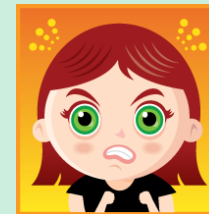


# Life without a path


**-bash: xxxx: command not found**



*Don't get mad, just fix your path!*



## Six steps of the shell

- 1) Prompt *for a command*
- 2) Parse *what the user typed*
-  3) Search *the path for the parsed command*
- 4) Execute *the command found*
- 5) Nap
- 6) Repeat

## The Path

- The path is a ordered set of directories that contain commands.
- The shell will search these directories from left to right.
- If you try to run a command **xxxxxx** that is not on your path the shell will print an error message like:

```
-bash: xxxxxx: command not found
```

- To run a command that is not on your path, you must know where it is and specify it with a complete pathname. E.g. **/usr/bin/who** or **./myscript**
- To show your path use: **echo \$PATH**
- To set your path use these examples:
  - PATH=directory:directory:directory** *(sets entire path to three directories)*
  - PATH=\$PATH:directory** *(appends a directory to current path)*

## View your shell path on Opus-II

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:/home/cis90/simben/..  
/bin:/home/cis90/simben/bin:.
```

*The shell will search the path for commands in this order:*

- 1) /usr/local/bin
- 2) /usr/bin
- 3) /usr/local/sbin
- 4) /usr/sbin
- 5) /home/cis90/simben/./bin
- 6) /home/cis90/simben/bin
- 7) .

*yes, . is a directory too and it is whatever directory you are currently in*

# Activity

*Try each of these commands on Opus-II.*

```
/home/cis90/simben $ echo I love Linux
I love Linux
```

```
/home/cis90/simben $ route
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref    Use Iface
default          nosweat.cis.cab 0.0.0.0         UG    100   0      0 ens32
172.30.5.0       0.0.0.0         255.255.255.0  U    100   0      0 ens32
```

```
/home/cis90/simben $ who
simben90 pts/0      2017-09-08 14:45 (localhost)
rsimms pts/2      2017-09-08 11:52 (c-71-198-222-56.hsd1.ca.comcast.net)
cis90 pts/25     2017-09-06 13:43 (2607:f380:80f:f830::90:119)
```

```
/home/cis90/simben $ gotd
and that's all there is to it.
```

```
/home/cis90/simben $ hi
Welcome to Introduction to UNIX/Linux,
simben90
```

```
/home/cis90/simben $ timecal
Sun Sep  9 17:06:32 PDT 2018

   August 2018   September 2018   October 2018
Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
1 2 3 4         1 2 3 4         1 2 3 4 5 6
5 6 7 8 9 10 11 2 3 4 5 6 7 8   1 2 3 4 5 6
12 13 14 15 16 17 18 9 10 11 12 13 14 15 7 8 9 10 11 12 13
19 20 21 22 23 24 25 16 17 18 19 20 21 22 14 15 16 17 18 19 20
26 27 28 29 30 31 23 24 25 26 27 28 29 21 22 23 24 25 26 27
                          30                          28 29 30 31
```

```
/home/cis90/simben $ scavenge
#####
# S C A V E N G E R H U N T #
#####
snipped
```

*When finished type the output from running the gotd command into the chat window.*

## Activity

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:  
/home/cis90/simben/../../bin:/home/cis90/simben/bin:.
```

```
/home/cis90/simben $ type echo route who scavenge qotd hi timecal  
echo is a shell builtin  
route is /usr/sbin/route  
who is hashed (/usr/bin/who)  
scavenge is /usr/local/bin/scavenge  
qotd is /home/cis90/simben/../../bin/qotd  
hi is /home/cis90/simben/bin/hi  
timecal is ./timecal
```

*What directory contains the **echo** command?*

*Put your answer in the chat window.*

## Activity

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:  
/home/cis90/simben/../../bin:/home/cis90/simben/bin:.
```

```
/home/cis90/simben $ type echo route who scavenge qotd hi timecal  
echo is a shell builtin  
route is /usr/sbin/route  
who is hashed (/usr/bin/who)  
scavenge is /usr/local/bin/scavenge  
qotd is /home/cis90/simben/../../bin/qotd  
hi is /home/cis90/simben/bin/hi  
timecal is ./timecal
```

- 1) What directory contains the **route** command?
- 2) How many directories must the shell search to find this command?

*Put your answers in the chat window.*

## Activity

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:  
/home/cis90/simben/../../bin:/home/cis90/simben/bin:.
```

```
/home/cis90/simben $ type echo route who scavenge qotd hi timecal  
echo is a shell builtin  
route is /usr/sbin/route  
who is hashed (/usr/bin/who)  
scavenge is /usr/local/bin/scavenge  
qotd is /home/cis90/simben/../../bin/qotd  
hi is /home/cis90/simben/bin/hi  
timecal is ./timecal
```

