



Bash

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About Bash

In addition to the NX-OS CLI, Cisco Nexus 3600 devices support access to the Bourne-Again SHell (Bash). Bash interprets commands that you enter or commands that are read from a shell script. Using Bash enables access to the underlying Linux system on the device and to manage the system.

Guidelines and Limitations

The Bash shell has the following guidelines and limitations:

- The binaries located in the `/isan` folder are meant to be run in an environment which is setup differently from that of the shell entered from the **run bash** command. It is advisable not to use these binaries from the Bash shell as the behavior within this environment is not predictable.

Accessing Bash

In Cisco NX-OS, Bash is accessible from user accounts that are associated with the Cisco NX-OS dev-ops role or the Cisco NX-OS network-admin role.

The following example shows the authority of the dev-ops role and the network-admin role:

```
switch# show role name dev-ops
```

```
Role: dev-ops
```

```
Description: Predefined system role for devops access. This role
cannot be modified.
Vlan policy: permit (default)
Interface policy: permit (default)
Vrf policy: permit (default)
```

Rule	Perm	Type	Scope	Entity
4	permit	command		conf t ; username *
3	permit	command		bcm module *
2	permit	command		run bash *
1	permit	command		python *

```
switch# show role name network-admin
```

```
Role: network-admin
Description: Predefined network admin role has access to all commands
on the switch
```

Rule	Perm	Type	Scope	Entity
1	permit	read-write		

```
switch#
```

Bash is enabled by running the **feature bash-shell** command.

The **run bash** command loads Bash and begins at the home directory for the user.

The following examples show how to enable the Bash shell feature and how to run Bash.

```
switch# configure terminal
switch(config)# feature bash-shell
```

```
switch# run?
run          Execute/run program
run-script   Run shell scripts
```

```
switch# run bash?
bash        Linux-bash
```

```
switch# run bash
bash-4.2$ whoami
admin
bash-4.2$ pwd
/bootflash/home/admin
bash-4.2$
```



Note You can also execute Bash commands with **run bash** *command*.

For instance, you can run **whoami** using **run bash** *command*:

```
run bash whoami
```

You can also run Bash by configuring the user **shelltype**:

```
username foo shelltype bash
```

This command puts you directly into the Bash shell.

Escalate Privileges to Root

The privileges of an admin user can escalate their privileges for root access.

The following are guidelines for escalating privileges:

- Only an admin user can escalate privileges to root.
- Bash must be enabled before escalating privileges.
- Escalation to root is password protected.

NX-OS network administrator users must escalate to root to pass configuration commands to the NX-OS VSH if:

- The NX-OS user has a shell-type Bash and logs into the switch with a shell-type Bash.
- The NX-OS user logged into the switch in Bash continues to use Bash on the switch.

Run `sudo su 'vsh -c "<configuration commands>"` or `sudo bash -c 'vsh -c "<configuration commands>"`.

The example below demonstrates with network administrator user MyUser with a default shelltype Bash using **sudo** to pass configuration commands to the NX-OS:

```
ssh -l MyUser 1.2.3.4
-bash-4.2$ sudo vsh -c "configure terminal ; interface eth1/2 ; shutdown ; sleep 2 ; show interface eth1/2 brief"
```

```
-----
```

Ethernet Interface	VLAN	Type	Mode	Status	Reason	Speed	Port Ch #
Eth1/2	--	eth	routed	down	Administratively down	auto(D)	--

```
-----
```

The example below demonstrates with network administrator user MyUser with default shelltype Bash entering the NX-OS and then running Bash on the NX-OS:

```
ssh -l MyUser 1.2.3.4
-bash-4.2$ vsh -h
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http://www.gnu.org/licenses/lgpl.html
*****
```

```

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*****
switch# run bash
bash-4.2$ vsh -c "configure terminal ; interface eth1/2 ; shutdown ; sleep 2 ; show interface
eth1/2 brief"

```

```

-----
Ethernet      VLAN      Type Mode      Status Reason                      Speed      Port
Interface                                           Ch #
-----
Eth1/2        --        eth  routed down  Administratively down      auto(D)  --

```

The following example shows how to escalate privileges to root and how to verify the escalation:

```

switch# run bash
bash-4.2$ sudo su root
bash-4.2# whoami
root
bash-4.2# exit
exit

```

Examples of Bash Commands

This section contains examples of Bash commands and output.

