

System Settings

This chapter provides instructions for configuring the following StarOS options.

It is assumed that the procedures to initially configure the system as described in *Getting Started* have been completed.

Important For VPC-DI deployments, you must log into the active Control Function (CF) VM to complete the procedures in this chapter.

Important The commands used in the configuration examples in this section are the most likely-used commands and/or keyword options. In many cases, other optional commands and/or keyword options are available. Refer to the *Command Line Interface Reference* for complete information.

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Verifying and Saving Your Interface and Port Configuration

Verify that your interface configuration settings are correct by entering the following StarOS CLI command:

```
show ip interface
```

The output from this command should be similar to that shown below. In this example an interface named *mangement1* was configured in the local context.

```
Intf Name:       LOCAL1
Intf Type:       Broadcast
Description:     management1
VRF:             None
IP State:        UP (Bound to 1/1 untagged, ifIndex 16842753)
IP Address:      192.168.100.3        Subnet Mask:     255.255.255.0
Bcast Address:   192.168.100.255      MTU:             1500
Resoln Type:     ARP                  ARP timeout:     60 secs
L3 monitor LC-port switchover: Disabled
Number of Secondary Addresses: 0
```

Verify that the port configuration settings are correct by entering the following command:

show configuration port *slot/port*

For VPC-DI, the *slot* corresponds to a CF or SF VM. The hypervisor assigns a unique slot number to each VM during initial configuration of the VPC-DI instance. Slots 1 and 2 are assigned to the CF VMs slot numbers 3 through 32 are assigned to SF VMs. Each SF supports four vNICs numbered 1 through 12 with corresponding virtual ethernet ports numbered 10 through 21. SF port number 10 must be configured.

This previous command produces an output similar to the one shown below. It displays the configuration of port 1 in slot 1 (active CF).

```
config
  port ethernet 1/1
    no shutdown
    bind interface LOCAL1 local
```

Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.

Configuring System Timing

The system is equipped with a clock that supplies the timestamp for statistical counters, accounting records, logging, and event notification. After the initial configuration of the system clock, you can configure the system to communicate with one or more Network Time Protocol (NTP) server(s) to ensure that the clock is always accurate.

All VPC instances must be aligned with the timing standard used by the IaaS datacenter in which the hosts are located.

In addition to configuring the timing source, you must configure the system's time zone.

Setting the System Clock and Time Zone

Use the following command example to configure the system clock and time zone:

clock set *date:time*
configure
  clock timezone *timezone* [**local**]
  end

Notes:

- Enter the date and time in the format YYYY:MM:DD:HH:mm or YYYY:MM:DD:HH:mm:ss.

- Refer to the online Help for the **clock timezone** command for a complete list of supported time zones.
- The optional **local** keyword indicates that the time zone specified is the local timezone.
- Daylight Savings Time is automatically adjusted for time zones supporting it.

Save your configuration as described in the *Verifying and Saving Your Configuration* chapter.

Verifying and Saving Your Clock and Time Zone Configuration

Enter the following command to verify that you configured the time and time zone correctly:

```
show clock
```

The output displays the date, time, and time zone that you configured.

Configuring Network Time Protocol Support

This section provides information and instructions for configuring the system to enable the use of the Network Time Protocol (NTP).

Important Configure the system clock and time zone prior to implementing NTP support. This greatly reduces the time period that must be corrected by the NTP server.

Note NTP should also be configured on all commercial off-the-shelf (COTS) servers running VPC VMs. The StarOS NTP configuration should match that of the COTS servers.

Many of the services offered by the StarOS require accurate timekeeping derived through NTP. If the time reference(s) used by StarOS are not accurate, the services may be unreliable. For this reason it should be assumed that normal system operation requires that NTP be configured.

The system uses NTP to synchronize its internal clock to external time sources (typically GPS NTP sources, or other Stratum 2 or 3 servers, switches or routers).

The system should have:

- NTP enabled.
- NTP configured for use in the local context only. Use of other contexts (which can be specified in the enable configurable) will cause issues.
- NTP configured for at least three external NTP servers. With three or more servers, outlyers and broken or misconfigured servers can be detected and excluded. Generally, the more servers the better (within reason).

Important Do not configure any external NTP servers using the **prefer** keyword. The NTP clock selection algorithms already have the built-in ability to pick the best server. Use of **prefer** usually results in a poorer choice than NTP can determine for itself.

Important Do not change the **maxpoll**, **minpoll**, or **version** keyword settings unless instructed to do so by Cisco TAC.

Use the following example to configure the necessary NTP association parameters:

```
configure
   ntp
      enable
      server ip_address1
      server ip_address2
      server ip_address3
      end
```

Notes:

- By default *context_name* is set to *local*. This is the recommended configuration.
- A number of options exist for the **server** command. Refer to the *NTP Configuration Mode Commands* chapter in the *Command Line Interface Reference* for more information.
- Enter the IP address of NTP servers using IPv4 dotted-decimal or IPv6 colon-separated-hexadecimal notation.
- You can configure a maximum of 6 NTP server IP addresses.

Important Configure the system with at least three (preferably four) NTP servers.

Save the configuration as described in the *Verifying and Saving Your Configuration* chapter.

Configuring NTP Servers with Local Sources

NTP can use network peers, local external clocks (such as GPS devices), or a local clock with no external source.

A local clock with no external source is usually a last-resort clock when no better clock is available. It is typically configured on a site's intermediate NTP server so that when a WAN network outage occurs, hosts within the site can continue to synchronize amongst themselves.

You can configure this in ntpd or on many commercially available NTP devices. This local clock should always have a high stratum number (8+) so that under normal conditions (when real sources are available) this local clock will not be used.

Configuring NTP on Tagged Interfaces

Use the following NTP configuration mode commands to enable NTP on tagged interface:

```
configure
   NTP
      [ no ] vlan  vlan_id
      end
```

NOTES:

- **vlan** *vlan_id* : vlan_id is the vlan where the local context interface is bound to. After configuration the NTP daemon starts listening on the tagged interface.
- **no vlan** : Resets the NTP configuration to default and NTP daemon will start listening on the default untagged interface.