- 1) *What directory contains the **who** command?*
- 2) *How many directories must the shell search to find this command?*

*Put your answers in the chat window.*



## Activity

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:  
/home/cis90/simben/../../bin:/home/cis90/simben/bin:.
```

```
/home/cis90/simben $ type echo route who scavenge qotd hi timecal  
echo is a shell builtin  
route is /usr/sbin/route  
who is hashed (/usr/bin/who)  
scavenge is /usr/local/bin/scavenge  
qotd is /home/cis90/simben/../../bin/qotd  
hi is /home/cis90/simben/bin/hi  
timecal is ./timecal
```

- 1) What directory contains the **scavenge** command?
- 2) How many directories must the shell search to find this command?

*Put your answers in the chat window.*

## Activity

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:  
/home/cis90/simben/../../bin:/home/cis90/simben/bin:.
```

```
/home/cis90/simben $ type echo route who scavenge qotd hi timecal  
echo is a shell builtin  
route is /usr/sbin/route  
who is hashed (/usr/bin/who)  
scavenge is /usr/local/bin/scavenge  
qotd is /home/cis90/simben/../../bin/qotd  
hi is /home/cis90/simben/bin/hi  
timecal is ./timecal
```

- 1) What directory contains the **qotd** command?
- 2) How many directories must the shell search to find this command?

*Put your answers in the chat window.*

## Activity

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:  
/home/cis90/simben/../../bin:/home/cis90/simben/bin:.
```

```
/home/cis90/simben $ type echo route who scavenge qotd hi timecal  
echo is a shell builtin  
route is /usr/sbin/route  
who is hashed (/usr/bin/who)  
scavenge is /usr/local/bin/scavenge  
qotd is /home/cis90/simben/../../bin/qotd  
hi is /home/cis90/simben/bin/hi  
timecal is ./timecal
```

- 1) *What directory contains the **hi** command?*
- 2) *How many directories must the shell search to find this command?*

*Put your answers in the chat window.*

## Activity

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:  
/home/cis90/simben/../../bin:/home/cis90/simben/bin:.
```

```
/home/cis90/simben $ type echo route who scavenge qotd hi timecal  
echo is a shell builtin  
route is /usr/sbin/route  
who is hashed (/usr/bin/who)  
scavenge is /usr/local/bin/scavenge  
qotd is /home/cis90/simben/../../bin/qotd  
hi is /home/cis90/simben/bin/hi  
timecal is ./timecal
```

- 1) What directory contains the **timecal** command?
- 2) How many directories must the shell search to find this command?

*Put your answers in the chat window.*

## Answers

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:  
/home/cis90/simben/../../bin:/home/cis90/simben/bin:.
```

```
/home/cis90/simben $ type echo route who scavenge qotd hi timecal  
echo is a shell builtin  
route is /usr/sbin/route  
who is hashed (/usr/bin/who)  
scavenge is /usr/local/bin/scavenge  
qotd is /home/cis90/simben/../../bin/qotd  
hi is /home/cis90/simben/bin/hi  
timecal is ./timecal
```

- 1) echo - is built into the shell and is not is a directory.
- 2) route - is found in the 4th directory, **/usr/sbin**.
- 3) who - is found in the 2nd directory, **/usr/bin**.
- 4) scavenge - is found in the 1st directory, **/usr/local/bin**.
- 5) qotd - is found in the 5th directory, **/home/cis90/xxxxxx/../../bin**.
- 6) hi - is found in the 6th directory, **/home/cis90/xxxxxx/bin**.
- 7) timecal - is found in the 7th directory, **.** (the directory you are in).

xxxxxx is your username on Opus-II without the ending "90".

## Activity

### Show your path

```
/home/cis90/simben $ echo $PATH  
/usr/local/bin:/usr/bin:/usr/local/sbin:/usr/sbin:/home/cis9  
0/simben/./bin:/home/cis90/simben/bin:.
```

### Now break your path by removing all the directories!

```
/home/cis90/simben $ PATH="" "  
/home/cis90/simben $ echo $PATH
```

Try each of the following commands:

```
echo  
route  
who  
qotd  
hi  
timecal  
scavenge
```

Type the commands that work in the chat window

## No path now!

