AUTHORIZED DOCUMENTATION

Administration Guide

Novell®
Modular Authentication Services (NMAS)

3.3.3

December 08, 2010

www.novell.com

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Contents

About This Guide

This guide provides an overview of the Novell Modular Authentication Services (NMAS) technology and software. It includes instructions on how to install, configure, and manage NMAS.

Audience

This guide is written primarily for network administrators.

Feedback

We want to hear your comments and suggestions about this manual and the other documentation included with this product. Please use the User Comment feature at the bottom of each page of the online documentation, or go to www.novell.com/documentation/feedback.html and enter your comments there.

Documentation Updates

For the most recent version of the *NMAS 3.3.3 Administration Guide*, see the NMAS 3.3.3 Administration Guide Web site (http://www.novell.com/documentation/lg/nmas33/index.html).

What's New

1

This documentation is for NMAS 3.3.3, which is part of eDirectory 8.8.6. For eDirectory 8.8*x* and later, NMAS is automatically installed when you install eDirectory. For information regarding eDirectory 8.8.6, including supported platforms and installation instructions, see the *Novell eDirectory 8.8 Administation Guide (http://www.novell.com/documentation/edir88/)*.

NMAS Overview

2

This section provides an overview of Novell Modular Authentication Services (NMAS).

2.1 NMAS Functionality

NMAS is designed to help you protect information on your network. In addition to NDS Password, NMAS brings together ways of authenticating to Novell eDirectory 8.7.3 or later networks. This helps to ensure that the people accessing your network resources are who they say they are.

2.1.1 NMAS Features

NMAS employs three different phases of operation during a user’s session on a workstation with respect to authentication devices. These phases are as follows:

1. User Identification Phase (who are you?)
2. Authentication (Login) Phase (prove who you say you are)
3. Device Removal Detection Phase (are you still there?)

All three of these phases of operation are completely independent. Authentication devices can be used in each phase, but the same device need not be used each time.

User Identification Phase

This is the process of gathering the username. Also provided in this phase are the tree name, the user’s context, the server name, and the name of the NMAS sequence to be used during the Authentication phase. This authentication information can be obtained from an authentication device, or it can be entered manually by the user.

Authentication (Login) Phase

NMAS uses three different approaches to logging in to the network called *login factors*. These login factors describe different items or qualities a user can use to authenticate to the network:

- Password Authentication (something you know)
- Physical Device Authentication (something you have)
- Biometric Authentication (something you are)

For more information on these login factors, see Section 2.1.2, "Login and Post-Login Methods and Sequences," on page 13.

Password Authentication

Passwords (something you know) are important methods for authenticating to networks. NMAS provides several password authentication options:

- **NDS password:** The NDS password is stored in a hash form that is non-reversible and only the NDS system can make use of this password. This option uses the Universal Password if it is enabled and set.
- **Simple password:** The simple password allows administrators to import users and passwords (clear text and hashed) from foreign LDAP directories. This option uses the Universal Password if it is enabled and set.
- **Digest-MD5 SASL:** Digest-MD5 SASL provides the IETF standard DIGEST-MD5 SASL mechanism that validates a password hashed by the MD5 algorithm to be used for a LDAP SASL bind. This option will use the Universal Password if it is enabled and set.
- **Challenge/Response:** Challenge/Response provides a way for a user to prove his or her identity using one or more responses to pre-configured challenge questions.

Universal Password is a way to simplify the integration and management of different password and authentication systems into a coherent network. For more information on Universal Password, see the *Novell Password Management 3.3.1 Administration Guide* (http://www.novell.com/documentation/password_management33/pwm_administration/data/bookinfo.html).

Physical Device Authentication

Novell developers and third-party authentication developers have written authentication modules for NMAS for several types of physical devices (something you have):

NOTE: NMAS uses the word *token* to refer to all physical device authentication methods (smart cards with certificates, one-time password (OTP) devices, proximity cards, etc.).

- **Smart card:** A smart card is a plastic card, about the size of a credit card, or a USB device that includes an embedded, programmable microchip that can store data and perform cryptographic functions. With NMAS, a smart card can be used to establish an identity when authenticating to eDirectory.

Novell provides the Novell Enhanced Smart Card login method for the use of smart cards. The Novell Enhanced Smart Card login method is provided as part of the Identity Assurance Client. For more information, see the *Novell Enhanced Smart Card Method Installation Guide* (http://www.novell.com/documentation/iasclient30x/nescm_install/data/bookinfo.html).

- **One-Time Password (OTP) device:** An OTP device is a hand-held hardware device that generates a one-time password to authenticate its owner.
- **Proximity card:** A proximity card is a card worn by a person. This technology locks and unlocks a person's workstation based on the card's proximity to the workstation.

  Novell provides the pcProx login method, which supports RFID proximity cards. The pcProx login method is provided as part of the Novell SecureLogin product. For more information, see *NMAS Login Method and Login ID Snap-In for pcProx* (http://www.novell.com/documentation/securelogin61/quickstart_card/data/b20g4u4.html).

Biometric Authentication

Biometrics is the science and technology of measuring and statistically analyzing human body characteristics (something you are). Biometric methods are provided by third-party companies for use with NMAS.

Biometric authentication requires readers or scanning devices, software that converts the scanned information into digital form, and a database or directory that stores the biometric data for comparison with entered biometric data.

In converting the biometric input, the software identifies specific points of data as match points. The match points are processed by using an algorithm to create a value that can be compared with biometric data scanned when a user tries to gain access.

Some examples of biometric authentication include scans of fingerprints, retinas, irises, and facial features. Biometrics can also include, handwriting, typing patterns, voice recognition, etc.

Device Removal Detection Phase

The user's session enters this phase after login is complete. Two methods are available:

- The Secure Workstation method, which is available with Novell SecureLogin. The user's session can be terminated when an authentication device (such as a smart card) is removed. This device need not be used in any of the other phases

  For more information on the Secure Workstation method, see the *Novell SecureLogin 6.1 Administration Guide* (http://www.novell.com/documentation/securelogin61/nsl61_administration_guide/data/bb3z215.html).
- The Novell Enhanced Smart Card login method also provides smart card removal detection. For more information on the Novell Enhanced Smart Card login method, see the *Novell Enhanced Smart Card Method 3.0.3 Installation Guide*http://www.novell.com/documentation/iasclient30x/nescm_install/data/bookinfo.html (http://www.novell.com/documentation/ias303/nescm_install/data/bookinfo.html).

2.1.2 Login and Post-Login Methods and Sequences

A *login method* is a specific implementation of a login factor. NMAS provides multiple login methods to choose from based on the three login factors (password, physical device or token, and biometric authentication).

A *post-login method* is a security process that is executed after a user has authenticated to Novell eDirectory. For example, one post-login method is the Novell Secure Workstation method (available with Novell SecureLogin), which requires the user to provide credentials in order to access the computer after the workstation is locked.

NMAS software includes support for a number of login and post-login methods from Novell and from third-party authentication developers. Additional hardware might be required, depending on the login method. Refer to the third-party product's documentation for more information.

After you have decided upon and installed a method, you need to assign it to a login sequence in order for it to be used. A *login sequence* is an ordered set of one or more methods. Users log in to the network by using these defined login sequences. If the sequence contains more than one method, the methods are presented to the user in the order specified. Login methods are presented first, followed by post-login methods.

Both And and Or login sequences exist with NMAS. An And login sequence requires all of the login methods in the sequence to complete successfully. An Or login sequence requires only one of the login methods in the sequence to complete successfully. An example of an Or login sequence is to allow users to use the same login sequence to login to workstations with different authentication devices.

2.1.3 Graded Authentication

Another feature of NMAS is *graded authentication*. Graded authentication allows you to "grade," or control, users' access to the network based on the login methods used to authenticate to the network.

IMPORTANT: Graded authentication is an additional level of control. It does not take the place of regular eDirectory and file system access rights, which still need to be administered.

Graded authentication is only available on NetWare.

Graded authentication is managed from the Security Policy object in the Security container by using iManager or ConsoleOne®. This object is created when NMAS is installed.

For more information on graded authentication, see Chapter 4, "Using Graded Authentication," on page 29.

- "Categories" on page 14
- "Security Labels" on page 15
- "Clearances" on page 15

Categories

A category is an element of a set that represents sensitivity and trust. You use categories to define security labels.

NMAS comes with three secrecy categories and three integrity categories (see Table 2-1). You can define additional secrecy and integrity categories to meet your company's needs.

For more information on defining secrecy and integrity categories, see Section 4.3.1, "Defining User-Defined Categories (Closed User Groups)," on page 36.

Security Labels

Security labels are a set of secrecy and integrity categories. NMAS comes with eight security labels defined. The following table shows the predefined security labels and the set of categories that define the label:

Table 2-1 *Security Labels*

Default Security Labels	Secrecy Categories	Integrity Categories
Biometric & Password & Token	{Biometric, Token, Password}	{0}
Biometric & Password	{Biometric, Password}	{0}
Biometric & Token	{Biometric, Token}	{0}
Password & Token	{Token, Password}	{0}
Biometric	{Biometric}	{0}
Password	{Password}	{0}
Token	{Token}	{0}
Logged In	{0}	{0}

These labels are used to assign access requirements to NetWare volumes and eDirectory attributes. You can define additional security labels to meet your company's needs.

For more information on defining Security labels, see Section 4.3.2, “Defining Security Labels,” on page 37.

Clearances

Clearances are assigned to users to represent the amount of trust you have in that user. A clearance has a Read label that specifies what a user can read, and a Write label that specifies what information a user can write to. A user can read data that is labeled at the Read label and below. A user can write data that is labeled between the Read label and the Write label.

NMAS defines only one clearance: Multi-level Administrator. Multi-level Administrator has Biometric and Token and Password for the Read label and Logged In for the Write label.

You can define additional clearances to meet your company's needs.

For more information on defining clearances, see Section 4.3.3, “Defining Clearances,” on page 38.

2.2 NMAS Software

NMAS is included as a bundled product with Novell eDirectory. The software image includes the following:

- NMAS server software
- Login methods software
- Support for multiple login methods per login sequence

- Support for graded authentication
- Universal Password

NMAS client software is available with the Novell Client for Windows and with Novell SecureLogin.

2.2.1 Server and Client Software Installation

NMAS server-side software must be installed with eDirectory 8.7.3 or later. NMAS client-side software must be installed on each client workstation that will access the network using the NMAS login methods. After installation, NMAS is managed using iManager or ConsoleOne.

The NMAS client software now ships with the Novell Client. For more information, refer to the Novell Client for Windows (http://www.novell.com/documentation/vista_client/index.html) Web site.

During the installation, NMAS extends the eDirectory schema and creates new objects in the Security container in the eDirectory tree. These new objects are the Authorized Login Methods container, the Authorized Post-Login Methods container, the Security Policy object, and the Login Policy object. All login methods are stored and managed in the Authorized Login Methods container. All post-login methods are stored and managed in the Authorized Post-Login Methods container.

2.2.2 Login Method Software and Partners

Software and Partners

Several currently supported login methods are available on the NMAS software image.

NMAS software includes support for a number of login methods from third-party authentication developers. Refer to the eDirectory Partners Web site (http://www.novell.com/products/edirectory/) for a list of Novell partners.

Each partner that develops login methods for NMAS addresses network authentication with unique product features and characteristics. Therefore, each login method varies in its actual security properties.

Novell has not evaluated the security methodologies of these partner products, so although these products might have qualified for the Novell Yes, Tested & Approved or Novell Directory Enabled logos, those logos relate to general product interoperability only.

We encourage you to carefully investigate each partner's product features to determine which product will best meet your security needs. Also note that some login methods require additional hardware and software not included with the NMAS product.

Installing a Login Method

NMAS login methods (server software, plug-ins, and snap-ins) can be installed by using the following:

- `nmasinst` (available on all eDirectory platforms), which requires eDirectory to be installed
- iManager plug-in
- ConsoleOne snap-in

For more information on installing a login method, see Section 3.1, “Installing a Login Method,” on page 19.

2.2.3 Universal Password

Universal Password is a way to simplify the integration and management of different password and authentication systems into a coherent network. It provides one password for all access to eDirectory, enables the use of extended characters in passwords, enables advanced password policy enforcement, and allows synchronization of passwords from eDirectory to other systems.

