Command-Line Tools Guide

iPlanet Certificate Management System

Version 4.2 - Service Pack 2

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Contents

About This Guide

The *Command-Line Tools Guide* describes various command-line tools or utilities that are bundled with iPlanet Certificate Management System (CMS). It provides the information such as the command syntax, platform support, examples, and so on, required to use these tools.

This preface has the following sections:

- What You Should Already Know
- What's in This Guide
- Conventions Used in This Guide
- Where to Go for Related Information

What You Should Already Know

This guide is intended for experienced system administrators who are planning to deploy Certificate Management System. CMS agents should refer to *iPlanet Certificate Management System Agent's Guide* for information on how to perform agent tasks, such as handling certificate requests and revoking certificates.

This guide assumes that you

- Are familiar with the basic concepts of public-key cryptography and the Secure Sockets Layer (SSL) protocol.
    - SSL cipher suites
    - The purpose of and major steps in the SSL handshake
- Understand the concepts of intranet, extranet, and the Internet security and the role of digital certificates in a secure enterprise. These include the following topics:
    - Encryption and decryption
    - Public keys, private keys, and symmetric keys

- Significance of key lengths
- Digital signatures
- Digital certificates, including various types of digital certificates
- The role of digital certificates in a public-key infrastructure (PKI)
- Certificate hierarchies

If you are new to these concepts, we recommend you read the security-related documents available online at this URL:
`http://docs.iplanet.com/docs/manuals/security.html`

You may also refer to the security-related appendixes (Appendix D and Appendix E) of the accompanying manual, *Managing Servers with Netscape Console*.

- Are familiar with the role of Netscape Console in managing Netscape version 4.x servers. Otherwise, see the accompanying manual, *Managing Servers with Netscape Console*.
- Are reading this guide in conjunction with the documentation listed in "Where to Go for Related Information" on page 13.

What's in This Guide

This guide covers the following topics:

- Chapter 1, "Command-Line Tools" Provides an overview of the command-line tools provided with Certificate Management System, including the ones that are not covered in this documentation.
- Chapter 2, "Password Cache Utility" Describes how to use the tool for managing the single sign-on password cache.
- Chapter 3, "Kill Process Tool" Describes how to use the tool for terminating CMS process if the server fails to respond to a start, restart, or stop commands.
- Chapter 4, "PIN Generator Tool" Describes how to use the tool for generating unique PINs for your users and for populating their directory entries with PINs.
- Chapter 5, "Extension Joiner Tool" Describes how to use the tool for joining MIME-64 encoded formats of certificate extensions to create a single blob.

- Chapter 7, “ASCII to Binary Tool” Describes how to use the tool for converting ASCII data to its binary equivalent.
- Chapter 8, “Binary to ASCII Tool” Describes how to use the tool for converting binary data to its ASCII equivalent.
- Chapter 9, “Pretty Print Certificate Tool” Describes how to use the tool for printing or viewing the contents of a certificate stored as ASCII base-64 encoded data in a human-readable form.
- Chapter 10, “Pretty Print CRL Tool” Describes how to use the tool for printing or viewing the contents of a CRL stored as ASCII base-64 encoded data in a human-readable form.
- Chapter 11, “Certificate Database Tool” Describes how to use the tool for manipulating the certificate database.
- Chapter 12, “Key Database Tool” Describes how to use the tool for manipulating the key database.
- Chapter 13, “Netscape Signing Tool” Describes how to use the tool to associate a digital signature with any file, including CMS log files.
- Chapter 14, “SSL Debugging Tool” Describes how to use the tool for testing and debugging purposes.
- Chapter 15, “SSL Strength Tool” Describes how to use the tool for testing and debugging purposes.
- Chapter 16, “Security Module Database Tool” Describes the Password Cache Utility and explains how to use it for managing the single sign-on password cache.

Conventions Used in This Guide

This guide uses the following conventions:

The following conventions are used in this guide:

- `Monospaced` font—This typeface is used for any text that appears on the computer screen or text that you should type. It’s also used for filenames, functions, and examples.

  Example: `Server Root` is the directory where the CMS binaries are kept.

- *Italic*—Italic type is used for emphasis, book titles, and glossary terms.

  Example: This control depends on the access permissions the *superadministrator* has set up for you.

- Text within "quotation marks"—Indicates cross-references to other topics within this guide.

  Example: For more information, see "Issuing a Certificate to a New User" on page 154.

- `[ ]`—Square brackets enclose commands that are optional.

  Example: `PrettyPrintCert <input_file> [<output_file>]`

  `<input_file>` specifies the path to the file that contains the base-64 encoded certificate.

  `<output_file>` specifies the path to the file to write the certificate. This argument is optional; if you don't specify an output file, the certificate information is written to the standard output.

- `<>`—Angle brackets enclose variables or placeholders. When following examples, replace the angle brackets and their text with text that applies to your situation. For example, when path names appear in angle brackets, substitute the path names used on your computer.

  Example: Using Netscape Communicator 4.04 or later, enter the URL for the administration server: `http://<hostname>:<port_number>`

- `/`—A forward slash is used to separate directories in a path. If you use the Windows NT operating system, you should replace / with \ in paths.

  Example: Except for the Security Module Database Tool, you can find all the other command-line utilities at this location: `<server_root>/bin/cert/tools`

- Sidebar text—Sidebar text marks important information. Make sure you read the information before continuing with a task.

  Examples:

NOTE You can use Netscape Console only when Administration Server is up and running.

CAUTION A caution note documents a potential risk of losing data, damaging software or hardware, or otherwise disrupting system performance.

Where to Go for Related Information

This section summarizes the documentation that ships with Certificate Management System, using these conventions:

- `<server_root>` is the directory where the CMS binaries are kept (specified during installation).
- `<instance_id>` is the ID for this instance of Certificate Management System (specified during installation).

The documentation set for Certificate Management System includes the following:

- *Managing Servers with Netscape Console*

  Provides background information on basic cryptography concepts and the role of Netscape Console.

  For the HTML version, open this file:
  `<server_root>/manual/en/admin/help/contents.htm`

- *iPlanet Certificate Management System Installation and Setup Guide*

  Describes how to plan for, install, and administer Certificate Management System. To access the installation and configuration information from within the CMS Installation Wizard or from the CMS window (within Netscape Console), click any help button.

  To view the HTML version of this guide, open this file:
  `<server_root>/manual/en/cert/setup_guide/contents.htm`

  To view the PDF version of this guide, open this file:
  `<server_root>/manual/en/cert/pdf/cms42sp2setup.pdf`

- *iPlanet Certificate Management System Plug-ins Guide*

  Provides detailed reference information on CMS plug-ins. To access this information from the CMS window within Netscape Console, click any help button.

  To view the HTML version of this guide, open this file:
  `<server_root>/manual/en/cert/plugin_guide/contents.htm`

  To view the PDF version of this guide, open this file:
  `<server_root>/manual/en/cert/pdf/cms42sp2plugin.pdf`

- *iPlanet Certificate Management System Command-Line Tools Guide* (this guide)

  Provides detailed reference information on CMS tools.

To view the HTML version of this guide, open this file:
`<server_root>/manual/en/cert/tools_guide/contents.htm`

To view the PDF version of this guide, open this file:
`<server_root>/manual/en/cert/pdf/cms42sp2tools.pdf`

- *iPlanet Certificate Management System Customization Guide*

  Provides detailed reference information on customizing the HTML-based agent and end-entity interfaces.

  To view the HTML version of this guide, open this file:
  `<server_root>/manual/en/cert/custom_guide/contents.htm`

  To view the PDF version of this guide, open this file:
  `<server_root>/manual/en/cert/pdf/cms42sp2custom.pdf`

- *iPlanet Certificate Management System Agent's Guide*

  Provides detailed reference information on CMS agent interfaces. To access this information from the Agent Services pages, click any help button.

  To view the HTML version of this guide, open this file:
  `<server_root>/<instance_id>/web/agent/manual/agent_guide/contents.htm`

  To view the PDF version of this guide, open this file:
  `<server_root>/manual/en/cert/pdf/cms42sp2agent.pdf`

- End-entity help (online only, not printed)

  Provides detailed reference information on CMS end-entity interfaces. To access this information from the end-entity pages, click any help button.

  To view the HTML version of this guide, open this file:
  `<server_root>/<instance_id>/web/ee/manual/ee_guide/contents.htm`

CAUTION Do not change the default location of any of the HTML files; they are used for online help. You may move the PDF files to another location..

For a complete list of all documentation that ships with Certificate Management System, including documentation for Directory Server, see Documentation Summary, at: `<server_root>/manual/index.html`

For the latest information about Certificate Management System, including current release notes, technical notes, and deployment information, check this site:
`http://docs.iplanet.com/docs/manuals/cms.html`

Chapter 1

Command-Line Tools

iPlanet Certificate Management System (CMS) is bundled with various command-line utilities. This chapter summarizes these utilities and provides pointers to chapters that further explain them.

Table 1-1 summarizes the command-line utilities that are bundled with Certificate Management System.

Table 1-1 Summary of command-line utilities

Utility/Tool	Function
Batch/Shell Scripts located under <server_root>/bin/cert/tools/ (require jre):	
`PasswordCache` (`Password Cache Utility`)	Manipulates the contents of the single sign-on password cache. For details, see Chapter 2, “Password Cache Utility.”
`AtoB` (`ASCII to Binary Tool`)	Converts ASCII base-64 encoded data to binary base-64 encoded data. For details, see Chapter 7, “ASCII to Binary Tool.”
`BtoA` (`Binary to ASCII Tool`)	Converts binary base-64 encoded data to ASCII base-64 encoded data. For details, see Chapter 8, “Binary to ASCII Tool.”
`PrettyPrintCert` (`Pretty Print Certificate Tool`)	Prints the contents of a certificate stored as ASCII base-64 encoded data in a human-readable form. For details, see Chapter 9, “Pretty Print Certificate Tool.”
`PrettyPrintCrl` (`Pretty Print CRL Tool`)	Prints the contents of a CRL stored as ASCII base-64 encoded data in a human-readable form. For details, see Chapter 10, “Pretty Print CRL Tool.”
Executable tools located under <server_root>/bin/cert/tools:	
`certutil` (`Certificate Database Tool`)	View and manipulate the certificate database (`cert7.db`) contents. For details, see Chapter 11, “Certificate Database Tool.”
`keyutil` (`Key Database Tool`)	View and manipulate the key database (`key3.db`) contents. For details, see Chapter 12, “Key Database Tool.”

Table 1-1 Summary of command-line utilities *(Continued)*

Utility/Tool	Function
`killproc` (Kill Process Tool)	Kills or terminates system processes in Windows NT. For details, see Chapter 3, "Kill Process Tool."
`setpin` `(PIN Generator tool)`	Generates PINs for end users for directory- and PIN-based authentication. For details, see Chapter 4, "PIN Generator Tool."
`signtool` `(Netscape Signing Tool)`	Digitally signs any file, including log files. For details, see Chapter 13, "Netscape Signing Tool."
`sslstrength` `(SSL Strength Tool)`	Connects to an SSL server and reports back the type and strength of the encryption cipher that it's using. For details, see Chapter 15, "SSL Strength Tool."
`ssltap` `(SSL Debugging Tool)`	Used to debug SSL applications. For details, see Chapter 14, "SSL Debugging Tool."
Perl Scripts located under <server_root> (require_perl):	
`cmsbackup`	Copies all of the pertinent data and configuration files for a CMS instance, the local Administration Server, and local Netscape Directory Servers that the instance uses into a compressed archive. For details, see Chapter 6, "Backing Up and Restoring Data."
`cmsrestore`	Opens a named archive, extracts the data, and uses it to restore the configuration of a CMS instance. For details, see Chapter 6, "Backing Up and Restoring Data."
Executable tools located under <server_root>/shared/bin:	
`modutil` `(Security Module Database Tool)`	Used for managing the PKCS #11 module information within `secmod.db` files or within hardware tokens. For details, see Chapter 16, "Security Module Database Tool."
Third-party executable tools located under <server_root>/bin/cert/tools:	
`dumpasn1`	Dumps the contents of binary base-64-encoded data. Note that the tool is freeware that is packaged with Certificate Management System for your convenience. For more information about this tool, check this site: http://www.cs.auckland.ac.nz/~pgut001/
Third-party support tools located under <server_root>:	
`bin/base/jre/bin/jre`	Java runtime executable for Netscape Console.
`bin/cert/jre/bin/jre`	Java runtime executable for Certificate Management System. Note that the CMS jre is invoked as `cms_daemon` during CMS installation and configuration, as `cms_watchdog` to monitor the status of the CMS server, and as `cms_server` to actually run the CMS server.

Table 1-1 Summary of command-line utilities *(Continued)*

Utility/Tool	Function
`bin/cert/tools/unzip`	Decompression utility executable.
`bin/cert/tools/zip`	Compression utility executable.
`install/perl`	`perl` scripting language executable.

The `AtoB`, `BtoA`, `PrettyPrintCert`, `PrettyPrintCrl`, and `dumpasn1` tools are useful for converting back and forth between various encodings and formats you may encounter when dealing with keys and certificates.

The Password Cache Utility can be used to manipulate the contents of an existing single sign-on password cache and to create a new cache.

The Certificate Database Tool, Key Database Tool, and Security Module Database Tool are useful for a variety of administrative tasks that involve manipulating certificate and key databases.

The PIN Generator tool is used to create PINs for directory authentication. The `killproc` tool is used to terminate the Java virtual machines, called `jre` processes, when Certificate Management System becomes unresponsive.

The Netscape Signing Tool can be used to associate a digital signature with any file, including CMS log files.

The SSL Strength Tool and SSL Debugging Tool are useful for testing and debugging purposes.

NOTE If you find any problems in Certificate Database Tool (`certutil`), Key Database Tool (`keyutil`), Netscape Signing Tool (`signtool`), SSL Debugging Tool (`ssltap`), and SSL Strength Tool (`sslstrength`), you may obtain the source code and build instructions for the very latest version of these tools (and/or potentially a binary image for the newer tool) at the following URL:

`http://www.mozilla.org/projects/security/pki/nss/tools/index.html`

Note that all Key Database Tool functions have now been incorporated into the single tool, Certificate Database Tool, and that several of the command-line options for many of the tools may have changed. Be sure to check back often to obtain the very latest version of the desired security tool, as this site will be updated often.

Chapter 2

Password Cache Utility

During the installation of iPlanet Certificate Management System (CMS), the watchdog stores all the passwords required by the server for starting up—such as passwords for the internal or external tokens, the bind password used by Certificate Management System to access and update the internal database, the bind password used by Certificate Management System to access and update the LDAP directory used for authentication or publishing—in a password cache. The cache is maintained in a file encrypted using the single sign-on password you specify during installation.

The command-line utility named `PasswordCache` enables you to manipulate the contents of the password cache. You will be required to manipulate the password cache for various reasons. For example, assume you've configured the Certificate Manager to publish certificates and CRLs to an LDAP directory and have configured it to bind to the directory with Directory Manager's DN and password. If the directory administrator changes the Directory Manager's password, the Certificate Manager will fail to bind to the directory during startup. You can resolve this problem by modifying the corresponding bind password in the cache using the `PasswordCache` utility.

This chapter has the following sections:

Location

The `PasswordCache` utility is located with the rest of the command-line tools in this directory: `<server_root>/bin/cert/tools`

Syntax

You can run the utility by executing the following command from the <server_root>/cert-<instance_id> directory:

PasswordCache <sso_password> <command>

where <sso_password> specifies the current single sign-on password and <command> can be any of the following:

- list
- add <password_name> <password>
- change <password_name> <password>
- delete <password_name>
- changesso <new_sso_password>
- create

<password_name> specifies the string (describing the password usage) you want to add to, or modify or delete from the cache; it is equivalent to the value assigned to the bindPWPrompt or tokenname parameter in the CMS configuration file.

<password> specifies the new password.

<new_sso_password> specifies the new single sign-on password.

NOTE You must run the PasswordCache utility from the <server_root>/cert-<instance_id> directory.

Usage

You can use the PasswordCache utility for the following:

- Changing the single sign-on password
- Listing or viewing the contents of the password cache
- Adding a new entry to the cache
- Changing the password associated with an entry
- Deleting an entry in the cache

The sections that follow explain how you can accomplish the above mentioned tasks.

NOTE The server queries the password cache only during start up, and hence recongnizes the changes you've made to the cache only if you restart the server from the command line. If you left any of the passwords blank, the server will prompt you to enter that during startup and from then on stores it in the password cache.

Changing the Single Sign-On Password

To change the single sign-on password:

1. Open a command window.
2. Go to this directory: `<server_root>/cert-<instance_id>`
3. At the prompt, enter the command below, substituting `<sso_password>` with the single sign-on password and `<new_sso_password>` with the new single sign-on password.

   ```
   PasswordCache <sso_password> changesso <new_sso_password>
   ```

   For example, if your old password is `mySsoPwd` and new password is `myNewSsoPwd`, the command would look like this:

   ```
   PasswordCache mySsoPwd changesso myNewSsoPwd
   ```

Listing the Contents of the Password Cache

To list or view the contents of the password cache:

1. Open a command window.
2. Go to this directory: `<server_root>/cert-<instance_id>`
3. At the prompt, enter the command below, substituting `<sso_password>` with the single sign-on password:

   ```
   PasswordCache <sso_password> list
   ```

   For example, if your single sign-on password is `mySsoPwd`, the command would look like this:

   ```
   PasswordCache mySsoPwd list
   ```

In response, you should see something similar to this:

```
----- Password Cache -----

Internal LDAP Database : myIdbPwd
Internal Key Storage Token : myTokenPwd
LDAP Publishing: myLdapPubPwd
```

Adding a New Entry to the Password Cache

To add a new entry to the cache:

1. Open a command window.
2. Go to this directory: `<server_root>/cert-<instance_id>`
3. At the prompt, enter the command below, substituting `<sso_password>` with the single sign-on password, `<password_name>` with a string describing the password usage, and `<password>` with the actual password:

   ```
   PasswordCache <sso_password> add <password_name> <password>
   ```

   For example, if your single sign-on password is `mySsoPwd`, the string describing the password usage is `Bind Password for LDAP Publishing Directory`, and password is `myLdapPubPwd`, the command would look like this:

   ```
   PasswordCache mySsoPwd add “Bind Password for LDAP Publishing Directory” myLdapPubPwd
   ```

   If the password name string includes spaces, be sure to enclose the string in double quotes as indicated in the above example.

Changing the Password of an Entry in the Password Cache

To change the password associated with an entry in the password cache:

1. Open a command window.
2. Go to this directory: `<server_root>/cert-<instance_id>`

3. At the prompt, enter the command below, substituting <sso_password> with the single sign-on password, <password_name> with the string that describes the password usage, and <password> with the new password:

   ```
   PasswordCache <sso_password> change <password_name> <password>
   ```

   For example, if your single sign-on password is mySsoPwd, the string describing the password usage is Bind Password for LDAP Publishing Directory, and the new password is myNewLdapPubPwd, the command would look like this:

   ```
   PasswordCache mySsoPwd change “Bind Password for LDAP Publishing Directory” myNewLdapPubPwd
   ```

   If the password name string includes spaces, be sure to enclose the string in double quotes as indicated in the above example.

Deleting an Entry From the Password Cache

To delete an entry from the cache:

1. Open a command window.
2. Go to this directory: <server_root>/cert-<instance_id>
3. At the prompt, enter the command below, substituting <sso_password> with the single sign-on password and <password_name> with the string that describes the password usage:

   ```
   PasswordCache <sso_password> delete <password_name>
   ```

   For example, if your single sign-on password is mySsoPwd and the string describing the password usage is Bind Password for LDAP Publishing Directory, the command would look like this:

   ```
   PasswordCache mySsoPwd delete “Bind Password for LDAP Publishing Directory”
   ```

   If the password name string includes spaces, be sure to enclose the string in double quotes as indicated in the above example.

Creating a New Password Cache

If you have changed CMS startup so that the server prompts for all the required passwords, instead of just the single sign-on password, and want to revert back to starting the server with a single sign-on password, you must create a new password cache. Before creating a new password cache, decide on the single sign-on password to protect the cache.

To create a new, empty password cache:

1. Open a command window.
2. Go to this directory: `<server_root>/cert-<instance_id>`
3. At the prompt, enter the command below, substituting `<sso_password>` with a password to protect the cache:

   ```
   PasswordCache <sso_password> create
   ```

   For example, if the password you want to use to protect the single sign-on cache is `mySsoPwd`, the command would look like this:

   ```
   PasswordCache mySsoPwd create
   ```

Chapter 3

Kill Process Tool

If an error causes iPlanet Certificate Management System (CMS) to become unresponsive, and all attempts to stop it from Netscape Console fail, it may be necessary to kill the server processes manually. This chapter describes the `killproc` utility, which enables you to terminate CMS processes manually.

This chapter has the following sections:

Location

The `killproc` tool is located with the rest of the command-line tools in this directory: `<server_root>/bin/cert/tools`

Syntax

The `killproc` command takes one argument, the process ID of the process to be killed:

```
killproc <process_id>
```

where `<process_id>` specifies the ID of the process that needs to be terminated.

Usage

If an error causes Certificate Management System to become unresponsive, and all attempts to stop it from Netscape Console fail, it may be necessary to kill the server processes manually. The processes that should be killed are identified as follows:

- `cms_server`
- `cms_watchdog`
- `cms_daemon`

On a Windows NT system, the server processes will have `.exe` file extension and will be listed in the Windows NT Task Manager. However, because they are system processes, you cannot terminate them from the Task Manager. Instead, you should terminate them using the `killproc` command-line tool.

In order to kill system processes, the user that runs `killproc` command must have the *Debug Programs* permission. By default, this permission is given only to the Administrators group, although this can be changed in the Windows NT User Manager. Assuming it is not changed, `killproc` command must be run by a member of the Administrators group (such as the user `Administrator`).

You can obtain the process ID from the Windows NT Task Manager. For example, to kill the `jre` process whose process ID is 255, you should type:

```
c:\> killproc 255
Killed process 255.
c:\>
```

NOTE The `killproc` tool should only be used as a last resort. Because it forces the process to terminate abruptly, the process is not able to cleanup or to save its internal state before exiting.

Chapter 4

PIN Generator Tool

For iPlanet Certificate Management System (CMS) to use the authentication plug-in module named `UidPwdPinDirAuth` your authentication directory must contain unique PINs for each end entity to whom you intend to issue a certificate. To aid you in generating PINs for end-entity entries in a directory, Certificate Management System provides a command-line tool called the *PIN Generator*. This tool allows you to generate unique PINs for entries in an LDAP-compliant user directory. The tool stores these PINs (as hashed values) in the same directory against the corresponding user entries, and it copies the PINs to a text file, from which you can deliver the PINs to end entities by an appropriate, secure means.

This chapter explains how to use the PIN Generator. The chapter has the following sections:

Locating the PIN Generator Tool

You can find the PIN Generator at this location:

```
<server_root>/bin/cert/tools/setpin.exe
```

The setpin Command

You run the PIN Generator by entering the `setpin` command and its arguments in a command shell and monitoring the output in the shell window. This section gives the syntax for the `setpin` command and its arguments. For instructions on generating PINs and storing them in your authentication directory, see section "Configuring Authentication for End-User Enrollment" in Chapter 15, "Setting Up End-User Authentication" of *CMS Installation and Setup Guide.*

Command-Line Syntax

Use the following command in a Unix or DOS command shell:

```
setpin [arguments]
setpin [optfile=filename] [param1] [param2]
```

Arguments

The `setpin` command takes the following arguments and options:

```
setpin

[host=<host_name> [port=<port_number>]]
[certdb=<path> nickname=<certificate_nickname> | "binddn=<user_id>"
   bindpw=<bind_password> [SSL=yes | no]]
[objectclass=<objectclass_to_add>]
[attribute=<attribute_name_for_pins>]
["filter=<LDAP_search_filter>"]
[input=<file_name>]
[length=<PIN_length> | minlength=<minimum_PIN_length>
   maxlength=<maximum_PIN_length>]
[gen=RNG-alpha | RNG-alphanum | RNG=printableascii]
[case=upperonly]
[hash=sha1 | md5 | none]
[output=<file_name>]
[clobber]
[write]
[saltattribute=<LDAP_attribute_to_use_for_salt_creation>]
[debug]
```

A description for each argument follows:

- `[host=<host_name> [port=<port_number>]]`

  `<host_name>` specifies the LDAP directory to connect to.

