IBM SPSS Modeler 14.2 Batch User's Guide

IBM®

Preface

IBM® SPSS® Modeler is the IBM Corp. enterprise-strength data mining workbench. SPSS Modeler helps organizations to improve customer and citizen relationships through an in-depth understanding of data. Organizations use the insight gained from SPSS Modeler to retain profitable customers, identify cross-selling opportunities, attract new customers, detect fraud, reduce risk, and improve government service delivery.

   SPSS Modeler's visual interface invites users to apply their specific business expertise, which leads to more powerful predictive models and shortens time-to-solution. SPSS Modeler offers many modeling techniques, such as prediction, classification, segmentation, and association detection algorithms. Once models are created, IBM® SPSS® Modeler Solution Publisher enables their delivery enterprise-wide to decision makers or to a database.

About IBM Business Analytics

IBM Business Analytics software delivers complete, consistent and accurate information that decision-makers trust to improve business performance. A comprehensive portfolio of business intelligence, predictive analytics, financial performance and strategy management, and analytic applications provides clear, immediate and actionable insights into current performance and the ability to predict future outcomes. Combined with rich industry solutions, proven practices and professional services, organizations of every size can drive the highest productivity, confidently automate decisions and deliver better results.

As part of this portfolio, IBM SPSS Predictive Analytics software helps organizations predict future events and proactively act upon that insight to drive better business outcomes. Commercial, government and academic customers worldwide rely on IBM SPSS technology as a competitive advantage in attracting, retaining and growing customers, while reducing fraud and mitigating risk. By incorporating IBM SPSS software into their daily operations, organizations become predictive enterprises – able to direct and automate decisions to meet business goals and achieve measurable competitive advantage. For further information or to reach a representative visit *http://www.ibm.com/spss*.

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Technical support is available to maintenance customers. Customers may contact Technical Support for assistance in using IBM Corp. products or for installation help for one of the supported hardware environments. To reach Technical Support, see the IBM Corp. web site at *http://www.ibm.com/support*. Be prepared to identify yourself, your organization, and your support agreement when requesting assistance.

iii

Contents

About IBM SPSS Modeler

IBM® SPSS® Modeler is a set of data mining tools that enable you to quickly develop predictive models using business expertise and deploy them into business operations to improve decision making. Designed around the industry-standard CRISP-DM model, SPSS Modeler supports the entire data mining process, from data to better business results.

SPSS Modeler offers a variety of modeling methods taken from machine learning, artificial intelligence, and statistics. The methods available on the Modeling palette allow you to derive new information from your data and to develop predictive models. Each method has certain strengths and is best suited for particular types of problems.

SPSS Modeler can be purchased as a standalone product, or used in combination with SPSS Modeler Server. A number of additional options are also available, as summarized in the following sections. For more information, see *http://www.ibm.com/software/analytics/spss/products/modeler/*.

IBM SPSS Modeler Server

SPSS Modeler uses a client/server architecture to distribute requests for resource-intensive operations to powerful server software, resulting in faster performance on larger data sets. Additional products or updates beyond those listed here may also be available. For more information, see *http://www.ibm.com/software/analytics/spss/products/modeler/*.

SPSS Modeler. SPSS Modeler is a functionally complete version of the product that is installed and run on the user's desktop computer. It can be run in local mode as a standalone product or in distributed mode along with IBM® SPSS® Modeler Server for improved performance on large data sets.

SPSS Modeler Server. SPSS Modeler Server runs continually in distributed analysis mode together with one or more IBM® SPSS® Modeler installations, providing superior performance on large data sets because memory-intensive operations can be done on the server without downloading data to the client computer. SPSS Modeler Server also provides support for SQL optimization and in-database modeling capabilities, delivering further benefits in performance and automation. At least one SPSS Modeler installation must be present to run an analysis.

IBM SPSS Modeler Options

The following components and features can be separately purchased and licensed for use with SPSS Modeler. Note that additional products or updates may also become available. For more information, see *http://www.ibm.com/software/analytics/spss/products/modeler/*.

- SPSS Modeler Server access, providing improved scalability and performance on large data sets, as well as support for SQL optimization and in-database modeling capabilities.

1

- SPSS Modeler Solution Publisher, for real-time or automated scoring outside the SPSS Modeler environment.
- Adapters to enable deployment to IBM SPSS Collaboration and Deployment Services or the thin-client application IBM SPSS Modeler Advantage.