For more information on Universal Password, see the *Novell Password Management 3.3.1 Administration Guide* (http://www.novell.com/documentation/password_management33/pwm_administration/data/bookinfo.html).

2.2.4 iManager and ConsoleOne Management

You can manage NMAS by using iManager or ConsoleOne. Novell iManager is a Web-based utility for managing eDirectory. ConsoleOne is a GUI-based Java* utility for managing eDirectory. Specific property pages in each utility let you manage login methods, login sequences, enrollment, and graded authentication.

By default, NMAS installs the standard NDS password login method. Additional login methods can be installed by using ConsoleOne, iManager, and a wizard launched from the Authorized Login Methods container using the Create New Object option. Post-login methods can be installed using a wizard launched from the Authorized Post-Login Methods container using the Create New Object option.

For more information about installing login methods, see Section 3.1, “Installing a Login Method,” on page 19.

2.3 What's Next

- To install and set up login methods and sequences, see Chapter 3, “Managing Login and Post-Login Methods and Sequences,” on page 19.
- To set up graded authentication, see Chapter 4, “Using Graded Authentication,” on page 29.
- To log in using NMAS, see Chapter 5, “Using NMAS to Log In to the Network,” on page 45.

Managing Login and Post-Login Methods and Sequences

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This section describes how to install, set up, and configure login and post-login methods and sequences for NMAS.

NMAS provides multiple login methods to choose from, based on the three login factors (password, physical device or token, and biometric authentication).

NMAS includes support for a number of login and post-login methods from Novell and from third-party authentication developers. Some methods require additional hardware and software. Make sure that you have all of the necessary hardware and software for the methods you will use.

NMAS includes several login methods in the software build. Other login methods are available from third-party vendors.

See the eDirectory Web site (http://www.novell.com/products/edirectory/) for a list of eDirectory partners. Some partners develop third-party login methods.

3.1 Installing a Login Method

You have three ways of installing a login method for use in Novell eDirectory:

- nmasinst utility (UNIX and Windows), which allows you to install login methods into eDirectory.
- Novell iManager (UNIX and Windows), which allows you to install login and post-login methods into eDirectory.
- ConsoleOne (Windows), which allows you to install login and post-login methods into eDirectory.

- Section 3.1.3, “Using ConsoleOne to Install a Login Method,” on page 20
- Section 3.1.4, “Using ConsoleOne to Install a Post-Login Method,” on page 21

3.1.1 Using the nmasinst Utility to Install a Login Method

1 From the server console command line, enter:

```
nmasinst -addmethod admin.context treename config.txt_path [-h
hostname[:port]] [-w password] [-checkversion]
```

- *admin.context*: The admin name and context.
- *treename*: The name of the eDirectory tree where you are installing the login method.
- *config.txt_ path* - The complete or relative path to the `config.txt` file of the login method. A `config.txt` file is provided with each login method.
- [-h *hostname*[:*port*]]: (Optional) The hostname and port of the server. Use this if eDirectory is not running on the default port.
- [-w password]: This option is used to specify the password on the command line.
- [-checkversion]: This option reports an error if the installed method version is the same or newer than the method version being installed.

If the login method already exists, nmasinst updates it.

3.1.2 Using Novell iManager to Install a Login or Post-Login Method

1 Launch Novell iManager.
2 Authenticate to the eDirectory tree as an administrator or a user with administrative rights.
3 On the *Roles and Tasks* menu, click *NMAS* > *NMAS Login Methods*.
4 Click *New*.
5 Browse for and select the login method (`.zip`) file you want to install, then click *Next*.
6 Follow the installation wizard to completion.

3.1.3 Using ConsoleOne to Install a Login Method

1 In ConsoleOne, select the Security container.
2 Right-click the Authorized Login Methods container.
3 Click *New*, then click *Object*.

The New Object Wizard starts.

4 Select the SAS:NMAS Login Method object class, then click *OK*.
5 Specify the configuration file, then click *Next*.

The configuration file is located in the login method folder and is usually named `config.txt`.

6 On the license agreement page, click *Accept*, then click *Next*.
7 Accept the default method name, then click Next.
8 Review the available modules for this method, then click Next.

9 If you want a login sequence to use only this login method, select the appropriate check box, then click *Finish*.

10 Review the installation summary, then click *OK*.

11 If necessary, close and restart ConsoleOne to run the newly installed ConsoleOne snap-ins provided by the login method to configure the login and enroll users to use this login method.

3.1.4 Using ConsoleOne to Install a Post-Login Method

1 In ConsoleOne, select the Security container.

2 Right-click the Authorized Post-Login Methods container.

3 Click *New*, then click *Object*.

The New Object Wizard starts.

4 Select the sasPostLoginMethod object class, then click *OK*.

5 Specify the configuration file, then click *Next*.

The configuration file is located in the post-login method folder and is usually named `config.txt`.

6 On the license agreement page, click *Accept*, then click *Next*.

7 Accept the default method name, then click *Next*.

8 Review the available modules for this method, then click *Finish*.

9 Review the installation summary, then click *OK*.

10 If necessary, close and restart ConsoleOne to run the newly installed ConsoleOne snap-ins provided by the login method to configure the login and enroll users to use this post-login method.

3.2 Updating Login and Post-Login Methods

When a login method vendor provides an update for a login or post-login method, you can update the method by doing the following:

- Section 3.2.1, "Using the nmasinst Utility to Update a Login Method," on page 21
- Section 3.2.2, "Using Novell iManager to Update a Login Method," on page 21
- Section 3.2.3, "Using ConsoleOne to Update a Login Method," on page 22

3.2.1 Using the nmasinst Utility to Update a Login Method

Use the same procedure you used to install a login method with the nmasinst utility (see Section 3.1.1, "Using the nmasinst Utility to Install a Login Method," on page 20). Include the path to the new `config.txt` file and the login method is updated.

3.2.2 Using Novell iManager to Update a Login Method

1 Launch Novell iManager.

2 Authenticate to the eDirectory tree as an administrator or a user with administrative rights.

3 On the *Roles and Tasks* menu, click *NMAS > NMAS Login Methods*.

4 Click the login method you want to update.

5 On the login method property page, click *Update Method*.

6 Follow the update wizard to completion.

3.2.3 Using ConsoleOne to Update a Login Method

1 Right-click the login or post-login method to be updated, select *Properties*, click the *General* tab, then click *Update Method*.

2 Specify the configuration file, then click *Next*.

The configuration file is located in the post-login method folder and is usually named `config.txt`.

3 On the license agreement page, click *Accept*, then click *Next*.

4 Accept the default method name or rename it, then click *Next*.

5 Review the available modules for this method, then click *Finish*.

6 Review the installation summary, then click *OK*.

7 Close and restart ConsoleOne to use the newly updated method.

The updated method is available to the users the next time they log in.

3.3 Managing Login Sequences

When you install a login, you are asked if you want to create a login sequence that uses only the login method you are installing. If you answer yes, a login sequence is created for you that contains just the one login method.

You can also manually create and manage login sequences. After login and post-login methods are installed, you can view, add, modify, or delete login sequences by using iManager or ConsoleOne. Login sequences are not created when methods are modified or updated.

In NMAS, you can set up multiple login and post-login methods per sequence. You must have at least one login method selected to be able to select a post-login method.

When multiple methods are selected for a sequence, they are executed in the order they are listed. Login methods are executed first, then post-login methods.

A login sequence can be an And or an Or sequence. An And sequence is successful if all of the login methods successfully validate the identity of the user. An Or sequence only requires that one of the login methods validate the identity of the user for the login to be successful.

The post-login methods are only executed if the login is successful, regardless of the And/Or relationship.

After a sequence is created, you can authorize users to use the new sequence to log in to eDirectory.

- “Creating a New Login Sequence (ConsoleOne)” on page 23
- “Creating a New Login Sequence (Novell iManager)” on page 23
- “Modifying a Login Sequence (ConsoleOne)” on page 24
- “Modifying a Login Sequence (Novell iManager)” on page 24

3.3.1 Creating a New Login Sequence (ConsoleOne)

1. In ConsoleOne, select the Security container.
2. Right-click the Login Policy container, then select *Properties*.
3. Click *New Sequence*.
4. Specify a name for the new login sequence, then click *OK* to continue.

   All available methods are listed under *Available Login Methods* and *Available Post-Login Methods*.
5. Select the *Sequence Type* from the drop-down list.

   If you select *And*, a user must log in using every login method that makes up the login sequence. If you select *Or*, the user only needs to log in using one of the login methods that make up the login sequence.
6. Double-click or use the horizontal arrows to add each desired method to the sequence.

   If you are using multiple methods, use the vertical arrows to change the execution order.

   The *Sequence Grade* field displays the grade for the login sequence. For *And* sequences, the sequence grade is the union of the grades of the login methods. For *Or* sequences, the sequence grade is the intersection of the method grades.
7. Click *OK* when you are finished.

3.3.2 Creating a New Login Sequence (Novell iManager)

1. Launch Novell iManager.
2. Authenticate to the eDirectory tree as an administrator or a user with administrative rights.
3. From the *Roles and Tasks* menu, click *NMAS > NMAS Login Sequences*.
4. Click *New* and specify a name for the new login sequence.

   All available methods are listed under *Available Login Methods* and *Available Post-Login Methods*.
5. Select the *Sequence Type* from the drop-down list.

   If you select *And*, a user must log in using every login method that makes up the login sequence. If you select *Or*, the user only needs to log in using one of the login methods that makes up the login sequence.
6. Use the horizontal arrows to add each desired method to the sequence.

   If you are using multiple methods, use the vertical arrows to change the execution order.

   The *Sequence Grade* field displays the grade for the login sequence. For And sequences, the sequence grade is the union of the grades of the login methods. For Or sequences, the sequence grade is the intersection of the method grades.
7. Click *Finish* to save the login sequence.

3.3.3 Modifying a Login Sequence (ConsoleOne)

1. In ConsoleOne, select the Security container.
2. Right-click the Login Policy container, then select *Properties*.
3. Select a login sequence from the *Defined Login Sequences* drop-down list.

   The sequence grade and login and post-login sequences for the selected method are displayed. All of the available methods appear in the *Available Login Methods* and *Available Post-Login Methods* lists.
4. Select an action:
   - To add or remove login or post-login methods from a sequence, use the left-arrow and right-arrow.

     NOTE: You must have at least one login method selected in order to select a post-login method.
   - To change the sequence order of the login methods, use the up-arrow and down-arrow.
   - To exit without saving changes, click *Cancel*.

   IMPORTANT: Login sequences that don't have a method associated with them are not saved.
5. Click *Apply* or *OK*.

3.3.4 Modifying a Login Sequence (Novell iManager)

1. Launch Novell iManager.
2. Authenticate to the eDirectory tree as an administrator or a user with administrative rights.
3. On the *Roles and Tasks* menu, click *NMAS > NMAS Login Sequences*.
4. Click a login sequence name.

   The sequence grade and sequence type are displayed and the login and post-login methods are listed. All of the available methods appear in the *Available Login Methods* and *Available Post-Login Methods* lists.
5. Select an action:
   - To change the sequence type, use the drop-down list next to sequence type.
   - To add or remove login or post-login methods from a sequence, use the left-arrow and right-arrow.

     NOTE: You must have at least one login method selected in order to select a post-login method.
   - To change the sequence order of the login methods, use the up-arrow and down-arrow.
   - To exit without saving changes, click *Cancel*.

   IMPORTANT: Login sequences that don't have a method associated with them are not saved.
6. Click *Apply* or *OK*.

3.3.5 Deleting a Login Sequence (ConsoleOne)

1. In ConsoleOne, select the Security container.
2. Right-click the Login Policy container, then select *Properties*.
3. Select the sequence from the *Defined Login Sequences* drop-down list (Alt+S).
4. Click *Delete Sequence*.
5. Click *Apply* or *OK*.

3.3.6 Deleting a Login Sequence (Novell iManager)

1. Launch Novell iManager.
2. Authenticate to the eDirectory tree as an administrator or a user with administrative rights.
3. On the *Roles and Tasks* menu, click *NMAS > NMAS Login Sequences*.
4. Select the login sequence you want to delete, then click *Delete*.
5. Click *Apply* or *OK*.

3.4 Authorizing Login Sequences for Users (ConsoleOne)

To restrict the login sequences each user can use:

1. In ConsoleOne, right-click a User object, click *Properties*, click the *Security* tab, then click *Login Sequences*.
2. Select either *No Restrictions* or *Restrict the User to the Sequences Authorized Below*.

