

27 | 案例篇：為什麼我的磁盤 I/O延遲很高？

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- 日誌：能了解應用程序內部運行情況
 - 調試(debug)、信息(info)、警告(warm)、錯誤(error)
- 生產環境：警告(warm)
 - 若需找問題才改 debug
- 可用工具：iostat、strace、lsof
- 確認是否可動態調整日誌級別
 - SIGUSR1 → INFO
 - SIGUSR2 → WARMING

VM1 環境

OS: ubuntu 18.04 (16.04)

CPU: x2、RAM: 8G

需安裝 docker.io 和 sysstat



Flask

web development,
one drop at a time

<http://192.168.0.10:10000/>

<http://192.168.10.247:10000/>

VM1: 案例应用

curl

VM2: 客户端

Debian buster OUT!!!!

無法讓 filetop-bpfcc 正常運作

```
root@27-1: lrwxrwxrwx 1 root root      39 Aug 12 11:31 build -> /usr/src/linux-headers-4.19.0-10-amd64/
modprobe: drwxr-xr-x 12 root root    4096 Aug 11 21:28 kernel
Unable to -rw-r--r-- 1 root root 1128489 Aug 11 21:28 modules.alias          ickage for
your runni -rw-r--r-- 1 root root 1074839 Aug 11 21:28 modules.alias.bin
chdir(/lib -rw-r--r-- 1 root root    4683 Jul 25 02:46 modules.builtin
Traceback -rw-r--r-- 1 root root    5999 Aug 11 21:28 modules.builtin.bin
  File "/l -rw-r--r-- 1 root root   434780 Aug 11 21:28 modules.dep
    b = BF -rw-r--r-- 1 root root   592745 Aug 11 21:28 modules.dep.bin
  File "/l -rw-r--r-- 1 root root    456 Aug 11 21:28 modules.devname
    raise -rw-r--r-- 1 root root   140056 Jul 25 02:46 modules.order
Exception: -rw-r--r-- 1 root root    800 Aug 11 21:28 modules.softdep
          -rw-r--r-- 1 root root   506712 Aug 11 21:28 modules.symbols
          -rw-r--r-- 1 root root   625568 Aug 11 21:28 modules.symbols.bin
lrwxrwxrwx 1 root root      39 Jul 25 02:46 source -> /usr/src/linux-headers-4.19.0-10-common
root@27-1:/lib/modules/4.19.0-10-amd64# filetop-bpfcc
Segmentation fault
```

```
apt update  
apt upgrade
```

```
apt install docker.io sysstat  
apt-key adv --keyserver keyserver.ubuntu.com --recv-keys 4052245BD4284CDD
```

```
echo "deb https://repo.iovisor.org/apt/$(lsb_release -cs) $(lsb_release -cs) main" |  
sudo tee /etc/apt/sources.list.d/iovisor.list
```

```
apt update  
apt-get install bcc-tools libbcc-examples linux-headers-$(uname -r)
```

```
docker run --name=app -p 10000:80 -itd feisky/word-pop
```

```
root@27-2:~# curl http://192.168.10.247:10000/ ; echo
hello world
root@27-2:~# curl http://192.168.10.247:10000/popularity/word ; echo
{
  "popularity": 0.0,
  "word": "word"
}
```



很久才出現

```
while true; do time curl
http://192.168.10.247:10000/popularity/word; sleep 1; done
```

```
root@27-1-16:/tmp# iostat -d -x 1
```

```
Linux 4.4.0-186-generic (27-1-16)
```

```
08/12/2020
```

```
_x86_64_
```

```
(2 CPU)
```

Device:	rrqm/s	wrqm/s	r/s	w/s	rkB/s	wkB/s	avgrq-sz	avgqu-sz	await	r_await	w_await	svctm	%util
loop0	0.00	0.00	0.00	0.00	0.00	0.00	3.20	0.00	0.00	0.00	0.00	0.00	0.00
sda	0.00	17.17	0.48	78.20	18.13	70226.50	1785.60	74.38	945.40	18.82	951.07	7.83	61.58