Displaying System Statistics

The following example displays system statistics:

```

switch# run bash
bash-4.2$ cat /proc/meminfo
<snip>
MemTotal:      16402560 kB
MemFree:       14098136 kB
Buffers:       11492 kB
Cached:        1287880 kB
SwapCached:    0 kB
Active:        1109448 kB
Inactive:      717036 kB
Active(anon):  817856 kB
Inactive(anon): 702880 kB
Active(file):  291592 kB
Inactive(file): 14156 kB
Unevictable:   0 kB
Mlocked:       0 kB
SwapTotal:     0 kB
SwapFree:      0 kB
Dirty:         32 kB
Writeback:     0 kB
AnonPages:     527088 kB
Mapped:        97832 kB
<\snip>

```

Running Bash from CLI

The following example runs **ps** from Bash using **run bash** command:

```
switch# run bash ps -el
F S   UID   PID  PPID  C  PRI  NI ADDR  SZ  WCHAN  TTY          TIME CMD
4 S   0     1    0  0  80   0 -   528 poll_s ?          00:00:03 init
1 S   0     2    0  0  80   0 -    0 kthrea ?          00:00:00 kthreadd
1 S   0     3    2  0  80   0 -    0 run_ks ?        00:00:56 ksoftirqd/0
1 S   0     6    2  0 -40  - -    0 cpu_st ?        00:00:00 migration/0
1 S   0     7    2  0 -40  - -    0 watchd ?        00:00:00 watchdog/0
1 S   0     8    2  0 -40  - -    0 cpu_st ?        00:00:00 migration/1
1 S   0     9    2  0  80   0 -    0 worker ?        00:00:00 kworker/1:0
1 S   0    10    2  0  80   0 -    0 run_ks ?        00:00:00 ksoftirqd/1
```

Running Python from Bash

The following example shows how to load Python and configure a switch using Python objects:

```
switch# run bash
bash-4.2$ python
Python 2.7.5 (default, Oct 8 2013, 23:59:43)
[GCC 4.7.2] on linux2
Type "help", "copyright", "credits" or "license" for more information.
>>> from cisco import *
>>> from cisco.vrf import *
>>> from cisco.interface import *
>>> vrfobj=VRF('myvrf')
>>> vrfobj.get_name()
'myvrf'
>>> vrfobj.add_interface('Ethernet1/3')
True
>>> intf=Interface('Ethernet1/3')
>>> print intf.config()

!Command: show running-config interface Ethernet1/3
!Time: Mon Nov 4 13:17:56 2013

version 6.1(2)I2(1)

interface Ethernet1/3
  vrf member myvrf

>>>
```

Managing RPMs

Installing RPMs from Bash

Procedure

	Command or Action	Purpose
Step 1	<code>sudo yum installed grep platform</code>	Displays a list of the NX-OS feature RPMs installed on the switch.

	Command or Action	Purpose
Step 2	<code>sudo yum list available</code>	Displays a list of the available RPMs.
Step 3	<code>sudo yum -y install rpm</code>	Installs an available RPM.