   If you select *No Restrictions*, the user can use any defined login sequence to log in.

   If you select *Restrict the User to the Sequences Authorized Below*, use the arrows to authorize or select the sequences you want this user to use to log in.
3. Click *Apply* or *OK*.

For more information, see "Assigning Login Sequences" on page 25.

3.5 Authorizing Login Sequences for Users (Novell iManager)

3.5.1 Assigning Login Sequences

Authorized and default login sequences can be assigned to a user, a container, a partition root, or the login policy object. NMAS searches for the authorized or default login sequences for a user by attempting to read the attributes from first the User object, then the container of the user object, then the partition root of the user object, and finally the login policy object.

The attributes found with the User object supersede any attributes found with container, partition root, or login policy object. If a login sequence has been assigned to a partition root, that login sequence applies to all the users under that partition root only if a login sequence has not already been individually assigned to specific users.

Also, a login sequence assigned to a container applies only to the users with unassigned sequences in that container, and not to the users in subcontainers of that container.

3.5.2 Authorizing a Login Sequence

1. Launch Novell iManager.
2. Authenticate to the eDirectory tree as an administrator or a user with administrative rights.
3. On the *Roles and Tasks* menu, click *NMAS* > *NMAS Users*, select the user you want to authorize the login sequences for, then click the *NMAS* tab.
4. Authorize or de-authorize a login sequence for a user by selecting the login sequence and clicking *Authorize* or *De-authorize*.
5. Click *Apply* or *OK*.

3.6 Setting Default Login Sequences (ConsoleOne)

To set a default login sequence so that users are not required to specify a login sequence when logging in:

1. In ConsoleOne, right-click a User object, click *Properties*, click the *Security* tab, then click *Login Sequences*.
2. Click the *Default Login Sequence* drop-down list, then select an authorized login sequence.

   The sequence you select will be the default login sequence. If a user attempts to log in without using a login sequence, this default login sequence is used.
3. Click *Apply* or *OK*.

NOTE: If a workstation is unable to execute the user's default login sequence, the NDS password login method is used.

See "Assigning Login Sequences" on page 25.

3.7 Setting Default Login Sequences (Novell iManager)

To set a default login sequence so that users are not required to specify a login sequence when logging in:

1. Launch Novell iManager.
2. Authenticate to the eDirectory tree as an administrator or a user with administrative rights.
3. On the *Roles and Tasks* menu, click *NMAS* > *NMAS Users*, select the user you want to set the default login sequence for, then click the *NMAS* tab.
4. Select an authorized login sequence, then click *Make Default*.

The sequence you select will be the default login sequence. If a user attempts to log in without using a login sequence, this default login sequence is used.

5 Click *Apply* or *OK*.

NOTE: If a workstation is unable to execute the user's default login sequence, the NDS password login method is used.

For more information on how to assign login sequences, see "Assigning Login Sequences" on page 25.

3.8 Deleting a Login Method

The NMAS iManager plug-ins and ConsoleOne snap-ins do not allow you to delete a login method if that method is part of any login sequence. The default installation of a login method creates a login sequence containing only that method. As a result, most methods exist in at least one sequence.

NOTE: nmasinst does not have an option to remove NMAS methods. It must be done through iManager or ConsoleOne.

To delete a login method, you must complete the following two procedures:

- "Removing the Login Method from Any Login Sequence" on page 27
- "Deleting the Login Method" on page 28

3.8.1 Removing the Login Method from Any Login Sequence

To use ConsoleOne to remove the login method for any login sequence:

1 In ConsoleOne, click the Security container, right-click the Login Policy, then select *Properties*.

2 Click *General*.

3 For each sequence in the *Defined Login Sequences* drop-down list:

3a Select the sequence.

3b Verify that the login method you will be deleting is not listed in the *Selected Login Methods* or *Selected Post-Login Methods* lists.

3c If the login method is listed as one of the selected methods, you can move it from the list by selecting it and clicking the left-arrow.

To use iManager to remove the login method for any login sequence:

1 In iManager, click *NMAS > NMAS Login Sequences*.

2 For each sequence in the *NMAS Login Sequences* list:

2a Click the sequence name.

2b Verify that the login method you will be deleting is not listed in the *Login Methods* or *Post-Login Methods* lists.

2c If the login method is listed as one of the selected methods, you can move it from the list by selecting it and clicking the left-arrow.

When the login method has been removed from all login sequences, you can then delete it. See Section 3.8.2, “Deleting the Login Method,” on page 28.

3.8.2 Deleting the Login Method

To use ConsoleOne to delete the login method:

1. In ConsoleOne, click the Security container and select either the Authorized Login Methods container or the Authorized Post Login Methods container, depending on the type of method you are deleting.
2. Select the login method you want to delete.
3. Press the *Delete key*, then click *Yes*.

To use iManager to delete the login method:

1. In iManager, click *NMAS* > *NMAS Login Methods*.
2. Select the login method or methods you want to delete.
3. Click *Delete*, then click *Yes*.

3.9 Deleting a Login Sequence

1. Launch Novell iManager.
2. Authenticate to the eDirectory tree as an administrator or a user with administrative rights.
3. On the *Roles and Tasks* menu, click *NMAS* > *NMAS Login Sequences*.
4. Select the login sequence you want to delete.
5. Click *Delete*, then click *Yes*.

3.10 What's Next

- To set up graded authentication, see Chapter 4, “Using Graded Authentication,” on page 29.
- To log in using NMAS, see Chapter 5, “Using NMAS to Log In to the Network,” on page 45.

Using Graded Authentication

4

The graded authentication feature of NMAS allows you to control users' access to network resources based on the login methods used to log in to the network. This means that you can set access rights to NetWare volumes and any attribute in Novell eDirectory based on how users log in.

NOTE: Graded authentication is only available on NetWare.

Graded authentication is based on the relationship between a user and an object, where an object is a network volume or eDirectory attribute. Graded authentication uses the same NMAS login factors (password, physical device, and biometric authentication) and security grades to establish the user object relationship and to determine the grade or level of authentication.

To set up graded authentication, you need to do the following:

1. Understand the graded authentication rules.
2. Set up and assign security labels to volumes and eDirectory attributes.
3. Assign clearances for each user who is logging in to the network using NMAS. By default, all users have a clearance.

The following topics provide information on setting up graded authentication:

An example of graded authentication is located at the end of this chapter.

4.1 Graded Authentication Terms

4.1.1 Security Policy Object

The Security Policy object is the object in Novell eDirectory that you can use to manage the elements of graded authentication. The Security Policy object resides in the Security container.

For more information, see Section 4.3, “Configuring the Security Policy Object,” on page 36.

4.1.2 Category

A category is an element of a set that represents sensitivity and trust. You use categories to define security labels.

There are two types of categories: secrecy and integrity.

- **Secrecy Categories:** Secrecy controls the disclosure of information.

  A user that is assigned a certain secrecy category can't read an object of a higher level of secrecy, but it can read an object of the same or lower level of secrecy. The user can't write to an object of a lower level of secrecy, but it can write to an object of the same or higher level.

  Think of it in terms of a government secret agent. The government agency has three levels of secrecy; Unclassified, Secret, and Top Secret. The agent is given a Secret level of secrecy. The agent cannot read information designated as Top Secret, but the agent can read information designated as Unclassified or Secret. The agent cannot write information from his Secret level to the Unclassified level, but the agent can write information to the Secret or Top Secret levels.

- **Integrity Categories:** Integrity controls the validity of information.

  A user that is assigned a certain integrity category can't write to an object of a higher level of integrity, but it can write to an object of the same or lower level. The user can't read to an object of a lower level of integrity, but it can read to an object of the same or higher level.

  Think of this in terms of two newspapers. One newspaper is highly respected for its honesty in reporting the facts. The other newspaper is a supermarket tabloid that manufactures stories. The newspaper with the lower integrity cannot publish stories in the newspaper with higher integrity, but the newspaper with higher integrity could publish a story in the newspaper with less integrity. Likewise, the newspaper with higher integrity would not quote from the stories produced by the newspaper with lower integrity, but the newspaper with lower integrity might quote from the stories produced by the newspaper with higher integrity.

NMAS comes with three secrecy categories (Biometric, Token, Password) and three integrity categories (Biometric, Token, Password) defined. You can define additional integrity categories to meet your company's needs.

For more information, see "Defining User-Defined Categories (Closed User Groups)" on page 36.

4.1.3 Security Label

A security label represents the sensitivity of information. It is a set made up of categories. For example, the Biometric security label contains the Biometric secrecy category. The Biometric and Token and Password security label contains three secrecy categories: Biometric, Token, and Password.

A security label can be assigned to a volume or to any eDirectory attribute. The security label is compared against a user's current clearance to determine what information the user can access.

NMAS comes with eight security labels defined. The following table shows the predefined security labels and single-level clearances:

Table 4-1 *Predefined Security Levels and Single-Level Clearances*

Default Security Labels	Secrecy Categories	Integrity Categories
Biometric & Password & Token	{Biometric, Token, Password}	{0}
Biometric & Password	{Biometric, Password}	{0}
Biometric & Token	{Biometric, Token}	{0}
Password & Token	{Token, Password}	{0}
Biometric	{Biometric}	{0}
Password	{Password}	{0}
Token	{Token}	{0}
Logged In	{0}	{0}

Novell only uses secrecy categories to define the default security labels. This meets the needs of most users. However, Novell provides you with the ability to create your own security labels that can be a combination of both secrecy and integrity categories to meet your company's needs. This, however, can become very complex. See Section 4.2.1, “Determining Access with Security Labels Made Up of Both Secrecy and Integrity Categories,” on page 33

For information on how to create a security label, see “Defining Security Labels” on page 37.

4.1.4 Clearance

Clearances are assigned to users to represent the amount of trust you have in that user. A clearance has a Read label that specifies what a user can read and a Write label that specifies what information a user can write to. For more information, see “Dominance” on page 32 and Section 4.2, “Graded Authentication Rules,” on page 33.

There are two types of clearances: single-level and multi-level.

- “Single-Level Clearance” on page 31
- “Multi-Level Clearance” on page 31

Single-Level Clearance

A single-level clearance is a clearance in which the Read label and the Write label are the same. For example, the Biometric clearance's Read label and Write label use the same Biometric label. Therefore, a user who is assigned the Biometric clearance can read information labeled with Biometric and below, but can only write to information labeled Biometric. All labels are used as single-level clearances.

Multi-Level Clearance

A multi-level clearance is a clearance in which the Read label and the Write label are different. For example, the Multi-Level Administrator clearance is a multi-level clearance and has Biometric and Token and Password for the Read label and Logged In for the Write label. This clearance allows the user to read all information and to write to all information that is labeled with the default security labels.

NMAS defines only one multi-level clearance: Multi-Level Administrator.

You can define additional clearances to meet your company's needs.

The following table summarizes the access relationships between the predefined single-level clearances and the predefined security labels. Remember that the Novell predefined security labels use secrecy categories only.

USER AUTHENTICATION LEVEL	NETWORK OBJECT SECURITY LABEL							
	Biometric & Password & Token	Biometric & Password	Biometric & Token	Password & Token	Biometric	Password	Token	Logged In
Biometric & Password & Token	R & W	R	R	R	R	R	R	R
Biometric & Password	NA	R & W	NA	NA	R	R	NA	R
Biometric & Token	NA	NA	R & W	NA	R	NA	R	R
Password & Token	NA	NA	NA	R & W	NA	R	R	R
Biometric	NA	NA	NA	NA	R & W	NA	NA	R
Password	NA	NA	NA	NA	NA	R & W	NA	R
Token	NA	NA	NA	NA	NA	NA	R & W	R
Logged In	NA	NA	NA	NA	NA	NA	NA	R & W
Multi-level Admin	R & W	R & W	R & W	R & W	R & W	R & W	R & W	R & W

NA = No Access R = Read W = Write

For more information, see “Defining Clearances” on page 38.

4.1.5 Dominance

In administering graded authentication, it is vitally important that you understand the concept of dominance.

All access control decisions are based on the relationship between the labels of the information and the session clearance of the user. There are only three such relationships:

- *Dominate Relationship*

  Label A1 is said to dominate Label A2 if:

  A1’s secrecy categories include all those of A2

  AND

  A2’s integrity categories include all those of A1
- *Equal Relationship*

  Label A1 is equal to Label A2 if:

A1’s secrecy categories are the same as A2’s secrecy categories.

