

Investigating Hard Disk Drive Failure Through Disk Torture

Presenter: Daniel Perry

Mentors: David Bonnie,
Garrett Ransom



Managed by Triad National Security, LLC for the U.S. Department of Energy's NNSA

Project Overview

Problem: Significant increase in production storage system HDD failure rates under certain circumstances.

Goal: Gather disk failure statistics to determine cause of increase.

- Establish monitoring framework
- Create high-stress workloads to cause failures

Testbed Hardware:

- Dell PowerEdge R7425 Server
- 2x LSI/Broadcom 9207-8e 6Gb/s SAS Adapters
- 4x Seagate OneStor SP-3584 JBODs
 - 84x 4TB Seagate ST4000NC000 HDDs

336 drives totaling 1.344 PB of storage space.

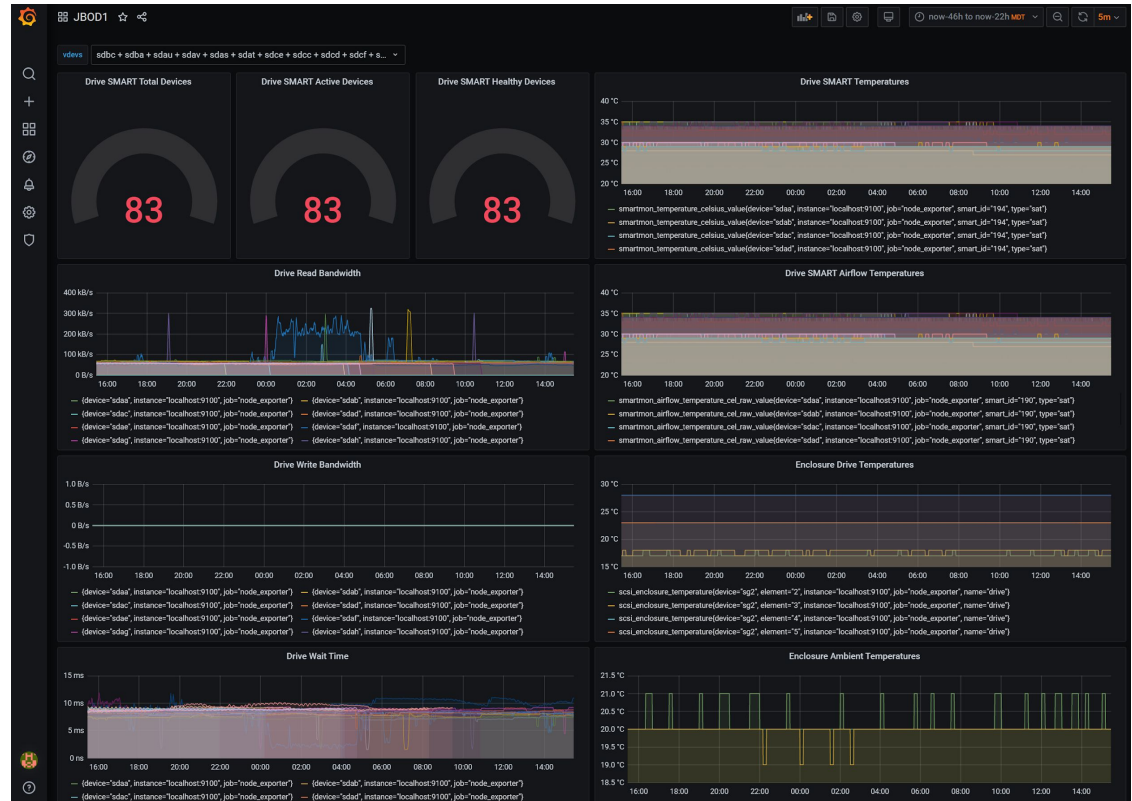
Monitoring Framework

Grafana/Prometheus

- procs
- SMART
- SCSI Enclosure Services

Metrics:

