

nixCraft

Linux and Unix tutorials for new and seasoned sysadmin.

Understanding Bash fork() Bomb ~ :(){ :|:& };;

by VIVEK GITE on NOVEMBER 26, 2007 last updated SEPTEMBER 2, 2012

in [BASH SHELL](#), [FREEBSD](#), [LINUX](#), [SECURITY](#), [UNIX](#)

Can you explain the following bash code or bash fork() bomb?
`:(){ :|:& };;`

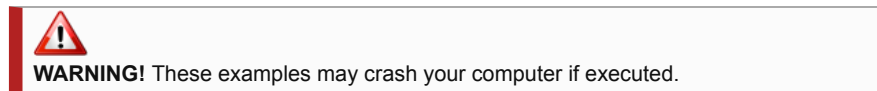


The fork bomb is a form of denial-of-service (DoS) attack against a Linux based system. It makes use of the fork operation.



`:(){ :|:& };;` is nothing but a [bash function](#). This function get executed recursively. It is often used by sys admin to test user process limitations. Linux process limits can be configured via `/etc/security/limits.conf` and PAM.

Once a successful fork bomb has been activated in a system it may not be possible to resume normal operation without rebooting the system as the only solution to a fork bomb is to destroy all instances of it.



WARNING! These examples may crash your computer if executed.

Understanding `:(){ :|:& };;` fork() bomb code

`: ()` – Defined the function called `:`. This function accepts no arguments. The syntax for bash function is as follows:

```
foo(){  
  arg1=$1  
  arg2=$2  
  echo 'Bar...'  
  #do_something on $arg argument  
}
```

`fork()` bomb is defined as follows:

```
:() {  
  :|:&  
};:
```

:|: – Next it will call itself using programming technique called recursion and pipes the output to another call of the function ‘:’. The worst part is function get called two times to bomb your system.

& – Puts the function call in the background so child cannot die at all and start eating system resources.

; – Terminate the function definition

: – Call (run) the function aka set the fork() bomb.

Here is more human readable code:

```
bomb() {  
    bomb | bomb &  
}; bomb
```

Properly configured Linux / UNIX box should not go down when fork() bomb sets off.

Related: [How to: Prevent a fork bomb by limiting user process under Linux.](#)

Update: Check out [comment # 5](#) for more fork bomb examples under Perl, Windows XP and C.

Sysadmin because even developers need heroes!!!



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About the author: Vivek Gite is a seasoned sysadmin and a trainer for the Linux/Unix & shell scripting. Follow him on [Twitter](#). OR [read more like this:](#)

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{ 31 comments... add one }

mastroy November 26, 2007, 9:53 am

i tested this on a fresh install of CentOS and it totally crashed :P

How about a nice “howto” for protecting against this attacks?

REPLY LINK

raj November 27, 2007, 12:01 am

I second the vote for a nice howto.

Cheers

REPLY LINK

queue November 27, 2007, 5:02 pm

Thirded!

How to prevent a “fork bomb”.

REPLY LINK

Bharat November 28, 2007, 1:19 am

Yes How to must be started, for the benefits of the innocent users, as the viruses are spread by entities whose brains are configured differently.

REPLY LINK

I33t November 28, 2007, 9:09 am

Perl exmample:

perl -e "fork while fork" &

Python example:

```
import os
while(1):
    os.fork()
```

Windows XP / Vista bat file example:

```
:bomb
start %0
goto bomb
```

UNIX style for Windows:

```
%0|%0
```

C program example:

```
#include
int main() { while(1) fork(); }
```

Plz note that the fork bomb is a form of denial of service, so don't run on production or unauthorized system.

REPLY LINK

Ofloo November 28, 2007, 11:42 am

An other one is that when you have set a quota for your mailboxes and crontab is generating mail over and over eventually the quota will exceed, after a while the mailq will fill up with 1000's of mail and the system will crash.

REPLY LINK

kunal November 28, 2007, 11:52 am

Hi,

i run it on my testing server and it start consuming my server process.
so one thing is clear from this form bomb that it starting issuing new processes rather than threads.

how we prevent our sites from such fork attacks

Thanks in advance

REPLY LINK

Toni Kingo January 5, 2013, 6:39 pm

Yes. And when I don't tie my shoe laces, I can fall...

And, and, ... And, ... when I eat too much, I get stomach ache

REPLY LINK

nixCraft November 28, 2007, 12:56 pm

kunal,

Read <http://www.cyberciti.biz/tips/linux-limiting-user-process.html>

REPLY LINK

Bash November 28, 2007, 2:27 pm

I tried this on a virtual instance of SLAX, and it totally killed it.

REPLY LINK

bert December 5, 2007, 4:21 pm

perl inline...

perl -e "fork while fork" &

REPLY LINK

ATOzTOA January 30, 2008, 4:15 am

Sleek code :)

I tried on FC4. Took only 1 minute as root.