AND

A1’s integrity categories are the same as A2’s integrity categories.

This can also be expressed as:

A1 dominates A2 and A2 dominates A1.

- *Incomparable Relationship*

  Label A1 cannot be compared to Label A2 if none of the previous relationships apply.

For more information, see Section 4.2, “Graded Authentication Rules,” on page 33.

4.2 Graded Authentication Rules

IMPORTANT: Graded authentication is an additional level of control. It does not take the place of regular eDirectory and file system access rights. Regular eDirectory and file system access rights still need to be administered. Graded authentication is available only on Netware.

The following rules apply to graded authentication in NMAS:

- If the Read label of the clearance dominates or is equal to the assigned security label and the security label dominates or is equal to the Write label of the clearance, then access is Read and Write.
- If the Read label of the clearance dominates or is equal to the assigned security label but the security label does not dominate and is not equal to the write label, then access is Read-only.

  For example, if a user has a clearance with a Read label of Password & Token and a Write label of Password & Token and wants to access a NetWare volume that has a security label of Password & Token, then the user has Read and Write access to that volume. However, the user has Read-only access to each NetWare volume assigned a Password security label.

  NOTE: Read-only access prevents passing higher classified data to lower classified areas. Access is always Read-only to security labels that are lower than the clearance's Write label.

- If the Read label of the clearance is dominated by the assigned security label, then no access is allowed.
- Using a login sequence does not grant access rights unless the user is assigned the session clearance.

4.2.1 Determining Access with Security Labels Made Up of Both Secrecy and Integrity Categories

If you were to create a security label with both the Token and Password secrecy categories (Ts and Ps) and the Token and Password integrity categories (Ti and Pi), the possible combinations would look like the following:

{Ts, Ps; 0}

{Ts; 0}

{Ps; 0}

{0; 0}

{Ts, Ps; Ti}

{Ts; Ti}

{Ps; Ti}

{0; Ti}

{Ts, Ps; Pi}

{Ts; Pi}

{Ps; Pi}

{0; Pi}

{Ts, Ps; Ti, Pi}

{Ts; Ti, Pi}

{Ps; Ti, Pi}

{0; Ti, Pi}

Now, using the rules of dominance (see "Dominance" on page 32), you can check these combinations as user clearances against all possible security labels. For the purposes of this example, we will just compare the single-level clearances (Read and Write label are the same) against two randomly selected security labels - {Ts, Ps; Ti} and {Ts; Pi}.

Table 4-2 *Dominance Example*

User Clearances (A1)	Security Label (A2)	Security Label (A2)
Read = R . . . Write = W	{Ts, Ps; Ti}	{Ts; Pi}
R {Ts, Ps; 0} W {Ts, Ps; 0}	Dominate	Dominate
R {Ts; 0} W {Ts; 0}	Incomparable	Incomparable
R {Ps; 0} W {Ps; 0}	Incomparable	Incomparable
R {0; 0} W {0; 0}	Incomparable	Incomparable
R {Ts, Ps; Ti} W {Ts, Ps; Ti}	Equal	Incomparable
R {Ts; Ti} W {Ts; Ti}	Incomparable	Incomparable
R {Ps; Ti} W {Ps; Ti}	Incomparable	Incomparable
R {0; Ti} W {0; Ti}	Incomparable	Incomparable
R {Ts, Ps; Pi} W {Ts, Ps; Pi}	Incomparable	Incomparable
R {Ts; Pi} W {Ts; Pi}	Incomparable	Equal
R {Ps; Pi} W {Ps; Pi}	Incomparable	Incomparable
R {0; Pi} W {0; Pi}	Incomparable	Incomparable
R{Ts, Ps; Ti, Pi} W {Ts, Ps; Ti, Pi}	Incomparable	Incomparable

User Clearances (A1)	Security Label (A2)	Security Label (A2)
R {Ts; Ti, Pi} W {Ts; Ti, Pi}	Incomparable	Incomparable
R {Ps; Ti, Pi} W {Ps; Ti, Pi}	Incomparable	Incomparable
R {0; Ti, Pi} W {0; Ti, Pi}	Incomparable	Incomparable

After you have determined the dominance for each combination, you can refer to the graded authentication rules (see Section 4.2, “Graded Authentication Rules,” on page 33) to determine the access the user will have, as follows:

Table 4-3 *User Access*

User Clearances (A1)	Security Label (A2)	Security Label (A2)
R = Read . . . W=Write	{Ts, Ps; Ti}	{Ts; Pi}
R {Ts, Ps; 0} W {Ts, Ps; 0}	Read	Read
R {Ts; 0} W {Ts; 0}	NA	NA
R {Ps; 0} W {Ps; 0}	NA	NA
R {0; 0} W {0; 0}	NA	NA
R {Ts, Ps; Ti} W {Ts, Ps; Ti}	Read/Write	NA
R {Ts; Ti} W {Ts; Ti}	NA	NA
R {Ps; Ti} W {Ps; Ti}	NA	NA
R {0; Ti} W {0; Ti}	NA	NA
R {Ts, Ps; Pi} W {Ts, Ps; Pi}	NA	NA
R {Ts; Pi} W {Ts; Pi}	NA	Read/Write
R {Ps; Pi} W {Ps; Pi}	NA	NA
R {0; Pi} W {0; Pi}	NA	NA
R{Ts, Ps; Ti, Pi} W {Ts, Ps; Ti, Pi}	NA	NA
R {Ts; Ti, Pi} W {Ts; Ti, Pi}	NA	NA
R {Ps; Ti, Pi} W {Ps; Ti, Pi}	NA	NA
R {0; Ti, Pi} W {0; Ti, Pi}	NA	NA

The above example is provided to help you understand the details of how security access is determined. NMAS provides a tool calculates this access information for you. See “Viewing Security Clearance Access” on page 40.

For another example of how Graded Authentication works, see Section 4.6, “Graded Authentication Example,” on page 42.

4.3 Configuring the Security Policy Object

When you install and configure NMAS, a Security container is created and a Security Policy object is created in the Security container. The Security Policy object allows you to create, view, and rename names for clearances, security labels and categories for your NMAS implementation. You can then use these names to assign the security labels to any eDirectory attribute or NetWare volumes. You can also assign clearances to User objects in your eDirectory tree from the user's property page.

Authorized and default clearances can be assigned to a user, a container, a partition root, or the login policy object. NMAS searches for the authorized or default authorized and default clearances for a user by attempting to read the attributes from first the User object, then the container of the user object, then the partition root of the user object, and finally the login policy object.

The clearances assigned to the User object supersede any clearances assigned to the container, partition root, or login policy object. If a clearance has been assigned to a partition root, that clearance applies to all the users under that partition root only if a clearance has not already been individually assigned to specific users.

Also, a clearance assigned to a container applies only to the users with unassigned clearances in that container, and not to the users in subcontainers of that container.

4.3.1 Defining User-Defined Categories (Closed User Groups)

You can define secrecy and integrity categories that can be used to create security labels in addition to the three integrity and three secrecy categories (Biometric, Token, Password) that are predefined. For example, Biometric integrity and secrecy categories represent that access to an object is restricted to users logging in with a biometric method.

After you have created a category, you cannot delete it. You can view or rename it.

- "Using iManager to Create a New Category" on page 36
- "Using ConsoleOne to Create a New Category" on page 36
- "Using iManager to Rename a Category" on page 37
- "Using ConsoleOne to Rename a Category" on page 37

Using iManager to Create a New Category

1. In iManager, click *eDirectory Administration* > *Modify Object*.
2. Browse for and select the Security container, select *Security Policy*, then click *OK*.
3. Click the *Define Categories* tab, then select either *Secrecy Categories* or *Integrity Categories*.
4. Click *Add*, specify a name for the category, then click *OK*.
5. Click *OK* or *Apply*.

Using ConsoleOne to Create a New Category

1. In ConsoleOne, double-click the Security container, then click *Security Policy*.
2. Click the *Define Categories* tab, then select either *Secrecy Categories* or *Integrity Categories*.

3 Click *Add*, then specify a name for the category.

4 Click *OK*.

The new category is now available for use in defining a security label.

Using iManager to Rename a Category

1 In iManager, click *eDirectory Administration* > *Modify Object*.

2 Browse for and select the Security container, select *Security Policy*, then click *OK*.

3 Click the *Define Categories* tab, then select either *Secrecy Categories* or *Integrity Categories*.

4 Select the category you want to rename, then click *Rename*.

5 Specify the new name, click *OK*, then click *OK* or *Apply*.

Using ConsoleOne to Rename a Category

1 In ConsoleOne, double-click the Security container > click *Security Policy*.

2 Click the *Define Categories* tab, then select either *Secrecy Categories* or *Integrity Categories*.

3 Select the category you want to rename, then click *Rename Category*.

4 Specify the new name, click *OK*, then click *OK* or *Apply*.

4.3.2 Defining Security Labels

NMAS provides eight security labels by default. Security labels are also used as single-level security clearances.

After you have created a security label, you cannot modify it or delete it. You can view its properties and rename it.

- "Using iManager to Create a New Security Label" on page 37
- "Using ConsoleOne to Create a New Security Label" on page 37
- "Using iManager to Rename a Security Label" on page 38
- "Using ConsoleOne to Rename a Security Label" on page 38

Using iManager to Create a New Security Label

1 In iManager, click *Directory Administration* > *Modify Object*.

2 Browse for and select the Security container, select *Security Policy*, then click *OK*.

3 Click *Define Labels*.

4 Click *New*, specify a name for the label, then click *OK*.

5 Assign integrity and secrecy categories to the new label by using the horizontal arrows.

6 Click *OK* or *Apply*.

Using ConsoleOne to Create a New Security Label

1 In ConsoleOne, double-click the Security container, then click *Security Policy*.

2 Click *Define Labels*.

3 Click *New Label*, then specify a name for the label.

4 Assign integrity and secrecy categories to the new label by using the horizontal arrows.

5 Click *OK*.

Using iManager to Rename a Security Label

1 In iManager, click *Directory Administration* > *Modify Object*.

2 Browse for and select the Security container, select *Security Policy*, then click *OK*.

3 Click *Define Labels*.

4 Select a label from the *Defined Security Labels* drop-down list.

5 Click *Rename*.

6 Specify a new name for the label, then click *OK*.

7 Click *OK* or *Apply*.

Using ConsoleOne to Rename a Security Label

1 In ConsoleOne, select a label from the *Defined Security Labels* drop-down list.

2 Click *Rename Label*.

3 Specify a new name for the label.

4 Click *OK*.

4.3.3 Defining Clearances

When you create a clearance, you select two labels, a Read label and a Write label. The Read label must dominate or be equal to the Write label. In fact, when creating a security clearance, you won't have the option to select a Write label that dominates the Read label.

For example, the Password & Token security label has dominance over the Password security label, so you could select the Password & Token label as your Read label and the Password label for your Write label.

You can also define your own security clearances to meet your company's authentication needs.

After you have created a clearance, you cannot modify it or delete it. You can view its properties and rename it.

- "Using iManager to Create a New Clearance" on page 38
- "Using ConsoleOne to Create a New Clearance" on page 39
- "Using iManager to View the Properties of a Clearance" on page 39
- "Using ConsoleOne to View the Properties of a Clearance" on page 39
- "Using iManager to Rename a Clearance" on page 39
- "Using ConsoleOne to Rename a Clearance" on page 40

Using iManager to Create a New Clearance

1 In iManager, click *Directory Administration* > *Modify Object*.

2 Browse for and select the Security container, select *Security Policy*, then click *OK*.

3 Click the *Clearances* tab.

4 Click *New*, specify a name for the clearance, then click *OK*.

5 Select a security label from the *Read label* drop-down list.

This label is the Read label for this clearance. You must select a Read label before you can select a Write label.

6 Select a security label from the *Write label* drop-down list.

This label is the Write label for this clearance. You can't select a Write label that has greater dominance than the Read label.

7 Click *OK* or *Apply*.

Using ConsoleOne to Create a New Clearance

1 In ConsoleOne, double-click the Security container, then click *Security Policy*.

2 Click the *Clearances* tab > *Definition*.

3 Click *New Clearance*, then specify a name for the clearance.

4 Select a security label from the *Read label* drop-down list.

This label is the Read label for this clearance. You must select a Read label before you can select a Write label.