Device:	rrqm/s	wrqm/s	r/s	w/s	rkB/s	wkB/s	avgrq-sz	avgqu-sz	await	r_await	w_await	svctm	%util
loop0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sda	0.00	45.00	0.00	121.00	0.00	115216.00	1904.40	78.14	1174.28	0.00	1174.28	8.26	100.00

```
root@27-2:~# while true; do time curl http://192.168.10.247:10000/popularity/word; sleep 1; done
{
  "popularity": 0.0,
  "word": "word"
}
```

```
real    0m54.591s
user    0m0.012s
sys     0m0.006s
```



```
top - 16:16:21 up 6:26, 2 users, load average: 1.71, 1.44, 0.83
Tasks: 179 total, 2 running, 177 sleeping, 0 stopped, 0 zombie
%Cpu0 : 59.5 us, 40.5 sy, 0.0 ni, 0.0 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
%Cpu1 : 0.7 us, 4.0 sy, 0.0 ni, 0.0 id, 94.0 wa, 0.0 hi, 1.3 si, 0.0 st
KiB Mem : 8175036 total, 5080580 free, 185836 used, 2908620 buff/cache
KiB Swap: 998396 total, 998396 free, 0 used. 7678808 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
5170	root	20	0	101912	26660	7340	S	101.0	0.3	264:48.55	/usr/local/bin/python /app.py

top → c → 1

PID: 5170

PID: 5170

```
root@27-1-16:/tmp# strace -p 5170
strace: Process 5170 attached
select(0, NULL, NULL, NULL, {0, 783244}) = 0 (Timeout)
futex(0x7ffc88ae4424, FUTEX_WAIT_PRIVATE, 2, {0, 4998490}) = -1 ETIMEDOUT (Connection timed out)
futex(0x7ffc88ae4424, FUTEX_WAIT_PRIVATE, 2, {0, 4998731}) = 0
futex(0x7f67b7f042a4, FUTEX_WAKE_PRIVATE, 1) = 1
futex(0x7f67b7f04234, FUTEX_WAKE_PRIVATE, 1) = 1
stat("/usr/local/lib/python3.7/importlib/_bootstrap.py", {st_mode=S_IFREG|0644, st_size=39278, ...}) = 0
stat("/usr/local/lib/python3.7/importlib/_bootstrap.py", {st_mode=S_IFREG|0644, st_size=39278, ...}) = 0
futex(0x7ffc88ae4014, FUTEX_WAIT_PRIVATE, 2, {0, 4998733}) = 0
futex(0x7ffc88ae4014, FUTEX_WAIT_PRIVATE, 2, {0, 4998421}) = 0
futex(0x7ffc88ae4014, FUTEX_WAIT_PRIVATE, 2, {0, 4999245}) = 0
stat("/usr/local/lib/python3.7/importlib/_bootstrap.py", {st_mode=S_IFREG|0644, st_size=39278, ...}) = 0
stat("/usr/local/lib/python3.7/importlib/_bootstrap_external.py", {st_mode=S_IFREG|0644, st_size=59012, ...}) = 0
stat("/usr/local/lib/python3.7/importlib/_bootstrap_external.py", {st_mode=S_IFREG|0644, st_size=59012, ...}) = 0
stat("/usr/local/lib/python3.7/importlib/_bootstrap_external.py", {st_mode=S_IFREG|0644, st_size=59012, ...}) = 0
```

```
root@27-1-16:/tmp# strace -p 5170 2>&1 | grep write
^C
root@27-1-16:/tmp#
```

無相關 **write** 訊息

```
17:14:52 loadavg: 1.93 1.89 1.90 2/233 7528
```

TID	COMM	READS	WRITES	R_Kb	W_Kb	T	FILE
7509	python	2	0	5712	0	R	620.txt
7509	python	2	0	5712	0	R	268.txt
7509	python	2	0	4931	0	R	347.txt
7509	python	2	0	4687	0	R	316.txt
7509	python	2	0	4687	0	R	545.txt
7509	python	2	0	4541	0	R	528.txt
7509	python	2	0	4492	0	R	291.txt
7509	python	2	0	4394	0	R	733.txt
7509	python	2	0	4394	0	R	927.txt
7509	python	2	0	4345	0	R	171.txt
7509	python	2	0	4345	0	R	477.txt
7509	python	2	0	4150	0	R	133.txt
7509	python	2	0	4101	0	R	624.txt
7509	python	2	0	4003	0	R	102.txt
7509	python	2	0	4003	0	R	75.txt
7509	python	2	0	3906	0	R	595.txt
7509	python	2	0	3857	0	R	483.txt
7509	python	2	0	3759	0	R	586.txt
7509	python	2	0	3759	0	R	116.txt
7509	python	2	0	3515	0	R	449.txt

