

Rockchip_RK3568_Reference_SATA_Performance_CN

文件标识: RK-KF-YF-138

发布版本: 1.0.0

日期: 2020-12-21

文件密级: ☐绝密 ☐秘密 ☐内部资料 ☒公开

免责声明

本文档按“现状”提供，瑞芯微电子股份有限公司（“本公司”，下同）不对本文档的任何陈述、信息和内容的准确性、可靠性、完整性、适销性、特定目的性和非侵权性提供任何明示或暗示的声明或保证。本文档仅作为使用指导的参考。

由于产品版本升级或其他原因，本文档将可能在未经任何通知的情况下，不定期进行更新或修改。

商标声明

“Rockchip”、“瑞芯微”、“瑞芯”均为本公司的注册商标，归本公司所有。

本文档可能提及的其他所有注册商标或商标，由其各自拥有者所有。

版权所有 © 2020 瑞芯微电子股份有限公司

超越合理使用范畴，非经本公司书面许可，任何单位和个人不得擅自摘抄、复制本文档内容的部分或全部，并不得以任何形式传播。

瑞芯微电子股份有限公司

Rockchip Electronics Co., Ltd.

地址: 福建省福州市铜盘路软件园A区18号

网址: www.rock-chips.com

客户服务电话: +86-4007-700-590

客户服务传真: +86-591-83951833

客户服务邮箱: fae@rock-chips.com

前言

概述

本文档描述RK3568 SATA性能测试和指标数据，测试基于RK3568 EVB1 开发板。

各芯片 **feature** 支持状态

芯片名称	内核版本
RK3568/RK3566	4.19

读者对象

本文档主要适用于以下工程师：

技术支持工程师

软件开发工程师

项目管理人员

测试工程师

修订记录

版本号	作者	修改日期	修改说明
V1.00	赵仪峰	2020-12-21	初始版本

目录

Rockchip_RK3568_Reference_SATA_Performance_CN

1. SATA硬盘测试方法
2. SATA机械硬盘测试性能
 - 2.1 机械硬盘测试环境
 - 2.2 机械硬盘测试数据
 - 2.2.1 1.5G测试数据
 - 2.2.1.1 机械硬盘DD测试
 - 2.2.1.2 机械硬盘FIO测试
 - 2.2.2 3G测试数据
 - 2.2.2.1 机械硬盘DD测试
 - 2.2.2.2 机械硬盘FIO测试
 - 2.2.3 6G测试数据
 - 2.2.3.1 机械硬盘DD测试
 - 2.2.3.2 机械硬盘FIO测试
3. 固态硬盘测试性能
 - 3.1 固态硬盘测试环境
 - 3.2 固态硬盘测试数据
 - 3.2.1 1.5G测试数据
 - 3.2.1.1 固态硬盘DD测试
 - 3.2.1.2 固态硬盘FIO测试
 - 3.2.2 3G测试数据
 - 3.2.2.1 固态硬盘DD测试
 - 3.2.2.2 固态硬盘FIO测试
 - 3.2.3 6G测试数据
 - 3.2.3.1 固态硬盘DD测试
 - 3.2.3.2 固态硬盘FIO测试
4. SATA 硬盘测试结论
 - 4.1 机械硬盘性能
 - 4.1.1 DD读写性能
 - 4.1.2 FIO读写性能
 - 4.1.3 1.5G、3.0G 和 6.0G 模式对比
 - 4.1.4 fat32和ext4 文件系统对比
 - 4.2 固态硬盘性能
 - 4.2.1 DD读写性能
 - 4.2.2 FIO读写性能
 - 4.2.3 1.5G、3.0G 和 6.0G 模式对比
 - 4.2.4 fat32和ext4 文件系统对比
5. 测试原始数据
 - 5.1 6G 固态FIO RAW写
 - 5.2 6G 固态FIO RAW读
 - 5.3 6G 固态FIO RAW读写
 - 5.4 6G 固态FIO EXT4写
 - 5.5 6G 固态FIO EXT4读
 - 5.6 6G 固态FIO EXT4读写
 - 5.7 3G 固态FIO RAW写
 - 5.8 3G 固态FIO RAW读
 - 5.9 3G 固态FIO RAW读写
 - 5.10 3G 固态FIO EXT4写
 - 5.11 3G 固态FIO EXT4读
 - 5.12 3G 固态FIO EXT4读写
 - 5.13 1.5G 固态FIO RAW写
 - 5.14 1.5G 固态FIO RAW读
 - 5.15 1.5G 固态FIO RAW读写
 - 5.16 1.5G 固态FIO EXT4写
 - 5.17 1.5G 固态FIO EXT4读

5.18 1.5G 固态FIO EXT4读写
5.19 6G 机械FIO RAW写
5.20 6G 机械FIO RAW读
5.21 6G 机械FIO RAW读写
5.22 6G 机械FIO EXT4写
5.23 6G 机械FIO EXT4读
5.24 6G 机械FIO EXT4读写
5.25 3G 机械FIO RAW写
5.26 3G 机械FIO RAW读
5.27 3G 机械FIO RAW读写
5.28 3G 机械FIO EXT4写
5.29 3G 机械FIO EXT4读
5.30 3G 机械FIO EXT4读写
5.31 1.5G 机械FIO RAW写
5.32 1.5G 机械FIO RAW读
5.33 1.5G 机械FIO RAW读写
5.34 1.5G 机械FIO EXT4写
5.35 1.5G 机械FIO EXT4读
5.36 1.5G 机械FIO EXT4读写

1. SATA硬盘测试方法

固态硬盘每次测试写数据前建议先格式化一下磁盘或者删除测试文件，让固态硬盘恢复写性能，命令如下：

```
mkfs.ext4 /dev/block/sda
rm /mnt/sda/test
```

- **dd 速率统计：** 使用带有速率计算功能的 **dd** 命令进行统计；
- 使用格式化命令进行格式化，如下：

```
mkdosfs -F 32 /dev/block/sda
mkfs.ext4 /dev/block/sda
```

- 挂载硬盘到/mnt/目录， 例如：

```
mkdir /mnt/sda
mount -t vfat /dev/block/sda /mnt/sda
mount -t ext4 /dev/block/sda /mnt/sda
```

- 写速率：

```
dd if=/dev/zero of=/mnt/sda/test bs=1024K count=2048
```

- 读速率：

```
echo 3 > /proc/sys/vm/drop_caches
dd if=/mnt/sda/test of=/dev/null bs=1024K count=2048
```

- **FIO RAW写性能测试：**

```
fio -filename=/dev/block/sda -direct=1 -iodepth 1 -thread -rw=write -
ioengine=psync -bs=1024k -size=10G -numjobs=10 -runtime=180 -group_reporting
-name=seq_100write_1024k
```

- **FIO 写性能测试：**

```
fio -filename=/mnt/sda/test -direct=1 -iodepth 1 -thread -rw=write -
ioengine=psync -bs=1024k -size=10G -numjobs=10 -runtime=180 -group_reporting
-name=seq_100write_1024k
```

- **FIO RAW读性能测试：**

```
fio -filename=/dev/block/sda -direct=1 -iodepth 1 -thread -rw=read -
ioengine=psync -bs=1024k -size=10G -numjobs=10 -runtime=180 -group_reporting
-name=seq_100read_1024k
```

- FIO 读性能测试:

```
fio -filename=/mnt/sda/test -direct=1 -iodepth 1 -thread -rw=read -  
ioengine=psync -bs=1024k -size=10G -numjobs=10 -runtime=180 -group_reporting  
-name=seq_100read_1024k
```

- FIO RAW读写性能测试:

```
fio -filename=/dev/block/sda -direct=1 -iodepth 1 -thread -rw=randrw -  
rwmixread=70 -ioengine=psync -bs=128k -size=30G -numjobs=10 -runtime=180 -  
group_reporting -name=randrw_70read_128k
```

- FIO 读写性能测试:

```
fio -filename=/mnt/sda/test -direct=1 -iodepth 1 -thread -rw=randrw -  
rwmixread=70 -ioengine=psync -bs=128k -size=30G -numjobs=10 -runtime=180 -  
group_reporting -name=randrw_70read_128k
```

- 1.5G、3.0G 和 6.0G 速率配置:

```
6G: io -w -4 0xfdc50000 0x33302220  
3G: io -w -4 0xfdc50000 0x33301110  
1.5G: io -w -4 0xfdc50000 0x33300000
```

2. SATA机械硬盘测试性能

2.1 机械硬盘测试环境

型号	品牌	容量	模式	备注
WD10EZEX	WD	1TB	SATA1.0&2.0&3.0	64MB 缓存, 蓝 盘

2.2 机械硬盘测试数据

注: 由于FIO测试命令采用10个线程读写同一个文件, 部分读取会直接从硬盘内部缓存返回, 读速度比单线读取要快很多。写数据时多线程会比单线程慢一点。

2.2.1 1.5G测试数据

2.2.1.1 机械硬盘DD测试

测试项	FAT32	EXT4
DD写	79MB/S	130MB/S
DD读	135MB/S	117MB/S

2.2.1.2 机械硬盘FIO测试

测试项	RAW	EXT4
FIO写	118MB/S	91.2MB/S
FIO读	143MB/S	138MB/S
FIO读写	R:19.2MB/S W:8523KB/S	R:11.1MB/S W:4715KB/S

2.2.2 3G测试数据

2.2.2.1 机械硬盘DD测试

测试项	FAT32	EXT4
DD写	98MB/S	174MB/S
DD读	186MB/S	176MB/S

2.2.2.2 机械硬盘FIO测试

测试项	RAW	EXT4
FIO写	193MB/S	163MB/S
FIO读	276MB/S	262MB/S
FIO读写	R:20.3MB/S W:8601KB/S	R:12.7MB/S W:5447KB/S

2.2.3 6G测试数据

2.2.3.1 机械硬盘DD测试

测试项	FAT32	EXT4
DD写	102MB/S	176MB/S
DD读	187MB/S	177MB/S

2.2.3.2 机械硬盘FIO测试

测试项	RAW	EXT4
FIO写	238MB/S	188MB/S
FIO读	451MB/S	463MB/S
FIO读写	R:19.3MB/S W:8567KB/S	R:11.7MB/S W:4967KB/S

3. 固态硬盘测试性能

3.1 固态硬盘测试环境

型号	品牌	容量	模式	备注
SC001	长江存储	256GB	SATA1.0&2.0&3.0	FW: YM013200

3.2 固态硬盘测试数据

3.2.1 1.5G测试数据

3.2.1.1 固态硬盘DD测试

测试项	FAT32	EXT4
DD写	83MB/S	135MB/S
DD读	135MB/S	129MB/S

3.2.1.2 固态硬盘FIO测试

测试项	RAW	EXT4
FIO写	132MB/S	110MB/S
FIO读	142MB/S	142MB/S
FIO读写	R:95.1MB/S W:41.2MB/S	R:72.1MB/S W:30.8MB/S

3.2.2 3G测试数据

3.2.2.1 固态硬盘DD测试

测试项	FAT32	EXT4
DD写	122MB/S	251MB/S
DD读	267MB/S	257MB/S

3.2.2.2 固态硬盘FIO测试

测试项	RAW	EXT4
FIO写	257MB/S	197MB/S
FIO读	284MB/S	284MB/S
FIO读写	R:189MB/S W:81.2MB/S	R: 121MB/S W:57MB/S

3.2.3 6G测试数据

3.2.3.1 固态硬盘DD测试

测试项	FAT32	EXT4
DD写	162MB/S	287MB/S
DD读	403MB/S	443MB/S

3.2.3.2 固态硬盘FIO测试

测试项	RAW	EXT4
FIO写	378MB/s	313MB/S
FIO读	567MB/s	547MB/S
FIO读写	R: 339MB/S W:145MB/S	R:175MB/S W:74.9MB/S

4. SATA 硬盘测试结论

4.1 机械硬盘性能

测试了型号为 WD10EZEX 的一款 1TB SATA 机械硬盘在 fat32和ext4 文件系统下DD读写性能，以及ext4 文件系统和无文件系统下FIO的读写性能。