Using a Load Balancer

The NTP daemon and protocol assume that each configured server is running NTP. If a NTP client is configured to synchronize to a load balancer that relays and distributes packets to a set of real NTP servers, the load balancer may distribute those packets dynamically and confuse the NTP client. NTP packets are latency and jitter sensitive. Relaying them through a load balancer can confuse the NTP client and is not a supported practice.

Verifying the NTP Configuration

Verify the NTP configuration is correct. Enter the following command at the Exec mode prompt:

```
show ntp associations
```

The output displays information about all NTP servers. See the output below for an example deploying two NTP servers.

```
+----Peer Selection: ( ) - Rejected / No Response
|                    (x) - False Tick
|                    (.) - Excess
|                    (-) - Outlyer
|                    (+) - Candidate
|                    (#) - Selected
|                    (*) - System Peer
|                    (o) - PPS Peer
v
     remote            refid      st t when poll reach   delay   offset  jitter
==============================================================================
*10.81.254.202   .GPS.            1 u  160 1024  377   21.516    0.019   0.009
```

The following table describes the parameters output by the **show ntp associations** command.

Table 1: NTP Parameters

Column Title	Description
remote	List of the current NTP servers. One of these characters precedes each IP address to show the server's current condition: • ( ) Rejected/No response • X False tick • . Excess • - Outlyer • + Candidate • # Selected • * System peer • (o) PPS peer
refid	Last reported NTP reference to which the server is synchronizing.
st	NTP server stratum level.
t	Communication type: broadcast, multicast, etc.
when	Number of seconds since the last contact.
poll	Polling interval between the system and the NTP server.
reach	Octal value of the reachability shift register indicating which responses were received for the previous eight polls to this NTP server.
delay	Round-trip delay (in milliseconds) for messages exchanged between the system and the NTP server.
offset	Number of milliseconds by which the system clock must be adjusted to synchronize it with the NTP server.
jitter	Jitter in milliseconds between the system and the NTP server.

Configuring Software RSS

The Cisco Unified Computing System (USC) NIC supports hardware-based Receive Side Scaling (RSS); however RSS is only supported on IP traffic. For other network protocols, such as MPLS, GTP, L2TP, and GRE, all the traffic is routed into a single queue.

The VPC-DI provides a software RSS capability that distributes MPLS traffic to the available vCPU cores for processing. This increases resource utilization and provides improved throughput.

The software RSS capability can be supplemental to the Cisco UCS NIC hardware RSS support, meaning that it distributes some traffic not supported by the hardware NIC (MPLS traffic only in this release). The

VPC-DI can also provide comprehensive RSS coverage, meaning that it distributes all traffic. This option is applicable when hardware that does not support RSS is used.

Configure the use of RSS with the **iftask sw-rss** command.

```
config
   iftask sw-rss {comprehensive | supplemental}
```

Use the **comprehensive** keyword to configure RSS for all incoming traffic. Use the **supplemental** keyword to configure RSS on protocols not supported by the hardware RSS functionality (MPLS traffic only in this release).

DI-Network RSS Encryption

Feature Summary and Revision History

Summary Data

Applicable Product(s) or Functional Area	All
Applicable Platform(s)	VPC-DI
Feature Default	Disabled - Configuration Required
Related Changes in This Release	Not applicable
Related Documentation	*VPC-DI System Administration Guide*

Revision History



Important Revision history details are not provided for features introduced before releases 21.2 and N5.1.

Revision Details	Release
The default setting for Distributed Instance Network (DI-network) RSS traffiic is now disabled and can be enabled with a new CLI command. In prior releases, this was functionality was automatically enabled and was not configurable.	21.8
First introduced.	Pre 21.2

Feature Changes

Previous Behavior: In Releases prior to 21.8, Receive Side Scaling (RSS) was enabled by default for all traffic on the internal Distributed Instance network (DI-network) for virtualized StarOS instances.

New Behavior: In Release 21.8 and later, RSS is disabled by default and can be enabled via a new CLI.

Command Changes

iftask di-net-encrypt-rss

This new CLI command has been added to control the enablement of RSS on encrypted traffic on the DI-network.

```
configure
   [no] iftask di-net-encrypt-rss
   end
```

Note The default setting is disabled.

Configuring SF Boot Configuration Pause

Under certain circumstances, within VPC-DI deployments, the CF applies the boot configuration before all SFs have completed their boot process.

The following Configuration Mode command, **wait cards active**, pauses configuration until all specified cards are operational or the timeout period expires (whichever criteria is met first). The pause occurs immediately following local management context creation and ntp/snmp configuration.

This command corrects a scenario where SFs come online late following chassis load or reload and the configuration pertaining to those SFs is not applied (and thereby lost).

```
configure
   [ no ] wait cards active { all | number } [ standby number ] timeout seconds

   end
```

Notes:

- **all**: Pause until all active mode cards attain operational status.
- *number* : Pause until the specified number of active mode cards attain operational status.*number* is 0 through the number of active mode cards.
- **standby** *number* : (Optional) Also wait for the specified number of non-active mode cards to attain operational status.

  number is 0 through the number of service slots not configured for active mode SFs.
- **timeout** *seconds*: Wait from 1 through 3600 *seconds* for the specified card set to attain operational status. The wait is terminated early when or if this condition is satisfied. Otherwise the wait is terminated when the timeout period expires.

The following example command instructs the system to wait up to 120 seconds for all active cards and 1 standby card to become active:

wait cards active all standby 1 timeout 120

Enabling CLI Timestamping

To display a timestamp (date and time) for every command that is executed on the CLI, enter the following command at the root prompt for the Exec mode:

```
timestamps
```

The date and time appear immediately after you execute the command.

Save the configuration as described in the *Verifying and Saving Your Configuration* chapter.

Configuring CLI Confirmation Prompts

A number of Exec mode and Global Configuration mode commands prompt users for a confirmation (Are you sure? [Yes|No]:) prior to executing the command.

This section describes configuration settings that:

- Automatically confirm commands for the current CLI session (Exec mode) or for all CLI sessions and users (Global Configuration mode).
- Requires confirmation prompting only for the Exec mode **configure** command and **autoconfirm** command.
- Selectively requires confirmation of Exec mode configuration commands.

