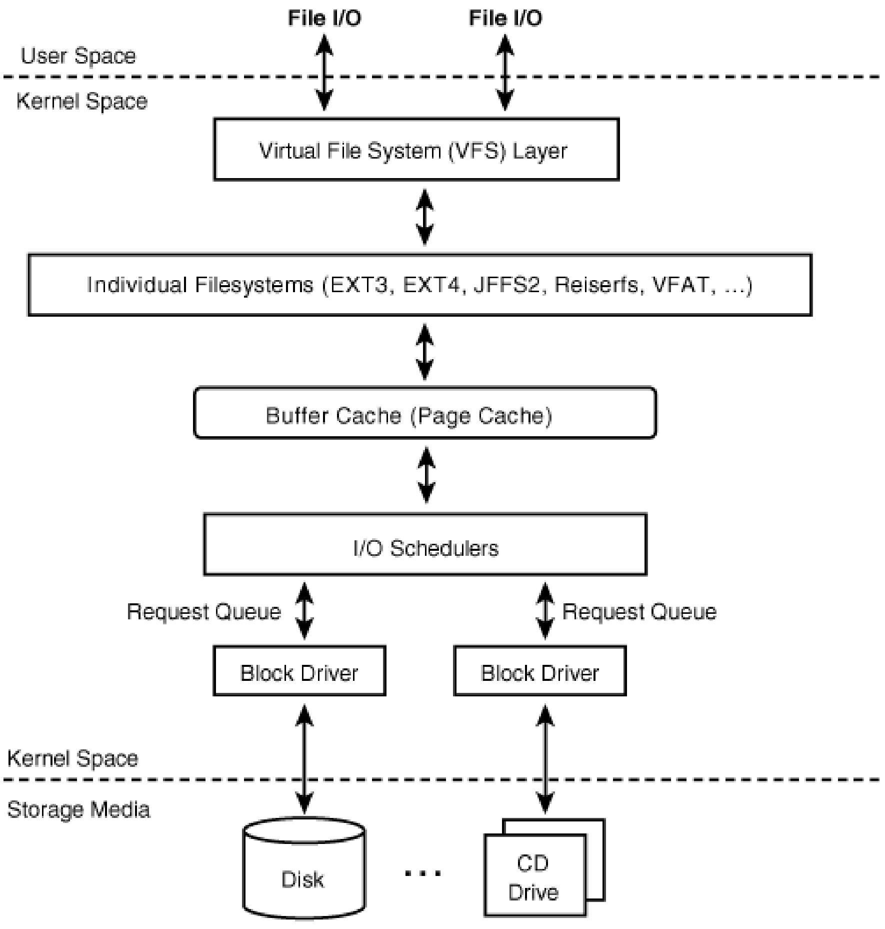
Project Report
(IO Tracing)

Asif Ali
143059009
CSE Mtech 1

Problem Statement

- To know about the operations of each I/O layer performed when a process request for I/O from a block device.