IBM SPSS Text Analytics

IBM® SPSS® Text Analytics is a fully integrated add-on for SPSS Modeler that uses advanced linguistic technologies and Natural Language Processing (NLP) to rapidly process a large variety of unstructured text data, extract and organize the key concepts, and group these concepts into categories. Extracted concepts and categories can be combined with existing structured data, such as demographics, and applied to modeling using the full suite of IBM® SPSS® Modeler data mining tools to yield better and more focused decisions.

- The Text Mining node offers concept and category modeling, as well as an interactive workbench where you can perform advanced exploration of text links and clusters, create your own categories, and refine the linguistic resource templates.
- A number of import formats are supported, including blogs and other web-based sources.
- Custom templates, libraries, and dictionaries for specific domains, such as CRM and genomics, are also included.

Note: A separate license is required to access this component. For more information, see *http://www.ibm.com/software/analytics/spss/products/modeler/*.

IBM SPSS Modeler Documentation

Complete documentation in online help format is available from the Help menu of SPSS Modeler. This includes documentation for SPSS Modeler, SPSS Modeler Server, and SPSS Modeler Solution Publisher, as well as the Applications Guide and other supporting materials.

Complete documentation for each product in PDF format is available under the *\Documentation* folder on each product DVD.

- **IBM SPSS Modeler User's Guide.** General introduction to using SPSS Modeler, including how to build data streams, handle missing values, build CLEM expressions, work with projects and reports, and package streams for deployment to IBM SPSS Collaboration and Deployment Services, Predictive Applications, or IBM SPSS Modeler Advantage.
- **IBM SPSS Modeler Source, Process, and Output Nodes.** Descriptions of all the nodes used to read, process, and output data in different formats. Effectively this means all nodes other than modeling nodes.
- **IBM SPSS Modeler Modeling Nodes.** Descriptions of all the nodes used to create data mining models. IBM® SPSS® Modeler offers a variety of modeling methods taken from machine learning, artificial intelligence, and statistics.
- **IBM SPSS Modeler Algorithms Guide.** Descriptions of the mathematical foundations of the modeling methods used in SPSS Modeler.

■ **IBM SPSS Modeler Applications Guide.** The examples in this guide provide brief, targeted introductions to specific modeling methods and techniques. An online version of this guide is also available from the Help menu. For more information, see the topic Application Examples on p. 3.

■ **IBM SPSS Modeler Scripting and Automation.** Information on automating the system through scripting, including the properties that can be used to manipulate nodes and streams.

■ **IBM SPSS Modeler Deployment Guide.** Information on running SPSS Modeler streams and scenarios as steps in processing jobs under IBM® SPSS® Collaboration and Deployment Services Deployment Manager.

■ **IBM SPSS Modeler CLEF Developer's Guide.** CLEF provides the ability to integrate third-party programs such as data processing routines or modeling algorithms as nodes in SPSS Modeler.

■ **IBM SPSS Modeler In-Database Mining Guide.** Information on how to use the power of your database to improve performance and extend the range of analytical capabilities through third-party algorithms.

■ **IBM SPSS Modeler Server and Performance Guide.** Information on how to configure and administer IBM® SPSS® Modeler Server.

■ **IBM SPSS Modeler Administration Console User Guide.** Information on installing and using the console user interface for monitoring and configuring SPSS Modeler Server. The console is implemented as a plug-in to the Deployment Manager application.

■ **IBM SPSS Modeler Solution Publisher Guide.** SPSS Modeler Solution Publisher is an add-on component that enables organizations to publish streams for use outside of the standard SPSS Modeler environment.

■ **IBM SPSS Modeler CRISP-DM Guide.** Step-by-step guide to using the CRISP-DM methodology for data mining with SPSS Modeler.

Application Examples

While the data mining tools in SPSS Modeler can help solve a wide variety of business and organizational problems, the application examples provide brief, targeted introductions to specific modeling methods and techniques. The data sets used here are much smaller than the enormous data stores managed by some data miners, but the concepts and methods involved should be scalable to real-world applications.

You can access the examples by clicking Application Examples on the Help menu in SPSS Modeler. The data files and sample streams are installed in the *Demos* folder under the product installation directory. For more information, see the topic Demos Folder on p. 4.

Database modeling examples. See the examples in the *IBM SPSS Modeler In-Database Mining Guide*.

