

- Basic Switch Management -

Catalyst Operating Systems

Catalyst switches, depending on the model, support one of two possible operating systems:

- **Catalyst OS (CatOS)**
- **IOS**

The **CatOS** is an antiquated interface based on “set” commands. Retired Catalyst models such as the 40xx and 50xx series supported the CatOS interface.

Modern Catalyst switches support the **Cisco IOS**, enhanced with switching-specific commands. Catalyst models that support the Cisco IOS include:

- 29xx series
- 35xx series
- 37xx series
- 45xx series
- 49xx series
- 65xx series

The Cisco IOS interface on Catalyst switches is nearly identical to that of the router IOS (with the exception of the switching-specific commands). The IOS is covered in *great* detail in other guides on this site, specifically:

- [Router Components](#)
- [Introduction to the Cisco IOS](#)
- [Advanced IOS Functions](#)

Some basic IOS concepts will be reviewed in this guide. For more comprehensive information, please consult the above guides.

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Using Lines to Configure the IOS

Three methods (or *lines*) exist to configure Cisco IOS devices (including Catalyst switches):

- Console ports
- Auxiliary ports
- VTY (telnet) ports

Nearly every modern Cisco router or switch includes a **console port**, sometimes labeled on the device simply as *con*. The console port is generally a RJ-45 connector, and requires a **rollover** cable to connect to. The opposite side of the rollover cable connects to a PC's serial port using a serial **terminal adapter**.

From the PC, software such as HyperTerminal is required to make a connection from the local serial port to the router console port. The following settings are necessary for a successful connection:

- Bits per second - *9600 baud*
- Data bits - *8*
- Parity - *None*
- Stop bits - *1*
- Flow Control - *Hardware*

Some Cisco devices include an **auxiliary port**, in addition to the console port. The auxiliary port can function similarly to a console port, and can be accessed using a rollover cable. Additionally, auxiliary ports support modem commands, thus providing dial-in access to Cisco devices.

Telnet, and now **SSH**, are the most common methods of remote access to routers and switches. The standard edition of the IOS supports up to **5 simultaneous** VTY connections. Enterprise editions of the IOS support up to **255 VTY** connections.

There are two requirements before a Catalyst switch will accept a VTY connection:

- An **IP address** must be configured on the **Management VLAN** (by default, this is **VLAN 1**)
- At least one VTY port must be configured with a **password**

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IOS Modes on Cisco Catalyst Switches

The Cisco IOS is comprised of several modes, each of which contains a set of commands specific to the function of that mode.

By default, the first mode you enter when logging into a Cisco device is **User EXEC mode**. User mode appends a “>” after the device hostname:

```
Switch>
```

No configuration can be changed or viewed from User mode. Only basic status information can be viewed from this mode.

Privileged EXEC mode allows all configuration files, settings, and status information to be viewed. Privileged mode appends a “#” after the device hostname:

```
Switch#
```

To enter Privileged mode, type *enable* from User mode:

```
Switch> enable
Switch#
```

To return back to User mode from Privileged mode, type *disable*:

```
Switch# disable
Switch>
```

Very little configuration can be *changed* directly from Privileged mode. Instead, to actually configure the Cisco device, one must enter **Global Configuration mode**:

```
Switch(config)#
```

To enter Global Configuration mode, type *configure terminal* from Privileged Mode:

```
Switch# configure terminal
Switch(config)#
```

To return back to Privileged mode, type *exit*:

```
Switch(config)# exit
Switch#
```

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IOS Modes on Cisco Catalyst Switches (continued)

As its name implies, Global Configuration mode allows parameters that *globally* affect the device to be changed. Additionally, Global Configuration mode is sectioned into several sub-modes dedicated for specific functions. Among the most common sub-modes are the following:

- **Interface Configuration mode** - Switch(config-if)#
- **Line Configuration mode** - Switch(config-line)#

Recall the difference between *interfaces* and *lines*. **Interfaces** connect routers and switches to each other. In other words, traffic is actually routed or switched across interfaces. Examples of interfaces include Serial, ATM, Ethernet, Fast Ethernet, and Token Ring.

To configure an interface, one must specify both the *type* of interface, and the interface *number* (which always begins at “0”). Thus, to configure the first Ethernet interface on a router:

```
Switch(config)# interface ethernet 0
Switch(config-if)#
```

Lines identify ports that allow us to connect into, and then configure, Cisco devices. Examples would include console ports, auxiliary ports, and VTY (or telnet) ports.