4.1.1 DD读写性能

FAT32文件系统下，读速率在1.5Gbps模式可以达到135MB/S， 3.0Gbps 和 6.0Gbps 模式下可达到186MB/s。

EXT4文件系统下，写速率在1.5Gbps模式可以达到130MB/S， 3.0Gbps 和 6.0Gbps 模式下可达到174MB/s。

1.5Gbps模式时速率接近接口速率，3.0Gbps 和 6.0Gbps 模式时速率接近硬盘最高速率。

4.1.2 FIO读写性能

多线程读时，在6Gbps模式下读可以达到451MB/S,超过了机械硬盘实际速率，通过协议分析仪抓取数据，确定是多线程读取同一个文件，大部分读会命中硬盘的缓存。

多线程写时，在6Gbps模式下读可以达到180MB/S, 接近硬盘写性能。

多线程读写并发时，读写性能下降非常多，符合机械硬盘特性。详情可以参考测试原始数据。

4.1.3 1.5G、3.0G 和 6.0G 模式对比

6.0Gbps、3.0Gbps、1.5Gbps 的性能依次降低，但是写速率差别不是很显著，读速率 3.0Gbps 和 6.0Gbps 模式下显著高于 1.5Gbps。

4.1.4 fat32和ext4 文件系统对比

从整体来看，写性能在 ext4文件系统下显著高于 fat32，读性能相差不大。

4.2 固态硬盘性能

测试了型号为 SC001的一款 256GB SATA 固态硬盘（64层3D TLC）在 fat32和ext4 文件系统下DD读写性能，以及ext4文件系统和无文件系统下FIO的读写性能。

4.2.1 DD读写性能

FAT32文件系统下，读速率在1.5Gbps模式可以达到135MB/S， 3.0Gbps模式下可达到 267MB/s， 6.0Gbps 模式下可以达到407MB/S。

EXT4文件系统下，写速率在1.5Gbps模式可以达到135MB/S， 3.0Gbps模式下可达到 251MB/s， 6.0Gbps 模式下可以达到287MB/S。

1.5Gbps和3.0Gbps模式时速率接近接口速率，6.0Gbps 模式时速率接近硬盘单线程最高速率。

4.2.2 FIO读写性能

RAW模式下读写性能比EXT4文件系统要好一点，多线程读时，在6Gbps模式下读可以达到567MB/S,接近接口速率。

多线程写时，在6Gbps模式下读可以达到378MB/S, 接近硬盘写性能。在3Gbps和1.5Gbps模式下，速率接近接口速率。

多线程读写时，在EXT4文件系统下，读写性能下降比较多，原因是文件系统小数据读写增加。无文件系统下读写速度加起来接近接口速率。

4.2.3 1.5G、3.0G 和 6.0G 模式对比

从整体来看，1.5Gbps和3.0Gbps模式下读写性能都接近接口速率，6.0Gbps 的读写性能显著优于1.5Gbps和3.0Gbps模式性能。

4.2.4 fat32和ext4 文件系统对比

从整体来看，写性能在 ext4文件系统下显著高于 fat32，读性能相差不大。

5. 测试原始数据

5.1 6G 固态FIO RAW写

```
seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=1874: Tue Nov 24 18:01:16
2020
write: IOPS=360, BW=361MiB/s (378MB/s) (63.4GiB/180053msec)
  clat (msec): min=6, max=499, avg=27.40, stdev=23.79
    lat (msec): min=6, max=499, avg=27.69, stdev=23.79
  clat percentiles (msec):
    | 1.00th=[ 20], 5.00th=[ 20], 10.00th=[ 20], 20.00th=[ 20],
    | 30.00th=[ 20], 40.00th=[ 20], 50.00th=[ 20], 60.00th=[ 20],
    | 70.00th=[ 20], 80.00th=[ 20], 90.00th=[ 58], 95.00th=[ 59],
    | 99.00th=[ 61], 99.50th=[ 89], 99.90th=[ 306], 99.95th=[ 338],
    | 99.99th=[ 498]
  bw ( KiB/s): min= 4104, max=54113, per=0.01%, avg=37206.85, stdev=15908.21
    lat (msec) : 10=0.01%, 20=80.55%, 50=2.84%, 100=16.19%, 250=0.03%
    lat (msec) : 500=0.38%
  cpu           : usr=1.09%, sys=0.98%, ctx=68607, majf=0, minf=0
  IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
    submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued rwts: total=0,64943,0, short=0,0,0, dropped=0,0,0
    latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  WRITE: bw=361MiB/s (378MB/s), 361MiB/s-361MiB/s (378MB/s-378MB/s), io=63.4GiB
(68.1GB), run=180053-180053msec
```

```
Disk stats (read/write):
sda: ios=0/64908, merge=0/0, ticks=0/1759057, in_queue=1757523, util=100.00%
```

5.2 6G 固态FIO RAW读

```
seq_100read_1024k: (g=0): rw=read, bs=(R) 1024KiB-1024KiB, (W) 1024KiB-1024KiB,
(T) 1024KiB-1024KiB, ioengine=psync, iodepth=1
...
fio-2.20
Starting 10 threads
Jobs: 10 (f=10): [R(10)][100.0%][r=541MiB/s,w=0KiB/s][r=541,w=0 IOPS][eta
00m:00s]
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=1795: Tue Nov 24 17:37:13
2020
    read: IOPS=540, BW=541MiB/s (567MB/s) (31.7GiB/60018msec)
        clat (usec): min=16345, max=27735, avg=18463.75, stdev=102.66
            lat (usec): min=16348, max=27737, avg=18466.33, stdev=102.57
        clat percentiles (usec):
            | 1.00th=[18304], 5.00th=[18304], 10.00th=[18304], 20.00th=[18304],
            | 30.00th=[18560], 40.00th=[18560], 50.00th=[18560], 60.00th=[18560],
            | 70.00th=[18560], 80.00th=[18560], 90.00th=[18560], 95.00th=[18560],
            | 99.00th=[18560], 99.50th=[18560], 99.90th=[18816], 99.95th=[18816],
            | 99.99th=[23936]
        bw ( KiB/s): min=53354, max=58040, per=0.01%, avg=55715.52, stdev=505.47
            lat (msec) : 20=99.97%, 50=0.03%
    cpu           : usr=0.19%, sys=1.69%, ctx=68267, majf=0, minf=2560
    IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
        submit    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
        complete  : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
        issued rw: total=32450,0,0, short=0,0,0, dropped=0,0,0
        latency   : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
    READ: bw=541MiB/s (567MB/s), 541MiB/s-541MiB/s (567MB/s-567MB/s), io=31.7GiB
(34.0GB), run=60018-60018msec

Disk stats (read/write):
sda: ios=35595/0, merge=0/0, ticks=642173/0, in_queue=635899, util=100.00%
```

5.3 6G 固态FIO RAW读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=2159: Tue Nov 24 21:58:19
2020
    read: IOPS=2589, BW=324MiB/s (339MB/s) (56.9GiB/180003msec)
        clat (usec): min=602, max=188853, avg=1267.86, stdev=937.61
            lat (usec): min=605, max=188854, avg=1269.76, stdev=937.65
        clat percentiles (usec):
            | 1.00th=[ 684], 5.00th=[ 732], 10.00th=[ 900], 20.00th=[ 932],
            | 30.00th=[ 980], 40.00th=[ 1096], 50.00th=[ 1176], 60.00th=[ 1256],
            | 70.00th=[ 1368], 80.00th=[ 1496], 90.00th=[ 1704], 95.00th=[ 1896],
            | 99.00th=[ 4048], 99.50th=[ 4640], 99.90th=[ 5728], 99.95th=[ 6816],
```

```

    | 99.99th=[21376]
bw ( KiB/s): min=16128, max=49250, per=0.01%, avg=33222.29, stdev=3878.80
write: IOPS=1109, BW=139MiB/s (145MB/s) (24.4GiB/180003msec)
  clat (usec): min=496, max=196193, avg=5944.85, stdev=2379.55
    lat (usec): min=520, max=196229, avg=5974.87, stdev=2379.22
  clat percentiles (usec):
    | 1.00th=[ 2800], 5.00th=[ 3408], 10.00th=[ 3792], 20.00th=[ 4320],
    | 30.00th=[ 4768], 40.00th=[ 5216], 50.00th=[ 5664], 60.00th=[ 6112],
    | 70.00th=[ 6624], 80.00th=[ 7328], 90.00th=[ 8384], 95.00th=[ 9280],
    | 99.00th=[11456], 99.50th=[12608], 99.90th=[24960], 99.95th=[26496],
    | 99.99th=[29568]
bw ( KiB/s): min= 7951, max=17255, per=0.01%, avg=14234.57, stdev=963.78
  lat (usec) : 500=0.01%, 750=4.07%, 1000=18.99%
  lat (msec) : 2=44.47%, 4=5.78%, 10=25.78%, 20=0.82%, 50=0.08%
  lat (msec) : 250=0.01%
cpu          : usr=1.28%, sys=3.73%, ctx=1119108, majf=0, minf=0
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
  submit     : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  complete   : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued rwt: total=466133,199726,0, short=0,0,0, dropped=0,0,0
  latency    : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=324MiB/s (339MB/s), 324MiB/s-324MiB/s (339MB/s-339MB/s), io=56.9GiB
(61.1GB), run=180003-180003msec
  WRITE: bw=139MiB/s (145MB/s), 139MiB/s-139MiB/s (145MB/s-145MB/s), io=24.4GiB
(26.2GB), run=180003-180003msec

Disk stats (read/write):
  sda: ios=465784/199535, merge=0/0, ticks=550694/1168569, in_queue=1691665,
util=100.00%

```

5.4 6G 固态FIO EXT4写

