# Troubleshoot Storage Issues

**Andrew Mallett**
Author and Trainer

@theurbanpenguin www.theurbanpenguin.com

# Overview

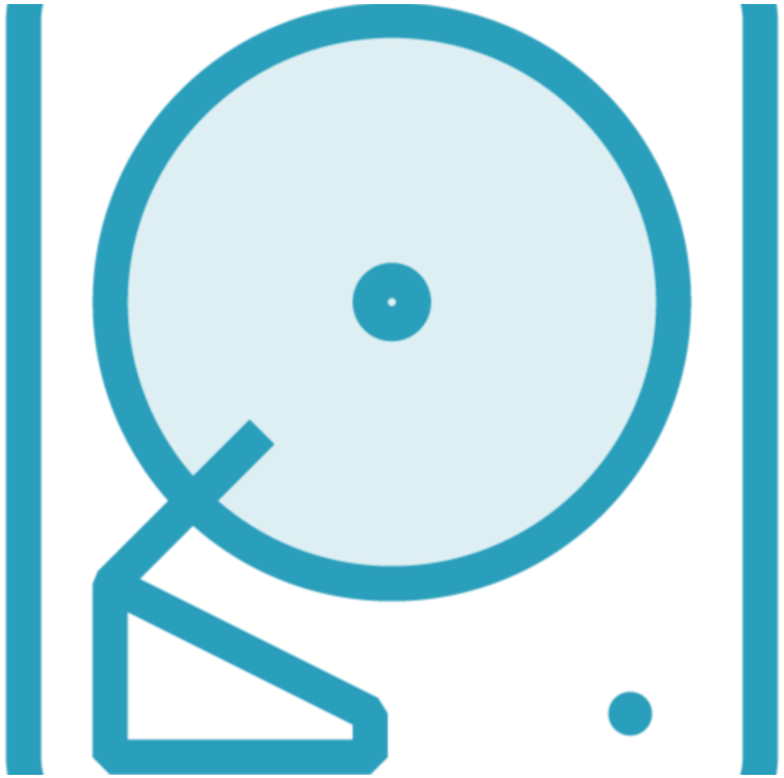
## Troubleshooting Storage

## Disk Operations

- IOPS
- Capacity
- Filesystem Fragmentation
- Mount Issues and Options

# IOPS

# Understanding Disk Operations



**Disk performance is measured in IOPS, i/o per second. The effective IOPS rate you see is due to many things**

- Client application
- Disk Controller
- Disk
- Contentiion

```
$ sudp apt install -y ioping
$ ioping . -c20
$ ioping . -R -c20
$ sudo ioping -R /dev/sdb
```

# Measuring IOPS

**The ioping utility, can be used to measure disk spend and latency in much the same way that ping can measure your network access speed.**

# Demo

**To begin we will install ioping:**

- Measure speed to the current directory
- Measure speed to a second disk

# SAR and Disk Access

```
$ sar -b
$ sar -d
$ sar -f -b /var/log/sysstat/sann
```

# Historical Disk Activity

**The sar command can show us disk activity, with sar -b showing transaction per second and sar -d breaking it down further by block device. As with and sar activity, we can query information other than today's data using -f to specify the file.**

# Demo

**Let's look for the disk activity over a period of time:**

- sar -b
- sar -d
- query other days data

# Disk Defragmentation

# Fragmentation

Over a period of time the data that makes up a file can become fragmented. This can slow access down as multiple blocks need to be read to load the file. Ideally don't load more than 80% of the filesystem to allow for defragmentation.

```
$ sudo dumpe2fs /dev/sda1 | grep extent
$ sudo e4defrag -c /
$ sudo e4defrag /
```

# Defrag EXT4

**Later EXT4 filesystems support defragmentation if the extent feature is enabled.**

```
$ sudo xfs_fsr /
```

# Defrag XFS

**In XFS, defragmentation is known as File System Reorganization, hence xfs_fsr. The Alma Linux 8 system has an XFS root filesystem by default.**

# Demo

**Defrag File Systems:**

- View disk free
- Defrag ext4 on Ubuntu 20.04
- Defrag xfs on AlmaLinux 8

# Mount Options

# Improving Performance with Mount Options

In general, mount options can improve performance but may impact on data security. Disabling the journal and changing the sync speed will improve performance but may increase the possibility of data loss.

```
$ sudo mount -o remount,barrier=0,commit=60 /
$ sudo mount -o remount,barrier=1,commit=5 / #defaults
$ man 5 ext4
```

# Mount Options EXT4

**Disabling the barrier option will turn the filesystem journal off. The journal implements transaction tracking for open files that can be replayed on a reboot. The filesystem sync defaults to 5 seconds, but we can extend it. We keep writes longer in cache before writing to disk.**

# Demo

**Investigating Mount Options:**

- Setting mount option in EXT4

# Summary

**We have introduced monitoring of our disks and block devices**

- iops
- sar -b
- sar -d
- sar -f
- ioping
- defragmentation
- mount options

# Up Next:
# Troubleshoot User Access