Iometer for Zoned Block Devices
Microbenchmarking SMR HDDs

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CMR 8K Block Random Writes - WCD QD=1

Time (seconds)

IOPS

CMR 7200 RPM Enterprise Drive with Standard Iometer
ZBD 8K Block Random Writes - WCD QD=1

![Graph showing ZBD 5400 RPM Archive with Standard Iometer with IOPS on the y-axis and Time (seconds) on the x-axis. The graph displays a pattern of fluctuations with a drop at around 500 seconds.]
What’s wrong with Iometer?

- Industry Standard Benchmark tool with no support/intelligence for Zoned Block Devices (ZBD)

- Customers need a way to microbenchmark ZBDs to validate primitive performance capabilities that are a function of seek speed, spin speed and media data rate
Iometer Big Picture

Iometer GUI

Dynamo

Cross-Platform

Windows Only

HDD

HDD

HDD
Iometer Design Challenges

- No support for issuing individual ATA/SCSI commands to enumerated raw devices
- Device Identification (e.g. Model Number, size) are determined through OS APIs
Iometer Design Challenges

- IOs (Read & Writes) are issued to volumes & raw devices based on an offset (no concept of Zones or even LBAs)

- IO Manager has a hands off approach towards worker threads who are unaware of each other

- Comparing CMR to ZBDs in a ZBD-friendly workload
Dynamo Big Picture

Manager

Worker

Worker

Worker

Target

Target

Target

Target
Dynamo Changes
SMR Iometer Change List Highlights

- New SMRTarget Class
  - ZBD Type
  - Number of Zones
  - Max Open Zones
  - Open Zone List (index)
  - Zone List (Descriptor)
  - Mutex (Threadsafe)
  - Function that supports these data structures
SMR Iometer Change List Highlights

- TargetDisk Class
  - Added ZBD identifiers
  - Command Passthrough transport (ZAC/Windows)
  - Modified Seek / Write / Read

- Manager Class
  - m_SMRTgts <vector>
  - force_ZBD_Flag
  - max_open_zones
ZBD 8K Block Random Writes - (Recap)
ZBD 8K Zone Random Writes - ZBD-lometer

![Graph showing ZBD 8K Zone Random Writes](image-url)
CMR Drive Iometer vs ZBD-Iometer
CMR vs ZBD - 8K Zone Random Writes

![Graph comparing CMR vs ZBD in terms of IOPS over time.](image-url)
SMR Iometer ToDo:

- Adding Dynamo support for other OSes (Linux)
- Updating ZAC/ZBC commands
- Logic support for Host Managed Devices
- Testing Error Paths
- Visual Studio 2013/15
References

- Repository
  https://github.com/Seagate

- Original Iometer Project
  http://iometer.org