Example

The following is an example of installing the **bfd** RPM:

```
bash-4.2$ sudo yum list installed | grep n3600
base-files.n3600                3.0.14-r74.2                installed
bfd.lib32_n3600                1.0.0-r0                    installed
core.lib32_n3600               1.0.0-r0                    installed
eigrp.lib32_n3600              1.0.0-r0                    installed
eth.lib32_n3600                1.0.0-r0                    installed
isis.lib32_n3600               1.0.0-r0                    installed
lACP.lib32_n3600               1.0.0-r0                    installed
linecard.lib32_n3600           1.0.0-r0                    installed
lldp.lib32_n3600               1.0.0-r0                    installed
ntp.lib32_n3600                1.0.0-r0                    installed
nxos-ssh.lib32_n3600           1.0.0-r0                    installed
ospf.lib32_n3600               1.0.0-r0                    installed
perf-cisco.n3600_gdb           3.12-r0                     installed
platform.lib32_n3600           1.0.0-r0                    installed
shadow-securetty.n3600_gdb     4.1.4.3-r1                  installed
snmp.lib32_n3600               1.0.0-r0                    installed
svi.lib32_n3600                1.0.0-r0                    installed
sysvinit-inittab.n3600_gdb     2.88dsf-r14                 installed
tacacs.lib32_n3600             1.0.0-r0                    installed
task-nxos-base.n3600_gdb       1.0-r0                       installed
tor.lib32_n3600                1.0.0-r0                    installed
vtp.lib32_n3600                1.0.0-r0                    installed
bash-4.2$ sudo yum list available
bgp.lib32_n3600                1.0.0-r0
bash-4.2$ sudo yum -y install bfd
```



Note Upon switch reload during boot up, use the **rpm** command instead of **yum** for persistent RPMs. Otherwise, RPMs initially installed using **yum bash** or **install CLI** will show **reponame** or **filename** instead of **installed**.

Upgrading RPMs

Before you begin

There must be a higher version of the RPM in the Yum repository.

Procedure

	Command or Action	Purpose
Step 1	<code>sudo yum -y upgrade rpm</code>	Upgrades an installed RPM.

Example

The following is an example of upgrading the **bfd** RPM:

```
bash-4.2$ sudo yum -y upgrade bfd
```

Downgrading an RPM

Procedure

	Command or Action	Purpose
Step 1	<code>sudo yum -y downgrade rpm</code>	Downgrades the RPM if any of the Yum repositories has a lower version of the RPM.

Example

The following example shows how to downgrade the **bfd** RPM:

```
bash-4.2$ sudo yum -y downgrade bfd
```

Erasing an RPM

**Note**

The SNMP RPM and the NTP RPM are protected and cannot be erased.

You can upgrade or downgrade these RPMs. It requires a system reload for the upgrade or downgrade to take effect.

For the list of protected rpms, see `/etc/yum/protected.d/protected_pkgs.conf`.

Procedure

	Command or Action	Purpose
Step 1	<code>sudo yum -y erase rpm</code>	Erases the RPM.

Example

The following example shows how to erase the **bfd** RPM:

```
bash-4.2$ sudo yum -y erase bfd
```

Persistently Daemonizing an SDK- or ISO-built Third Party Process

Your application should have a startup bash script that gets installed in `/etc/init.d/application_name`. This startup bash script should have the following general format (for more information on this format, see <http://linux.die.net/man/8/chkconfig>).

```
#!/bin/bash
#
# <application_name> Short description of your application
#
# chkconfig: 2345 15 85
# description: Short description of your application
#
### BEGIN INIT INFO
# Provides: <application_name>
# Required-Start: $local_fs $remote_fs $network $named
# Required-Stop: $local_fs $remote_fs $network
# Description: Short description of your application
### END INIT INFO
# See how we were called.
case "$1" in
start)
# Put your startup commands here
# Set RETVAL to 0 for success, non-0 for failure
;;
stop)
# Put your stop commands here
# Set RETVAL to 0 for success, non-0 for failure
;;
status)
# Put your status commands here
# Set RETVAL to 0 for success, non-0 for failure
;;
restart|force-reload|reload)
# Put your restart commands here
# Set RETVAL to 0 for success, non-0 for failure
;;
*)
echo $"Usage: $prog {start|stop|status|restart|force-reload}"
RETVAL=2
esac

exit $RETVAL
```

Persistently Starting Your Application from the Native Bash Shell

Procedure

- Step 1** Install your application startup bash script that you created above into `/etc/init.d/application_name`
- Step 2** Start your application with `/etc/init.d/application_name start`