<port_number> specifies the TCP/IP port to bind to; the default port number is the default LDAP port, 389.

- [certdb=<path> nickname=<certificate_nickname> | "binddn=<user_id>" bindpw=<bind_password> [SSL=yes | no]]

  Use this argument to specify how the tool should connect to the directory: whether to use basic authentication, SSL, or SSL with client authentication. By default, SSL is not used (SSL=no).

  - If you want the tool to use basic authentication, you must turn off SSL (SSL=no) and enter the bind DN and password information. Do not enter values for the remaining options.
  - If you want the tool to use SSL, you must turn on SSL (SSL=yes) and enter the bind DN and password information. Do not enter values for the remaining options.
  - If you want the tool to use SSL with client authentication, you must turn on SSL (SSL=yes) and enter the nickname of the certificate to use for SSL client authentication and the path to the certificate database that contains this certificate. You don't have to provide the bind DN and password.

  <path> specifies the path to the certificate database containing the client authentication certificate to use for SSL client authentication. If you provide the path to the certificate database (cert7.db in Netscape Directory Server), it is assumed that the LDAP directory has been set up for SSL-based access. You must also specify the certificate for SSL client authentication to the directory.

  <certificate_nickname> specifies the nickname of the certificate to use for SSL client authentication to the directory. The tool looks for this certificate in the database specified by the path parameter value. If you want the tool to use a client certificate residing on a token or smart card to access the directory, prefix the nickname with the word *module* (module:nickname); then a PKCS #11 module will be used.

  <user_id> specifies the user ID that has read and write permission to the LDAP directory; the PIN Generator binds to the directory as this user.

  <bind_password> specifies the password for the user ID that has read and write access to the LDAP directory.

  If the bind password is not given at the command line, the tool prompts for it.

- [objectclass=<objectclass_to_add>]

  Use this argument to specify the object class, if any, the tool should add to the authentication directory. By default it is pinPerson.

- `[attribute=<attribute_name_for_pins>]`

  Use this argument to specify the authentication directory attribute to which PINs should be published. If you don't specify an attribute, it defaults to `pin`, the new attribute added to the authentication directory schema.

- `["filter=<LDAP_search_filter>"]`

  Use this argument to filter those DNs in the directory for which the tool should generate PINs. For information on how to specify filters, see the information available at this URL: `http://developer.netscape.com/docs/manuals/dirsdk/capi/search.htm`

- `[input=<file_name>]`

  Use this argument to specify the name of the file that contains the list of DNs to process. Using this argument is optional. If you do, the tool compares the filtered DNs to the ones specified by the input file and generates PINs for only those DNs that are also in the file.

- `[length=<PIN_length> | minlength=<minimum_PIN_length> maxlength=<maximum_PIN_length>]`

  Use this argument to specify the exact number or a range of characters that a PIN must contain. The PINs can be either a fixed length or generated to be between two values (x,y) inclusive (x,y>0).

  `<PIN_length>` specifies the exact length for the PINs. For example, if you want PIN length to be eight characters, enter `8`. PIN length must be an integer greater than zero.

  `<minimum_PIN_length>` specifies the minimum length for the PINs. For example, if you want PIN length to be at least six characters, enter `6`.

  `<maximum_PIN_length>` specifies the maximum length for the PINs. For example, if you want PIN length to be nine characters at the most, enter `9`.

- `[gen=RNG-alpha | RNG-alphanum | RNG-printableascii]`

  Use this argument to specify the type of characters for PINs. The characters in the password can be constructed out of alphabetic characters (`RNG-alpha`), alphanumeric characters (`RNG-alphanum`), or any printable ASCII characters (`printableascii`).

- `[case=upperonly]`

  Use this argument with the `gen` parameter. If you do, the case for all alphabetic characters is fixed to uppercase only; otherwise, the case is mixed. Restricting alphabetic characters to uppercase reduces the overall combinations for the password space significantly.

- `[hash=sha1 | md5 | none]`

  Use this argument to specify the message digest algorithm the tool should use to hash the PINs before storing them in the authentication directory. If you want to store PINs as SHA-1 or MD5 hashed values in the directory, be sure to specify an output file for storing PINs in plain text. You will need the PINs in plain text for delivering them to end entities.

  `sha1` produces a 160-bit message digest. This option is used by default.
  `md5` produces a 128-bit message digest.
  none does not hash the PINs.

- `[output=<file_name>]`

  Use this argument to specify the absolute path to the file to which the tool should write the PINs as it generates them; this is the file to which the tool will capture the output.

  If you don't specify a filename, the tool will write the output to the standard output. In any case, all the error messages will be directed to the standard error.

- `[clobber]`

  Use this argument to specify whether the tool should overwrite preexisting PINs, if any, associated with a DN (user). If specified, the tool overwrites the existing PINs with the one it generates. Otherwise, it leaves the existing PINs as they are.

- `[write]`

  Use this argument to specify whether the tool should write PINs to the directory. If specified, the tool writes PINs (as it generates) to the directory. Otherwise, the tool does not make any changes to the directory.

  For example, if you want to check PINs—that the PINs are being given to the correct users and that they are conforming to the length and character-set restrictions—before updating the directory, do not specify this option. You can check the PINs before updating the directory by looking at the output file; for details, see "Output File" on page 36.

- `[saltattribute=<LDAP_attribute_to_use_for_salt_creation>]`

  Use this argument to specify the LDAP attribute the tool should use for salt creation. If you specify an attribute, the tool integrates the corresponding value of the attribute with each PIN, and hashes the resulting string with the hash routine specified in the hash argument.

If you don't specify this argument, the DN of the user is used. For details, see "How PINs Are Stored in the Directory" on page 37.

- `[debug]`

  Use this argument to specify whether the tool should write debugging information (to the standard error). If `debug=attrs` is specified, the tool writes much more information about each entry in the directory.

- `[testpingen=<count>]`

  Use this argument to test the pin-generation mode.

  `<count>` specifies the total number (in decimal) of PINs to be generated for testing purposes.

- `[optfile]`

  Use this argument to specify that the tool should read in options (one per line) from specified file; this option enables you to put all the arguments in a file, instead of typing them on the command line.

Example

The following command generates PINs for all entries that have the `CN` attribute (in their distinguished name) defined in an LDAP directory named `laiking` that is listening at port `19000`. The PIN Generator binds to the directory as user `DirectoryManager` and starts searching the directory from the node `dn=o=siroe.com` in the directory tree. The tool overwrites the existing PINs, if any, with the new ones.

```
setpin host=lailing port=19000 "binddn=CN=directoryManager"
bindpw=password "filter=(cn=*)" basedn=o=siroe.com clobber write
```

How the Tool Works

The Pin Generator allows you to generate PINs for user entries in an LDAP-compliant directory and update the directory with these PINs. To run the `setpin` command, you need at a minimum to specify the following:

- The host name (`host`) and port number (`port`) of the LDAP server
- The bind DN (`binddn`) and password (`bindpw`)
- An LDAP filter (`filter`) for filtering out the user entries that require PINs

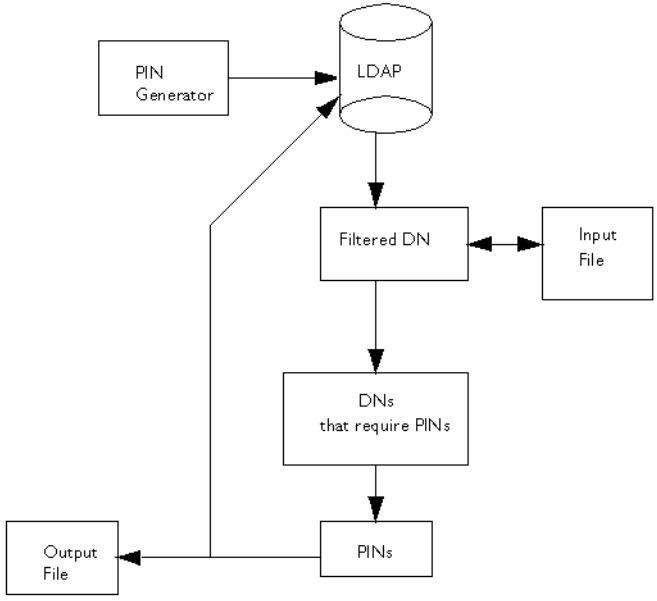
For example:

```
setpin host=laiking port=19000 "binddn=CN=Directory Manager"
bindpw=netscape "filter=(ou=employees)" basedn=o=siroe.com
```

This command, if run, will query the directory for all the entries that match the filter criteria, which in this case is all users belonging to an organizational unit (ou) called `employees`. For each entry matching the filter, information is printed out to standard error. Additionally, to the standard output or the file named in output; see “Output File” on page 36.

You can also provide the tool with an input argument using the `input` option. The argument must be in the form of an ASCII file of pre-prepared DNs and PINs (see Figure 4-1). Note that the input file isn’t a substitute for the LDAP directory entries; the filter attribute must still be provided. If an input file is provided, the tool updates only those filtered attributes that match the ones in the input file. For more information about the input file, see “Input File” on page 35.

Figure 4-1 Using an input and output file for the PIN-generation process



Examples of output follow:

```
Processing: cn=QA Managers,ou=employees,o=siroe.com

 Adding new pin/password

dn:cn=QA Managers,ou=employees,o=siroe.com
pin:lDWynV
status:notwritten


Processing: cn=PD Managers,ou=employees,o=siroe.com

 Adding new pin/password

dn:cn=PD Managers,ou=employees,o=siroe.com
pin:G69uV7
status:notwritten
```

Because the PIN Generator makes a lot of changes to your directory, it is important that you specify the correct filter; otherwise, you may change the wrong entries. As a safeguard, a `write` option is provided that you use to enable writing to the directory after you verify the output; the tool doesn't make any changes to the directory until you specify the `write` option on the command line.

The output also contains the status of each entry in the directory. It can be one of the values specified in Table 4-1.

Table 4-1 PIN Generator status

Exit code	Description
`notwritten`	Specifies that the PINs were not written to the directory, because the `write` option was not specified on the command line.
`writefailed`	Specifies that the tool made an attempt to modify the directory, but the write operation was unsuccessful.
`added`	Specifies that the tool added the new PIN to directory successfully.
`replaced`	Specifies that the tool replaced an old PIN with a new one (the `clobber` option was specified).
`notreplaced`	Specifies that the tool did not replace the old PIN with a new one (the `clobber` option was not specified).

If a PIN already exists for a user, it will by default not be changed if you run the `setpin` command a second time. This is so that you can generate PINs for new users without overwriting PINs for users who have previously been notified of their PINs. If you want to overwrite a PIN, you should use the `clobber` option.

Once you are sure that the filter is matching the right users, you should run the `setpin` command again with the `write` option, and with `output` set to the name of the file to capture the unhashed PINs. This output file is in the same format as the input file. For details about the output file, see “Output File” on page 36.

Input File

The PIN Generator can receive a list of DNs to modify in a text file specified by the `input=<file_name>` argument. If you specify an input file, the tool compares the DNs it filtered from the LDAP directory with the ones in the input file, and updates only those DNs that matched the ones in the input file.

The purpose of the input file is multifold. It enables you to provide the Pin Generator with an exact list of DNs to modify. Via the input file, you can also provide the PIN Generator with PINs (in *plain text* format) for all DNs or for specific DNs.

The following examples explain why you might want to use the input file:

- Assume that you have set PINs for all entries in the user directory. Two new users joined your organization and you updated the directory with new users’ information. For the new users to get certificates, the directory must contain PINs. And you want to set PINs for just those user entries without making changes to any of the other user entries. Instead of constructing a complex LDAP filter to filter out just these two entries, you can construct a general filter, put the two users’ DNs in the input file, and run the PIN Generator.
- Assume that you want your users to use their social security numbers as PINs. You can enter users’ social security numbers as PINs in the input file, and the PIN Generator will store them as hashed values in the directory.

The format of the input file is the same as that of the output file (see “Output File” on page 36), with the omission of the status line. In the input file, you can choose to specify PINs for all the DNs in the file, for specific DNs, or for none of the DNs. If the PIN attribute is missing for a DN, the tool automatically generates a random PIN.

For example, you can set up your input file to look like this:

```
dn:cn=user1, o=siroe
<blank line>

dn:cn=user2, o=siroe
<blank line>

...

dn:cn=user3, o=siroe
```

You can also provide PINs, in plain-text format, for the DNs in the input file, which is then hashed according to the command-line arguments. For example, you can set up your input file to look like this:

```
dn:cn=user1, o=siroe
pin:pl229Ab
<blank line>

dn:cn=user2, o=siroe
pin:9j65dSf
<blank line>

...

dn:cn=user3, o=siroe
pin:3knAg60
<blank line>
```

NOTE You cannot provide hashed PINs to the tool.

Output File

The PIN Generator can capture the output to a text file specified by the `output=<file_name>` argument.

The captured output will contain a sequence of records and will be in the following format:

```
dn: <user_dn>1
pin: <generated_pin>1
status: <status>1
<blank line>
```

```
dn: <user_dn>2
pin: <generated_pin>2
status: <status>2
<blank line>

...

dn: <user_dn>n
pin: <generated_pin>n
status: <status>n
<blank line>
```

where

<user_dn> is a distinguished name that matched the specified DN pattern (specified by the DN filter) or that was in the input file (the DN file). By default, the delimiter is ";" or the character defined on the command line.

<generated_pin> is a string of characters with either fixed or variable length, dependent on parameters passed into the command.

<status> is one of the values specified in Table 4-1 on page 34.

The first line in each record will always be the distinguished name. The subsequent lines, for `pin` and `status`, are optional. The record ends with a blank line. The end of line (EOL) sequence is as follows:

- On Windows NT: `\r\n`
- On Unix: `\n`

How PINs Are Stored in the Directory

Each PIN is concatenated with the corresponding user's LDAP attribute named in the `saltattribute` argument. If this argument is not specified, the DN of the user is used. Then, this string is hashed with the hash routine specified in the hash argument (the default selection is SHA-1).

Then, one byte is prepended to indicate the hash type used. Here's how the PIN gets stored:

```
byte[0] = X
```

The value of `X` depends on the hash algorithm chosen during the PIN generation process:

`X=0` if the hash algorithm chosen is `SHA-1`.
`X=1` if the hash algorithm chosen is `MD5`.
`X=45` if the hash algorithm chosen is `none`.

```
byte[1...] = hash("DN"+"pin")
```

The PIN is stored in the directory as a binary value, not as a base-64 encoded value.

Exit Codes

The PIN Generator returns exit codes to the shell window; for a list of codes, see Table 4-2. If you plan on automating the PIN-generation process, exit codes are useful in programming shell scripts.

Table 4-2 Exit codes returned by the PIN Generator

Exit code	Description
0	Indicates that PIN generation was successful; that is, PINs are set for all the DNs in the specified directory.
2	Indicates that the tool could not open the certificate database specified by the `certdb` parameter.
3	Indicates that the tool could not locate the certificate specified by the `nickname` parameter in the specified certificate database.
4	Indicates that the tool could not bind to the directory as the user specified by the `binddn` parameter (over SSL).
5	Indicates that the tool could not open the output file specified by the `output` parameter.
7	Indicates an error parsing command-line arguments.
8	Indicates that the tool could not open the input file specified by the `input` parameter.
9	Indicates that the tool encountered an internal error.
10	Indicates that the tool found a duplicate entry in the input file specified by the `input` parameter.
11	Indicates that the tool didn't find the salt attribute, specified by the `saltattribute` parameter, in the directory.

Chapter 5

Extension Joiner Tool

iPlanet Certificate Management System (CMS) provides many policy plug-in modules that enable you to add standard and custom X.509 certificate extensions to end-entity certificates the server issues. Similarly, the wizard that helps you generate the certificates required by the Certificate Manager, Registration Manager, and Data Recovery Manager enables you to select extensions that you want to include in the certificates. Additionally, the wizard interface and the request-approval page of the Agent interface contains a text area, enabling you to paste any extension in its MIME-64 encoded format.

Certificate Management System also provides tools that generate MIME-64 encoded blobs for many standard extensions. You can use these tools for generating MIME-64 encoded blobs for any extensions that you may want to include in CA and other certificate requests. The tools are located with the rest of the command-line utilities in this directory: `<server_root>/bin/cert/tools`

The text field provided for pasting the extension in general accepts a single extension blob. If you want to add multiple extensions, you should first join them to form a single extension blob and then paste the blob into the text field.

The ExtJoiner is a program that joins a sequence of extensions together so that the final output can be used in the wizard text field or in the request-approval page of the Agent interface for specifying multiple extensions.

This chapter has the following sections:

Location

The ExtJoiner program is located with the rest of the command-line tools in this directory: `<server_root>/bin/cert/tools`

Syntax

To run the `ExtJoiner` tool, type the following command:

```
java ExtJoiner <ext_file0> <ext_file1> ... <ext_fileN>
```

where `<ext_file>` specifies the path, including the filename, to files that contain the base-64 encoded DER encoding of an X.509 extension.

Usage

As discussed in the introduction of this chapter, the ExtJoiner program doesn't generate an extension in its MIME-64 encoded format, it only joins the extensions that are in MIME-64 encoded format. The steps below outline how you can use the `ExtJoiner` to join multiple custom extensions and add the extensions to a certificate request.

1. Write the appropriate Java programs for the extensions.
2. Join the extensions using ExtJoiner. To do this:
   a. Note the file paths to the files that contain the programs for extensions.
   b. Open a command window.
   c. Run the ExtJoiner, substituting the appropriate file paths. For example, if you have two extension files named `myExt1` and `myExt2` and have copied them to the same directory as the ExtJoiner, the command would look like this: `java ExtJoiner myExt1 myExt2`

      You should see a base-64 encoded blob, similar to the one below, of the joined extensions on screen:

      ```
      MEwwLgYDVR0lAQHBCQwIgYFKoNFBAMGClGC5EKDM5PeXzUGBi2CVyLNCQYFU
      iBakowGgYDVR0SBBMwEaQPMA0xCzAJBgNVBAYTAlVT
      ```

   d. Copy the encoded blob, without any modifications, to a file.

3. Verify that the extensions are joined correctly before adding them to a certificate request. To do this, first you'll need to convert the binary data to ASCII format using the `AtoB` utility and then verify the binary data by dumping the contents of the base-64 encoded blob using the `dumpasn1` utility. For information on the `AtoB` utility see, Chapter 7, "ASCII to Binary Tool" and for the `dumpasn1` utility see, Table 1-1 on page 15.

   Here's how you would do this verification:

   a. Go to this directory: `<server_root>/bin/cert/tools`

   b. Enter this command: `AtoB <input_file> <output_file>`, substituting `<input_file>` with the path to the file that contains the base-64 encoded data in ASCII format (from Step 2) and `<output_file>` with the path to the file to write the base-64 encoded data in binary format.

   c. Next, enter this command: `dumpasn1 <ouput_file>`, substituting `<output_file>` with the path to the file to that contains the base-64 encoded data in binary format. Your output should look similar to this:

```
0 30   76: SEQUENCE {
2 30   46:   SEQUENCE {
4 06     3:     OBJECT IDENTIFIER extKeyUsage (2 5 29 37)
9 01     1:     BOOLEAN TRUE
12 04   36:     OCTET STRING
           :       30 22 06 05 2A 83 45 04 03 06 0A 51 82 E4 42 83
           :       33 93 DE 5F 35 06 06 2D 82 57 22 CD 09 06 05 51
           :       38 81 6A 4A
           :     }
50 30   26:   SEQUENCE {
52 06    3:     OBJECT IDENTIFIER issuerAltName (2 5 29 18)
57 04   19:     OCTET STRING
           :       30 11 A4 0F 30 0D 31 0B 30 09 06 03 55 04 06 13
           :       02 55 53
           :     }
           :   }


     0 warnings, 0 errors.
```

   d. If the output doesn't appear right, repeat steps 1 through 3 to get the correct output.

4. Copy the base-64 encoded blob in step 2 (the output generated by the ExtJoiner) to the CMS wizard screen and generate the certificate or the certificate signing request (CSR), if submitting the request to another CA.

Chapter 6

Backing Up and Restoring Data

This chapter explains how to back up the iPlanet Certificate Management System (CMS) data and configuration information and how to use the backups to restore data if there is a need.

The chapter has the following sections:

Backup and Restore Tools

Certificate Management System provides tools to backup and restore the data and configuration for a CMS instance. These tools can be used, for example, to back up just your CMS data before you upgrade hardware or software on a machine. You might also use these tools as part of your overall system backup plan, perhaps to provide more frequent checkpoints of the CMS data than a nightly disk backup would record.

Since only CMS configuration and data are backed up, you will need to take other measures to back up data for external PKCS#11 cryptographic or key storage devices (such as smart card readers). If you rely on an external device for key storage (for example, to store the CA signing key), make sure that its data is backed up whenever you back up CMS data. When you restore the CMS data, it will rely on the external keys still being available. Refer to the PKCS#11 module vendor's instructions for how to back up the data.

The backup and restore tools are simple Perl scripts; most Perl programmers should find no difficulty in customizing or extending them. Read this chapter to familiarize yourself with how the scripts work as well as their capabilities and limitations.

The Perl scripts that perform the backup or restore are called from shell scripts installed in the `<server_root>/cert-<instance_id>/` directory of every CMS instance:

- `cmsbackup[.bat]` copies all of the pertinent data and configuration files for a CMS instance, the local Administration Server, and local Netscape Directory Servers that the instance uses into an compressed archive (a zip file). See “Backing Up Data” on page 44 for instructions on how to use this tool.
- `cmsrestore[.bat]` opens a named archive, extracts the data, and uses it to restore the configuration of a CMS instance. You have the option to restore everything or to select a subset of the archived data. See “Restoring Data” on page 49 for instructions on how to use this tool.

Be aware that the backup archives contain sensitive information (for example, your CMS key database). Protect the backup archives as carefully as you protect the server itself. The backups are stored on a local disk by default. To avoid losing both the current data and the backup because of a disk failure, move the backup archives to another medium as soon as they are created. If possible, encrypt the archives or store them on removable media in a secured location.

Backing Up Data

Backing up your data is actually a very simple process. You run the script, and it creates an archive that you store securely. This section explains what the backup tool (`cmsbackup`) does and does not do so that you can plan your overall system maintenance and backup procedures.

What the Backup Tool Does

There is a script or batch file installed in the instance directory of every CMS instance. This file calls the Perl script `<server_root>/bin/cert/tools/CMSBackup.pl` (using a Perl 5.003 interpreter bundled with Certificate Management System). `CMSBackup.pl` does the following:

- Creates a log file where all backup actions are logged
- Creates a temporary backup directory

- Copies non-CMS certificate and key databases and shared files
- Copies files required to configure the Netscape Console and Administration Server
- Backs up the configuration directory server using that server's `db2bak` backup utility (if the server is running locally)
- Backs up the CMS internal database directory server using that server's `db2bak` backup utility
- Copies CMS global and local class files
- Copies CMS user interface files and templates
- Copies CMS instance configuration files
- Creates a compressed archive of all files in the backup directory

The log file is in `<server_root>/cert-<instance_id>/logs/cmsbackup.log`. You should review the log file after each backup to make sure that all phases of the backup completed successfully. If all or part of the backup fails it is usually due to a directory that is missing or not readable by the user running the backup.

The default temporary backup directory is `/var/tmp` (Unix) or `C:\Temp` (Windows NT). Ensure that access to this directory is restricted so that no one can intercept backup files while the archive is being built. You can change the working backup directory by changing the value of `$backup_path_prefix` in `CMSBackup.pl`.