```

seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=2258: Tue Nov 24 22:40:13
2020
write: IOPS=298, BW=298MiB/s (313MB/s) (52.4GiB/180053msec)
  clat (msec): min=2, max=663, avg=33.19, stdev=17.39
    lat (msec): min=3, max=663, avg=33.49, stdev=17.39
  clat percentiles (msec):
    | 1.00th=[  28], 5.00th=[  30], 10.00th=[  31], 20.00th=[  31],
    | 30.00th=[  31], 40.00th=[  31], 50.00th=[  31], 60.00th=[  31],
    | 70.00th=[  31], 80.00th=[  33], 90.00th=[  34], 95.00th=[  46],
    | 99.00th=[  71], 99.50th=[ 196], 99.90th=[ 258], 99.95th=[ 281],
    | 99.99th=[ 660]
bw ( KiB/s): min= 2052, max=36937, per=0.01%, avg=30764.35, stdev=4778.12
  lat (msec) : 4=0.05%, 10=0.01%, 20=0.01%, 50=95.77%, 100=3.52%
  lat (msec) : 250=0.53%, 500=0.09%, 750=0.02%
cpu          : usr=0.75%, sys=4.72%, ctx=109396, majf=0, minf=3
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
  submit     : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  complete   : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued rwt: total=0,53699,0, short=0,0,0, dropped=0,0,0
  latency    : target=0, window=0, percentile=100.00%, depth=1

```

```
Run status group 0 (all jobs):
  WRITE: bw=298MiB/s (313MB/s), 298MiB/s-298MiB/s (313MB/s-313MB/s), io=52.4GiB
(56.3GB), run=180053-180053msec

Disk stats (read/write):
  sda: ios=1/63043, merge=0/268, ticks=1/189794, in_queue=192985, util=84.22%
```

5.5 6G 固态FIO EXT4读

```
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=2284: Tue Nov 24 22:47:02
2020
  read: IOPS=521, BW=521MiB/s (547MB/s) (91.7GiB/180019msec)
    clat (msec): min=6, max=767, avg=19.15, stdev= 8.45
    lat (msec): min=6, max=767, avg=19.15, stdev= 8.45
    clat percentiles (msec):
      | 1.00th=[ 19], 5.00th=[ 19], 10.00th=[ 19], 20.00th=[ 19],
      | 30.00th=[ 19], 40.00th=[ 19], 50.00th=[ 19], 60.00th=[ 19],
      | 70.00th=[ 19], 80.00th=[ 19], 90.00th=[ 19], 95.00th=[ 20],
      | 99.00th=[ 37], 99.50th=[ 48], 99.90th=[ 65], 99.95th=[ 74],
      | 99.99th=[ 742]
    bw ( KiB/s): min=14336, max=58040, per=0.01%, avg=53712.45, stdev=4266.89
    lat (msec) : 10=0.01%, 20=95.02%, 50=4.53%, 100=0.43%, 250=0.01%
    lat (msec) : 750=0.01%, 1000=0.01%
  cpu           : usr=0.18%, sys=4.25%, ctx=95144, majf=0, minf=2560
  IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
    submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued rwt: total=93858,0,0, short=0,0,0, dropped=0,0,0
    latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=521MiB/s (547MB/s), 521MiB/s-521MiB/s (547MB/s-547MB/s), io=91.7GiB
(98.4GB), run=180019-180019msec

Disk stats (read/write):
  sda: ios=103230/486, merge=5/11, ticks=1915566/84958, in_queue=1976259,
util=100.00%
```

5.6 6G 固态FIO EXT4读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=2314: Tue Nov 24 22:56:26
2020
  read: IOPS=1332, BW=167MiB/s (175MB/s) (29.3GiB/180006msec)
    clat (msec): min=1, max=41, avg= 5.15, stdev= 1.86
    lat (msec): min=1, max=41, avg= 5.15, stdev= 1.86
    clat percentiles (usec):
      | 1.00th=[ 2008], 5.00th=[ 2800], 10.00th=[ 3408], 20.00th=[ 3984],
      | 30.00th=[ 4448], 40.00th=[ 4768], 50.00th=[ 5024], 60.00th=[ 5344],
      | 70.00th=[ 5664], 80.00th=[ 6048], 90.00th=[ 6624], 95.00th=[ 7328],
      | 99.00th=[10176], 99.50th=[11840], 99.90th=[27008], 99.95th=[31872],
      | 99.99th=[37120]
    bw ( KiB/s): min=10773, max=22573, per=0.01%, avg=17081.38, stdev=1432.00
```

```

write: IOPS=571, BW=71.4MiB/s (74.9MB/s) (12.5GiB/180006msec)
  clat (usec): min=485, max=40867, avg=5355.29, stdev=1888.80
    lat (usec): min=515, max=40904, avg=5395.19, stdev=1887.50
  clat percentiles (usec):
    | 1.00th=[ 2672], 5.00th=[ 3344], 10.00th=[ 3824], 20.00th=[ 4256],
    | 30.00th=[ 4640], 40.00th=[ 4960], 50.00th=[ 5216], 60.00th=[ 5472],
    | 70.00th=[ 5792], 80.00th=[ 6176], 90.00th=[ 6688], 95.00th=[ 7584],
    | 99.00th=[10304], 99.50th=[12352], 99.90th=[28288], 99.95th=[33024],
    | 99.99th=[38144]
  bw ( KiB/s): min= 2816, max=11286, per=0.01%, avg=7322.25, stdev=1135.78
    lat (usec) : 500=0.01%, 750=0.18%, 1000=0.04%
    lat (msec) : 2=0.70%, 4=17.46%, 10=80.40%, 20=0.95%, 50=0.27%
  cpu           : usr=0.98%, sys=6.38%, ctx=682432, majf=0, minf=0
  IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
    submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued rwts: total=239797,102799,0, short=0,0,0, dropped=0,0,0
    latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=167MiB/s (175MB/s), 167MiB/s-167MiB/s (175MB/s-175MB/s), io=29.3GiB
(31.4GB), run=180006-180006msec
  WRITE: bw=71.4MiB/s (74.9MB/s), 71.4MiB/s-71.4MiB/s (74.9MB/s-74.9MB/s),
io=12.5GiB (13.5GB), run=180006-180006msec

Disk stats (read/write):
  sda: ios=239570/106858, merge=0/78, ticks=287546/59409, in_queue=331198,
util=75.19%

```

5.7 3G 固态FIO RAW写

```

seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=1724: Tue Nov 24 15:28:01
2020
write: IOPS=245, BW=246MiB/s (257MB/s) (43.2GiB/180036msec)
  clat (msec): min=8, max=409, avg=40.40, stdev=18.29
    lat (msec): min=8, max=409, avg=40.69, stdev=18.29
  clat percentiles (msec):
    | 1.00th=[ 36], 5.00th=[ 36], 10.00th=[ 39], 20.00th=[ 39],
    | 30.00th=[ 39], 40.00th=[ 39], 50.00th=[ 39], 60.00th=[ 39],
    | 70.00th=[ 39], 80.00th=[ 39], 90.00th=[ 40], 95.00th=[ 40],
    | 99.00th=[ 60], 99.50th=[ 128], 99.90th=[ 322], 99.95th=[ 322],
    | 99.99th=[ 338]
  bw ( KiB/s): min= 6193, max=29138, per=0.01%, avg=25342.06, stdev=3108.25
    lat (msec) : 10=0.01%, 20=0.01%, 50=96.71%, 100=2.64%, 250=0.26%
    lat (msec) : 500=0.38%
  cpu           : usr=0.73%, sys=0.96%, ctx=46661, majf=0, minf=3
  IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
    submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued rwts: total=0,44207,0, short=0,0,0, dropped=0,0,0
    latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  WRITE: bw=246MiB/s (257MB/s), 246MiB/s-246MiB/s (257MB/s-257MB/s), io=43.2GiB
(46.4GB), run=180036-180036msec

```

```
Disk stats (read/write):
sda: ios=0/52957, merge=0/0, ticks=0/2106071, in_queue=2105193, util=100.00%
```

5.8 3G 固态FIO RAW读

```
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=1701: Tue Nov 24 15:25:18
2020
read: IOPS=270, BW=271MiB/s (284MB/s) (47.6GiB/180034msec)
clat (usec): min=20181, max=44303, avg=36903.07, stdev=139.02
lat (usec): min=20183, max=44304, avg=36905.65, stdev=138.95
clat percentiles (usec):
| 1.00th=[36608], 5.00th=[36608], 10.00th=[36608], 20.00th=[37120],
| 30.00th=[37120], 40.00th=[37120], 50.00th=[37120], 60.00th=[37120],
| 70.00th=[37120], 80.00th=[37120], 90.00th=[37120], 95.00th=[37120],
| 99.00th=[37120], 99.50th=[37120], 99.90th=[37120], 99.95th=[37120],
| 99.99th=[38144]
bw ( KiB/s): min=26624, max=29079, per=0.01%, avg=27866.93, stdev=1036.09
lat (msec) : 50=100.00%
cpu          : usr=0.10%, sys=1.02%, ctx=112243, majf=0, minf=2564
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rw: total=48741,0,0, short=0,0,0, dropped=0,0,0
latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
READ: bw=271MiB/s (284MB/s), 271MiB/s-271MiB/s (284MB/s-284MB/s), io=47.6GiB
(51.1GB), run=180034-180034msec

Disk stats (read/write):
sda: ios=63286/0, merge=0/0, ticks=2289137/0, in_queue=2279921, util=100.00%
```

5.9 3G 固态FIO RAW读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=1721: Tue Nov 24 15:33:54
2020
read: IOPS=1445, BW=181MiB/s (189MB/s) (31.8GiB/180005msec)
clat (usec): min=1108, max=31177, avg=1525.27, stdev=421.16
lat (usec): min=1108, max=31179, avg=1527.61, stdev=421.16
clat percentiles (usec):
| 1.00th=[ 1320], 5.00th=[ 1352], 10.00th=[ 1368], 20.00th=[ 1384],
| 30.00th=[ 1384], 40.00th=[ 1400], 50.00th=[ 1416], 60.00th=[ 1416],
| 70.00th=[ 1448], 80.00th=[ 1816], 90.00th=[ 1896], 95.00th=[ 1928],
| 99.00th=[ 2384], 99.50th=[ 3824], 99.90th=[ 4896], 99.95th=[ 5344],
| 99.99th=[16320]
bw ( KiB/s): min= 8464, max=31294, per=0.01%, avg=18547.76, stdev=3244.61
write: IOPS=619, BW=77.4MiB/s (81.2MB/s) (13.6GiB/180005msec)
clat (msec): min=4, max=47, avg=12.46, stdev= 3.57
lat (msec): min=4, max=47, avg=12.50, stdev= 3.57
clat percentiles (usec):
| 1.00th=[ 6240], 5.00th=[ 7648], 10.00th=[ 8256], 20.00th=[ 9536],
```



```

| 30.00th=[10432], 40.00th=[11328], 50.00th=[11968], 60.00th=[12864],
| 70.00th=[13760], 80.00th=[15168], 90.00th=[17024], 95.00th=[18816],
| 99.00th=[22912], 99.50th=[24448], 99.90th=[29568], 99.95th=[32128],
| 99.99th=[38144]
bw ( KiB/s): min= 6168, max= 9490, per=0.01%, avg=7944.42, stdev=491.15
lat (msec) : 2=68.78%, 4=0.91%, 10=8.30%, 20=21.08%, 50=0.92%
cpu          : usr=0.87%, sys=2.60%, ctx=635887, majf=0, minf=0
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit       : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete     : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=260174,111453,0, short=0,0,0, dropped=0,0,0
latency      : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=181MiB/s (189MB/s), 181MiB/s-181MiB/s (189MB/s-189MB/s), io=31.8GiB
(34.1GB), run=180005-180005msec
  WRITE: bw=77.4MiB/s (81.2MB/s), 77.4MiB/s-77.4MiB/s (81.2MB/s-81.2MB/s),
io=13.6GiB (14.6GB), run=180005-180005msec

