

## **Configuring User Accounts and RBAC**

This chapter describes how to configure user accounts and role-based access control (RBAC) on Cisco NX-OS devices.

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### **About User Accounts and RBAC**

You can create and manage users accounts and assign roles that limit access to operations on the Cisco NX-OS device. RBAC allows you to define the rules for an assign role that restrict the authorization that the user has to access management operations.

### **User Accounts**

You can configure up to a maximum of 256 user accounts. By default, the user account does not expire unless you explicitly configure it to expire. The expire option determines the date when the user account is disabled.

The following words are reserved and cannot be used to configure users: bin, daemon, adm, lp, sync, shutdown, halt, mail, news, uucp, operator, games, gopher, ftp, nobody, nscd, mailnull, root, rpc, rpcuser, xfs, gdm, mtsuser, ftpuser, man, and sys.



Note

User passwords are not displayed in the configuration files.



Caution

Usernames must begin with an alphanumeric character and can contain only these special characters: ( + = . \_ \ -). The # and ! symbols are not supported. If the username contains characters that are not allowed, the specified user is unable to log in.

### **Characteristics of Strong Passwords**

A strong password has the following characteristics:

- Is at least eight characters long
- Does not contain many consecutive characters (such as abcd)
- Does not contain many repeating characters (such as aaabbb)
- · Does not contain dictionary words
- Does not contain proper names
- Contains both uppercase and lowercase characters
- Contains numbers

The following are examples of strong passwords:

- If2CoM18
- · 2004AsdfLkj30
- Cb1955S21



Note

Clear text passwords cannot contain dollar signs (\$) or spaces anywhere in the password. Also, they cannot include these special characters at the beginning of the password: quotation marks (" or '), vertical bars (|), or right angle brackets (>).



Note

All printable ASCII characters are supported in the password string if they are enclosed in quotation marks.

If a password is trivial (such as a short, easy-to-decipher password), the Cisco NX-OS software will reject your password configuration if password-strength checking is enabled. Be sure to configure a strong password as shown in the sample configuration. Passwords are case sensitive.

### **User Roles**

User roles contain rules that define the operations allowed for the user who is assigned the role. Each user role can contain multiple rules, and each user can have multiple roles. For example, if role1 allows access only to configuration operations, and role2 allows access only to debug operations, then users who belong to both role1 and role2 can access configuration and debug operations. You can also limit access to specific virtual routing and forwarding instances (VRFs), VLANs, and interfaces.

The Cisco NX-OS software provides the following user roles:

- network-admin—Complete read-and-write access to the entire Cisco NX-OS device
- network-operator or vdc-operator—Complete read access to the entire Cisco NX-OS device



Note

You cannot change the user roles.



Note

Some **show** commands may be hidden from network-operator users. In addition, some non-**show** commands (such as **telnet**) may be available for this user role.

By default, the user accounts without an administrator role can access only the **show**, **exit**, **end**, and **configure terminal** commands. You can add rules to allow users to configure features.



Note

If you belong to multiple roles, you can execute a combination of all the commands permitted by these roles. Access to a command takes priority over being denied access to a command. For example, suppose a user has RoleA, which denied access to the configuration commands. However, the user also has RoleB, which has access to the configuration commands. In this case, the user has access to the configuration commands.

### **User Role Rules**

The rule is the basic element of a role. A rule defines what operations the role allows the user to perform. You can apply rules for the following parameters:

#### Command

A command or group of commands defined in a regular expression.

#### **Feature**

A command or group of commands defined in a regular expression.

#### Feature group

Default or user-defined group of features.

#### **OID**

An SNMP object identifier (OID).

The command, feature, and feature group parameters create a hierarchical relationship. The most basic control parameter is the command. The next control parameter is the feature, which represents all commands associated with the feature. The last control parameter is the feature group. The feature group combines related features and allows you to easily manage the rules. The Cisco NX-OS software also supports the predefined feature group L3 that you can use.

You can configure up to 256 rules for each role. The user-specified rule number determines the order in which the rules are applied. Rules are applied in descending order. For example, if a role has three rules, rule 3 is applied before rule 2, which is applied before rule 1.