In WinXP, I waited till 7 minutes. Displayed some errors and all, but was responding. Tried MS Word, Task Manager, nothing could be executed. The machine was useless untill reset.

REPLY LINK

bradley March 31, 2008, 6:06 pm

This works very quickly on all windows:

```
:bomb
%0 | %0
goto bomb
```

REPLY LINK

Joe November 13, 2008, 11:04 pm

This works faster on all windows:

```
:bomb
start %0
%0|%0
goto bomb
```

REPLY LINK

sharfah November 22, 2008, 2:42 pm

A fork bomb process which can no longer fork exits. The following short Z Shell code will typically get rid of the above fork bomb in about a minute:

while (sleep 100 &!) do; done

It keeps trying and will eventually start a new do-nothing process; Each new do-nothing process reduces the number of rampant "fork bomb" processes by one, until eventually all of them are eradicated, at which point the do-nothing processes can exit.

REPLY LINK

stealth August 29, 2009, 9:00 pm

Use ulimit -u 30 (where 30 it is a max number of process) to protect yourself from this attack(or config your limits.conf)

REPLY LINK

Peter September 28, 2009, 3:55 pm

That would make a VERY geeky tattoo.

:(){ :|& };;

REPLY LINK

Edward October 17, 2009, 1:20 pm

This did 100% of nothing on my AuroraUX^[1] machine.
Load went up for about min to min and a half, then the kernel killed the process for me.
Silly Linux..
[1] – <http://www.auroraux.org/>

REPLY LINK

PyrexKidd June 17, 2010, 6:15 pm
On my Ubuntu 10.04 LTS the fork bomb launched about 2500 processes and then my kernel killed it. Total time ~< 5 min.

REPLY LINK

Marc November 20, 2009, 6:33 pm

How would i send a forkbomb/ebomb to an ip without requiring passwords like the ones controled by keys when u stimotauniskusley press keys it opens up stuff on the targets ip.

REPLY LINK

Victor Chaves August 12, 2010, 7:31 pm

Debian 5 is immune to this fork bomb.

REPLY LINK

newklear November 17, 2010, 8:25 pm

PCLinuxOS is immune

REPLY LINK

Ä,,nÄ¶nymÄ¶Ä¶s January 11, 2011, 4:26 pm

WARNING! These examples may crash your computer if executed.

may?
They WILL crash your comp.
Win7 – batch WILL kill (also input lag)

REPLY LINK

Ellisgeek March 4, 2011, 1:22 am

try this on for (lack) of size:

```
#/bin/bash
$0&
$0
```

Very tiny fork bomb :D

REPLY LINK

modchan October 7, 2011, 10:47 am

Tried on Mac OS X 10.7.1 from root, bomb was killed in 0.003 s.

REPLY LINK

Tryme December 1, 2011, 3:52 pm

```
:(){ : | : & };; :
```

- :() is a function name with the open and close parenthesis representing no parameters. The body of this function is within the braces {}.
- : | : is a recursive call since : is the name of the function. The function gets called twice and is piping input from one call to the other.
- & backgrounds the previous function call so that it will not die.
- ; finishes the function declaration.
- : Calls the function just defined.

REPLY LINK

StarDust January 6, 2012, 11:52 am

I did the %0|%0 command in Windows XP. Type into Notepad and saved as FORKBOMB.BAT then double-clicked. Fortunately, I already had task manager running, so I right-clicked explorer and hit “end process tree” which left me with a blank desktop. I then used Alt+Ctrl+Del to reopen Task Manager and from there, typed explorer.exe in the RUN dialog to get Windows back up without rebooting.

If you add an additional command, for example:

PING [insert url of hated website]

you can spam out DOS attacks as well while you watch your computer crash. Seriously people, don’t do that...

REPLY LINK

Stephen Wood July 24, 2012, 11:15 pm

It's almost a right-of-passage to get tricked into running this command when you get your first system. Part of unwinding why your system just crashed actually teaches you quite a bit about unix pipes.

For that reason I'm partly sad that in at least Ubuntu 12.04, the default ulimit setting prevents the bomb from taking down the system.

REPLY LINK

mark February 25, 2014, 10:36 pm

There is a minimal "cure" for this.

Classic REISUB Linux magic key combo always works for rebooting computer, however, using Alt+SysRq+K will stop all processes on current tty. In the case it doesn't work, probably you're on X server and need to use Alt+SysRq+RK.

REPLY LINK

sugatang itlog July 22, 2014, 3:18 pm

Ahihi! CoreOS is immune. Though the system was unresponsive for 2 minutes.

REPLY LINK

sugatang itlog July 22, 2014, 3:33 pm

Ooops! Totally crashed. fork: Cannot allocate memory. Then Call Trace.

Then, not responding to anything, just call trace. Awesome! Is this second to vmsplICE?


More power nixCraft!

REPLY LINK

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