Enabling Automatic Confirmation

You can use the **autoconfirm** command to disable confirmation prompting for configuration commands. The **autoconfirm** command is available in the Exec mode and Global Configuration mode. Enabling the autoconfirm feature automatically supplies a "Yes" response to configuration command prompts, including for critical commands such as **reload** and **shutdown**. By default autoconfirm is disabled.

In the Exec mode, autoconfirm applies only to the current interactive CLI session.

In the Global Configuration mode, autoconfirm applies to all CLI sessions for all CLI users:

```
configure
   autoconfirm
   end
```

To disable autoconfirm once it has been enabled, use the **no autoconfirm** command.



Important If commandguard is enabled, autoconfirm will disable commandguard.

Autoconfirm is intended as an "ease-of-use" feature. It presumes that the answer to "Are you sure? [Y/N]" prompts will be "Yes", and skips the prompt. Its use implies that the user is an expert who does not need these "safety-net" prompts.

Requiring Confirmation for autoconfirm and configure Commands

You can require confirmation prompting for the **autoconfirm** (Exec mode and Global Configuration mode) and **configure** (Exec mode) commands via the Global Configuration mode **commandguard** command.



Important If autoconfirm is enabled, commandguard will not take effect until autoconfirm is disabled in both Exec and Global Configuration modes.

The following command sequence enables the commandguard feature:

```
configure
   commandguard
   end
```

With commandguard enabled the confirmation prompt appears as shown in the example below:

```
[local]host_name# configure
Are you sure? [Yes|No]: yes
[local]host_name(config)#
```

To disable commandguard once it has been enabled, use the **no commandguard** command.

The status of **commandguard** is output in **show configuration** commands.

Requiring Confirmation for Specific Exec Mode Commands

A keyword for the **commandguard** command allows you to apply mandatory prompting for specified categories of Exec mode configuration commands, even when autoconfirm is enabled.

The command syntax is as follows:

```
configure
   commandguard exec-command exec_mode_category
   end
```

Notes:

- **exec-command** *exec_mode_category* specifies one of the following categories of Exec mode configuration commands.
  - card
  - clear
  - copy
  - debug
  - delete
  - filesystem
  - hd
  - reload
  - rename
  - shutdown
  - task
  - upgrade

- You can enter multiple **commandguard exec-command** *exec_mode_category* commands.
- All Exec mode commands beginning with the specified category word will prompt for confirmation, regardless if autoconfirm is enabled.
- You can turn off confirmation prompting for a specific category using **no commandguard exec-command** *exec_mode_category*.
- If autoconfirm is overridden by **commandguard exec-command** for an Exec mode command, StarOS displays an informational message indicating why autoconfirm is being overridden when you attempt to execute the command.
- Users may selectively override confirmation prompting for any Exec mode configuration command that supports the **-noconfirm** keyword.

For example, with **commandguard exec-command card** enabled, the confirmation prompt appears as shown below:

```
[local]host_name# card busy-out 1
Info: commandguard prevents autoconfirm of this command
Are you sure? [Yes|No]: yes
[local]host_name#
```

Configuring System Administrative Users

Getting Started describes how to configure a context-level security administrator for the system.

This section provides instructions for configuring additional administrative users having the following privileges:

- **Security Administrators**: have read-write privileges and can execute all CLI commands, including those available to Administrators, Operators, and Inspectors
- **Administrators**: have read-write privileges and can execute any command in the CLI except for a few security-related commands that can only be configured by Security Administrators. Administrators can configure or modify system settings and execute all system commands, including those available to the Operators and Inspectors.
- **Operators**: have read-only privileges to a larger subset of the Exec Mode commands. They can execute all commands that are part of the inspector mode, plus some system monitoring, statistic, and fault management functions. Operators do not have the ability to enter the Config Mode.
- **Inspectors**: are limited to a few read-only Exec Mode commands. The bulk of these are **show** commands for viewing a variety of statistics and conditions. An Inspector cannot execute **show configuration** commands and does not have the privilege to enter the Config Mode.

Configuration instructions are categorized according to the type of administrative user: context-level or local-user.



Important For information on the differences between these user privileges and types, refer to *Getting Started*.

User Name Character Restrictions

User names can only contain alphanumeric characters (a-z, A-Z, 0-9), hyphen, underscore, and period. The hyphen character cannot be the first character. This applies to AAA user names as well as local user names.

If you attempt to create a user name that does not adhere to these standards, you will receive the following message: "Invalid character; legal characters are "0123456789.-_abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ".

Configuring Context-level Administrative Users

This user type is configured at the context-level and relies on the AAA subsystems for validating user names and passwords during login. This is true for both administrative user accounts configured locally through a configuration file or on an external RADIUS or TACACS+ server. Passwords for these user types are assigned once and are accessible in the configuration file.

This section contains information and instructions for configuring context-level administrative user types.

It is possible to configure the maximum number of simulations CLI sessions on a per account or per authentication method basis. It will protect certain accounts that may have the ability to impact security configurations and attributes or could adversely affect the services, stability and performance of the system. The maximum number of simultaneous CLI sessions is configurable when attempting a new Local-User login and a new AAA context-based login. If the maximum number of sessions is set to 0, then the user is authenticated regardless of the login type. When the CLI task starts, a check is complete to identify the count. In this case, the CLI determines that the sessions for that user is 1 which is greater than 0 and it will display an error message in the output, it generate starCLIActiveCount and starCLIMaxCount SNMP MIB Objects and starGlobalCLISessionsLimit and starUserCLISessionsLimit SNMP MIB Alarms.

The **max-sessions** keyword for the **local-user username** *Global Configuration Mode* command configures the maximum number of simultaneous sessions available for a local user.

The **max-sessions** *Context Configuration Mode* command allows administrative users to configure the maximum simultaneous sessions allowed for corresponding users.

Refer to the *Command Line Interface Reference* for detailed information about these commands.

