA NULLs are converted to SAS missing values.

To apply the environment variable, perform the following steps:

- 1 Stop the SAS Federation Server.

UNIX: Execute `<SASHome>/SASFederationServer/4.1/fedserver/bin/dfsadmin stop`

Windows: Stop the Windows service.

- 2 Add the environment variable to the `dfs_serv.xml` file.

To add the environment variable functionality, modify the `dfs_serv.xml` to include the `OptionSet` as defined below. The default and recommended value is `TRUE`.

The `dfs_serv.xml` file is located under

`<SASHome>/SASFederationServer/4.1/fedserver/etc`

Edit the `dfs_serv.xml` file and add the following `OptionSet`:

```
<OptionSet name="SetEnv">
  <Option name="DS2_SASMISSING">TRUE</Option>
</OptionSet>
```

- 3 Turn on additional logging.

Add an appender to `dfs_log.xml`, if you require additional logging information.

The `dfs_log.xml` file is located at

`<SASHome>/SASFederationServer/4.1/fedserver/etc` and a sample path to the `dfs_serv.log` file is

`<SASHome>/SASFederationServer/4.1/fedserver/var/log/dfs_serv.log`

Add the following code to the `dfs_log.xml`:

```
<appender name="LOG" class="FileAppender">
  <param name="File" value="<path to the dfs_serv.log>"/>
  <param name="ImmediateFlush" value="true"/>
  <param name="Append" value="false"/>
  <layout>
    <param name="ConversionPattern" value="%d %-5p [%t] %u %c - %m (%F@%L)"/>
  </layout>
</appender> <!-- DS2 Application message logger -->
<logger name="App.TableServices.tkeds.parms.initload">
  <level value="Trace"/>
  <appender-ref ref="LOG"/>
</logger>
```

- 4 Start the SAS Federation Server.
 - o **UNIX:** Execute
`<SASHome>/SASFederationServer/4.1/fedserver/bin/dfsadmin start.`
 - Windows:** Stop the Windows service.
- 5 Verify that logging is turned on.
 - o Verify that the file `dfs_serv.log` is created at
`<SASHome>/SASFederationServer/4.1/fedserver/var/log.`
 - o The log displays the current value for the mode setting (ANSI or SAS) that is being used by the SAS Federation Server.

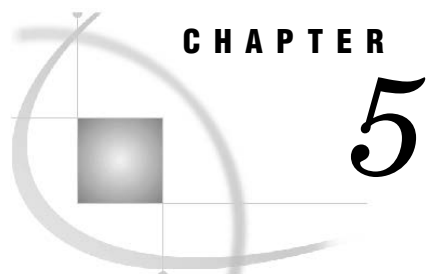
Configuring TKNLS encoding

It is recommended that you set the multi-vendor architecture session encoding for the SAS Federation Server to utf-8, by performing the following steps.

This allows the SAS Federation Server to process character strings containing international characters.

- 1 Stop the SAS Federation Server.
 - UNIX:** Execute `<SASHome>/SASFederationServer/4.1/fedserver/bin/dfsadmin stop`
 - Windows:** Stop the Windows service.
- 2 Add the following option to the `dfs_serv.xml` file located under `<SASHome>/SASFederationServer/4.1/fedserver/etc.`

```
<Option name="env:TKNLS.MVA_SESSION_CEI"
type="integer">20</Option>
```
- 3 Restart the SAS Federation Server and disregard the error in the SAS Federation Server log.



Firewall and Port Access

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SAS Decision Services Firewall Considerations

The SAS Decision Services middle-tier engine computes and processes data. It requires access to databases and other components. Therefore, it should be afforded the same security as the data and compute tiers. It processes data at high throughput and low latency. If you build firewalls between the engine and the data it needs access to at runtime, it will affect latency.

Any topology design should consider the high throughput and low latency requirement when designing firewalls. The addition of firewalls causes additional security concerns. This is due to the number of ports that need to be opened for the engine to access its required components as well as additional maintenance to support the number of open ports. Careful consideration should be made when designing firewalls between SAS Decision Services components and the software's dependencies.

