数据中心实验报告

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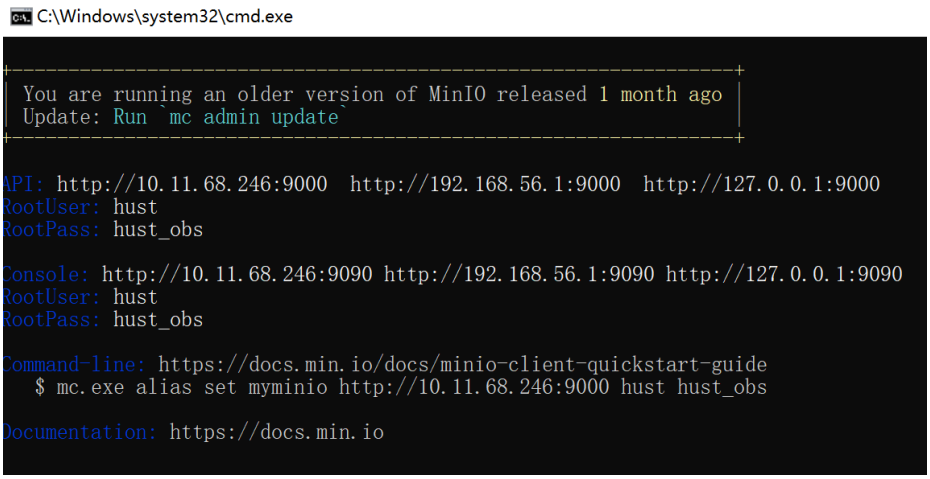
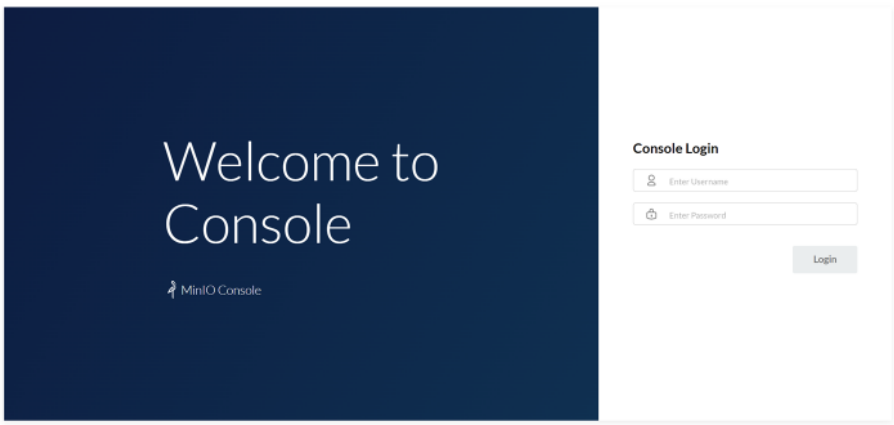
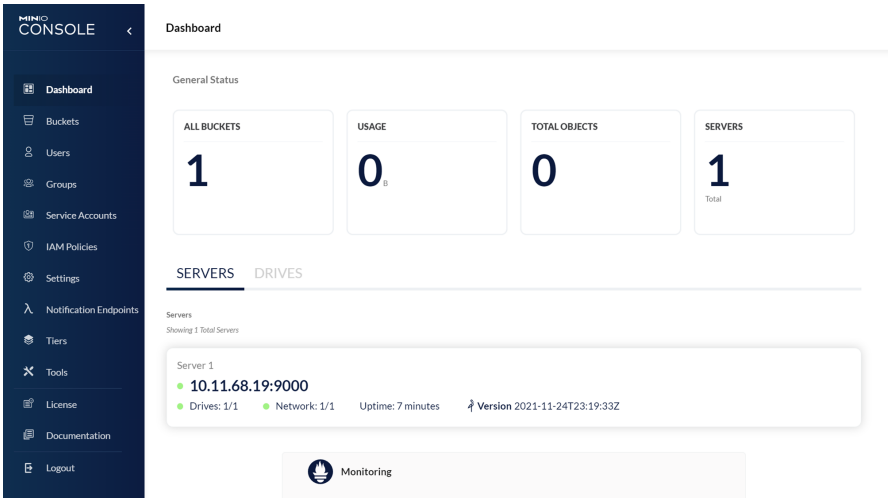
实验一 系统搭建

