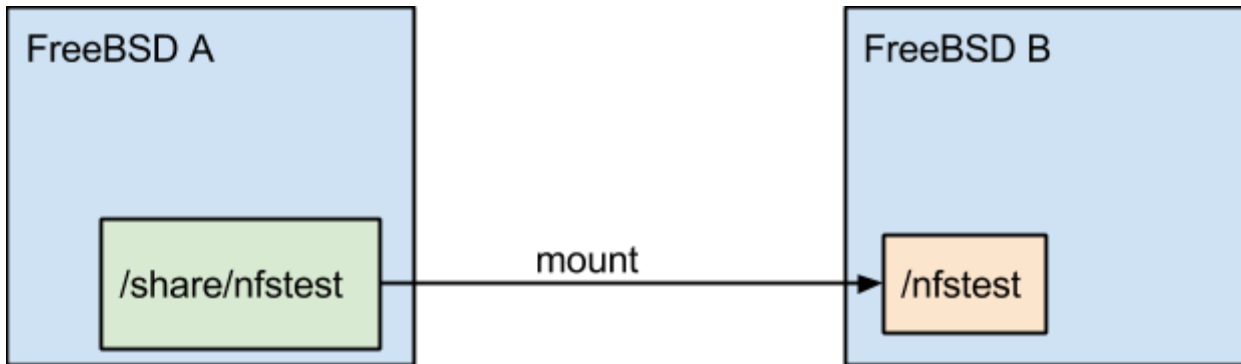


1. Environment



1. FreeBSD_A is a NFS server, FreeBSD_B is a NFS client.
2. FreeBSD_A and FreeBSD_B are connected directly through a CAT-6 cable with 10G interface.
3. **/share/nfstest** is a 20GB ramdisk with UFS2 FS. And is exported as a NFS mount point.
`/sbin/mdmfs -M -S -o async -v 2 -s 20g md10 /share/nfstest`
4. **/nfstest** mount the remote share folder **/share/nfstest** from FreeBSD_A
`mount -t nfs -o rsize=262144 -o async -o noatime 10.10.10.10:/share/nfstest /nfstest`

2. FIO Setting

```
ioengine=vsync
direct=0
directory=/nfstest
size=5000m or 16000m
thread
numjobs=1
refill_buffers
iodepth=16
```

3. FIO Benchmark result with FIO

Read

read 4k								
read_file: (groupid=0, jobs=1): err= 0: pid=100599: Tue Mar 25 12:11:44 2014								
read : io=16000MB, bw=212304KB/s, iops=53076, runt= 77172msec								
clat (usec): min=2, max=77917, avg=17.39, stdev=90.72								
lat (usec): min=2, max=77917, avg=17.66, stdev=90.72								
clat percentiles (usec):								
1.00th=[2], 5.00th=[3], 10.00th=[3], 20.00th=[3],								
30.00th=[3], 40.00th=[3], 50.00th=[3], 60.00th=[3],								
70.00th=[3], 80.00th=[3], 90.00th=[4], 95.00th=[21],								
99.00th=[410], 99.50th=[588], 99.90th=[620], 99.95th=[628],								
99.99th=[660]								
bw (KB /s): min=20752, max=237872, per=100.00%, avg=212432.26, stdev=17126.74								
lat (usec) : 4=82.40%, 10=11.36%, 20=0.17%, 50=2.33%, 100=0.04%								
lat (usec) : 250=0.78%, 500=2.14%, 750=0.78%, 1000=0.01%								
lat (msec) : 2=0.01%, 4=0.01%, 10=0.01%, 20=0.01%, 50=0.01%								
lat (msec) : 100=0.01%								
cpu : usr=7.06%, sys=23.97%, ctx=159048, majf=0, minf=16								
IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%								
issued : total=r=4096000/w=0/d=0, short=r=0/w=0/d=0								
Run status group 0 (all jobs):								
READ: io=16000MB, aggrb=212304KB/s, minb=212304KB/s, maxb=212304KB/s, mint=77172msec, maxt=77172msec								
Client Info:								
Rpc Counts:								
Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove	
1	0	1	0	256000	0	0	0	
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access	
0	0	0	0	0	0	0	1	
Mknod	Fsstat	Fsinfo	PathConf	Commit				
0	0	0	0	0				
Rpc Info:								
TimedOut	Invalid X	Replies	Retries	Requests				
256003	0	0	0	0				
Cache Info:								
Attr Hits	Misses	Lkup Hits	Misses	BioR Hits	Misses	BioW Hits	Misses	
4096006	1	2	1	3840000	256000	0	0	
BioRLHits	Misses	BioD Hits	Misses	DirE Hits	Misses	Accs Hits	Misses	
0	0	0	0	0	0	3	1	

read 128k

```
read_file: (groupid=0, jobs=1): err= 0: pid=100553: Tue Mar 25 11:57:58 2014
read : io=15998MB, bw=276067KB/s, iops=2157, runt= 59341msec
  clat (usec): min=249, max=406501, avg=459.53, stdev=1225.72
  lat (usec): min=249, max=406501, avg=459.91, stdev=1225.72
  clat percentiles (usec):
    | 1.00th=[ 322], 5.00th=[ 342], 10.00th=[ 354], 20.00th=[ 370],
    | 30.00th=[ 382], 40.00th=[ 390], 50.00th=[ 398], 60.00th=[ 414],
    | 70.00th=[ 446], 80.00th=[ 498], 90.00th=[ 668], 95.00th=[ 700],
    | 99.00th=[ 748], 99.50th=[ 780], 99.90th=[ 2192], 99.95th=[ 5792],
    | 99.99th=[13888]
  bw (KB /s): min=137620, max=308480, per=100.00%, avg=276874.63, stdev=21948.25
  lat (usec) : 250=0.01%, 500=80.10%, 750=18.97%, 1000=0.67%
  lat (msec) : 2=0.14%, 4=0.04%, 10=0.04%, 20=0.03%, 50=0.01%
  lat (msec) : 100=0.01%, 500=0.01%
cpu      : usr=1.24%, sys=13.45%, ctx=243749, majf=0, minf=512
IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued  : total=r=128000/w=0/d=0, short=r=0/w=0/d=0

Run status group 0 (all jobs):
  READ: io=15998MB, aggrb=276066KB/s, minb=276066KB/s, maxb=276066KB/s, mint=59341msec,
  maxt=59341msec
```