Disk stats (read/write):
  sda: ios=259948/111345, merge=0/0, ticks=369841/1375732, in_queue=1725902,
util=100.00%

```

5.10 3G 固态FIO EXT4写

```

seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=1764: Tue Nov 24 15:49:43
2020
write: IOPS=187, BW=188MiB/s (197MB/s) (33.0GiB/180050msec)
  clat (msec): min=4, max=654, avg=52.85, stdev=18.20
  lat (msec): min=4, max=655, avg=53.17, stdev=18.20
  clat percentiles (msec):
    | 1.00th=[ 48], 5.00th=[ 50], 10.00th=[ 50], 20.00th=[ 50],
    | 30.00th=[ 50], 40.00th=[ 50], 50.00th=[ 50], 60.00th=[ 50],
    | 70.00th=[ 50], 80.00th=[ 57], 90.00th=[ 57], 95.00th=[ 58],
    | 99.00th=[ 72], 99.50th=[ 200], 99.90th=[ 326], 99.95th=[ 347],
    | 99.99th=[ 652]
  bw ( KiB/s): min= 2052, max=27002, per=0.01%, avg=19407.14, stdev=2083.78
  lat (msec) : 10=0.07%, 20=0.01%, 50=70.37%, 100=28.93%, 250=0.41%
  lat (msec) : 500=0.18%, 750=0.03%
  cpu          : usr=1.04%, sys=2.36%, ctx=69291, majf=0, minf=3
  IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
  submit       : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  complete     : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued rwt: total=0,33834,0, short=0,0,0, dropped=0,0,0
  latency      : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  WRITE: bw=188MiB/s (197MB/s), 188MiB/s-188MiB/s (197MB/s-197MB/s), io=33.0GiB
(35.5GB), run=180050-180050msec

Disk stats (read/write):
  sda: ios=1/40436, merge=0/244, ticks=1/204040, in_queue=192872, util=82.95%

```

5.11 3G 固态FIO EXT4读

```
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=1797: Tue Nov 24 16:08:02
2020
  read: IOPS=270, BW=271MiB/s (284MB/s) (47.6GiB/180035msec)
    clat (usec): min=18046, max=57894, avg=36882.02, stdev=309.35
    lat (usec): min=18049, max=57897, avg=36884.77, stdev=309.32
    clat percentiles (usec):
      | 1.00th=[36608], 5.00th=[36608], 10.00th=[36608], 20.00th=[37120],
      | 30.00th=[37120], 40.00th=[37120], 50.00th=[37120], 60.00th=[37120],
      | 70.00th=[37120], 80.00th=[37120], 90.00th=[37120], 95.00th=[37120],
      | 99.00th=[37120], 99.50th=[37120], 99.90th=[37120], 99.95th=[37632],
      | 99.99th=[54016]
    bw ( KiB/s): min=26624, max=28787, per=0.01%, avg=27804.70, stdev=1022.87
    lat (msec) : 20=0.01%, 50=99.98%, 100=0.01%
  cpu           : usr=0.11%, sys=2.26%, ctx=49150, majf=0, minf=2560
  IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
    submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued rwts: total=48769,0,0, short=0,0,0, dropped=0,0,0
    latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=271MiB/s (284MB/s), 271MiB/s-271MiB/s (284MB/s-284MB/s), io=47.6GiB
(51.1GB), run=180035-180035msec

Disk stats (read/write):
  sda: ios=48745/8, merge=0/1, ticks=1771129/824, in_queue=1761614, util=100.00%
```

5.12 3G 固态FIO EXT4读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=1866: Tue Nov 24 16:39:27
2020
  read: IOPS=919, BW=115MiB/s (121MB/s) (20.2GiB/180009msec)
    clat (usec): min=936, max=47371, avg=7464.51, stdev=2302.38
    lat (usec): min=939, max=47374, avg=7467.06, stdev=2302.40
    clat percentiles (usec):
      | 1.00th=[ 3184], 5.00th=[ 4640], 10.00th=[ 5536], 20.00th=[ 6176],
      | 30.00th=[ 6624], 40.00th=[ 6944], 50.00th=[ 7264], 60.00th=[ 7648],
      | 70.00th=[ 7968], 80.00th=[ 8384], 90.00th=[ 9024], 95.00th=[10304],
      | 99.00th=[15936], 99.50th=[17024], 99.90th=[30848], 99.95th=[35072],
      | 99.99th=[42752]
    bw ( KiB/s): min= 7182, max=15421, per=0.01%, avg=11792.56, stdev=1079.07
  write: IOPS=394, BW=49.3MiB/s (51.7MB/s) (8879MiB/180009msec)
    clat (usec): min=683, max=46903, avg=7791.02, stdev=2291.15
    lat (usec): min=707, max=46939, avg=7828.04, stdev=2291.56
    clat percentiles (usec):
      | 1.00th=[ 5088], 5.00th=[ 5600], 10.00th=[ 6112], 20.00th=[ 6560],
      | 30.00th=[ 6944], 40.00th=[ 7200], 50.00th=[ 7520], 60.00th=[ 7712],
      | 70.00th=[ 8096], 80.00th=[ 8384], 90.00th=[ 9024], 95.00th=[11072],
      | 99.00th=[16064], 99.50th=[17280], 99.90th=[34048], 99.95th=[38656],
      | 99.99th=[44800]
    bw ( KiB/s): min= 1285, max= 8481, per=0.01%, avg=5057.83, stdev=949.29
```

```

lat (usec) : 750=0.01%, 1000=0.05%
lat (msec) : 2=0.07%, 4=1.30%, 10=93.07%, 20=5.20%, 50=0.32%
cpu        : usr=0.78%, sys=4.42%, ctx=471975, majf=0, minf=0
IO depths  : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit     : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete   : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=165608,71031,0, short=0,0,0, dropped=0,0,0
latency    : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=115MiB/s (121MB/s), 115MiB/s-115MiB/s (121MB/s-121MB/s), io=20.2GiB
(21.7GB), run=180009-180009msec
  WRITE: bw=49.3MiB/s (51.7MB/s), 49.3MiB/s-49.3MiB/s (51.7MB/s-51.7MB/s),
io=8879MiB (9310MB), run=180009-180009msec

Disk stats (read/write):
  sda: ios=165541/74271, merge=0/76, ticks=307094/72751, in_queue=357032,
util=78.18%

```

5.13 1.5G 固态FIO RAW写

```

seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=1906: Tue Nov 24 16:58:14
2020
write: IOPS=125, BW=126MiB/s (132MB/s) (22.1GiB/180072msec)
  clat (msec): min=23, max=553, avg=79.24, stdev=21.42
  lat (msec): min=23, max=553, avg=79.52, stdev=21.42
  clat percentiles (msec):
    | 1.00th=[ 63], 5.00th=[ 71], 10.00th=[ 71], 20.00th=[ 78],
    | 30.00th=[ 78], 40.00th=[ 79], 50.00th=[ 79], 60.00th=[ 79],
    | 70.00th=[ 79], 80.00th=[ 79], 90.00th=[ 79], 95.00th=[ 86],
    | 99.00th=[ 98], 99.50th=[ 258], 99.90th=[ 359], 99.95th=[ 367],
    | 99.99th=[ 537]
  bw ( KiB/s): min= 2072, max=16616, per=0.01%, avg=12944.93, stdev=1602.08
  lat (msec) : 50=0.48%, 100=98.62%, 250=0.14%, 500=0.75%, 750=0.01%
cpu        : usr=0.38%, sys=0.39%, ctx=23915, majf=0, minf=3
IO depths  : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit     : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete   : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=0,22630,0, short=0,0,0, dropped=0,0,0
latency    : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  WRITE: bw=126MiB/s (132MB/s), 126MiB/s-126MiB/s (132MB/s-132MB/s), io=22.1GiB
(23.7GB), run=180072-180072msec

Disk stats (read/write):
  sda: ios=0/22629, merge=0/0, ticks=0/1785919, in_queue=1785792, util=100.00%

```

5.14 1.5G 固态FIO RAW读

```
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=1926: Tue Nov 24 17:02:55
2020
read: IOPS=135, BW=136MiB/s (142MB/s) (23.8GiB/180069msec)
  clat (msec): min=22, max=287, avg=73.70, stdev= 8.79
    lat (msec): min=22, max=287, avg=73.70, stdev= 8.79
  clat percentiles (msec):
    | 1.00th=[ 60], 5.00th=[ 67], 10.00th=[ 74], 20.00th=[ 74],
    | 30.00th=[ 74], 40.00th=[ 74], 50.00th=[ 74], 60.00th=[ 74],
    | 70.00th=[ 74], 80.00th=[ 75], 90.00th=[ 75], 95.00th=[ 75],
    | 99.00th=[ 82], 99.50th=[ 82], 99.90th=[ 260], 99.95th=[ 273],
    | 99.99th=[ 289]
  bw ( KiB/s): min= 6168, max=16616, per=0.01%, avg=13960.30, stdev=1047.08
    lat (msec) : 50=0.25%, 100=99.50%, 250=0.12%, 500=0.13%
cpu           : usr=0.05%, sys=0.49%, ctx=48939, majf=0, minf=2560
IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
  submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued rwts: total=24419,0,0, short=0,0,0, dropped=0,0,0
  latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=136MiB/s (142MB/s), 136MiB/s-136MiB/s (142MB/s-142MB/s), io=23.8GiB
(25.6GB), run=180069-180069msec

Disk stats (read/write):
  sda: ios=24385/0, merge=0/0, ticks=1787374/0, in_queue=1783850, util=100.00%
```

5.15 1.5G 固态FIO RAW读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=1942: Tue Nov 24 17:07:04
2020
read: IOPS=731, BW=91.5MiB/s (95.9MB/s) (16.1GiB/180010msec)
  clat (msec): min=2, max=52, avg= 8.33, stdev= 2.94
    lat (msec): min=2, max=52, avg= 8.33, stdev= 2.94
  clat percentiles (usec):
    | 1.00th=[ 4704], 5.00th=[ 5728], 10.00th=[ 6560], 20.00th=[ 7456],
    | 30.00th=[ 7520], 40.00th=[ 7584], 50.00th=[ 8384], 60.00th=[ 8512],
    | 70.00th=[ 8512], 80.00th=[ 8640], 90.00th=[ 9536], 95.00th=[10432],
    | 99.00th=[27520], 99.50th=[29568], 99.90th=[33024], 99.95th=[34048],
    | 99.99th=[42240]
  bw ( KiB/s): min= 3591, max=14592, per=0.01%, avg=9377.67, stdev=1486.42
write: IOPS=314, BW=39.3MiB/s (41.2MB/s) (7069MiB/180010msec)
  clat (msec): min=1, max=55, avg=12.29, stdev= 4.42
    lat (msec): min=1, max=55, avg=12.33, stdev= 4.42
  clat percentiles (usec):
    | 1.00th=[ 5600], 5.00th=[ 8384], 10.00th=[ 8512], 20.00th=[ 9408],
    | 30.00th=[ 9664], 40.00th=[10432], 50.00th=[11328], 60.00th=[12224],
    | 70.00th=[13120], 80.00th=[14272], 90.00th=[17024], 95.00th=[19840],
    | 99.00th=[31360], 99.50th=[34048], 99.90th=[39680], 99.95th=[42752],
    | 99.99th=[48384]
  bw ( KiB/s): min= 1282, max= 7182, per=0.01%, avg=4024.96, stdev=830.57
```