The non-CMS databases and shared files that are backed up are:

- `<server_root>/alias/*`
- `<server_root>/shared/config/*.conf`

The Netscape Console Administration Server files that are backed up are the following files from `<server_root>/admin-serv/config/`:

- `admpw`, the Administration Server password cache
- `*.conf`, the Configuration files for the server and its associated LDAP data
- `*.db`, the certificate and key databases for the Administration Server and `secmodule.db` (database of PKCS#11 modules available to all server instances)

The backup tool will use the Netscape Directory Server `db2bak` tool to create a backup of the CMS server instance internal database directory and the configuration directory (if it is running locally). See Chapter 4, "Managing Directory Server Databases," in *Netscape Directory Server Administrator's Guide* for full details of what this tool does. The data backed up includes all schema and object class definitions and, of course, all entries in the directory.

These CMS global and local class files are Java classes for custom plug-ins used by CMS servers. To back up this data, all files and subdirectories in the following directories are backed up:

- `<server_root>/bin/cert/classes`
- `<server_root>/cert-<instance_id>/classes`

The CMS user interface files and templates are the files used to create the forms end entities and agents use to interact with CMS servers. All of these files for the instance you are backing up are in

- `<server_root>/cert-<instance_id>/web`

The CMS configuration files that get backed up are in `<server_root>/cert-<instance_id>/config`. The specific files and their purposes are:

- `CMS.cfg`, the current master configuration file for the instance.
- `CMS.cfg.*`, previous configuration files, available for reverting to an earlier configuration.
- `*.db`, the server instance key and certificate databases.
- `*.ldif`, ldif-format files that describe objects in the configuration database.
- `pwcache.p12`, the server instance password cache.

All of the data to be backed up is copied to the temporary backup directory. After all of the data has been copied, the script archives the entire backup directory into a compressed archive using `zip` (a copy of `zip` is installed in `<server_root>/bin/cert/tools/zip`). The script deletes the backup directory once the zip archive is created.

What the Backup Tool Does Not Do

The `cmsbackup` script backs up only configuration and data related to a single CMS server instance. You may need to back up other files to recover from a failure completely, depending on the nature of the failure. For example, if some entries in your configuration directory server become corrupted then the data backed up by `cmsbackup` is sufficient to restore the directory to a previous state. If, however, you suffer a catastrophic disk failure, you will probably have to reinstall or restore Certificate Management System, Netscape Console, and Netscape Directory Server binaries and related tools before you use `cmsrestore` to recover your previous configuration.

The following is a list of items which may be part of your overall CMS deployment, but which are not backed up by `cmsbackup`:

- Other instances of CMS servers in the same server root

  Each instance has a copy of the cmsbackup script that backs up only data related to that instance.

- External PKCS#11 module data

  If you use an external PKCS#11 device for key storage, make sure you follow the vendor's instructions for backing up its data whenever you back up your CMS server. It may be possible to extend the `CMSBackup.pl` and `CMSRestore.pl` Perl scripts to include this data in the archives used by the CMS backup tools.

- Server binaries, libraries, and tools

  These files do not change after installation, and are not backed up. To restore these files, you can install the software again from the original media. You can also use a more generic disk backup tool to archive the contents of all directories beneath the server root.

Running the Backup Tool

Before you run `cmsbackup`, make sure that

- You are logged in as a user with permission to run `cmsbackup`, to run `db2bak` for the LDAP servers, and to write to the output directory; you may need to become superuser on a UNIX system or Administrator on a Windows NT system.
- There is plenty of disk space in the output directory; the size of the backup archive will vary with the amount of data in your system, so you will learn from experience how much space you require.

The configuration that you back up, of course, will use all of your current passwords. You will need to remember the current passwords if you restore this data after you change some passwords.

To run `cmsbackup`:

1. Log in to the machine where your CMS instance is running and open a command shell.

2. Change to the CMS server instance directory in the server root. For example, if your server root is `/usr/netscape/server4` and the instance ID of the server you want to back up is `cmsinstance`:

   ```
   # cd /usr/netscape/server4/cert-cmsinstance
   ```

3. Execute the backup script: either `cmsbackup` on UNIX or `cmsbackup.bat` on Windows NT systems. For example,

   ```
   # ./cmsbackup
   ```

The script will run. Control returns to the command prompt when the script has finished.

After You Finish a Backup

Immediately after running the backup tool, you should check the log file to make sure that all systems were archived successfully. The log file is

```
<server_root>/cert-<instance>/logs/cmsbackup.log
```

If the any part of the backup was not successful, there will be a message labeled `WARNING` or `ERROR` that tells you why. Most of the time, the problems are the result of directories or files that are missing or inaccessible to the user running `cmsbackup`. If necessary, change the permissions on the required files, delete the zip archive in the output directory, and run `cmsbackup` again.

Once you have a successful zip archive, you should secure it. The output directory is probably accessible to any user on the system, and it may be on the same physical disk as the server instance itself. You want to make sure the archive is not accessible to unauthorized users and that you can use the archive if there is a system hardware failure. Remember, the archive contains a database of private keys. Although it is not easy to extract a key from the database without the correct passwords, you do not want anyone to have the opportunity to try.

Move the zip archive to another machine or removable medium. If possible, encrypt the archive (do not use the private keys stored in your CMS server's database, since they may not be available when you need to restore the data). If you copy the archive to removable media such as tape or CD, make sure the copy is kept in a limited-access, locked area.

Restoring Data

The purpose of creating back up archives, of course, is to allow you to restore a previous state of the CMS server instance after a hardware or software failure corrupts your current state. The restore tool allows you to recover all or part of the configuration that was backed up. For example, you can use the tool to restore just the internal database of a CMS server instance.

A special case, automatic restore, allows you to completely restore the configuration from the latest backup archive quickly and without interaction.

Before You Restore Data

Before you can restore from a backup archive, the archive you want to use has to be available on a disk accessible from the server instance directory. If you want to use the automatic restore feature, you should put the archive in the output directory where `cmsbackup` originally created it (`C:\Temp` on Windows NT or `/var/tmp` on UNIX).

Note the full path name to the backup archive; in the instructions later it will be referred to as `<archive_path>`. For example, on a UNIX system, the `<archive_path>` might be

```
/var/tmp/CMS_cmsdemo_BACKUP-19991115093827.zip.
```

You can use the word `automatic` instead of a path name to indicate the location of the backup archive. If you use `automatic`, the restore tool will read the file `logs/latest_backup` to find the path name of the archive. This file is created by `cmsbackup` and contains the name of the last archive created. Note that `automatic` always causes *all* data to be restored: you will not be able to select only a subset of the data.

If you moved the zip archive to another machine or removable medium, copy it back to the local file system. If you encrypted the archive, decrypt it before you try to restore the data.

You cannot restore data to a CMS instance that has not been configured. If you re-installed CMS prior to attempting to restore data, you must configure the new CMS instance. When you configure the new installation, keep the following points in mind:

- All services should be running on the same network ports as they were when the backup archive was created. For example, the administration console port is a random number by default; be sure to change the default to the same port that your original installation used.

- During configuration, you still need to create new keys and certificates for any servers that use the internal token. You only need to create these keys to complete the configuration process. Your signing, SSL, or DRM transport certificates will be restored (replacing whatever you create during the new configuration) when you run the restore script.

The user running the restore tool will probably need superuser (UNIX) or Administrator (Windows NT) privileges. The user running the tool will need privileges to do the following:

- Read the backup zip archive
- Create a temporary working directory in the directory where the archive is located
- Create directories and files in the server root and server instance directories (for example, if the `CMS.cfg` file needs to be restored)
- Run the `bak2db` tool for any Netscape Directory Servers that are being restored
- (UNIX) Change file ownership of the LDAP database backup files to the directory server user. The directory server user is defined by the `localuser` parameter in `slapd.conf`. If the directory server user is different from the user running `cmsrestore`, the user running the tool must be able to run `chown` to change the owner of the files to the LDAP server user (typically only the superuser has this privilege).

The process of restoring data will require that some servers be stopped and restarted. If any of your servers require passwords to start (for example, if they need to unlock the key database in order to listen for SSL requests), you will be prompted for the password. If any passwords have changed since you created the backup archive, make sure you know the password that was valid at the time the archive was created.

Running the Restore Tool

To run `cmsrestore`:

1. Log in to the machine where the CMS instance you want to restore is installed and open a command shell.
2. Change to the CMS server instance directory in the server root. For example, if your server root is `/usr/netscape/server4` and the instance ID of the server you want to restore is `cmsinstance`:

   ```
   # cd /usr/netscape/server4/cert-cmsinstance
   ```

3. Execute the restore script: either `cmsrestore` on UNIX or `cmsrestore.bat` on Windows NT systems.

   You can either provide the `<archive_path>` as an argument or use the argument `automatic` (to read the archive path from `logs/latest_backup`):

   ```
   # ./cmsrestore <archive_path> | automatic
   ```

   For example,

   ```
   # ./cmsrestore \
   /var/tmp/CMS_cmsdemo_BACKUP-19991115093827.zip
   ```

   If you use `automatic` as the argument, the restore proceeds automatically; go to Step 9 when `cmsrestore` completes.

4. The script asks if you would like to perform a complete or prompted restore. Enter

   - `c` (complete) to completely restore the contents of the archive without further prompts. Proceed with Step 9 when the restore is complete.
   - `p` (prompted) to have the script ask you whether you want to restore specific parts of the archive.

5. If the configuration directory server is located in the same server root, the first prompt asks if you want to restore it. The configuration directory server is the directory used by the Administration Server to store information about servers, users, and groups.

   If you answer `yes`, the restore tool stops the directory server, restores the data, then restarts the server. You may be asked to enter a password if one is required to start the server.

6. Next you are asked if you want to restore selected Administration Server data.

   If you answer `no`, no Administration Server data will be restored; proceed with the next step.

   If you answer `yes`, you will be asked three more questions about specific Administration Server data you want to restore:

   a. Main admin data is data in the Administration Server's config directory.

   b. Non-CMS shared data is data in the `<server_root>/shared/config` directory.

   c. Non-CMS certificate and key databases are the databases in the `<server_root>/alias` directory; CMS instances maintain their own `alias` directories in the instance subdirectories.

After you answer the questions, the Administration Server is stopped, the data restored from the archive, and the server is started again. If necessary, you will be prompted to enter a password to start the Administration Server.

7. Next you are asked if you want to restore the CMS internal database directory server. This is the directory server this CMS instance uses as its internal database.

   If you answer `yes`, the restore tool stops the directory server, restores the data, then restarts the server. You may be asked to enter a password if one is required to start the server.

8. Next you are asked if you want to restore selected data for this CMS server instance.

   If you answer `yes`, you will be asked four more questions about the following CMS server instance data that you can restore:

   a. Global CMS classes are Java classes that are shared by all CMS servers in the same server root.

   b. Critical CMS data includes the configuration files, certificate and key databases, and password cache in the `config` directory for this CMS instance.

   c. Local CMS classes are Java classes used only by this server instance.

   d. Custom CMS UI data includes all HTML files and templates in the web subdirectory of this CMS instance.

   After you answer these questions, the tool stops the CMS server, restores the data, then restarts the server. You will be asked to enter the single sign-on password that unlocks the password cache when the server restarts (see section “Password Cache” in Chapter 8, “Starting and Stopping CMS Instances” of *CMS Installation and Setup Guide*.)

9. After the tool finishes restoring data, view the `cmsrestore.log` file in the server instance `logs` directory.

   Review each step to make sure there were no errors in restoring the data. If there were errors or warnings, you may want to run cmsrestore again. You may need to change permissions on some files or manually start some servers before running `cmsrestore` again.

The restore tool deletes the working directory where it unpacked the archive, but it does not delete the archive itself. You probably will not want to keep the backup archive on disk. Remember that the backup archive contains sensitive information. Delete or secure the archive when you are done using it to restore data.

Chapter 7

ASCII to Binary Tool

You can use the ASCII to Binary tool to convert ASCII base-64 encoded data to binary base-64 encoded data.

This chapter has the following sections:

Availability

This tool is available for AIX 4.3, OSF/1 v4.0D, Solaris 2.6 (SunOS 5.6), Solaris 8, and Windows NT 4.0.

Syntax

To run the ASCII to Binary tool, type the following command:

```
AtoB[.bat] <input_file> <output_file>
```

`.bat` specifies the file extension; this is required only when running the utility on a Windows NT system.

`<input_file>` specifies the path to the file that contains the base-64 encoded data in ASCII format.

`<output_file>` specifies the path to the file to write the base-64 encoded data in binary format.

Example

```
AtoB.bat C:\test\data.in C:\test\data.out
```

The above command takes the base-64 encoded data (in ASCII format) in the file named `data.in` and writes the binary equivalent of the data to the file named `data.out`.

Chapter 8

Binary to ASCII Tool

You can use the Binary to ASCII tool to convert binary base-64 encoded data to ASCII base-64 encoded data.

The chapter has the following sections:

Availability

This tool is available for AIX 4.3, OSF/1 v4.0D, Solaris 2.6 (SunOS 5.6), Solaris 8, and Windows NT 4.0.

Syntax

To run the Binary to ASCII tool, type the following command:

```
BtoA[.bat] <input-file> <output_file>
```

`.bat` specifies the file extension; this is required only when running the utility on a Windows NT system.

`<input_file>` specifies the path to the file that contains the base-64 encoded data in binary format.

`<output_file>` specifies the path to the file to write the base-64 encoded data in ASCII format.

Example

```
BtoA.bat C:\test\data.in C:\test\data.out
```

The above command takes the base-64 encoded data (in binary format) in the file named `data.in` and writes the ASCII equivalent of the data to the file named `data.out`.

Chapter 9

Pretty Print Certificate Tool

You can use the Pretty Print Certificate tool to print the contents of a certificate stored as ASCII base-64 encoded data in a human-readable form.

The chapter has the following sections:

Availability

This tool is available for AIX 4.3, OSF/1 v4.0D, Solaris 2.6 (SunOS 5.6), Solaris 8, and Windows NT 4.0.

Syntax

To run the Pretty Print Certificate tool, type the following command:

```
PrettyPrintCert[.bat] <input_file> [<output_file>]
```

`.bat` specifies the file extension; this is required only when running the utility on a Windows NT system.

`<input_file>` specifies the path to the file that contains the base-64 encoded certificate.

`<output_file>` specifies the path to the file to write the certificate. This argument is optional; if you don't specify an output file, the certificate information is written to the standard output.

Example

```
PrettyPrintCert.bat C:\test\cert.in C:\test\cert.out
```

The above command takes the base-64 encoded certificate in the `cert.in` file and writes the certificate in the pretty-print form to the output file named `cert.out`.

The base-64 encoded certificate (content of the `cert.in` file) would look similar to this:

```
-----BEGIN CERTIFICATE-----

MIIC2DCCAkGgAwIBAgICEAwwDQYJKoZIhvcNAQEFBQAwfDELMAkGA1UEBhMCVVMxIzAhBgNVBAoT
GlBhbG9va2FWaWxsZSBXaWRnZXRzLCBJbmMuMR0wGwYDVQQLExRXaWRnZXQgTWFrZXJzICdSJyBV
czEpMCcGA1UEAxMgVGVzdCBUZXN0IFRlc3QgVGVzdCBUZXN0IFRlc3QgQ0EwHhcNOTkwMjE4MDMM
zM5WhcNMDAwMjE4MDM0MzM5WjCBrjELMAkGA1UEBhMCVVMxJjAkBgNVBAoTHU5ldHNjYXBlIENvb
W11bmljYXRpb25zIENvcnAuMRUwEwYDVQQLEwOZXRzY2FwZSBDTVMxGDAWBEBEwhtaGFybXNlbjE
fMB0GA1UEAxMWaW50ZGV2Y2EgQWRtaW5pcwp0frfJOObeiSsia3BuifRHBNw95ZZQR9NIXr1x5bE

-----END CERTIFICATE-----
```

The certificate in pretty-print form (content of the `cert.out` file) would look similar to this:

```
Certificate:
   Data:
      Version:  v3
      Serial Number: 0x100C
      Signature Algorithm: OID.1.2.840.113549.1.1.5 -1.2.840.113549.1.1.5
      Issuer: CN=Test CA,OU=Widget Makers 'R'Us,O=Siroe Corp ,
            Widgets\,Inc.,C=US
      Validity:
           Not Before: Wednesday, February 17, 1999 7:43:39 PM
           Not  After: Thursday, February 17, 2000 7:43:39 PM
      Subject: MAIL=admin@siroe.com,CN=testCA,Administrator,  UID=admin,
            OU=IS, O=Siroe Corp.,C=US
      Subject Public Key Info:
           Algorithm: RSA - 1.2.840.113549.1.1.1
           Public Key:
             30:81:89:02:81:81:00:DE:26:B3:C2:9D:3F:7F:FA:DF:
             24:E3:9B:7A:24:AC:89:AD:C1:BA:27:D1:1C:13:70:F7:
             96:59:41:1F:4D:21:7A:F5:C7:96:C4:75:83:35:9F:49:
             E4:B0:A7:5F:95:C4:09:EA:67:00:EF:BD:7C:39:92:11:
             31:F2:CA:C9:16:87:B9:AD:B8:39:69:18:CE:29:81:5F:
```

```
        F3:4D:97:B9:DF:B7:60:B3:00:03:16:8E:C1:F8:17:6E:
        7A:D2:00:0F:7D:9B:A2:69:35:18:70:1C:7C:AE:12:2F:
        0B:0F:EC:69:CD:57:6F:85:F3:3E:9D:43:64:EF:0D:5F:
        EF:40:FF:A6:68:FD:DD:02:03:01:00:01:

Extensions:
     Identifier: 2.16.840.1.113730.1.1
       Critical: no
       Value: 03:02:00:A0:

     Identifier: Authority Key Identifier - 2.5.29.35
       Critical: no
       Key Identifier:
          EB:B5:11:8F:00:9A:1A:A6:6E:52:94:A9:74:BC:65:CF:
          07:89:2A:23:

Signature:
     Algorithm: OID.1.2.840.113549.1.1.5 - 1.2.840.113549.1.1.5
     Signature:
       3E:8A:A9:9B:D1:71:EE:37:0D:1F:A0:C1:00:17:53:26:
       6F:EE:28:15:20:74:F6:C5:4F:B4:E7:95:3C:A2:6A:74:
       92:3C:07:A8:39:12:1B:7E:C4:C7:AE:79:C8:D8:FF:1F:
       D5:48:D8:2E:DD:87:88:69:D5:3A:06:CA:CA:9C:9A:55:
       DA:A9:E8:BF:36:BC:68:6D:1F:2B:1C:26:62:7C:75:27:
       E2:8D:24:4A:14:9C:92:C6:F0:7A:05:A1:52:D7:CC:7D:
       E0:9D:6C:D8:97:3A:9C:12:8C:25:48:7F:51:59:BE:3C:
       2B:30:BF:EB:0A:45:7D:A6:49:FB:E7:BE:04:05:D6:8F:
```

Example

Chapter 10

Pretty Print CRL Tool

You can use the Pretty Print CRL tool to print the contents of a CRL stored as ASCII base-64-encoded data in a human-readable form.

The chapter has the following sections:

Availability

This tool is available for AIX 4.3, OSF/1 v4.0D, Solaris 2.6 (SunOS 5.6), Solaris 8, and Windows NT 4.0.

Syntax

To run the Pretty Print CRL tool, type the following command:

```
PrettyPrintCrl[.bat] <input_file> [<output-file>]
```

`.bat` specifies the file extension; this is required only when running the utility on a Windows NT system.

`<input_file>` specifies the path to the file that contains the base-64 encoded CRL.

`<output_file>` specifies the path to the file to write the CRL. This argument is optional; if you don't specify an output file, the CRL information is written to the standard output.

Example

```
PrettyPrintCrl.bat C:\test\crl.in C:\test\crl.out
```

The above command takes the base-64 encoded CRL in the `crl.in` file and writes the CRL in the pretty-print form to the output file named `crl.out`.

The base-64 encoded CRL (content of the `crl.in` file) would look similar to this:

```
-----BEGIN CRL-----

MIIBkjCBAIBATANBgkqhkiG9w0BAQQFADAsMREwDwYDVQQKEwhOZXRzY2FwZTEXMBUGA1UEA
xMOQ2VydDQwIFRlc3QgQ0EXDTk4MTIxNzIyMzcyNFowgaowIAIBExcNOTgxMjE1MTMxODMyW
jAMMAoGA1UdFQQDCgEBMCACARIXDTk4MTIxNTEzMjA0MlowDDAKBgNVHRUEAwoBAjAgAgERF
w05ODEyMTYxMjUxNTRaMAwwCgYDVR0VBAMKAQEwIAIBEBcNOTgxMjE3MTAzNzI0WjAMMAoGA
1UdFQQDCgEDMCACAQoXDTk4MTEyNTEzMTExOFowDDAKBgNVHRUEAwoBATANBgkqhkiG9w0BQ
QFAAOBgQBCN85O0GPTnHfImYPROvoorx7HyFz2ZsuKsVblTcemsX0NL7DtOa+MyY0pPrkXgm
157JrkxEJ7GBOeogbAS6iFbmeSqPHj8+JBH5stJNnfTCuhaM6Wx63Wc9LwZXOXTPsvpGxq0Y
I0+DPfBZlI3z4lCsNczxJV+9NkeMrheEg==

-----END CRL-----
```

The CRL in pretty-print form (content of the `crl.out` file) would look similar to this:

```
Certificate Revocation List:

    Data:

        Version:  v2

        Signature Algorithm: MD5withRSA - 1.2.840.113549.1.1.4

        Issuer: CN=Cert40 Test CA,O=Netscape

        This Update: Thu Dec 17 14:37:24 PST 1998

        Revoked Certificates:

            Serial Number: 0x13
            Revocation Date: Tuesday, December 15, 1998 5:18:32 AM
            Extensions:
                Identifier: Revocation Reason - 2.5.29.21
                Critical: no
                Reason: Key_Compromise

            Serial Number: 0x12
            Revocation Date: Tuesday, December 15, 1998 5:20:42 AM
            Extensions:
                Identifier: Revocation Reason - 2.5.29.21
                Critical: no
                Reason: CA_Compromise
```

```
    Serial Number: 0x11
    Revocation Date: Wednesday, December 16, 1998 4:51:54 AM
    Extensions:
        Identifier: Revocation Reason - 2.5.29.21
        Critical: no
        Reason: Key_Compromise

    Serial Number: 0x10
    Revocation Date: Thursday, December 17, 1998 2:37:24 AM
    Extensions:
        Identifier: Revocation Reason - 2.5.29.21
        Critical: no
        Reason: Affiliation_Changed

    Serial Number: 0xA
    Revocation Date: Wednesday, November 25, 1998 5:11:18 AM
    Extensions:
        Identifier: Revocation Reason - 2.5.29.21
        Critical: no
        Reason: Key_Compromise

Signature:
    Algorithm: MD5withRSA - 1.2.840.113549.1.1.4
    Signature:
        42:37:CE:4E:D0:63:D3:9C:77:C8:99:83:D1:3A:FA:28:
        AF:1E:C7:C8:5C:F6:66:CB:8A:B1:56:E5:4D:C7:A6:B1:
        7D:0D:2F:B0:ED:39:AF:8C:C9:8D:29:3E:B9:17:82:6D:
        79:EC:9A:E4:C4:42:7B:18:13:9E:A2:06:C0:4B:A8:85:
        6E:67:92:A8:F1:E3:F3:E2:41:1F:9B:2D:24:D9:DF:4C:
        2B:A1:68:CE:96:C7:AF:F7:5B:F7:3D:2F:06:57:39:74:
        CF:B2:FA:46:C6:AD:18:60:8D:3E:0C:F7:C1:66:52:37:
        CF:89:42:B0:D7:33:C4:95:7E:F4:D9:1E:32:B8:5E:12:
```

Example

Chapter 11

Certificate Database Tool

Certificate Database Tool is a command-line utility that can create the certificate database file (`cert7.db`) for Certificate Management System. The utility can also list, generate, modify, or delete certificates within the file.

Certificate database management tasks are part of a process that typically also involves managing key databases (`key3.db` files). The key and certificate management process generally begins with creating keys in the key database, then generating and managing certificates in the certificate database.