5 Select a security label from the *Write label* drop-down list.

This label is the Write label for this clearance. You can't select a Write label that has greater dominance than the Read label.

6 Click *OK* or *Apply*.

Using iManager to View the Properties of a Clearance

1 In iManager, click *Directory Administration* > *Modify Object*.

2 Browse for and select the Security container, select *Security Policy*, then click *OK*.

3 Click the *Clearances* tab.

4 Select a clearance from the *Default Clearance* drop-down list.

The Read and Write labels that are used to define the clearance are displayed.

Using ConsoleOne to View the Properties of a Clearance

1 In ConsoleOne, select a clearance from the *Clearance* drop-down list.

You can see the Read and Write labels that are used to define the clearance.

Using iManager to Rename a Clearance

1 In iManager, click *Directory Administration* > *Modify Object*.

2 Browse for and select the Security container, select *Security Policy*, then click *OK*.

3 Click the *Clearances* tab.

4 Select a clearance from the *Default Clearance* drop-down list.

5 Click *Rename*.

6 Specify the new name for the clearance, then click *OK*.

7 Click *OK* or *Apply*.

Using ConsoleOne to Rename a Clearance

1 In ConsoleOne, select a clearance from the *Default Clearance* drop-down list.

2 Click *Rename Clearance*.

3 Specify the new name for the clearance.

4 Click *OK*.

4.3.4 Viewing Security Clearance Access

A quick way to determine the access rights a clearance allows to objects assigned to a particular label is to view the Access page (Click *Clearance* > *Access*). This page tells you the clearance that a user needs for Read and Write access, Read-only access, and No access to information and resources with a specific label.

- "Using iManager to View the Access Rights for a Clearance" on page 40
- "Using ConsoleOne to View the Access Rights for a Clearance" on page 40

Using iManager to View the Access Rights for a Clearance

1 In iManager, click *eDirectory Administration* > *Modify Object*.

2 Browse for and select the *Security container*, select *Security Policy*, then click *OK*.

3 Click the *Clearances* tab > *Access*.

4 Select a clearance from the *Clearance* drop-down box.

Each defined label is grouped by the access the clearance has to the labeled object.

Using ConsoleOne to View the Access Rights for a Clearance

1 In ConsoleOne, double-click the Security container, then click *Security Policy*.

2 Click the *Clearances* tab > *Access*.

3 Select a clearance from the *Clearance* drop-down box.

Each defined label is grouped by the access the clearance has to the labeled object.

4.4 Assigning Security Labels to Network Resources

With NMAS, you can assign a security label to NetWare volumes and to any eDirectory attribute. Users who log in to the network can access only those areas, based upon their clearance and the resource's label.

For example, if you label a volume as Biometric & Token, an NMAS user must be assigned the Biometric & Token clearance and authenticate to the network using a Biometric & Token clearance in order to access the volume.

Authorized and default clearances can be assigned to a user, a container, a partition root, or the login policy object. NMAS searches for the authorized or default authorized and default clearances for a user by attempting to read the attributes from the User object first, then the container of the user object, then the partition root of the user object, and finally the login policy object.

The clearances assigned to the User object supersede any clearances assigned to the container, partition root, or login policy object. If a clearance has been assigned to a partition root, that clearance applies to all the users under that partition root only if a clearance has not already been individually assigned to specific users.

Also, a clearance assigned to a container applies only to the users with unassigned clearances in that container, and not to the users in subcontainers of that container.

IMPORTANT: Labels assigned to traditional NetWare volumes (non-NSS volumes) are not effective until the volume is dismounted and mounted again.

To use ConsoleOne to assign a security clearance to a volume:

1. In ConsoleOne, right-click a volume.
2. Click *Properties* > click the *Security* tab.
3. Select a security label from the *Security Label* drop-down list.
4. Click *OK* to finish.
5. (Conditional) If you are using traditional NetWare volumes (non-NSS volumes), dismount and mount the volume again for the labels to take effect.

To use iManager to assign a security clearance to a volume:

1. In iManager, click *Directory Administration* > *Modify Object*.
2. Browse for and select a volume, then click *OK*.
3. Click the *Security* tab.
4. Select a security label from the *Security Label* drop-down list.
5. Click *OK* or *Apply*.
6. (Conditional) If you are using traditional NetWare volumes (non-NSS volumes), dismount and mount the volume again for the labels to take effect.

To use ConsoleOne to assign a security clearance to eDirectory attributes:

1. In ConsoleOne, click the *Security Container*, then double-click the Security Policy object, then click *Directory Attribute Labels*.
2. Click the label next to the directory attribute.
3. Click the down-arrow, then select a new label from the drop-down list.
4. After making all necessary changes, click *Apply* or *OK* to save the changes.

To use ConsoleOne to assign a security clearance to eDirectory attributes:

1. In iManager, click *Directory Administration* > *Modify Object*.
2. Browse for and select the Security container, select *Security Policy*, then click *OK*.
3. Click the *Directory Attribute Labels* tab.
4. Click the label next to the directory attribute.

5 Click the down-arrow, then select a new label from the drop-down list.

6 After making all necessary changes, click *OK* or *Apply* to save the changes.

4.5 Assigning User Clearances

To use ConsoleOne to assign user clearances:

1 In ConsoleOne, right-click the desired User object > click *Properties* > *Security* > *Clearances*.

2 On the Security Clearance page, select the user clearances.

3 Select the desired default login clearance.

4 Click *OK*.

To use iManager to assign user clearances:

1 In iManager, click *eDirectory Administration* > *Modify Object*.

2 Browse for and select a User object, then click *OK*.

3 Click the *Security* tab > *Clearances*.

4 Select the desired default clearance.

5 Use the horizontal arrows to assign authorized clearances for this user.

6 Click *OK* or *Apply*.

4.6 Graded Authentication Example

Departments within a company are often assigned security classifications that are based on the department's function and the kind of information that it handles. For example:

- Human Resources handles sensitive information such as personnel files.
- Engineering handles restricted or confidential information such as product specifications and schematics.
- Sales handles public information that is freely accessible.
- Finance handles sensitive information critical to the operation and survival of the company.

Depending upon the sensitivity of the information, it might be secured in locked filing cabinets that serve as access control mechanisms. Access control to this information is with a separate key for each filing cabinet issued to a person authorized to access the information.

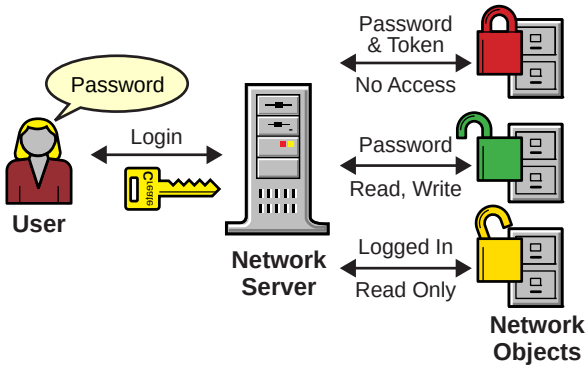
Graded authentication replaces the physical key given to users with a clearance. Also, NMAS replaces the filing cabinet with NetWare file system volumes that are also assigned security labels. These security labels replace the filing cabinet lock type.

As the network administrator, you assign users authorization levels for login. When a user logs in, the user is assigned a clearance for that login session. The clearance becomes the key that is necessary for access. Access is granted to the user based on the clearance (key) that the user is authorized to hold and the security label (lock) that is being accessed.

Although a user can be authorized to have more than one clearance, only one clearance is assigned at login, and it is this clearance that determines what information can be unlocked. For example, the following would apply (as illustrated in Figure 4-1 on page 43) to a user logging in with an authentication grade of Password:

- Read/Write access to network resources labeled Password.
- No access to resources labeled Password and Token, because this label is higher than the Password clearance.
- Read-only access to any information labeled with a lower label than Password (for example, Logged In).

Figure 4-1 *Single-Factor Authentication*

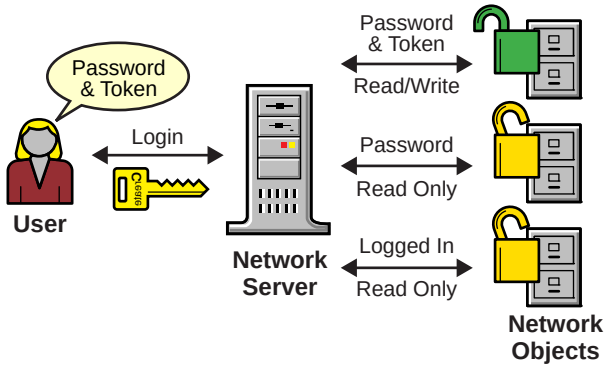


Single Factor Authentication

The following would apply (as illustrated in Figure 4-2 on page 43) to a user logging in with a password and token:

- Read/write access to network resources labeled Password and Token.
- Read-only access to any information labeled with a lower label than Password and Token, including Password and Logged In.

Figure 4-2 *Multiple-Factor Authentication*



Multiple Factor Authentication

A user working in Human Resources with information classified as sensitive logs in with a Password & Token clearance. The information that the user needs is on a network volume that is also labeled Password & Token. Because the user's clearance and the volume security label match (the Read label dominates the volume label and the volume label dominates the Write label), the user is able to read from and write to the NetWare volume.

However, suppose the same user attempts to copy the sensitive information to a network area that requires only a password for access. Graded authentication prevents this action because copying or moving information from a higher label to a lower label is not allowed. This prevents the user from compromising the sensitive information.

The following table shows how several departments within a company might classify their information. Security labels and clearances are assigned based on the information classification and not on a user.

Table 4-4 *Information Classification and Security Labels*

Department	Information Classification	Assigned Security Label (Lock)	Assigned Clearance (Key)
Human Resources	Sensitive	Password & Token	Password & Token
Engineering	Confidential	Password	Password
Sales	Public	Logged In	Logged In
Finance	Sensitive	Biometric & Token	Biometric & Token

In this example, because Sales has been assigned a Public clearance and Sales information is freely accessible, a user only needs to be logged in to access Sales information.

However, users who work in Engineering must use a password to access the confidential information needed for their job function. Engineering's data volumes would also be labeled Password for read/write access.

Human Resources often deals with sensitive information related to personnel records. A password and token are required to access this information.

Finance also has sensitive classified information and considers financial information critical to the company's operation and survival. A biometric and token are required to access this information.

4.7 What's Next

- To set up login methods and sequences, see Chapter 3, “Managing Login and Post-Login Methods and Sequences,” on page 19.
- To log in using NMAS, see Chapter 5, “Using NMAS to Log In to the Network,” on page 45.

Using NMAS to Log In to the Network

5

After NMAS is installed , you are ready for users to log in to the network. This section describes some of the additional features of the login experience that you should communicate to your network users.

5.1 Password Field

Depending upon how the NMAS client software was installed, there might or might not be a password field in the Novell Client login dialog box. If users are using a biometric or physical device (token) login factor, they might not need a password to log in to the network.

See the Novell Client For Windows documentation (http://www.novell.com/documentation/noclienu/index.html) for more information on hiding the password field.

5.2 Advanced Login

Those using NMAS login methods to log in to the network can customize the login by selecting a desired clearance and login sequence. Otherwise, the last login sequence and clearance (if any) are used. If no clearance or login sequence has been previously specified, the defaults are used.

1. When the Novell Client dialog box appears, click *Advanced*.
2. Click the *NMAS* tab.
3. Select the desired login sequence from the *Login* drop-down list or browse the Novell eDirectory tree for a complete and current list.

   You can browse only if an eDirectory tree has been specified on the *eDirectory* tab.
4. Specify the desired user session clearance or browse the eDirectory tree for a complete and current list.

   By default, the *Clearance* field is disabled. To enable the *Clearance* field:

   4a Right-click the red N in the task bar.

   4b Click *Novell Client Properties* > *Location Profiles*.

   4c Select the desired profile, click *Properties*, then click *Properties*.

   4d On the *NMAS* tab, select *Display Clearance Field*.

   4e Click *OK* three times.

IMPORTANT: Users might have multiple session clearances for each login sequence. Make sure that the *Clearance* field is filled in with the desired user session clearance.

5 Click *OK*.

5.3 Unlocking the Workstation

With the addition of NMAS to a user's workstation, the process to unlock Windows workstations changes. Normally, users can enable password protection for their workstations by using a screen saver configured from the Windows Display control panel. To unlock a workstation with NMAS, users must instead go through the same authentication process used to originally log in.