```

    lat (msec) : 2=0.04%, 4=0.36%, 10=74.25%, 20=22.65%, 50=2.70%
    lat (msec) : 100=0.01%
cpu      : usr=0.43%, sys=1.28%, ctx=322893, majf=0, minf=0
IO depths : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
    submit  : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    complete : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued rwt: total=131754,56549,0, short=0,0,0, dropped=0,0,0
    latency  : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
    READ: bw=91.5MiB/s (95.9MB/s), 91.5MiB/s-91.5MiB/s (95.9MB/s-95.9MB/s),
io=16.1GiB (17.3GB), run=180010-180010msec
    WRITE: bw=39.3MiB/s (41.2MB/s), 39.3MiB/s-39.3MiB/s (41.2MB/s-41.2MB/s),
io=7069MiB (7412MB), run=180010-180010msec

Disk stats (read/write):
    sda: ios=131642/56496, merge=0/0, ticks=1080048/687574, in_queue=1757585,
util=100.00%

```

5.16 1.5G 固态FIO EXT4写

```

seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=1993: Tue Nov 24 17:26:43
2020
write: IOPS=104, BW=104MiB/s (110MB/s) (18.4GiB/180081msec)
    clat (msec): min=8, max=492, avg=95.33, stdev=19.82
    lat (msec): min=8, max=492, avg=95.66, stdev=19.82
    clat percentiles (msec):
        | 1.00th=[ 88], 5.00th=[ 90], 10.00th=[ 90], 20.00th=[ 90],
        | 30.00th=[ 90], 40.00th=[ 90], 50.00th=[ 90], 60.00th=[ 90],
        | 70.00th=[ 103], 80.00th=[ 104], 90.00th=[ 104], 95.00th=[ 104],
        | 99.00th=[ 119], 99.50th=[ 124], 99.90th=[ 445], 99.95th=[ 478],
        | 99.99th=[ 494]
    bw ( KiB/s): min= 4104, max=14539, per=0.01%, avg=10772.55, stdev=1206.94
    lat (msec) : 10=0.06%, 50=0.03%, 100=68.38%, 250=31.16%, 500=0.37%
cpu      : usr=0.59%, sys=1.39%, ctx=38861, majf=0, minf=2
IO depths : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
    submit  : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    complete : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued rwt: total=0,18815,0, short=0,0,0, dropped=0,0,0
    latency  : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
    WRITE: bw=104MiB/s (110MB/s), 104MiB/s-104MiB/s (110MB/s-110MB/s), io=18.4GiB
(19.7GB), run=180081-180081msec

Disk stats (read/write):
    sda: ios=1/21167, merge=0/221, ticks=12/204862, in_queue=199912, util=90.91%

```

5.17 1.5G 固态FIO EXT4读

```
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=2024: Tue Nov 24 17:46:28
2020
read: IOPS=135, BW=136MiB/s (142MB/s) (23.8GiB/180067msec)
  clat (msec): min=21, max=294, avg=73.70, stdev=14.09
  lat (msec): min=21, max=294, avg=73.70, stdev=14.09
  clat percentiles (msec):
    | 1.00th=[ 60], 5.00th=[ 67], 10.00th=[ 67], 20.00th=[ 74],
    | 30.00th=[ 74], 40.00th=[ 74], 50.00th=[ 74], 60.00th=[ 74],
    | 70.00th=[ 74], 80.00th=[ 75], 90.00th=[ 75], 95.00th=[ 75],
    | 99.00th=[ 82], 99.50th=[ 237], 99.90th=[ 260], 99.95th=[ 273],
    | 99.99th=[ 273]
  bw ( KiB/s): min= 6168, max=18468, per=0.01%, avg=13981.93, stdev=1298.81
  lat (msec) : 50=0.38%, 100=98.94%, 250=0.34%, 500=0.34%
cpu           : usr=0.05%, sys=1.15%, ctx=24777, majf=0, minf=2560
IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
  submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued rwts: total=24418,0,0, short=0,0,0, dropped=0,0,0
  latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=136MiB/s (142MB/s), 136MiB/s-136MiB/s (142MB/s-142MB/s), io=23.8GiB
(25.6GB), run=180067-180067msec

Disk stats (read/write):
  sda: ios=24401/12, merge=0/1, ticks=1784470/1085, in_queue=1781073,
util=100.00%
```

5.18 1.5G 固态FIO EXT4读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=2249: Tue Nov 24 21:04:13
2020
read: IOPS=549, BW=68.7MiB/s (72.1MB/s) (12.1GiB/180028msec)
  clat (msec): min=2, max=58, avg=12.57, stdev= 3.81
  lat (msec): min=2, max=58, avg=12.58, stdev= 3.81
  clat percentiles (usec):
    | 1.00th=[ 5536], 5.00th=[ 8512], 10.00th=[ 9920], 20.00th=[10816],
    | 30.00th=[11328], 40.00th=[11840], 50.00th=[12096], 60.00th=[12480],
    | 70.00th=[12864], 80.00th=[13376], 90.00th=[14272], 95.00th=[17280],
    | 99.00th=[28800], 99.50th=[29824], 99.90th=[41728], 99.95th=[43776],
    | 99.99th=[55552]
  bw ( KiB/s): min= 3855, max= 9767, per=0.01%, avg=7054.99, stdev=797.76
write: IOPS=234, BW=29.4MiB/s (30.8MB/s) (5287MiB/180028msec)
  clat (msec): min=1, max=56, avg=12.99, stdev= 3.72
  lat (msec): min=1, max=56, avg=13.03, stdev= 3.72
  clat percentiles (usec):
    | 1.00th=[ 9792], 5.00th=[10432], 10.00th=[10816], 20.00th=[11328],
    | 30.00th=[11712], 40.00th=[11968], 50.00th=[12352], 60.00th=[12480],
    | 70.00th=[12864], 80.00th=[13376], 90.00th=[14016], 95.00th=[18304],
    | 99.00th=[28800], 99.50th=[29568], 99.90th=[42240], 99.95th=[43264],
    | 99.99th=[55040]
```

```

bw ( KiB/s): min= 769, max= 5654, per=0.01%, avg=3014.60, stdev=724.07
lat (msec) : 2=0.04%, 4=0.07%, 10=8.38%, 20=87.10%, 50=4.39%
lat (msec) : 100=0.02%
cpu          : usr=0.40%, sys=2.71%, ctx=282229, majf=0, minf=2
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit       : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete     : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=98969,42292,0, short=0,0,0, dropped=0,0,0
latency      : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=68.7MiB/s (72.1MB/s), 68.7MiB/s-68.7MiB/s (72.1MB/s-72.1MB/s),
io=12.1GiB (12.0GB), run=180028-180028msec
  WRITE: bw=29.4MiB/s (30.8MB/s), 29.4MiB/s-29.4MiB/s (30.8MB/s-30.8MB/s),
io=5287MiB (5543MB), run=180028-180028msec

Disk stats (read/write):
  sda: ios=98936/44649, merge=0/74, ticks=336017/83716, in_queue=410934,
util=88.31%

```

5.19 6G 机械FIO RAW写

```

seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=1685: Tue Nov 24 15:24:39
2020
write: IOPS=226, BW=227MiB/s (238MB/s) (39.8GiB/180037msec)
  clat (msec): min=7, max=6827, avg=43.82, stdev=120.95
  lat (msec): min=8, max=6827, avg=44.11, stdev=120.95
  clat percentiles (msec):
    | 1.00th=[ 21], 5.00th=[ 21], 10.00th=[ 21], 20.00th=[ 21],
    | 30.00th=[ 39], 40.00th=[ 39], 50.00th=[ 39], 60.00th=[ 40],
    | 70.00th=[ 40], 80.00th=[ 40], 90.00th=[ 56], 95.00th=[ 79],
    | 99.00th=[ 176], 99.50th=[ 243], 99.90th=[ 1057], 99.95th=[ 1582],
    | 99.99th=[ 6849]
  bw ( KiB/s): min= 2048, max=41541, per=0.01%, avg=24787.27, stdev=6090.58
  lat (msec) : 10=0.01%, 20=0.29%, 50=89.51%, 100=6.26%, 250=3.45%
  lat (msec) : 500=0.27%, 750=0.05%, 1000=0.03%, 2000=0.12%, >=2000=0.03%
cpu          : usr=0.72%, sys=0.95%, ctx=42976, majf=0, minf=2
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit       : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete     : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=0,40780,0, short=0,0,0, dropped=0,0,0
latency      : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  WRITE: bw=227MiB/s (238MB/s), 227MiB/s-227MiB/s (238MB/s-238MB/s), io=39.8GiB
(42.8GB), run=180037-180037msec

Disk stats (read/write):
  sda: ios=0/52941, merge=0/0, ticks=0/2293956, in_queue=2293911, util=100.00%

```

5.20 6G 机械FIO RAW读

```
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=1770: Tue Nov 24 15:42:48
2020
  read: IOPS=430, BW=431MiB/s (451MB/s) (75.7GiB/180019msec)
    clat (msec): min=2, max=64, avg=23.19, stdev= 6.02
    lat (msec): min=2, max=64, avg=23.20, stdev= 6.02
    clat percentiles (usec):
      | 1.00th=[11456], 5.00th=[18816], 10.00th=[19072], 20.00th=[19072],
      | 30.00th=[19072], 40.00th=[19072], 50.00th=[19328], 60.00th=[23680],
      | 70.00th=[26240], 80.00th=[30080], 90.00th=[31104], 95.00th=[31872],
      | 99.00th=[41216], 99.50th=[44288], 99.90th=[51968], 99.95th=[55040],
      | 99.99th=[60672]
    bw ( KiB/s): min=32768, max=56195, per=0.01%, avg=44230.76, stdev=4049.64
    lat (msec) : 4=0.01%, 10=0.03%, 20=56.78%, 50=43.03%, 100=0.15%
  cpu           : usr=0.15%, sys=1.30%, ctx=162770, majf=0, minf=2560
  IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
    submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued rwts: total=77513,0,0, short=0,0,0, dropped=0,0,0
    latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=431MiB/s (451MB/s), 431MiB/s-431MiB/s (451MB/s-451MB/s), io=75.7GiB
(81.3GB), run=180019-180019msec

Disk stats (read/write):
  sda: ios=85192/0, merge=0/0, ticks=1943514/0, in_queue=1930157, util=99.68%
```