This chapter discusses certificate database management:

For information on key database and security module database management, see Chapter 12, “Key Database Tool” and Chapter 16, “Security Module Database Tool.”

Availability

This tool is available for AIX 4.3, OSF/1 v4.0D, Solaris 2.6 (SunOS 5.6), Solaris 8, and Windows NT 4.0.

Syntax

To run Certificate Database Tool, type the following command:

`certutil` *option* [*arguments*]

where *options* and *arguments* are combinations of the options and arguments listed in the following section. Each command takes one option. Each option may take zero or more arguments. To see a usage string, issue the command without options, or with the `-H` option.

Options and Arguments

Options specify an action and are uppercase. Option arguments modify an action and are lowercase. Certificate Database Tool command options and their arguments are defined as follows:

Table 11-1 Command options and their arguments

Option	Description
`-N`	Create a new certificate database.
`-S`	Create an individual certificate and add it to a certificate database.
`-R`	Create a certificate-request file that can be submitted to a certificate authority (CA) for processing into a finished certificate. Output defaults to standard out unless you use `-o` *output-file* argument.
	Use the `-a` argument to specify ASCII output.
`-C`	Create a new binary certificate file from a binary certificate-request file. Use the `-i` argument to specify the certificate-request file. If this argument is not used Certificate Database Tool prompts for a filename.
`-A`	Add an existing certificate to a certificate database. The certificate database should already exist; if one is not present, this option will initialize one by default.
`-L`	List all the certificates, or display information about a named certificate, in a certificate database.
	Use the `-h` *tokenname* argument to specify the certificate database on a particular hardware or software token.
`-V`	Check the validity of a certificate and its attributes.
`-M`	Modify a certificate's trust attributes using the values of the `-t` argument.

Table 11-1 Command options and their arguments

`-H`	Display a list of the options and arguments used by Certificate Database Tool.
Argument	
`-a`	Use ASCII format or allow the use of ASCII format for input or output. This formatting follows RFC #1113. For certificate requests, ASCII output defaults to standard output unless redirected.
`-b` *validity-time*	Specify a time at which a certificate is required to be valid. Use when checking certificate validity with the `-V` option. The format of the *validity-time* argument is `"YYMMDDHHMMSS[+HHMM|-HHMM|Z]"`. Specifying seconds (SS) is optional. When specifying an explicit time, use `"YYMMDDHHMMSSZ".` When specifying an offset time, use `"YYMMDDHHMMSS+HHMM"` or `"YYMMDDHHMMSS-HHMM".` If this option is not used, the validity check defaults to the current system time.
`-c` *issuer*	Identify the certificate of the CA from which a new certificate will derive its authenticity. Use the exact nickname or alias of the CA certificate, or use the CA's email address. Bracket the *issuer* string with quotation marks if it contains spaces.
`-d` *certdir*	Specify a directory containing a certificate database file. On Unix Certificate Database Tool defaults to `$HOME/.netscape` (that is, `~/.netscape`). On Windows NT the default is the current directory. The `cert7.db` and `key3.db` database files must reside in the same directory.
`-e`	Check a certificate's signature during the process of validating a certificate.
`-f` *password-file*	Specify a file that will automatically supply the password to include in a certificate or to access a certificate database. This is a plain-text file containing one password. Be sure to prevent unauthorized access to this file.
`-h` *tokenname*	Specify the name of a token to use or act on. Unless specified otherwise the default token is an internal slot (specifically, internal slot 2). This slot can also be explicitly named with the string `"internal"`. An internal slots is a virtual slot maintained in software, rather than a hardware device. Internal slot 2 is used by key and certificate services. Internal slot 1 is used by cryptographic services.
`-i` *cert|cert-request-file*	Specify a specific certificate, or a certificate-request file.
`-k` *shortkeyID*	Specify the public key to use when creating a certificate or certificate request. The *shortkeyID* is the first few bytes of the keyID (as shown by the `keyutil -L` command), starting from the second byte, with a length sufficient to identify it uniquely.

Table 11-1 Command options and their arguments

`-l`	Display detailed information when validating a certificate with the `-V` option.
`-m` *serial-number*	Assign a unique serial number to a certificate being created. This operation should be performed by a CA. The default serial number is 0 (zero). Serial numbers are limited to integers.
`-n` *certname*	Specify the nickname of a certificate to list, create, add to a database, modify, or validate. Bracket the *certname* string with quotation marks if it contains spaces.
`-o` *output-file*	Specify the output file name for new certificates or binary certificate requests. Bracket the *output-file* string with quotation marks if it contains spaces. If this argument is not used the output destination defaults to standard output.
`-p` *phone*	Specify a contact telephone number to include in new certificates or certificate requests. Bracket this string with quotation marks if it contains spaces.
`-r`	Display a certificate's binary DER encoding when listing information about that certificate with the `-L` option.
`-s` *subject*	Identify a particular certificate owner for new certificates or certificate requests. Bracket this string with quotation marks if it contains spaces. The subject identification format follows RFC #1485.
`-t` *trustargs*	Specify the trust attributes to modify in an existing certificate or to apply to a certificate when creating it or adding it to a database. There are three available trust categories for each certificate, expressed in this order: "*SSL*, *email*, *object signing*". In each category position use zero or more of the following attribute codes: `p` Valid peer `P` Trusted peer (implies `p`) `c` Valid CA `T` Trusted CA to issue client certificates (implies `c`) `C` Trusted CA to issue server certificates (SSL only) (implies `c`) `u` Certificate can be used for authentication or signing `w` Send warning (use with other attributes to include a warning when the certificate is used in that context) The attribute codes for the categories are separated by commas, and the entire set of attributes enclosed by quotation marks. For example: `-t "TCu,Cu,Tuw"` Use the `-L` option to see a list of the current certificates and trust attributes in a certificate database.

Table 11-1 Command options and their arguments

`-u` *certusage*	Specify a usage context to apply when validating a certificate with the `-V` option. The contexts are the following: `C` (as an SSL client) `V` (as an SSL server) `S` (as an email signer) `R` (as an email recipient)
`-v` *valid-months*	Set the number of months a new certificate will be valid. The validity period begins at the current system time unless an offset is added or subtracted with the `-w` option. If this argument is not used, the default validity period is three months. When this argument is used, the default three-month period is automatically added to any value given in the *valid-month* argument. For example, using this option to set a value of `3` would cause 3 to be added to the three-month default, creating a validity period of six months. You can use negative values to reduce the default period. For example, setting a value of `-2` would subtract 2 from the default and create a validity period of one month.
`-w` *offset-months*	Set an offset from the current system time, in months, for the beginning of a certificate's validity period. Use when creating the certificate or adding it to a database. Express the offset in integers, using a minus sign (`-`) to indicate a negative offset. If this argument is not used, the validity period begins at the current system time. The length of the validity period is set with the `-v` argument.
`-x`	Use Certificate Database Tool to generate the signature for a certificate being created or added to a database, rather than obtaining a signature from a separate CA.
`-y rsa|dsa`	Specify the type of key used to generate a new certificate, either RSA or DSA. The default is `rsa`.
`-1`	Add a key usage extension to a certificate that is being created or added to a database. This extension allows a certificate's key to be dedicated to supporting specific operations such as SSL server or object signing. Certificate Database Tool will prompt you to select a particular usage for the certificate's key. These usages are described under "Standard X.509 v3 Certifiate Extensions' in Appendix C of *CMS Plug-ins Guide.*
`-2`	Add a basic constraint extension to a certificate that is being created or added to a database. This extension supports the certificate chain verification process. Certificate Database Tool will prompt you to select the certificate constraint extension. Constraint extensions are described in "Standard X.509 v3 Certifiate Extensions' in Appendix C of *CMS Plug-ins Guide.*

Table 11-1 Command options and their arguments

`-3`	Add an authority key ID extension to a certificate that is being created or added to a database. This extension supports the identification of a particular certificate, from among multiple certificates associated with one subject name, as the correct issuer of a certificate. Certificate Database Tool will prompt you to select the authority key ID extension. Authority key ID extensions are described under "Standard X.509 v3 Certifiate Extensions' in Appendix C of *CMS Plug-ins Guide.*
`-4`	Add a CRL distribution point extension to a certificate that is being created or added to a database. This extension identifies the URL of a certificate's associated certificate revocation list (CRL). Certificate Database Tool prompts you to enter the URL.

Usage

Certificate Database Tool's capabilities are grouped as follows, using these combinations of options and arguments. Options and arguments in square brackets are optional, those without square brackets are required.

- Creating a new `cert7.db` file:

  `-N [-d` *certdir*`]`

- Creating a new certificate and adding it to the database with one command:

  `-S -k` *shortkeyID* `-y rsa|dsa -n` *certname* `-s` *subject*
  `[-c` *issuer* `|-x] -t` *trustargs* `[-h` *tokenname*`]`
  `[-m` *serial-number*`] [-v` *valid-months*`] [-w` *offset-months*`]`
  `[-d` *certdir*`] [-p` *phone*`] [-f` *password-file*`] [-1] [-2] [-3] [-4]`

- Making a separate certificate request:

  `-R -k` *shortkeyID* `-y rsa|dsa -s` *subject* `[-h` *tokenname*`]`
  `[-d` *certdir*`] [-p` *phone*`] [-o` *output-file*`] [-f` *password-file*`]`

- Creating a new binary certificate from a binary certificate request:

  `-C [-c` *issuer* `|-k` *shortkeyID* `-y rsa|dsa -x] [-f` *password-file*`]`
  `[-h` *tokenname*`] -i` *cert-request-file* `-o` *output-file* `[-m` *serial-number*`]`
  `[-v` *valid-months*`] [-w` *offset-months*`] [-d` *certdir*`] [-1] [-2] [-3]`
  `[-4]`

- Adding a certificate to an existing database:

  `-A -n` *certname* `-t` *trustargs* `[-h` *tokenname*`] [-d` *certdir*`] [-a] [-i` *cert-request-file*`]`

- Listing all certificates or a named certificate:

  `-L [-n` *certname*`] [-d` *certdir*`] [-r] [-a]`

- Validating a certificate:

  `-V -n` *certname* `-b` *validity-time* `-u` *certusage* `[-e] [-l] [-d` *certdir*`]`

- Modifying a certificate's trust attribute:

  `-M -n` *certname* `-t` *trustargs* `[-d` *certdir*`]`

- Displaying a list of the options and arguments used by Certificate Database Tool:

  `-H`

Examples

This section contains examples for the following tasks:

- Creating a New Certificate Database
- Listing Certificates in a Database
- Creating a Certificate Request
- Creating a Certificate
- Adding a Certificate to the Database
- Validating a Certificate

Creating a New Certificate Database

This example creates a new certificate database (`cert7.db` file) in the specified directory:

`certutil -N -d` *certdir*

You must generate the associated `key3.db` and `secmod.db` files by using the Key Database Tool or other tools.

Listing Certificates in a Database

This example lists all the certificates in the `cert7.db` file in the specified directory:

`certutil -L -d` *certdir*

Certificate Database Tool displays output similar to the following:

```
Certificate Name              Trust Attributes

Uptime Group Plc. Class 1 CA        C,C,
VeriSign Class 1 Primary CA         ,C,
VeriSign Class 2 Primary CA         C,C,C
AT&T Certificate Services           C,C,
GTE CyberTrust Secure Server CA     C,,
Verisign/RSA Commercial CA          C,C,
AT&T Directory Services             C,C,
BelSign Secure Server CA            C,,
Verisign/RSA Secure Server CA       C,C,
GTE CyberTrust Root CA              C,C,
Uptime Group Plc. Class 4 CA        ,C,
VeriSign Class 3 Primary CA         C,C,C
Canada Post Corporation CA          C,C,
Integrion CA                        C,C,C
IBM World Registry CA               C,C,C
GTIS/PWGSC, Canada Gov. Web CA      C,C,
GTIS/PWGSC, Canada Gov. Secure CA   C,C,C
MCI Mall CA                         C,C,
VeriSign Class 4 Primary CA         C,C,C
KEYWITNESS, Canada CA               C,C,
BelSign Object Publishing CA        ,,C
BBN Certificate Services CA Root 1  C,C,
p    Valid peer
P    Trusted peer (implies p)
c    Valid CA
T    Trusted CA to issue client certs (implies c)
C    Trusted CA to issue server certs(for ssl only) (implies c)
u    User cert
w    Send warning
```

Creating a Certificate Request

This example generates a binary certificate request file named `e95c.req` in the specified directory:

```
certutil -R -s "CN=John Smith, O=Netscape, L=Mountain View,
ST=California, C=US" -p "650-555-8888" -k e95c -o e95c.req -d certdir
```

Before it creates the request file, Certificate Database Tool prompts you for a password:

```
Enter Password or Pin for "Communicator Certificate DB":
```

Creating a Certificate

A valid certificate must be issued by a trusted CA. If a CA key pair is not available, you can create a self-signed certificate (for purposes of illustration) with the `-x` argument. This example creates a new, self-signed binary certificate named `e95c.crt`, from a binary certificate request named `e95c.req`, in the specified directory.

```
certutil -C -i e95c.req -o e95c.crt -k e95c -m 1234
-f password-file -x -d certdir
```

The following example creates a new binary certificate named `one.crt`, from a binary certificate request named `one.req`, in the specified directory. It is issued by the self-signed certificate created above, `e95c.crt`.

```
certutil -C -m 2345 -i one.req -o one.crt -c e95c.crt -d certdir
```

Adding a Certificate to the Database

This example adds a certificate to the certificate database:

```
certutil -A -n jsmith@netscape.com -t "C,C,C" -i e95c.crt
-d certdir
```

You can see this certificate in the database with this command:

```
certutil -L -n jsmith@netscape.com -d certdir
```

Certificate Database Tool displays output similar to the following:

```
Certificate:
  Data:
    Version: 3 (0x2)
    Serial Number: 0 (0x0)
    Signature Algorithm: PKCS #1 MD5 With RSA Encryption
    Issuer: CN=John Smith, O=Netscape, L=Mountain View,
ST=California, C=US
    Validity:
```

```
        Not Before: Thu Mar 12 00:10:40 1998
        Not After: Sat Sep 12 00:10:40 1998
Subject: CN=John Smith, O=Netscape, L=Mountain View, ST=California,
C=US

Subject Public Key Info:
  Public Key Algorithm: PKCS #1 RSA Encryption
  RSA Public Key:
    Modulus:
        00:da:53:23:58:00:91:6a:d1:a2:39:26:2f:06:3a:
        38:eb:d4:c1:54:a3:62:00:b9:f0:7f:d6:00:76:aa:
        18:da:6b:79:71:5b:d9:8a:82:24:07:ed:49:5b:33:
        bf:c5:79:7c:f6:22:a7:18:66:9f:ab:2d:33:03:ec:
        63:eb:9d:0d:02:1b:da:32:ae:6c:d4:40:95:9f:b3:
        44:8b:8e:8e:a3:ae:ad:08:38:4f:2e:53:e9:e1:3f:
        8e:43:7f:51:61:b9:0f:f3:a6:25:1e:0b:93:74:8f:
        c6:13:a3:cd:51:40:84:0e:79:ea:b7:6b:d1:cc:6b:
        78:d0:5d:da:be:2b:57:c2:6f
    Exponent: 65537 (0x10001)
Signature Algorithm: PKCS #1 MD5 With RSA Encryption
Signature:
  44:15:e5:ae:c4:30:2c:cd:60:89:f1:1d:22:ed:5e:5b:10:c8:
  7e:5f:56:8c:b4:00:12:ed:5f:a4:6a:12:c3:0d:01:03:09:f2:
  2f:e7:fd:95:25:47:80:ea:c1:25:5a:33:98:16:52:78:24:80:
  c9:53:11:40:99:f5:bd:b8:e9:35:0e:5d:3e:38:6a:5c:10:d1:
  c6:f9:54:af:28:56:62:f4:2f:b3:9b:50:e1:c3:a2:ba:27:ee:
  07:9f:89:2e:78:5c:6d:46:b6:5e:99:de:e6:9d:eb:d9:ff:b2:
  5f:c6:f6:c6:52:4a:d4:67:be:8d:fc:dd:52:51:8e:a2:d7:15:
  71:3e

Certificate Trust Flags:
  SSL Flags:
    Valid CA
    Trusted CA
  Email Flags:
    Valid CA
    Trusted CA
  Object Signing Flags:
    Valid CA
    Trusted CA
```

Validating a Certificate

This example validates a certificate:

```
certutil -V -n jsmith@netscape.com -b 9803201212Z -u SR -e -l
-d certdir
```

Certificate Database Tool shows results similar to

```
Certificate:’jsmith@netscape.com’ is valid.
```

or

```
UID=jsmith, E=jsmith@netscape.com, CN=John Smith, O=Netscape
Communications Corp., C=US : Expired certificate
```

or

```
UID=jsmith, E=jsmith@netscape.com, CN=John Smith, O=Netscape
Communications Corp., C=US : Certificate not approved for this
operation
```

Chapter 12

Key Database Tool

Key Database Tool is a command-line utility that can modify the key database file (`key3.db`) of iPlanet Certificate Management System (CMS). You can use the utility to create or change the database password, generate new public and private key pairs, display the contents of the database, or delete key pairs from the database.

Key database management tasks are part of a process that typically also involves managing client certificate databases (`cert7.db` file). The key and certificate management process generally begins with creating keys in the key database, then generating and managing certificates in the certificate database.

This chapter discusses key database management. For information on certificate database and security module database management, see Chapter 11, “Certificate Database Tool” and Chapter 16, “Security Module Database Tool.”

This chapter has the following sections:

Availability

This tool is available for AIX 4.3, OSF/1 v4.0D, Solaris 2.6 (SunOS 5.6), Solaris 8, and Windows NT 4.0.

Syntax

To run Key Database Tool, type the command

`keyutil` *option* [*arguments*]

where *option* and *arguments* are combinations of the options and arguments listed in the following section. Each command takes one option. Each option may take zero or more arguments. To see a usage string, issue the command without options, or with the `-H` option.

Options and Arguments

Options specify an action and are uppercase. Option arguments modify an action and are lowercase. Key Database Tool options and their arguments are defined as follows:

Table 12-1 Description of options and arguments

Option	Description
`-N`	Create a new key database and set its password. Use the `-h` *tokenname* argument to specify a specific hardware or software token in which to create the new database.
`-C`	Change the password to a key database.
`-G`	Generate a new public and private key pair within a database. The key database should already exist; if one is not present, this option will initialize one by default. Some smart cards (for example, the Litronic card) can store only one key pair. If you create a new key pair for such a card, the previous pair is overwritten.
`-L`	List the keyID of keys in the key database. A keyID is the modulus of the RSA key or the `publicValue` of the DSA key. IDs are displayed in hexadecimal (“0x” is not shown). You can identify keys by a *shortkeyID*. The shortkeyID is the first few bytes of the keyID, starting from the second byte, with a length sufficient to identify it uniquely. Use the `-a` argument to list keys of all tokens. Otherwise the list will contain only keys in the default (internal) slot. Use the `-l` argument to list DSA as well as RSA keys.
`-P`	Display public key information on the screen.

Table 12-1 Description of options and arguments *(Continued)*

`-D`	Delete a private key from a key database. Specify the key to delete with the `-k` argument. Specify the database from which to delete the key with the `-d` argument. Use the `-t` argument to specify explicitly whether to delete a DSA or an RSA key. If you do not use the `-t` argument, the option looks for an RSA key matching the shortkeyID. When you delete keys, be sure to also remove any certificates associated with those keys from the certificate database, by using the Certificate Database Tool. Some smart cards (for example, the Litronic card) do not let you remove a public key you have generated. In such a case, only the private key is deleted from the key pair. You can display the public key with the command `keyutil -L -h` *tokenname.*
`-H`	Display a list of the options and arguments used by Key Database Tool.
Argument	**Description**
`-a`	List the RSA keys of all tokens when listing keys in the database.
`-d` *keydir*	Specify a directory containing a key database file. On Unix Key Database Tool defaults to `$HOME/.netscape` (that is, `~/.netscape`), and on Windows NT the default is the current directory. The `key3.db` and `cert7.db` database files must reside in the same directory.
`-e` *exp*	Set an alternate exponent value to use in generating a new RSA public key for the database, instead of the default value of `65537`. The available alternate values are `3` and `17`.
`-f` *noise-file*	Read a seed value from the specified binary file to use in generating a new RSA private and public key pair. This argument makes it possible to use hardware-generated seed values and unnecessary to manually create a value from the keyboard. The minimum file size is 20 bytes.
`-h` *tokenname*	Specify the name of a token to act on. Unless otherwise specified, the default token is an internal slot (specifically, internal slot 2). An internal slot is a virtual slot maintained in software, rather than a hardware device. Internal slot 2 is used by key and certificate services. Internal slot 1 is used by cryptographic services. Use the Module Database Tool (`modutil -list`) to get a list of token names in the module database.
`-k` *shortkeyID*	Specify a private key by using the key identifier. You can use the complete keyID (as shown by the `-L` option), or the shortkeyID. The shortkeyID is the first few bytes of the keyID, starting from the second byte, with a length sufficient to identify it uniquely. If you specify a shortkeyID that is not unique, the first private key that matches the shortkeyID is found.

Table 12-1 Description of options and arguments *(Continued)*

`-l`	List DSA as well as RSA keys when listing keys in the key database.
`-q` *pqgfile*	Read an alternate PQG value from the specified file when generating DSA key pairs. If this argument is not used, Key Database Tool generates its own PQG value. PQG files are created with a separate DSA utility.
`-s` *size*	Set a key size to use when generating new public and private key pairs. The minimum is `256` bits and the maximum is `1024 bits.` The default is `1024` bits. Any size between the minimum and maximum is allowed.
`-t rsa|dsa`	Specify the type of a key, either RSA or DSA. The default value is `rsa`. By specifying the type of key you can avoid mistakes caused by duplicate shortkeyIDs.
`-w` *password-file*	Specify a file to automatically supply the password necessary to access a key database. This is a plain-text file containing one password. You should not use this argument if you are accessing an internal slot and hardware tokens that use different passwords. Be sure to prevent unauthorized access to this file.

Usage

Key Database Tool's capabilities are grouped as follows, using these combinations of options and arguments. The specifications in square brackets are optional, those without square brackets are required.

- Creating a new `key3.db` file and setting its password:

  `-N [-d` *keydir*`] [-w` *password-file*`]`

- Changing the password to a key database file:

  `-C [-d` *keydir*`]`

- Generating new RSA key pairs in a key database file:

  `-G [-h` *tokenname*`] [-t rsa] [-s` *num*`][-e` *exp*`] [-d` *keydir*`]`
  `[-f` *noise-file*`] [-w` *password-file*`]`

- Generating new DSA key pairs in a key database file:

  `-G [-h` *tokenname*`] -t dsa [-q` *pqgfile* `-s` *num*`]`
  `[-d` *keydir*`] [-w` *password-file*`]`

- Listing the keyIDs of the keys in a database:

  `-L [-a] [-l] [-t rsa|dsa] [-h` *tokenname*`] [-d` *keydir*`]`

- Displaying public key information from the database:

  `-P -k` *shortkeyID* `[-t rsa|dsa] [-h` *tokenname*`]`
  `[-d` *keydir*`] [-w` *password-file*`]`

- Deleting private keys from a key database file:

  `-D -k` *shortkeyID* `[-t rsa|dsa] [-h` *tokenname*`]`
  `[-d` *keydir*`] [-w` *password-file*`]`

- Displaying a list of the options and arguments used by Key Database Tool:

  `-H`

Examples

Includes the following:

- Creating a Key Database
- Generating a New Key
- Displaying Public Key Information
- Listing Key IDs
- Deleting a Private Key

Creating a Key Database

This example creates new key database files (`key3.db and secmod.db`) in the specified directory:

`keyutil -N -d` *keydir*

Key Database Tool prompts you as follows:

```
Creating a brand new key database:keydir/key3.db
Database not initialized. Setting password.
Enter new password:
Re-enter password:
```

After you enter the password, Key Database Tool creates new `key3.db` and `secmod.db` files in the specified directory.