Password Change Option in Warning Period

During warning period you can change the password. For example, following is the sample output.

```
When in warning period
1.Warning: Your password is about to expire in 3 days.
         We recommend you to change password.
         Logins are not allowed without acknowleding this.
         Do you want to change it now ? [y/n] (times out in 30 seconds) : n
# <you are logged in>
2.Warning: Your password is about to expire in 3 days.
         We recommend you to change password.
         Logins are not allowed without acknowleding this.
         Do you want to change it now ? [y/n] (times out in 30 seconds) : y
Auto generated password : <Jc42Q8hU>
Do you want to use auto-generated password? [y/n]: n
New password:
Repeat new password:
# <you are logged in>
```

Configuring Context-level Security Administrators

Use the example below to configure additional security administrators:

```
configure
  context local
    administrator user_name { [ encrypted ] [ nopassword ] password password
 }
    end
```

Notes:

- Additional keyword options are available that identify active administrators or place time thresholds on the administrator. Refer to the *Command Line Interface Reference* for more information about the **administrator** command.
- The **nopassword** option allows you to create an administrator without an associated password. Enable this option when using ssh public keys (**authorized key** command in SSH Configuration mode) as a sole means of authentication. When enabled this option prevents someone from using an administrator password to gain access to the user account.

Save the configuration as described in the *Verifying and Saving Your Configuration* chapter.

Configuring Context-level Administrators

Use the example below to configure context-level configuration administrators:

```
configure
  context local
    config-administrator user_name { [ encrypted ] [ nopassword ] password
 password }
    end
```

Notes:

- Additional keyword options are available that identify active administrators or place time thresholds on the administrator. Refer to the *Command Line Interface Reference* for more information about the **config-administrator** command.
- The **nopassword** option allows you to create a config-administrator without an associated password. Enable this option when using ssh public keys (**authorized key** command in SSH Configuration mode) as a sole means of authentication. When enabled this option prevents someone from using a config-administrator password to gain access to the user account.

Save the configuration as described in the *Verifying and Saving Your Configuration* chapter.

Configuring Context-level Operators

Use the example below to configure context-level operators:

```
configure
  context local
    operator user_name { [ encrypted ] [ nopassword ] password password }
    end
```

Notes:

- Additional keyword options are available that identify active administrators or place time thresholds on the administrator. Refer to the *Command Line Interface Reference* for more information about the **operator** command.
- The **nopassword** option allows you to create an operator without an associated password. Enable this option when using ssh public keys (**authorized key** command in SSH Configuration mode) as a sole means of authentication. When enabled this option prevents someone from using an operator password to gain access to the user account.

Save the configuration as described in the *Verifying and Saving Your Configuration* chapter.

Configuring Context-level Inspectors

Use the example below to configure context-level inspectors:

```
configure
  context local
    inspector user_name { [ encrypted ] [ nopassword ] password password }
    end
```

Notes:

- Additional keyword options are available that identify active administrators or place time thresholds on the administrator. Refer to the *Command Line Interface Reference* for more information about the **inspector** command.
- The **nopassword** option allows you to create an inspector without an associated password. Enable this option when using ssh public keys (**authorized key** command in SSH Configuration mode) as a sole means of authentication. When enabled this option prevents someone from using an inspector password to gain access to the user account.

Save the configuration as described in the *Verifying and Saving Your Configuration* chapter.

Segregating System and LI Configurations

Lawful Intercept (LI) configuration includes sensitive information. By default in a Normal build, an administrator without li-administration privilege can view the LI configuration commands. However, display of the LI configuration commands can be restricted or segregated from the rest of the system configuration.

The Global Configuration mode **require segregated li-configuration** command permanently segregates display of System and Lawful Intercept CLI. The CLI commands with Lawful-Intercept keyword are encrypted and can only be viewed by an administrator with li-administration privilege.



Important In a Trusted build, LI segregation is turned on and cannot be disabled. The **require segregated li-configuration** command is invisible.

Segregating LI configuration from system configuration has the following impacts on StarOS:

- Only administrators with li-administration privilege can see Lawful Intercept CLI commands in the output of the **show configuration** command.
- Executing the **save configuration** command will automatically encrypt Lawful Intercept CLI configuration commands.

- When loading a saved configuration file via CLI command (for example, **configure** <*url*>), encrypted Lawful Intercept CLI commands will be decrypted and executed only for an administrator with LI privilege. For an administrator without LI privilege, encrypted Lawful Intercept CLI commands will not be decrypted and executed.
- During a system boot wherein the boot config is loaded, encrypted Lawful Intercept configuration will be decrypted and loaded silently, in other words Lawful Intercept CLI configuration will not be visible on the console port.
- The Exec mode **configure** command now supports a keyword that allows an LI administrator to load only encrypted Lawful Intercept configuration from a saved configuration file (for example, **configure encrypted** <*url*>). The **encrypted** keyword can only be executed by an LI Administrator.
- If you are running a system with encrypted Lawful Intercept configuration (segregated LI), the output of the **show boot initial-config** command contains a line indicating whether it needed to run the second pass or not during the initial boot. This line displays "encrypted li" if the encrypted Lawful Intercept configuration was processed. If the line reads "encrypted li errors" then the second pass was not successful, or gave some output which was not expected or informational in nature.
- A user with li-administration privileges can view the boot config output for the encrypted Lawful Intercept configuration with the **show logs encrypted-li** command.

For a detailed description of the Global Configuration mode **require segregated li-configuration** and associated commands, see the *Lawful Intercept CLI Commands* appendix in the *Lawful Intercept Configuration Guide*.

Note The *Lawful Intercept Configuration Guide* is not available on www.cisco.com. Contact your Cisco account representative to obtain a copy of this guide.

In Release 21.4 and higher (Trusted builds only):

- Users can only access the system through their respective context interface.
- If the user attempts to log in to their respective context through a different context interface, that user will be rejected.
- Irrespective of whether the users are configured in any context with 'authorized-keys' or 'allowusers', with this feature these users will be rejected if they attempt to log in via any other context interface other than their own context interface.
- Users configured in any non-local context are required to specify which context they are trying to log in to. For example:

  ssh username@ctx_name@ctx_ip_addrs

Verifying Context-level Administrative User Configuration

Verify that the configuration was successful by entering the following command:

```
show configuration context local
```

This command displays all of the configuration parameters you modified within the Local context during this session. The following displays sample output for this command. In this example, a security administrator named *testadmin* was configured.

```
config
  context local
    interface mgmt1
      ip address 192.168.1.10 255.255.255.0
    #exit
    subscriber default
    #exit
    administrator testadmin encrypted password fd01268373c5da85
    inspector testinspector encrypted password 148661a0bb12cd59
exit
  port ethernet 5/1
    bind interface mgmt1 local
  #exit
```

Configuring Local-User Administrative Users

The local user type supports ANSI T1.276-2003 password security protection. Local-user account information, such as passwords, password history, and lockout states, is maintained in /flash. This information is saved immediately in a separate local user database subject to AAA based authentication and is not used by the rest of the system. As such, configured local-user accounts are not visible with the rest of the system configuration.