5.21 6G 机械FIO RAW读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=1803: Tue Nov 24 15:58:47
2020
  read: IOPS=154, BW=19.3MiB/s (20.2MB/s) (3467MiB/180082msec)
    clat (msec): min=4, max=751, avg=63.50, stdev=66.70
    lat (msec): min=4, max=751, avg=63.51, stdev=66.70
    clat percentiles (msec):
      | 1.00th=[ 8], 5.00th=[ 10], 10.00th=[ 13], 20.00th=[ 18],
      | 30.00th=[ 24], 40.00th=[ 31], 50.00th=[ 41], 60.00th=[ 53],
      | 70.00th=[ 71], 80.00th=[ 96], 90.00th=[ 147], 95.00th=[ 198],
      | 99.00th=[ 322], 99.50th=[ 375], 99.90th=[ 529], 99.95th=[ 611],
      | 99.99th=[ 709]
    bw ( KiB/s): min= 256, max= 5130, per=0.01%, avg=1981.30, stdev=721.91
  write: IOPS=65, BW=8366KiB/s (8567kB/s) (1471MiB/180082msec)
    clat (usec): min=405, max=452016, avg=3178.54, stdev=4599.31
    lat (usec): min=420, max=452043, avg=3212.31, stdev=4599.72
    clat percentiles (usec):
      | 1.00th=[ 588], 5.00th=[ 604], 10.00th=[ 660], 20.00th=[ 964],
      | 30.00th=[ 1004], 40.00th=[ 2416], 50.00th=[ 3696], 60.00th=[ 4128],
      | 70.00th=[ 4576], 80.00th=[ 4960], 90.00th=[ 5472], 95.00th=[ 5984],
      | 99.00th=[ 7328], 99.50th=[ 8512], 99.90th=[11968], 99.95th=[12096],
      | 99.99th=[12992]
    bw ( KiB/s): min= 256, max= 4360, per=0.01%, avg=931.25, stdev=584.42
```



```

lat (usec) : 500=0.01%, 750=3.36%, 1000=5.39%
lat (msec) : 2=2.90%, 4=5.19%, 10=17.52%, 20=12.70%, 50=23.22%
lat (msec) : 100=16.37%, 250=11.60%, 500=1.63%, 750=0.10%, 1000=0.01%
cpu        : usr=0.09%, sys=0.29%, ctx=66008, majf=0, minf=0
IO depths  : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete  : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=27736,11770,0, short=0,0,0, dropped=0,0,0
latency    : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=19.3MiB/s (20.2MB/s), 19.3MiB/s-19.3MiB/s (20.2MB/s-20.2MB/s),
io=3467MiB (3635MB), run=180082-180082msec
  WRITE: bw=8366KiB/s (8567kB/s), 8366KiB/s-8366KiB/s (8567kB/s-8567kB/s),
io=1471MiB (1543MB), run=180082-180082msec

Disk stats (read/write):
  sda: ios=27707/11763, merge=0/0, ticks=1755482/36079, in_queue=1761213,
util=98.44%

```

5.22 6G 机械FIO EXT4写

```

seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=1840: Tue Nov 24 16:08:16
2020
write: IOPS=179, BW=179MiB/s (188MB/s) (31.5GiB/180064msec)
  clat (msec): min=3, max=189, avg=55.47, stdev=17.47
  lat (msec): min=3, max=189, avg=55.77, stdev=17.47
  clat percentiles (msec):
    | 1.00th=[ 31], 5.00th=[ 32], 10.00th=[ 32], 20.00th=[ 45],
    | 30.00th=[ 47], 40.00th=[ 50], 50.00th=[ 55], 60.00th=[ 56],
    | 70.00th=[ 61], 80.00th=[ 67], 90.00th=[ 77], 95.00th=[ 85],
    | 99.00th=[ 119], 99.50th=[ 130], 99.90th=[ 155], 99.95th=[ 163],
    | 99.99th=[ 178]
  bw ( KiB/s): min=10240, max=26947, per=0.01%, avg=18461.36, stdev=2820.78
  lat (msec) : 4=0.04%, 20=0.02%, 50=40.76%, 100=56.69%, 250=2.49%
cpu        : usr=0.50%, sys=2.80%, ctx=65524, majf=0, minf=3
IO depths  : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete  : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=0,32261,0, short=0,0,0, dropped=0,0,0
latency    : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  WRITE: bw=179MiB/s (188MB/s), 179MiB/s-179MiB/s (188MB/s-188MB/s), io=31.5GiB
(33.8GB), run=180064-180064msec

Disk stats (read/write):
  sda: ios=1/38549, merge=0/243, ticks=11/196614, in_queue=189871, util=87.77%

```

5.23 6G 机械FIO EXT4读

```
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=1858: Tue Nov 24 16:12:50
2020
read: IOPS=441, BW=442MiB/s (463MB/s) (77.7GiB/180024msec)
clat (msec): min=2, max=120, avg=22.60, stdev= 7.44
lat (msec): min=2, max=120, avg=22.60, stdev= 7.44
clat percentiles (msec):
| 1.00th=[ 15], 5.00th=[ 20], 10.00th=[ 20], 20.00th=[ 20],
| 30.00th=[ 20], 40.00th=[ 20], 50.00th=[ 20], 60.00th=[ 20],
| 70.00th=[ 21], 80.00th=[ 25], 90.00th=[ 32], 95.00th=[ 40],
| 99.00th=[ 49], 99.50th=[ 55], 99.90th=[ 76], 99.95th=[ 82],
| 99.99th=[ 103]
bw ( KiB/s): min=28729, max=53461, per=0.01%, avg=45371.18, stdev=4391.10
lat (msec) : 4=0.02%, 10=0.21%, 20=66.16%, 50=32.86%, 100=0.74%
lat (msec) : 250=0.01%
cpu          : usr=0.17%, sys=3.64%, ctx=80690, majf=2, minf=2568
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=79560,0,0, short=0,0,0, dropped=0,0,0
latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=442MiB/s (463MB/s), 442MiB/s-442MiB/s (463MB/s-463MB/s), io=77.7GiB
(83.4GB), run=180024-180024msec

Disk stats (read/write):
sda: ios=87461/2861, merge=0/42, ticks=1921401/67756, in_queue=1956591,
util=99.36%
```

5.24 6G 机械FIO EXT4读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=1883: Tue Nov 24 16:20:06
2020
read: IOPS=89, BW=11.2MiB/s (11.7MB/s) (2008MiB/180056msec)
clat (msec): min=4, max=308, avg=79.74, stdev=38.98
lat (msec): min=4, max=308, avg=79.75, stdev=38.98
clat percentiles (msec):
| 1.00th=[ 14], 5.00th=[ 30], 10.00th=[ 41], 20.00th=[ 51],
| 30.00th=[ 59], 40.00th=[ 67], 50.00th=[ 73], 60.00th=[ 81],
| 70.00th=[ 89], 80.00th=[ 102], 90.00th=[ 130], 95.00th=[ 163],
| 99.00th=[ 210], 99.50th=[ 227], 99.90th=[ 258], 99.95th=[ 269],
| 99.99th=[ 297]
bw ( KiB/s): min= 256, max= 2313, per=0.01%, avg=1146.01, stdev=357.97
write: IOPS=37, BW=4850KiB/s (4967kB/s) (853MiB/180056msec)
clat (usec): min=656, max=307631, avg=75962.42, stdev=32347.37
lat (usec): min=691, max=307652, avg=75999.63, stdev=32347.41
clat percentiles (msec):
| 1.00th=[ 32], 5.00th=[ 43], 10.00th=[ 48], 20.00th=[ 55],
| 30.00th=[ 60], 40.00th=[ 64], 50.00th=[ 70], 60.00th=[ 75],
| 70.00th=[ 81], 80.00th=[ 89], 90.00th=[ 111], 95.00th=[ 151],
| 99.00th=[ 198], 99.50th=[ 217], 99.90th=[ 245], 99.95th=[ 249],
```

```

    | 99.99th=[ 310]
bw ( KiB/s): min= 256, max= 1542, per=0.01%, avg=552.43, stdev=264.13
lat (usec) : 750=0.04%, 1000=0.01%
lat (msec) : 10=0.38%, 20=1.22%, 50=15.49%, 100=64.23%, 250=18.50%
lat (msec) : 500=0.12%
cpu          : usr=0.07%, sys=0.45%, ctx=46120, majf=0, minf=0
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=16063,6823,0, short=0,0,0, dropped=0,0,0
latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=11.2MiB/s (11.7MB/s), 11.2MiB/s-11.2MiB/s (11.7MB/s-11.7MB/s),
io=2008MiB (2105MB), run=180056-180056msec
  WRITE: bw=4850KiB/s (4967kB/s), 4850KiB/s-4850KiB/s (4967kB/s-4967kB/s),
io=853MiB (894MB), run=180056-180056msec

Disk stats (read/write):
  sda: ios=16046/9823, merge=0/76, ticks=458841/35050, in_queue=464929,
util=93.20%

```

5.25 3G 机械FIO RAW写

```

seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=1913: Tue Nov 24 16:33:27
2020
write: IOPS=184, BW=184MiB/s (193MB/s) (32.4GiB/180036msec)
clat (msec): min=4, max=470, avg=53.89, stdev=11.89
lat (msec): min=5, max=470, avg=54.17, stdev=11.89
clat percentiles (msec):
  | 1.00th=[ 39], 5.00th=[ 44], 10.00th=[ 45], 20.00th=[ 45],
  | 30.00th=[ 46], 40.00th=[ 47], 50.00th=[ 55], 60.00th=[ 57],
  | 70.00th=[ 60], 80.00th=[ 64], 90.00th=[ 67], 95.00th=[ 74],
  | 99.00th=[ 75], 99.50th=[ 75], 99.90th=[ 86], 99.95th=[ 104],
  | 99.99th=[ 469]
bw ( KiB/s): min= 4096, max=20770, per=0.01%, avg=18986.94, stdev=1492.77
lat (msec) : 10=0.01%, 20=0.01%, 50=46.60%, 100=53.33%, 250=0.02%
lat (msec) : 500=0.03%
cpu          : usr=0.57%, sys=0.57%, ctx=37035, majf=0, minf=3
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=0,33204,0, short=0,0,0, dropped=0,0,0
latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  WRITE: bw=184MiB/s (193MB/s), 184MiB/s-184MiB/s (193MB/s-193MB/s), io=32.4GiB
(34.8GB), run=180036-180036msec

Disk stats (read/write):
  sda: ios=0/33205, merge=0/895, ticks=0/1777898, in_queue=1746829, util=98.40%

```

5.26 3G 机械FIO RAW读

```
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=1843: Sat Nov 14 02:12:49
2020
  read: IOPS=262, BW=263MiB/s (276MB/s) (46.2GiB/180036msec)
    clat (msec): min=9, max=79, avg=38.01, stdev= 3.31
    lat (msec): min=9, max=79, avg=38.02, stdev= 3.31
    clat percentiles (usec):
      | 1.00th=[36608], 5.00th=[36608], 10.00th=[36608], 20.00th=[36608],
      | 30.00th=[36608], 40.00th=[37120], 50.00th=[37120], 60.00th=[37120],
      | 70.00th=[37120], 80.00th=[37120], 90.00th=[43264], 95.00th=[46848],
      | 99.00th=[47872], 99.50th=[48384], 99.90th=[62720], 99.95th=[70144],
      | 99.99th=[77312]
    bw ( KiB/s): min=20480, max=29079, per=0.01%, avg=27047.76, stdev=1790.16
    lat (msec) : 10=0.01%, 20=0.06%, 50=99.71%, 100=0.22%
  cpu           : usr=0.09%, sys=0.76%, ctx=99482, majf=0, minf=2560
  IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
    submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued rwts: total=47316,0,0, short=0,0,0, dropped=0,0,0
    latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=263MiB/s (276MB/s), 263MiB/s-263MiB/s (276MB/s-276MB/s), io=46.2GiB
(49.6GB), run=180036-180036msec

Disk stats (read/write):
  sda: ios=51994/0, merge=0/0, ticks=1951402/0, in_queue=1948913, util=100.00%
```