### **Guidelines and Limitations for User Accounts and RBAC**

User accounts and RBAC have the following configuration guidelines and limitations:

- You can add up to 256 rules to a user role.
- You can add up to 64 user-defined feature groups in addition to the default feature group, L3.
- You can configure up to 256 users.
- You can assign a maximum of 64 user roles to a user account.
- If you have a user account configured on the local Cisco NX-OS device that has the same name as a remote user account on an AAA server, the Cisco NX-OS software applies the user roles for the local user account to the remote user, not the user roles configured on the AAA server.
- You cannot delete the default admin and SNMP user accounts.
- You cannot remove the default user roles from the default admin user accounts.
- The network-operator role cannot run the **show running-config** and **show startup-config** commands.



Note

If you are familiar with the Cisco IOS CLI, be aware that the Cisco NX-OS commands for this feature might differ from the Cisco IOS commands that you would use.

# **Default Settings for User Accounts and RBAC**

This table lists the default settings for user accounts and RBAC parameters.

Table 1: Default User Accounts and RBAC Parameters

Parameters	Default
User account password	Undefined
User account expiry date	None
User account role	Network-operator if the creating user has the network-admin role
Default user role	Network-operator
Interface policy	All interfaces are accessible
VLAN policy	All VLANs are accessible
VRF policy	All VRFs are accessible
Feature group	L3

# **Enabling Password-Strength Checking**

You can enable password-strength checking which prevents you from creating weak passwords for user accounts.



Note

When you enable password-strength checking, the Cisco NX-OS software does not check the strength of existing passwords.

#### **Procedure**

	Command or Action	Purpose
Step 1	configure terminal	Enters global configuration mode.
	Example:	
	<pre>switch# configure terminal switch(config)#</pre>	
Step 2	password strength-check	Enables password-strength checking. The
	Example:	default is enabled.
	switch(config) # password strength-check	You can disable password-strength checking by using the <b>no</b> form of this command.
Step 3	exit	Exits global configuration mode.
	Example:	
	<pre>switch(config)# exit switch#</pre>	
Step 4	(Optional) show password strength-check	Displays the password-strength check
	Example:	configuration.
	switch# show password strength-check	
Step 5	(Optional) copy running-config startup-config	Copies the running configuration to the startup
	Example:	configuration.
	switch# copy running-config startup-config	

# **Configuring User Accounts**

You can create a maximum of 256 user accounts on a Cisco NX-OS device. User accounts have the following attributes:

- Username
- Password

- · Expiry date
- User roles

You can enter the password in clear text format or encrypted format. The Cisco NX-OS password encrypts clear text passwords before saving them to the running configuration. Encrypted format passwords are saved to the running configuration without further encryption.

User accounts can have a maximum of 64 user roles. The user can determine what commands are available by using the command-line interface (CLI) context sensitive help utility.



Note

Changes to user account attributes do not take effect until the user logs in and creates a new session.

	Command or Action	Purpose
Step 1	configure terminal	Enters global configuration mode.
	Example:	
	<pre>switch# configure terminal switch(config)#</pre>	
Step 2	(Optional) show role	Displays the user roles available. You can configure other user roles, if necessary.
	Example:	
	switch(config)# show role	
	Configures a user account. The <i>user-id</i> argument is a case-sensitive, alphanumeric	
	Example:	character string with a maximum length of 2 characters. Valid characters are uppercase lett
	switch(config)# username NewUser password 4Ty18Rnt	
		Usernames must begin with an alphanumeric character.
		The default password is undefined. The <b>0</b> option indicates that the password is clear text, and the <b>5</b> option indicates that the password is encrypted. The default is <b>0</b> (clear text).
		Note If you do not specify a password, the user might not be able to log in to the Cisco NX-OS device.