- Step 3** Enter `chkconfig --add application_name`
- Step 4** Enter `chkconfig --level 3 application_name on`
- Run level 3 is the standard multi-user run level, and the level at which the switch normally runs.
- Step 5** Verify that your application is scheduled to run on level 3 by running `chkconfig --list application_name` and confirm that level 3 is set to on
- Step 6** Verify that your application is listed in `/etc/rc3.d`. You should see something like this, where there is an 'S' followed by a number, followed by your application name (tcollector in this example), and a link to your bash startup script in `../init.d/application_name`

```
bash-4.2# ls -l /etc/rc3.d/tcollector
lrwxrwxrwx 1 root root 20 Sep 25 22:56 /etc/rc3.d/S15tcollector -> ../init.d/tcollector
bash-4.2#
```

An Example Application in the Native Bash Shell

The following example demonstrates an application in the Native Bash Shell:

```
bash-4.2# cat /etc/init.d/hello.sh
#!/bin/bash

PIDFILE=/tmp/hello.pid
OUTPUTFILE=/tmp/hello

echo $$ > $PIDFILE
rm -f $OUTPUTFILE
while true
do
    echo $(date) >> $OUTPUTFILE
    echo 'Hello World' >> $OUTPUTFILE
    sleep 10
done
bash-4.2#
bash-4.2#
bash-4.2# cat /etc/init.d/hello
#!/bin/bash
#
# hello Trivial "hello world" example Third Party App
#
# chkconfig: 2345 15 85
# description: Trivial example Third Party App
#
### BEGIN INIT INFO
# Provides: hello
# Required-Start: $local_fs $remote_fs $network $named
# Required-Stop: $local_fs $remote_fs $network
# Description: Trivial example Third Party App
### END INIT INFO

PIDFILE=/tmp/hello.pid

# See how we were called.
case "$1" in
start)
    /etc/init.d/hello.sh &
```

```

    RETVAL=$?
;;
stop)
    kill -9 `cat $PIDFILE`
    RETVAL=$?
;;
status)
    ps -p `cat $PIDFILE`
    RETVAL=$?
;;
restart|force-reload|reload)
    kill -9 `cat $PIDFILE`
    /etc/init.d/hello.sh &
    RETVAL=$?
;;
*)
echo $"Usage: $prog {start|stop|status|restart|force-reload}"
RETVAL=2
esac

exit $RETVAL
bash-4.2#
bash-4.2# chkconfig --add hello
bash-4.2# chkconfig --level 3 hello on
bash-4.2# chkconfig --list hello
hello          0:off  1:off  2:on   3:on   4:on   5:on   6:off
bash-4.2# ls -al /etc/rc3.d/*hello*
lrwxrwxrwx 1 root root 15 Sep 27 18:00 /etc/rc3.d/S15hello -> ../init.d/hello
bash-4.2#
bash-4.2# reboot

```

After reload

```

bash-4.2# ps -ef | grep hello
root      8790      1  0 18:03 ?        00:00:00 /bin/bash /etc/init.d/hello.sh
root      8973    8775  0 18:04 ttyS0    00:00:00 grep hello
bash-4.2#
bash-4.2# ls -al /tmp/hello*
-rw-rw-rw- 1 root root 205 Sep 27 18:04 /tmp/hello
-rw-rw-rw- 1 root root   5 Sep 27 18:03 /tmp/hello.pid
bash-4.2# cat /tmp/hello.pid
8790
bash-4.2# cat /tmp/hello
Sun Sep 27 18:03:49 UTC 2015
Hello World
Sun Sep 27 18:03:59 UTC 2015
Hello World
Sun Sep 27 18:04:09 UTC 2015
Hello World
Sun Sep 27 18:04:19 UTC 2015
Hello World
Sun Sep 27 18:04:29 UTC 2015
Hello World
Sun Sep 27 18:04:39 UTC 2015
Hello World
bash-4.2#

```