Chameleon Cloud Tutorial

National Science Foundation

Program Solicitation # NSF 13-602

CISE Research Infrastructure: Mid-Scale Infrastructure - NSFCloud (CRI: NSFCloud)

Cloud - I/O Trace using Block Trace

Objectives

In this tutorial, you will learn how to install a blocktrace and how to captures all activity in the storage stack in the Linux kernel's block layer from the OS perspective.

#	Action	Detail	Time (min)
1	Install Blocktrace in your Linux machine	You will learn how to setup a **BlockTrace** tool and captures all activity in the storage stack in the Linux kernel's block layer from the OS perspective	3
2	Install "seekwatcher" and get output image/movie.	You will learn how to setup seekwatcher to visualize block I/O patterns.	1
3	Run Blocktrace and Create a file using "dd" that will do disk access	In this step you will learn how to make a disk access	1
4	Run Blockparse and Seekwatcher to visualize the block I/O pattern	Lastly, trace the I/O patterns	5

Prerequisites

The following prerequisites are expected for successful completion of this tutorial:

- An SSH client (Windows users: downloadPuTTY (http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html)
- A basic knowledge of Linux
- Install Blocktrace and Seekwatcher.

Blocktrace:

- Provides an ability to see the events going inside block i/o layer.
- Using it, it is possible to generate events for all I/O request and monitor it from beginning.
- It has low overhead, less that 2%.

Architecture level:

The following diagram illustrates the the level at which blktrace captures the IO workload. Blktrace captures events up to the driver level and operates one level higher than a bus trace does.

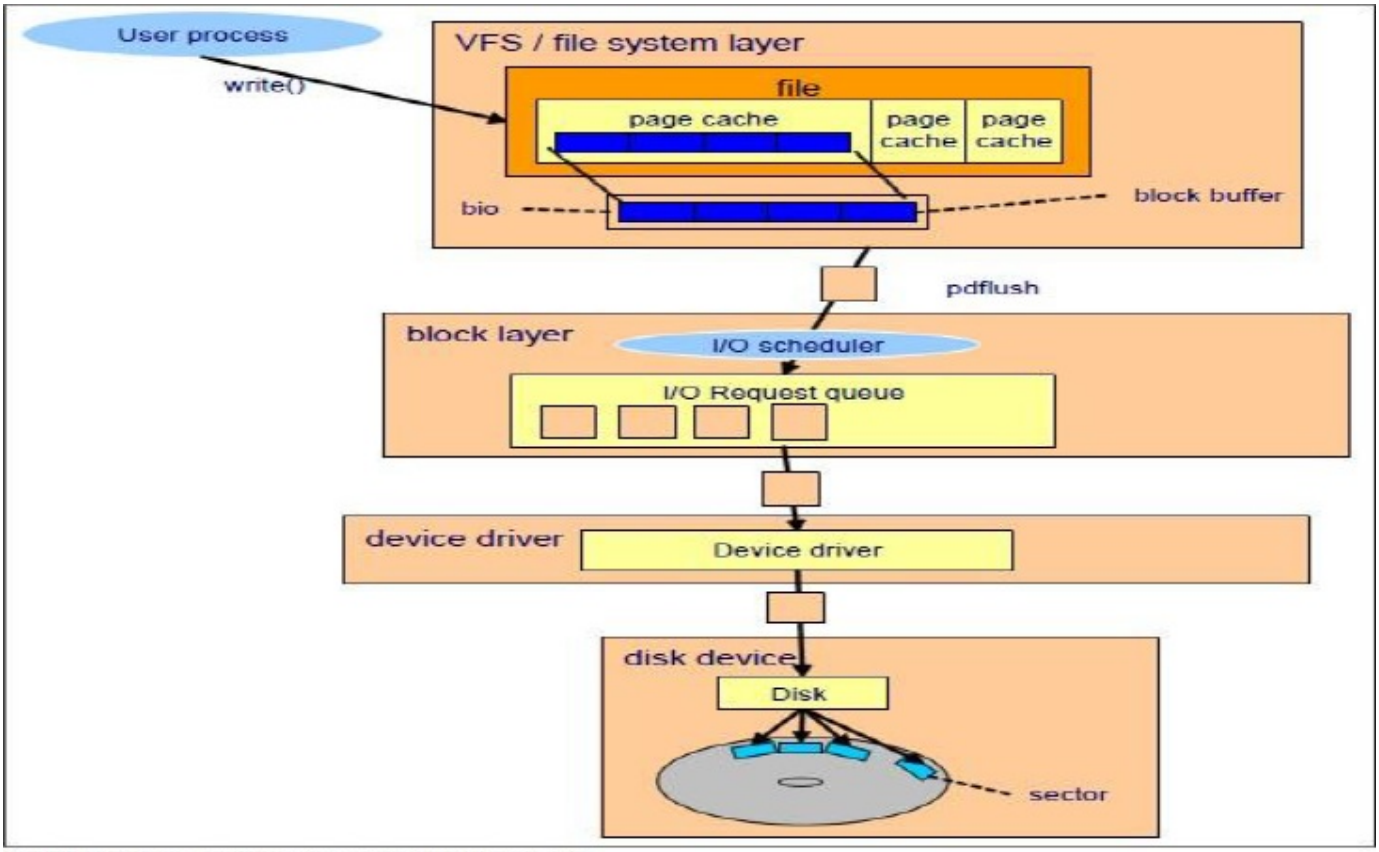
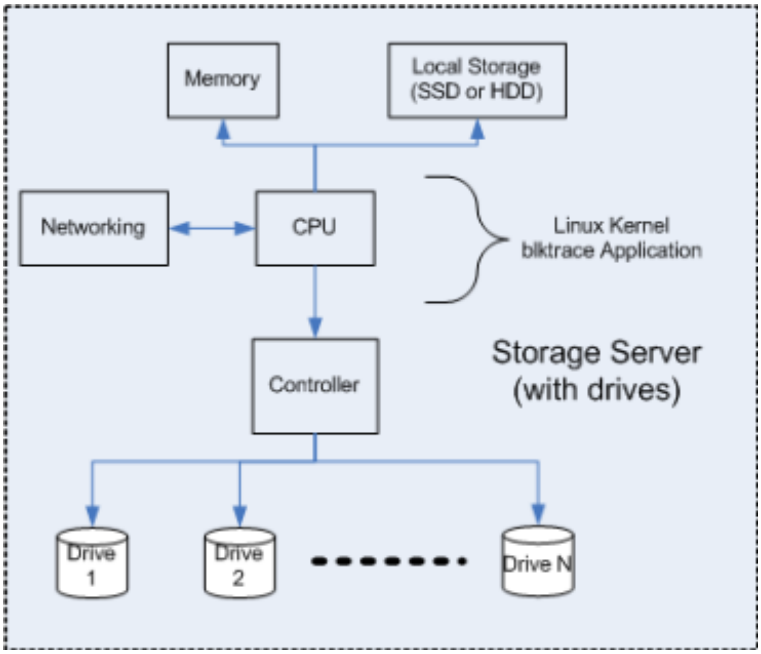