Important The local user database is disabled. The Global Configuration mode **local-user** commands, and Exec mode **show local-user** and **update local-user** commands are unavailable. For additional information on Trusted builds, see the *System Operation and Configuration* chapter.

Use the example below to configure local-user administrative users:

```
configure
   local-user username name
   end
```

Notes:

- Additional keyword options are available identify active administrators or place time thresholds on the administrator. Refer to the *Command Line Interface Reference* for more information about the **local-user username** command.

For additional information on the local-user database, see Updating and Downgrading the local-user Database, on page 17.

Verifying Local-User Configuration

Verify that the configuration was successful by entering the following command:

```
show local-user verbose
```

This command displays information on configured local-user administrative users. A sample output for this command appears below. In this example, a local-user named *SAUser* was configured.

```
Username:               SAUser
  Auth Level:           secadmin
  Last Login:           Never
  Login Failures:       0
  Password Expired:     Yes
  Locked:               No
  Suspended:            No
```

```
Lockout on Pw Aging:   Yes
Lockout on Login Fail: Yes
```

Updating Local-User Database

Update the local-user (administrative) configuration by running the following Exec mode command. This command should be run immediately after creating, removing or editing administrative users.

```
update local-user database
```

Updating and Downgrading the local-user Database

PBKDF2 (Password Based Key Derivation Function - Version 2) is used to derive a key of given length, based on entered data, salt and number of iterations. Local-user account passwords are hashed using the PBKDF2 method with a randomly generated salt coupled with a large number of iterations to make password storage more secure.

When upgrading to release 20.0, existing user passwords in the local-user database are not automatically upgraded from MD5 to PBKDF2 hashing (only hashed password values are stored). Since hash functions are one-way, it is not possible to derive user passwords from the stored hash values. Thus it is not possible to convert existing hashed passwords to strongly hashed passwords automatically.

To update the database, a Security Administrator must run the Exec mode **update local-user database** CLI command. When this command is executed, StarOS reads the database from the /flash directory, reconstructs the database in the new format, and writes it back to the disk.

To reactivate suspended users a Security Administrator can:

- Set temporary passwords for suspended users, using the Exec mode **password change local-user** *username* command.
- Reset the suspend flag for users, using the Configuration mode **no suspend local-user** *username* command.

Restricting User Access to a Specified Root Directory

By default an admin user who has FTP/SFTP access can access and modify any files under the /mnt/user/ directory. Access is granted on an "all-or-nothing" basis to the following directories: /flash, /cdrom, /hd-raid, /records, /usb1 and /usb2.

An administrator or configuration administrator can create a list of SFTP subsystems with a file directory and access privilege. When a local user is created, the administrator assigns an SFTP subsystem. If the user's authorization level is not security admin or admin, the user can only access the subsystem with read-only privilege. This directory is used as the user's root directory. The information is set as environmental variables passed to the openssh sftp-server.

You must create the SFTP root directory before associating it with local users, administrators and config administrators. You can create multiple SFTP directories; each directory can be assigned to one or more users.

Configuring an SFTP root Directory

The **subsystem sftp** command allows the assignment of an SFTP root directory and associated access privilege level.

```
configure
   context local
```

```
    server sshd
       subsystem sftp  [ name sftp_name root-dir pathname mode { read-only
| readwrite } ]
```

Notes:

- *sftp_name* is an alphanumeric string that uniquely identifies this subsystem.
- *pathname* specifies the root directory to which SFTP files can be transferred. Options include:
  - /hd-raid/records/cdr
  - /flash

Associating an SFTP root Directory with a Local User

The **local-user username** command allows an administrator to associate an SFTP root directory with a specified username.

```
configure
  local-user username user_name authorization-level level ftp sftp-server
sftp_name password password
  exit
```

Associating an SFTP root Directory with an Administrator

The **administrator** command allows an administrator to associate an SFTP root directory for a specified administrator.

```
configure
   context local
     administrator user_name password password ftp sftp-server sftp_name
     exit
```

Associating an SFTP root Directory with a Config Administrator

The config-administrator command allows an administrator to associate an SFTP root directory with a specified configuration administrator.

```
configure
   context local
    config-administrator user_name password password ftp sftp-server sftp_name
     exit
```

Configuring TACACS+ for System Administrative Users

This section describes TACACS+ (Terminal Access Controller Access Control System+) AAA (Authentication Authorization and Accounting) service functionality and configuration on the VPC-DI.

Operation

TACACS+ is a secure, encrypted protocol. By remotely accessing TACACS+ servers that are provisioned with the administrative user account database, the VPC-DI system can provide TACACS+ AAA services for

system administrative users. TACACS+ is an enhanced version of the TACACS protocol that uses TCP instead of UDP.

The system serves as the TACACS+ Network Access Server (NAS). As the NAS the system requests TACACS+ AAA services on behalf of authorized system administrative users. For the authentication to succeed, the TACACS+ server must be in the same local context and network accessed by the system.

The system supports TACACS+ multiple-connection mode. In multiple-connection mode, a separate and private TCP connection to the TACACS+ server is opened and maintained for each session. When the TACACS+ session ends, the connection to the server is terminated.

TACACS+ is a system-wide function on the VPC-DI. TACACS+ AAA service configuration is performed in TACACS Configuration Mode. Enabling the TACACS+ function is performed in the Global Configuration Mode. The system supports the configuration of up to three TACACS+ servers.

Once configured and enabled on the system, TACACS+ authentication is attempted first. By default, if TACACS+ authentication fails, the system then attempts to authenticate the user using non-TACACS+ AAA services, such as RADIUS.