Generating a New Key

This example generates a new key in a key database:

`keyutil -G -d` *keydir*

Key Database Tool then displays the following:

```
--------------------------------------------------
Netscape Communications Corporation
Key Generation
--------------------------------------------------

Welcome to the key generator. With this program, you can
generate the public and private keys that you use for secure
communications.

A random seed must be generated that will be used in the
creation of your key. One of the easiest ways to create a random
seed is to use the timing of keystrokes on a keyboard.

You have specified the name 'mykey' for your key

If this is correct, press enter:

To begin, type keys on the keyboard until this progress meter is
full. DO NOT USE THE AUTOREPEAT FUNCTION ON YOUR KEYBOARD!

Continue typing until the progress meter is full:

|************************************************************|

Finished. Press enter to continue:

Generating key. This may take a few moments...

Password:

generated public/private key pair
```

Note that if you do not specify a token name, the key is generated on the internal slot. This is equivalent to the `-h internal` argument.

If you use the `-f` *noise-file* argument, Key Database Tool does not ask for keyboard input.

If you use the `-w` *password-file* argument, Key Database Tool reads the password from the file instead of asking for keyboard input. Avoid using this argument when you are accessing both the internal slot and tokens that have different passwords.

Displaying Public Key Information

This example prints the public key's information:

```
keyutil -P -k e95c -d keydir
```

The public key information appears after you give the correct password:

```
Password:

It's the first key found.
RSA Public-Key:
modulus:
00:e9:5c:4a:73:74:39:22:6d:c6:da:4e:b3:1f:01:26:9d:be:
d1:74:ae:cd:c7:7d:65:f9:1d:31:1f:71:fb:60:d0:45:46:5f:
5a:19:e7:61:1e:e7:ce:9f:4a:13:4e:d6:e9:06:90:2a:ba:bd:
0b:5f:7b:a3:28:21:1e:0f:1c:f4:3a:ba:3a:8f:0b:e1:99:91:
cc:e8:fd:17:d2:1c:66:13:6b:95:27:b1:eb:bc:9c:e6:7b:f0:
3a:b9:44:dc:24:a6:f8:83:9a:9e:80:3f:74:48:09:6b:3f:a6:
46:51:be:e0:1b:51:87:8c:44:94:f0:fe:41:fe:b4:9f:4c:0a:
04:a9:a1
publicExponent: 65537 (0x10001)
```

Listing Key IDs

This command lists the key IDs in the key database:

```
keyutil -L -d keydir
```

After you enter the password, Key Database Tool displays the following:

```
RSA Public-Key:
modulus:
00:e9:5c:4a:73:74:39:22:6d:c6:da:4e:b3:1f:01:26:9d:be:
d1:74:ae:cd:c7:7d:65:f9:1d:31:1f:71:fb:60:d0:45:46:5f:
5a:19:e7:61:1e:e7:ce:9f:4a:13:4e:d6:e9:06:90:2a:ba:bd:
0b:5f:7b:a3:28:21:1e:0f:1c:f4:3a:ba:3a:8f:0b:e1:99:91:
cc:e8:fd:17:d2:1c:66:13:6b:95:27:b1:eb:bc:9c:e6:7b:f0:
3a:b9:44:dc:24:a6:f8:83:9a:9e:80:3f:74:48:09:6b:3f:a6:
46:51:be:e0:1b:51:87:8c:44:94:f0:fe:41:fe:b4:9f:4c:0a:
04:a9:a1
```

When unmodified, this command lists all the RSA keys in the default (internal) slot. You can refine this command's output with the `-a`, `-h`, and `-l` arguments.

Deleting a Private Key

This example deletes a private key from the key database:

`keyutil -D -k e95c -d` *keydir*

When you delete keys, be sure to remove any certificates associated with those keys from the certificate database by using the Certificate Database Tool.

Chapter 13

Netscape Signing Tool

This chapter describes how to use version 1.3 of Netscape Signing Tool (`signtool` on the command line) to digitally sign software, including binary files intended for distribution via SmartUpdate, Java class files, and JavaScript scripts. Version 1.3 includes all the capabilities of, and is fully compatible with, previous versions of Netscape Signing Tool (.50, .60, 1.0, 1.1, and 1.2).

This chapter has these sections:

Introduction to Netscape Signing Tool

This section reviews basic concepts that you need to understand before you begin using version 1.3 of Netscape Signing Tool to sign files or JavaScript scripts. If you are already familiar with object-signing concepts, go straight to “Using Netscape Signing Tool” on page 89.

- Object-Signing Certificates

For a complete introduction to object signing technology, see *Netscape Object Signing: Establishing Trust for Downloaded Software* at this URL:

`http://developer.netscape.com/docs/manuals/signedobj/trust/index.htm`

What Is Netscape Signing Tool?

Netscape Signing Tool is a stand-alone command-line tool that creates digital signatures and uses the Java Archive (JAR) format to associate them with files in a directory. It is intended for use by system administrators and by developers who want to distribute software electronically over the Internet.

Netscape Signing Tool 1.3 is available for AIX 4.3, OSF / 1 v4.0D, Solaris 2.6 (SunOS 5.6), Solaris 8, and Windows NT 4.0.

This chapter describes how to use Netscape Signing Tool 1.3 to sign Java applets, JavaScript scripts, plug-ins, and other files and how to package the signed objects in a *JAR archive* (also called a *JAR file*), which is a digital envelope for a compressed collection of files. Communicator client software uses JAR archives to install or update software automatically.

Electronic software distribution over any network involves potential security problems. To help address some of these problems, you can associate digital signatures with the files in a JAR archive. Digital signatures allow Communicator to perform two operations that are important to end users:

- Confirm the identity of the individual, company, or other entity whose digital signature is associated with the files
- Check whether the files have been tampered with since being signed

You do not need to understand the technical details of JAR archives or digital signatures to use Netscape Signing Tool. However, you do need some familiarity with the concepts described in the rest of this chapter. If you are already familiar with basic object-signing concepts, go straight to “Using Netscape Signing Tool” on page 89.

JAR Format and JAR Archives

The *Java Archive (JAR) format* **is** a set of conventions for associating digital signatures, installer scripts, and other information with files in a directory. Signing tools such as Netscape Signing Tool allow you to sign files using the JAR format and package them as a single JAR file. JAR files are used by Communicator client software to support automatic software installation, user-controlled access to local system resources by Java applets, and other features that help address potential security problems.

The *JAR file type* is a registered Internet MIME type based on the standard cross-platform ZIP archive format. A JAR file functions as a digital envelope for a compressed collection of files. The JAR file type is distinct from the JAR format, which is simply a way of organizing information in a directory.

Because the JAR format doesn't require a digital signature to be stored physically inside the file with which it is associated, JAR files are extremely flexible. You can use Netscape Signing Tool to sign any files, including Java class files, Communicator plug-ins, or any other kind of document or application. You can also use version 1.1 and later versions of Netscape Signing Tool to sign inline JavaScript scripts.

You must create a JAR file if you want to take advantage of Communicator's SmartUpdate feature. Communicator can automatically locate, download, and install components, plug-ins, and Java classes on a user's machine, thus freeing the user from this chore. Automatic software installation also helps both software developers who want to distribute software and updates over the Internet and system administrators using Mission Control to manage a corporate intranet.

You don't need to know anything else about the JAR format to use Netscape Signing Tool, which takes care of the details for you. For detailed information about the JAR format, see *The Jar Format* at this URL:

`http://developer.netscape.com/docs/manuals/signedobj/jarfile/index.html`

For detailed information about using the JAR Installation Manager to package your software for use with SmartUpdate, see *Using JAR Installation Manager for SmartUpdate* at this URL:

`http://developer.netscape.com/docs/manuals/communicator/jarman/index.htm`

What Signing a File Means

If you have a signing certificate, you can use Netscape Signing Tool to digitally sign files and package them as a JAR file**.** An *object-signing certificate* is a special kind of certificate that allows you to associate your digital signature with one or more files. For information about obtaining an object-signing certificate, see *Object-Signing Tools* at this URL:

```
http://developer.netscape.com/docs/manuals/index.html?content=security.html
```

An individual file can potentially be signed with multiple digital signatures. For example, a commercial software developer might sign the files that constitute a software product to prove that the files are indeed from a particular company. A network administrator manager might sign the same files with an additional digital signature based on a company-generated certificate to indicate that the product is approved for use within the company.

The significance of a digital signature is comparable to the significance of a handwritten signature. Once you have signed a file, it is difficult to claim later that you didn't sign it. In some situations, a digital signature may be considered as legally binding as a handwritten signature. Therefore, you should take great care to ensure that you can stand behind any file you sign and distribute.

For example, if you are a software developer, you should test your code to make sure it is virus-free before signing it. Similarly, if you are a network administrator, you should make sure, before signing any code, that it comes from a reliable source and will run correctly with the software installed on the machines to which you are distributing it.

Object-Signing Certificates

Before you can use Netscape Signing Tool to sign files, you must have an object-signing certificate, which is a special certificate whose associated private key is used to create digital signatures.

For testing purposes only, you can create an object-signing certificate with Netscape Signing Tool 1.3. When testing is finished and you are ready to disitribute your software, you should obtain an object-signing certificate from one of two kinds of sources:

- An independent certificate authority (CA) that authenticates your identity and charges you a fee. You typically get a certificate from an independent CA if you want to sign software that will be distributed over the Internet.

- CA server software running on your corporate intranet or extranet. iPlanet Certificate Management System provides a complete management solution for creating, deploying, and managing certificates, including CAs that issue object-signing certificates.

You must also have a certificate for the CA that issues your signing certificate before you can sign files. If the certificate authority's certificate isn't already installed in your copy of Communicator, you typically install it by clicking the appropriate link on the certificate authority's web site, for example on the page from which you initiated enrollment for your signing certificate. This is the case for some test certificates, as well as certificates issued by iPlanet Certificate Management System: you must download the the CA certificate in addition to obtaining your own signing certificate. CA certificates for several certificate authorities are preinstalled in the Communicator certificate database.

When you receive an object-signing certificate for your own use, it is automatically installed in your copy of the Communicator client software. Communicator supports the public-key cryptography standard known as PKCS #12, which governs key portability. You can, for example, move an object-signing certificate and its associated private key from one computer to another on a credit-card-sized device called a smart card. For motr information, see “Using Netscape Signing Tool with Smart Cards” on page 104.

Using Netscape Signing Tool

This section describes how to use Netscape Signing Tool to create digital signatures for files in a directory and to associate the signatures with the files according to the JAR format. Netscape Signing Tool also provides an option that automatically creates a JAR file containing the directory; this option was not implemented in pre-1.0 versions. For maximum flexibility, and for compatibility with scripts that used earlier versions of Netscape Signing Tool, you can still use a ZIP utility to create the JAR file.

- Getting Ready to Use Netscape Signing Tool
- Signing a File
- Using Netscape Signing Tool with a ZIP Utility
- Tips and Techniques

For a complete list of Netscape Signing Tool command-line options, see “SignTool Syntax and Options” on page 95.

Getting Ready to Use Netscape Signing Tool

Before using Netscape Signing Tool, you must have the `signtool` executable in your path environment variable. You must also have an object-signing certificate.

Netscape Signing Tool includes an option that allows you to generate an object-signing certificate for testing purposes. For information about using this option, see “Generating Test Object-Signing Certificates” on page 102.

Although suitable for testing purposes, the object-signing certificate produced by Netscape Signing Tool is not recommended for signing finished software that will be widely distributed over the Internet or an intranet. When you are ready to sign finished software, you will need to get an object-signing certificate from your company’s internal certificate authority, if it has one, or from a third-party certificate authority.

The sections that follow describe how to prepare Netscape Signing Tool for signing files.

Setting Up Your Certificate

These instructions apply to an object-signing certificate obtained from a third party or an in-house CA for use in signing finished code. During development, you may wish to use a special certificate generated by Netscape Signing Tool for testing purposes.

If you obtained your object-signing certificate while running Communicator on a system that’s different from the system on which you intend to sign files, you need to copy your certificate and private key files to the new system. Communicator’s certificate and key databases are portable among all platforms.

On the computer where you ran Communicator to get the object-signing certificate, locate the files `key3.db` and `cert7.db`. For example, on a typical Windows NT system, these files are found at `C:\Program Files\NETSCAPE\USERS\username\`. You must copy these files to the system where you intend to sign pages. (If you use FTP, be sure to transfer in binary mode.)

If you are running Netscape Signing Tool on a Unix system and you don’t already have a `~/.netscape` directory, first run Communicator once to create one. If you want to maintain whatever certificates are already in your `~/.netscape` directory, put the existing `key3.db` and `cert7.db` files in some other directory before replacing them with the versions that include the object-signing certificate you want to use with Netscape Signing Tool.

If you are using Unix, set up an alias to call `signtool`, or place it in your path.

If you are using Windows 95 or NT, the `signtool` executable doesn't know where your certificates are, so either put the `key3.db` and `cert7.db` files in the current directory and use "`-d.`" or use `-d` to point to the directory in which they are located.

CAUTION Keep copies of the `key3.db` and `cert7.db` files somewhere separate from the copies you use with the `signtool` executable. This ensures that you won't lose your certificates if you accidentally damage the files. If your keys are on external tokens, such as smart cards, you should keep a copy the `secmod.db` file.

Listing Available Certificates

You use the `-L` option to list the nicknames for all available certificates and check which ones are signing certificates, as shown in this Unix example:

```
% signtool -L
using certificate directory: /u/jsmith/.netscape
S Certificates
- ------------
  BBN Certificate Services CA Root 1
  IBM World Registry CA
  VeriSign Class 1 CA - Individual Subscriber - VeriSign, Inc.
  GTE CyberTrust Root CA
  Uptime Group Plc. Class 4 CA
* Verisign Object Signing Cert
  Integrion CA
  GTE CyberTrust Secure Server CA
  AT&T Directory Services
* test object signing cert
  Uptime Group Plc. Class 1 CA
  VeriSign Class 1 Primary CA
- ------------
Certificates that can be used to sign objects have *'s to their left.
%
```

In the above example, two signing certificates are displayed: `Verisign Object Signing Cert` and `test object signing cert`.

You use the `-l` option to get a list of signing certificates only, including the signing CA for each, as shown in this Unix example:

```
% signtool -l
using certificate directory: /u/jsmith/.netscape
Object signing certificates
-------------------------------------
```

```
Verisign Object Signing Cert
    Issued by: VeriSign, Inc. - Verisign, Inc.
    Expires: Tue May 19, 1998
test object signing cert
    Issued by: test object signing cert (Signtool 1.0 Testing
Certificate (960187691))
    Expires: Sun May 17, 1998
-------------------------------------
For a list including CAs, use "signtool -L"
```

Signing a File

To sign a file using Netscape Signing Tool, follow these steps:

1. Create an empty directory.

   ```
   % mkdir signdir
   ```

2. Put some file into it.

   ```
   % echo boo > signdir/test.f
   ```

3. Specify the name of your object-signing certificate and sign the directory.

   If you are using Unix, this example assumes you have put your `.db` files in the `~/.netscape` directory, as explained in “Setting Up Your Certificate” on page 90.

   ```
   % signtool -k MySignCert -Z testjar.jar signdir

   using key "MySignCert"
   using certificate directory: /u/jsmith/.netscape
   Generating signdir/META-INF/manifest.mf file..
   --> test.f
   adding signdir/test.f to testjar.jar
   Generating signtool.sf file..
   Enter Password or Pin for "Communicator Certificate DB":
   ```

4. At the prompt, type the password to your private-key database.

   If it accepts the password, `signtool` responds as follows:

   ```
   adding signdir/META-INF/manifest.mf to testjar.jar
   adding signdir/META-INF/signtool.sf to testjar.jar
   adding signdir/META-INF/signtool.rsa to testjar.jar
   tree "signdir" signed successfully
   ```

5. Test the archive you just created.

```
% signtool -v testjar.jar

using certificate directory: /u/jsmith/.netscape
archive "testjar.jar" has passed crypto verification.

           status   path
     ------------   -------------------
         verified   test.f
```

You can also use Netscape Signing Tool from within a script to automate some aspects of signing. For example, here's a Windows script that starts with an unsigned JAR file, unpackages it, signs it, and then repackages it:

```
rem Expand the jar file into a new directory
unzip -qq myjar.jar -d signjar
del myjar.jar
rem Sign everything in the new directory and recompress
signtool -k MySignCert -Z myjar.jar signdir
```

Using Netscape Signing Tool with a ZIP Utility

To use Netscape Signing Tool with a ZIP utility, you must have the utility in your path environment variable. You should use the `zip.exe` utility rather than `pkzip.exe`, which cannot handle long filenames.

You can use a ZIP utility instead of the `-Z` option to package a signed archive into a JAR file after you have signed it:

```
% cd signdir
% zip -r ../myjar.jar *
  adding: META-INF/ (stored 0%)
  adding: META-INF/manifest.mf (deflated 15%)
  adding: META-INF/signtool.sf (deflated 28%)
  adding: META-INF/signtool.rsa (stored 0%)
  adding: text.txt (stored 0%)
%
```

Tips and Techniques

- If you are storing JAR files or their components in CVS, store them as binary files.

- If you are signing metadata only and not files, you still need to create a blank directory for Netscape Signing Tool to sign.
- When using the Windows NT version of Netscape Signing Tool, always use a relative path.
- The command `signtool -L` should list your object-signing certificate with an asterisk (`*`) beside it. If it doesn't, you cannot sign files.
- If you are having problems using the JAR file from within Navigator, check `signtool -v` on your final archive.
- Don't use Netscape Signing Tool's `-G` option while Communicator is running. The `-G` option writes to the security databases as it generates certificates, and corruption could occur if Communicator simultaneously attempts to write to these files. All other Netscape Signing Tool options are read-only and can't harm these files.
- If you see the error `Unknown issuer`, you need to get the certificate of the certificate authority that issued your signing certificate. Alternatively, you may have the certificate authority's certificate, but it may not be trusted for object signing.
- If you see the error `Issuer not trusted`, open Communicator on the system you used when you obtained the certificate and follow these steps:

  a. Click the Security button in a Navigator window.

  b. Click Signers under Certificates in the left frame.

  c. Select the CA that issued your signing certificate.

  d. Click the Edit button.

  e. Select the "Accept this Certificate Authority for Certifying software developers" checkbox.

  f. Click OK.

  You then need to transfer the `cert7.db` file to the appropriate directory on the system on which you are running Netscape Signing Tool, as described in "Setting Up Your Certificate" on page 90.

SignTool Syntax and Options

This section summarizes the syntax and options for Netscape Signing Tool 1.3.

- Command Syntax
- Command Options
- Command File Syntax
- Command File Keywords and Example

Command Syntax

To run Netscape Signing Tool, type

`signtool` *`options`*

where *options* can be any sequence of the options listed in this chapter.

Each argument for each `signtool` option must be in quotes if it contains any spaces or other nonalphanumeric characters.

Command Options

Options for `signtool` are defined as follows:

Table 13-1 Description of options

Option	Description
`-b` *basename*	Specifies the base filename for the .rsa and .sf files in the META-INF directory (required by The JAR Format). For example, `-b signatures` causes the files to be named `signatures.rsa` and `signatures.sf`. The default is `signtool`. The `-b` option is available in Netscape Signing Tool 1.0 and later versions only.

Table 13-1 Description of options

`-c#`	Specifies the compression level for the `-J` or `-Z` option. The symbol # represents a number from 0 to 9, where 0 means no compression and 9 means maximum compression. The higher the level of compression, the smaller the output but the longer the operation takes. If the `-c#` option is not used with either the `-J` or the `-Z` option, the default compression value used by both the `-J` and `-Z` options is 6.
`-d` *certdir*	Specifies your certificate database directory; that is, the directory in which you placed your `key3.db` and `cert7.db` files. To specify the current directory, use "`-d.`" (including the period). The Unix version of `signtool` assumes `~/.netscape` unless told otherwise. The NT version of `signtool` always requires the use of the -d option to specify where the database files are located.
`-e` *extension*	Tells `signtool` to sign only files with the given extension; for example, use `-e".class"` to sign only Java class files. Note that with Netscape Signing Tool version 1.1 and later this option can appear multiple times on one command line, making it possible to specify multiple file types or classes to include.
`-f` *commandfile*	Specifies a text file containing Netscape Signing Tool options and arguments in *keyword*=*value* format. All options and arguments can be expressed through this file. For more information about the syntax used with this file, see "Tips and Techniques" on page 93.
`-i` *scriptname*	Specifies the name of an installer script for SmartUpdate. This script installs files from the JAR archive in the local system after SmartUpdate has validated the digital signature. For more details, see the description of `-m` that follows. The `-i` option provides a straightforward way to provide this information if you don't need to specify any metadata other than an installer script.
`-j` *directory*	Specifies a special JavaScript directory. This option causes the specified directory to be signed and tags its entries as inline JavaScript. This special type of entry does not have to appear in the JAR file itself. Instead, it is located in the HTML page containing the inline scripts. When you use `signtool -v`, these entries are displayed with the string `NOT PRESENT`.

Table 13-1 Description of options

`-k` *key* `...` *directory*	Specifies the nickname (*key*) of the certificate you want to sign with and signs the files in the specified directory. The directory to sign is always specified as the last command-line argument. Thus, it is possible to write `signtool -k MyCert -d . signdir` You may have trouble if the nickname contains a single quotation mark. To avoid problems, escape the quotation mark using the escape conventions for your platform. It's also possible to use the `-k` option without signing any files or specifying a directory. For example, you can use it with the `-l` option to get detailed information about a particular signing certificate.
`-G` *nickname*	Generates a new private-public key pair and corresponding object-signing certificate with the given nickname. The newly generated keys and certificate are installed into the key and certificate databases in the directory specified by the `-d` option. With the NT version of Netscape Signing Tool, you must use the `-d` option with the `-G` option. With the Unix version of Netscape Signing Tool, omitting the `-d` option causes the tool to install the keys and certificate in the Communicator key and certificate databases. If you are installing the keys and certificate in the Communicator databases, you must exit Communicator before using this option; otherwise, you risk corrupting the databases. In all cases, the certificate is also output to a file named `x509.cacert`, which has the MIME-type `application/x-x509-ca-cert`. Unlike certificates normally used to sign finished code to be distributed over a network, a test certificate created with `-G` is not signed by a recognized certificate authority. Instead, it is self-signed. In addition, a single test signing certificate functions as both an object-signing certificate and a CA. When you are using it to sign objects, it behaves like an object-signing certificate. When it is imported into browser software such as Communicator, it behaves like an object-signing CA and cannot be used to sign objects. The `-G` option is available in Netscape Signing Tool 1.0 and later versions only. By default, it produces only RSA certificates with 1024-byte keys in the internal token. However, you can use the `-s` option specify the required key size and the `-t` option to specify the token. For more information about the use of the `-G` option, see "Generating Test Object-Signing Certificates" on page 102.
`-l`	Lists signing certificates, including issuing CAs. If any of your certificates are expired or invalid, the list will so specify. This option can be used with the `-k` option to list detailed information about a particular signing certificate. The `-l` option is available in Netscape Signing Tool 1.0 and later versions only.

Table 13-1 Description of options

`-J`	Signs a directory of HTML files containing JavaScript and creates as many archive files as are specified in the HTML tags. Even if `signtool` creates more than one archive file, you need to supply the key database password only once. The `-J` option is available only in Netscape Signing Tool 1.0 and later versions. The `-J` option cannot be used at the same time as the `-Z` option. If the `-c#` option is not used with the `-J` option, the default compression value is 6. Note that versions 1.1 and later of Netscape Signing Tool correctly recognizes the `CODEBASE` attribute, allows paths to be expressed for the `CLASS` and `SRC` attributes instead of filenames only, processes LINK tags and parses HTML correctly, and offers clearer error messages.
`-L`	Lists the certificates in your database. An asterisk appears to the left of the nickname for any certificate that can be used to sign objects with `signtool`.
`--leavearc`	Retains the temporary `.arc` (archive) directories that the `-J` option creates. These directories are automatically erased by default. Retaining the temporary directories can be an aid to debugging.