```
/usr/share/bcc/tools/filetop
```

```
/usr/share/bcc/tools/filetop  
ps -efT | grep 7669
```

```
17:18:57 loadavg: 1.88 1.90 1.91 2/236 7674
```

TID	COMM	READS	WRITES	R_Kb	W_Kb	T	FILE
7669	python	0	1	0	3906	R	280.txt
7669	python	0	1	0	2685	R	278.txt
7669	python	0	1	0	2490	R	279.txt
7674	clear	2	0	8	0	R	xterm
7659	filetop	2	0	2	0	R	loadavg
7674	clear	1	0	0	0	R	libtinfo.so.5.9
7674	clear	1	0	0	0	R	libc-2.23.so
7674	filetop	3	0	0	0	R	clear
7674	filetop	2	0	0	0	R	ld-2.23.so

```
Detaching... 7669 為 5170 之 child pid
```

```
root@27-1-16: /tmp# ps -efT | grep 7669
```

root	5170	7669	5126	85	17:18	pts/0	00:00:07	/usr/local/bin/python	/app.py
root	7676	7676	1276	0	17:19	pts/0	00:00:00	grep --color=auto	7669


```
1:1:tcsh - "mars2" ... 2:9:ssh - "mars2" 4!... 3:0:tcsh - "mars2" (t... 0:3:ssh - "root@27-1...  
7818 opensnoop -1 2 /usr/lib/python2.7/encodings/ascii.x86_64-linux-gnu.so  
7818 opensnoop -1 2 /usr/lib/python2.7/encodings/ascii.so  
7818 opensnoop -1 2 /usr/lib/python2.7/encodings/asciimodule.so  
7818 opensnoop 12 0 /usr/lib/python2.7/encodings/ascii.py  
7818 opensnoop 13 0 /usr/lib/python2.7/encodings/ascii.pyc  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/544.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/545.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/546.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/547.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/548.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/549.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/550.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/551.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/552.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/553.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/554.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/555.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/556.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/557.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/558.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/559.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/560.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/561.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/562.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/563.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/564.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/565.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/566.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/567.txt  
5170 python 6 0 /tmp/60a13a94-dc7f-11ea-80e3-0242ac110002/568.txt  
0 | 0:vim 1:ssh 2:ssh 3:ssh* 4:ssh- 5:tcsh 6:tcsh 7:tcsh 8:tcsh 9:ssh  
cytseng 2020-08-12 17:35:36 Load:0.57
```

```
@app.route("/popularity/<word>")
def word_popularity(word):
    dir_path = '/tmp/{}'.format(uuid.uuid1())
    count = 0
    sample_size = 1000

    def save_to_file(file_name, content):
        with open(file_name, 'w') as f:
            f.write(content)

    try:
        # initial directory firstly
        os.mkdir(dir_path)

        # save article to files
        for i in range(sample_size):
            file_name = '{}/{}.txt'.format(dir_path, i)
            article = generate_article()
            save_to_file(file_name, article)
```

```
        # count word popularity
        for root, dirs, files in os.walk(dir_path):
            for file_name in files:
                with open('{}{}'.format(dir_path,
file_name)) as f:
                    if validate(word, f.read()):
                        count += 1

            finally:
                # clean files
                shutil.rmtree(dir_path, ignore_errors=True)

        return jsonify({'popularity': count / sample_size
* 100, 'word': word})
```

開 1000 個檔案寫入
再讀 1000 個檔案

```
root@27-2:~# time curl http://192.168.10.247:10000/popularity/word
{
  "popularity": 0.0,
  "word": "word"
}
```

```
real    0m29.042s
user    0m0.008s
sys     0m0.004s
```

```
root@27-2:~# time curl http://192.168.10.247:10000/popular/word
{
  "popularity": 0.0,
  "word": "word"
}
```

```
real    0m12.051s
user    0m0.011s
sys     0m0.001s
```

Q&A



THANK

YOU