It is possible to configure the maximum number of simulations CLI sessions on a per account or per authentication method basis. It will protect certain accounts that may have the ability to impact security configurations and attributes or could adversely affect the services, stability and performance of the system. The maximum number of simultaneous CLI sessions is configurable when attempting a new TACACS+ user login. The recommendation is to use the max-sessions feature is through the TACACS+ server attribute option **maxsess**. The second way is though the StarOS CLI configuration mode TACACS+ mode using the **maxsess** keyword in the **user-id** command. If the maximum number of sessions is set to 0, then the user is authenticated regardless of the login type. When the CLI task starts, a check is complete to identify the count. In this case, the CLI determines that the sessions for that user is 1 which is greater than 0 and it will display an error message in the output, it generate starCLIActiveCount and starCLIMaxCount SNMP MIB Objects and starGlobalCLISessionsLimit and starUserCLISessionsLimit SNMP MIB Alarms.

The **max-sessions** *TACACS+ Configuration Mode command* configures the maximum number of sessions available for TACACS+. Also the **default** option for the **user-id** *TACACS+ Configuration Mode command* configures the default attributes for a specific TACACS+ user identifier. Refer to the *Command Line Interface Reference* for detailed information about these commands.



Important The user can define the maximum number of simulations CLI sessions available in both the StarOS and TACACS+ server configuration. However, this option is extremely discouraged.



Important TACACS+ accounting (CLI event logging) will not be generated for Lawful Intercept users with privilege level set to 15 and 13.

User Account Requirements

Before configuring TACACS+ AAA services, note the following TACACS+ server and StarOS user account provisioning requirements.

TACACS+ User Account Requirements

The TACACS+ server must be provisioned with the following TACACS+ user account information:

- A list of known administrative users.
- The plain-text or encrypted password for each user.
- The name of the group to which each user belongs.
- A list of user groups.
- TACACS+ privilege levels and commands that are allowed/denied for each group.

Important TACACS+ privilege levels are stored as Attribute Value Pairs (AVPs) in the network's TACACS+ server database. Users are restricted to the set of commands associated with their privilege level. A mapping of TACACS+ privilege levels to StarOS CLI administrative roles and responsibilities is provided in the table below.

To display the default mapping of TACACS+ privilege levels to CLI administrative roles, run the Exec mode **show tacacs priv-lvl** command. The default mapping varies based on the StarOS release and build type.

Table 2: Default Mapping of TACACS+ Privilege Levels to CLI Administrative Roles

TACACS+ Privilege Level	CLI Administrative Access Privileges					
	CLI	FTP (pre r19.3)	FTP (r19.3+)	ECS/EMS	Lawful Intercept	CLI
0	Yes	No	No	No	No	Insp
1	Yes	No	No	Yes	No	Insp
2	No	Yes	No	No	No	Insp
3	Yes	Yes	No	No	No	Insp
4	Yes	Yes	No	Yes	No	Insp
5	Yes	No	No	No	No	Ope
6	Yes	No	No	Yes	No	Ope
7	No	Yes	No	No	No	Ope
8	Yes	Yes	No	No	No	Ope
9	Yes	Yes	No	Yes	No	Ope
10	Yes	No	No	No	No	Adr
11	Yes	No	No	Yes	No	Adr
12	No	Yes	Yes	No	No	Adr

TACACS+ Privilege Level	CLI Administrative Access Privileges				
	CLI	FTP (pre r19.3)	FTP (r19.3+)	ECS/EMS	Lawful Intercept
13	Yes	Yes	Yes	No	Yes
14	Yes	Yes	Yes	Yes	No
15	Yes	Yes	Yes	Yes	Yes

TACACS+ priv-levels can be reconfigured from their default StarOS authorization values via the TACACS+ Configuration mode **priv-lvl** and **user-id** commands. For additional information, see the *TACACS+ Configuration Mode Commands* chapter of the *Command Line Interface Reference*.

Important FTP is not supported.

StarOS User Account Requirements

TACACS+ users who are allowed administrative access to the system must have the following user account information defined in StarOS:

- username
- password
- administrative role and privileges

Important For instructions on defining users and administrative privileges on the system, refer to *Configuring System Administrative Users*.

Configuring TACACS+ AAA Services

This section provides an example of how to configure TACACS+ AAA services for administrative users on the system.

Caution When configuring TACACS+ AAA services for the first time, the administrative user must use non-TACACS+ services to log into the StarOS. Failure to do so will result in the TACACS+ user being denied access to the system.

Log in to the system using non-TACACS+ services.

Use the example below to configure TACACS+ AAA services on the system:

```
configure
   tacacs mode
```

```
server priority priority_number ip-address tacacs+srvr_ip_address
end
```

Note:

- **server priority** *priority_number*: Must be an integer from 1 through 4, that specifies the order in which this TACACS+ server will be tried for TACACS+ authentication. 1 is the highest priority, and 4 is the lowest. The priority number corresponds to a configured TACACS+ server.
- **ip-address**: Must be the IPv4 address of a valid TACACS+ server that will be used for authenticating administrative users accessing this system via TACACS+ AAA services.
- By default, the TACACS+ configuration will provide authentication, authorization, and accounting services.

Enable TACACS+ on the StarOS:

```
configure
   aaa tacacs+
   end
```

For additional information, see Disable TACACS+ Authentication for Console, on page 25.

Save the configuration as described in the *Verifying and Saving Your Configuration* chapter.

Important For complete information on all TACACS+ Configuration Mode commands and options, refer to the *TACACS Configuration Mode Commands* chapter in the *Command Line Reference*.

Configuring TACACS+ for Non-local VPN Authentication

By default TACACS+ authentication is associated with login to the local context. TACACS+ authentication can also be configured for non-local context VPN logins. TACACS+ must configured and enabled with the option described below.

A **stop** keyword option is available for the TACACS+ Configuration mode **on-unknown-user** command. If TACACS+ is enabled with the command-keyword option, the VPN context name into which the user is attempting a login must match the VPN name specified in the username string. If the context name does not match, the login fails and exits out.

Without this option the login sequence will attempt to authenticate in another context via an alternative login method. For example, without the **on-unknown-user stop** configuration, an admin account could log into the local context via the non-local VPN context. However, with the **on-unknown-user stop** configuration, the local context login would not be attempted and the admin account login authentication would fail.

```
configure
   tacacs mode
      on-unkown-user stop &quest;
      end
```

Verifying the TACACS+ Configuration

This section describes how to verify the TACACS+ configuration.

Log out of the system CLI, then log back in using TACACS+ services.