1. 启动minio



2. 登录网页，创建bucket



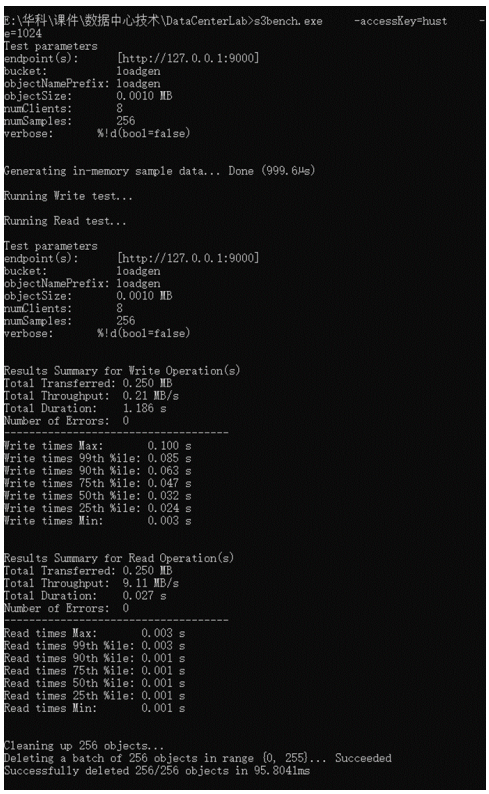


实验二 性能观测

指标：吞吐率Throughput，延迟Latency，以及环境参数：对象尺寸、并发性、服务器数量

1. 初始配置

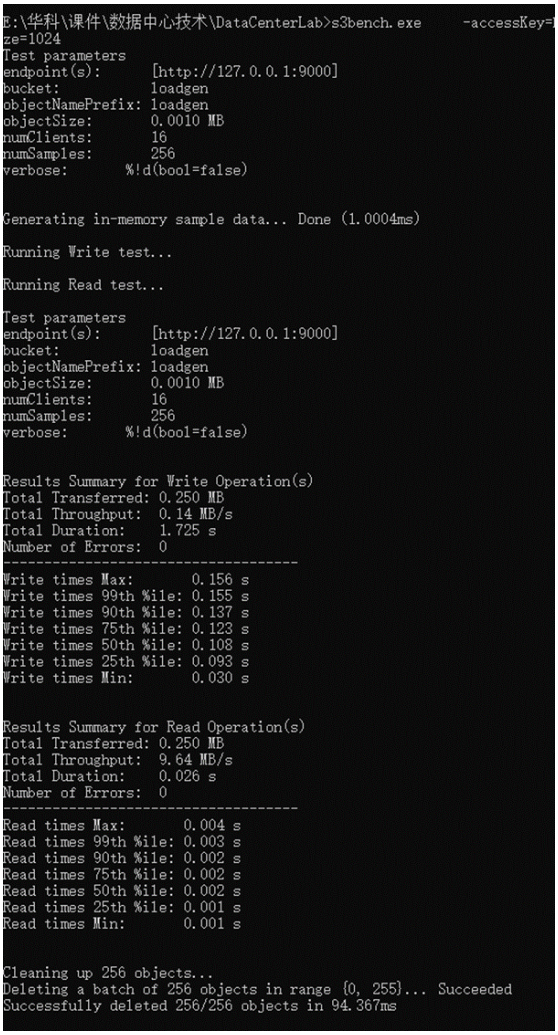
   numClients=8 、numSamples=256 、objectSize=1024



```
E:\华科\课件\数据中心技术\DataCenterLab>s3bench.exe     -accessKey=hust     -
e=1024
Test parameters
endpoint(s):      [http://127.0.0.1:9000]
bucket:           loadgen
objectNamePrefix: loadgen
objectSize:       0.0010 MB
numClients:       8
numSamples:       256
verbose:      %!d(bool=false)


Generating in-memory sample data... Done (999.64µs)

Running Write test...

Running Read test...

Test parameters
endpoint(s):      [http://127.0.0.1:9000]
bucket:           loadgen
objectNamePrefix: loadgen
objectSize:       0.0010 MB
numClients:       8
numSamples:       256
verbose:      %!d(bool=false)


Results Summary for Write Operation(s)
Total Transferred: 0.250 MB
Total Throughput:  0.21 MB/s
Total Duration:    1.186 s
Number of Errors:  0
---------------------------------------
Write times Max:       0.100 s
Write times 99th %ile: 0.085 s
Write times 90th %ile: 0.063 s
Write times 75th %ile: 0.047 s
Write times 50th %ile: 0.032 s
Write times 25th %ile: 0.024 s
Write times Min:       0.003 s


Results Summary for Read Operation(s)
Total Transferred: 0.250 MB
Total Throughput:  9.11 MB/s
Total Duration:    0.027 s
Number of Errors:  0
---------------------------------------
Read times Max:       0.003 s
Read times 99th %ile: 0.003 s
Read times 90th %ile: 0.001 s
Read times 75th %ile: 0.001 s
Read times 50th %ile: 0.001 s
Read times 25th %ile: 0.001 s
Read times Min:       0.001 s


Cleaning up 256 objects...
Deleting a batch of 256 objects in range {0, 255}... Succeeded
Successfully deleted 256/256 objects in 95.8041ms
```