Scripting examples. See the examples in the *IBM SPSS Modeler Scripting and Automation Guide*.

Demos Folder

The data files and sample streams used with the application examples are installed in the *Demos* folder under the product installation directory. This folder can also be accessed from the IBM SPSS Modeler 14.2 program group on the Windows Start menu, or by clicking *Demos* on the list of recent directories in the File Open dialog box.

Figure 1-1
Selecting the Demos folder from the list of recently-used directories
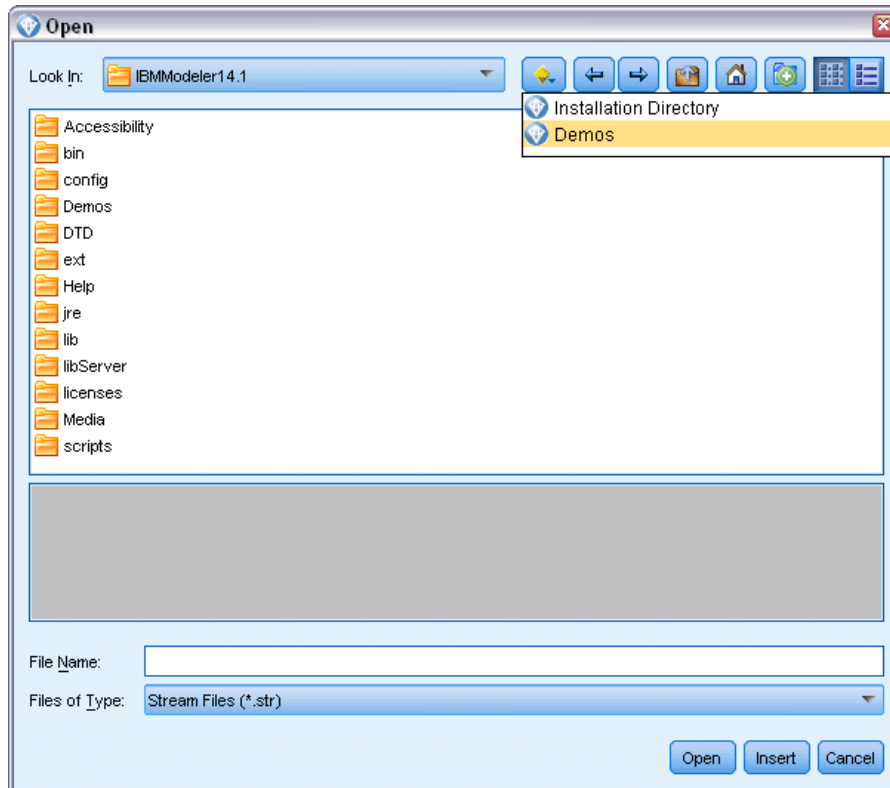
Batch Mode Execution

Introduction to Batch Mode

Data mining is usually an interactive process—you interact with data and models to improve your understanding of the data and the domain it represents. However, IBM® SPSS® Modeler streams can also be used to process data and perform data mining tasks in **batch mode**, with no visible user interface. Batch mode allows long-running or repetitive tasks to be performed without your intervention and without the presence of the user interface on the screen.

For customers who want to run SPSS Modeler exclusively in batch mode, IBM® SPSS® Modeler Batch is a special version of the product that provides support for the complete analytical capabilities of SPSS Modeler without access to the regular user interface. An IBM® SPSS® Modeler Server license is required to use batch mode.

Examples of tasks appropriate for batch mode include:

■ Running a time-consuming modeling exercise in the background.

■ Running a stream at a scheduled time (for example, overnight, when the resultant load on the computer will not be inconvenient).

■ Running a data preprocessing stream on a large volume of data (for example, in the background and/or overnight).

■ Running regularly scheduled tasks, such as monthly reports.

■ Running a stream as an embedded part of another process, such as a scoring engine facility.

Note: SPSS Modeler operations can be scheduled in batch mode using the appropriate operating system commands or utilities (for example, the `at` command under Windows NT).

Working in Batch Mode

Working in batch mode typically involves:

▶ Invoking IBM® SPSS® Modeler in batch mode using the `clemb` command.

▶ Connecting to a server.

▶ Loading an existing stream or script file.

▶ Executing the stream or script.

Once execution is complete, you can then consult the log file produced by default in batch mode and view the results of graphs, output nodes, and models. For more information about these steps, see the following topics.