- Activity/Health
- Performance
- Temperature



Disk Geometry Analysis for Workload Development

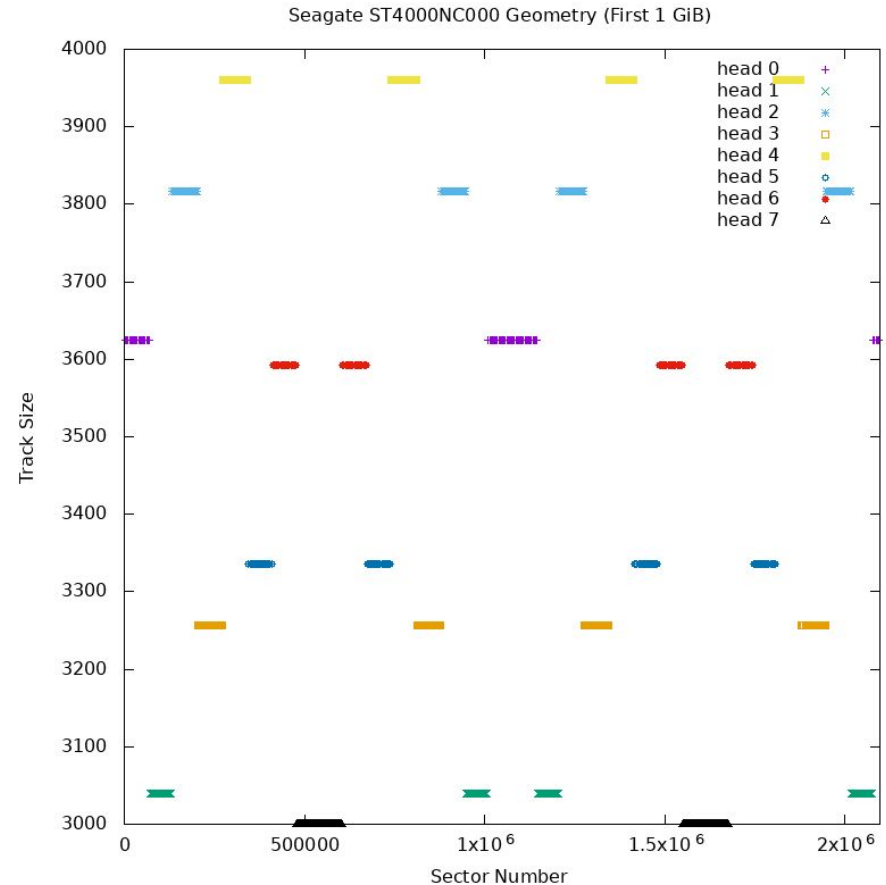
Simulate high-stress environments

- Target specific disk heads

Track size detection algorithm:

- Distinct groups of same-sized tracks
- Mirror symmetry: alternating surface order serpentine
- 4 platters/8 recording surfaces

Algorithm referenced from:
<http://blog.stuffedcow.net/2019/09/hard-disk-geometry-microbenchmarking/>



Disk Geometry Analysis for Workload Development

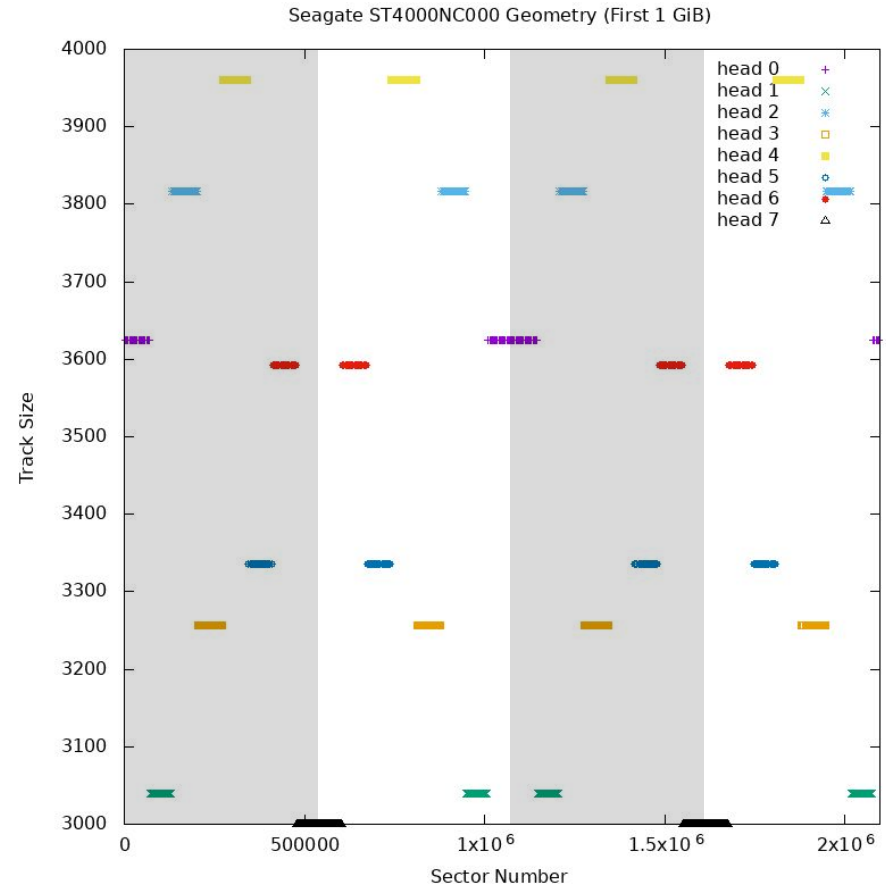
Simulate high-stress environments

- Target specific disk heads

Track size detection algorithm:

- Distinct groups of same-sized tracks
- Mirror symmetry: alternating surface order serpentine
- 4 platters/8 recording surfaces

Algorithm referenced from:
<http://blog.stuffedcow.net/2019/09/hard-disk-geometry-microbenchmarking/>



Questions?

Please direct further discussion to danmperry@lanl.gov

Special thanks to my mentors, managers, and all those who have provided assistance over the course of the summer.