For example, if you used NMAS to authenticate to the network and you used a biometric login method, you must use the same biometric login method again to unlock and use the workstation.

If you are using a Windows workstation, you must unlock the workstation using the login method that was used to log into the tree. If you have connections to multiple eDirectory trees, the login sequence for any eDirectory tree can be used. The default is the first eDirectory tree.

5.4 Capturing an NMAS Client Trace

Capturing an NMAS client trace can help in troubleshooting NMAS authentication problems. For more information, see TID # 3331372 (http://www.novell.com/support/search.do?cmd=displayKC&docType=kc&externalId=3331372&sliceId=SAL_Public&dialogID=2494055&stateId=1%200%202492379).

5.5 Viewing NMAS Clearance Status

1 Right-click the red N in the task bar.

2 Click *NetWare Connections*.

3 Scroll over to view the NMAS clearance associated with each connection.

5.6 Single Sign-on Tab

In the properties of the Novell Client for Windows, a *Single Sign-on* tab is available for the convenience of users authenticating via an NMAS login method.

When you use Novell SecretStore, you eliminate the need to remember or synchronize all the multiple passwords required for accessing password-protected applications, Web sites, and mainframes.

To configure the *Single Sign-on* tab:

1 Open the Novell Client Windows property page.

2 Click the *Single Sign-on* tab.

3 Select the *Enable Single Sign On* check box to enable this feature.

4 Click *OK*.

NOTE: Single Sign-on feature is available only on Windows XP.

History of Novell Passwords

6

In the past, administrators have had to manage multiple passwords (simple password, NDS password, enhanced password) because of password limitations. Administrators have also needed to deal with keeping the passwords synchronized.

- NDS Password: The older NDS password is stored in a hash form that is non-reversible. Only the NDS system can make use of this password, and it cannot be converted into any other form for use by any other system.
- Simple Password: The simple password was originally implemented to allow administrators to import users and passwords (clear text and hashed) from foreign LDAP directories such as Active Directory* and iPlanet*.

  The limitations of the simple password are that no password policy (minimum length, expiration, etc.) is enforced.
- Enhanced Password: The enhanced password (no longer supported), the forerunner of Universal Password, offers some password policies, but its design is not consistent with other passwords. It provides a one-way synchronization and it replaces the simple or NDS password.

Universal Password was created to address these password problems. It provides:

- One password for all access to eDirectory.
- Enables the use of extended characters in password.
- Enables advanced password policy enforcement.
- Allows synchronization of passwords from eDirectory to other systems.

Universal Password is managed by the Secure Password Manager, a component of the NMAS module (`nmas.nlm` on NetWare). Secure Password Manager simplifies the management of password-based authentication schemes across a wide variety of Novell products as well as Novell partner products. The management tools only expose one password and do not expose all of the behind-the-scenes processing for backwards compatibility.

Secure Password Manager and the other components that manage or make use of Universal Password are installed as part of the NetWare 6.5 or later and eDirectory 8.7.3 or later install; however, Universal Password is not enabled by default. Because all APIs for authentication and setting passwords are moving to support Universal Password, all the existing management tools, when run on clients with these new libraries, automatically work with the Universal Password.

NOTE: The Password Management plug-in is available for download at the Novell Free Download Site (http://download.novell.com).

The Novell Client supports the Universal Password. It also continues to support the NDS password for older systems in the network. The Novell Client has the capability of automatically migrating the NDS password to the Universal Password at the time of the first login.

For NMAS 3.2*x* and earlier, when the NDS password is migrated to the Universal password, the password expiration time is recalculated from the current time plus the password expiration interval. For NMAS 3.3 and later, password expiration time is not updated when the NDS password is migrated to the Universal Password unless the “Verify whether existing passwords comply with the password policy (verification occurs on login)” password policy rule is set to “true”.

For more information about deploying and managing Universal Password, see the *Password Management Administration Guide* (http://www.novell.com/documentation/password_management33/).

NMAS HOTP Method 7

The following sections contain information about the NMAS HOTP method:

7.1 Overview

HOTP is an HMAC-based one-time password (OTP) algorithm. An OTP is a password that is valid for only one login session or transaction. An OTP provides better performance than the traditional (static) passwords because there are less chances of security attacks associated with it. A potential intruder who records an OTP that has been used to log into a service or to conduct a transaction, cannot manipulate it because it has already been used once and is no longer valid.

Every OTP based authentication requires an OTP server and an OTP client (hardware/software token). Implementation of OTP based authentication in NMAS is based on the RFC 4226 standard. Traditionally, the NDS password that was individually presented to the server is now appended to the OTP to enhance the password based authentication by retaining all the client components and their user interface.

The authentication to eDirectory server is done through the HOTP feature by using LDAP-based login or NCP-based login.

7.1.1 LDAP-Based Login

Prerequisites

- Set the NDSD_TRY_NMASLOGIN_FIRST environment variable to true.

  For more information, refer to the How to Make Your Password Case-Sensitive (http://www.novell.com/documentation/edir88/edir88new/data/brvwgsv.htm) in the *Novell eDirectory 8.8 What's New Guide*.

Login Method

An HOTP enabled user can perform LDAP bind by concatenating the NDS password with the HOTP value.

For example,

```
ldapsearch -D cn=user1,o=novell -w secret40338314 -h 164.99.91.165 -p 389 -b
"o=novell" -s sub -LLL dn
```

7.1.2 NCP-Based Login

A HOTP-ready/enabled user can perform NCP login by concatenating the NDS Password with the HOTP value by using any of the following utilities:

- ndslogin

  For example,

  ```
  ndslogin user1.org -h org.com -p secret40338314
  ```

- iManager (replace the existing libnmasclnt.so in the iManager-installed location)
- iMonitor

7.2 Prerequisites

- eDirectory 8.8 SP6 on all supported platforms of eDirectory 8.8 SP6.

  For more information on the supported platforms of eDirectory 8.8 SP6, refer to the *Novell eDirectory 8.8 SP6 Installation Guide* (http://www.novell.com/documentation/edir88/edirin88/data/a2iii88.html).

7.3 Installation

- Section 7.3.1, “Server Installation,” on page 50
- Section 7.3.2, “Client Installation,” on page 50
- Section 7.3.3, “nmashotpconf Utility Installation,” on page 51

7.3.1 Server Installation

The HOTP server module is a part of the NMAS server component. The server module validates the OTP presented from the client.

Download the latest patch from the Novell download site (http://download.novell.com/). Install the patch and extend the schema.

After extending the schema, the following attributes are available on the NMAS HOTP server:

- sasOTPCounter (per user attribute)
- sasOTPEnabled (per user/immediate parent container/partition root/Login Policy object)
- sasOTPDigits (per user/immediate parent container/partition root/Login Policy object)
- asOTPLookAheadWindow (tree wide set at the Login Policy object)
- sasOTPResync (9 per user attribute)

7.3.2 Client Installation

To login through the HOTP enabled user, the client needs the latest libnmasclnt.so file that contains the HOTP information needed to enable the HOTP method. Download the latest libnmasclnt.so file from the Novell download site (http://download.novell.com/). To enable the HOTP method, the clients do not need any changes because the changes are available in the NMAS patch file.

NOTE: The HOTP client installation is only available for Linux 32-bit and 64-bit platforms.

7.3.3 nmashotpconf Utility Installation

The nmashotpconf utility is a configuration utility that configures the OTP attributes on the eDirectory server.

NOTE: The HOTP utility is available only for the Linux 32-bit and 64-bit platforms.

7.4 Resynchronization of the Counter

The counter value of the server is incremented only after successful HOTP authentication, and the counter on the token is incremented every time a new HOTP is requested by the user. The counter values on the server and the counter on the token might be out of synchronization.

To address this, you should have a tree-wide look-ahead or a resynchronization window setting in place. If the server finds that the received HOTP does not correspond to the server counter value, the server can recalculate the next few HOTP values that are within the resynchronization window, and check them against the received HOTP. If there is a match, authentication succeeds and the server counter is set to the counter value that corresponds to the matched HOTP.

For successful authentication the server counter is set to the next counter value at which the authentication succeeds.

The tree-wide resynchronization window setting should be as low as possible in order to restrict the space of possible solutions for an attacker trying to recreate the HOTP values.

If the mismatch between the client and server counters is beyond the tree-wide resynchronization window setting, resynchronization can be achieved by temporarily setting a user-specific resynchronization window to a large value and then attempting an HOTP-based authentication.

The nmashotpconf utility should be used for configuring HOTP-based authentication. For more information, read the Configuration section.

7.5 Configuration

To provision an eDirectory user for an HOTP-based authentication, do the following configuration settings according to the RFC 4226 standard.

- Enable HOTP on the user/container/partition root/Login Policy object in the same order of precedence.
- Set the HOTP-shared secret key and counter on the user. These two settings together determine the HOTP value.
- Configure the number of digits in HOTP values on the user/ container/partition root/Login Policy object.The valid range of digits is from 6 to 9.
- Set the resynchronization windows as follows:
  - Set the tree-wide resynchronization window at the Login Policy object.
  - Set the user-specific resynchronization window at the user level. This is needed only when the client and server are out of sync.

To execute the nmashotpconf utility, perform the following steps:

1. Specify the directory where you unzipped the NMAS HOTP utility.

   The unzipped file contains the `linux` and `linux_x64` directories for the 32-bit and 64-bit Linux machines.

   The `linux` and `linux_x64` directories contain the nmashotpconf executable and libnmasext.so files.

2. Go to the `linux/final` directory on a Linux 32-bit machine, else go to the `linux_x64/final` directory on a Linux 64-bit machine.

3. Download the trusted root certificate and store it locally.

   Refer to the section "Exporting a Root Certificate (http://www.novell.com/documentation/imanager20/?page=/documentation/lg/iman ager20/imanager20/data/am4ajce.html#bow4dv4) in the *iManager 2.0.x Administration Guide*.

   For example,

```
nmashotpconf -h <host_name> [-p <ssl_port>] -D <login_dn> [-w <password>]
 -e <trusted_cert> -t <cert_type> [-r <resync_window>] [-y
 <user_resync_window>] [-u <hotp_dn> [-o <hotp_options>] [-d digits] [-c
 <counter>] [-s <secret> -f <secret_format>]]
```

Option	Description
host_name	Specifies the LDAP server name or the IP address of the server.
ssl_port	Specifies the SSL port on the LDAP server. The default value is 636.
login_dn	Specifies the DN for the user.
password	Specifies the password for the user DN.
trusted_cert	Specifies the trusted root certificate file.
cert_type	Specifies the trusted root certificate encoding type. For example, DER means der-encoded file, and B64 means b64-encoded file.
encoded file digits	Specifies the number of digits used as the HOTP value. **NOTE:** This setting is applicable to all the users in the tree.
resync_window	Specifies the counter re-synchronization look-ahead window.
user_resync_window	Specifies the counter user re-synchronization look-ahead window.
hotp_dn	Specifies the target DN for which you are configuring the HOTP attributes. To configure the HOTP at the tree level, enable/disable HOTP at the tree level, or configure *digits* at tree level, then specify the DN as `cn=Login Policy,cn=Security`.
hotp_options	Enables or disables the HOTP for the *hotp_dn* option. Specify ENABLE to enable the HOTP, and DISABLE to disable HOTP.
counter	Specifies the HOTP counter value. The vaild range of the counter value is between 0 and 2147483647. The counter value is set through the *hotp_dn* option.

Option	Description
hotp_dn secret	Specifies the OATH HOTP secret. For example, the raw byte value of *secret* in the hexadecimal format is 31323334353637383930313233343536373839 30, or the corresponding ASCII/Extended ASCII string is 12345678901234567890.
secret_format	Specifies the format of the OATH HOTP secret. ◆ **STRING:** This format is used for an ASCII/Extended ASCII string. For example, 12345678901234567890. ◆ **RAW:** This format is used for raw byte values in a hexadecimal format. For example, 31323334353637383930313233343536373839 30, where hexadecimal value of the first character is 31, the value of the second character is 32, and so on.