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
1	1	4	0	256000	243793	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	1
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X	Replies	Retries	Requests
509117	0	0	0	0

Cache Info:

Attr Hits	Misses	Lkup	Hits	Misses	BioR	Hits	Misses	BioW	Hits	Misses
128006	1	1	1	4	0	0	256000	663	663	255337
BioRLHits	Misses	BioD	Hits	Misses	DirE	Hits	Misses	Accs	Hits	Misses
0	0	0	0	0	0	0	0	5	5	1

random read 4k

```
read_file: (groupid=0, jobs=1): err= 0: pid=100833: Tue Mar 25 13:49:24 2014
read : io=4999.1MB, bw=77752KB/s, iops=19438, runt= 65850msec
  clat (usec): min=3, max=9658, avg=49.29, stdev=137.03
    lat (usec): min=3, max=9658, avg=49.61, stdev=137.04
  clat percentiles (usec):
    | 1.00th=[   3],  5.00th=[   4], 10.00th=[   4], 20.00th=[   5],
    | 30.00th=[   6], 40.00th=[  19], 50.00th=[  20], 60.00th=[  20],
    | 70.00th=[  21], 80.00th=[  21], 90.00th=[  23], 95.00th=[ 516],
    | 99.00th=[ 620], 99.50th=[ 628], 99.90th=[ 676], 99.95th=[1064],
    | 99.99th=[1640]
  bw (KB /s): min= 4416, max=433200, per=96.92%, avg=75356.92, stdev=95855.97
  lat (usec) : 4=1.36%, 10=30.87%, 20=15.43%, 50=46.08%, 100=0.01%
  lat (usec) : 250=0.01%, 500=0.98%, 750=5.20%, 1000=0.02%
  lat (msec) : 2=0.05%, 4=0.01%, 10=0.01%
cpu      : usr=4.31%, sys=34.59%, ctx=80219, majf=0, minf=16
IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued   : total=r=1280000/w=0/d=0, short=r=0/w=0/d=0
```

Run status group 0 (all jobs):

```
  READ: io=4999.1MB, aggrb=77751KB/s, minb=77751KB/s, maxb=77751KB/s, mint=65850msec,
maxt=65850msec
```

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
1	1	4	0	160000	80000	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	1
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X	Replies	Retries	Requests
240008	0	0	0	0

Cache Info:

Attr Hits	Misses	Lkup Hits	Misses	BioR Hits	Misses	BioW Hits	Misses
1280006	1	1	4	1120000	160000	1200000	80000
BioRLHits	Misses	BioD Hits	Misses	DirE Hits	Misses	Accs Hits	Misses
0	0	0	0	0	0	5	1

random read 128k

read_file: (groupid=0, jobs=1): err= 0: pid=100835: Tue Mar 25 13:51:26 2014
read : io=4998.2MB, bw=107683KB/s, iops=841, runt= 47529msec
clat (usec): min=793, max=250508, avg=1181.94, stdev=1670.55
lat (usec): min=793, max=250508, avg=1182.32, stdev=1670.55
clat percentiles (usec):
| 1.00th=[1020], 5.00th=[1048], 10.00th=[1048], 20.00th=[1080],
| 30.00th=[1112], 40.00th=[1128], 50.00th=[1144], 60.00th=[1176],
| 70.00th=[1208], 80.00th=[1224], 90.00th=[1256], 95.00th=[1288],
| 99.00th=[1880], 99.50th=[2320], 99.90th=[4448], 99.95th=[5856],
| 99.99th=[6560]
bw (KB /s): min=54930, max=112128, per=100.00%, avg=107806.84, stdev=7836.86
lat (usec) : 1000=0.26%
lat (msec) : 2=98.97%, 4=0.63%, 10=0.10%, 250=0.01%, 500=0.01%
cpu : usr=0.49%, sys=10.87%, ctx=80026, majf=0, minf=512
IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
issued : total=r=40000/w=0/d=0, short=r=0/w=0/d=0

Run status group 0 (all jobs):

READ: io=4998.2MB, aggrb=107683KB/s, minb=107683KB/s, maxb=107683KB/s,
mint=47529msec, maxt=47529msec

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
1	1	4	0	80000	77285	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	1
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X	Replies	Retries	Requests
159418	0	0	0	0

Cache Info:

Attr Hits	Misses	Lkup	Hits	Misses	BioR	Hits	Misses	BioW	Hits	Misses
40006	1	1	1	4	0	0	80000	126	126	79874
BioRLHits	Misses	BioD	Hits	Misses	DirE	Hits	Misses	Accs	Hits	Misses
0	0	0	0	0	0	0	0	5	5	1