Architecture



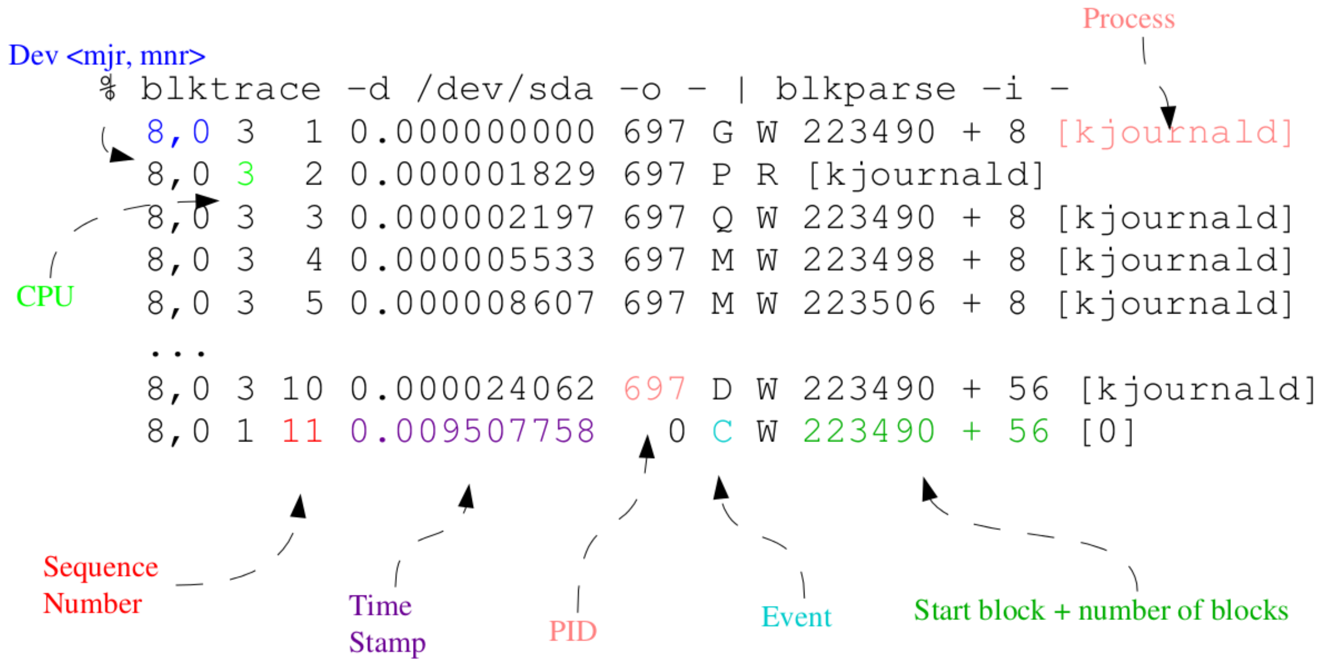
An Example: Blktrace

Introduction

Blktrace is a block layer IO tracing mechanism which provides detailed information about request queue operations up to user space. There are three major components: a kernel component, a utility to record the i/o trace information for the kernel to user space, and utilities to analyse and view the trace information. This man page describes blktrace, which records the i/o event trace information for a specific block device to a file.

The blktrace utility extracts event traces from the kernel (via the relaying through the debug file system).

blktrace – live



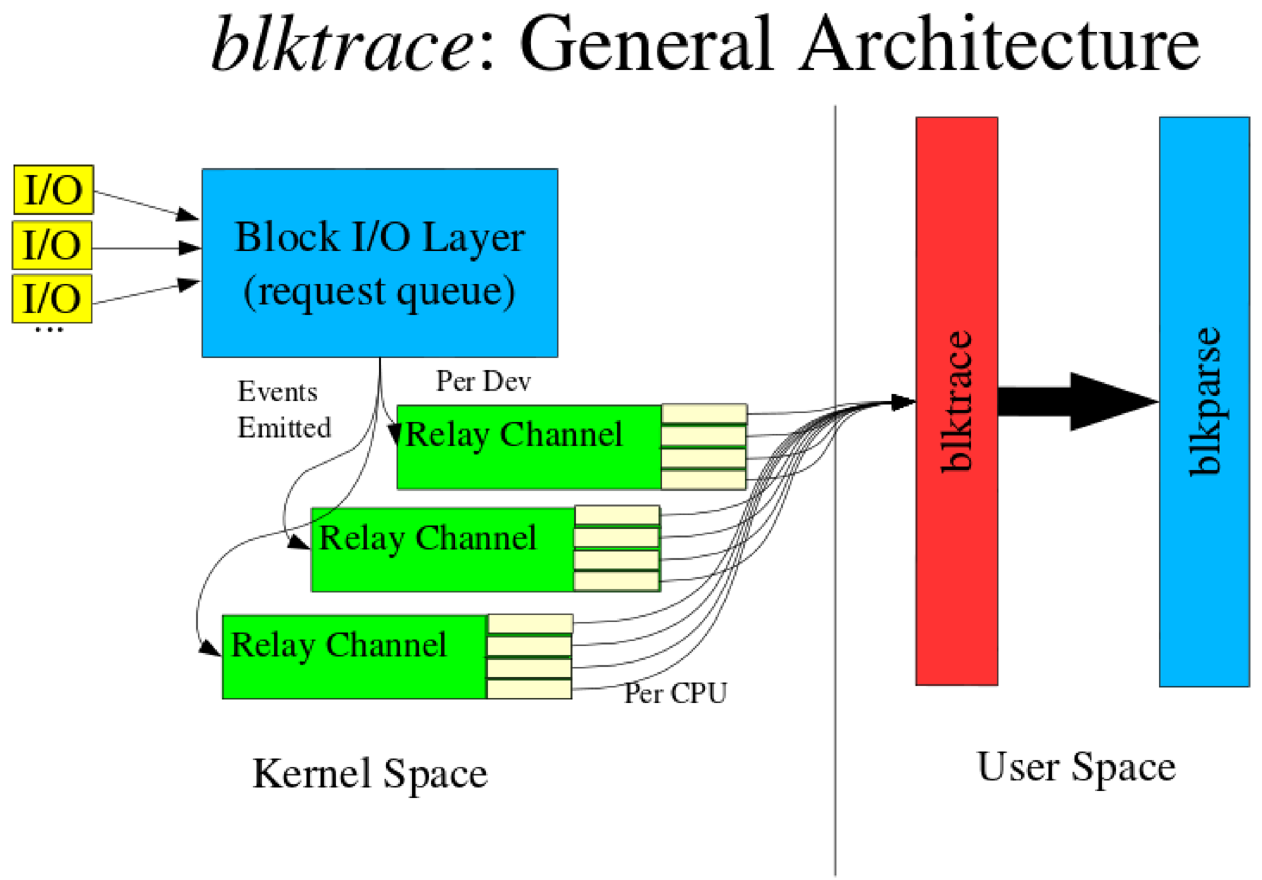
```
% blktrace -d /dev/sda -o - | blkparse -i -
  8,0 3  1 0.000000000 697 G W 223490 + 8 [kjournald]
  8,0 3  2 0.000001829 697 P R [kjournald]
  8,0 3  3 0.000002197 697 Q W 223490 + 8 [kjournald]
  8,0 3  4 0.000005533 697 M W 223498 + 8 [kjournald]
  8,0 3  5 0.000008607 697 M W 223506 + 8 [kjournald]
  ...
  8,0 3 10 0.000024062 697 D W 223490 + 56 [kjournald]
  8,0 1 11 0.009507758   0 C W 223490 + 56 [0]
```

```
CPU1 (8,0):
 Reads Queued:           0,        0KiB  Writes Queued:          7,      128KiB
 Read Dispatches:        0,        0KiB  Write Dispatches:       7,      128KiB
 Reads Completed:        0,        0KiB  Writes Completed:      11,      168KiB
 Read Merges:            0               Write Merges:          25
 IO unplugs:             0               Timer unplugs:          0
...
CPU3 (8,0):
 Reads Queued:           0,        0KiB  Writes Queued:          1,       28KiB
 Read Dispatches:        0,        0KiB  Write Dispatches:       1,       28KiB
 Reads Completed:        0,        0KiB  Writes Completed:       0,        0KiB
 Read Merges:            0               Write Merges:           6
 IO unplugs:             0               Timer unplugs:          0

Total (8,0):
 Reads Queued:           0,        0KiB  Writes Queued:         11,      168KiB
 Read Dispatches:        0,        0KiB  Write Dispatches:      11,      168KiB
 Reads Completed:        0,        0KiB  Writes Completed:      11,      168KiB
 Read Merges:            0               Write Merges:          31
 IO unplugs:             0               Timer unplugs:          3

Events (8,0): 89 entries, 0 skips
```