This section describes the port access between the components of SAS Decision Services and its dependencies.

Engine Server and Design Server Port Access

The engine server and design server are implemented as a platform service and require access to the SAS Web Infrastructure Platform Data Server, Gemfire, SAS Metadata Server, Object Spawner, Pooled Workspace Server and Customer database access.

The engines communicate with each other using multicast and need access to the SAS Federation Server.

The following table lists the ports of all product components accessed by the SAS Decision Services engine and design server.

Component Port Description	Usage	Default	Actual
Object Spawner	It redirects the client into a pooled workspace server process using a port from the object spawner port bank (8801, 8811, 8821).	8801 8811 8821	
Pooled Workspace Server	The object spawner listens for pooled workspace server requests on port 8701.	8701	
Customer Database (such as Postgres, Oracle, and DB2)	The servers need to access any database that is needed for executing the flow and this depends on the port that is defined in the General IO system resource.	Database Specific Default	
SAS Federation Server	The Pooled Workspace Server communicates with the SAS Federation Server to automatically publish DS2 code. The servers execute packages on the SAS Federation Server.	24140	
SAS Web Infrastructure Platform Data Server	The servers require access at initial start up to retrieve authentication. The engine server also requires access to update the UserLog tables.	9432	
SAS Metadata Server	The servers require access at initial start up to retrieve SAS Decision Services artifacts.	8561	
Cache Locator Port (middle tier)	The servers require access at initial startup.	41415	
SAS Web Application Server (SASServer7)	The servers are deployed on this application server.	8680	
SAS Web Server	The load balancer for the server cluster.	80/7980	

Monitor Port Access

The SAS Decision Services Monitor is implemented as a platform service and requires access to the SAS Web Infrastructure Platform Data Server and SAS Metadata Server.

The following table lists the ports of all product components accessed by the SAS Decision Services Monitor.

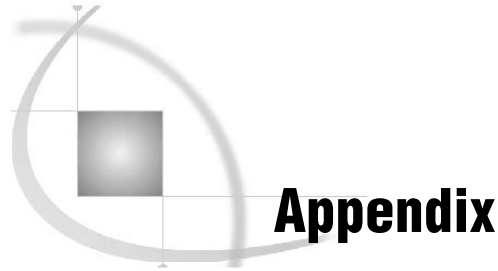
Component Port Description	Usage	Default	Actual
SAS Web Infrastructure Platform Data Server	The monitor requires access at initial start up to retrieve authentication.	9432	
Cache Locator Port (middle tier)	The monitor requires access at initial startup.	41415	
SAS Web Application Server (SASServer7)	The monitor server is deployed on this application server.	8680	
SAS Web Server	The web server access for the monitor.	80/7980	

Miscellaneous Port Access

There are miscellaneous ports that are accessed that are not necessarily accessed directly from the SAS Decision Services components. However, these ports are required based on the dependencies.

The following table lists the ports of all miscellaneous product components accessed by the SAS Decision Services dependencies.

Component Port Description	Usage	Default	Actual
SAS Federation Server Manager	This is accessed by the SAS Federation Server to manage configuration.	21077	
SAS Deployment Agent		5660	
SAS Environment Manager Agent	This is used for plug-in replication.	2143-2153	



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Manual Instructions for SAS Decision Services 6.2 to 6.4 Upgrade

The following instructions will need to be completed after applying SAS Decision Services 6.4 maintenance to SAS Decision Services 6.2.

1. Start SAS Federation Server 4.1.
2. From SAS Management Console, complete the following steps:
 - a. Select the **Folders** tab.
 - b. Navigate to **System > Applications > SAS Decision Services > Decision Services 6.4**.
 - c. Expand each design and production repository folder.
 - d. Right-click \$SAS_Activity_Resource, and edit the SAS Federation Server port number for the server URL, as well as the system user ID and password, if applicable.
 - e. If SAS was selected as the Customer Data Access database, then edit the GeneralIO_Activity_Resource.

