Enabling Freeform Configurations on Fabric Switches, Release 12.2.2/12.2.3

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New and Changed Information

The following table provides an overview of the significant changes up to this current release. The table does not provide an exhaustive list of all changes or of the new features up to this release.

Release Version	Feature	Description
There were no major changes from the previous release.		

Enabling Freeform Configurations on Fabric Switches

In Nexus Dashboard Fabric Controller, you can add custom configurations through freeform policies in the following ways:

1. Fabric-wide:
    - On all leaf, border leaf, and border gateway leaf switches in the fabric, at once.
    - On all spine, super spine, border spine, border super spine, border gateway spine and border switches, at once.
2. On a specific switch at the global level.
3. On a specific switch on a per network or a per VRF level.
4. On a specific interface on a switch.

Leaf switches are identified by the roles Leaf, Border, and Border Gateway. The spine switches are identified by the roles Spine, Border Spine, Border Gateway Spine, Super Spine, Border Super Spine, and Border Gateway Super Spine.

You can deploy freeform CLIs when you create a fabric or when a fabric is already created. The following examples are for an existing fabric. However, you can use this as a reference for a new fabric.

Deploying Fabric-Wide Freeform CLIs on Leaf and Spine Switches

1. Choose **Manage > Fabrics**.
2. Select the fabric, and select **Edit Fabric** from the **Actions** drop-down list.

   (If you are creating a fabric for the first time, click **Create Fabric**).
3. Click the **Advanced** tab and update the following fields:

   Leaf Freeform Config - In this field, add configurations for all leaf, border leaf, and border gateway leaf switches in the fabric.

   Spine Freeform Config - In this field, add configurations for all Spine, Border Spine, Border Gateway Spine, Super Spine, Border Super Spine, and Border Gateway Super Spine switches in the fabric.

   

   Copy-paste the intended configuration with the correct indentation, as seen in the running configuration on the Nexus switches. For more information, see Resolving Freeform Config Errors in Switches.
4. Click **Save**. The fabric topology screen comes up.
5. Click **Deploy Config** from the **Actions** drop-down list to save and deploy the configurations.

Configuration Compliance functionality ensures that the intended configuration as expressed by those CLIs are present on the switches and if they are removed or there is a mismatch, then NDFC flags it as a mismatch and indicates that the device is out-of-sync.

Incomplete Configuration Compliance - On some Cisco Nexus 9000 Series switches, in spite of configuring pending switch configurations using the **Deploy Config** option, there could be a mismatch between the intended and switch configuration. To resolve the issue, add a **switch_freeform** policy to the affected switch (as explained in the Deploying Freeform CLIs on a Specific Switch on a Per VRF/Network Basis). For example, consider the following persistent pending configurations:

```
line vty
logout-warning 0
```

After adding the above configurations in a policy and saving the updates, click **Deploy Config** in the topology screen to complete the deployment process.

To bring back the switch in-sync, you can add the above configuration in a **switch_freeform** policy saved and deployed onto the switch.

Deploying Freeform CLIs on a Specific Switch

1. Choose **Manage > Fabrics**.
2. Select the fabric, and select **Edit Fabric** from the **Actions** drop-down list.
3. Click the **Policies** tab.
4. From the **Actions** drop-down list, choose **Add Policy**.

   The **Create Policy** screen comes up.

   

   To provision freeform CLIs on a new fabric, you have to create a fabric, import switches into it, and then deploy freeform CLIs.

5. In the **Priority** field, the priority is set to 500 by default. You can choose a higher priority (by specifying a lower number) for CLIs that need to appear higher up during deployment. For example, a command to enable a feature should appear earlier in the list of commands.
6. In the **Description** field, provide a description for the policy.
7. From the **Template Name** field, select **freeform_policy**.
8. Add or update the CLIs in the **Freeform Config CLI** box.

   Copy-paste the intended configuration with the correct indentation, as seen in the running configuration on the Nexus switches. For more information, see Resolving Freeform Config Errors in Switches.

9. Click **Save**.

   After the policy is saved, it gets added to the intended configurations for that switch.

10. From the **Fabric Overview** page, click the **Switches** tab and choose the required switches.

11. On the **Switches** tab, click the **Actions** drop-down list and choose **Deploy**.

Pointers for freeform_policy Policy Configuration:

- You can create multiple instances of the policy.
- For a vPC switch pair, create consistent **freeform_policy** policies on both the vPC switches.
- When you edit a **freeform_policy** policy and deploy it onto the switch, you can see the changes being made (in the **Side-by-side** tab of the Preview option).

Freeform CLI Configuration Examples

Console Line Configurations

This example involves deploying some fabric-wide freeform configurations (for all leaf, and spine switches), and individual switch configurations.

Fabric-wide session timeout configuration:

```
line console
  exec-timeout 1
```

Console speed configuration on a specific switch:

```
line console
  speed 115200
```

For Cisco Nexus 9804 and Cisco Nexus 9808 switches, you need to create a **switch_freeform** policy for the non-default console speed, as these switches only support a speed of 115200.