修改负载

2. numClients=16 、numSamples=256 、objectSize=1024



3. numClients=8、numSamples=512、objectSize=1024

```
E:\华科\课件\数据中心技术\DataCenterLab>s3bench.exe     -accessKey=hust
e=1024
Test parameters
endpoint(s):      [http://127.0.0.1:9000]
bucket:           loadgen
objectNamePrefix: loadgen
objectSize:       0.0010 MB
numClients:       8
numSamples:       512
verbose:      %!d(bool=false)


Generating in-memory sample data... Done (1.0002ms)

Running Write test...

Running Read test...

Test parameters
endpoint(s):      [http://127.0.0.1:9000]
bucket:           loadgen
objectNamePrefix: loadgen
objectSize:       0.0010 MB
numClients:       8
numSamples:       512
verbose:      %!d(bool=false)


Results Summary for Write Operation(s)
Total Transferred: 0.500 MB
Total Throughput:  0.18 MB/s
Total Duration:    2.805 s
Number of Errors:  0
------------------------------------
Write times Max:       0.100 s
Write times 99th %ile: 0.086 s
Write times 90th %ile: 0.063 s
Write times 75th %ile: 0.061 s
Write times 50th %ile: 0.046 s
Write times 25th %ile: 0.031 s
Write times Min:       0.004 s


Results Summary for Read Operation(s)
Total Transferred: 0.500 MB
Total Throughput:  9.63 MB/s
Total Duration:    0.052 s
Number of Errors:  0
------------------------------------
Read times Max:       0.002 s
Read times 99th %ile: 0.002 s
Read times 90th %ile: 0.001 s
Read times 75th %ile: 0.001 s
Read times 50th %ile: 0.001 s
Read times 25th %ile: 0.001 s
Read times Min:       0.000 s


Cleaning up 512 objects...
Deleting a batch of 512 objects in range {0, 511}... Succeeded
Successfully deleted 512/512 objects in 196.5917ms
```

4. numClients=8、numSamples=256、objectSize=2048

```
E:\华科\课件\数据中心技术\DataCenterLab>s3bench.exe     -accessKey=h
e=2048
Test parameters
endpoint(s):      [http://127.0.0.1:9000]
bucket:           loadgen
objectNamePrefix: loadgen
objectSize:       0.0020 MB
numClients:       8
numSamples:       256
verbose:      %!d(bool=false)


Generating in-memory sample data... Done (999.8µs)

Running Write test...

Running Read test...

Test parameters
endpoint(s):      [http://127.0.0.1:9000]
bucket:           loadgen
objectNamePrefix: loadgen
objectSize:       0.0020 MB
numClients:       8
numSamples:       256
verbose:      %!d(bool=false)


Results Summary for Write Operation(s)
Total Transferred: 0.500 MB
Total Throughput:  0.39 MB/s
Total Duration:    1.291 s
Number of Errors:  0
------------------------------------
Write times Max:       0.095 s
Write times 99th %ile: 0.094 s
Write times 90th %ile: 0.064 s
Write times 75th %ile: 0.049 s
Write times 50th %ile: 0.032 s
Write times 25th %ile: 0.029 s
Write times Min:       0.004 s


Results Summary for Read Operation(s)
Total Transferred: 0.500 MB
Total Throughput:  18.59 MB/s
Total Duration:    0.027 s
Number of Errors:  0
------------------------------------
Read times Max:       0.002 s
Read times 99th %ile: 0.002 s
Read times 90th %ile: 0.001 s
Read times 75th %ile: 0.001 s
Read times 50th %ile: 0.001 s
Read times 25th %ile: 0.001 s
Read times Min:       0.001 s


Cleaning up 256 objects...
Deleting a batch of 256 objects in range {0, 255}... Succeeded
Successfully deleted 256/256 objects in 99.1872ms
```