Architecture of Blktrace



Components of My Project:

- Tracing Module
- Parse script (written in python)

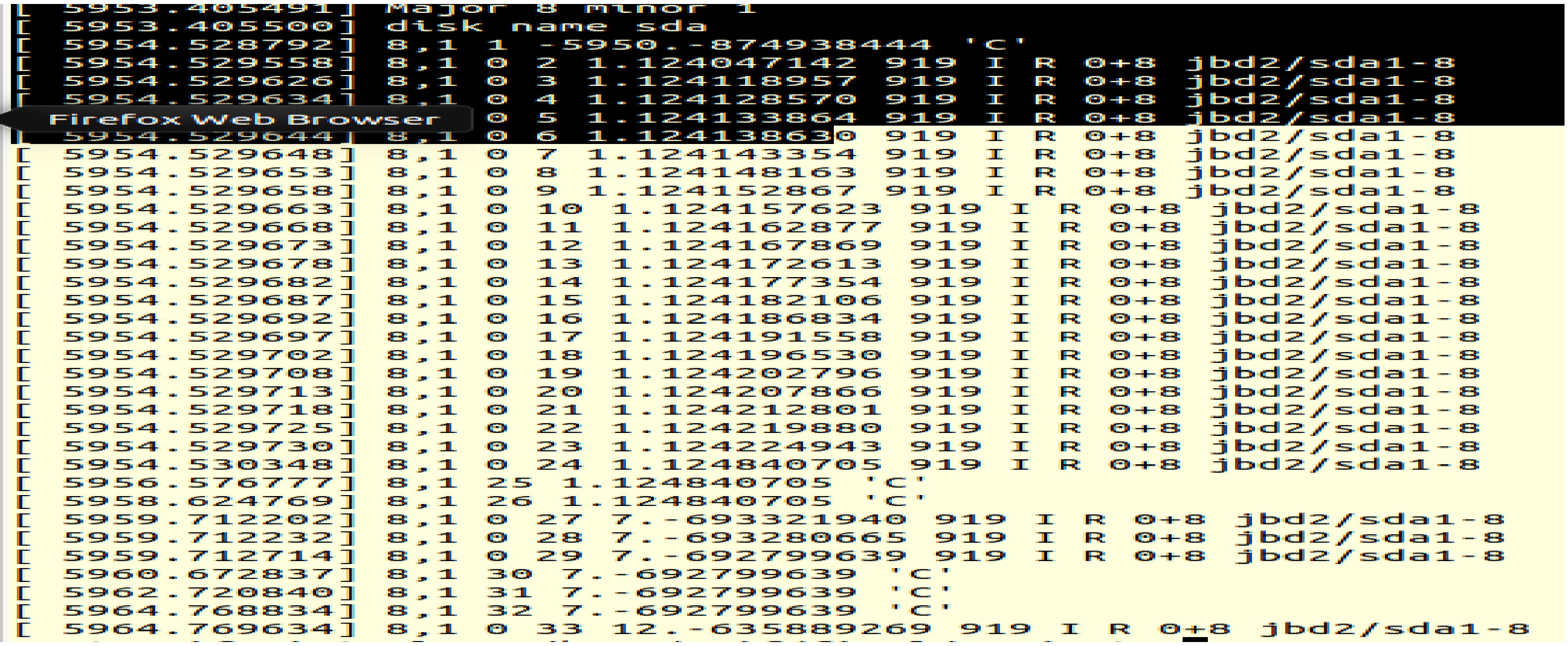
Methodology And Approach

Put three hook functions(block_fun, block_comp, block_requeue) in generic_make_request function, blk_requeue_request, blk_put_request function respectively. Then pass the state of request_queue to our module.Our module just prints that states (traces).

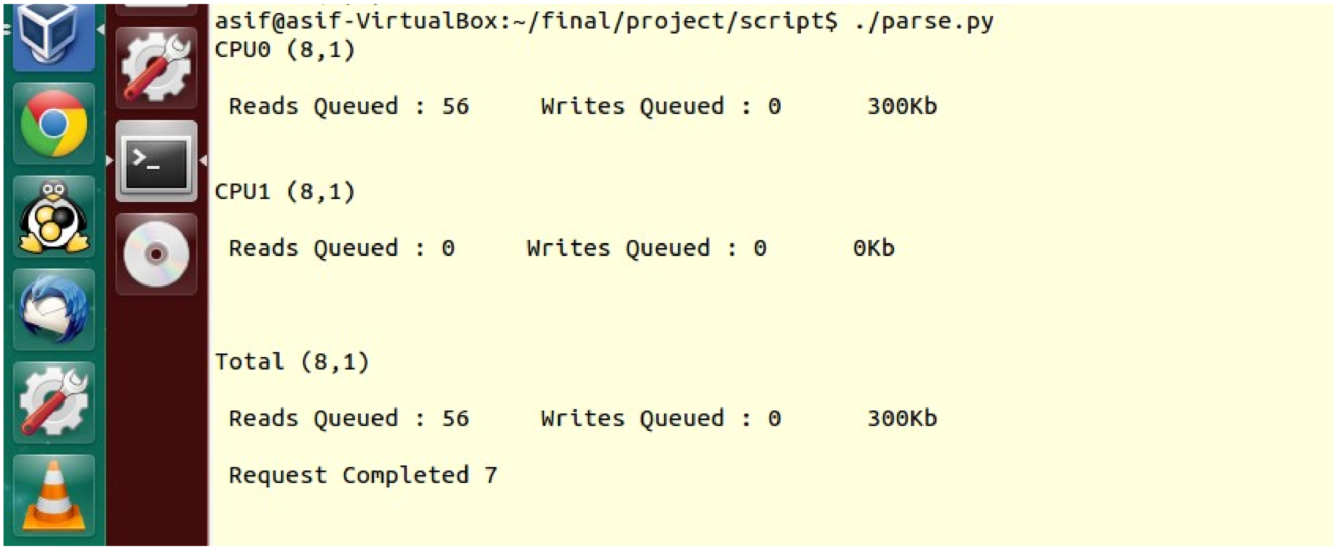
What our parse script does is to take that traces from /var/log/syslog file and collect these trace and make combined data.