Write

write 4K

```
write_file: (groupid=0, jobs=1): err= 0: pid=100723: Tue Mar 25 12:54:02 2014
write: io=16000MB, bw=85475KB/s, iops=21368, runt=191682msec
  clat (usec): min=2, max=118937, avg=44.11, stdev=179.62
    lat (usec): min=3, max=118937, avg=44.38, stdev=179.62
  clat percentiles (usec):
    | 1.00th=[   3], 5.00th=[   3], 10.00th=[   3], 20.00th=[   3],
    | 30.00th=[   3], 40.00th=[   3], 50.00th=[   3], 60.00th=[   3],
    | 70.00th=[   3], 80.00th=[   4], 90.00th=[   5], 95.00th=[  486],
    | 99.00th=[  868], 99.50th=[  908], 99.90th=[  964], 99.95th=[  996],
    | 99.99th=[ 1192]
  bw (KB /s): min=   7, max=99136, per=100.00%, avg=85538.42, stdev=6570.54
  lat (usec) : 4=72.44%, 10=21.28%, 20=0.02%, 50=0.01%, 100=0.01%
  lat (usec) : 250=0.01%, 500=1.48%, 750=2.75%, 1000=1.97%
  lat (msec) : 2=0.04%, 4=0.01%, 10=0.01%, 20=0.01%, 100=0.01%
  lat (msec) : 250=0.01%
cpu      : usr=5.60%, sys=16.97%, ctx=257339, majf=0, minf=0
IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued   : total=r=0/w=4096000/d=0, short=r=0/w=0/d=0

Run status group 0 (all jobs):
  WRITE: io=16000MB, aggrbw=85474KB/s, minb=85474KB/s, maxb=85474KB/s, mint=191682msec,
  maxt=191682msec
```

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
178	356	4	0	256174	512160	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	1
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X Replies	Retries	Requests
768880	0	0	0

Cache Info:

Attr Hits	Misses	Lkup Hits	Misses	BioR Hits	Misses	BioW Hits	Misses
7	178	1	4	-256174	256174	36351826	512174
BioRLHits	Misses	BioD Hits	Misses	DirE Hits	Misses	Accs Hits	Misses
0	0	0	0	0	0	5	1

write 128k

write_file: (groupid=0, jobs=1): err= 0: pid=100658: Tue Mar 25 12:16:56 2014

write: io=15998MB, bw=663511KB/s, iops=5184, runt= 24690msec

clat (usec): min=41, max=317475, avg=154.53, stdev=1960.82

lat (usec): min=42, max=317476, avg=155.03, stdev=1960.82

clat percentiles (usec):

| 1.00th=[47], 5.00th=[66], 10.00th=[67], 20.00th=[69],
| 30.00th=[70], 40.00th=[71], 50.00th=[73], 60.00th=[76],
| 70.00th=[82], 80.00th=[89], 90.00th=[94], 95.00th=[99],
| 99.00th=[1304], 99.50th=[1656], 99.90th=[33536], 99.95th=[35584],
| 99.99th=[55040]

bw (KB /s): min=395264, max=1130752, per=100.00%, avg=667552.57, stdev=124431.73

lat (usec) : 50=1.49%, 100=93.56%, 250=3.25%, 500=0.11%, 750=0.01%

lat (usec) : 1000=0.10%

lat (msec) : 2=1.20%, 4=0.10%, 10=0.03%, 20=0.01%, 50=0.12%

lat (msec) : 100=0.01%, 250=0.01%, 500=0.01%

cpu : usr=20.67%, sys=39.29%, ctx=3914, majf=0, minf=0

IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%

issued : total=r=0/w=128000/d=0, short=r=0/w=0/d=0

Run status group 0 (all jobs):

WRITE: io=15998MB, agrgb=663510KB/s, minb=663510KB/s, maxb=663510KB/s, mint=24690msec, maxt=24690msec

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
180	360	4	0	177	500530	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	2
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X Replies	Retries	Requests
510020	0	0	0

Cache Info:

Attr Hits	Misses	Lkup Hits	Misses	BioR Hits	Misses	BioW Hits	Misses
7	180	1	4	-177	177	32512550	511450
BioRLHits	Misses	BioD Hits	Misses	DirE Hits	Misses	Accs Hits	Misses
0	0	0	0	0	0	4	2

random write 4k

```
write_file: (groupid=0, jobs=1): err= 0: pid=100853: Tue Mar 25 14:25:10 2014
write: io=4999.1MB, bw=8993.6KB/s, iops=2248, runt=569288msec
  clat (usec): min=4, max=745067, avg=439.50, stdev=3573.82
  lat (usec): min=5, max=745068, avg=439.90, stdev=3573.82
  clat percentiles (usec):
    | 1.00th=[ 30], 5.00th=[ 126], 10.00th=[ 211], 20.00th=[ 262],
    | 30.00th=[ 278], 40.00th=[ 286], 50.00th=[ 290], 60.00th=[ 294],
    | 70.00th=[ 302], 80.00th=[ 446], 90.00th=[ 668], 95.00th=[ 748],
    | 99.00th=[ 1064], 99.50th=[ 6752], 99.90th=[13120], 99.95th=[14272],
    | 99.99th=[43264]
  bw (KB /s): min= 2034, max=45480, per=100.00%, avg=9191.08, stdev=3931.44
  lat (usec) : 10=0.14%, 20=0.23%, 50=1.37%, 100=2.03%, 250=13.97%
  lat (usec) : 500=65.45%, 750=11.73%, 1000=3.95%
  lat (msec) : 2=0.23%, 4=0.10%, 10=0.58%, 20=0.19%, 50=0.01%
  lat (msec) : 100=0.01%, 250=0.01%, 500=0.01%, 750=0.01%
cpu      : usr=1.55%, sys=68.82%, ctx=509220, majf=0, minf=0
IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued   : total=r=0/w=1280000/d=0, short=r=0/w=0/d=0
```