IP Prefix List/Route-map Configurations

IP prefix list and route-map configurations are typically configured on border devices. These configurations are global because they can be defined once on a switch and then applied to multiple VRFs as needed. The intent for this configuration can be captured and saved in a **switch_freeform** policy. As mentioned earlier, note that the configuration saved in the policy should match the show run output. This is especially relevant for prefix lists where the NX-OS switch may generate sequence numbers automatically when configured on the CLI. An example snippet is shown below:

```
ip prefix-list prefix-list-name1 seq 5 permit 20.2.0.1/32
ip prefix-list prefix-list-name1 seq 6 permit 20.2.0.2/32
ip prefix-list prefix-list-name2 seq 5 permit 192.168.100.0/24
```

ACL Configurations

Access control list (ACL) configurations are typically configured on specific switches and are not fabric-wide configurations. When you configure ACLs as freeform CLIs on a switch, you should include sequence numbers. Otherwise, there will be a mismatch between the intended and the running configurations.

Following is a configuration example with sequence numbers:

```
ip access-list ACL_VTY
  10 deny tcp 172.29.171.67/32 172.29.171.36/32
  20 permit ip any any
ip access-list vlan65-acl
  10 permit ip 69.1.1.201/32 65.1.1.11/32
  20 deny ip any any

interface Vlan65
  ip access-group vlan65-acl in
line vty
  access-class ACL_VTY in
```

If you have configured ACLs without sequence numbers in a **freeform_policy** policy, update the policy with the sequence numbers as shown in the running configuration of the switch.

After the policy is updated and saved, right-click the device and select the per switch **Deploy Config** option to deploy the configuration.

Prior to NDFC release 12.2.1, when you perform a **Recalculate & Deploy** on a fabric where switches are imported with the **Preserve Config** option enabled (a Brownfield deployment), the IP ACL configuration for a VXLAN fabric is captured in the **switch_freeform** policy, along with the non-matched switch configuration. For the same situation in an Enhanced Classic LAN fabric, where you have a Brownfield import with the **Preserve Config** option enabled, the same configuration information is captured into a smaller subset of individual ACL freeforms.

Beginning with NDFC release 12.2.1, for both VXLAN and Enhanced Classic LAN fabrics:

- If the ACL configurations match with the **ip_acl** and **ipv6_acl** nvPairs, then those configurations will be captured in the **ip_acl** and **ipv6_acl** policies.
- If the ACL configurations do not match with the **ip_acl** and **ipv6_acl** nvPairs, then those configurations will be captured in a smaller subset of per ACL freeforms, which means that MAC-based ACLs would continue to be captured into their individual switch freeforms.

Resolving Freeform Config Errors in Switches

Copy and paste the running-config to the freeform config with correct indentation, as seen in the running configuration on the NX-OS switches. The freeform config must match the running config. Otherwise, configuration compliance in Nexus Dashboard Fabric Controller marks the switches as out-of-sync.

Following is an example of the freeform config of a switch.

```
feature bash-shell
feature telemetry

clock timezone CET 1 0
# Daylight saving time is observed in
Metropolitan France from the last Sunday in March (02:00 CET) to the last Sunday in October
(03:00 CEST) clock summer-time CEST 5 Sunday March 02:00 5 Sunday October 03:00 60
clock protocol ntp

telemetry
  destination-profile
    use-vrf management
```

The highlighted line about the daylight saving time is a comment that is not displayed in the show running config command output. Therefore, configuration compliance marks the switch as out-of-sync because the intent does not match the running configuration.

Next, check the running config in the switch for the clock protocol.

```
spine1# show run all | grep " clock protocol"
clock protocol ntp vdc 1
```

You can see that **vdc 1** is missing from the freeform config.

In this example, let us copy-paste the running config to the freeform config.

Following is the updated freeform config:

```
feature bash-shell
feature telemetry

clock timezone CET 1 0
clock summer-time CEST 5 Sunday March 02:00 5 Sunday October 03:00 60 clock protocol
ntp vdc 1

telemetry
  destination-profile
    use-vrf management
```

After you copy-paste the running config and deploy, the switch will be in-sync. When you click **Recalculate Config**, click the **Pending Config** column. You can view the **Side-by-Side Comparison** for information about the difference between the defined intent and the running config.

Deploying Freeform CLIs on a Specific Switch on a Per VRF/Network Basis

1. Navigate to **Manage > Fabrics**.
2. Select the fabric, then select **Edit Fabric** from the **Actions** drop-down list.
3. Click the **VRFs** tab.
4. From the **Actions** drop-down list, select **Create**.

   The **Create VRF** screen comes up.

5. Select an individual switch.

   The VRF attachment form is displayed, listing the switch that is selected. In the case of a vPC pair, both switches belonging to the pair are displayed.

6. Under the **CLI Freeform** column, select the button labeled **Freeform config**. This option allows a user to specify additional configurations that should be deployed to the switch along with the VRF profile configuration.
7. Add or update the CLIs in the **Free Form Config** CLI box. Copy-paste the intended configuration with the correct indentation, as seen in the running configuration on the Nexus switches. For more information, see Resolving Freeform Config Errors in Switches.
8. Click **Deploy Config**.

   

   The **Freeform config** button will be gray when there is no per VRF per switch config specified. The button will be blue when some config has been saved by the user.

   After the policy is saved, click **Save** on the **VRF Attachment** pop-up to save the intent to deploy the VRF to that switch. Ensure that the checkbox on the left next to the switch is checked.

9. (Optional) Click **Preview** to look at the configuration that will be pushed to the switch.
10. Click **Deploy Config** to push the configuration to the switch.

The same procedure can be used to define a per network per switch configuration.

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