5. 总结

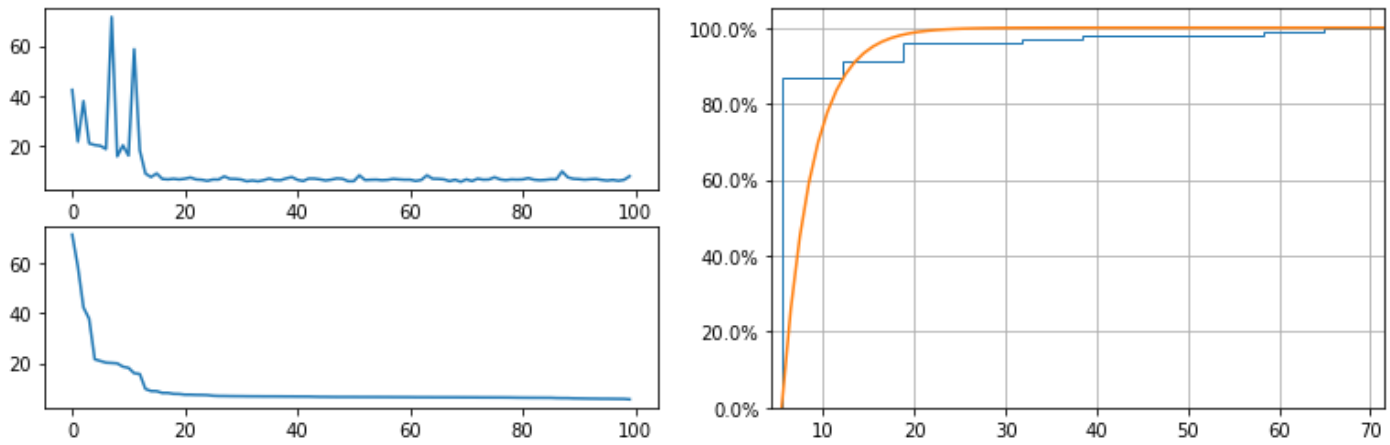
吞吐率Throughput，延迟Latency，以及环境参数：对象尺寸、并发性、服务器数量

numClients	numSamples	objectSize	吞吐率（写）MB/s	总延迟（写）s	吞吐率（读）MB/s	总延迟（读）s
8	256	1024	0.21	1.186	9.11	0.027
16	256	1024	0.14	1.725	9.64	0.026
8	512	1024	0.18	2.805	9.63	0.052
8	256	2048	0.39	1.291	18.59	0.027

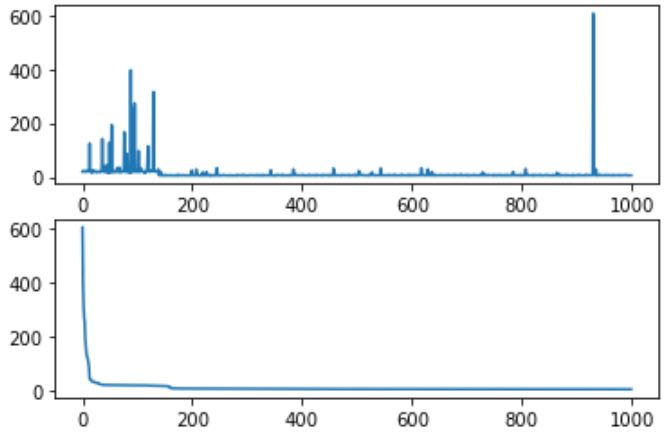
实验三：尾延迟挑战

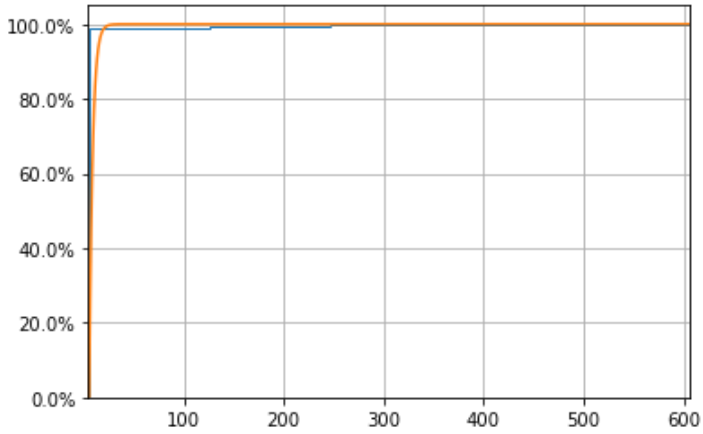
1. 原始尾延迟现象，排队论

队列长度100



队列长度1000





大部分数据都可以在20ms内发送出去，但有少数延迟很高。