The following steps will need to be completed, if you have not performed the manual upgrade steps to migrate the SAS Federation Server 3.2 configuration tables. See the *SAS Federation Server 4.1 Administration Guide*.

3. Navigate to
 <SAS_Configuration_Directory>\Lev1\Applications\SASDecisionServicesServer
 Config\Utilities.
4. Edit sasds_fs_sas_env.sas and replace the following macro variables with the connection information for SAS Federation Server 4.1
 - a. %let fedport = 24141; /* The SAS Federation Server port */
 - b. %let server = <hostname>; /* The SAS Federation Server host */

- c. `%let saspath = <path> /* The local path on SAS Federation Server to SAS data */`
- d. `%let feduid = <system userID>; /* The SAS Federation Server system user ID */`
- 5. Edit `systemuser.sas` and enter the password for the SAS Federation Server system user ID.
- 6. If the SAS Federation Server system user ID has changed, then you must edit the connection string for each `tap_*.sas` file to include the new system user ID. Under `<SAS_Configuration_Directory>\Lev1\Applications\SASDecisionServicesServerConfig\SASCode`

```
proc ds2 nolibs
noprompt="driver=remts;server=<hostname>;port=24141;protocol=bridge;
uid=<systemUserID>;fepwd='&fedpw';conopts=(driver=ds2;conopts=(driver=sql;
conopts=(DSN=BASE_DSN)))";
```

- 7. From the SAS Display Manager, execute the following scripts in order.
 - a. `<SAS_Configuration_Directory>\Lev1\Applications\SASDecisionServicesServerConfig\Utilities\sasds_fedserver_sas.sas`
 - b. `<SAS_Configuration_Directory>\Lev1\Applications\SASDecisionServicesServerConfig\Utilities\createFDSN.sas`
 - c. `<SAS_Configuration_Directory>\Lev1\Applications\SASDecisionServicesServerConfig\SASCode\loadutilpackages.sas`
- 8. Modify `<SAS_Configuration_Directory>\Lev1\Applications\SASDecisionServicesServerConfig\Utilities\systemuser.sas` by removing the password for the SAS Federation Server system user ID.
- 9. Restart the SAS Decision Services engine and design middle-tier servers.

Manual Instructions for Creating Monitor Tables

The following are generic instructions that allow you to execute the SQL statements for creating your monitor tables, if you selected to create your tables manually. These instructions only apply if you have not selected to automatically create your monitor tables.

The SQL statements are located in the following files that are created in the `<SAS_Configuration_Directory>\Lev1\Web\Applications\SASDecisionServicesEngineServer6.4` directory.

1. You can execute the contents of the SQL files from:

```
<SASHome>\SASWebInfrastructurePlatformDataServer\9.4\bin\psql
```

Command Line:

```
psql -h <host> -p <port> -d DecisionServices -U DecisionServices
```

Execute the SQL statements in the following order:

- 1 create-dcsv-data-manual.sql
 - 2 schema-dcsv-batch.sql
 - 3 schema-dcsv-monitor.sql
2. If you have access to the PostGreSQL Access Engine, then you can execute the SQL statements using PROC SQL.
- ```
PROC SQL NOERRORSTOP;

CONNECT TO POSTGRES
(SERVER=<SAS_Web_Infrastructure_Data_Server_Hostname>
PORT=<SAS_Web_Infrastructure_Data_Server_Port> USER=DecisionServices
PASSWORD=<DecisionServices_User_Password> DATABASE=DecisionServices);

EXECUTE (<Insert SQL statement>) BY POSTGRES;

DISCONNECT FROM POSTGRES;

QUIT;
```

---

## Modifying the Topology Information for the Monitor Application

The SAS Decision Services Monitor uses information from the topology table to connect to the engines in a cluster and collect operating statistics. While the install process populates this table with appropriate initial values, sometimes it may be necessary to modify the contents of this table to reflect changes in topology.

Some of these cases include:

- Adding a new engine node to the cluster or removing an engine node from the cluster.
- Configuring the system to use Transport Layer Security between the vFabric Webserver and the application server. This usually requires changing the port.