Invoking the Software

You can use the command line of your operating system to launch IBM® SPSS® Modeler as follows:

▶ On a computer where IBM® SPSS® Modeler is installed, open a DOS, or command-prompt, window.

▶ To launch the SPSS Modeler interface in interactive mode, type the modelerclient command followed by the required arguments; for example:

modelerclient -stream report.str -execute

The available arguments (flags) allow you to connect to a server, load streams, run scripts, or specify other parameters as needed.

Using Command Line Arguments

In order for IBM® SPSS® Modeler to open and execute files (such as streams and scripts) in batch mode, you need to alter the initial command (clemb) that launches the software. There are a number of command line arguments, also referred to as **flags**, that you can use to:

- Connect to a server.
- Load streams, scripts, models, states, projects, and output files. (If you have licensed IBM® SPSS® Collaboration and Deployment Services Repository, you can connect to a repository and load objects from it.)
- Specify log file options.
- Set default directories for use in SPSS Modeler.

All of the above operations require the use of flags appended to the clemb command. Flags follow the form -flag, where the hyphen precedes the argument itself. For example, using the flag -server in conjunction with the initial argument clemb will connect to the server specified using other flag options.
   You can combine the clemb command with a number of other startup flags, such as -server, -stream, and -execute, in order to load and execute streams in batch mode. The following command loads and executes the stream *report.str* without invoking the user interface:

clemb -server -hostname myserver -port 80
-username dminer -password 1234 -stream report.str -execute

For a complete list of command line arguments, see Chapter 3.

- SPSS Modeler states and scripts are also executed in this manner, using the -state and -script flags, respectively. Multiple states and streams can be loaded by specifying the relevant flag for each item.
- Multiple arguments can be combined into a single command file and specified at startup using the @ symbol. For more information, see the topic Combining Multiple Arguments in Chapter 3 on p. 11.

Batch Mode Log Files

Running in batch mode produces a log file. By default, the name of this log file is *clem_batch.log*, but you can specify an alternative name using the -log flag. For example, the following command executes *report.str* in batch mode and sends the logging information to *report.log*:

```
clemb -server -hostname myserver -port 80
-username dminer -password 1234 -stream report.str
-execute -log report.log
```

Normally, the log file overwrites any existing file of the same name, but you can make IBM® SPSS® Modeler append to the log file instead by using the -appendlog flag. Logging can also be suppressed altogether by using the -nolog flag.

Note: Logging arguments are available only when running in batch mode.

Scripting in Batch Mode

In its simplest form, batch mode execution of IBM® SPSS® Modeler streams is performed one at a time using the command line arguments discussed in this guide. A given stream is executed without significantly altering its node parameters. While this may work well for automated production of monthly churn reports or predictions, it cannot handle the sophisticated processes that many advanced data miners would like to automate.

For example, a financial institution may want to construct a number of models using different data or modeling parameters, test the models on another set of data, and produce a report on the results. Because this process requires repetitive modifications to a stream and the creation and deletion of nodes, automating it requires the use of scripting. Scripting allows complex processes that would otherwise require user intervention to be automated and executed in batch mode.

To Execute a Script in Batch Mode

▶ Append the clemb command with the -script flag, specifying the name of the script that you want to execute.

▶ Also use the -execute flag with the above arguments to execute the specified script. This will run the stand-alone script in its entirety.

For example, to load and execute a script that runs a model producing churn scores that are stored as output for the data warehouse, you would use the following command:

```
clemb -server -hostname myserver -port 80
-username dminer -password 1234
-script clemscript.txt -execute
```

Using Parameters in Batch Mode

You can modify the effect of executing a stream in batch mode by supplying parameters to the command line launch of IBM® SPSS® Modeler. These might be **simple parameters** used directly in CLEM expressions, or they might be node properties, also called **slot parameters**, which are used to modify the settings of nodes in the stream.

For example, the following stream selects a subset of data from a file, passes it through a neural net, and sends the results to a file:

Figure 2-1
Stream operations in the user interface
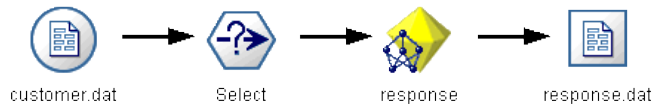
The value of the field *Month* determines the selected data; the expression in the Select node is:

```
Month == '$P-mth'
```

When running the same stream in batch mode, select the appropriate month by setting the value of the parameter *mth* in the command line:

```
clemb -server -hostname myserver -port 80
-username dminer -password 1234
-stream predict.str -Pmth=Jan -execute
```

Note: In command line arguments, the -P flag is used to denote a parameter.