```
✓ /home/cis90/simben $ PATH=" "  
/home/cis90/simben $ echo I love Linux  
I love Linux  
/home/cis90/simben $ route  
-bash: route: command not found  
/home/cis90/simben $ who  
-bash: who: command not found  
/home/cis90/simben $ qotd  
-bash: qotd: command not found  
/home/cis90/simben $ hi  
-bash: hi: command not found  
/home/cis90/simben $ timecal  
-bash: timecal: command not found  
/home/cis90/simben $ scavenge  
-bash: scavenge: command not found
```

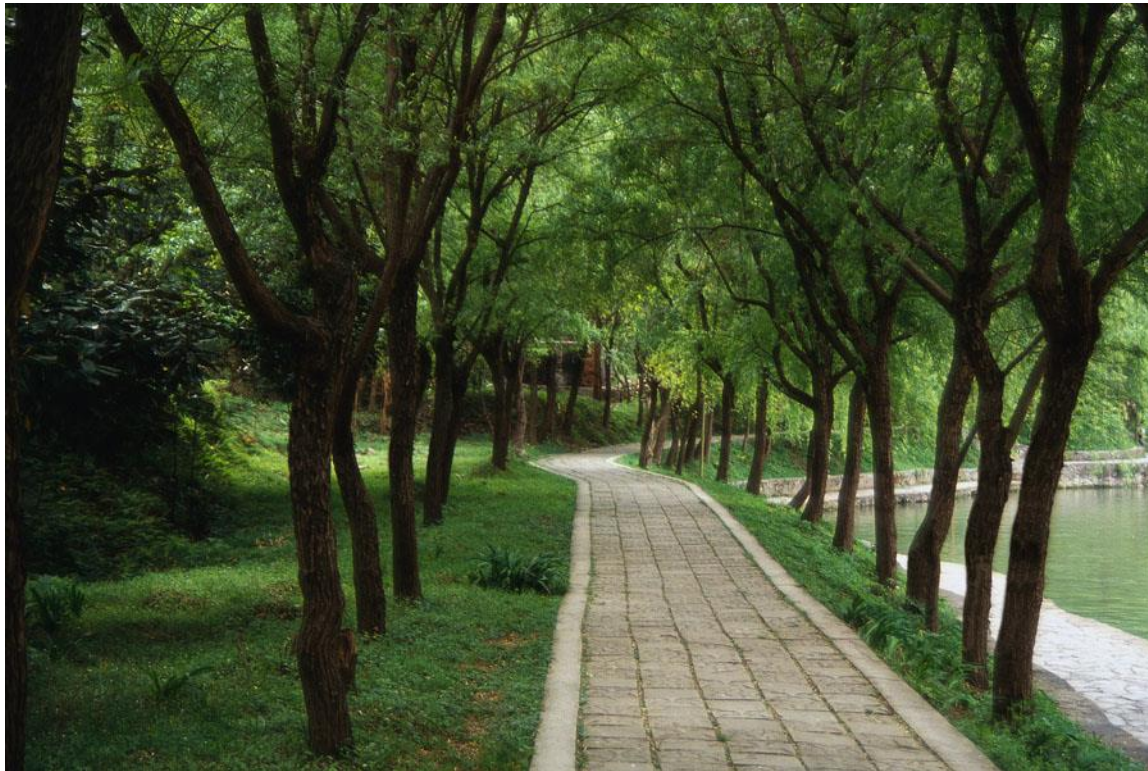
*Only **echo** works because it is built into the shell.*

*The **other** commands are still in their directories but since those directories are no longer on the path the shell does not find them!*



```
/home/cis90/simben $ echo $PATH
```

```
/home/cis90/simben $
```



*There is nothing on the path!*



## Activity

*Add the /usr/bin directory to the path*

```
/home/cis90/simben $ PATH=/usr/bin  
/home/cis90/simben $ echo $PATH  
/usr/bin
```

*Try each of the following commands:*