`-m` *metafile*	Specifies the name of a metadata control file. Metadata is signed information attached either to the JAR archive itself or to files within the archive. This metadata can be any ASCII string, but is used mainly for specifying an installer script.
	
	The metadata file contains one entry per line, each with three fields:
	
	• field #1: file specification, or + if you want to specify global metadata (that is, metadata about the JAR archive itself or all entries in the archive)
	
	• field #2: the name of the data you are specifying; for example: `Install-Script`
	
	• field #3: data corresponding to the name in field #2
	
	For example, the `-i` option uses the equivalent of this line:
	
	`+ Install-Script: script.js`
	
	This example associates a MIME type with a file:
	
	`movie.qt MIME-Type: video/quicktime`
	
	For information about the way installer script information appears in the manifest file for a JAR archive, see The JAR Format on Netscape DevEdge.

Table 13-1 Description of options

`-M`	Lists the PKCS #11 modules available to `signtool`, including smart cards. The `-M` option is available in Netscape Signing Tool 1.0 and later versions only. For information on using Netscape Signing Tool with smart cards, see "Using Netscape Signing Tool with Smart Cards" on page 104. For information on using the `-M` option to verify FIPS-140-1 validated mode, see "Netscape Signing Tool and FIPS-140-1" on page 107.
`--norecurse`	Blocks recursion into subdirectories when signing a directory's contents or when parsing HTML.
`-o`	Optimizes the archive for size. Use this *only* if you are signing very large archives containing hundreds of files. This option makes the manifest files (required by the JAR format) considerably smaller, but they contain slightly less information.
`--outfile` *outputfile*	Specifies a file to receive redirected output from Netscape Signing Tool.
`-p` *password*	Specifies a password for the private-key database. Note that the password entered on the command line is displayed as plain text.
`-s` *keysize*	Specifies the size of the key for generated certificate. Use the `-M` option to find out what tokens are available. The `-s` option can be used with the `-G` option only.
`-t` *token*	Specifies which available token should generate the key and receive the certificate. Use the `-M` option to find out what tokens are available. The `-t` option can be used with the `-G` option only.
`-v` *archive*	Displays the contents of an archive and verifies the cryptographic integrity of the digital signatures it contains and the files with which they are associated. This includes checking that the certificate for the issuer of the object-signing certificate is listed in the certificate database, that the CA's digital signature on the object-signing certificate is valid, that the relevant certificates have not expired, and so on.
`--verbosity` *value*	Sets the quantity of information Netscape Signing Tool generates in operation. A value of `0` (zero) is the default and gives full information. A value of `-1` suppresses most messages, but not error messages.
`-w` *archive*	Displays the names of signers of any files in the archive.
`-x` *directory*	Excludes the specified directory from signing. Note that with Netscape Signing Tool version 1.1 and later this option can appear multiple times on one command line, making it possible to specify several particular directories to exclude.

Table 13-1 Description of options

`-z`	Tells `signtool` not to store the signing time in the digital signature. This option is useful if you want the expiration date of the signature checked against the current date and time rather than the time the files were signed.
`-Z` *jarfile*	Creates a JAR file with the specified name. You must specify this option if you want `signtool` to create the JAR file; it does not do so automatically. If you don't specify `-Z`, you must use an external ZIP tool to create the JAR file. The `-Z` option cannot be used at the same time as the `-J` option. If the `-c#` option is not used with the `-Z` option, the default compression value is 6.

Command File Syntax

Entries in a Netscape Signing Tool command file have this general format:

keyword=value

Everything before the = sign on a single line is a keyword, and everything from the = sign to the end of line is a value. The value may include = signs; only the first = sign on a line is interpreted. Blank lines are ignored, but white space on a line with keywords and values is assumed to be part of the keyword (if it comes before the equal sign) or part of the value (if it comes after the first equal sign). Keywords are case insensitive, values are generally case sensitive. Since the = sign and newline delimit the value, it should not be quoted.

Command File Keywords and Example

Here are the command file keywords and their values:

Keyword	Value
`basename`	Same as `-b` option.
`compression`	Same as `-c` option.
`certdir`	Same as `-d` option.
`extension`	Same as `-e` option.
`generate`	Same as `-G` option.
`installscript`	Same as `-i` option.

Keyword	Value
javascriptdir	Same as -j option.
htmldir	Same as -J option.
certname	Nickname of certificate, as with -k and -l -k options.
signdir	The directory to be signed, as with -k option.
list	Same as -l option. Value is ignored, but = sign must be present.
listall	Same as -L option. Value is ignored, but = sign must be present.
metafile	Same as -m option.
modules	Same as -M option. Value is ignored, but = sign must be present.
optimize	Same as -o option. Value is ignored, but = sign must be present.
password	Same as -p option.
keysize	Same as -s option.
token	Same as -t option.
verify	Same as -v option.
who	Same as -w option.
exclude	Same as -x option.
notime	Same as -z option. value is ignored, but = sign must be present.
jarfile	Same as -Z option.
outfile	Name of a file to which output and error messages will be redirected. This option has no command-line equivalent.

Here's an example of the use of the command file. The command

```
signtool -d c:\netscape\users\james -k mycert -Z myjar.jar signdir > output.txt
```

becomes

```
signtool -f somefile
```

where *somefile* contains the following lines:

```
certdir=c:\netscape\users\james
certname=mycert
jarfile=myjar.jar
signdir=signdir
outfile=output.txt
```

Generating Test Object-Signing Certificates

Netscape Signing Tool allows you to create object-signing certificates for testing purposes. This section describes how to create and use such test certificates.

Unlike certificates normally used to sign finished code to be distributed over a network, the test certificates created with Netscape Signing Tool are not signed by a recognized certificate authority. Instead, they are self-signed. In addition, a single test signing certificate functions as both an object-signing certificate and a CA. When you are using it to sign objects, it behaves like an object-signing certificate. When it is imported into browser software such as Communicator, it behaves like an object-signing CA.

Generating the Keys and Certificate

The `signtool` option `-G` generates a new public-private key pair and certificate. It takes the nickname of the new certificate as an argument. The newly generated keys and certificate are installed into the key and certificate databases in the directory specified by the `-d` option. With the NT version of Netscape Signing Tool, you must use the `-d` option with the `-G` option. With the Unix version of Netscape Signing Tool, omitting the `-d` option causes the tool to install the keys and certificate in the Communicator key and certificate databases. In all cases, the certificate is also output to a file named `x509.cacert`, which has the MIME-type `application/x-x509-ca-cert`.

Important

Before installing new keys and certificates in the key and certificate databases, you must set the database password (if you have not done so already). To set the password for the key and certificate databases currently being used by Communicator, click the Security icon in the Communicator toolbar, click Passwords, and click Set Password to create a password.

Warning

If you intend to install the new key pair and certificate in the Communicator databases, you must exit Communicator before using Netscape Signing Tool to generate the object-signing certificate. Otherwise, you risk corrupting your certificate and key databases.

Certificates contain standard information about the entity they identify, such as the common name and organization name. Netscape Signing Tool prompts you for this information when you run the command with the `-G` option. However, all of the requested fields are optional for test certificates. If you do not enter a common name, the tool provides a default name. In the following example, the user input is in boldface:

```
% signtool -G MyTestCert
using certificate directory: /u/someuser/.netscape
Enter certificate information. All fields are optional. Acceptable
characters are numbers, letters, spaces, and apostrophes.
certificate common name: Test Object Signing Certificate
organization: Netscape Communications Corp.
organization unit: Server Products Division
state or province: California
country (must be exactly 2 characters): US
username: someuser
email address: someuser@netscape.com
Enter Password or Pin for "Communicator Certificate DB": [Password will
not echo]
generated public/private key pair
certificate request generated
certificate has been signed
certificate "MyTestCert" added to database
Exported certificate to x509.raw and x509.cacert.
%
```

The certificate information is read from standard input. Therefore, the information can be read from a file using the redirection operator (<) in some operating systems. To create a file for this purpose, enter each of the seven input fields, in order, on a separate line. Make sure there is a newline character at the end of the last line. Then run `signtool` with standard input redirected from your file as follows:

```
% signtool -G MyTestCert <inputfile
```

The prompts show up on the screen, but the responses will be automatically read from the file. The password will still be read from the console unless you use the `-p` option to give the password on the command line.

Using Netscape Signing Tool with Smart Cards

This section describes how to use smart cards from within Netscape Signing Tool to digitally sign files.

- What Is a Smart Card?
- Setting Up a Smart Card
- Using the -M Option to List Smart Cards
- Using Netscape Signing Tool and a Smart Card to Sign Files

What Is a Smart Card?

A *smart card* (sometimes called a *token*) is a credit-card-sized card, a key, or other easily removable device that can be used for cryptographic operations and for storing certificates. Smart cards are portable and must be physically inserted in an appropriate smart card reader attached to a computer for use with Communicator software running on that computer. Smart cards extend the private-key protection provided by Communicator, since private keys stored on the card require the card's presence as well as the password to the private-key database.

Navigator and Netscape Signing Tool support PKCS #11, a cryptographic standard developed to support services provided by smart cards. Before purchasing a smart card for use with Communicator, you should ensure that your vendor provides a PKCS #11 driver that has been tested with Communicator on your platform. Tested brands include Litronic Netsign and Datakey's SignaSURE.

Setting Up a Smart Card

Connect the smart card reader according to the manufacturer instructions. You may need to reset the smart card to a default state using the manufacturer's configuration utility. Not all smart cards require this step.

Smart cards designed for use with Communicator come with a software driver that you should install in your computer according to the manufacturer's instructions. You can then add the driver (also called a *cryptographic module*) to Communicator as follows:

1. Make sure the smart card is inserted in the smart card reader.
2. Click the Security button near the top of a Navigator window.

3. Click Cryptographic Modules in the left frame.
4. Click the Add button.
5. Type an appropriate name for the module you want to add in the box labeled Security Module Name.
6. Type the name of the driver that was supplied with your smart card in the box labeled Security Module File. For Windows systems, this is a dynamic linked library (DLL). You don't have to type the entire path, but you may.
7. Click OK.
8. If Communicator asks for it, type the smart card password.
9. Select the module you've just installed and click the View / Edit button.
10. Make sure the displayed information is correct for the smart card you just installed.
11. Select the name of the smart card.
12. Click the More Info button and examine that information as well.
13. If the state of the smart card (shown near the bottom of the More Info window) is Not Logged In, click OK and then click the Login button. Otherwise, just click OK. (Logging in allows you to install your signing certificate on the smart card. The smart card doesn't have to be logged in within Communicator for you to use it with Netscape Signing Tool.)
14. Click OK again.

After you have activated the smart card, use Communicator to visit the web site for the certificate authority (CA) you want to use and request a signing certificate.

When you submit your information to the certificate authority, Communicator asks you to select the card or database you wish to use to generate your private key. You should select the name of your smart card.

Your system then generates a public-private key pair and submits your request to the CA. When you receive the certificate, it is installed directly onto the card and travels with that smart card. However, you will be unable to use the certificate unless the smart card is inserted in the appropriate reader and you have entered its password correctly.

Using the -M Option to List Smart Cards

You can use the `-M` option to list the PKCS #11 modules, including smart cards, that are available to `signtool`:

```
% signtool -d "c:\netscape\users\jsmith" -M
using certificate directory: c:\netscape\users\<username>
Listing of PKCS11 modules
-----------------------------------------------
   1. Netscape Internal PKCS #11 Module
            (this module is internally loaded)
            slots: 2 slots attached
            status: loaded
     slot: Communicator Internal Cryptographic Services Version 4.0
    token: Communicator Generic Crypto Svcs
     slot: Communicator User Private Key and Certificate Services
    token: Communicator Certificate DB
   2. CryptOS
            (this is an external module)
 DLL name: core32
    slots: 1 slots attached
   status: loaded
     slot: Litronic 210
    token:
   3. Datakey SignaSURE
            (this is an external module)
 DLL name: dkck232.dll
    slots: 1 slots attached
   status: loaded
    slot: Datakey Reader
    token: <username>
   -----------------------------------------------
```

Using Netscape Signing Tool and a Smart Card to Sign Files

Before you try to use Netscape Signing Tool with a smart card, try using it to sign a file without a smart card as described in “Using Netscape Signing Tool” on page 89.

The `signtool` command normally takes an argument of the `-k` option to specify a signing certificate. To sign with a smart card, you supply only the fully qualified name of the certificate.

To see fully qualified certificate names when you run Communicator, click the Security button in Navigator, then click Yours under Certificates in the left frame. Fully qualified names are of the format *smart card:certificate*, for example "`MyCard:My Signing Cert`". You use this name with the `-k` argument as follows:

`signtool -k "MyCard:My Signing Cert"` *directory*

where *directory* is the directory tree you want to sign. `signtool` asks you for two passwords: the password that protects the Communicator certificate database and the password that protects your smart card. If the passwords are correct, `signtool` signs the files in the directory.

Netscape Signing Tool and FIPS-140-1

This section describes how to use Netscape Signing Tool in FIPS-140-1 validated mode. FIPS 140-1 is a U.S. government standard for implementations of cryptographic modules--that is, hardware or software that encrypts and decrypts data or performs other cryptographic operations (such as creating or verifying digital signatures). Many products sold to the U.S. government must comply with one or more of the FIPS standards.

- Using FIPS-140 Mode
- Verifying FIPS Mode

For general information on FIPS standards and Netscape FIPS-140-1 validation, see the FIPS 140-1 FAQ.

Using FIPS-140 Mode

Netscape Signing Tool is FIPS-140-1 validated when it uses the FIPS-validated Netscape cryptographic module. The FIPS module can be activated and deactivated from within Communicator. Communicator stores the module choice in the security module database (called `secmod.db` on Windows platforms and `secmodule.db` on Unix platforms). This database is stored in the same directory as your certificate database (`cert7.db`) and key database (`key3.db`), as indicated by the `-d` option of Netscape Signing Tool.

Before using Netscape Signing Tool in FIPS-validated mode, you must use Navigator to switch to FIPS mode. For information on how to do this, see Operating Netscape Navigator in FIPS PUB-140-1 Compliant Mode on Netscape DevEdge.

After switching the Navigator cryptographic module to FIPS mode, you have two choices:

- Use the same security module database from Netscape Signing Tool (by specifying the same directory with the `-d` option).
- Make a copy of Communicator's security module database and place it in Netscape Signing Tool's database directory.

Verifying FIPS Mode

Use the `-M` option to verify that you are using the FIPS-140-1 module.

This Unix example shows that Netscape Signing Tool is using a non-FIPS module:

```
% signtool -d "c:\netscape\users\jsmith" -M
using certificate directory: c:\netscape\users\jsmith
Listing of PKCS11 modules
-----------------------------------------------
  1. Netscape Internal PKCS #11 Module
          (this module is internally loaded)
          slots: 2 slots attached
          status: loaded
    slot: Communicator Internal Cryptographic Services Version 4.0
   token: Communicator Generic Crypto Svcs
    slot: Communicator User Private Key and Certificate Services
   token: Communicator Certificate DB
-----------------------------------------------
```

This Unix example shows that Netscape Signing Tool is using a FIPS-140-1 module:

```
% signtool -d "c:\netscape\users\jsmith" -M
using certificate directory: c:\netscape\users\jsmith
Enter Password or Pin for "Communicator Certificate DB": [password will not
echo]
Listing of PKCS11 modules
-----------------------------------------------
 1. Netscape Internal FIPS PKCS #11 Module
       (this module is internally loaded)
       slots: 1 slots attached
       status: loaded
  slot: Netscape Internal FIPS-140-1 Cryptographic Services
 token: Communicator Certificate DB
-----------------------------------------------
```

Answers to Common Questions

This section answers the most common technical questions regarding Netscape Signing Tool.

Netscape Signing Tool, or Communicator, fails to report the presence of a particular certificate in the database, even though that certificate should be there.

Netscape Signing Tool 1.x and Communicator 4.x are designed to read only the `cert7.db` files used by Communicator 4.x. If it happens that a certificate gets downloaded with Navigator 3.x *after* Communicator 4.x was installed and run, that certificate is recorded in a database of the older (3.x) format. While Communicator does automatically convert Navigator's `cert5.db` and `key.db` databases to the `cert7.db` and `key3.db` formats the first time it runs, it does not do so again.

To get a certificate into the new database from an old one requires forcing Communicator to reinitialize its `cert7.db` file as it does at first run-time. This requires that the certificates in the current `cert7.db` file be exported for later re-importing.

a. Click the Security Info button on the Communicator toolbar.

b. Click Yours under Certificates in the left panel, and select a certificate to export.

c. Click Export and save a PKCS #12 copy of the certificate to a safe location (if no copy already exists).

d. Repeat steps 2 and 3 for each certificate present.

e. Exit Communicator completely.

f. Move the `cert7.db` and `key3.db` files from your user profile directory to a backup directory. This is a safety measure: these files shouldn't be needed again. Once the following steps are successfully completed, and you have used `signtool -l` to verify that the upgraded `cert7.db` file has the right certificates, you can discard these backup copies.

g. Copy Navigator's `cert5.db` and `key.db` files to your Communicator user-profile directory.

h. Restart Communicator. It automatically upgrades the older database files, including their contents.

i. Click the Security Info button on the Communicator toolbar, then click Yours under Certificates in the left panel.

j. Click Import a Certificate and give the database password.

k. Select a certificate file to open and give the certificate's password.

l. Repeat steps 9 and 10 for each certificate to be re-imported.

The certificate needed to sign an object is in the certificate database, but Netscape Signing Tool's `-l` and `-k` options report "Unable to find issuer certificate" or "Unknown user" errors.

Netscape Signing Tool 1.x reads the `cert7.db` files used by Communicator 4.x. Normally, `cert7.db` files record a certificate's complete certificate chain information using the PKCS #7 cryptographic message-syntax standard. However, Navigator 3.x wasn't designed to properly use this standard (it wasn't in wide use yet). Therefore, certificates used by Communicator 4.x that were originally imported with Navigator 3.x may not have all the certificate chain information required for object signing.

In the case of VeriSign Class 2 or Class 3 certificates, the missing portion of the chain is the intermediate node, since the root is provided with Communicator by default and the leaf is included in the existing certificate information. To get the intermediate portion, use Communicator 4.x and click these links for VeriSign Class 2 or VeriSign Class 3 certificate authority updates.

When trying to read a JAR file into Communicator 4.05 the error message "Inconsistent files in manifest" appears in the Java console.

Communicator 4.05 (and only that version) has a bug that makes it sensitive to the case of the JAR manifest's filename as stored in the META-INF directory. Version 4.05 requires the filename to be all lowercase. Although the JAR specification calls for case insensitivity and Netscape Signing Tool does generate a lowercase filename, an uppercase filename can appear if another tool is used to create the JAR, or case translation occurs on the Windows platform.

This problem can be repaired by re-signing the JAR with Netscape Signing Tool, or by unzipping the file and changing `MANIFEST.MF` to `manifest.mf`.

How can users change the nicknames of their own certificates?

For convenience, users may want to shorten the nicknames of some of the certificates they use. While certificates cannot be renamed directly, it may be possible to replace them and give the replacement a new name.

Note that this process can present a risk because it requires the user to delete a certificate before replacing it, and if the replacement fails and there is no backup certificate, the certificate is lost.

a. Click the Security Info button on Communicator's toolbar.

b. Click Yours under Certificates and select a certificate to rename.

c. Click Export and save a PKCS #12 copy of the certificate to a safe location (if no copy already exists). This copy is needed if replacement fails.

d. Click Delete and remove the certificate from the certificate database. Note that the certificate's corresponding private key isn't deleted, just the certificate itself.

e. Retrieve the certificate again from the Certificate Authority. The specific procedure for doing this depends on the Certificate Authority being used. Be very sure that the replacement is the correct one.

f. Enter a new name for the certificate when downloading it.

Note: The Export and Import buttons in the Security Info dialog box can't be used to change certificate nicknames. These functions can affect only a certificate's exported PKCS #12 filename.

When I click the Security icon in the Communicator toolbar, click Yours under Certificates, select my object-signing certificate, and click Verify, Communicator informs me that the certificate is not valid. Why?

This is a common occurrence. The Verify button works with S/MIME certificates only. It does not work with object-signing certificates.

To verify an object-signing certificate, use

`signtool -l -k` *nickname*

where nickname is the nickname of the certificate you want to verify.

I get the following error when trying to create a test certificate:

```
failure authenticating to key database .: Security I/O error.
```

This error typically means that you have not yet set a password for the certificate database. To set the password for the Communicator database, click the Security icon in the Communicator toolbar, click Passwords, and click Set Password to create a password.

Objects to be signed will be stored and used long-term, well after the certificates used for signing have expired. Will signed objects still be trusted even after their object-signing certificates have expired?

Although certificates expire, valid signatures do not. Signature validation is based on the date of the signature rather than the time verification occurs. If a certificate chain was valid at signing, Communicator will continue to recognize that signature even after certificates in that chain expire. Note that this would not be true, however, if an object was signed using the -z option which omits the original timestamp and forces validation to rely on the current status of the certificate chain.

Chapter 14

SSL Debugging Tool

SSL Debugging Tool is an SSL-aware command-line proxy. It watches TCP connections and displays the data going by. If a connection is SSL, the data display includes interpreted SSL records and handshaking information.

This chapter has the following sections:

Availability

This tool is available for AIX 4.3, OSF/1 v4.0D, Solaris 2.6 (SunOS 5.6), Solaris 8, and Windows NT 4.0.

Description

The `ssltap` command opens a socket on a rendezvous port and waits for an incoming connection from the client side. Once this connection arrives, the tool makes another connection to the specified host name and port on the server side. It passes any data sent by the client to the server and vice versa. The tool also displays the data to the shell window from which it was called. It can do this for plain HTTP connections or any TCP protocol, as well as for SSL streams, as described here.

The tool cannot and does not decrypt any encrypted message data. You use the tool to look at the plain text and binary data that are part of the handshake procedure, before the secure connection is established.

Syntax

To run SSL Debugging Tool, type this command in a command shell:

`ssltap` [`-vhfsxl`] [`-p` *port*] *hostname*:*port*

Options

The command does not require any options other than *hostname:port*, but you normally use them to control the connection interception and output. The options for the command are the following:

Table 14-1 Description of command options

Option	Description
`-v`	Print a version string for the tool.
`-h`	Turn on hex / ASCII printing. Instead of outputting raw data, the command interprets each record as a numbered line of hex values, followed by the same data as ASCII characters. The two parts are separated by a vertical bar. Nonprinting characters are replaced by dots.
`-f`	Turn on fancy printing. Output is printed in colored HTML. Data sent from the client to the server is in blue; the server's reply is in red. When used with looping mode, the different connections are separated with horizontal lines. You can use this option to upload the output into a browser.
`-s`	Turn on SSL parsing and decoding. The tool does not automatically detect SSL sessions. If you are intercepting an SSL connection, use this option so that the tool can detect and decode SSL structures. If the tool detects a certificate chain, it saves the DER-encoded certificates into files in the current directory. The files are named `cert.0`*x*, where *x* is the sequence number of the certificate. If the `-s` option is used with `-h`, two separate parts are printed for each record: the plain hex / ASCII output, and the parsed SSL output.
`-x`	Turn on hex / ASCII printing of undecoded data inside parsed SSL records. Used only with the `-s` option. This option uses the same output format as the `-h` option.

Table 14-1 Description of command options

`-l`	Turn on looping; that is, continue to accept connections rather than stopping after the first connection is complete.
`-p` *`port`*	Change the default rendezvous port (1924) to another port. The following are well-known port numbers: HTTP 80 HTTPS 443 SMTP 25 FTP 21 IMAP 143 IMAPS 993 (IMAP over SSL) NNTP 119 NNTPS 563 (NNTP over SSL)

Examples

You can use SSL Debugging Tool to intercept any connection information. Although you can run the tool at its most basic by issuing the `ssltap` command with no options other than *hostname:port*, the information you get in this way is not very useful.