Important Once TACACS+ AAA services are configured and enabled on the StarOS, the system first will try to authenticate the administrative user via TACACS+ AAA services. By default, if TACACS+ authentication fails, the system then continues with authentication using non-TACACS+ AAA services.

At the Exec Mode prompt, enter the following command:

show tacacs [client | priv-lvl | session | summary]

The output of the **show tacacs** commands provides summary information for each active TACACS+ session such as username, login time, login status, current session state and privilege level. Optional filter keywords provide additional information.

An example of this command's output is provided below. In this example, a system administrative user named *asradmin* has successfully logged in to the system via TACACS+ AAA services.

```
active session #1:
   login username               : asradmin
   login tty                    : /dev/pts/1
   time of login                : Fri Oct 22 13:19:11 2011
   login server priority        : 1
   current login status         : pass
   current session state        : user login complete
   current privilege level      : 15
   remote client application    : ssh
   remote client ip address     : 111.11.11.11
   last server reply status     : -1
total TACACS+ sessions          : 1
```

Important For details on all TACACS+ maintenance commands, refer to the *Command Line Interface Reference*.

TACACS+ MFA support for console login

Table 3: Feature History

Feature Name	Release Information	Description
Support for MFA based Authentication for Console Login	2025.02.0	This feature enables the support for TACACS+ MFA using the console port login through Telnet and SSH services. **Commands Introduced:** **[no] console challenge-response-authentication**: This CLI is configured under Context configuration mode to enable the TACACS+ MFA for console port login through SSH or Telnet. **Default Settings:** Disabled-Configuration required to enable

The ASR5500 system supports Multi-Factor Authentication (MFA) based console port login. The MFA-based login is supported using the SSH or Telnet services.

Configuring TACACS+ MFA support for console login

Follow these steps to enable the TACACS+ MFA for console port login through SSH/Telnet:

Procedure

Step 1 Use the command **context** *context_name*

Example:

```
[local]host_name(config)# context local
[local]host_name(config-ctx)#
```

Step 2 Use the command **[no] console challenge-response-authentication** to enable or disable the TACACS+ MFA for console port login through SSH or Telnet.

Example:

```
[local]host_name(config-ctx)# [no] console challenge-response-authentication
```

The command **no** is used for disabling this functionality.

Step 3 Use the command **end** to exit the Context configuration mode using the command.

Example:

```
[local]host_name(config-ctx)# end
[local]host_name(config)#
```

Step 4 Use the command **Show configuration** to verify the configuration.

Example:

```
[local]host_name# Show configuration
config
context local
console challenge-response-authentication
end
```

This task results in enabling the TACACS+ MFA for console port login through SSH/Telnet.

Limitations

These are the known limitations of this feature:

- Currently, there is no way to prevent this feature from enabling in other products or platforms. If this feature is enabled in other products or platforms, it causes undefined behavior.
- TACACS+ server can send up to 511 characters in AUTHEN-REPLY Server message field. If the CLI is enabled, it is displayed to the user . If the Server message length is 512 characters or more, the prompt "**ERROR: Enter any key to proceed**" is displayed to the user and TACACS+ authentication is expected to be failed in later stage.
- The user is allowed to enter decode string or password response of size less than 128 characters.
- If TACACS+ MFA CLI is enabled, the non-local context TACACS+ user login is not supported.

- When the **challenge-response-authentication** is enabled, the user must respond to the prompt within 60 seconds.

IPv6 Address Support for TACACS+ Server

Separating Authentication Methods

You can configure separate authentication methods for accessing the Console port and establishing SSH/telnet sessions (vty lines).

If you configure TACACS+ globally, access to the Console and vty lines are both authenticated using that method.

Since the Console port is a last resort access to StarOS, you can configure local authentication for the Console and employ TACACS+ for the vty lines.



Important This feature extends to AAA (Authentication, Authorization and Accounting) service as well as local users. For example, local-users may have only Console access and AAA (VPN context) users with access only via vty lines.

Separating authentication methods (Console versus vty lines) requires disabling Console access for users based on the type of authentication.

Disable TACACS+ Authentication for Console

A **noconsole** keyword for the Global Configuration mode **aaa tacacs+** command disables TACACS+ authentication on the Console line.

```
configure
  aaa tacacs+ noconsole
  exit
```

By default, TACACS+ server authentication is performed for login from a Console or vty line. With **noconsole** enabled, TACACS+ authentication is bypassed in favor of local database authentication for a console line; on vty lines, TACACS+ remains enabled.



Important When **aaa tacacs+ noconsole** is configured, a local user with valid credentials can log into a Console port even if **on-authen-fail stop** and **on-unknown-user stop** are enabled via the TACACS+ Configuration mode. If the user is not a TACACS+ user, he/she cannot login on a vty line.

Disable AAA-based Authentication for Console

A **noconsole** keyword for the Global Configuration mode **local-user allow-aaa-authentication** command disables AAA-based authentication on the Console line.

```
configure
  local-user allow-aaa-authentication noconsole
  exit
```

Since local-user authentication is always performed before AAA-based authentication and **local-user allow-aaa-authentication noconsole** is enabled, the behavior is the same as if **no local-user allow-aaa-authentication** is configured. There is no impact on vty lines.



Important This command does not apply for a Trusted build because the local-used database is unavailable.

Disable TACACS+ Authentication at the Context Level

When you enable **aaa tacacs+** in the Global Configuration mode, TACACS+ authentication is automatically applied to all contexts (local and non-local). In some network deployments you may wish to disable TACACS+ services for a specific context(s).

You can use the **no aaa tacacs+** Context Configuration command to disable TACACS+ services within a context.

```
configure
  context ctx_name
    no aaa tacacs+
```

Use the **aaa tacacs+** Context Configuration command to enable TACACS+ services within a context where it has been previously disabled.



Important AAA TACACS+ services must be enabled in the Global Configuration mode (all contexts) before you can selectively disable the services at the context level. You cannot selectively enable TACACS+ services at the context level when it has not been enabled globally.