```
echo  
route  
who  
qotd  
hi  
timecal  
scavenge
```

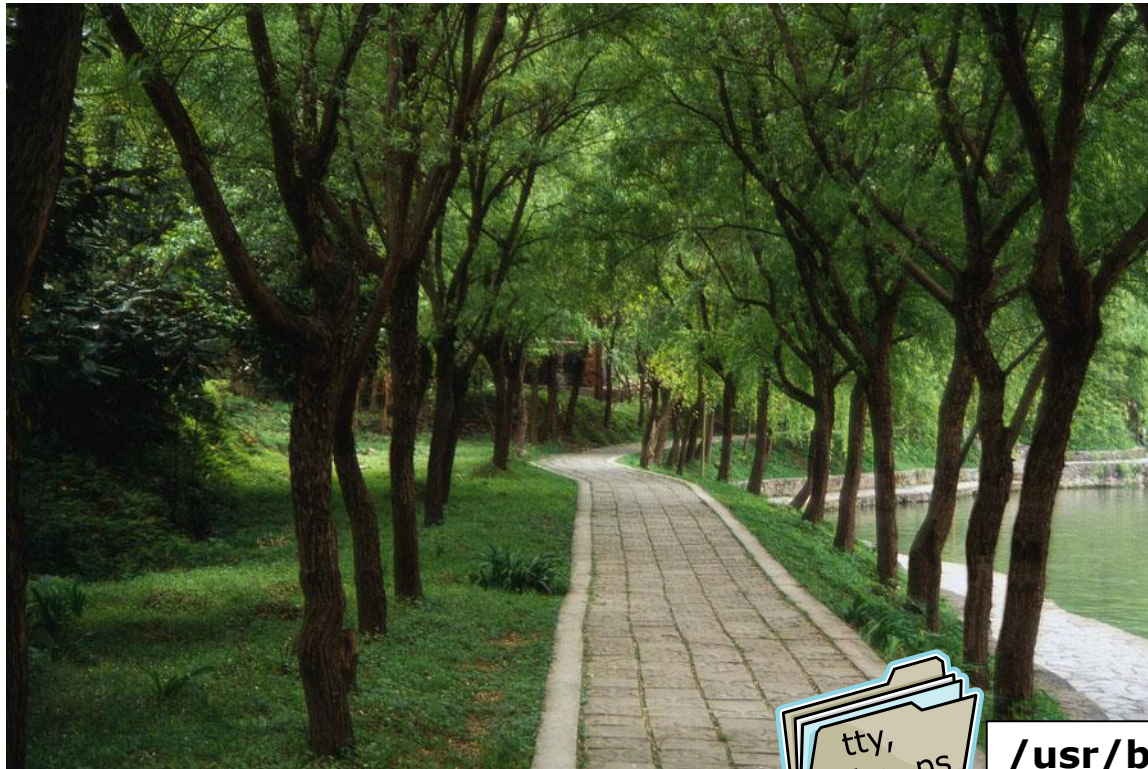
*Type the commands that work in the chat window*

## **`/usr/bin` added to path**

```
✓ /home/cis90/simben $ echo I love Linux
I love Linux
/home/cis90/simben $ route
-bash: route: command not found
✓ /home/cis90/simben $ who
simben90 pts/4          2018-09-09 17:48 (c-73-222-184-235.hsd1.ca.comcast.net)
/home/cis90/simben $ qotd
-bash: qotd: command not found
/home/cis90/simben $ hi
-bash: hi: command not found
/home/cis90/simben $ timecal
-bash: timecal: command not found
/home/cis90/simben $ scavenge
-bash: scavenge: command not found
```

*Some progress! Both echo and who commands work now!*

```
/home/cis90/simben $ echo $PATH  
/usr/bin  
/home/cis90/simben $
```



*Note the path has the /usr/bin directory on it*

## Activity

*Add the /usr/sbin directory to the path*

```
/home/cis90/simben $ PATH=/usr/bin:/usr/sbin  
/home/cis90/simben $ echo $PATH  
/usr/bin:/usr/sbin
```

*Try each of the following commands:*

```
echo  
route  
who  
qotd  
hi  
timecal  
scavenge
```

*Type the commands that work in the chat window*

*Note: alternatively you could have appended /usr/sbin to the current path using:*

```
PATH=$PATH:/usr/sbin
```

## **/usr/bin and /usr/sbin added to path**

✓ /home/cis90/simben \$ **echo I love Linux**

I love Linux

✓ /home/cis90/simben \$ **route**

Kernel IP routing table

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
default	nosweat.cis.cab	0.0.0.0	UG	100	0	0	ens32
172.30.5.0	0.0.0.0	255.255.255.0	U	100	0	0	ens32

✓ /home/cis90/simben \$ **who**

simben90 pts/4 2018-09-09 17:48 (c-73-222-184-235.hsd1.ca.comcast.net)

/home/cis90/simben \$ **qotd**

-bash: qotd: command not found

/home/cis90/simben \$ **hi**

-bash: hi: command not found

/home/cis90/simben \$ **timecal**

-bash: timecal: command not found

/home/cis90/simben \$ **scavenge**

-bash: scavenge: command not found

*More progress! Now echo, route and who commands work!*