Information about engine nodes is stored in the monitor.DCSV\_TOPOLOGY table of the Decision Services database. Every row in this table contains the IP address and the port information for each engine node in the cluster. The IP address and port are the actual address and port of the SAS Web Application Server hosting the engine application.

SAS Decision Services applications are installed on SASServer7\_n, where n is a positive integer. The port usually associated with SASServer7\_1 is 8680. If there is more than one SASServer7 on the same host, the port numbers increment for each such server. (e.g. SASServer7\_2 runs on port 8681).

It is possible to manually configure the system so that all communications between the SAS Web Server and the SAS Web Application Server use Transport Layer Security using certificates. The details of this are described in the *SAS 9.4 Intelligence Platform: Installation and Configuration Guide*.

Configuring the SAS Server7 for TLS may cause it to run on a different port. The following sections provide information on typical ways in which the topology table may be modified.

---

## Add Engine Node to Topology Table

To add a new engine node, add a new row to the topology table. The following is an example of the SQL to use, which can be submitted through PSQL:

```
INSERT INTO monitor.DCSV_TOPOLOGY
VALUES ('<engine_cluster_node_ip_address>', <engine_cluster_node_port>);
```

The PSQL commands can be executed on the SAS Web Infrastructure Platform Data Server:

```
<SAS_HOME>/SASWebInfrastructurePlatformDataServer/9.4/bin/psql
```

---

## Remove Engine Node from Topology Table

To remove an engine node, delete the row from the topology table. The following is an example of the SQL to use, which can be submitted through PSQL:

```
DELETE FROM monitor.DCSV_TOPOLOGY WHERE
IP_ADDRESS='<engine_cluster_node_ip_address>' AND
PORT=<engine_cluster_node_port>;
```

The PSQL commands can be executed on the SAS Web Infrastructure Platform Data Server:

```
<SAS_HOME>/SASWebInfrastructurePlatformDataServer/9.4/bin/psql
```

---

# Using Transport Layer Security to Communicate between the SAS Web Server and the SAS Web Application Server

It is possible to manually configure the system so that all communications between the SAS Web Server and the SAS Web Application Server use Transport Layer Security using certificates. The details of this are described in the SAS 9.4 Intelligence Platform: Installation and Configuration Guide.

In addition to the changes described in the referenced document, SAS Decision Services requires the following two changes:

- The configuration property `sasds.engine.protocol` of SAS Decision Services Monitor application must be changed from "http" to "https".
  - In the SAS Management Console, expand Application Management --> Configuration Manager --> SAS Application Infrastructure.
  - Right click on Decision Services Monitor 6.4 and select Properties.

- On the Advanced tab, update the sasds.engine.protocol property.
- Using TLS may cause the port of the SAS Web Application Server to change and require updating the topology table. Instructions are provided in the section "Modifying the Topology Information for the Monitor Application" on how to add and remove a row from the topology table. You may use those commands to add a row containing the host and the new port and delete the row containing the old port.

These changes will require a restart of the SAS Web Application Server.

---

## Best Practices for Removing a Configuration

Stop all application servers prior to running the SAS Deployment Wizard to remove SAS Decision Services components.

Create a backup .spk file for all of the SAS Decision Services flows, events, variables, activities, and system resources.

---

## SAS Decision Services Log Locations

---

### SAS Decision Services Design Middle Tier

The SAS Decision Services design middle-tier log location:

```
<SAS_Configuration_Directory>\Web\Logs\
SASServer7_1\SASDecisionServicesDesignServer6.4.log
```

---

### SAS Decision Services Engine Server

The SAS Decision Services engine server log location:

```
<SAS_Configuration_Directory>\Web\Logs\
SASServer7_1\SASDecisionServicesEngineServer6.4.log
```

---

### SAS Decision Services Monitor

The SAS Decision Services monitor log location:

```
<SAS_Configuration_Directory>\Web\Logs\
SASServer7_1\SASDecisionServicesMonitor6.4.log
```