Limit local-user Login on Console/vty Lines

As a security administrator when you create a StarOS user you can specify whether that user can login through the Console or vty line. The **[noconsole | novty]** keywords for the Global Configuration mode **local-user username** command support these options.

```
configure
  local-user username <username> [ noconsole | novty ]
  exit
```

The **noconsole** keyword prevents the user from logging into the Console port. The **novty** keyword prevents the user from logging in via an SSH or telnet session. If neither keyword is specified access to both Console and vty lines is allowed.

Important Use of the **noconsole** or **novty** keywords is only supported on the new local-user database format. If you have not run **update local-user database**, you should do so before enabling these keywords. Otherwise, **noconsole** and **novty** keywords will not be saved in the local-user database. After a system reboot, all users will still be able to access the Console and vty lines. For additional information, see the Updating and Downgrading the local-user Database, on page 17.

Important This command does not apply for a Trusted build because the local-used database is unavailable.

Limit Console Access for AAA-based Users

AAA-based users normally login through on a vty line. However, you may want to limit a few users to accessing just the Console line. If you do not use the local-user database (or you are running a Trusted build), this needs to be done by limiting access to the Console line for other AAA-based users. Enable the **noconsole** keyword for all levels of admin users that will not have access to the Console line.

The **noconsole** keyword is available for the Context Configuration mode commands shown below.

```
configure
  context <ctx_name>
    administrator <username> { encrypted | nopassword | password } noconsole

    config-administrator <username> { encrypted | nopassword | password }
noconsole
    inspector <username> { encrypted | nopassword | password } noconsole
    operator <username> { encrypted | nopassword | password } noconsole
    exit
```

The **noconsole** keyword disables user access to the Console line. By default **noconsole** is not enabled, thus all AAA-based users can access the Console line.

Important The **local-user allow-aaa-authentication noconsole** command takes precedence. In that case, all AAA-based users cannot access the Console line.

Verify Configuration Changes

You can verify changes made related to the separation of authentication methods via the Exec mode **show configuration** command. After saving the configuration changes, run **show configuration |grep noconsole** and **show configuration |grep novty**. The output of these commands will indicate any changes you have made.

Configuring a Chassis Key

A chassis key should be configured for each system. This key is used to decrypt encrypted passwords found in configuration files.

Overview

The chassis key is used to encrypt and decrypt encrypted passwords in the configuration file. If two or more chassis are configured with the same chassis key value, the encrypted passwords can be decrypted by any of the chassis sharing the same chassis key value. As a corollary to this, a given chassis key value will not be able to decrypt passwords that were encrypted with a different chassis key value.

The chassis key is used to generate the chassis ID which is stored in a file and used as the master key for protecting sensitive data (such as passwords and secrets) in configuration files

The chassis ID is an SHA256 hash of the chassis key. The chassis key can be set by users through a CLI command or via the Quick Setup Wizard. If the chassis ID does not exist, a local MAC address is used to generate the chassis ID.

The user must explicitly set the chassis key through the Quick Setup Wizard or CLI command. If it is not set, a default chassis ID using the local MAC address will not be generated. In the absence of a chassis key (and hence the chassis ID), sensitive data will not appear in a saved configuration file. The chassis ID is the SHA256 hash (encoded in base36 format) of the user entered chassis key plus a 32-byte secure random number. This assures that the chassis key and chassis ID have 32-byte entropy for key security.

If a chassis ID is not available encryption and decryption for sensitive data in configuration files will not work.

Configuring a New Chassis Key Value

CLI Commands



Important Only a user with Security Administrator privilege can execute the **chassis key value** and **chassis keycheck** commands.

Use the Exec mode **chassis key value** *key_string* command to enter a new chassis key.

The *key_string* is an alphanumeric string of 1 through 16 characters. The chassis key is stored as a one-way encrypted value, much like a password. For this reason, the chassis key value is never displayed in plain-text form.

The Exec mode **chassis keycheck** *key_string* command generates a one-way encrypted key value based on the entered *key_string*. The generated encrypted key value is compared against the encrypted key value of the previously entered chassis key value. If the encrypted values match, the command succeeds and keycheck passes. If the comparison fails, a message is displayed indicating that the key check has failed. If the default chassis key (MAC address) is currently being used, this key check will always fail since there will be no chassis key value to compare against.

Use the **chassis keycheck** command to verify whether multiple chassis share the same chassis key value.

Important In the absence of an existing chassis ID file the **chassis keycheck** command is hidden.

For additional information, refer to the *Exec Mode Commands* chapter in the *Command Line Interface Reference*.

The chassis ID will be generated from the chassis key using a more secure algorithm. The resulting 44-character chassis ID will be stored in the same file.

In a chassis where the chassis ID file already exists nothing is changed. However, if the chassis ID file is lost in both management cards, all existing configuration files become invalid. Entering a new chassis key that is the same as the original value will not resolve the issue because of the new method used to generate the chassis ID.

Caution After setting a new chassis key, you must save the configuration before initiating a reload. See the *Verifying and Saving Your Configuration* chapter.

Quick Setup Wizard

If the chassis ID file does not exist, the Quick Setup Wizard prompts the user to enter a chassis key. A default chassis ID is not generated if a chassis key is not entered.

To run the Quick Setup Wizard, execute the Exec mode **setup** command.

```
[local]host_name# setup
1. Do you wish to continue with the Quick Setup Wizard[yes/no]: y
2. Enable basic configuration[yes/no]: y
3. Change chassis key value[yes/no]: y
4. New chassis key value: key_string
```

Enabling Automatic Reset of FSC Fabric

By default if an excessive number of discarded fabric egress packets occurred in the switch fabric, a manual reset of the Fabric Storage Card(s) is required for fabric recovery.

You can optionally enable automatic resets of FSCs if an excessive number of discarded fabric egress packets is detected.

A Global Configuration mode **fabric fsc-auto-recover** command enables or disables automatic FSC resets upon detection of an excessive number of discarded fabric egress packets.

The following command sequence enables this feature:

```
configure
   fabric fsc-auto-recovery { disable | enable } [ max-attempts [
number_attempts | unlimited ] ]
   end
```

max-attempts [*number_attempts* **| unlimited]** specifies how many times StarOS will attempt to reset each FSC as an integer from 1 to 99 or unlimited (will not stop until FSC is reset). The default setting is 1.



Important To enable this feature, you must first configure the Fabric Egress Drop Threshold via the Global Configuration mode **fabric egress drop-threshold** command.