Just like interfaces, to configure a line, one must specify both the *type* of line, and the line *number* (again, always begins at “0”). Thus, to configure the first console line on a switch:

```
Switch(config)# line console 0
Switch(config-line)#
```

Multiple telnet lines can be configured simultaneously. To configure the first sixteen telnet (or VTY) lines on a switch:

```
Switch(config)# line vty 0 15
Switch(config-line)#
```

Notice that Catalyst switches natively support up to 16 VTY connections. A Cisco router running the standard IOS supports up to 5 VTY connections.

Remember that the numbering for both interfaces and lines begins with “0.”

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Enable Passwords

The *enable* password protects a switch's Privileged mode. This password can be set or changed from Global Configuration mode:

```
Switch(config)# enable password MYPASSWORD
Switch(config)# enable secret MYPASSWORD2
```

The *enable password* command sets an unencrypted password intended for legacy systems that do not support encryption. It is no longer widely used.

The *enable secret* command sets an MD5-hashed password, and thus is far more secure. The *enable password* and *enable secret* passwords **cannot be identical**. The switch will not accept identical passwords for these two commands.

Line Passwords and Configuration

Passwords can additionally be configured on switch **lines**, such as telnet (vty), console, and auxiliary ports. To change the password for a console port and all telnet ports:

```
Switch(config)# line console 0          Switch(config)# line vty 0 15
Switch(config-line)# login             Switch(config-line)# login
Switch(config-line)# password cisco1234 Switch(config-line)# password cisco1234

Switch(config-line)# exec-timeout 0 0  Switch(config-line)# exec-timeout 0 0
Switch(config-line)# logging synchronous Switch(config-line)# logging synchronous
```

The *exec-timeout 0 0* command is optional, and disables the automatic timeout of your connection. The two zeroes represent the timeout value in minutes and seconds, respectively. Thus, to set a timeout for 2 minutes and 30 seconds:

```
Switch(config-line)# exec-timeout 2 30
```

The *logging synchronous* command is also optional, and prevents system messages from interrupting your command prompt.

By default, line passwords are stored in clear-text in configuration files. To ensure these passwords are encrypted in all configuration files:

```
Switch(config)# service password-encryption
```

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Catalyst Configuration Files

Like Cisco routers, Catalyst switches employ a **startup-config** file (stored in **NVRAM**) and a **running-config** (stored in **RAM**). The startup-config is the saved configuration used when a router boots, and the running-config is the currently active configuration.

Any configuration change made to an IOS device is made to the running-config. Because the running-config file is stored in RAM, the contents of this file will be lost during a power-cycle. To save the contents of the running-config to the startup-config file:

```
Switch# copy run start
```

Catalyst switches additionally employ the following configuration and diagnostic files, all stored in **Flash memory**:

- **vlan.dat**
- **system_env_vars**
- **crashinfo**

The **vlan.dat** file contains a list all created VLANs, and includes any VTP specific information. The vlan.dat file *does not* contain information on interface-to-VLAN assignments (which is stored in the startup-config).

The **system_env_vars** file contains environmental information specific to the Catalyst switch, including serial/model numbers and MAC addresses.

The **crashinfo** file contains memory-dump information about previous switch failures.

To delete all files in flash:

```
Switch# erase flash:
```

To delete a specific file in flash:

```
Switch# erase flash:FILENAME
```

To delete a specific file in flash:

```
Switch# format flash:
```

To upload an IOS image file from a TFTP server to flash:

```
Switch# copy tftp: flash:FILENAME
```

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Configuring Telnet Access on Catalyst Switches

Recall the two requirements to configure a Catalyst switch for VTY access:

- An **IP address** must be configured on the **Management VLAN** (by default, this is **VLAN 1**)
- At least one VTY port must be configured with a **password**.

Configuring passwords on VTY lines was covered previously:

```
Switch(config)# line vty 0 15
Switch(config-line)# login
Switch(config-line)# password cisco1234
```

To assign an IP address to the Management VLAN:

```
Switch(config)# interface vlan 1
Switch(config-if)# ip address 192.168.123.151 255.255.255.0
Switch(config-if)# no shut
```

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