---

## SAS Decision Services Data Backup Locations

The configured engine and design repositories are backed up after unconfiguring SAS Decision Services.

```
<SAS_Configuration_Directory>\Lev1\Web\Applications\SASDecisionServicesDesignS
erver6.4\Data\Backup
```

```
<SAS_Configuration_Directory>\Lev1\Web\Applications\SASDecisionServicesEngine
Server6.4\Data\Backup
```

## SAS Decision Services Validation Checklist

| Decision Services Functionality                                                                 | Items to Review and Verify                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Completed |
|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Decision Services Design middle tier                                                            | <a href="http://hostname.domain.com:port/RTDMDesign/jsp/Diagnostics.jsp">http://hostname.domain.com:port/RTDMDesign/jsp/Diagnostics.jsp</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |
| Decision Services engine server                                                                 | <a href="http://hostname.domain.com:port/RTDM/Diagnostics.jsp">http://hostname.domain.com:port/RTDM/Diagnostics.jsp</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |
| Decision Services Monitor                                                                       | <a href="http://hostname.domain.com:port/DCSVMonitor/jsp/Diagnostics.jsp">http://hostname.domain.com:port/DCSVMonitor/jsp/Diagnostics.jsp</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |
| Audit, user log, batch execution, and monitor tables are created.                               | These tables are created automatically in the SAS Decision Services database residing in the SAS Web Infrastructure Platform Data Server, if you selected to create them automatically during the execution of the SAS Deployment Wizard.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |
| Ensure that the topology table has the correct value for the engine servers that are monitored. | If you select SAS, this value is automatically loaded by the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |
| Load the utility packages that are loaded by default.                                           | You will need to have already run the “Load Decision Services Utility DS2 Packages” step in Instructions.html file that loads the utility packages in the SAS data sets configured with the SAS Federation Server.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |
| Validate that the monitor can connect to the engine server and obtain a JDBC connection.        | <p>Check the log that is located in this directory:<br/> <a href="">&lt;SAS_Configuration_Directory&gt;/Lev1/Web/Logs/SASDecisionServicesMonitor6.4.log</a></p> <p>Verify that there are no errors indicated in the log.</p> <p>Common errors with the JDBC connection are usually associated with the following:</p> <ul style="list-style-type: none"> <li>• Wrong database password.</li> <li>• The service on the Oracle database server was not configured to use a service name and was configured to use an SID.</li> <li>• The wrong JDBC driver or data source class was used for the application server.</li> <li>• The wrong version of the JDBC driver or data source class was used for the application server.</li> <li>• The name that was specified in the dialog box was incorrect.</li> <li>• The database server is not running.</li> </ul> |           |



| Decision Services Functionality                                        | Items to Review and Verify                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Completed |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Validate that the DSNs, data services, and federated DSN were created. | <p>These can usually be fixed by editing the configured data source.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |           |
|                                                                        | <p>You should be able to execute the SAS Federation Server Manager to see the configured values.</p> <ul style="list-style-type: none"> <li>• Execute <a href="http://hostname.domain.com:21077/fsmanager/#">http://hostname.domain.com:21077/fsmanager/#</a>.</li> <li>• Log in as the Data Management System user.</li> <li>• Verify that your DSN and data service has been created. The BASE DSN is created by default.</li> <li>• You can log in as the Data Management System user and execute a test connection for the DSN and the data service. SAS Decision Services uses this user to connect to the SAS Federation Server through the DSNs, so if your test connection works then you will be able to connect to the SAS Federation Server from SAS Decision Services.</li> </ul> <p>Common errors associated with creating the DSNs or data services are:</p> <ul style="list-style-type: none"> <li>• The SAS Federation Server services were not running.</li> <li>• Invalid passwords for the SAS Federation Server were specified, or the user was not configured in the SAS Authentication Server.</li> <li>• The data source name was not found or no default driver was specified in the SAS Federation Server Manager. This usually means that either the database client is not installed on the SAS Federation Server, or the ODBC system data source has not been defined in the operating system. Create the ODBC system DSN.</li> </ul> |           |