Run status group 0 (all jobs):

```
WRITE: io=4999.1MB, aggrb=8993KB/s, minb=8993KB/s, maxb=8993KB/s, mint=569288msec,
maxt=569288msec
```

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
59	118	4	0	80058	1209267	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	1
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X Replies	Retries	Requests
1294444	0	0	0

Cache Info:

Attr Hits	Misses	Lkup Hits	Misses	BioR Hits	Misses	BioW Hits	Misses
7	59	1	4	-80058	80058	10303816	1216184
BioRLHits	Misses	BioD Hits	Misses	DirE Hits	Misses	Accs Hits	Misses
0	0	0	0	0	0	5	1

random write 128k

```
write_file: (groupid=0, jobs=1): err= 0: pid=100857: Tue Mar 25 14:40:31 2014
write: io=14998MB, bw=631760KB/s, iops=4936, runt= 24310msec
  clat (usec): min=43, max=450063, avg=163.95, stdev=2094.65
  lat (usec): min=43, max=450063, avg=164.43, stdev=2094.65
  clat percentiles (usec):
    | 1.00th=[ 49], 5.00th=[ 66], 10.00th=[ 68], 20.00th=[ 71],
    | 30.00th=[ 72], 40.00th=[ 74], 50.00th=[ 76], 60.00th=[ 79],
    | 70.00th=[ 83], 80.00th=[ 89], 90.00th=[ 96], 95.00th=[ 104],
    | 99.00th=[ 1336], 99.50th=[ 1400], 99.90th=[33536], 99.95th=[34560],
    | 99.99th=[51968]
  bw (KB /s): min=37888, max=1134336, per=100.00%, avg=633251.50, stdev=151134.41
  lat (usec) : 50=1.03%, 100=91.96%, 250=4.80%, 500=0.07%, 750=0.01%
  lat (usec) : 1000=0.08%
  lat (msec) : 2=1.72%, 4=0.17%, 10=0.01%, 50=0.13%, 100=0.01%
  lat (msec) : 250=0.01%, 500=0.01%
cpu      : usr=18.76%, sys=39.20%, ctx=4394, majf=0, minf=0
IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued   : total=r=0/w=120000/d=0, short=r=0/w=0/d=0

Run status group 0 (all jobs):
  WRITE: io=14998MB, agrb=631759KB/s, minb=631759KB/s, maxb=631759KB/s, mint=24310msec,
  maxt=24310msec
```

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
170	340	4	0	164	469297	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	1
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X Replies	Retries	Requests
478146	0	0	0

Cache Info:

Attr Hits	Misses	Lkup Hits	Misses	BioR Hits	Misses	BioW Hits	Misses
7	170	1	4	-164	164	30480310	479690
BioRLHits	Misses	BioD Hits	Misses	DirE Hits	Misses	Accs Hits	Misses
0	0	0	0	0	0	5	1

4. FIO Benchmark result with the patch

Read

read 4k

read_file: (g=0): rw=read, bs=4K-4K/4K-4K/4K-4K, ioengine=vsync, iodepth=16
fio-2.1.3

Starting 1 thread

read_file: Laying out IO file(s) (1 file(s) / 16000MB)

read_file: (groupid=0, jobs=1): err= 0: pid=100438: Tue Mar 25 16:21:33 2014

read : io=16000MB, bw=245320KB/s, iops=61330, runt= 66786msec

clat (usec): min=2, max=120677, avg=14.99, stdev=98.27

lat (usec): min=2, max=120678, avg=15.27, stdev=98.27

clat percentiles (usec):

| 1.00th=[2], 5.00th=[2], 10.00th=[3], 20.00th=[3],
| 30.00th=[3], 40.00th=[3], 50.00th=[3], 60.00th=[3],
| 70.00th=[3], 80.00th=[3], 90.00th=[4], 95.00th=[22],
| 99.00th=[338], 99.50th=[362], 99.90th=[540], 99.95th=[580],
| 99.99th=[676]

bw (KB /s): min=187536, max=305136, per=100.00%, avg=245363.62, stdev=13298.07

lat (usec) : 4=83.27%, 10=10.42%, 20=0.25%, 50=2.01%, 100=0.03%

lat (usec) : 250=1.89%, 500=2.02%, 750=0.10%, 1000=0.01%

lat (msec) : 2=0.01%, 4=0.01%, 10=0.01%, 20=0.01%, 50=0.01%

lat (msec) : 100=0.01%, 250=0.01%

cpu : usr=7.83%, sys=27.30%, ctx=170227, majf=0, minf=16

IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%

issued : total=r=4096000/w=0/d=0, short=r=0/w=0/d=0

Run status group 0 (all jobs):

READ: io=16000MB, aggrbw=245319KB/s, minb=245319KB/s, maxb=245319KB/s, mint=66786msec,
maxt=66786msec

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
0	1	4	0	512000	256000	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	2
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X	Replies	Retries	Requests
768008	0	0	0	0

Cache Info:

Attr Hits	Misses	Lkup	Hits	Misses	BioR	Hits	Misses	BioW	Hits	Misses
4096006	0		1	4	3584000	512000	3840000	256000		
BioRLHits	Misses	BioD	Hits	Misses	DirE	Hits	Misses	Accs	Hits	Misses
0	0		0	0		0		0	4	2

read 128k

```
read_file: (groupid=0, jobs=1): err= 0: pid=100422: Tue Mar 25 16:15:49 2014
read : io=15998MB, bw=315568KB/s, iops=2465, runt= 51913msec
  clat (usec): min=234, max=495062, avg=402.20, stdev=1460.86
  lat (usec): min=235, max=495063, avg=402.58, stdev=1460.86
  clat percentiles (usec):
    | 1.00th=[ 322], 5.00th=[ 338], 10.00th=[ 350], 20.00th=[ 362],
    | 30.00th=[ 370], 40.00th=[ 378], 50.00th=[ 382], 60.00th=[ 386],
    | 70.00th=[ 394], 80.00th=[ 406], 90.00th=[ 426], 95.00th=[ 450],
    | 99.00th=[ 676], 99.50th=[ 740], 99.90th=[ 2416], 99.95th=[ 5408],
    | 99.99th=[12608]
  bw (KB /s): min=87238, max=332032, per=100.00%, avg=316418.15, stdev=28181.84
  lat (usec) : 250=0.01%, 500=96.67%, 750=2.85%, 1000=0.24%
  lat (msec) : 2=0.11%, 4=0.05%, 10=0.04%, 20=0.02%, 100=0.01%
  lat (msec) : 250=0.01%, 500=0.01%
  cpu          : usr=1.40%, sys=15.00%, ctx=244746, majf=1, minf=512
  IO depths    : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued     : total=r=128000/w=0/d=0, short=r=0/w=0/d=0

Run status group 0 (all jobs):
  READ: io=15998MB, aggrb=315567KB/s, minb=315567KB/s, maxb=315567KB/s, mint=51913msec,
  maxt=51913msec
```

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
1	1	4	0	256000	245033	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	2
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X	Replies	Retries	Requests
511556	0	0	0	0

Cache Info:

Attr Hits	Misses	Lkup	Hits	Misses	BioR	Hits	Misses	BioW	Hits	Misses
128006	1	1	1	4	0	0	256000	415	255585	
BioRLHits	Misses	BioD	Hits	Misses	DirE	Hits	Misses	Accs	Hits	Misses
0	0	0	0	0	0	0	0	4	4	2

random read 4k

```
read_file: (groupid=0, jobs=1): err= 0: pid=100424: Tue Mar 25 16:17:38 2014
read : io=4999.1MB, bw=93592KB/s, iops=23398, runt= 54705msec
  clat (usec): min=3, max=11231, avg=40.53, stdev=103.69
  lat (usec): min=3, max=11231, avg=40.85, stdev=103.70
  clat percentiles (usec):
    | 1.00th=[   3],  5.00th=[   4], 10.00th=[   4], 20.00th=[   5],
    | 30.00th=[   6], 40.00th=[  20], 50.00th=[  20], 60.00th=[  21],
    | 70.00th=[  21], 80.00th=[  22], 90.00th=[  24], 95.00th=[ 334],
    | 99.00th=[ 516], 99.50th=[ 588], 99.90th=[ 700], 99.95th=[ 724],
    | 99.99th=[1320]
  bw (KB /s): min= 5264, max=469728, per=98.20%, avg=91903.56, stdev=100151.03
  lat (usec) : 4=1.72%, 10=30.47%, 20=7.70%, 50=53.82%, 100=0.02%
  lat (usec) : 250=0.03%, 500=5.15%, 750=1.04%, 1000=0.02%
  lat (msec) : 2=0.03%, 4=0.01%, 10=0.01%, 20=0.01%
  cpu          : usr=5.74%, sys=42.35%, ctx=80347, majf=0, minf=16
  IO depths    : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
    issued    : total=r=1280000/w=0/d=0, short=r=0/w=0/d=0

Run status group 0 (all jobs):
  READ: io=4999.1MB, aggrb=93591KB/s, minb=93591KB/s, maxb=93591KB/s, mint=54705msec,
  maxt=54705msec
```

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
1	1	4	0	160000	80000	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	2
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X	Replies	Retries	Requests
240009	0	0	0	0

Cache Info:

Attr Hits	Misses	Lkup Hits	Misses	BioR Hits	Misses	BioW Hits	Misses
1280006	1	1	4	1120000	160000	1200000	80000
BioRLHits	Misses	BioD Hits	Misses	DirE Hits	Misses	Accs Hits	Misses
0	0	0	0	0	0	4	2

random read 128k

```
read_file: (groupid=0, jobs=1): err= 0: pid=100420: Tue Mar 25 16:14:29 2014
read : io=4998.2MB, bw=164267KB/s, iops=1283, runt= 31157msec
  clat (usec): min=595, max=343318, avg=772.52, stdev=1713.36
    lat (usec): min=595, max=343318, avg=772.90, stdev=1713.36
  clat percentiles (usec):
    | 1.00th=[ 716],  5.00th=[ 732], 10.00th=[ 740], 20.00th=[ 756],
    | 30.00th=[ 756], 40.00th=[ 764], 50.00th=[ 764], 60.00th=[ 764],
    | 70.00th=[ 764], 80.00th=[ 772], 90.00th=[ 788], 95.00th=[ 796],
    | 99.00th=[ 820], 99.50th=[ 876], 99.90th=[ 1144], 99.95th=[ 1160],
    | 99.99th=[ 1896]
  bw (KB /s): min=52736, max=167168, per=100.00%, avg=164376.77, stdev=15448.49
  lat (usec) : 750=14.30%, 1000=85.47%
  lat (msec) : 2=0.18%, 4=0.01%, 500=0.01%
cpu      : usr=0.56%, sys=17.15%, ctx=80037, majf=0, minf=512
IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued   : total=r=40000/w=0/d=0, short=r=0/w=0/d=0
```

Run status group 0 (all jobs):

```
  READ: io=4998.2MB, aggrb=164267KB/s, minb=164267KB/s, maxb=164267KB/s,
mint=31157msec, maxt=31157msec
```