For example, assume your development machine is called `intercept`. The simplest way to use the debugging tool is to execute the following command from a command shell:

```
ssltap www.netscape.com:80
```

The program waits for an incoming connection on the default port 1924. In your browser window, enter the URL `http://intercept:1924`. The browser retrieves the requested page from the server at `www.netscape.com`, but the page is intercepted and passed on to the browser by the debugging tool on `intercept`.

On its way to the browser, the data is printed to the command shell from which you issued the command. Data sent from the client to the server is surrounded by the following symbols:

```
--> [ data ]
```

Data sent from the server to the client is surrounded by the following symbols:

```
<-- [ data ]
```

The raw data stream is sent to standard output and is not interpreted in any way. This can result in peculiar effects, such as sounds, flashes, and even crashes of the command shell window. To output a basic, printable interpretation of the data, use the `-h` option, or, if you are looking at an SSL connection, the `-s` option.

You will notice that the page you retrieved looks incomplete in the browser. This is because, by default, the tool closes down after the first connection is complete, so the browser is not able to load images. To make the tool continue to accept connections, switch on looping mode with the `-l` option.

The following examples show the output from commonly used combinations of options.

Example 1

The `s` and `x` options in this example turn on SSL parsing and show undecoded values in hex / ASCII format. The output is routed to a text file.

Command

```
ssltap.exe -sx -p 444 interzone.mcom.com:443 > sx.txt
```

Output

```
Connected to interzone.mcom.com:443
--> [
alloclen = 66 bytes
   [ssl2]  ClientHelloV2 {
             version = {0x03, 0x00}
             cipher-specs-length = 39 (0x27)
             sid-length = 0 (0x00)
             challenge-length = 16 (0x10)
             cipher-suites = {

                (0x010080) SSL2/RSA/RC4-128/MD5
                    (0x020080) SSL2/RSA/RC4-40/MD5
                    (0x030080) SSL2/RSA/RC2CBC128/MD5
                    (0x040080) SSL2/RSA/RC2CBC40/MD5
                    (0x060040) SSL2/RSA/DES64CBC/MD5
                    (0x0700c0) SSL2/RSA/3DES192EDE-CBC/MD5
                    (0x000004) SSL3/RSA/RC4-128/MD5
                    (0x00ffe0) SSL3/RSA-FIPS/3DES192EDE-CBC/SHA
                    (0x00000a) SSL3/RSA/3DES192EDE-CBC/SHA
                    (0x00ffe1) SSL3/RSA-FIPS/DES64CBC/SHA
                    (0x000009) SSL3/RSA/DES64CBC/SHA
                    (0x000003) SSL3/RSA/RC4-40/MD5
```

```
                    (0x000006) SSL3/RSA/RC2CBC40/MD5
                    }
              session-id = { }
              challenge = { 0xec5d 0x8edb 0x37c9 0xb5c9 0x7b70 0x8fe9
0xd1d3

0x2592 }
}
]
<-- [
SSLRecord {
   0: 16 03 00 03  e5                                      |.....
   type    = 22 (handshake)
   version = { 3,0 }
   length  = 997 (0x3e5)
   handshake {
   0: 02 00 00 46                                          |...F
      type = 2 (server_hello)
      length = 70 (0x000046)
             ServerHello {
             server_version = {3, 0}
             random = {...}
   0: 77 8c 6e 26  6c 0c ec c0  d9 58 4f 47  d3 2d 01 45  |
wŒn&amp;amp;l.ì..XOG.-.E
   10: 5c 17 75 43  a7 4c 88 c7  88 64 3c 50  41 48 4f 7f  |

\.uC§L.Ç.d&amp;lt;PAHO.
                    session ID = {
                    length = 32

                contents = {..}
   0: 14 11 07 a8  2a 31 91 29  11 94 40 37  57 10 a7 32  |
...¨*1.)..@7W.§2
   10: 56 6f 52 62  fe 3d b3 65  b1 e4 13 0f  52 a3 c8 f6  |
VoRbþ=³e±...R£È.
          }
                cipher_suite = (0x0003) SSL3/RSA/RC4-40/MD5
          }
   0: 0b 00 02 c5                                          |...Å
      type = 11 (certificate)
      length = 709 (0x0002c5)
             CertificateChain {
             chainlength = 706 (0x02c2)
                Certificate {
             size = 703 (0x02bf)
                data = { saved in file 'cert.001' }
             }
          }
   0: 0c 00 00 ca                                          |....
```

```
           type = 12 (server_key_exchange)
           length = 202 (0x0000ca)
    0: 0e 00 00 00                                          |....
           type = 14 (server_hello_done)
           length = 0 (0x000000)
    }
}
]
--> [
SSLRecord {
    0: 16 03 00 00  44                                       |....D
    type    = 22 (handshake)
    version = { 3,0 }
    length  = 68 (0x44)
    handshake {
    0: 10 00 00 40                                          |...@
    type = 16 (client_key_exchange)
    length = 64 (0x000040)
           ClientKeyExchange {
              message = {...}
           }
    }
}
]
--> [
SSLRecord {
    0: 14 03 00 00  01                                       |.....
    type    = 20 (change_cipher_spec)
    version = { 3,0 }
    length  = 1 (0x1)
    0: 01                                                   |.
}
SSLRecord {
    0: 16 03 00 00  38                                       |....8
    type    = 22 (handshake)
    version = { 3,0 }
    length  = 56 (0x38)
                < encrypted >

}
]
<-- [
SSLRecord {
    0: 14 03 00 00  01                                       |.....
    type    = 20 (change_cipher_spec)
    version = { 3,0 }
    length  = 1 (0x1)
    0: 01                                                   |.
```

```
}
]
<-- [
SSLRecord {
   0: 16 03 00 00  38                                        |....8
   type    = 22 (handshake)
   version = { 3,0 }
   length  = 56 (0x38)
                   < encrypted >

}
]
--> [
SSLRecord {
   0: 17 03 00 01  1f                                        |.....
   type    = 23 (application_data)
   version = { 3,0 }
   length  = 287 (0x11f)
               < encrypted >
}
]
<-- [
SSLRecord {
   0: 17 03 00 00  a0                                        |....
   type    = 23 (application_data)
   version = { 3,0 }
   length  = 160 (0xa0)
               < encrypted >

}
]
<-- [
SSLRecord {
0: 17 03 00 00  df                                       |....ß
   type    = 23 (application_data)
   version = { 3,0 }
   length  = 223 (0xdf)
               < encrypted >

}
SSLRecord {
   0: 15 03 00 00  12                                        |.....
   type    = 21 (alert)
   version = { 3,0 }
   length  = 18 (0x12)
               < encrypted >
}
]
Server socket closed.
```

Example 2

The `-s` option turns on SSL parsing. Because the `-x` option is not used in this example, undecoded values are output as raw data. The output is routed to a text file.

Command

```
ssltap.exe -s  -p 444 interzone.mcom.com:443 > s.txt
```

Output

```
Connected to interzone.mcom.com:443
--> [
alloclen = 63 bytes
   [ssl2]  ClientHelloV2 {
             version = {0x03, 0x00}
             cipher-specs-length = 36 (0x24)
             sid-length = 0 (0x00)
             challenge-length = 16 (0x10)
             cipher-suites = {
                    (0x010080) SSL2/RSA/RC4-128/MD5
                    (0x020080) SSL2/RSA/RC4-40/MD5
                    (0x030080) SSL2/RSA/RC2CBC128/MD5
                    (0x060040) SSL2/RSA/DES64CBC/MD5
                    (0x0700c0) SSL2/RSA/3DES192EDE-CBC/MD5
                    (0x000004) SSL3/RSA/RC4-128/MD5
                    (0x00ffe0) SSL3/RSA-FIPS/3DES192EDE-CBC/SHA
                    (0x00000a) SSL3/RSA/3DES192EDE-CBC/SHA
                    (0x00ffe1) SSL3/RSA-FIPS/DES64CBC/SHA
                    (0x000009) SSL3/RSA/DES64CBC/SHA
                    (0x000003) SSL3/RSA/RC4-40/MD5
                    }
                session-id = { }
             challenge = { 0x713c 0x9338 0x30e1 0xf8d6 0xb934 0x7351
0x200c
0x3fd0 }
]
<-- [
SSLRecord {
   type    = 22 (handshake)
   version = { 3,0 }
   length  = 997 (0x3e5)
   handshake {
          type = 2 (server_hello)
          length = 70 (0x000046)
             ServerHello {
```

```
                server_version = {3, 0}
                random = {...}
                session ID = {
                    length = 32
                    contents = {..}
                    }
                    cipher_suite = (0x0003) SSL3/RSA/RC4-40/MD5
                }
            type = 11 (certificate)
            length = 709 (0x0002c5)
                CertificateChain {
                    chainlength = 706 (0x02c2)
                    Certificate {
                        size = 703 (0x02bf)
                        data = { saved in file 'cert.001' }
                    }
                }
            type = 12 (server_key_exchange)
            length = 202 (0x0000ca)
            type = 14 (server_hello_done)
            length = 0 (0x000000)
    }
}
]
--> [
SSLRecord {
    type    = 22 (handshake)
    version = { 3,0 }
    length  = 68 (0x44)
    handshake {
            type = 16 (client_key_exchange)
            length = 64 (0x000040)
                ClientKeyExchange {
                    message = {...}
                }
    }
}
]
--> [
SSLRecord {
    type    = 20 (change_cipher_spec)
    version = { 3,0 }
    length  = 1 (0x1)
}
SSLRecord {
    type    = 22 (handshake)
    version = { 3,0 }
```

```
    length  = 56 (0x38)
                < encrypted >
}
]
<-- [
SSLRecord {
    type    = 20 (change_cipher_spec)
    version = { 3,0 }
    length  = 1 (0x1)
}
]
<-- [
SSLRecord {
    type    = 22 (handshake)
    version = { 3,0 }
    length  = 56 (0x38)
                < encrypted >
}
]
--> [
SSLRecord {
    type    = 23 (application_data)
    version = { 3,0 }
    length  = 287 (0x11f)
                < encrypted >
}
]
[
SSLRecord {
    type    = 23 (application_data)
    version = { 3,0 }
    length  = 160 (0xa0)
                < encrypted >
}
]
<-- [
SSLRecord {
    type    = 23 (application_data)
    version = { 3,0 }
    length  = 223 (0xdf)
                < encrypted >
}
SSLRecord {
    type    = 21 (alert)
    version = { 3,0 }
    length  = 18 (0x12)
```

```
                    < encrypted >
}
]
Server socket closed.
```

Example 3

In this example, the `-h` option turns hex / ASCII format. There is no SSL parsing or decoding. The output is routed to a text file.

Command

```
ssltap.exe -h  -p 444 interzone.mcom.com:443 > h.txt
```

Output

```
Connected to interzone.mcom.com:443
--> [
  0: 80 40 01 03  00 00 27 00  00 00 10 01  00 80 02 00  | .@....'.........
  10: 80 03 00 80  04 00 80 06  00 40 07 00  c0 00 00 04  | .........@......
  20: 00 ff e0 00  00 0a 00 ff  e1 00 00 09  00 00 03 00  | ........á.......
  30: 00 06 9b fe  5b 56 96 49  1f 9f ca dd  d5 ba b9 52  | ..›þ[V.I.Ÿ...º¹R
  40: 6f 2d                                              |o-
]
<-- [
  0: 16 03 00 03  e5 02 00 00  46 03 00 7f  e5 0d 1b 1d  | ........F.......
  10: 68 7f 3a 79  60 d5 17 3c  1d 9c 96 b3  88 d2 69 3b  | h.:y‘..&lt;.œ.³.Òi;
  20: 78 e2 4b 8b  a6 52 12 4b  46 e8 c2 20  14 11 89 05  | x.K.¦R.KFè. ..‰.
  30: 4d 52 91 fd  93 e0 51 48  91 90 08 96  c1 b6 76 77  | MR.ý..QH.....¶vw
  40: 2a f4 00 08  a1 06 61 a2  64 1f 2e 9b  00 03 00 0b  | *ô..¡.a¢d..›....
  50: 00 02 c5 00  02 c2 00 02  bf 30 82 02  bb 30 82 02  | ..Å......0...0..
  60: 24 a0 03 02  01 02 02 02  01 36 30 0d  06 09 2a 86  | $ .......60...*.
  70: 48 86 f7 0d  01 01 04 05  00 30 77 31  0b 30 09 06  | H.÷......0w1.0..
  80: 03 55 04 06  13 02 55 53  31 2c 30 2a  06 03 55 04  | .U....US1,0*..U.
  90: 0a 13 23 4e  65 74 73 63  61 70 65 20  43 6f 6d 6d  | ..#Netscape Comm
  a0: 75 6e 69 63  61 74 69 6f  6e 73 20 43  6f 72 70 6f  | unications Corpo
  b0: 72 61 74 69  6f 6e 31 11  30 0f 06 03  55 04 0b 13  | ration1.0...U...
  c0: 08 48 61 72  64 63 6f 72  65 31 27 30  25 06 03 55  | .Hardcore1’0%..U
  d0: 04 03 13 1e  48 61 72 64  63 6f 72 65  20 43 65 72  | ....Hardcore Cer
  e0: 74 69 66 69  63 61 74 65  20 53 65 72  76 65 72 20  | tificate Server
  f0: 49 49 30 1e  17 0d 39 38  30 35 31 36  30 31 30 33  | II0...9805160103
<additional data lines>
]
<additional records in same format>
Server socket closed.
```

Example 4

In this example, the `-s` option turns on SSL parsing, and the `-h` options turns on hex / ASCII format. Both formats are shown for each record. The output is routed to a text file.

Command

```
ssltap.exe -hs -p 444 interzone.mcom.com:443 > hs.txt
```

Output

```
Connected to interzone.mcom.com:443
--> [
   0: 80 3d 01 03  00 00 24 00  00 00 10 01  00 80 02 00  | .=....$.........
   10: 80 03 00 80  04 00 80 06  00 40 07 00  c0 00 00 04  | .........@......
   20: 00 ff e0 00  00 0a 00 ff  e1 00 00 09  00 00 03 03  | ........á.......
   30: 55 e6 e4 99  79 c7 d7 2c  86 78 96 5d  b5 cf e9     |U..™yÇ×,.x.]µÏé
alloclen = 63 bytes
   [ssl2]  ClientHelloV2 {
         version = {0x03, 0x00}
         cipher-specs-length = 36 (0x24)
         sid-length = 0 (0x00)
         challenge-length = 16 (0x10)
         cipher-suites = {
              (0x010080) SSL2/RSA/RC4-128/MD5
              (0x020080) SSL2/RSA/RC4-40/MD5
              (0x030080) SSL2/RSA/RC2CBC128/MD5
              (0x040080) SSL2/RSA/RC2CBC40/MD5
              (0x060040) SSL2/RSA/DES64CBC/MD5
              (0x0700c0) SSL2/RSA/3DES192EDE-CBC/MD5
              (0x000004) SSL3/RSA/RC4-128/MD5
              (0x00ffe0) SSL3/RSA-FIPS/3DES192EDE-CBC/SHA
              (0x00000a) SSL3/RSA/3DES192EDE-CBC/SHA
              (0x00ffe1) SSL3/RSA-FIPS/DES64CBC/SHA
              (0x000009) SSL3/RSA/DES64CBC/SHA
              (0x000003) SSL3/RSA/RC4-40/MD5
              }
         session-id = { }
         challenge = { 0x0355 0xe6e4 0x9979 0xc7d7 0x2c86 0x7896 0x5db

0xcfe9 }
}
]
<additional records in same formats>
Server socket closed.
```

Usage Tips

- When SSL restarts a previous session, it makes use of cached information to do a partial handshake. If you wish to capture a full SSL handshake, restart the browser to clear the session id cache.
- If you run the tool on a machine other than the SSL server to which you are trying to connect, the browser will complain that the host name you are trying to connect to is different from the certificate. If you are using the default BadCert callback, you can still connect through a dialog. If you are not using the default BadCert callback, the one you supply must allow for this possibility.

Chapter 15

SSL Strength Tool

SSL Strength Tool is a command-line tool that connects to an SSL server and reports back the encryption cipher and strength used for the connection.

This chapter has the following sections:

Availability

This tool is available for AIX 4.3, OSF/1 v4.0D, Solaris 2.6 (SunOS 5.6), Solaris 8, and Windows NT 4.0.

Syntax

```
sslstrength hostname[:port]
             [ciphers=ciphercode(s)]
             [verbose]
             [policy=export|domestic]
```

This form of the command returns a list of enabled ciphers on the client, then attempts to connect to the named SSL host, on the specified port. If the connection is successful, it returns information about the negotiated encryption strength.

```
sslstrength ciphers
```

This form of the command returns a list of the possible ciphers. A letter in the first column of the output is the code used by the `ciphers=` option. Pass any number of cipher codes to the `ciphers=` argument to identify the cipher preferences.

Options and Arguments

The SSL Strength Tool command options and their arguments are defined as follows:

Table 15-1 Description of options and arguments

Options and Arguments	Description
`hostname`	Required. Identifies the SSL server to which to connect.
`port`	Optional. Identifies a specific port on the specified SSL server to which to connect. If not specified, defaults to the standard HTTPS port, 443.
`ciphers=`	Optional. Turns on the cipher preferences corresponding to the specified cipher codes, and turns off all other cipher preferences. To obtain the list of cipher character codes, execute the special form of the command: `sslstrength ciphers`.
`verbose`	Optional. Turns on the verbose form of command output, which provides additional information about the progress of the connection.
`policy=`	Optional. Sets your policy regarding which ciphers can be permitted. Restricts the available ciphers to the same set used by Netscape Communicator for domestic or export versions (to comply with federal export restrictions). The value can be `export` or `domestic`. If not specified, defaults to `domestic`.

Usage

During an SSL handshake, the client sends the server a list of the ciphers it can use. The server chooses one of the ciphers based on its cipher policies, and notifies the client of which one to use.

When you issue the `sslstrength` command, the tool first prints the list of ciphers enabled on the client. It then connects to an SSL server and reports back the following information:

- The bulk encryption algorithm selected
- The key size selected
- The secret key size
- Information about the SSL server certificate, including:
  - The issuer subject name
  - The certificate subject name
  - The validity period

Restricting Ciphers

You can selectively enable or disable specific ciphers on the client, to determine what strength of connection is used for those ciphers. Use the `policy=` or `ciphers=` option to restrict which ciphers are available.

- To restrict the available ciphers to the same set used by Communicator for exportable or domestic versions, set the `policy=` option to either `domestic` or `export`. In an exportable client, only those ciphers that are valid for export are enabled.
- To further restrict the ciphers available, use the `ciphers=` option. The argument to this option is a string of characters, where each single character represents a cipher. For example, `ciphers=bfi` turns on the cipher preferences corresponding to the codes `b`, `f` ,and `i`. It turns off all other cipher preferences.

  To obtain the list of cipher character codes, execute this command:

  ```
  sslstrength ciphers
  ```

Export Policy and Step-up

Some institutions, such as banks, may be qualified to obtain a special “step-up” certificate (also know as a “global server ID”) that allows the server to override export policy. When this certificate is installed in the server, it allows an export client that has step-up capability to renegotiate the SSL cipher and use domestic-strength encryption.

A connection that steps up starts out with 40-bit encryption, then, upon encountering a `change-cipher-spec` handshake, changes to 128-bit encryption. To check whether a client has stepped up correctly upon encountering a step-up certificate, check that it is using export policy, and that the secret key size is 128 bits.

Examples

The following examples show the output from various `sslstrength` commands.

Example 1

This example shows output from a command that allows all options to default.

```
sslstrength  myhost.netscape.com


Using domestic policy
Connecting to myhost.netscape.com:443
Using all ciphersuites usually found in client
Your Cipher preference:
id    CipherName                                    Domestic     Export
a     SSL_EN_RC4_128_WITH_MD5              (ssl2)    Yes          No
b     SSL_EN_RC2_128_CBC_WITH_MD5          (ssl2)    Yes          No
c     SSL_EN_DES_192_EDE3_CBC_WITH_MD5     (ssl2)    Yes          No
d     SSL_EN_DES_64_CBC_WITH_MD5           (ssl2)    Yes          No
e     SSL_EN_RC4_128_EXPORT40_WITH_MD5     (ssl2)    Yes         Yes
f     SSL_EN_RC2_128_CBC_EXPORT40_WITH_MD5 (ssl2)    Yes         Yes
i     SSL_RSA_WITH_RC4_128_MD5            (ssl3)    Yes Step-up only
j     SSL_RSA_WITH_3DES_EDE_CBC_SHA       (ssl3)    Yes Step-up only
k     SSL_RSA_WITH_DES_CBC_SHA             (ssl3)    Yes          No
l     SSL_RSA_EXPORT_WITH_RC4_40_MD5       (ssl3)    Yes          Yes
m     SSL_RSA_EXPORT_WITH_RC2_CBC_40_MD5   (ssl3)    Yes         Yes
o     SSL_RSA_WITH_NULL_MD5               (ssl3)    Yes         Yes
p     SSL_RSA_FIPS_WITH_3DES_EDE_CBC_SHA   (ssl3)    Yes          No
q     SSL_RSA_FIPS_WITH_DES_CBC_SHA        (ssl3)    Yes          No
SSL Connection Status
Cipher:          RC4
Key Size:        128
Secret Key Size: 128
Issuer:          OU=Secure Server Certification Authority, O="RSA
Data Security, Inc.", C=US
```

```
Subject:        CN=myhost.netscape.com, OU=E-Store Merchant Server,
O=Netscape Communications Corp., L=Mountain View, ST=California,
C=US
Valid:           from Fri Oct 02, 1998 to Sat Oct 02, 1999
```

Example 2

This example shows output from a command that limits the client to three ciphers.

```
sslstrength  myhost.netscape.com  ciphers=jkl


Using domestic policy
Connecting to myhost.netscape.com:443
Your Cipher preference:
id    CipherName                                  Domestic     Export
j     SSL_RSA_WITH_3DES_EDE_CBC_SHA       (ssl3)    Yes Step-up only
k     SSL_RSA_WITH_DES_CBC_SHA            (ssl3)    Yes          No
l     SSL_RSA_EXPORT_WITH_RC4_40_MD5      (ssl3)    Yes         Yes
SSL Connection Status
Cipher:          3DES-EDE-CBC
Key Size:        168
Secret Key Size: 168
Issuer:          OU=Secure Server Certification Authority, O="RSA
Data Security, Inc.", C=US
Subject:        CN=myhost.netscape.com, OU=E-Store Merchant Server,
O=Netscape Communications Corp., L=Mountain View, ST=California,
C=US
Valid:           from Fri Oct 02, 1998 to Sat Oct 02, 1999
```

Example 3

This example shows output from a command that sets the client's policy to enable standard export ciphers.

```
sslstrength  myhost.netscape.com  policy=export


Using export policy
Connecting to myhost.netscape.com:443
Using all ciphersuites usually found in client
Your Cipher preference:
id    CipherName                                  Domestic     Export
e     SSL_EN_RC4_128_EXPORT40_WITH_MD5    (ssl2)    Yes         Yes
```

```
f     SSL_EN_RC2_128_CBC_EXPORT40_WITH_MD5 (ssl2)    Yes         Yes
i     SSL_RSA_WITH_RC4_128_MD5            (ssl3)    Yes Step-up only
j     SSL_RSA_WITH_3DES_EDE_CBC_SHA       (ssl3)    Yes Step-up only
l     SSL_RSA_EXPORT_WITH_RC4_40_MD5      (ssl3)    Yes         Yes
m     SSL_RSA_EXPORT_WITH_RC2_CBC_40_MD5  (ssl3)    Yes         Yes
o     SSL_RSA_WITH_NULL_MD5               (ssl3)    Yes         Yes
SSL Connection Status
Cipher:          RC4-40
Key Size:        128
Secret Key Size: 40
Issuer:          OU=Secure Server Certification Authority, O="RSA
Data Security, Inc.", C=US
Subject:        CN=myhost.netscape.com, OU=E-Store Merchant Server,
O=Netscape Communications Corp., L=Mountain View, ST=California,
C=US
Valid:           from Fri Oct 02, 1998 to Sat Oct 02, 1999
```

Chapter 16

Security Module Database Tool

The Security Module Database Tool is a command-line utility for managing PKCS#11 module information within `secmod.db` files or within hardware tokens. You can use the tool to add and delete PKCS #11 modules, change passwords, set defaults, list module contents, enable or disable slots, enable or disable FIPS-140-1 compliance, and assign default providers for cryptographic operations. This tool can also create `key3.db`, `cert7.db`, and `secmod.db` security database files.