Examples:

- To configure a secret and a counter on the user object, run the following command:

```
./nmashotpconf -h 164.99.91.165  -p 636 -D cn=admin,o=novell -w novell
-e   /var/opt/novell/eDirectory/data/SSCert.der  -t  DER  -u
cn=user1,o=novell  -c 0   -s
31323334353637383930313233343536373839 30 -f  RAW
```

- To enable the OTP for a user object, run the following command:

```
./nmashotpconf -h 164.99.91.165  -p 636 -D cn=admin,o=novell -w novell
-e   /var/opt/novell/eDirectory/data/SSCert.der  -t  DER  -u
cn=user1,o=novell  -o ENABLE
```

- To disable the OTP for a user object, run the following command:

```
./nmashotpconf -h 164.99.91.165  -p 636 -D cn=admin,o=novell -w novell
-e   /var/opt/novell/eDirectory/data/SSCert.der  -t  DER  -u
cn=user1,o=novell  -o DISABLE
```

  Similarly, you can enable or disable the OTP for a container/partition or a root/Login Policy object.

- To configure an OTP digit for a user object, run the following command:

```
./nmashotpconf -h 164.99.91.165  -p 636 -D cn=admin,o=novell -w novell
-e /var/opt/novell/eDirectory/data/SSCert.der  -t  DER  -u
cn=user1,o=novell  -d 6
```

  Similarly, you can set the OTP digit for a parent container/partition root/ Login Policy object.

- To configure the user resyncronization window, run the following command:

```
./nmashotpconf -h 164.99.91.165  -p 636 -D cn=admin,o=novell -w novell
-y 5 -e   /var/opt/novell/eDirectory/data/SSCert.der  -t  DER  -u
cn=user1,o=novell
```

- To configure the counter re-synchronization look ahead window, run the following command:

```
./nmashotpconf -h 164.99.91.165 -p 636 -D cn=admin,o=novell -w novell
-r 6
```

7.6 Known issues

7.6.1 Ndsconfig add fails for an HOTP enabled administrative user

For HOTP enabled users, the OTP digit is used for authentication. The ndsconfig utility uses the same OTP digit for subsequent authentication, which causes the ndsconfig add to fail. Similarly, ndsconfig upgrade also fails.

To work around this issue, do not enable HOTP for the user through which you are performing ndsconfig add/ upgrade.

7.6.2 Login through HOTP-enabled user to a read-only replica fails

If you perform LDAP login through the HOTP-enabled user by sending a request to the read-only replica, the LDAP chaining does not happen. The read-only replica does not forward the request to the server where the actual user resides. The replica fails giving an illegal replica type error.

7.6.3 Nmashotpconf utility cannot modify the user resynchronization window

If the value of the user resynchronization window is already set (say 2) and its value is changed by using the nmashotpconf utility, it displays the following error:

```
ldap_modify_ext_s on HOTP DN failed: error code=19: Constraint violation
```

One of the reasons for the error could be using a combination of the *-o* (the OTP enable or disable option), *-d* (OTP digit), *-c* (otpcouter) and *-y* (user_resync_window) options for modifying the user resynchronization value.

Other Administrative Tasks

8

This section describes other administrative tasks for NMAS™:

8.1 Using the Policy Refresh Rate Command

With NMAS 3.1 or later, you can configure NMAS to refresh the cached NMAS login policy from the NMAS login policy stored in the Security container at scheduled intervals instead of upon every login attempt. This configuration is set per server by using the NMAS policy refresh rate command.

NOTE: The server accesses the Security container once during startup to cache the policy. Then, based on the configured intervals, the server attempts to access the Security container to refresh the policy.

The policy refresh rate command has the following syntax:

```
nmas RefreshRate minutes
```

where *minutes* is the number of minutes between each attempt to check if the cached NMAS login policy needs to be updated.

For information on how the policy refresh rate command can be invoked for each NMAS Server platform, see Section 8.4, “Invoking NMAS Commands,” on page 57.

8.2 Using the LoginInfo Command

With NMAS 3.2 or later, you can turn off automatic updating of certain user object login attributes by using the `LoginInfo <numb>` command. You might want to do this manually if automatically updating attributes causes problems. The following sections further explain this functionality:

8.2.1 NMAS Login for LDAP Bind

In order to make your passwords case-sensitive, you must enable the NMAS login for LDAP Bind. For information on how to do this, see How to Make Your Password Case-Sensitive (http://www.novell.com/documentation/edir88/edir88new/data/brvwgsv.html) in the *Novell eDirectory 8.8 What's New Guide.*

When the NMAS login is enabled for LDAP Bind, eDirectory automatically updates user object login attributes after the user has authenticated. The following is a non-exhaustive list of login attributes that are updated:

- Login Time
- Network Address
- Last Login Time

8.2.2 Problems Caused by Automatically Updating User Object Login Attributes

The automatic updating of user object login attributes can lead to the following problems:

- High utilization
- Unresponsiveness
- Client time-outs seen on busy authentication servers, especially in LDAP environments

If you are experiencing these problems, you might want to regulate when the login attributes are updated. For information on how to do this, see Section 8.2.3, "Using the LoginInfo Command to Control LoginInfo Attributes When Attributes are Updated," on page 56.

8.2.3 Using the LoginInfo Command to Control LoginInfo Attributes When Attributes are Updated

To control when login attributes are updated, execute the `nmas LoginInfo <num>` command.

The value for `<num>` is as follows:

- **0 or off:** Do not update any login attributes.
- **1:** Only update attributes that are required by intruder detection.
- **2:** Update all login attributes except unused user password policy attributes.
- **3 or on:** Update all login attributes.

For information on how to invoke the LoginInfo command for each NMAS Server platform, see Section 8.4, "Invoking NMAS Commands," on page 57.

8.2.4 Using the sasUpdateLoginInfo Attribute

The sasUpdateLoginInfo attribute controls the updates of LoginInfo attributes. Use the attribute to control the updates of login- related attributes for the following:

- User

- Container of the user
- Partition root
- LoginPolicy

If the attribute is set on the LoginPolicy object, the setting becomes effective after the next policy refresh cycle. If the attribute is not set for the User/Container/Partition root /LoginPolicy, the value set on a server via command line is used to maintain backward compatibility.

The sasUpdateLoginInfo attribute can have the following values:

- **0 or off:** Do not update any login attributes.
- **1:** Only update attributes that are required by intruder detection.
- **2:** Update all login attributes except unused user password policy attributes.
- **3 or on:** Update all login attributes.

You can set or manually edit the value of the sasUpdateLoginInfo attribute either via iManager or via an `ldif` file. For example:

```
#cat changesasUpdateLoginInfo.ldif
dn: cn=user1,o=org
changetype: modify
replace: sasUpdateLoginInfo
sasUpdateLoginInfo: 1
```

IMPORTANT: You must use NMAS logins for the settings to work. Therefore, NDSD_TRY_NMASLOGIN_FIRST should be set to true.

8.3 Setting Up NDSD_TRY_NMASLOGIN_FIRST

You must set NDSD_TRY_NMASLOGIN_FIRST to true to enable the NMAS login. This environment variable is available in eDirectory 8.8 and later versions. NDSD_TRY_NMASLOGIN_FIRST acts as a switch to enable or disable the NMAS-based login for LDAP authentication.

NOTE: NMAS-based login is slower compared to the traditional eDirectory login.

For more information on setting up NDSD_TRY_NMASLOGIN_FIRST, refer to How to Make Your Password Case-Sensitive (http://www.novell.com/documentation/edir88/edir88new/data/brvwgsv.html) in *eDirectory 8.8 What's New Guide*.

8.4 Invoking NMAS Commands

How you invoke an NMAS command differs depending on what platform you are running. The following platforms are supported:

- Section 8.4.1, "Windows," on page 58
- Section 8.4.2, "Linux, Solaris, and AIX," on page 58

8.4.1 Windows

When NMAS is started, it processes the commands in the `nmas.cfg` file. The `nmas.cfg` file must be in the same directory as the `dib` files, which are usually in `c:/novell/nds/dibfiles`.

or

After NMAS has been started, use the following procedure:

1. In the Novell eDirectory Services console, select `nmas.dlm`.
2. Type the command in the *Startup Parameters* field.
3. Click *Configure*.

8.4.2 Linux, Solaris, and AIX

When NMAS is started, it processes the commands in the `nmas.config` file. The `nmas.config` file must be in the same directory as the `dib` directory. For example, if the `.dib` directory path is `/var/opt/novell/eDirectory/data/dib`, then the `nmas.config` file path is `/var/opt/novell/eDirectory/data/nmas.config`.

8.5 Setting the Delay Time for Failed Login Attempts

1. Install the NMAS 3.1.3 plug-in into iManager.

   The NMAS 3.1.3 plug-in can be downloaded from the Novell Download site (http://download.novell.com/index.jsp)
2. In iManager, on the *Roles and Tasks* menu, click *Directory Administration* > *Modify Object*.
3. Browse for and select the Login Policy object, then click *OK*.
4. Click the *NMAS* tab, then click *Settings*.
5. Type the number of seconds you want the login screen to be delayed between failed login attempts, then click *OK*.

8.6 Using DSTrace

You can use the DSTrace utility to get trace information from NMAS.

For information on how to capture an NMAS client trace, see TID # 3331372 (http://www.novell.com/support/search.do?cmd=displayKC&docType=kc&externalId=3331372&sliceId=SAL_Public&dialogID=2494055&stateId=1%200%202492379).

For information on how to capture an NMAS server trace, see TID # 3815371 (http://www.novell.com/support/search.do?cmd=displayKC&docType=kc&externalId=3815371&sliceId=SAL_Public&dialogID=2494055&stateId=1%200%202492379).

8.7 Disabling and Uninstalling the NMAS Client

To disable the NMAS Client:

1. On the workstation, right-click the Red N.
2. Click *Novell Client Properties*.
3. Click the *Advanced Login* tab.
4. From the *Parameter Groups* list, select *NMAS Authentication*.
5. Under *Setting*, select *Off*.
6. Click *OK*.

To uninstall the NMAS Client, use the Add/Remove Programs option of the Windows Control Panel.

NOTE: Disabling or removing NMAS does not remove support for changing the Universal Password from the Novell Client for Windows.

8.8 Disabling NMAS on the Server

NMAS is defined as a core service after it is installed because other services (such as eDirectory) might auto-integrate to use NMAS features. Because of these dependencies, it is not possible to fully uninstall this release of NMAS. However, you can disable NMAS on a server-by-server basis by performing the following steps:

On Windows with Novell eDirectory

1. Stop the eDirectory service.
2. Rename the `nmas.dlm` file.
3. Restart the eDirectory service.

On Linux, Solaris, and AIX

1. Stop the eDirectory service.
2. Rename the `libnmas.so` file.
3. Restart the eDirectory service.

8.9 Auditing NMAS Events

There are two products you can use to audit NMAS events:

- Novell Audit Secure Logging Server

  You can use the Novell Audit Secure Logging Server to install the `nmas_en.lsc` file. This file is located in the following directories:

  Windows: `novell\nds`

  Linux, Solaris, and AIX: `/opt/novell/eDirectory/lib/nds-schema` (relative to where eDirectory is installed)

For information on installing and managing Novell Audit, see the Novell Audit online documentation (http://www.novell.com/documentation/novellaudit20/index.html).

- Novell Sentinel

  For information on installing and managing Novell Sentinel, see the Novell Sentinel online documentation (http://www.novell.com/documentation/sentinel61/).

With either product, you also need to enable NMAS Audit by using the NMAS 3.3 or later plug-in for iManager.

1. Install the NMAS 3.3 or later plug-in into iManager.

   You can download the NMAS 3.3 or later plug-in from the Novell Download site (http://download.novell.com/index.jsp)
2. In iManager, on the *Roles and Tasks* menu, click *Directory Administration* > *Modify Object*.
3. Browse for and select the Login Policy object, then click *OK*.
4. Click the *NMAS* tab, then click *Settings*.
5. Click the box next to *Enable auditing*, then click *OK*.

8.9.1 Using External Certificates with Novell Audit

To use an external certificate with NMAS and Novell Audit, you must first convert the certificate into two `.pem` files with the following names:

- `nmascert.pem`: This is the file containing the certificate.
- `nmaskey.pem`: This is the file containing the private key.

These files need to be copied to the following directories on each platform for each NMAS server in the system:

- Linux/UNIX: `/etc`
- Windows: the return from GetWindowsDirectory (typically `c:\windows`)

NMAS provides the `nmascert.pem` and the `nmaskey.pem` files to the Novell Audit platform agent when the log is open, if they exist. If the files don't exist, NMAS provides the internal certificate and key to the Novell Audit platform agent.