5.27 3G 机械FIO RAW读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=1864: Sat Nov 14 02:19:47
2020
  read: IOPS=154, BW=19.3MiB/s (20.3MB/s) (3486MiB/180168msec)
    clat (msec): min=4, max=862, avg=63.07, stdev=64.99
    lat (msec): min=4, max=862, avg=63.08, stdev=64.99
    clat percentiles (msec):
      | 1.00th=[ 8], 5.00th=[ 10], 10.00th=[ 13], 20.00th=[ 18],
      | 30.00th=[ 24], 40.00th=[ 32], 50.00th=[ 41], 60.00th=[ 53],
      | 70.00th=[ 70], 80.00th=[ 95], 90.00th=[ 143], 95.00th=[ 194],
      | 99.00th=[ 318], 99.50th=[ 371], 99.90th=[ 498], 99.95th=[ 545],
      | 99.99th=[ 619]
    bw ( KiB/s): min= 256, max= 4626, per=0.01%, avg=1991.20, stdev=714.46
  write: IOPS=65, BW=8400KiB/s (8601kB/s) (1478MiB/180168msec)
    clat (usec): min=626, max=13245, avg=3373.21, stdev=2033.05
    lat (usec): min=638, max=13266, avg=3408.54, stdev=2034.17
    clat percentiles (usec):
      | 1.00th=[ 836], 5.00th=[ 852], 10.00th=[ 884], 20.00th=[ 1176],
      | 30.00th=[ 1224], 40.00th=[ 2736], 50.00th=[ 3952], 60.00th=[ 4384],
      | 70.00th=[ 4768], 80.00th=[ 5152], 90.00th=[ 5728], 95.00th=[ 6240],
      | 99.00th=[ 7968], 99.50th=[ 8896], 99.90th=[12096], 99.95th=[12480],
      | 99.99th=[13248]
    bw ( KiB/s): min= 256, max= 4369, per=0.01%, avg=929.73, stdev=579.06
```

```

lat (usec) : 750=0.03%, 1000=4.45%
lat (msec) : 2=7.00%, 4=3.64%, 10=18.32%, 20=12.96%, 50=24.15%
lat (msec) : 100=16.50%, 250=11.29%, 500=1.60%, 750=0.06%, 1000=0.01%
cpu        : usr=0.10%, sys=0.27%, ctx=68262, majf=0, minf=0
IO depths  : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit     : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete   : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=27889,11823,0, short=0,0,0, dropped=0,0,0
latency    : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=19.3MiB/s (20.3MB/s), 19.3MiB/s-19.3MiB/s (20.3MB/s-20.3MB/s),
io=3486MiB (3655MB), run=180168-180168msec
  WRITE: bw=8400KiB/s (8601kB/s), 8400KiB/s-8400KiB/s (8601kB/s-8601kB/s),
io=1478MiB (1550MB), run=180168-180168msec

Disk stats (read/write):
sda: ios=27886/11823, merge=0/0, ticks=1754898/38561, in_queue=1792906,
util=100.00%

```

5.28 3G 机械FIO EXT4写

```

seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=1945: Tue Nov 24 16:40:06
2020
write: IOPS=136, BW=136MiB/s (143MB/s) (23.0GiB/180105msec)
clat (msec): min=4, max=242, avg=73.01, stdev=16.29
lat (msec): min=4, max=242, avg=73.31, stdev=16.29
clat percentiles (msec):
|  1.00th=[  50],  5.00th=[  58], 10.00th=[  63], 20.00th=[  63],
| 30.00th=[  64], 40.00th=[  64], 50.00th=[  70], 60.00th=[  72],
| 70.00th=[  75], 80.00th=[  82], 90.00th=[  94], 95.00th=[ 101],
| 99.00th=[ 135], 99.50th=[ 157], 99.90th=[ 188], 99.95th=[ 194],
| 99.99th=[ 235]
bw (  KiB/s): min= 8192, max=18580, per=0.01%, avg=14107.55, stdev=1484.39
lat (msec) : 10=0.04%, 20=0.02%, 50=1.72%, 100=93.07%, 250=5.15%
cpu        : usr=0.50%, sys=2.03%, ctx=50021, majf=0, minf=0
IO depths  : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit     : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete   : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=0,24546,0, short=0,0,0, dropped=0,0,0
latency    : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  WRITE: bw=136MiB/s (143MB/s), 136MiB/s-136MiB/s (143MB/s-143MB/s), io=23.0GiB
(25.7GB), run=180105-180105msec

Disk stats (read/write):
sda: ios=1/29607, merge=0/236, ticks=9/216452, in_queue=205944, util=88.47%

```

5.29 3G 机械FIO EXT4读

```
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=1984: Tue Nov 24 16:55:43
2020
read: IOPS=250, BW=250MiB/s (262MB/s) (43.0GiB/180035msec)
  clat (msec): min=7, max=119, avg=39.94, stdev= 8.79
    lat (msec): min=7, max=119, avg=39.94, stdev= 8.79
  clat percentiles (msec):
    | 1.00th=[ 19], 5.00th=[ 34], 10.00th=[ 37], 20.00th=[ 37],
    | 30.00th=[ 37], 40.00th=[ 37], 50.00th=[ 37], 60.00th=[ 38],
    | 70.00th=[ 38], 80.00th=[ 45], 90.00th=[ 49], 95.00th=[ 57],
    | 99.00th=[ 76], 99.50th=[ 81], 99.90th=[ 98], 99.95th=[ 105],
    | 99.99th=[ 120]
  bw ( KiB/s): min=18432, max=30781, per=0.01%, avg=25692.11, stdev=1972.95
    lat (msec) : 10=0.02%, 20=1.36%, 50=89.64%, 100=8.90%, 250=0.07%
cpu           : usr=0.10%, sys=2.10%, ctx=45599, majf=0, minf=2560
IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
  submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued rwts: total=45037,0,0, short=0,0,0, dropped=0,0,0
  latency    : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=250MiB/s (262MB/s), 250MiB/s-250MiB/s (262MB/s-262MB/s), io=43.0GiB
(47.2GB), run=180035-180035msec

Disk stats (read/write):
  sda: ios=44989/2325, merge=0/40, ticks=1771943/96460, in_queue=1834482,
util=99.18%
```

5.30 3G 机械FIO EXT4读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=1821: Sat Nov 14 02:04:53
2020
read: IOPS=97, BW=12.1MiB/s (12.7MB/s) (2187MiB/180115msec)
  clat (msec): min=5, max=227, avg=72.72, stdev=27.60
    lat (msec): min=5, max=227, avg=72.72, stdev=27.60
  clat percentiles (msec):
    | 1.00th=[ 15], 5.00th=[ 31], 10.00th=[ 41], 20.00th=[ 51],
    | 30.00th=[ 59], 40.00th=[ 65], 50.00th=[ 72], 60.00th=[ 79],
    | 70.00th=[ 85], 80.00th=[ 93], 90.00th=[ 106], 95.00th=[ 120],
    | 99.00th=[ 155], 99.50th=[ 174], 99.90th=[ 198], 99.95th=[ 206],
    | 99.99th=[ 223]
  bw ( KiB/s): min= 256, max= 2313, per=0.01%, avg=1247.62, stdev=352.57
write: IOPS=41, BW=5319KiB/s (5447kB/s) (936MiB/180115msec)
  clat (usec): min=817, max=197771, avg=70451.12, stdev=20182.61
    lat (usec): min=842, max=197809, avg=70490.22, stdev=20182.64
  clat percentiles (msec):
    | 1.00th=[ 35], 5.00th=[ 43], 10.00th=[ 48], 20.00th=[ 55],
    | 30.00th=[ 60], 40.00th=[ 65], 50.00th=[ 70], 60.00th=[ 74],
    | 70.00th=[ 79], 80.00th=[ 85], 90.00th=[ 94], 95.00th=[ 102],
    | 99.00th=[ 143], 99.50th=[ 159], 99.90th=[ 180], 99.95th=[ 184],
    | 99.99th=[ 198]
```

```

bw ( KiB/s): min= 256, max= 1799, per=0.01%, avg=583.17, stdev=285.13
lat (usec) : 1000=0.03%
lat (msec) : 2=0.02%, 10=0.36%, 20=1.10%, 50=16.03%, 100=70.92%
lat (msec) : 250=11.55%
cpu          : usr=0.09%, sys=0.47%, ctx=50401, majf=0, minf=0
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=17494,7485,0, short=0,0,0, dropped=0,0,0
latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=12.1MiB/s (12.7MB/s), 12.1MiB/s-12.1MiB/s (12.7MB/s-12.7MB/s),
io=2187MiB (2293MB), run=180115-180115msec
  WRITE: bw=5319KiB/s (5447kB/s), 5319KiB/s-5319KiB/s (5447kB/s-5447kB/s),
io=936MiB (981MB), run=180115-180115msec

Disk stats (read/write):
  sda: ios=17490/7557, merge=0/36, ticks=433099/10178, in_queue=436335,
util=97.52%

```

5.31 1.5G 机械FIO RAW写

```

seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=1954: Sat Nov 14 02:52:00
2020
write: IOPS=112, BW=112MiB/s (118MB/s) (19.7GiB/180085msec)
  clat (msec): min=8, max=412, avg=88.71, stdev=11.99
  lat (msec): min=8, max=412, avg=89.01, stdev=11.99
  clat percentiles (msec):
    | 1.00th=[ 77], 5.00th=[ 78], 10.00th=[ 78], 20.00th=[ 78],
    | 30.00th=[ 87], 40.00th=[ 88], 50.00th=[ 90], 60.00th=[ 91],
    | 70.00th=[ 92], 80.00th=[ 95], 90.00th=[ 100], 95.00th=[ 106],
    | 99.00th=[ 115], 99.50th=[ 133], 99.90th=[ 206], 99.95th=[ 215],
    | 99.99th=[ 396]
  bw ( KiB/s): min= 6156, max=14422, per=0.01%, avg=11580.72, stdev=1067.37
  lat (msec) : 10=0.01%, 20=0.01%, 50=0.05%, 100=92.78%, 250=7.11%
  lat (msec) : 500=0.05%
cpu          : usr=0.36%, sys=0.36%, ctx=24231, majf=0, minf=2
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=0,20214,0, short=0,0,0, dropped=0,0,0
latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  WRITE: bw=112MiB/s (118MB/s), 112MiB/s-112MiB/s (118MB/s-118MB/s), io=19.7GiB
(21.2GB), run=180085-180085msec

Disk stats (read/write):
  sda: ios=0/20284, merge=0/747, ticks=0/1788377, in_queue=1783124, util=99.91%