	Command or Action	Purpose
		Note If you create a user account with the encrypted password option, the corresponding SNMP user will not be created.
		The <b>expire</b> <i>date</i> option format is YYYY-MM-DD. The default is no expiry date. User accounts can have a maximum of 64 user roles.
Step 4	username user-id ssh-cert-dn dn-name {dsa   rsa}	Specifies an SSH X.509 certificate distinguished name and DSA or RSA algorithm to use for
	Example:	authentication for an existing user account. The distinguished name can be up to 512 characters
	<pre>switch(config) # username NewUser ssh-cert-dn "/CN = NewUser, OU = Cisco Demo, O = Cisco, C = US" rsa</pre>	and must follow the format shown in the examples. Make sure the email address and stat are configured as emailAddress and ST, respectively.
	Example:	
	<pre>switch(config)# username jsmith ssh-cert-dn "/O = ABCcompany, OU = ABC1, emailAddress = jsmith@ABCcompany.com, L = Metropolis, ST = New York, C = US, CN = jsmith" rsa</pre>	
Step 5	exit	Exits global configuration mode.
	Example:	
	switch(config)# exit switch#	
Step 6	(Optional) show user-account	Displays the role configuration.
	Example:	
	switch# show user-account	
Step 7	(Optional) copy running-config startup-config	Copies the running configuration to the startup
	Example:	configuration.
	switch# copy running-config startup-config	

# **Configuring Roles**

This section describes how to configure user roles.

## **Creating User Roles and Rules**

You can configure up to 64 user roles. Each user role can have up to 256 rules. You can assign a user role to more than one user account.

The rule number that you specify determines the order in which the rules are applied. Rules are applied in descending order. For example, if a role has three rules, rule 3 is applied before rule 2, which is applied before rule 1.



Note

Regardless of the read-write rule configured for a user role, some commands can be executed only through the predefined network-admin role.

#### Before you begin

If you want to distribute the user role configuration, enable user role configuration distribution on all Cisco NX-OS devices to which you want the configuration distributed.

	Command or Action	Purpose
Step 1	configure terminal	Enters global configuration mode.
	Example:	
	<pre>switch# configure terminal switch(config)#</pre>	
Step 2	role name role-name	Specifies a user role and enters role
	Example:	configuration mode. The <i>role-name</i> argument is a case-sensitive, alphanumeric character
	<pre>switch(config)# role name UserA switch(config-role)#</pre>	string with a maximum length of 16 characters.
Step 3	rule number {deny   permit} command	Configures a command rule.
	command-string	The <i>command-string</i> argument can contain
	Example:	spaces and regular expressions. For example,
	<pre>switch(config-role)# rule 1 deny command   clear users</pre>	interface ethernet includes all Ethernet interfaces.
		Repeat this command for as many rules as needed.
Step 4	rule number {deny   permit} {read   read-write}	Configures a read-only or read-and-write rule for all operations.
	Example:	
	<pre>switch(config-role)# rule 2 deny read-write</pre>	
Step 5	rule number {deny   permit} {read	Configures a read-only or read-and-write rule
	read-write} feature feature-name	for a feature.
	Example:	Use the <b>show role feature</b> command to display
	switch(config-role) # rule 3 permit read	a list of features.
	feature router-bgp	Repeat this command for as many rules as needed.

	Command or Action	Purpose
Step 6	rule number {deny   permit} {read   read-write} feature-group group-name	Configures a read-only or read-and-write rule for a feature group.
	<pre>Example: switch(config-role) # rule 4 deny</pre>	Use the <b>show role feature-group</b> command to display a list of feature groups.
	read-write feature-group L3	Repeat this command for as many rules as needed.
Step 7	<pre>rule number {deny   permit} {read   read-write} oid snmp_oid_name  Example: switch(config-role) # rule 5 deny read-write oid 1.3.6.1.2.1.1.9</pre>	Configures a read-only or read-and-write rule for an SNMP object identifier (OID). You can enter up to 32 elements for the OID. This command can be used to allow SNMP-based performance monitoring tools to poll devices but restrict their access to system-intensive branches such as the IP routing table, MAC address tables, specific MIBs, and so on.
		Note The deepest OID can be at the scalar level or at the table root level.  Repeat this command for as many rules as needed.
Step 8	(Optional) description text  Example:  switch(config-role) # description This role does not allow users to use clear commands	Configures the role description. You can include spaces in the description.
Step 9	<pre>exit Example: switch(config-role) # exit switch(config) #</pre>	Exits role configuration mode.
Step 10	(Optional) show role  Example: switch(config) # show role	Displays the user role configuration.
Step 11	(Optional) show role {pending   pending-diff}  Example: switch(config) # show role pending	Displays the user role configuration pending for distribution.
Step 12	(Optional) role commit  Example: switch(config) # role commit	Applies the user role configuration changes in the temporary database to the running configuration.