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
1	1	4	0	80000	77769	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	1
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X	Replies	Retries	Requests
159921	0	0	0	0

Cache Info:

Attr Hits	Misses	Lkup	Hits	Misses	BioR	Hits	Misses	BioW	Hits	Misses
40006	1	1	1	4	0	0	80000	97	79903	
BioRLHits	Misses	BioD	Hits	Misses	DirE	Hits	Misses	Accs	Hits	Misses
0	0	0	0	0	0	0	0	5	5	1

Write

write 4k

```
write_file: (groupid=0, jobs=1): err= 0: pid=100496: Tue Mar 25 16:37:31 2014
write: io=16000MB, bw=88713KB/s, iops=22178, runt=184685msec
  clat (usec): min=2, max=265284, avg=42.37, stdev=233.67
    lat (usec): min=3, max=265284, avg=42.64, stdev=233.67
  clat percentiles (usec):
    | 1.00th=[   3], 5.00th=[   3], 10.00th=[   3], 20.00th=[   3],
    | 30.00th=[   3], 40.00th=[   3], 50.00th=[   3], 60.00th=[   3],
    | 70.00th=[   3], 80.00th=[   4], 90.00th=[   5], 95.00th=[  390],
    | 99.00th=[  844], 99.50th=[  876], 99.90th=[  940], 99.95th=[  972],
    | 99.99th=[ 1112]
  bw (KB /s): min=   5, max=104576, per=100.00%, avg=88914.43, stdev=7246.62
  lat (usec) : 4=72.10%, 10=21.62%, 20=0.02%, 50=0.01%, 100=0.01%
  lat (usec) : 250=0.01%, 500=1.76%, 750=2.57%, 1000=1.88%
  lat (msec) : 2=0.03%, 4=0.01%, 10=0.01%, 20=0.01%, 50=0.01%
  lat (msec) : 250=0.01%, 500=0.01%
cpu      : usr=5.62%, sys=17.83%, ctx=257355, majf=0, minf=0
IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued   : total=r=0/w=4096000/d=0, short=r=0/w=0/d=0

Run status group 0 (all jobs):
  WRITE: io=16000MB, agrb=88712KB/s, minb=88712KB/s, maxb=88712KB/s, mint=184685msec,
  maxt=184685msec
```

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
177	354	4	0	256169	512152	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	1
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X Replies	Retries	Requests
768875	0	0	0

Cache Info:

Attr Hits	Misses	Lkup Hits	Misses	BioR Hits	Misses	BioW Hits	Misses
7	177	1	4	-256169	256169	36351832	512168
BioRLHits	Misses	BioD Hits	Misses	DirE Hits	Misses	Accs Hits	Misses
0	0	0	0	0	0	5	1

write 8k

write_file: (groupid=0, jobs=1): err= 0: pid=100459: Tue Mar 25 16:23:49 2014

write: io=15998MB, bw=653636KB/s, iops=5107, runt= 25063msec

clat (usec): min=42, max=570520, avg=155.77, stdev=2341.70

lat (usec): min=43, max=570520, avg=156.32, stdev=2341.69

clat percentiles (usec):

| 1.00th=[47], 5.00th=[67], 10.00th=[69], 20.00th=[70],
| 30.00th=[72], 40.00th=[74], 50.00th=[77], 60.00th=[83],
| 70.00th=[88], 80.00th=[91], 90.00th=[96], 95.00th=[108],
| 99.00th=[1224], 99.50th=[1672], 99.90th=[33024], 99.95th=[36096],
| 99.99th=[60160]

bw (KB /s): min= 3567, max=1123072, per=100.00%, avg=659169.77, stdev=173637.66

lat (usec) : 50=1.84%, 100=91.15%, 250=5.04%, 500=0.67%, 750=0.15%

lat (usec) : 1000=0.07%

lat (msec) : 2=0.82%, 4=0.09%, 10=0.04%, 20=0.01%, 50=0.11%

lat (msec) : 100=0.01%, 250=0.01%, 500=0.01%, 750=0.01%

cpu : usr=20.93%, sys=39.72%, ctx=10848, majf=0, minf=0

IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%

issued : total=r=0/w=128000/d=0, short=r=0/w=0/d=0

Run status group 0 (all jobs):

WRITE: io=15998MB, agrb=653636KB/s, minb=653636KB/s, maxb=653636KB/s, mint=25063msec, maxt=25063msec

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
175	350	4	0	172	501112	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	1
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X Replies	Retries	Requests
512394	0	0	0

Cache Info:

Attr Hits	Misses	Lkup Hits	Misses	BioR Hits	Misses	BioW Hits	Misses
7	175	1	4	-172	172	32512275	511725
BioRLHits	Misses	BioD Hits	Misses	DirE Hits	Misses	Accs Hits	Misses
0	0	0	0	0	0	5	1