Experiments:

What we did is to run our trace program and see the result.



```
[  5953.405491]  Major 8 minor 1
[  5953.405500]  disk name sda
[  5954.528792]  8,1 1 -5950.-874938444 'C'
[  5954.529558]  8,1 0 2 1.124047142 919 I R 0+8 jbd2/sda1-8
[  5954.529626]  8,1 0 3 1.124118957 919 I R 0+8 jbd2/sda1-8
[  5954.529634]  8,1 0 4 1.124128570 919 I R 0+8 jbd2/sda1-8
                      0 5 1.124133864 919 I R 0+8 jbd2/sda1-8
[  5954.529644]  8,1 0 6 1.124138630 919 I R 0+8 jbd2/sda1-8
[  5954.529648]  8,1 0 7 1.124143354 919 I R 0+8 jbd2/sda1-8
[  5954.529653]  8,1 0 8 1.124148163 919 I R 0+8 jbd2/sda1-8
[  5954.529658]  8,1 0 9 1.124152867 919 I R 0+8 jbd2/sda1-8
[  5954.529663]  8,1 0 10 1.124157623 919 I R 0+8 jbd2/sda1-8
[  5954.529668]  8,1 0 11 1.124162877 919 I R 0+8 jbd2/sda1-8
[  5954.529673]  8,1 0 12 1.124167869 919 I R 0+8 jbd2/sda1-8
[  5954.529678]  8,1 0 13 1.124172613 919 I R 0+8 jbd2/sda1-8
[  5954.529682]  8,1 0 14 1.124177354 919 I R 0+8 jbd2/sda1-8
[  5954.529687]  8,1 0 15 1.124182106 919 I R 0+8 jbd2/sda1-8
[  5954.529692]  8,1 0 16 1.124186834 919 I R 0+8 jbd2/sda1-8
[  5954.529697]  8,1 0 17 1.124191558 919 I R 0+8 jbd2/sda1-8
[  5954.529702]  8,1 0 18 1.124196530 919 I R 0+8 jbd2/sda1-8
[  5954.529708]  8,1 0 19 1.124202796 919 I R 0+8 jbd2/sda1-8
[  5954.529713]  8,1 0 20 1.124207866 919 I R 0+8 jbd2/sda1-8
[  5954.529718]  8,1 0 21 1.124212801 919 I R 0+8 jbd2/sda1-8
[  5954.529725]  8,1 0 22 1.124219880 919 I R 0+8 jbd2/sda1-8
[  5954.529730]  8,1 0 23 1.124224943 919 I R 0+8 jbd2/sda1-8
[  5954.530348]  8,1 0 24 1.124840705 919 I R 0+8 jbd2/sda1-8
[  5956.576777]  8,1 25 1.124840705 'C'
[  5958.624769]  8,1 26 1.124840705 'C'
[  5959.712202]  8,1 0 27 7.-693321940 919 I R 0+8 jbd2/sda1-8
[  5959.712232]  8,1 0 28 7.-693280665 919 I R 0+8 jbd2/sda1-8
[  5959.712714]  8,1 0 29 7.-692799639 919 I R 0+8 jbd2/sda1-8
[  5960.672837]  8,1 30 7.-692799639 'C'
[  5962.720840]  8,1 31 7.-692799639 'C'
[  5964.768834]  8,1 32 7.-692799639 'C'
[  5964.769634]  8,1 0 33 12.-635889269 919 I R 0+8 jbd2/sda1-8
```



```
asif@asif-VirtualBox:~/final/project/script$ ./parse.py
CPU0 (8,1)

 Reads Queued : 56     Writes Queued : 0      300Kb


CPU1 (8,1)

 Reads Queued : 0     Writes Queued : 0      0Kb



Total (8,1)

 Reads Queued : 56     Writes Queued : 0      300Kb

 Request Completed 7
```

We did'nt perform any write request that's there si no writing traces came in our experiment.

References:

1.http://www.embeddedlinux.org.cn/EssentialLinuxDeviceDrivers/final/ch14lev1sec2.html
2.Blktrace User Guide

http://www.cse.unsw.edu.au/~aaronc/iosched/doc/blktrace.html
3.Block I/O Tracing
http://www.mimuw.edu.pl/~lichota/09-10/Optymalizacja-open-source/Materialy/10%20-%20Dysk/gelato_ICE06apr_blktrace_brunelle_hp.pdf
4.Makelinux.net
5.Reading block I/O from kernel module
http://stackoverflow.com/questions/14628275/reading-block-device-from-kernel-3-7-module-segfault-in-submit-bio-bd-disk-i/15946581#15946581