	Command or Action	Purpose
Step 13	(Optional) copy running-config startup-config	Copies the running configuration to the startup configuration.
	Example:	
	<pre>switch(config)# copy running-config startup-config</pre>	

### **Creating Feature Groups**

You can create custom feature groups to add to the default list of features provided by the Cisco NX-OS software. These groups contain one or more of the features. You can create up to 64 feature groups.



Note

You cannot change the default feature group L3.

#### Before you begin

If you want to distribute the user role configuration, enable user role configuration distribution on all Cisco NX-OS devices to which you want the configuration distributed.

	Command or Action	Purpose
Step 1	configure terminal	Enters global configuration mode.
	Example:	
	<pre>switch# configure terminal switch(config)#</pre>	
Step 2	role feature-group name group-name	Specifies a user role feature group and enters
	Example:	role feature group configuration mode.
	<pre>switch(config)# role feature-group name GroupA switch(config-role-featuregrp)#</pre>	The <i>group-name</i> argument is a case-sensitive, alphanumeric character string with a maximum length of 32 characters.
Step 3	feature feature-name	Specifies a feature for the feature group.
	<pre>Example: switch(config-role-featuregrp)# feature</pre>	Repeat this command for as many features as needed.
	radius	Note Use the show role component command to display a list of features.
Step 4	exit	Exits role feature group configuration mode.
	Example:	
	<pre>switch(config-role-featuregrp)# exit switch(config)#</pre>	

	Command or Action	Purpose
Step 5	(Optional) show role feature-group	Displays the role feature group configuration.
	Example:	
	switch(config)# show role feature-group	
Step 6	(Optional) show role {pending   pending-diff}	Displays the user role configuration pending
	<pre>Example: switch(config) # show role pending</pre>	for distribution.
Step 7	(Optional) role commit  Example:  switch(config) # role commit	Applies the user role configuration changes in the temporary database to the running configuration.
Step 8	(Optional) copy running-config startup-config  Example:  switch(config) # copy running-config startup-config	Copies the running configuration to the startup configuration.

## **Changing User Role Interface Policies**

You can change a user role interface policy to limit the interfaces that the user can access. By default, a user role allows access to all interfaces.

#### Before you begin

Create one or more user roles.

If you want to distribute the user role configuration, enable user role configuration distribution on all Cisco NX-OS devices to which you want the configuration distributed.

	Command or Action	Purpose
Step 1	configure terminal	Enters global configuration mode.
	Example:	
	<pre>switch# configure terminal switch(config)#</pre>	
•	role name role-name	Specifies a user role and enters role
	configuration mode.	
Step 3	interface policy deny	Enters role interface policy configuration mode.
	Example:	

	Command or Action	Purpose
	<pre>switch(config-role)# interface policy deny switch(config-role-interface)#</pre>	
Step 4	permit interface interface-list  Example:	Specifies a list of interfaces that the role can access.
	<pre>switch(config-role-interface) # permit interface ethernet 2/1-4</pre>	Repeat this command for as many interfaces as needed.
Step 5	exit	Exits role interface policy configuration mode.
	Example:	
	<pre>switch(config-role-interface)# exit switch(config-role)#</pre>	
Step 6	(Optional) show role	Displays the role configuration.
	Example:	
	switch(config-role)# show role	
Step 7	(Optional) show role {pending   pending-diff}	Displays the user role configuration pending
	Example:	for distribution.
	switch(config-role)# show role pending	
Step 8	(Optional) role commit	Applies the user role configuration changes in
	Example:	the temporary database to the running configuration.
	switch(config-role)# role commit	configuration.
Step 9	(Optional) copy running-config startup-config	Copies the running configuration to the startup
	Example:	configuration.
	<pre>switch(config-role)# copy running-config startup-config</pre>	

### **Changing User Role VLAN Policies**

You can change a user role VLAN policy to limit the VLANs that the user can access. By default, a user role allows access to all VLANs.