random write 4k

```
write_file: (groupid=0, jobs=1): err= 0: pid=100461: Tue Mar 25 16:33:41 2014
write: io=4999.1MB, bw=8876.7KB/s, iops=2219, runt=576789msec
  clat (usec): min=4, max=867751, avg=445.48, stdev=3480.16
  lat (usec): min=4, max=867752, avg=445.87, stdev=3480.16
  clat percentiles (usec):
    | 1.00th=[ 25], 5.00th=[ 94], 10.00th=[ 175], 20.00th=[ 255],
    | 30.00th=[ 278], 40.00th=[ 286], 50.00th=[ 290], 60.00th=[ 298],
    | 70.00th=[ 302], 80.00th=[ 422], 90.00th=[ 660], 95.00th=[ 748],
    | 99.00th=[ 3440], 99.50th=[ 9152], 99.90th=[14016], 99.95th=[15168],
    | 99.99th=[70144]
  bw (KB /s): min= 1774, max=44536, per=100.00%, avg=9034.15, stdev=4039.17
  lat (usec) : 10=0.28%, 20=0.45%, 50=1.68%, 100=2.99%, 250=13.64%
  lat (usec) : 500=65.54%, 750=10.34%, 1000=3.86%
  lat (msec) : 2=0.19%, 4=0.12%, 10=0.61%, 20=0.28%, 50=0.01%
  lat (msec) : 100=0.01%, 250=0.01%, 500=0.01%, 750=0.01%, 1000=0.01%
cpu      : usr=1.56%, sys=68.36%, ctx=562411, majf=0, minf=0
IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%
  issued   : total=r=0/w=1280000/d=0, short=r=0/w=0/d=0
```

Run status group 0 (all jobs):

```
WRITE: io=4999.1MB, aggrb=8876KB/s, minb=8876KB/s, maxb=8876KB/s, mint=576789msec,
maxt=576789msec
```

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
54	108	4	0	80052	1209235	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	1
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

Rpc Info:

TimedOut	Invalid X Replies	Retries	Requests
1297806	0	0	0

Cache Info:

Attr Hits	Misses	Lkup Hits	Misses	BioR Hits	Misses	BioW Hits	Misses
7	54	1	4	-80052	80052	10300566	1219434
BioRLHits	Misses	BioD Hits	Misses	DirE Hits	Misses	Accs Hits	Misses
0	0	0	0	0	0	5	1

random write 128k

write_file: (groupid=0, jobs=1): err= 0: pid=100457: Tue Mar 25 16:22:39 2014

write: io=14998MB, bw=629017KB/s, iops=4914, runt= 24416msec

clat (usec): min=45, max=266086, avg=163.43, stdev=1717.21

lat (usec): min=45, max=266087, avg=163.93, stdev=1717.21

clat percentiles (usec):

| 1.00th=[51], 5.00th=[71], 10.00th=[74], 20.00th=[77],
| 30.00th=[79], 40.00th=[80], 50.00th=[82], 60.00th=[85],
| 70.00th=[91], 80.00th=[97], 90.00th=[103], 95.00th=[114],
| 99.00th=[1304], 99.50th=[1688], 99.90th=[33024], 99.95th=[34560],
| 99.99th=[57088]

bw (KB /s): min=366848, max=1145600, per=100.00%, avg=630570.98, stdev=123750.83

lat (usec) : 50=0.58%, 100=84.09%, 250=13.33%, 500=0.37%, 750=0.07%

lat (usec) : 1000=0.03%

lat (msec) : 2=1.16%, 4=0.20%, 10=0.01%, 50=0.13%, 100=0.01%

lat (msec) : 250=0.01%, 500=0.01%

cpu : usr=18.34%, sys=42.84%, ctx=6944, majf=1, minf=0

IO depths : 1=0.1%, 2=0.1%, 4=0.1%, 8=0.1%, 16=100.0%, 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=0.1%, 4=100.0%, 8=0.0%, 16=0.0%, 32=0.0%, 64=0.0%, >=64=0.0%

issued : total=r=0/w=120000/d=0, short=r=0/w=0/d=0

Run status group 0 (all jobs):

WRITE: io=14998MB, agrb=629017KB/s, minb=629017KB/s, maxb=629017KB/s, mint=24416msec, maxt=24416msec

Client Info:

Rpc Counts:

Getattr	Setattr	Lookup	Readlink	Read	Write	Create	Remove
164	328	4	0	161	467559	1	0
Rename	Link	Symlink	Mkdir	Rmdir	Readdir	RdirPlus	Access
0	0	0	0	0	0	0	1
Mknod	Fsstat	Fsinfo	PathConf	Commit			
0	0	0	0	0			

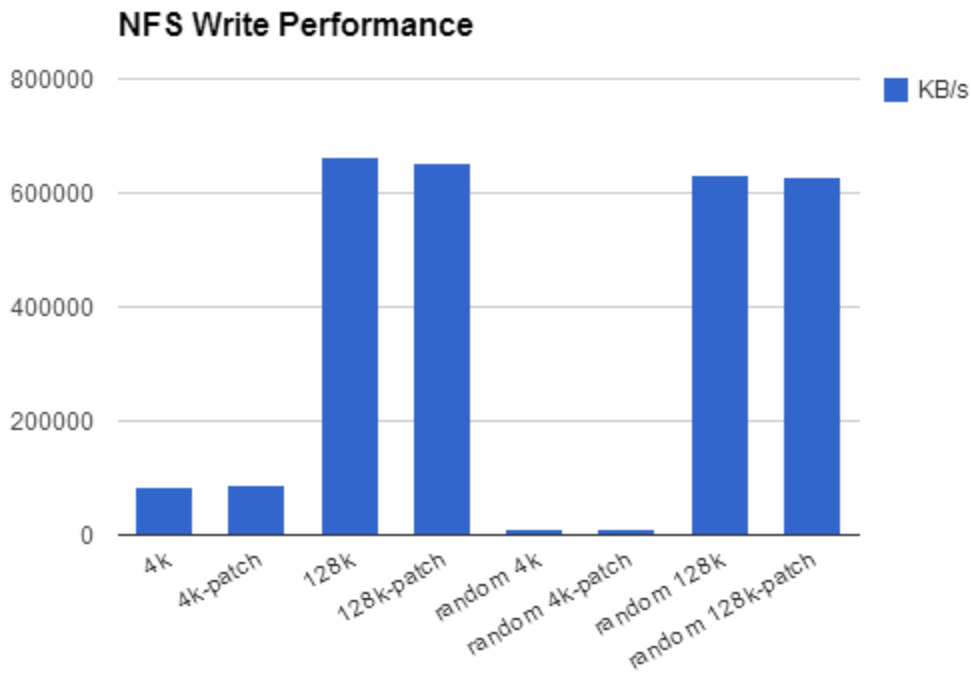
Rpc Info:

TimedOut	Invalid X Replies	Retries	Requests
480291	0	0	0

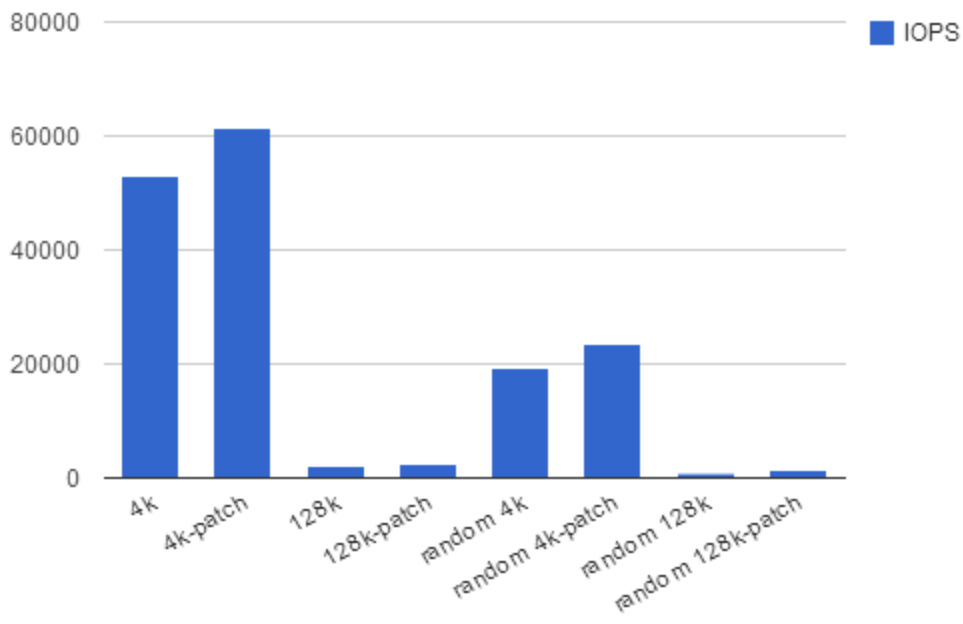
Cache Info:

Attr Hits	Misses	Lkup Hits	Misses	BioR Hits	Misses	BioW Hits	Misses
7	164	1	4	-161	161	30480296	479704
BioRLHits	Misses	BioD Hits	Misses	DirE Hits	Misses	Accs Hits	Misses
0	0	0	0	0	0	5	1

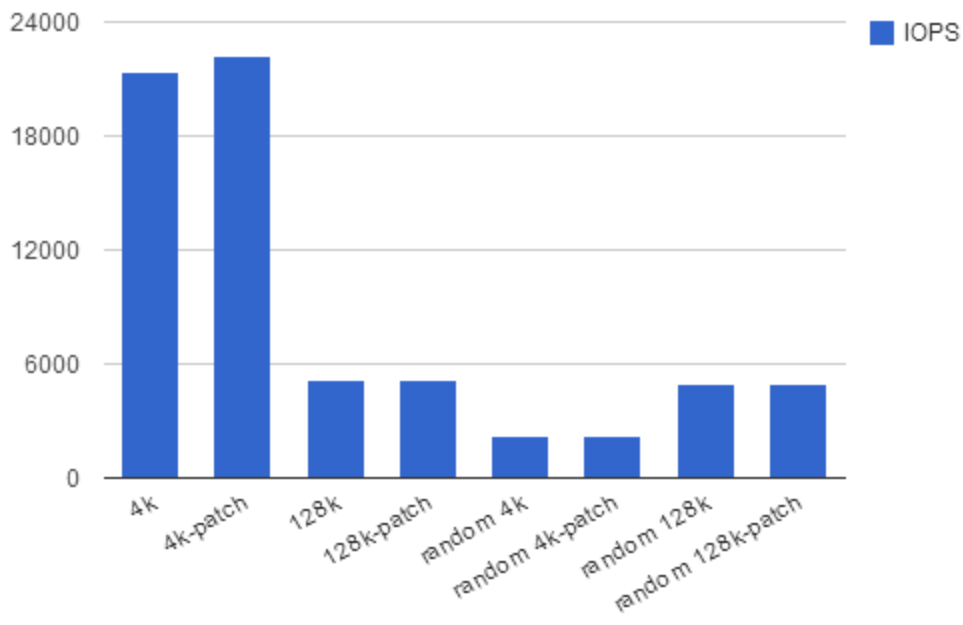
5. Performance of patched and unpatched NFS



NFS Read IOPS



NFS Write IOPS



6. CPU and Memory usage

On Server Side:

Create a file with size 10G Bytes

```
dd if=/dev/zero of=/share/nfstest/file bs=1024k count=10000
```

On Client Side:

Run dd for read for about 4 minutes.

```
while true; do dd if=/nfstest/file of=/dev/null bs=128k; done
```

CPU and Memory usage of nfsd on server(with command **top**.)

Without the patch

```
4695 admin      4  34    0 11892K  1628K CPU6    6   4:30 52.25% nfsd
```

With the patch

```
10548 admin     4  26    0 11892K  1596K rpcsvc 11   3:52 41.99% nfsd
```