8.9.2 Using XDASv2 for Auditing NMAS Events

NMAS events can be audited using XDASv2.

1. Install the NMAS 3.3 or later plug-in into iManager.

   You can download the NMAS 3.3 or later plug-in from the Novell Download site (http://download.novell.com/index.jsp)
2. In iManager, on the *Roles and Tasks* menu, click *Directory Administration* > *Modify Object*.
3. Browse for and select the Login Policy object, then click *OK*.
4. Click the *NMAS* tab, then click *Settings*.
5. Click the box next to *Enable auditing*, then click *OK*.

When NMAS auditing is enabled, if both Platform Agent and XDASv2 modules are installed and configured, NMAS logs events to both Platform Agent and XDASv2. For detailed installation and configuration instructions on XDASv2, refer to the XDASv2 Administration Guide (http://www.novell.com/documentation/edir88/edirxdas_admin/data/bookinfo.html).

Troubleshooting

9

The information in this section is provided to help you troubleshoot problems with NMAS™.

9.1 NMAS Error Codes

A complete list of NMAS error codes can be found in the *NMAS NDK* (http://developer.novell.com/documentation/nmas/index.html?page=/ndk/doc/nmas/nmas_enu/data/bqx8m3i.html).

9.2 Installation Issues

- When upgrading NMAS on a UNIX platform, you might be prompted to replace `libspmdclnt.so`. If this happens, answer Yes.
- If you uninstall the Novell Client, you must uninstall and reinstall the NMAS Client if it is used by another application.
- We strongly recommended that you upgrade NMAS to the latest version on all servers.
- You must have NMAS installed on a server that holds a writable replica of the user’s object in order for the user to use NMAS.
- You must have the NICI Client installed on each client workstation that will run ConsoleOne® and NMAS software.
- If you do not restart the server after installing NMAS and you try to reset passwords, you receive an error message.
- You should keep the login method up to date. The eDirectory UNIX/Linux and OES/Linux installs might not provide a way to upgrade the method.
- The `nmasinst` utility does not work on AIX. Therefore, use iManger as described in Section 3.1.2, “Using Novell iManager to Install a Login or Post-Login Method,” on page 20 or use other platforms as described in Section 3.1.1, “Using the nmasinst Utility to Install a Login Method,” on page 20.

9.3 Login Method and Sequence Issues

- For products to use NMAS login methods properly, at least one NMAS 2.3 or later server in the eDirectory partition needs to hold a R/W replica of the User objects that will be using NMAS.
- Not all login or post-login methods use the initial password field when they are activated. If you are prompted to enter a password, you can ignore the password field and close it.

- If a login method's ConsoleOne snap-ins are already present and you try to install the same login method again, you receive a failed status displayed in the login methods installation summary dialog box. This occurs only when running ConsoleOne from the server.
- Two password methods, such as Simple and NDS, cannot be used in an AND sequence if the Novell Client is set to display the password field, which is the default.

9.4 Administration Issues

- You must give explicit rights to users with graded authentication. Inherited rights do not work. For example, an administrator's Supervisor right is defined at the [Root] container. Rights for the administrator are not defined in the Volume object. If the administrator changes the volume's security label from Logged In to any other security label, the administrator cannot get the appropriate rights. The administrator must assign explicit rights to the volume, directories, or files in the volume.
- If the Universal Password is not enabled, the simple password is used for various authentication services in NetWare® 6.5 SP1. This includes the authentication support for CIFS and AFP.

  A problem might arise if you set or change a user's simple password from the ConsoleOne administrative snap-ins using Force Password Change. If you experience problems setting an initial password, you might need to select the Force Password Change check box. If the user already has a password set, Force Password Change might not work unless you remove the current password and specify a new one.
- If Universal Password is enabled and you attempt to set the simple password, a -1697 error message is returned.
- eDirectory 8.7.3 utilities like ndsbackup, ndsrepair, and ndsmerge work with NDS passwords alone but do not work with NMAS Simple password. eDirectory 8.8 uses Universal Password.

  For information on Universal Password, see the *Novell Password Management 3.3.1 Administration Guide* (http://www.novell.com/documentation/password_management33/pwm_administration/data/bookinfo.html).
- Clicking *OK* or switching between tabs when creating or renaming a label always creates or renames the label even if you respond *No* to the *Save Changes made for Labels?* prompt. You must click the *Cancel* button to cancel any changes. After a label is created, it cannot be deleted; however, you can rename it to an unused name, such as Unused_x.
- When you use XDAS auditing for NMAS, the DN format of the following events is not generated in the LDAP notation.
  - 00290035 SASL Mechanism Result
  - 00290061 Set Login Configuration
  - 00290062 Get Login Configuration
  - 00290064 Set Login Secret

NOTE: The ID (for example, 00290035 or 00290061) specifies the NMAS event ID as mentioned in the `lsc` file. The NMAS event ID is part of the subEvent field in the XDAS format.

Security Considerations

A

This section contains specific information related to security with Novell Modular Authentication Services. It contains the following subsections:

A.1 Partner Login Methods

Novell has not evaluated the security methodologies of partner login methods. Although the partner products might have qualified for the Novell Yes, Tested & Approved or Novell Directory Enabled logos, those logos relate to general product interoperability only.

A.2 Login Policies

- If authorized login sequences, default login sequences, authorized clearances, or default clearances are assigned to a container that is not a partition root, the policy is only effective for user objects in the container, and not for user objects in subcontainers.
- If authorized login sequences, default login sequences, authorized clearances, or default clearances are assigned to a container that is a partition root, the policy is effective for all users in the partition that do not have these values assigned to the user object or to the object's parent container.
- If authorized login sequences, default login sequences, authorized clearances, or default clearances are assigned to a Login policy, that policy is effective for all users in the tree that do not have these values assigned to the user object, to the object's parent container, or to the object's partition root.
- When users are assigned passwords or other guessable login secrets such as challenge question responses, you should enable intruder detection to slow down or prevent intruders from guessing the login secrets.
- By default, failed login attempts are delayed by three seconds. This delay is intended to slow down the attempts of intruders to guess passwords. The length of the failed login delay is configurable. You should use the default of three seconds.
- Login policies such as intruder detection, network address restrictions, and time of day restrictions are enforced for all login sequences. For example, the login policies are enforced when the forgotten password self-service feature of several Novell products invokes the challenge/response login method.
- You should enable NMAS™ Auditing so that you can track login attempts and changes in configuration.

- Using the policy refresh rate command to check if the cached password policy needs to be refreshed on defined intervals instead of during each login causes a delay in the application of login policy changes.
- The `LoginInfo` command can be used to disable updating login-related attributes during login. These attributes include the intruder detection attributes. Disabling the update of these login-related attributes improves login performance. However, disabling the update of these attributes might lessen the security of the system.
- With NMAS 3.3 and later, the intruder detection policy can be set on the user object's direct container or on the user object's partition root. NMAS checks the parent container first for an intruder detection policy; if no policy is found, then the partition root is checked for an intruder detection policy.

A.3 Graded Authentication

Graded authentication for file system and eDirectory attributes is only enforced on NetWare.

Carefully plan and test the use of Graded Authentication. Misuse of graded authentication might lock out users from NetWare volumes or eDirectory attributes.

A.4 NMASInst

When you are upgrading a login method, `nmasinst` replaces a newer version with the older version unless the `-checkversion` option is used.

Although `nmasinst` provides an option to specify the password on the command line, it is not recommended because the password could be compromised.

A.5 Universal Password

- Because the Security container contains global policies, you should be careful where you place writable replicas. Some servers can modify the overall security policies specified in the eDirectory tree. In order for users to log in with NMAS, replicas of the User objects and security container must be on the NMAS server.
- If a Password policy is assigned to a container that is not a partition root, that policy is only effective for the user objects in the container, and not for user objects in subcontainers.
- If a Password policy is assigned to a container that is a partition root, that policy is effective for all users in the partition that do not have these values assigned to the user object or to the object's parent container.
- If a Password policy is assigned to a Login policy, that policy is effective for all users in the tree that do not have these values assigned to the user object, to the object's parent container, or to the object's partition root.
- When the NDS Password is migrated to the Universal Password during a user login, the password expiration time might be changed in the following circumstances:

NOTE: This section only applies to NMAS 3.2*x* and earlier. For NMAS 3.3 and later, password expiration time is not updated when the NDS password is migrated to the Universal Password unless the "Verify whether existing passwords comply with the password policy (verification occurs on login)" password policy rule is set to "true".

  - If the password expiration time (calculated by adding the time that the NDS Password was set with the Password policy password expiration interval) is sooner than the user's current password expiration, the password expiration time is set to the calculated value.
  - If the password policy does not have a password expiration interval, the user's password expiration time attribute is removed.

- Password policies can be configured to allow the user or a password administrator to read the Universal Password by using documented NMAS LDAP extensions. These options should not be enabled unless required for your specific installation. If you require user passwords to be readable, you should configure the Password policy to only allow selected users to read the passwords.
- You should configure a password policy to synchronize to the Distribution Password only if Identity Manager Password Synchronization is being used to synchronize passwords between connected systems.

  For more information on sychronizing passwords between connected systems using Identity Manager Password Synchronization, see the *Novell Identity Manager 4.0 Password Management Guide* (http://www.novell.com/documentation/idm40/idm_password_management/data/front.html).
- You should only configure a password policy to synchronize to the Simple Password only if:
  - You have servers that hold a writable replica of user objects
  - Those servers are running NetWare 6.0 or earlier
  - Users access those servers using Native File Access Protocols such as CIFS and AFP.
- When advanced password rules are enabled for a password policy, the legacy password rules on the User object are ignored, and are updated to match the password policy rules when users change their passwords or log in.
- The password exclusion rules (password history, excluded passwords, and disallowed attribute vales) are not enforced when NMAS is used to generate random passwords.
- When selecting password rules, you should balance the requirements for hard-to-guess passwords with hard-to-remember passwords.
- When an administrator specifies that the NDS Password is to be removed, the result is that the NDS Password Hash is set to a random value that is unknown to anyone but eDirectory. There might or might not be a password value that could be hashed to that random value.
- XML Password Complexity
  - If there are duplicate rule tags, the most restrictive rule is used (others are ignored) for checking passwords against the policy and for random password generation.
  - The ViolationsAllowed and NumberOfCharactersToEvaluate rule set attributes are ignored for random password generation.
  - Only the first policy in an XML policy is used for random password generation.

For additional information on Universal Password security, see the *Novell Password Management 3.3.1 Administration Guide* (http://www.novell.com/documentation/password_management33/pwm_administration/data/bc11ish.html).

A.6 SDI Key

You should make the Security Domain Infrastructure (SDI) key, also known as the tree key, a Triple DES key (3DES). The SDI key can be checked and upgraded by using the SDIDiag utility. See Step 4: Verify that Your SDI Domain Key Servers Are Ready for Universal Password (http://www.novell.com/documentation/password_management33/pwm_administration/data/bwx6yhl.html).

Documentation Updates

B

The documentation was updated on the following dates:

B.1 November 25, 2010

Updates were made to the following sections. The changes are explained below:

Location	Change
Added a new chapter on multi-factor authentication by using HOTP.	Chapter 7, “NMAS HOTP Method,” on page 49
Entire Book	Changed version number to 3.3.3.

B.2 June 14, 2010

Updates were made to the following sections. The changes are explained below:

Location	Change
Section 9.2, “Installation Issues,” on page 63	Added a known issue that the `nmasinst` utility does not work on AIX.
Section 8.3, “Setting Up NDSD_TRY_NMASLOGIN_FIRST,” on page 57	Added a new section.
Section 8.2.4, “Using the sasUpdateLoginInfo Attribute,” on page 56	Added a new section.

B.3 October 28th, 2008

Updates were made to the following sections. The changes are explained below:

B.3.1 Overview

Location	Change
Entire Book	Changed version number from 3.3 to 3.3.1.

B.4 August 6th, 2008

Updates were made to the following sections. The changes are explained below:

B.4.1 Overview

Location	Change
Section 8.2, “Using the LoginInfo Command,” on page 55	Made modifications to this section.
Section 8.4, “Invoking NMAS Commands,” on page 57	Removed information from sections Section 8.1, “Using the Policy Refresh Rate Command,” on page 55 and Section 8.2, “Using the LoginInfo Command,” on page 55 and created this new section.