Sometimes the required command line control of the stream involves modifying the settings of the nodes in the stream using slot parameters. Consider the following stream, which reads a file, processes its contents, and sends a report to another file:

Figure 2-2
Stream operations in the user interface
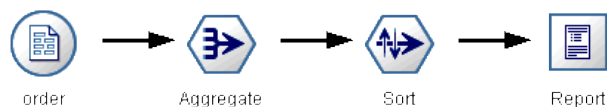
Suppose that you want to generate the report once a month, reading the appropriate month's data and sending the report to a file whose name indicates the relevant month. You might want to set the filenames for the source data and for the report. The following command sets the appropriate slot parameters and executes the stream:

```
clemb -stream report.str -Porder.full_filename=APR_orders.dat
-Preport.filename=APR_report.txt -execute
```

Note: This command does not contain the operating-system-specific code that schedules it to run monthly.

Working with Output in Batch Mode

Working with visual output, such as tables, graphs, and charts, typically requires a user interface. Since batch mode does not launch the IBM® SPSS® Modeler user interface, output objects are diverted to a file so that you can view them later, either in the user interface or in another software

package. Using the properties available for nodes (slot parameters), you can control the formats and filenames of output objects created during batch mode.

Command Line Arguments

Invoking the Software

You can use the command line of your operating system to launch IBM® SPSS® Modeler as follows:

▶ On a computer where IBM® SPSS® Modeler is installed, open a DOS, or command-prompt, window.

▶ To launch the SPSS Modeler interface in interactive mode, type the modelerclient command followed by the required arguments; for example:

modelerclient -stream report.str -execute

The available arguments (flags) allow you to connect to a server, load streams, run scripts, or specify other parameters as needed.

Using Command Line Arguments

You can append command line arguments (also referred to as **flags**) to the initial modelerclient command to alter the invocation of IBM® SPSS® Modeler.
For example, you can use the -server, -stream and -execute flags to connect to a server and then load and run a stream, as follows:

modelerclient -server -hostname myserver -port 80 -username dminer
-password 1234 -stream mystream.str -execute

Note that when running against a local client installation, the server connection arguments are not required.

Parameter values that contain spaces can be enclosed in double quotes—for example:

modelerclient -stream mystream.str -Pusername="Joe User" -execute

You can also execute SPSS Modeler states and scripts in this manner, using the -state and -script flags, respectively.

Debugging Command Line Arguments

To debug a command line, use the modelerclient command to launch SPSS Modeler with the desired arguments. This allows you to verify that commands will execute as expected. You can also confirm the values of any parameters passed from the command line in the Session Parameters dialog box (Tools menu, Set Session Parameters).

Figure 3-1
Setting parameters for the session
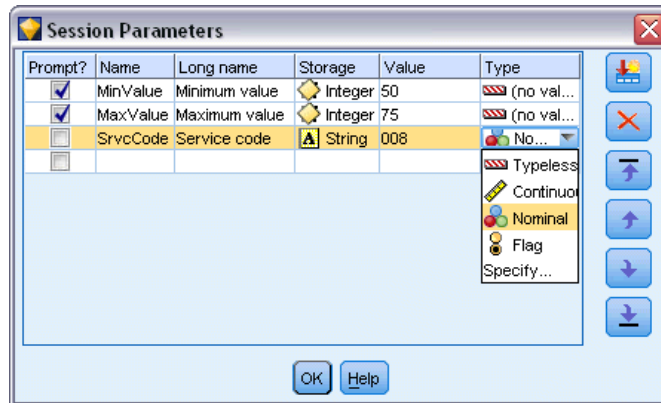
Combining Multiple Arguments

Multiple arguments can be combined in a single command file specified at invocation by using the @ symbol followed by the filename. This enables you to shorten the command line invocation and overcome any operating system limitations on command length. For example, the following startup command uses the arguments specified in the file referenced by <commandFileName>.

modelerclient @<commandFileName>

Enclose the filename and path to the command file in quotation marks if spaces are required, as follows:

modelerclient @ "C:\Program Files\IBM\SPSS\Modeler*nn*\scripts\my_command_file.txt"

The command file can contain all arguments previously specified individually at startup, with one argument per line. For example:

-stream report.str
-Porder.full_filename=APR_orders.dat
-Preport.filename=APR_report.txt
-execute

When writing and referencing command files, be sure to follow these constraints:
- Use only one command per line.
- Do not embed an @CommandFile argument within a command file.