The tasks associated with security module database management are part of a process that typically also involves managing key databases (`key3.db` files) and certificate databases (`cert7.db` files). The key, certificate, and PKCS #11 module management process generally begins with creating the keys and key database necessary to generate and manage certificates and the certificate database.

This chapter has the following sections:

Availability

This tool is available for Solaris 2.5.1 (SunOS 5.5.1) and Windows NT 4.0.

Syntax

To run the Security Module Database Tool, type the command

`modutil option [arguments]`

where `option` and `[arguments]` are combinations of the options and arguments listed in the following section. Each command takes one option. Each option may take zero or more arguments. To see a usage string, issue the command without options.

Options and Arguments

Options specify an action. Option arguments modify an action. The options and arguments for the modutil command are defined as follows:

Table 16-1 Options and Arguments for modutil

Options	Description
`-create`	Create new `secmod.db`, `key3.db`, and `cert7.db` files. Use the `-dbdir` *directory* argument to specify a directory. If any of these databases already exist in a specified directory, the Security Module Database Tool displays an error message.
`-list [modulename]`	Display basic information about the contents of the `secmod.db` file. Use *modulename* to display detailed information about a particular module and its slots and tokens.
`-add modulename`	Add the named PKCS #11 module to the database. Use this option with the `-libfile`, `-ciphers`, and `-mechanisms` arguments.
`-jar JAR-file`	Add a new PKCS #11 module to the database using the named JAR file. Use this option with the `-installdir` and `-tempdir` arguments. The JAR file uses the Netscape Server PKCS #11 JAR format to identify all the files to be installed, the module's name, the mechanism flags, and the cipher flags. The JAR file should also contain any files to be installed on the target machine, including the PKCS #11 module library file and other files such as documentation. See the section JAR Installation File for information on creating the special script needed to perform an installation through a server or with the Security Module Database Tool (that is, in environments without JavaScript support).
`-delete modulename`	Delete the named module. Note that you cannot delete the Netscape Communicator internal PKCS #11 module.

Table 16-1 Options and Arguments for modutil

`-changepw tokenname`	Change the password on the named token. If the token has not been initialized, this option initializes the password. Use this option with the `-pwfile` and `-newpwfile` arguments. In this context, the term "password" is equivalent to a personal identification number (PIN).
`-default modulename`	Specify the security mechanisms for which the named module will be a default provider. The security mechanisms are specified with the `-mechanisms` *mechanism-list* argument.
`-undefault modulename`	Specify the security mechanisms for which the named module will *not* be a default provider. The security mechanisms are specified with the `-mechanisms` *mechanism-list* argument.
`-enable modulename`	Enable all slots on the named module. Use the `[-slot` *slotname*`]` argument to enable a specific slot.
`-disable modulename`	Disable all slots on the named module. Use the `[-slot` *slotname*`]` argument to disable a specific slot.
`-fips [true | false]`	Enable (`true`) or disable (`false`) FIPS-140-1 compliance for the Netscape Communicator internal module.
`-force`	Disable the Security Module Database Tool's interactive prompts so it can be run from a script. Use this option only after manually testing each planned operation to check for warnings and to ensure that bypassing the prompts will cause no security lapses or loss of database integrity.
Arguments	
`-dbdir directory`	Specify a directory in which to access or create security module database files. On Unix, the Security Module Database Tool defaults to the user's Netscape directory. Windows NT has no default directory, so `-dbdir` must be used to specify a directory.
`-libfile library-file`	Specify a path to the DLL or other library file containing the implementation of the PKCS #11 interface module that is being added to the database.
`-ciphers cipher-enable-list`	Enable specific ciphers in a module that is being added to the database. The *cipher-enable-list* is a colon-delimited list of cipher names. Enclose this list in quotation marks if it contains spaces. The following cipher is currently available: FORTEZZA.

Table 16-1 Options and Arguments for modutil

`-mechanisms mechanism-list`	Specify the security mechanisms for which a particular module will be flagged as a default provider. The *mechanism-list* is a colon-delimited list of mechanism names. Enclose this list in quotation marks if it contains spaces. The module becomes a default provider for the listed mechanisms when those mechanisms are enabled. If more than one module claims to be a particular mechanism's default provider, that mechanism's default provider is undefined. The following mechanisms are currently available: RSA, DSA, RC2, RC4, RC5, DES, DH, FORTEZZA, SHA1, MD5, MD2, RANDOM (for random number generation), and FRIENDLY (meaning certificates are publicly readable).
`-installdir root-installation-directory`	Specify the root installation directory relative to which files will be installed by the `-jar` *JAR-file* option. This directory should be one below which it is appropriate to store dynamic library files (for example, a server's root directory or the Netscape Communicator root directory).
`-tempdir temporary-directory`	The temporary directory is the location where temporary files will be created in the course of installation by the `-jar` *JAR-file* option. If no temporary directory is specified, the current directory will be used.
`-pwfile old-password-file`	Specify a text file containing a token's existing password so that a password can be entered automatically when the `-changepw` *tokenname* option is used to change passwords.
`-newpwfile new-password-file`	Specify a text file containing a token's new or replacement password so that a password can be entered automatically with the `-changepw` *tokenname* option.
`-slot slotname`	Specify a particular slot to be enabled or disabled with the `-enable` *modulename* or `-disable` *modulename* options.
`-nocertdb`	Do not open the certificate or key databases. This has several effects: • With the `-create` command, only a `secmod.db` file will be created; `cert7.db` and `key3.db` will not be created. • With the `-jar` command, signatures on the JAR file will not be checked. • With the `-changepw` command, the password on the Netscape internal module cannot be set or changed, since this password is stored in `key3.db`.

Usage

The Security Module Database Tool's capabilities are grouped as follows, using these combinations of options and arguments. The options and arguments in square brackets are optional, those without square brackets are required.

- Creating a set of security management database files (`key3.db`, `cert7.db`, and `secmod.db`):

  `-create`

- Displaying basic module information or detailed information about the contents of a given module:

  `-list` [modulename]

- Adding a PKCS #11 module, which includes setting a supporting library file, enabling ciphers, and setting default provider status for various security mechanisms:

  `-add` modulename `-libfile` library-file `[-ciphers` cipher-enable-list`]` `[-mechanisms` mechanism-list`]`

- Adding a PKCS #11 module from an existing JAR file:

  `-jar` JAR-file `-installdir` root-installation-directory `[-tempdir` temporary-directory`]`

- Deleting a specific PKCS #11 module from a security module database:

  `-delete` modulename

- Initializing or changing a token's password:

  `-changepw` tokenname [-pwfile old-password-file] [-newpwfile new-password-file]

- Setting the default provider status of various security mechanisms in an existing PKCS #11 module:

  `-default` modulename -mechanisms mechanism-list

- Clearing the default provider status of various security mechanisms in an existing PKCS #11 module:

  `-undefault` modulename -mechanisms mechanism-list

- Enabling a specific slot or all slots within a module:

  -enable modulename [-slot slotname]

- Disabling a specific slot or all slots within a module:

  -disable modulename [-slot slotname]

- Enabling or disabling FIPS-140-1 compliance within the Netscape Communicator internal module:

  `-fips [true | false]`

- Disabling interactive prompts for the Security Module Database Tool, to support scripted operation:

  `-force`

JAR Installation File

When a JAR file is run by a server, by the Security Module Database Tool, or by any program that does not interpret JavaScript, a special information file must be included in the format described below.

This information file contains special scripting and must be declared in the JAR archive's manifest file. The script can have any name. The metainfo tag for this is `Pkcs11_install_script`. To declare meta-information in the manifest file, put it in a file that is passed to the Netscape Signing Tool.

Sample Script

For example, the PKCS #11 installer script could be in the file `pk11install`. If so, the metainfo file for the Netscape Signing Tool would include a line such as this:

```
+ Pkcs11_install_script: pk11install
```

The sample script file could contain the following:

```
ForwardCompatible { IRIX:6.2:mips SUNOS:5.5.1:sparc }
Platforms {
   WINNT::x86 {
      ModuleName { "Fortezza Module" }
      ModuleFile { win32/fort32.dll }
      DefaultMechanismFlags{0x0001}
      DefaultCipherFlags{0x0001}
      Files {
         win32/setup.exe {
            Executable
            RelativePath { %temp%/setup.exe }
```

```
            }
            win32/setup.hlp {
                RelativePath { %temp%/setup.hlp }
            }
            win32/setup.cab {
                RelativePath { %temp%/setup.cab }
            }
        }
    }
    WIN95::x86 {
        EquivalentPlatform {WINNT::x86}
    }
    SUNOS:5.5.1:sparc {
        ModuleName { "Fortezza UNIX Module" }
        ModuleFile { unix/fort.so }
        DefaultMechanismFlags{0x0001}
        CipherEnableFlags{0x0001}
        Files {
            unix/fort.so {
                RelativePath{%root%/lib/fort.so}
                AbsolutePath{/usr/local/netscape/lib/fort.so}
                FilePermissions{555}
            }
            xplat/instr.html {
                RelativePath{%root%/docs/inst.html}
                AbsolutePath{/usr/local/netscape/docs/inst.html}
                FilePermissions{555}
            }
        }
    }
    IRIX:6.2:mips {
        EquivalentPlatform { SUNOS:5.5.1:sparc }
    }
}
```

Script Grammar

The script file grammar is as follows:

```
--> valuelist

valuelist --> value valuelist
              <null>

value ---> key_value_pair
           string
```

key_value_pair --> *key* { *valuelist* }

key --> *string*

string --> *simple_string*
"*complex_string*"

simple_string --> [^ \t\n\""{""}"]+ (No whitespace, quotes, or braces.)

complex_string --> ([^\"\\\r\n]|(\\\")|(\\\\))+ (Quotes and backslashes must be escaped with a backslash. A complex string must not include newlines or carriage returns.)

Outside of complex strings, all white space (for example, spaces, tabs, and carriage returns) is considered equal and is used only to delimit tokens.

Keys

Keys are case-insensitive. This section discusses the following keys:

- Global Keys
- Per-Platform Keys
- Per-File Keys

Global Keys

Key	Description
ForwardCompatible	Gives a list of platforms that are forward compatible. If the current platform cannot be found in the list of supported platforms, then the `ForwardCompatible` list is checked for any platforms that have the same OS and architecture in an earlier version. If one is found, its attributes are used for the current platform.

Platforms (required)

Gives a list of platforms. Each entry in the list is itself a key-value pair: the key is the name of the platform and the value list contains various attributes of the platform. The `ModuleName`, `ModuleFile`, and `Files` attributes must be specified for each platform unless an `EquivalentPlatform` attribute is specified. The platform string is in the following format: *system name*`:`*OS release*`:`*architecture*. The installer obtains these values from NSPR. *OS release* is an empty string on non-Unix operating systems. The following system names and platforms are currently defined by NSPR:

- AIX (rs6000)
- BSDI (x86)
- FREEBSD (x86)
- HPUX (hppa1.1)
- IRIX (mips)
- LINUX (ppc, alpha, x86)
- MacOS (PowerPC)
- NCR (x86)
- NEC (mips)
- OS2 (x86)
- OSF (alpha)
- ReliantUNIX (mips)
- SCO (x86)
- SOLARIS (sparc)
- SONY (mips)
- SUNOS (sparc)
- UnixWare (x86)
- WIN16 (x86)
- WIN95 (x86)
- WINNT (x86)

Here are some examples of valid platform strings:

```
IRIX:6.2:mips
SUNOS:5.5.1:sparc
Linux:2.0.32:x86
WIN95::x86.
```

Per-Platform Keys

These keys have meaning only within the value list of an entry in the `Platforms` list.

Key	Description
`ModuleName` (required)	Gives the common name for the module. This name will be used to reference the module from Netscape Communicator, the Security Module Database tool (*`modutil`*), servers, or any other program that uses the Netscape security module database.
`ModuleFile` (required)	Names the PKCS #11 module file (DLL or `.so`) for this platform. The name is given as the relative path of the file within the JAR archive.
`Files` (required)	Lists the files that need to be installed for this module. Each entry in the file list is a key-value pair: the key is the path of the file in the JAR archive, and the value list contains attributes of the file. At least `RelativePath` or `AbsolutePath` must be specified for each file.

`FilePermissions`	Interpreted as a string of octal digits, according to the standard Unix format. This string is a bitwise OR of the following constants:
	`user read: 0400`
	`user write: 0200`
	`user execute: 0100`
	`group read: 0040`
	`group write: 0020`
	`group execute: 0010`
	`other read: 0004`
	`other write: 0002`
	`other execute: 0001`
	Some platforms may not understand these permissions. They are applied only insofar as they make sense for the current platform. If this attribute is omitted, a default of 777 is assumed.

DefaultMechanismFlags

Specifies mechanisms for which this module will be a default provider. This key-value pair is a bitstring specified in hexadecimal (0x) format. It is constructed as a bitwise OR of the following constants. If the DefaultMechanismFlags entry is omitted, the value defaults to 0x0.

```
RSA:                0x00000001
DSA:                0x00000002
RC2:                0x00000004
RC4:                0x00000008
DES:                0x00000010
DH:                 0x00000020
FORTEZZA:           0x00000040
RC5:                0x00000080
SHA1:               0x00000100
MD5:                0x00000200
MD2:                0x00000400
RANDOM:             0x08000000
FRIENDLY:           0x10000000
OWN_PW_DEFAULTS:    0x20000000
DISABLE:            0x40000000
```

CipherEnableFlags

Specifies ciphers that this module provides but Netscape products do not, so that Netscape products can enable them. This key is a bitstring specified in hexadecimal (0x) format. It is constructed as a bitwise OR of the following constants. If the CipherEnableFlags entry is omitted, the value defaults to 0x0.

```
FORTEZZA:           0x0000 0001
```

EquivalentPlatform

Specifies that the attributes of the named platform should also be used for the current platform. Saves typing when there is more than one platform using the same settings.

Per-File Keys

These keys have meaning only within the value list of an entry in a Files list. At least one of RelativePath and AbsolutePath must be specified. If both are specified, the relative path is tried first, and the absolute path is used only if no relative root directory is provided by the installer program.

Key	Description
AbsolutePath	Specifies the destination directory of the file as an absolute path. If both RelativePath and AbsolutePath are specified, the installer attempts to use the relative path; if it is unable to determine a relative path, it uses the absolute path.

`RelativePath`

Specifies the destination directory of the file, relative to some directory decided at install time. Two variables can be used in the relative path: "`%root%`" and "`%temp%`". "`%root%`" is replaced at run time with the directory relative to which files should be installed; for example, it may be the server's root directory or the Netscape Communicator root directory. The "`%temp%`" directory is created at the beginning of the installation and destroyed at the end.

The purpose of "`%temp%`" is to hold executable files (such as setup programs) or files that are used by these programs. For example, a Windows installation might consist of a `setup.exe` installation program, a help file, and a `.cab` file containing compressed information. All these files could be installed in the temporary directory. Files destined for the temporary directory are guaranteed to be in place before any executable file is run; they are not deleted until all executable files have finished.

`Executable`

Specifies that the file is to be executed during the course of the installation. Typically this string would be used for a setup program provided by a module vendor, such as a self-extracting `setup.exe`. More than one file can be specified as executable, in which case the files are run in the order in which they are specified in the script file.

`FilePermissions`

Interpreted as a string of octal digits, according to the standard Unix format. This string is a bitwise OR of the following constants:

```
user read:                0400
user write:               0200
user execute:             0100
group read:               0040
group write:              0020
group execute:            0010
other read:               0004
other write:              0002
other execute:       0001
```

Some platforms may not understand these permissions. They are applied only insofar as they make sense for the current platform. If this attribute is omitted, a default of 777 is assumed.

Examples

- Creating Database Files
- Displaying Module Information
- Setting a Default Provider

- Enabling a Slot
- Enabling FIPS Compliance
- Adding a Cryptographic Module
- Installing a Cryptographic Module from a JAR File
- Changing the Password on a Token

Creating Database Files

This example creates a set of security management database files in the specified directory:

```
modutil -create -dbdir c:\databases
```

The Security Module Database Tool displays a warning:

```
WARNING: Performing this operation while a Netscape product is
running could cause corruption of your security databases. If a
Netscape product is currently running, you should exit the product
before continuing this operation. Type 'q <enter>' to abort, or
<enter> to continue:
```

After you press Enter, the tool displays the following:

```
Creating "c:\databases\key3.db"...done.
Creating "c:\databases\cert7.db"...done.
Creating "c:\databases\secmod.db"...done.
```

Displaying Module Information

This example gives detailed information about the specified module:

```
modutil -list "Netscape Internal PKCS #11 Module" -dbdir
c:\databases
```

The Security Module Database Tool displays information similar to this:

```
Using database directory c:\databases...
-----------------------------------------------------------
Name: Netscape Internal PKCS #11 Module
Library file: **Internal ONLY module**
Manufacturer: Netscape Communications Corp
Description: Communicator Internal Crypto Svc
```

```
PKCS #11 Version 2.0
Library Version: 4.0
Cipher Enable Flags: None
Default Mechanism Flags: RSA:DSA:RC2:RC4:DES:SHA1:MD5:MD2

Slot: Communicator Internal Cryptographic Services Version 4.0
Manufacturer: Netscape Communications Corp
Type: Software
Version Number: 4.1
Firmware Version: 0.0
Status: Enabled
Token Name: Communicator Generic Crypto Svcs
Token Manufacturer: Netscape Communications Corp
Token Model: Libsec 4.0
Token Serial Number: 0000000000000000
Token Version: 4.0
Token Firmware Version: 0.0
Access: Write Protected
Login Type: Public (no login required)
User Pin: NOT Initialized

Slot: Communicator User Private Key and Certificate Services
Manufacturer: Netscape Communications Corp
Type: Software
Version Number: 3.0
Firmware Version: 0.0
Status: Enabled
Token Name: Communicator Certificate DB
Token Manufacturer: Netscape Communications Corp
Token Model: Libsec 4.0
Token Serial Number: 0000000000000000
Token Version: 7.0
Token Firmware Version: 0.0
Access: NOT Write Protected
Login Type: Login required
User Pin: NOT Initialized
```

Setting a Default Provider

This example makes the specified module a default provider for the RSA, DSA, and RC2 security mechanisms:

```
modutil -default "Cryptographic Module" -dbdir c:\databases
-mechanisms RSA:DSA:RC2
```

The Security Module Database Tool displays a warning:

```
WARNING: Performing this operation while a Netscape product is
running could cause corruption of your security databases. If a
Netscape product is currently running, you should exit the product
before continuing this operation. Type 'q <enter>' to abort, or
<enter> to continue:
```

After you press Enter, the tool displays the following:

```
Using database directory c:\databases...

Successfully changed defaults.
```

Enabling a Slot

This example enables a particular slot in the specified module:

```
modutil -enable "Cryptographic Module" -slot "Cryptographic Reader"
-dbdir c:\databases
```

The Security Module Database Tool displays a warning:

```
WARNING: Performing this operation while a Netscape product is
running could cause corruption of your security databases. If a
Netscape product is currently running, you should exit the product
before continuing this operation. Type 'q <enter>' to abort, or
<enter> to continue:
```

After you press Enter, the tool displays the following:

```
Using database directory c:\databases...

Slot "Cryptographic Reader" enabled.
```

Enabling FIPS Compliance

This example enables FIPS-140-1 compliance in Communicator's internal module:

```
modutil -fips true
```

The Security Module Database Tool displays a warning:

```
WARNING: Performing this operation while a Netscape product is
running could cause corruption of your security databases. If a
Netscape product is currently running, you should exit the product
before continuing this operation. Type 'q <enter>' to abort, or
<enter> to continue:
```

After you press Enter, the tool displays the following:

```
FIPS mode enabled.
```

Adding a Cryptographic Module

This example adds a new cryptographic module to the database:

```
C:\modutil> modutil -dbdir "C:\databases" -add "Cryptorific Module"
-libfile "C:\winnt\system32\crypto.dll" -mechanisms
RSA:DSA:RC2:RANDOM
```

The Security Module Database Tool displays a warning:

```
WARNING: Performing this operation while a Netscape product is
running could cause corruption of your security databases. If a
Netscape product is currently running, you should exit the product
before continuing this operation. Type 'q <enter>' to abort, or
<enter> to continue:
```

After you press Enter, the tool displays the following:

```
Using database directory C:\databases...
Module "Cryptorific Module" added to database.
C:\modutil>
```

Installing a Cryptographic Module from a JAR File

This example installs a cryptographic module from the following sample installation script.

```
Platforms {
   WinNT::x86 {
      ModuleName { "Cryptorific Module" }
      ModuleFile { crypto.dll }
      DefaultMechanismFlags{0x0000}
      CipherEnableFlags{0x0000}
      Files {
         crypto.dll {
            RelativePath{ %root%/system32/crypto.dll }
         }
         setup.exe {
            Executable
            RelativePath{ %temp%/setup.exe }
```

```
            }
        }
    }
    Win95::x86 {
        EquivalentPlatform { Winnt::x86 }
    }
}
```

To install from the script, use the following command. The root directory should be the Windows root directory (for example, `c:\\windows`, or `c:\\winnt`).

```
C:\modutil> modutil -dbdir "c:\databases" -jar install.jar
-installdir "C:/winnt"
```

The Security Module Database Tool displays a warning:

```
WARNING: Performing this operation while a Netscape product is
running could cause corruption of your security databases. If a
Netscape product is currently running, you should exit the product
before continuing this operation. Type 'q <enter>' to abort, or
<enter> to continue:
```

After you press Enter, the tool displays the following:

```
Using database directory c:\databases...

This installation JAR file was signed by:
-----------------------------------------------

**SUBJECT NAME**

C=US, ST=California, L=Mountain View, CN=Cryptorific Inc.,
OU=Digital ID Class 3 - Netscape Object Signing,
OU="www.verisign.com/repository/CPS Incorp. by Ref.,LIAB.LTD(c)9 6",
OU=www.verisign.com/CPS Incorp.by Ref. LIABILITY LTD.(c)97 VeriSign,
OU=VeriSign Object Signing CA - Class 3 Organization, OU="VeriSign,
Inc.", O=VeriSign Trust Network **ISSUER NAME**,
OU=www.verisign.com/CPS Incorp.by Ref. LIABILITY LTD.(c)97 VeriSign,
OU=VeriSign Object Signing CA - Class 3 Organization, OU="VeriSign,
Inc.", O=VeriSign Trust Network
-----------------------------------------------

Do you wish to continue this installation? (y/n) y
Using installer script "installer_script"
Successfully parsed installation script
Current platform is WINNT::x86
Using installation parameters for platform WinNT::x86
Installed file crypto.dll to C:/winnt/system32/crypto.dll
```

```
Installed file setup.exe to ./pk11inst.dir/setup.exe
Executing "./pk11inst.dir/setup.exe"...
"./pk11inst.dir/setup.exe" executed successfully
Installed module "Cryptorific Module" into module database

Installation completed successfully
C:\modutil>
```

Changing the Password on a Token

This example changes the password for a token on an existing module.

```
C:\modutil> modutil -dbdir "c:\databases" -changepw "Communicator
Certificate DB"
```

The Security Module Database Tool displays a warning:

```
WARNING: Performing this operation while a Netscape product is
running could cause corruption of your security databases. If a
Netscape product is currently running, you should exit the product
before continuing this operation. Type 'q <enter>' to abort, or
<enter> to continue:
```

After you press Enter, the tool displays the following:

```
Using database directory c:\databases...
Enter old password:
Incorrect password, try again...
Enter old password:
Enter new password:
Re-enter new password:
Token "Communicator Certificate DB" password changed successfully.
C:\modutil>
```

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