#### Before you begin

Create one or more user roles.

	Command or Action	Purpose
Step 1	configure terminal	Enters global configuration mode.
	Example:	

	Command or Action	Purpose	
	<pre>switch# configure terminal switch(config)#</pre>		
Step 2	role name role-name	Specifies a user role and enters role configuration mode.	
	<pre>Example: switch(config) # role name UserA switch(config-role) #</pre>		
Step 3	vlan policy deny	Enters role VLAN policy configuration mode.	
	Example:		
	<pre>switch(config-role)# vlan policy deny switch(config-role-vlan)#</pre>		
Step 4	permit vlan vlan-list	Specifies a range of VLANs that the role can access.	
	Example:  switch(config-role-vlan) # permit vlan  1-4	Repeat this command for as many VLANs as needed.	
Step 5	exit	Exits role VLAN policy configuration mode.	
	Example:		
	<pre>switch(config-role-vlan)# exit switch(config-role)#</pre>		
Step 6	(Optional) show role	Displays the role configuration.	
	Example:		
	switch(config)# show role		
Step 7	(Optional) show role {pending   pending-diff}	Displays the user role configuration pending	
	Example:	for distribution.	
	switch(config-role)# show role pending		
Step 8	(Optional) role commit	Applies the user role configuration changes in	
	Example:	the temporary database to the running configuration.	
	switch(config-role)# role commit	configuration.	
Step 9	(Optional) copy running-config startup-config	Copies the running configuration to the startuconfiguration.	
	Example:		
	switch(config-role)# copy running-config startup-config		

## **Changing User Role VRF Policies**

You can change a user role VRF policy to limit the VRFs that the user can access. By default, a user role allows access to all VRFs.

#### Before you begin

Create one or more user roles.

If you want to distribute the user role configuration, enable user role configuration distribution on all Cisco NX-OS devices to which you want the configuration distributed.

	Command or Action	Purpose	
Step 1	configure terminal	Enters global configuration mode.	
	Example:		
	<pre>switch# configure terminal switch(config)#</pre>		
Step 2	role name role-name	Specifies a user role and enters role	
	Example:	configuration mode.	
	<pre>switch(config)# role name UserA switch(config-role)#</pre>		
Step 3	vrf policy deny	Enters role VRF policy configuration mode.	
	Example:		
	<pre>switch(config-role)# vrf policy deny switch(config-role-vrf)#</pre>		
Step 4	permit vrf vrf-name	Specifies the VRF that the role can access.	
	Example:	Repeat this command for as many VRFs as	
	switch(config-role-vrf)# permit vrf vrf1	needed.	
Step 5	exit	Exits role VRF policy configuration mode.	
	Example:		
	<pre>switch(config-role-vrf)# exit switch(config-role)#</pre>		
Step 6	(Optional) show role	Displays the role configuration.	
	Example:		
	switch(config-role)# show role		
Step 7	(Optional) show role {pending   pending-diff}	Displays the user role configuration pending	
	Example:	for distribution.	
	switch(config-role)# show role pending		
Step 8	(Optional) role commit	Applies the user role configuration changes in	
	Example:	the temporary database to the running configuration.	
	switch(config-role)# role commit		
Step 9	(Optional) copy running-config startup-config	Copies the running configuration to the startup	
	Example:	configuration.	

Command or Action	Purpose
<pre>switch(config-role)# copy running-config startup-config</pre>	

## **About No Service Password-Recovery**

The No Service Password-Recovery feature enables anyone with console access, the ability to access the router and its network. The No Service Password-Recovery feature prevents the password recovery with standard procedure as described in the Cisco Nexus 3400-S NX-OS Troubleshooting Gude..

# **Enabling No Service Password-Recovery**

If the no service password-recovery feature is enabled, then none except the administrator with network privileges will be able to modify the administrator password.

#### Before you begin

If you plan to enter the no service password-recovery command, Cisco recommends that you save a copy of the system configuration file in a location away from the device.