Server Connection Arguments

The -server flag tells IBM® SPSS® Modeler that it should connect to a public server, and the flags -hostname, -use_ssl, -port, -username, -password, and -domain are used to tell SPSS Modeler how to connect to the public server. If no -server argument is specified, the default server is used.

Examples

To connect to a public server:

```
modelerclient -server -hostname myserver -port 80 -username dminer
-password 1234 -stream mystream.str -execute
```

To connect to a server cluster:

```
modelerclient -server -cluster "QA Machines" \
-spsscr_hostname pes_host -spsscr_port 8080 \
-spsscr_username asmith -spsscr_epassword xyz
```

Note that connecting to a server cluster requires the Coordinator of Processes through IBM®
SPSS® Collaboration and Deployment Services, so the -cluster argument must be used in
combination with the repository connection options (spsscr_*).

Argument	Behavior/Description
-server	Runs SPSS Modeler in server mode, connecting to a public server using the flags -hostname, -port, -username, -password, and -domain.
-hostname <name>	The hostname of the server machine. Available in server mode only.
-use_ssl	Specifies that the connection should use SSL (secure socket layer). This flag is optional; the default setting is *not* to use SSL.
-port <number>	The port number of the specified server. Available in server mode only.
-cluster <name>	Specifies a connection to a server cluster rather than a named server; this argument is an alternative to the hostname, port and use_ssl arguments. The name is the cluster name, or a unique URI which identifies the cluster in the IBM® SPSS® Collaboration and Deployment Services Repository. The server cluster is managed by the Coordinator of Processes through IBM SPSS Collaboration and Deployment Services. For more information, see the topic IBM SPSS Collaboration and Deployment Services Repository Connection Arguments on p. 12.
-username <name>	The user name with which to log on to the server. Available in server mode only.
-password <password>	The password with which to log on to the server. Available in server mode only. *Note*: If the -password argument is not used, you will be prompted for a password.
-epassword <encodedpasswordstring>	The encoded password with which to log on to the server. Available in server mode only. *Note*: An encoded password can be generated from the Tools menu of the SPSS Modeler application.
-domain <name>	The domain used to log on to the server. Available in server mode only.
-P <name>=<value>	Used to set a startup parameter. Can also be used to set node properties (slot parameters).

IBM SPSS Collaboration and Deployment Services Repository Connection Arguments

Note: A separate license is required to access an IBM® SPSS®
Collaboration and Deployment Services repository. For more information, see
http://www.ibm.com/software/analytics/spss/products/deployment/cds/

If you want to store or retrieve objects from IBM SPSS Collaboration and Deployment Services via the command line, you must specify a valid connection to the IBM® SPSS® Collaboration and Deployment Services Repository. For example:

modelerclient -spsscr_hostname myhost -spsscr_port 8080
-spsscr_username myusername -spsscr_password mypassword
-stream "spsscr:///folder_1/scoring_stream.str" -execute

The following table lists the arguments that can be used to set up the connection:

Argument	Behavior/Description
-spsscr_hostname <hostname or IP address>	The hostname or IP address of the server on which the IBM SPSS Collaboration and Deployment Services Repository is installed.
-spsscr_port <number>	The port number on which the IBM SPSS Collaboration and Deployment Services Repositoryaccepts connections (typically, 8080 by default).
-spsscr_use_ssl	Specifies that the connection should use SSL (secure socket layer). This flag is optional; the default setting is *not* to use SSL.
-spsscr_username <name>	The user name with which to log on to the IBM SPSS Collaboration and Deployment Services Repository.
-spsscr_password <password>	The password with which to log on to the IBM SPSS Collaboration and Deployment Services Repository.
-spsscr_epassword <encoded password>	The encoded password with which to log on to the IBM SPSS Collaboration and Deployment Services Repository.
-spsscr_domain <name>	The domain used to log on to the IBM SPSS Collaboration and Deployment Services Repository. This flag is optional—do not use it unless you log on by using LDAP or Active Directory.