```

5.32 1.5G 机械FIO RAW读

```
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=1973: Sat Nov 14 02:57:32
2020
read: IOPS=135, BW=136MiB/s (143MB/s) (23.9GiB/180067msec)
  clat (usec): min=22151, max=132908, avg=73528.77, stdev=763.20
    lat (usec): min=22154, max=132909, avg=73531.63, stdev=763.17
  clat percentiles (usec):
    | 1.00th=[73216], 5.00th=[73216], 10.00th=[73216], 20.00th=[73216],
    | 30.00th=[73216], 40.00th=[73216], 50.00th=[73216], 60.00th=[73216],
    | 70.00th=[73216], 80.00th=[73216], 90.00th=[73216], 95.00th=[73216],
    | 99.00th=[73216], 99.50th=[73216], 99.90th=[74240], 99.95th=[74240],
    | 99.99th=[96768]
  bw ( KiB/s): min=12312, max=14451, per=0.01%, avg=13991.68, stdev=831.22
    lat (msec) : 50=0.02%, 100=99.98%, 250=0.01%
cpu           : usr=0.05%, sys=0.43%, ctx=49106, majf=0, minf=2560
IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
  submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued rwts: total=24473,0,0, short=0,0,0, dropped=0,0,0
  latency     : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=136MiB/s (143MB/s), 136MiB/s-136MiB/s (143MB/s-143MB/s), io=23.9GiB
(25.7GB), run=180067-180067msec

Disk stats (read/write):
  sda: ios=24444/10, merge=0/0, ticks=1788949/42, in_queue=1788252, util=100.00%
```

5.33 1.5G 机械FIO RAW读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=1991: Sat Nov 14 03:02:31
2020
read: IOPS=153, BW=19.2MiB/s (20.1MB/s) (3454MiB/180115msec)
  clat (msec): min=5, max=939, avg=63.43, stdev=63.35
    lat (msec): min=5, max=939, avg=63.44, stdev=63.35
  clat percentiles (msec):
    | 1.00th=[ 10], 5.00th=[ 13], 10.00th=[ 15], 20.00th=[ 20],
    | 30.00th=[ 26], 40.00th=[ 33], 50.00th=[ 42], 60.00th=[ 54],
    | 70.00th=[ 70], 80.00th=[ 95], 90.00th=[ 141], 95.00th=[ 188],
    | 99.00th=[ 306], 99.50th=[ 363], 99.90th=[ 510], 99.95th=[ 562],
    | 99.99th=[ 758]
  bw ( KiB/s): min= 256, max= 4360, per=0.01%, avg=1970.27, stdev=665.76
write: IOPS=65, BW=8323KiB/s (8523kB/s) (1464MiB/180115msec)
  clat (msec): min=1, max=13, avg= 3.89, stdev= 2.04
    lat (msec): min=1, max=13, avg= 3.92, stdev= 2.04
  clat percentiles (usec):
    | 1.00th=[ 1352], 5.00th=[ 1368], 10.00th=[ 1400], 20.00th=[ 1448],
    | 30.00th=[ 1880], 40.00th=[ 3440], 50.00th=[ 4448], 60.00th=[ 4896],
    | 70.00th=[ 5280], 80.00th=[ 5664], 90.00th=[ 6176], 95.00th=[ 6816],
    | 99.00th=[ 8640], 99.50th=[ 9408], 99.90th=[11840], 99.95th=[12736],
    | 99.99th=[12992]
  bw ( KiB/s): min= 256, max= 3598, per=0.01%, avg=924.03, stdev=563.43
```



```

    lat (msec) : 2=10.35%, 4=2.91%, 10=17.53%, 20=13.25%, 50=25.97%
    lat (msec) : 100=17.03%, 250=11.43%, 500=1.45%, 750=0.07%, 1000=0.01%
cpu      : usr=0.09%, sys=0.28%, ctx=67701, majf=0, minf=0
IO depths : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
    submit  : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    complete : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued rwt: total=27634,11712,0, short=0,0,0, dropped=0,0,0
    latency  : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
    READ: bw=19.2MiB/s (20.1MB/s), 19.2MiB/s-19.2MiB/s (20.1MB/s-20.1MB/s),
io=3454MiB (3622MB), run=180115-180115msec
    WRITE: bw=8323KiB/s (8523kB/s), 8323KiB/s-8323KiB/s (8523kB/s-8523kB/s),
io=1464MiB (1535MB), run=180115-180115msec

Disk stats (read/write):
    sda: ios=27633/11722, merge=0/0, ticks=1749080/43881, in_queue=1791393,
util=100.00%

```

5.34 1.5G 机械FIO EXT4写

```

seq_100write_1024k: (groupid=0, jobs=10): err= 0: pid=2019: Sat Nov 14 03:10:51
2020
write: IOPS=86, BW=86.0MiB/s (91.2MB/s) (15.3GiB/180155msec)
    clat (msec): min=8, max=245, avg=114.59, stdev=16.52
    lat (msec): min=9, max=245, avg=114.92, stdev=16.52
    clat percentiles (msec):
        | 1.00th=[ 89], 5.00th=[ 95], 10.00th=[ 103], 20.00th=[ 105],
        | 30.00th=[ 106], 40.00th=[ 111], 50.00th=[ 114], 60.00th=[ 115],
        | 70.00th=[ 116], 80.00th=[ 122], 90.00th=[ 131], 95.00th=[ 139],
        | 99.00th=[ 190], 99.50th=[ 198], 99.90th=[ 225], 99.95th=[ 231],
        | 99.99th=[ 245]
    bw ( KiB/s): min= 6144, max=12487, per=0.01%, avg=8981.66, stdev=1120.68
    lat (msec) : 10=0.03%, 20=0.02%, 50=0.01%, 100=7.19%, 250=92.75%
cpu      : usr=0.34%, sys=1.31%, ctx=32281, majf=0, minf=0
IO depths : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
    submit  : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    complete : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued rwt: total=0,15666,0, short=0,0,0, dropped=0,0,0
    latency  : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
    WRITE: bw=86.0MiB/s (91.2MB/s), 86.0MiB/s-86.0MiB/s (91.2MB/s-91.2MB/s),
io=15.3GiB (16.4GB), run=180155-180155msec

Disk stats (read/write):
    sda: ios=1/19046, merge=0/214, ticks=0/217398, in_queue=211239, util=93.40%

```

5.35 1.5G 机械FIO EXT4读

```
seq_100read_1024k: (groupid=0, jobs=10): err= 0: pid=2042: Sat Nov 14 03:18:10
2020
read: IOPS=131, BW=131MiB/s (138MB/s) (23.1GiB/180070msec)
  clat (msec): min=15, max=157, avg=76.17, stdev= 7.91
    lat (msec): min=15, max=157, avg=76.17, stdev= 7.91
  clat percentiles (msec):
    | 1.00th=[ 60], 5.00th=[ 74], 10.00th=[ 74], 20.00th=[ 74],
    | 30.00th=[ 74], 40.00th=[ 74], 50.00th=[ 74], 60.00th=[ 74],
    | 70.00th=[ 74], 80.00th=[ 74], 90.00th=[ 89], 95.00th=[ 89],
    | 99.00th=[ 100], 99.50th=[ 117], 99.90th=[ 141], 99.95th=[ 149],
    | 99.99th=[ 157]
  bw ( KiB/s): min=10240, max=16616, per=0.01%, avg=13491.35, stdev=1056.88
    lat (msec) : 20=0.01%, 50=0.50%, 100=98.46%, 250=1.03%
cpu           : usr=0.05%, sys=1.04%, ctx=24344, majf=0, minf=2564
IO depths     : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
  submit      : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  complete    : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued rwts: total=23626,0,0, short=0,0,0, dropped=0,0,0
  latency    : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=131MiB/s (138MB/s), 131MiB/s-131MiB/s (138MB/s-138MB/s), io=23.1GiB
(24.8GB), run=180070-180070msec

Disk stats (read/write):
  sda: ios=23614/1575, merge=0/35, ticks=1785211/125916, in_queue=1884301,
util=100.00%
```

5.36 1.5G 机械FIO EXT4读写

```
randrw_70read_128k: (groupid=0, jobs=10): err= 0: pid=2062: Sat Nov 14 03:26:19
2020
read: IOPS=84, BW=10.6MiB/s (11.1MB/s) (1913MiB/180072msec)
  clat (msec): min=6, max=297, avg=83.62, stdev=32.09
    lat (msec): min=6, max=298, avg=83.62, stdev=32.09
  clat percentiles (msec):
    | 1.00th=[ 17], 5.00th=[ 35], 10.00th=[ 46], 20.00th=[ 59],
    | 30.00th=[ 68], 40.00th=[ 75], 50.00th=[ 81], 60.00th=[ 89],
    | 70.00th=[ 96], 80.00th=[ 108], 90.00th=[ 126], 95.00th=[ 141],
    | 99.00th=[ 176], 99.50th=[ 192], 99.90th=[ 235], 99.95th=[ 245],
    | 99.99th=[ 285]
  bw ( KiB/s): min= 256, max= 2565, per=0.01%, avg=1092.47, stdev=338.82
write: IOPS=35, BW=4604KiB/s (4715kB/s) (810MiB/180072msec)
  clat (msec): min=1, max=237, avg=80.21, stdev=23.97
    lat (msec): min=1, max=237, avg=80.25, stdev=23.97
  clat percentiles (msec):
    | 1.00th=[ 41], 5.00th=[ 50], 10.00th=[ 56], 20.00th=[ 62],
    | 30.00th=[ 68], 40.00th=[ 72], 50.00th=[ 76], 60.00th=[ 81],
    | 70.00th=[ 88], 80.00th=[ 97], 90.00th=[ 114], 95.00th=[ 126],
    | 99.00th=[ 153], 99.50th=[ 172], 99.90th=[ 202], 99.95th=[ 227],
    | 99.99th=[ 239]
```

```
bw ( KiB/s): min= 256, max= 1542, per=0.01%, avg=527.19, stdev=253.77
lat (msec) : 2=0.05%, 10=0.13%, 20=0.94%, 50=9.42%, 100=65.63%
lat (msec) : 250=23.81%, 500=0.02%
cpu          : usr=0.07%, sys=0.44%, ctx=43966, majf=0, minf=1
IO depths    : 1=100.0%, 2=0.0%, 4=0.0%, 8=0.0%, 16=0.0%, 32=0.0%, >=64=0.0%
submit       : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
complete     : 0=0.0%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued rwt: total=15305,6477,0, short=0,0,0, dropped=0,0,0
latency      : target=0, window=0, percentile=100.00%, depth=1

Run status group 0 (all jobs):
  READ: bw=10.6MiB/s (11.1MB/s), 10.6MiB/s-10.6MiB/s (11.1MB/s-11.1MB/s),
io=1913MiB (2006MB), run=180072-180072msec
  WRITE: bw=4604KiB/s (4715kB/s), 4604KiB/s-4604KiB/s (4715kB/s-4715kB/s),
io=810MiB (849MB), run=180072-180072msec

Disk stats (read/write):
  sda: ios=15301/8281, merge=0/74, ticks=465486/44059, in_queue=500849,
util=97.88%
```