Figure 1-18 I/O subsystem architecture

Why blocktrace?

It can provide a valuable way to test multi-drive workload, because the trace occurs at the logical layer prior to the physical layer. By tracing the logical layer all drives can be traced at once, where a bus trace would be limited by drive numbers. Every operating system is logging all the access its doing and so one can get a pretty broad picture of accesses.



Events Captured:

Action	Name	Description
A	Remap	I/O was remapped to different device.
B	Bounced	The data pages attached to this bio are not reachable by the hardware and must be bounced to a lower memory location.
C	Completion	I/O Completion.
D	Issued	I/O issued to driver.
F	Front merge	I/O ends where a previously inserted requests starts
G	Get request	To send any type of request to a block device, a struct request container must be allocated first
I	Inserted	A request is being sent to the i/o scheduler for addition to the internal queue and later service by the driver.
M	Back merge	A previously inserted request exists that ends on the boundary of where this I/O begins, so the i/o scheduler can merge them together.
P	Plug	When I/O is queued to a previously empty block device queue
Q		I/O request handled by queue code.
S	Sleep	No available request structures were available, so the issuer has to wait for one to be freed.
T	Unplug(timer)	unplug due to timer
U	Unplug	Some request data already queued in the device, start sending requests to the driver.

Action	Name	Description
X	Split	An incoming I/O may straddle a device or internal zone and needs to be chopped up into smaller pieces for service.

Hands-on

Step 1: Install Blocktrace in your Linux machine

In this step, you will –Install Block trace, if not there.

```
root@rack1-1:~\# apt-get install blktrace
```

Step 2: Install “seekwatcher” and get output image/movie.

In this step, you will –Install seekwatcher, if not there.

```
root@rack1-1:~\# apt-get install seekwatcher
```

Step 3: Run Blocktrace and Create a file using “dd” that will do disk access

```
blktrace /dev/sda &

if=/dev/zero of=abc.bin bs=1MB count=1000
```

NOTE : kill the blktrace process using process id and then run blockparse

```
root@rack1-1:~\# kill (pid)
```

Step 4: Run block parse and seekwatcher to visualize block i/o pattern

In this step, you will –Use blkparse and seekwatcher to visualize I/O patterns.

Blkparse : In this step you can monitor the drive you want and also pipe the selected output in text file.

```
blkparse –i sda.blktrace.7 –f “%a,%S,%t\\n” | sed –n ‘/\[CD\]/ p’ > result.txt
```

Seekwatcher : In this step, it will give you .png format image of disk IO, Throughput, Seek Count, IOPs

```
seekwatcher --io-graph-marker-size=5 -t tracenew5.blktrace.8 -o new5-dd1.png --dpi 200
```