	Command or Action	Purpose
Step 1	configure terminal	Enters global configuration mode.
	Example:	
	<pre>switch# configure terminal switch(config)#</pre>	
Step 2	no service password-recovery	Disables the password recovery mechanism.
	Example:	
	<pre>switch(config)# no service password-recovery WARNING: Executing this command will disable the password recovery mechanism. Do not execute this command without another plan for password recovery. Are you sure you want to continue? (y/n): [y] y switch(config)# copy run start [####################################</pre>	
Step 3	(Optional) copy running-config startup-config	Copies the running configuration to the startup
	Example:	configuration.
	<pre>switch# copy running-config startup-config</pre>	

	Command or Action	Purpose
Step 4	Reload	
	Example:	
	<pre>switch(config)# Reload This command will reboot the system. (y/n)? [n] y 2018 Jun 26 16:23:19 BAR %\$ VDC-1 %\$ %PLATFORM-2-PFM_SYSTEM_RESET: Manual system restart from Command Line Interface</pre>	
	CISCO SWITCH Ver 8.34	
	CISCO SWITCH Ver 8.34  Manual system restart from Command Line Interface writing reset reason 9,	
	<pre>switch(boot)# config t Enter configuration commands, one per line. End with CNTL/Z. switch(boot)(config)# admin-password Abcd!123\$ ERROR: service password-recovery disabled. Cannot change password! switch(boot)(config)#</pre>	
Step 5	exit	Exits global configuration mode.
·	<pre>Example: switch(config)# exit switch#</pre>	
Step 6	(Optional) show user-account	Displays the role configuration.
	Example:	
	switch# show user-account	
Step 7	(Optional) copy running-config startup-config	
	Example:	configuration.
	switch# copy running-config startup-config	

# **Verifying User Accounts and RBAC Configuration**

To display user account and RBAC configuration information, perform one of the following tasks:

Command	Purpose
show cli syntax roles network-admin	Displays the syntax of the commands that the network-admin role can use.
show cli syntax roles network-operator	Displays the syntax of the commands that the network-operator role can use.
show role	Displays the user role configuration.
show role feature	Displays the feature list.
show role feature-group	Displays the feature group configuration.
show startup-config security	Displays the user account configuration in the startup configuration.
show running-config security [all]	Displays the user account configuration in the running configuration. The <b>all</b> keyword displays the default values for the user accounts.
show user-account	Displays user account information.

# **Configuration Examples for User Accounts and RBAC**

The following example shows how to configure a user role:

```
role name User-role-A
  rule 2 permit read-write feature bgp
  rule 1 deny command clear *
```

The following example shows how to create a user role that can configure an interface to enable and show BGP and show EIGRP:

```
role name iftest
  rule 1 permit command config t; interface *; bgp *
  rule 2 permit read-write feature bgp
  rule 3 permit read feature eigrp
```

In the above example, rule 1 allows you to configure BGP on an interface, rule 2 allows you to configure the **config bgp** command and enable the exec-level **show** and **debug** commands for BGP, and rule 3 allows you to enable the exec-level **show** and **debug eigrp** commands.

The following example shows how to configure a user role that can configure only a specific interface:

```
role name Int_Eth2-3_only
  rule 1 permit command configure terminal; interface *
  interface policy deny
    permit interface Ethernet2/3
```

#### The following example shows how to configure a user role feature group:

```
role feature-group name Security-features
  feature radius
  feature tacacs
  feature aaa
  feature acl
  feature access-list
```

#### The following example shows how to configure a user account:

```
username user1 password A1s2D4f5 role User-role-A
```

#### The following example shows how to add an OID rule to restrict access to part of the OID subtree:

#### The following example shows how to give write permission to a specified OID subtree:

## **Additional References for User Accounts and RBAC**

This section includes additional information related to implementing user accounts and RBAC.

#### **Related Documents**

Related Topic	Document Title
Cisco NX-OS Licensing	Cisco NX-OS Licensing Guide
VRF configuration	Cisco Nexus 3400-S NX-OS Unicast Routing Configuration Guide

#### **Standards**

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	

**Additional References for User Accounts and RBAC**