System Arguments

The following table describes system arguments available for command line invocation of the user interface:

Argument	Behavior/Description
@ <commandFile>	The @ character followed by a filename specifies a command list. When modelerclient encounters an argument beginning with @, it operates on the commands in that file as if they had been on the command line.
-directory <dir>	Sets the default working directory. In local mode, this directory is used for both data and output.
-server_directory <dir>	Sets the default server directory for data. The working directory, specified by using the -directory flag, is used for output.
-execute	After starting, execute any stream, state, or script loaded at startup. If a script is loaded in addition to a stream or state, the script alone will be executed.
-stream <stream>	At startup, load the stream specified. Multiple streams can be specified, but the last stream specified will be set as the current stream.
-script <script>	At startup, load the standalone script specified. This can be specified in addition to a stream or state as described below, but only one script can be loaded at startup.
-model <model>	At startup, load the generated model (*.gm* format file) specified.
-state <state>	At startup, load the saved state specified.

Argument	Behavior/Description
-project \<project\>	Load the specified project. Only one project can be loaded at startup.
-output \<output\>	At startup, load the saved output object (*.cou* format file).
-help	Display a list of command line arguments. When this option is specified, all other arguments are ignored and the Help screen is displayed.
-P \<name\>=\<value\>	Used to set a startup parameter. Can also be used to set node properties (slot parameters).

Note: Default directories can also be set in the user interface. To access the options, from the File menu, choose Set Working Directory or Set Server Directory.

Loading Multiple Files

From the command line, you can load multiple streams, states, and outputs at startup by repeating the relevant argument for each object loaded. For example, to load and run two streams called *report.str* and *train.str*, you would use the following command:

modelerclient -stream report.str -stream train.str -execute

Loading Objects from the IBM SPSS Collaboration and Deployment Services Repository

Because you can load certain objects from a file or from the IBM® SPSS® Collaboration and Deployment Services Repository (if licensed), the filename prefix spsscr: and, optionally, file: (for objects on disk) tells IBM® SPSS® Modeler where to look for the object. The prefix works with the following flags:

- -stream
- -script
- -output
- -model
- -project

You use the prefix to create a URI that specifies the location of the object—for example, -stream "spsscr:///folder_1/scoring_stream.str". The presence of the spsscr: prefix requires that a valid connection to the IBM SPSS Collaboration and Deployment Services Repository has been specified in the same command. So, for example, the full command would look like this:

modelerclient -spsscr_hostname myhost -spsscr_port 8080
-spsscr_username myusername -spsscr_password mypassword
-stream "spsscr:///folder_1/scoring_stream.str" -execute

Parameter Arguments

Parameters can be used as flags during command line execution of IBM® SPSS® Modeler. In command line arguments, the -P flag is used to denote a parameter of the form -P *\<name\>=\<value\>*.

Parameters can be any of the following:

- **Simple parameters** (or parameters used directly in CLEM expressions).

- **Slot parameters**, also referred to as **node properties**. These parameters are used to modify the settings of nodes in the stream.

- **Command line parameters**, used to alter the invocation of SPSS Modeler.

For example, you can supply data source user names and passwords as command line flags, as follows:

```
modelerclient -stream response.str -P:databasenode.username=george
-P:databasenode.password=jetson
```

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Index

application examples, 2
arguments
   command file, 11
   IBM SPSS Collaboration and Deployment Services
    Repository connection, 12
   server connection, 11
   system, 13

batch mode
   log, 7
   output, 8
   parameters, 7
   scheduling streams, 5
   scripting, 7
   using arguments, 6

command line
   list of arguments, 11–13
   multiple arguments, 11
   parameters, 14
   running IBM SPSS Modeler, 6, 10
   starting IBM SPSS Modeler, 6, 10

documentation, 2

examples
   Applications Guide, 2
   overview, 3

flags
   combining multiple flags, 11
   command line arguments, 6, 10

IBM SPSS Collaboration and Deployment Services
 Repository
   command line arguments, 12
IBM SPSS Modeler, 1
   documentation, 2
   running from command line, 6, 10
IBM SPSS Text Analytics, 2

legal notices, 16
log files, 7

passwords
   encoded, 11

scripting
   in batch mode, 7
security
   encoded passwords, 11

server
   command line arguments, 11
SPSS Modeler Server, 1
streams
   scheduling, 5
system
   command line arguments, 13

trademarks, 17