```
/home/cis90/simben $ echo $PATH  
/usr/bin:/usr/sbin
```



*Not the path has the /usr/bin and /usr/sbin directories on it*

## Activity

*Add the /usr/local/bin directory to the path*

```
/home/cis90/simben $ PATH=/usr/bin:/usr/sbin:/usr/local/bin  
/home/cis90/simben $ echo $PATH  
/usr/bin:/usr/sbin:/usr/local/bin
```

*Try each of the following commands:*

```
echo  
route  
who  
qotd  
hi  
timecal  
scavenge
```

*Type the commands that work in the chat window*

*Note: alternatively you could have appended /usr/local/bin to the current path using:*  
**PATH=\$PATH:/usr/local/bin**

## **/usr/bin and /usr/sbin added to path**

✓ /home/cis90/simben \$ **echo I love Linux**

I love Linux

✓ /home/cis90/simben \$ **route**

Kernel IP routing table

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
default	nosweat.cis.cab	0.0.0.0	UG	100	0	0	ens32
172.30.5.0	0.0.0.0	255.255.255.0	U	100	0	0	ens32

✓ /home/cis90/simben \$ **who**

simben90 pts/4 2018-09-09 17:48 (c-73-222-184-235.hsdl.ca.comcast.net)

/home/cis90/simben \$ **qotd**

-bash: qotd: command not found

/home/cis90/simben \$ **hi**

-bash: hi: command not found

/home/cis90/simben \$ **timecal**

-bash: timecal: command not found

✓ /home/cis90/simben \$ **scavenge**

```
#####
#   S C A V E N G E R   H U N T   #
#####
snipped
```

*More progress! Now echo, route and who commands work!*



```
/home/cis90/simben $ echo $PATH  
/usr/bin:/usr/sbin:/usr/local/bin
```



*Not the path has the `/usr/bin`, `/usr/sbin` and `/usr/local/bin` directories on it*

## Continue fixing the Path

The **qotd** command is in */home/cis90/bin*

The **hi** command is in */home/cis90/xxxxxx/bin*  
(*xxxxxx is your username without the "90"*)

The **timecal** command is in the directory you are in right now

What **PATH=???????????????** command could be issued so **qotd**, **hi** and **timecal** commands all work?

*Put your best guess in the chat window*

## Activity

### Try this

```
/home/cis90/simben $ echo $PATH  
/usr/bin:/usr/sbin:/usr/local/bin  
/home/cis90/simben $ echo $HOME  
/home/cis90/simben  
/home/cis90/simben $ PATH=$PATH:/home/cis90/bin:$HOME/bin/..
```

*Try each of the following commands:*

```
echo  
route  
who  
qotd  
hi  
timecal  
scavenge
```

*Type the commands that work in the chat window*

## The PATH has been completely fixed!

✓ /home/cis90/simben \$ **echo I love Linux**  
I love Linux

✓ /home/cis90/simben \$ **route**  
Kernel IP routing table

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
default	nosweat.cis.cab	0.0.0.0	UG	100	0	0	ens32
172.30.5.0	0.0.0.0	255.255.255.0	U	100	0	0	ens32

✓ /home/cis90/simben \$ **who**

```
simben90 pts/0      2017-09-08 14:45 (localhost)
rsimms    pts/2      2017-09-08 11:52 (c-71-198-222-56.hsd1.ca.comcast.net)
cis90     pts/25     2017-09-06 13:43 (2607:f380:80f:f830::90:119)
```

*All commands  
are working  
again!*

✓ /home/cis90/simben \$ **qotd**  
and that's all there is to it.

✓ /home/cis90/simben \$ **hi**  
Welcome to Introduction to UNIX/Linux,  
simben90



✓ /home/cis90/simben \$ **timecal**  
Sun Sep 9 17:06:32 PDT 2018

```

August 2018          September 2018          October 2018
Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
      1  2  3  4          1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
5  6  7  8  9 10 11    2  3  4  5  6  7  8          1  2  3  4  5  6
12 13 14 15 16 17 18   9 10 11 12 13 14 15          7  8  9 10 11 12 13
19 20 21 22 23 24 25   16 17 18 19 20 21 22          14 15 16 17 18 19 20
26 27 28 29 30 31     23 24 25 26 27 28 29          21 22 23 24 25 26 27
                          30
                          28 29 30 31
```

✓ /home/cis90/simben \$ **scavenge**

```
#####
#  S C A V E N G E R  H U N T  #
#####
snipped
```



*Need a fresh start -- just log out  
and back in again and your path  
will be back to normal!*